Spittal-Peterhead HVDC Subsea Link

Marine Environmental Assessment (MEA)

PREPARED FOR
Scottish and Southern Electricity Networks Transmission (SSENT)

DATE
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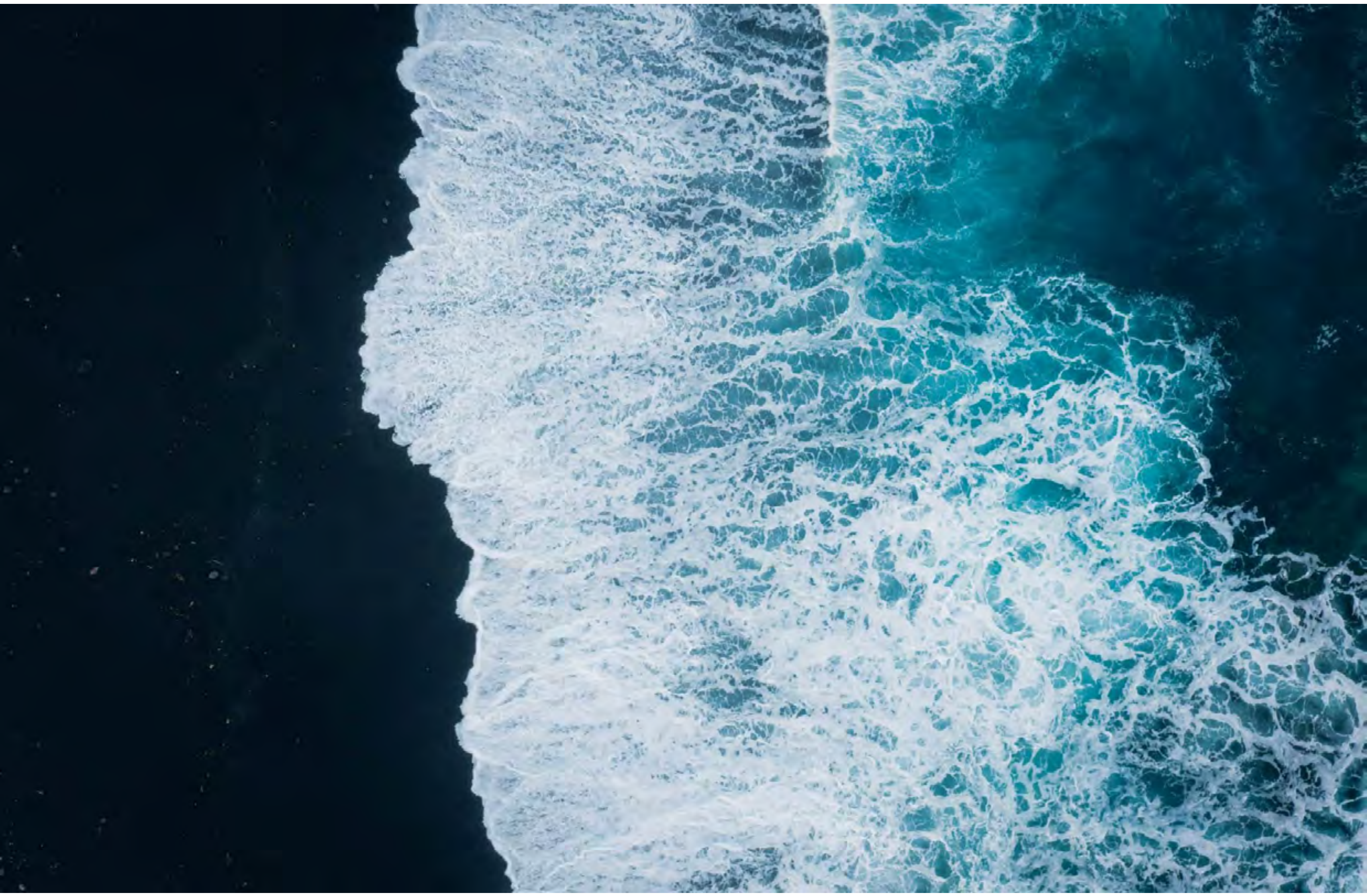

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GLOSSARY

Term	Description
Additional Mitigation	Additional mitigation beyond that of the embedded mitigation is suggested on a receptor specific basis to avoid or minimise likely significant effects.
Allision	An allision is a maritime term that describes when a moving vessel hits a stationary object, such as a bridge, dock, or pier. The term is different from a collision, which is when two moving vessels hit each other.
The Applicant	Scottish Hydro Electric Transmission plc.
Cable Corridor	A 500 m wide corridor (250 m either side of a centreline) where geotechnical and benthic surveys were undertaken. Note that there is a section of the cable corridor wider than 500m near to Rattray Head to provide some route-engineering choices, due to the existing infrastructure constraints.
Converter Station	High voltage converter stations are required to convert DC electricity to AC (and vice versa),
Cumulative Impact	Impacts that result from changes caused by other past, present or reasonably foreseeable actions together with the Project.
Effect	Term used to express the consequence of an impact. The significance of an effect is determined by correlating the magnitude of the impact with the importance, or sensitivity, of the receptor or resource in accordance with defined significance criteria.
Embedded Mitigation	Mitigation measures considered to be incorporated within the Project Design.
Habitats Regulations Appraisal (HRA)	A process which helps determine likely significant effects and (where appropriate) assesses adverse impacts on the integrity of European conservation sites and Ramsar sites. The process consists of up to four stages of assessment: screening, appropriate assessment, assessment of alternative solutions and assessment of imperative reasons of over-riding public interest (IROPI) and compensatory measures.
Impact	An impact is considered to be the change to the baseline as a result of an activity or event related to the Project. Impacts can be both adverse or beneficial impacts on the environment and be either temporary or permanent.
Landfall	The generic term applied to the entire landfall area between Mean Low Water Spring (MLWS) tide and 200 m landwards of Mean High Water Spring (MHWS) tide. The landfall locations are Sinclair's Bay (north) and Rattray Head (south).
Marine Environmental Assessment (MEA)	A statutory process, similar to an Environmental Impact Assessment but less detailed, by which the likely significant effects must be assessed before a formal decision to proceed can be made. It involves the collection and consideration of environmental information, which fulfils the assessment requirements of Part 4 of the Marine (Scotland) Act 2010 to obtain a Marine Licence.
Open Cut Trenching	A method of cable trenching for landfall installtion, involving the excavation of a trench and installation of a cable or duct. The trench is then backfilled or left to infill naturally in areas offshore.

Project Design	A description of the range of possible elements that make up the Spittal to Peterhead HVDC Link project design options under consideration. The Project Design is used to define the parameters considered within the MEA.
Residual Effect	The final assessment of the level of significance, after taking into account both embedded and additional mitigation.
Significance of Effect	The overall risk rating, determined on a receptor specific basis, resulting from a combination of the magnitude of impact and receptor sensitivity.
Spittal to Peterhead HVDC Link Project ('the Project')	The HVDC electricity transmission link between Caithness (Spittal) and Aberdeenshire (Peterhead), collectively known as the Spittal to Peterhead HVDC Link Project (also referred to as the Project).
Substation	The New Spittal 400 kV Substation and New Peterhead 400 kV Substation each comprises a compound containing the electrical components for transforming the power supplied from the Spittal to Peterhead HVDC Link Project, and to adjust the power quality and power factor, as required to meet the UK Grid Code for supply to the National Grid.
Transition Jointing Pit	An underground box, within which the cable will be pulled from the seabed to tie-in to the land cables which will be connected to the switching station.
Realistic Worst-case Parameters	Parameters identified within the Project Design which are expected to result in the 'realistic worst-case scenario' for a receptor based on subject matter expertise.

ABBREVIATIONS

Abbreviation	Description
AAP	Area of Archaeological Potential
AD	Anno Domini (Latin for "in the year of the Lord")
AEZ	Archaeological Exclusion Zone
AIS	Automatic Identification System
ALARP	As Low as Reasonably Practical
BAS	Burial Assessment Study
BLC	Bed Level Change
BP	Before Present
BRAG	Black Red Amber Green
BSL	Benthic Solutions Limited
CBP	Cable Burial Plan
CBRA	Cable Burial Risk Assessment
CEMP	Construction Environmental Management Plan
CES	Crown Estate Scotland
CFLO	Commercial Fisheries Liaison Officer
CGNS	Celtic and Greater North Seas
CHSR	Conservation of Habitats and Species Regulations 2017
CIA	Cumulative Impact Assessment
CIS	Cast Iron Shells
CLV	Cable Lay Vessel
COHSR	The Conservation of Offshore Habitats and Species Regulations 2017
CPA	Closest Point of Approach
CPS	Cable Protection System
CPT	Cone Penetration Test
CRP	Clear Range Procedure
DAS	Distributed Acoustic Sensing
DBA	Desk Based Assessment
DDV	Drop-Down Video
Defra	Department of Environment, Food and Rural Affairs
DfT	Department for Transport
DMR	Dedicated Metallic Return
DNVGL	Det Norske Veritas
DoL	Depth of Lowering

DP	Dynamic Positioning
DTS	Distributed Thermal Sensing
DVV	Dual Van Veen
EEZ	Exclusive Economic Zone
EIA	Environmental Impact Assessment
EMF	Electromagnetic Field
EPS	European Protected Species
ERCoP	Emergency Response Cooperation Plan
ERM	Environmental Resources Management Limited
ESO	Electricity System Operator
ESRP	Emergency Spill Response Plan
EU	European Union
EUNIS	European Nature Information System
FeAST	Feature Activity Sensitivity Tool
FLMAP	Fisheries Liaison Mitigation Action Plan
FSA	Formal Safety Assessment
GES	Good Environmental Status
GNS	Greater North Sea
GT	Gross Tonnes
GW	Gigawatt
HDD	Horizontal Directional Drilling
HES	Historic Environment Scotland
HER	Historic Environment Record
HRA	Habitats Regulations Appraisal
HVDC	High Voltage Direct Current
IALA	International Association of Marine Aids to Navigation and Lighthouse Authorities
IAMMWG	Inter-Agency Marine Mammal Working Group
IBTS	International Bottom Trawl Survey
ICES	International Council for the Exploration of the Sea
ICPC	International Cable Protection Committee
IDP	Initial Decommissioning Plan
IIP	Infrastructure Investment Plan
IMO	International Maritime Organisation
INNS	Invasive Non-Native Species
IUCN	International Union for Conservation of Nature

JNCC	Joint Nature Conservation Committee
KP	Kilometre Point
kV	Kilovolt
kwh	Kilowatt Hour
LAT	Lowest Astronomical Tide
LSE	Likely Significant Effect
MAIB	Marine Accident Investigation Branch
MarESA	Marine Evidence-based Sensitivity Assessment
MARPOL	The International Convention for the Prevention of Pollution from Ships
MBES	Multibeam Echo Sounder
MCA	Maritime and Coastguard Agency
MCAA	Marine and Coastal Access Act
MCZ	Marine Conservation Zone
MD-LOT	Marine Directorate Licensing Operations Team
MEA	Marine Environmental Appraisal
MHWS	Mean High Water Springs
MLA	Marine Licence Application
MLWS	Mean Low Water Springs
MMO	Marine Management Organisation
MMPP	Marine Mammal Protection Plan
MNNS	Marine Non-Native Species
MPA	Marine Protected Area
MPS	Marine Policy Statement
MSFD	Marine Strategy Framework Directive
NBN	National Biodiversity Network
NCMPA	Nature Conservation Marine Protected Area
NID	Nature Inclusive Design
nm	Nautical Miles
NMP	National Marine Plan
NMPi	National Marine Plan Interactive
NPF4	National Planning Framework 4
NRA	Navigation Risk Assessment
NSTA	North Sea Transition Authority
NtM	Notice to Mariners
OCT	Open Cut Trenching

OD	Ordnance Datum
ODN	Ordnance Datum Newlyn
OEM	Original Equipment Manufacturer
OWF	Offshore Wind Farm
PAD	Protocol for Archaeological Discoveries
PAH	Polycyclic Aromatic Hydrocarbon
PDE	Project Design Envelope
PEXA	Practice and Exercise Area
PIZ	Primary Impact Zone
PLGR	Pre-Lay Grapnel Run
PMF	Priority Marine Feature
PSA	Particle Size Analysis
PTS	Permanent Threshold Shift
PU	Polyurethane
PVC	Polyvinyl Chloride
RCP	Representative Concentration Pathway
RNLI	Royal National Lifeboat Institution
ROV	Remote Operated Vehicle
RPL	Route Position List
RSL	Relative Sea Level
RYA	Royal Yachting Association
SAC	Special Area of Conservation
SAR	Search and Rescue
SBI	Sub-Bottom Imagery
SBP	Sub-Bottom Profiler
SCOS	Special Committee on Seals
SFF	Scottish Fisherman’s Federation
SIRA	Simplified Risk Assessment
SIZ	Secondary Impact Zone
SMP	Seabird Monitoring Programme
SMS	Safety Management System
SMU	Seal Management Unit
SMWWC	Scottish Marine Wildlife Watching Code
SOLAS	Safety of Life at Sea
SOPEP	Shipboard Oil Pollution Emergency Plans
SPA	Special Protection Area

SPP	Scottish Planning Policy
SSC	Suspended Sediment Concentration
SSENT	Scottish and Southern Electricity Networks Transmission
SSS	Sidescan Sonar
SSSI	Site of Special Scientific Interest
SWFPA	Scottish White Fish Producers Association
TBT	Tributyltin
TO	Transmission Owner
TTD	Target Trench Depth
TTS	Temporary Threshold Shift
UKCS	UK Continental Shelf
UKHO	UK Hydrographic Office
USBL	Ultra-short Baseline
UXO	Unexploded Ordnance
VC	Vibrocore
VMS	Vessel Monitoring System
WFD	Water Framework Directive
WeBS	Wetland Bird Survey
WSI	Written Scheme of Investigation
WROV	Work Class Remote Operated Vehicle
XLPE	Cross-Linked Polyethylene

1. INTRODUCTION

Scottish and Southern Electricity Networks Transmission (SSENT, 'The Applicant') is the trading name for Scottish Hydro Electric Transmission plc, part of the SSE plc Group. SSENT is the licensed electricity Transmission Owner (TO) in the north of Scotland and is responsible for the electricity transmission network in this region. SSENT owns and operates >5,000 km of high voltage underground cables, overhead lines, and subsea cables, that provide electricity to people across northern Scotland.

Under the guidance provided by the Marine (Scotland) Act 2010, SSENT is submitting a Marine Licence Application (MLA) to the Marine Directorate Licensing Operations Team (MD-LOT) for the installation and operation of a 525 kilovolt (kV) High Voltage Direct Current (HVDC) transmission cable system between Spittal and Peterhead (**Figure 1-1**) of which the marine route spans approximately 172 kilometres (km) in length, and is hereby known as 'the Project'.

Under Part 4 of the Marine (Scotland) Act 2010, subsea cable projects require a Marine Licence prior to installation in Scottish Territorial Waters (within 12 nautical miles (nm)), however, as such projects are not listed on Schedule 1 or Schedule 2 of the Marine Works (Environmental Impact Assessment) (Scotland) Regulations 2017 (as amended), a formal Environmental Impact Assessment (EIA) is not required to be submitted as part of the Marine Licence Application (MLA). Subsea cables installed outside of Scottish Territorial Waters (beyond 12 nm) are exempt from Marine Licence requirement, however, a Marine Licence is required for any seabed deposits associated with the cable.

Current guidance from MD-LOT states that: "*Applicants for Marine Licences for submarine cables should consider the scale and nature of their projects and give consideration to the need for a proportionate environmental assessment*."

This report represents the proportionate environmental assessment in support of the MLA by outlining the current physical, biological, and human environment within the vicinity of the Project, and by conducting a Marine Environmental Assessment (MEA), a Habitats Regulations Appraisal (HRA), a Nature Conservation Marine Protected Area (NCMPA) Assessment, and a Cumulative Impact Assessment (CIA). The methods of the aforementioned assessments reflect those of a formal EIA process, however the level of detail is proportionate to the requirements of the MLA under Part 4 of the Marine (Scotland) Act 2010.

1.1 PROJECT NEED AND BACKGROUND

SSENT is the licensed electricity Transmission Owner in the north of Scotland, owning a >5,000 km network of high voltage underground cables, subsea cables and overhead lines, that provides electricity across northern Scotland, and connects northern Scotland to central and southern Scotland and the rest of Great Britain.

As part of the UK and Scotland Governments' 2030 net zero energy targets, the recent increase in renewable power generation across the north of Scotland has significantly increased demand on the transmission infrastructure across the country, and its ability to accommodate new connections, predominantly from the offshore wind market, and transfer this generation to demand centres. The Electricity System Operator's (ESO) Pathway to 2030

Holistic Network Design (HND) has identified the necessary transmission network reinforcements required to facilitate this increase in generation, further confirmed through the recent National Grid Network Options Assessment (NOA) refresh and HND publications. These strategic reinforcements include a high voltage direct current (HVDC) link from Spittal in Caithness to Peterhead. This link will enable the efficient, high volume, power transmission, from generators in the far north of Scotland to the network at Peterhead, for further transmission to demand centres, as appropriate.

Through this process, SSENT is looking to develop a HVDC electricity transmission link between Caithness (Spittal) and Aberdeenshire (Peterhead), collectively known as the Spittal to Peterhead HVDC Link Project.

In order to support the continued growth in onshore and offshore renewables across the north of Scotland, supporting the country's drive towards Net Zero, investment in network infrastructure is needed to connect this renewable power and transport it from source to areas of demand across the country.

The project proposal for the 2 gigawatt (GW) bi-pole, 525 kV high voltage direct current (HVDC) link will consist of:

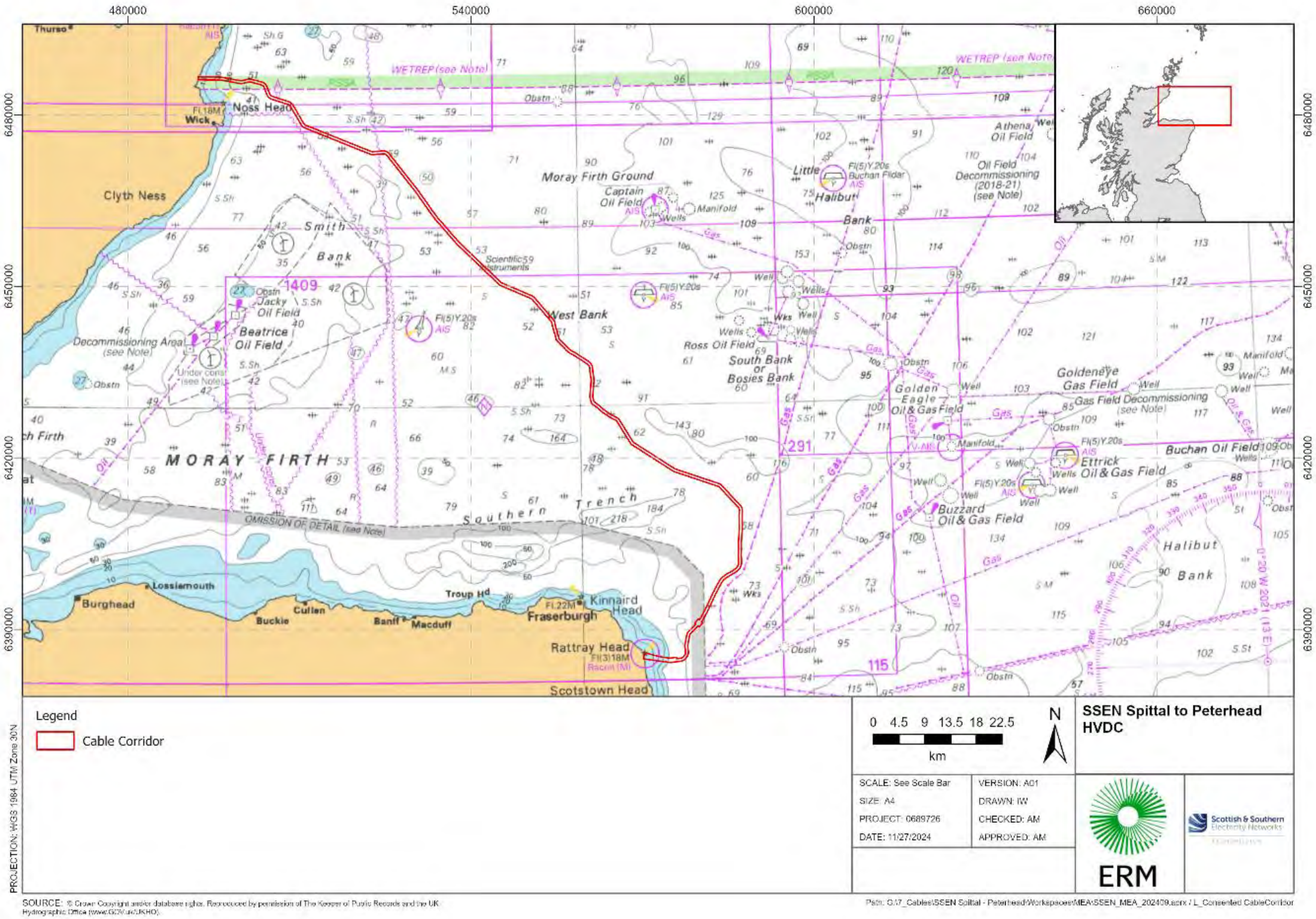
- A HVDC link, including approximately 172 km of subsea cable[1];
- A new HVDC Converter Station at Spittal; and
- A new HVDC Converter Station at Peterhead.

To ensure efficiency when connecting into the existing transmission network, the sites of the new HVDC converter stations will be located within close proximity to:

- New Spittal 400 kV Substation; and
- New Peterhead 400 kV Substation.

[1] Note that the Route Position List (RPL) for the Project is 167 km and covers the length of cable deposited on the seafloor between the two HDD exit points. However, the length of cable covering the entire route from marine high water springs (MHWS) to MHWS at both landfall locations is approximately 172 km.

FIGURE 1-1: SPITTAL TO PETERHEAD CABLE INSTALLATION CORRIDOR LOCATION



2. PLANNING POLICY AND LEGISLATIVE FRAMEWORK

This section describes the legislation and policies which regulate the consenting, construction, operation and decommissioning of the Project. It is intended to place the works in the wider context of national plans and polices, as well as providing comment on how the proposed works comply with relevant policies in the Scottish Marine Plan, and key nature conservation legislation and directives, including the Water Framework Directive (WFD) and HRA.

2.1 MARINE CONSENTING LEGISLATION

2.1.1 MARINE (SCOTLAND) ACT 2010

Part 4 of the Marine (Scotland) Act sets out the requirements for Marine Licences within Scottish Territorial Waters (0 to 12 nm). Cable sections outside Scottish Territorial Waters are exempt, although a Marine Licence is required for any deposits placed on the seabed to protect the cable. Two Marine Licence applications will need to be submitted for the Project - one for the cable installation and seabed deposits within the 12 nm limit, the other for seabed deposits only outside the 12 nm limit.

Section 21 describes the licensable marine activities, which require a Marine Licence submission to MD-LOT and consideration by Scottish Ministers. In line with Section 21, a Marine Licence is required for the Project as an activity "*to construct, alter or improve any works within the Scottish marine area either in or over the sea, or on or under the seabed*".

2.1.2 MARINE AND COASTAL ACCESS ACT 2009

Part 4 of the Marine and Coastal Access Act sets out the requirements for Marine Licences between 12 nm and the boundary of the Scottish Exclusive Economic Zone (EEZ) (200 nm).

Section 66 (1) sets out that a Marine Licence is required for the installation of a subsea cable or cable protection within 12 nm.

Section 81(1) outlines that any activity conducted in laying or maintaining an offshore cable, as defined in Section 81(4) as being beyond the seaward limits of the territorial sea (12 nm), is exempt from licensing under Section 81(5). The exemption to marine licensing outside of 12 nm, is due to the Marine and Coastal Access Act including provisions to ensure that the rights to lay subsea cables, under UNCLOS, are maintained within the marine licensing regime.

Section 81 has the effect that, if part of an exempt cable is within 12 nm, but part of the cable is outwith 12 nm, a marine licence is needed, but only in relation to the laying (and not the maintaining) of the part of the cable that is within 12 nm. This MEA report presents an overview of the baseline environment, and provides an environmental assessment to support a Marine Licence application to MD-LOT through consideration of the potential effects of the Project on the marine environment.

2.2 MARINE PLANNING FRAMEWORK

2.2.1 UK MARINE POLICY STATEMENT

The UK Marine Policy Statement (MPS) (Department of Environment, Food and Rural Affairs (Defra), 2011) applies to all UK waters and has been adopted by the UK Government, the Scottish Government, the Welsh Assembly Government and the Northern Ireland Executive. The function of the MPS is to provide the framework for preparing Marine Plans and taking decisions affecting the marine environment. All national and regional marine plans must be in conformity with the MPS, unless relevant considerations indicate otherwise.

The objectives of the MPS are to:

- Promote sustainable economic development;
- Enable the UK's move towards a low-carbon economy, in order to mitigate the causes of climate change and ocean acidification and adapt to their effects;
- Ensure a sustainable marine environment which promotes healthy, functioning marine ecosystems and protects marine habitats, species and our heritage assets; and
- Contribute to the societal benefits of the marine area, including the sustainable use of marine resources to address local social and economic issues.

2.2.2 SCOTTISH NATIONAL MARINE PLAN

The Scottish National Marine Plan (NMP) (Marine Scotland, 2015) establishes policies and objectives to enable the sustainable development and management of Scotland's marine resources, in both Scottish inshore (out to 12 nm) and offshore waters (12 to 200 nm). The NMP details 21 general policies that are applicable to all future developments and uses within Scottish waters. The key policies relevant to this Project include, but are not limited to, the key topic areas of the MEA. These general policies are supplemented by sector-specific policies, enabling policies, and objectives to be targeted at particular industries. With regards to this Project, the most relevant sectoral policy sections are set out in **Sections 2.2.3 – 2.2.5** below.

Currently, the Scottish National Marine Plan 2 is in consultation and, consequently, has not been considered further in this report.

2.2.3 SEA FISHERIES

The Sea Fisheries chapter of the NMP (Marine Scotland, 2015) details five marine planning policies that should be considered when developing within the vicinity of areas utilised for fishing purposes. Of these five, three are relevant to this Project. These are: Fisheries 1, Fisheries 2 and Fisheries 3.

2.2.4 SHIPPING PORTS, HARBOURS AND FERRIES

The Shipping, Ports, Harbours and Ferries chapter of the NMP (Marine Scotland, 2015) details seven marine planning policies that should be considered when considering developments. Of these, two are relevant to cable installation activities of this Project. These are Transport 1 and Transport 3.

2.2.5 SUBMARINE CABLES

The Submarine Cables chapter of the NMP (Marine Scotland, 2015) details four marine planning policies that should be considered when considering cable developments. All four policies are relevant to cable installation activities of this Project.

The policy objectives for this sector are as follows:

- Protect submarine cables whilst achieving successful seabed user co-existence;
- Achieve the highest possible quality and safety standards and reduce risks to all seabed users and the marine environment;
- Support the development of a Digital Fibre Network, connecting Scotland's rural and island communities and contributing to world class connectivity across Scotland;
- Safeguard and promote the global communications network; and
- Support the generation, distribution and optimisation of electricity from traditional and renewable sources to Scotland, UK and beyond.

2.2.6 SCOTTISH MARINE REGIONS

After multiple years of public consultation and specialist studies establishing the support for, and potential areas of, marine regions in Scottish waters, the Scottish Marine Regions Order 2015 came into force on 13 May 2015. This details the boundaries of the final 11 Scottish marine regions (Scottish Government, 2015). The Project is within the Moray Firth Marine Region. Within these marine regions, Regional Marine Plans will be developed by Marine Planning Partnerships. These partnerships are comprised of groups of local marine stakeholders, allowing for more focused decision making by the local community to target the issues specific to each marine region. The relevant Moray Firth Regional Marine Plan has not yet been published. In this case, where no Regional Marine Plan is in place, the National Marine Plan 2015 applies.

2.3 NATIONAL PLANNING FRAMEWORK

National Planning Framework 4 (NPF4) was adopted by the Scottish Government on 13 February 2023 and sets out the national spatial strategy for Scotland to 2045. NPF4 sets out Scotland’s spatial principles, regional priorities, national developments, and national planning policy. NPF4 replaces the previous NPF3 and Scottish Planning Policy (SPP) documents.

The Infrastructure Investment Plan (IIP), that forms part of NFP4, highlights that national planning policies will include an infrastructure first approach. The NPF4 strategy, policies and national developments are aligned to the strategic themes of the IIP. These aim to enable the transition to net zero emissions and environmental sustainability; driving inclusive economic growth; and building resilient and sustainable places.

The NPF4 has a 'plan-led approach', which is central to supporting the delivery of Scotland's national outcomes and broader sustainable development goals. It is a legislative requirement that planning decisions must be made in accordance with NPF4, unless material considerations indicate otherwise.

2.4 NATURE CONSERVATION LEGISLATION

2.4.1 HABITATS REGULATIONS APPRAISAL (HRA)

Regulation 63(1) of The Conservation of Habitats and Species Regulations 2017 (CHSR) (UK Government, 2017a), and Regulation 28 (1) of The Conservation of Offshore Habitats and Species Regulations 2017 (COHSR) (UK Government, 2017b) (collectively referred to as the 'Habitats Regulations') require that any plan or project which is likely to have a significant effect on a European site (either alone or in combination with other plans or projects), and is not directly connected with or necessary to the management of that site, be subject to an appropriate assessment. The first part of the HRA process involves undertaking an initial screening exercise to identify whether there are likely significant effects in order to establish whether an appropriate assessment is necessary.. This is to ensure protection of European Sites, including Special Areas of Conservation (SAC), Special Protection Areas (SPA) and Ramsar sites. The effects on these are considered in **APPENDIX A: Habitats Regulations Appraisal** and **APPENDIX B: Nature Conservation Marine Protected Area Assessment.**

2.4.2 MARINE PROTECTED AREAS

Scottish Marine Protected Areas (MPAs) are marine areas which are designated for nature conservation, protection of biodiversity, demonstrating sustainable management, protecting national heritage (Nature Conservation MPAs), testing novel approaches to marine management (Demonstration and Research MPAs), or historic and cultural artefacts (HistoricMPAs). The Nature Conservation MPA network consists of 36 MPAs: 23 MPAs under the Marine (Scotland) Act 2010 in Scottish Territorial Waters, and 13 MPAs under the Marine and Coastal Access Act 2009. The effects on these are considered in the biological section of this MEA and supported by **APPENDIX B: Nature Conservation Marine Protected Area Assessment**.

2.4.3 SITES OF SPECIAL SCIENTIFIC INTEREST

Sites of Special Scientific Interest (SSSIs) are areas of land that have been scientifically identified as being of the highest degree of conservation value. In Scotland, SSSIs were first designated under the National Parks and Access to the Countryside Act 1949 (UK Government, 1949) and are now designated under the Nature Conservation (Scotland)

Act 2004 (Scottish Government, 2004). The effects on these are considered in in the biological section of this MEA and supported by **APPENDIX B: Nature Conservation Marine Protected Area Assessment**.

2.4.4 WATER FRAMEWORK DIRECTIVE

The European Union (EU) WFD (2000/60/EC) was established in the year 2000. In Scotland, this is implemented by The Water Environment (Controlled Activities) (Scotland) Regulations 2011 (Scottish Government, 2011a). The objective of the Water Framework Directive is to have good quality water bodies, which includes inland waters, estuaries and the marine environment to 1 nm out to sea. These are assessed based on the biological, hydro-morphological and chemical environments of the water body. A WFD Assessment has been undertaken in **APPENDIX C: Water Framework Directive Compliance Assessment**, to consider the predicted effects at the cable landfall locations.

2.4.5 MARINE STRATEGY FRAMEWORK DIRECTIVE

The European Marine Strategy Framework Directive (MSFD) (2008/56/EC) was transposed into UK legislation on 15 July 2010 (UK Government, 2010). The Directive requires Member States to prepare national strategies to manage their seas to achieve Good Environmental Status (GES) by 2020. The MSFD applies to waters beyond 1 nm, and has been implemented in the UK by the Marine Strategy Regulations 2010 (UK Government, 2010).

Broadly, GES for the marine environment (Defra, 2014) means that marine waters are:

- Ecologically diverse;
- Clean, healthy and productive; and
- Used sustainably, so that the needs of current and future generations are safeguarded.

Annex I of the MSFD lists 11 high level descriptors of GES (Defra, 2014). These relate to:

- Biological diversity;
- Non-indigenous species;
- Commercially exploited fish and shellfish;
- Food webs;
- Human induced eutrophication;
- Sea floor integrity;
- Hydrographical conditions;
- Contaminants;
- Contaminants in fish and other seafood;
- Marine litter; and
- Introduction of energy (including underwater noise).

The above descriptors have been considered, within this MEA, to determine whether the Project is likely to affect the achievement of GES.

2.5 ADDITIONAL LEGISLATION AND POLICY

There is legislation which concerns specific receptors or topic areas, such as legislation relating specifically to commercial fisheries or safety and navigation. Legislation for these topic areas, and legislation relevant to assessing potential environmental impacts, is referred to in individual chapters of this MEA.

3. STAKEHOLDER ENGAGEMENT

3.1 INTRODUCTION

Consultation has been a key element in the development of the proposals and plan for the Project. This section provides a summary of the consultation undertaken during the development of the Project, and consultation relevant to the content of the Marine Environmental Assessment (MEA) (this document).

3.2 APPROACH TO CONSULTATION

Consultation has been undertaken with statutory consultees, stakeholders and the public during key stages of the Project. Consultation, including advice on additional studies required to inform the Marine Licence application, has had the following aims:

- To provide statutory and non-statutory consultees, as well as local communities and other stakeholders, with the opportunity to inform the development of the Project and the final design submitted as part of the Marine Licence application;
- To provide statutory consultees with the opportunity to provide comment on specialist studies commissioned to inform the MEA; and
- To provide statutory consultees with the opportunity to comment on the proposed approach to, and scope of the MEA.

NatureScot and the Joint Nature Conservation Committee (JNCC) were also provided the report to inform additional studies, with both consultees providing feedback to inform the basis of this MEA.

3.3 CONSULTATION ON THE CONTENT OF THE MEA

Whilst standalone submarine cables projects are not listed as EIA projects under Schedule 1 or 2 of The Marine Works (Environmental Impact Assessment) (Scotland) Regulations 2017 (as amended), the Scottish Ministers guidance requires an application for a Marine Licence to be accompanied by an assessment of the environmental effects, detailing the assessments carried out - in this case termed an MEA (this document). A Report to Identify Additional Studies has been produced, and consulted on with MD-LOT, on the proposed content of this MEA. This is similar to EIA projects, to ensure the required information is considered during the pre-application process.

3.4 PUBLIC CONSULTATION

A series of five initial public consultations was held between May and June 2023, and a second series of seven events was held in September 2024. These consultations took place at either end of the cable corridor, with events in both Caithness and Aberdeenshire. A summary of consultations undertaken, to date, is provided in **Table 3-1** below.

TABLE 3-1: SSENT CONSULTATION EVENTS

Consultation Event Location	Date
Dalrymple Hall, Fraserburgh	22 May 2023
St Fergus Village Hall	23 May 2023
Wick Village Hall	30 May 2023
Watten	31 May 23
Peterhead	01 June 2023
Dalrimple Hall, Fraserburgh	03 September 2024
St Fergus Village Hall	04 September 2024
Longside Parish Church Hall	05 September 2024
Keiss Village Hall	09 September 2024
Norseman Hotel, Wick	10 September 2024
Watten Village Hall	11 September 2024
Spittal Village Hall	11 September 2024

3.5 CONSULTATION DURING PROJECT DEVELOPMENT

SSEN Transmission provided targeted information to, and consulted with, a number of organisations throughout the project development process. A list of organisations that were provided information, and/or consulted with, is set out below.

Organisations in bold are those that further correspondence was received from, and/or that were engaged in additional meetings:

- **Ayre Offshore Wind Farm**;
- **BP**;
- **Broadshore Offshore Wind Farm**;
- **BT**;
- **Buchan Offshore Wind Farm**;
- **Commissioners of the Northern Lighthouse Board**;
- **Green Volt**;
- **Caledonia Offshore Wind Farm**;
- **Crown Estate Scotland**;
- East Grampian Coastal Partnership;
- Fraserburgh Harbour;
- **JNCC**;
- **Marine Directorate Licensing and Operations Team**;
- **Maritime and Coastguard Agency**;

- **Marram OWF**;
- Ministry of Defence / **Defence Infrastructure Organisation**;
- Moray Firth Coastal Partnership;
- **Muir Mhor Offshore Wind Farm**;
- **Nature.Scot**;
- **NSMP**;
- **Peterhead Developer's Forum**;
- **PX Ltd**;
- **The Royal Society for the Protection of Birds (RSPB)**;
- **Sage North Sea**;
- **Scottish Fisherman's Federation (SFF) and associated bodies**;
- **SHEFA**;
- **Shell**;
- Scottish Environment Protection Agency (SEPA);
- **Subsea7**;
- Wick Harbour Authority.

3.6 MEETINGS HELD

A number of meetings were held with key consultees and primary advisors throughout the project development process. These are outlined in **Table 3-2**.

Additionally, the Project has engaged regularly with other developers in the region. The Project is a member of the Peterhead Developer's Forum, which is comprised of offshore wind energy developers in the Peterhead area, and which meets regularly. The Project has also engaged with individual offshore wind energy projects, including the Ayre, Broadshore, Buchan, Caledonia, Marram, and Muir Mhor offshore wind projects. Notably, the Project's environmental team has worked collaboratively with counterparts at Buchan Offshore Wind to share information and understanding of key environmental features and constraints in the region of Rattray Head.

Finally, the Project has engaged with other operators whose assets (or out of service assets) the subsea cable will cross within the proposed cable corridor. These include SHEFA, BT, Subsea7, and the SSEN Transmission Shetland HVDC subsea cable. Further details of crossing arrangements are set out in **Section 5.7.3**.

TABLE 3-2: CONSULTATION WITH KEY CONSULTEES AND PRIMARY ADVISORS

Organisation	Date	Topics discussed	Outcome
Marine Directorate Licensing and Operations Team	17/04/2023	General SSENT portfolio review. MDLOT was provided an update on project progress and future licence submissions.	No project-specific outcomes.
Marine Directorate Licensing and Operations Team	08/06/2023	SSENT provided an update on project progress in advance of preliminary public consultations. Potential landfalls and cable corridors were discussed, as were submission and determination timelines for survey EPS and Basking Shark Licence Applications.	SSENT submitted redacted versions of EPS and Basking Shark Licence applications in order to expedite determination time frames.
JNCC	13/07/2023	SSENT provided an update on the Project need, programme, landfall and corridor development, and marine survey activities. JNCC requested that SSENT minimise rock placement along the subsea cable corridor.	SSENT has used minimisation of rock placement as a criterion for subsea cable corridor routing.
Scottish Fishermen's Federation	25/08/2023	SSENT provided an update on the project and survey activities and presented the proposed cable corridor options. Fisheries organisations provided commentary on potential impacts of the activity, and mitigations that could be put in place. Concerns about the volume of work ongoing in the area and cumulative impacts of multiple developments were raised.	SSENT agreed to communicate regularly with fisheries organisations, and to provide adequate notification of the works. SSENT also agreed to consider timing of other developers' works when planning marine activities.
RSPB	20/09/2023	SSENT provided an overview of the project to the Grampian Sites Manager, as well as details of plans for forthcoming marine survey activity. Consent was requested to undertake nearshore survey activities in association with a Crown Estate Scotland Small Works Licence.	SSENT provided further details to RSPB with respect to landfall areas, and a summary of ongoing terrestrial environmental work. RSPB confirmed by email that they were happy for survey activities to go ahead as no disturbance to the features of the SPA was anticipated.
Scottish Fishermen's Federation	05/09/2024	SSENT provided an update on the project and discussed forthcoming marine licence application. Fisheries organisations noted that Fraserburgh is an extremely busy fishing port. Further discussion included crossing methodologies, operational survey frequency, and decommissioning.	SSENT agreed to provide regular updates to fisheries organisations and to provide adequate notification to fishers of the works. SSENT agreed to consider whether it would be possible to make shapefiles or plotter files available for download on project websites.

Marine Directorate Licensing and Operations Team and Crown Estate Scotland	08/10/2024	SSENT provided an update on the project and the contents of the MEA, including the HRA and MPA assessments. Staged discharge of the marine licence was discussed.	SSENT may request staged discharge of the marine licence, provided that the request is made clear in the marine licence application and associated materials.
Nature.Scot	10/10/2024	SSENT provided an update on the project and discussed the consenting strategy, content of the MEA, including the HRA and MPA assessments.	Nature.Scot provided advice on HRA and MPA assessment. Advice has been incorporated into this MEA. The MEA also details additional survey works undertaken on *Sabellaria spinulosa* reef area, and outcomes are incorporated into MEA assessment.
JNCC	11/10/2024	SSENT provided an update on the project and the content of the MEA, including the HRA and MPA assessments, was discussed. A discretionary advice request was made to JNCC who responded with comments via email. JNCC requested that the geophysical survey reporting and Cable Risk Burial Assessment (CBRA) be appended to the MEA, if possible. JNCC noted that their ornithologists had reviewed the HRA and that no additional impacts required adding. JNCC also provided additional documentation for SSENT to review.	The CBRA has been appended to the Marine Environmental Assessment (**APPENDIX I**:. Geophysical survey reporting can be made available to relevant consultees on request. The additional documentation provided has been reviewed and incorporated into the MEA.

4. ROUTE SELECTION AND ALTERNATIVES CONSIDERED

4.1 OBJECTIVES

The main objective of route development is to engineer the shortest possible route between the landfalls, in order to minimise cable length, and determine preferred landfall locations. However, there are several criteria that may result in deviations from the shortest route. These criteria are related to environmental conditions; obstruction avoidance; protected areas and third-party installations, activities and exclusion zones; as well as safe cable installation and operational criteria. Costing and risk mitigation are also of high importance. The most important criteria for evaluation of the detailed route are to:

- Minimise total cable length, as far as possible;
- Reduce environmental impact;
- Prioritise burial of cable beneath seabed;
- Reduce/avoid impact and conflict with other human activities;
- Reduce/avoid impact from environmental hazards; and
- Minimise cost.

4.2 ASSESSMENT METHODOLOGY

The objectives of the potential landfall and subsea cable corridor assessments were to identify a preferred subsea cable corridor for the HVDC link from Spittal to Peterhead.

The methodology for both assessments was based on key principles that aligned with SSENT's requirements for the subsea cable corridor. These key principles include:

- Significant engineering factors that may affect cable laying feasibility, maintaining burial depth and cost effectiveness have been considered, as much as possible, at this stage of the process. This is to ensure the constructability of the subsea cable corridor;
- Mitigation of interactions with designated sites and sensitive habitats, primarily via avoidance, or, where this is not possible, minimise interactions e.g. following the mitigation hierarchy; and
- Minimising disruption to other users of the sea including commercial fisheries, recreation, other infrastructure and navigation.

To support the delivery of these key principles, detailed technical assessments were undertaken:

- Evaluation of physical data - bathymetry (depth and slope), geology (suitable substrates, exposed bedrock, boulders etc.) and topography (onshore to offshore elevation changes and suitability for onshore compounds);
- Evaluation of environmental constraints – protected areas, sensitive habitats, benthic species, fish and shellfish spawning and nursery etc.; and
- Evaluation of other users – shipping activity, commercial fisheries, other infrastructure (Offshore Wind Farms (OWF), anchorages, subsea cables and pipelines).

Potential constraints for each landfall and corridor were reviewed against a set of criteria defining the level of risk each posed to the project. Based on these criteria, each constraint was assigned a Black, Red, Amber, or Green (BRAG) rating (BRAG Assessment). The assignment of risk against these BRAG criteria was informed by specialist technical input, including geotechnical, geophysical, environmental and consenting topic areas. Feedback from each specialism also identified what constituted a 'hard' constraint in terms of potential subsea cable corridors, in contrast to a parameter/issue that may just represent some form of limitation to development.

4.2.1 TECHNICAL CONSIDERATIONS

Open Cut Trenching (OCT) was the preferred method of landfall installation considered during landfall and subsea cable corridor assessments. Crossing third-party assets, such as cables and pipelines, would require additional protection for both these third-party assets and the Spittal to Peterhead HVDC cable. Avoiding third party assets reduces complexity for future maintenance operations. Preferred route corridor options had minimal third-party asset interactions. Longer subsea cable corridors were not considered a constraint, provided that they led to a shorter onshore cable corridor. Efforts have been made, however, to minimise the length of the subsea corridors between landfalls. Physical constraints affecting the OCT methodology at landfall locations were included in the assessment. These included, but were not limited to, changes to geology, offshore to onshore elevation changes, seabed slope angles and seabed obstructions. The preferred landfall installation methodology, however, is now Horizontal Directional Drilling (HDD) at both ends of the route. HDD landfall installation involves drilling and installation of ducts from onshore to offshore, through which cables are pulled, largely avoiding disturbance of the dune environments found in Sinclair's Bay and Rattray Head. These are discussed further in **Section 7.1: Physical Processes**.

4.2.2 ENVIRONMENTAL CONSIDERATIONS

The Moray Firth has a number of European and nationally protected sites within the vicinity of the cable corridor. Where possible, these sites are avoided. Where it is not possible to avoid protected sites, interactions are minimised. As a result of the extent of the Southern Trench Marine Protected Area (MPA), some level of interaction with the Project is unavoidable. The presence of protected sites can be considered a constraint, however potential impacts on environmentally sensitive sites can be minimised through final cable routing refinement and construction methods, and therefore did not exclude corridor route options from further consideration.

4.2.3 FURTHER CONSIDERATIONS

4.2.3.1 FISHERIES CONSTRAINTS

Vessel Automatic Identification System (AIS) data, for the years 2020–2021, for both the northern and southern landfall locations, were reviewed as part of these assessments. These data show significant levels of fishing activity in the vicinity of the preferred landfall option of Sinclair's Bay, and along the entire southern coastline from Lossiemouth to Peterhead. On the southern coastline, Whitehills Marina, Macduff Marina, Fraserburgh Harbour and Peterhead Port presented high densities of fishing vessel transits. As a result of the significant levels of commercial fishers active in the area, this criterion was not included in the BRAG assessment, as all potential landfalls would carry the same consenting risk.

4.3 EXISTING DOCUMENTATION

The following documents have been produced to refine the Cable Corridor to date:

- Preliminary Landfall Options Assessment (LT000360-MRS-ENV-RPT-01);
- Preliminary Subsea Cable Corridor Options Assessment (LT000360-MRS-ENV-RPT-03);
- Final Corridor Report (LT000360-MRS-ENV-RPT-004);
- Cable Burial Risk Assessment (LT360-SSEN-XX-XX-RP-EH-001);
- Unexploded Ordnance (UXO) Desk Assessment (LT000360-MRS-ENV-RPT-05); and
- European Protected Species (EPS) and Basking Shark Risk Assessment (LT000360-MRS-ENV-RPT-02).

4.4 DESK BASED LANDFALL SELECTION ASSESSMENT

In March 2023, Environmental Resources Management Limited (ERM), on behalf of SSENT, undertook a desk based assessment (DBA) to identify potential landfall locations for the Project. This built upon initial work undertaken by SSENT which identified four broad areas of interest, with one area at the northern landfall location, and three areas along the Aberdeenshire coast for the southern cable landfall (**Figure 4-1**). These locations included:

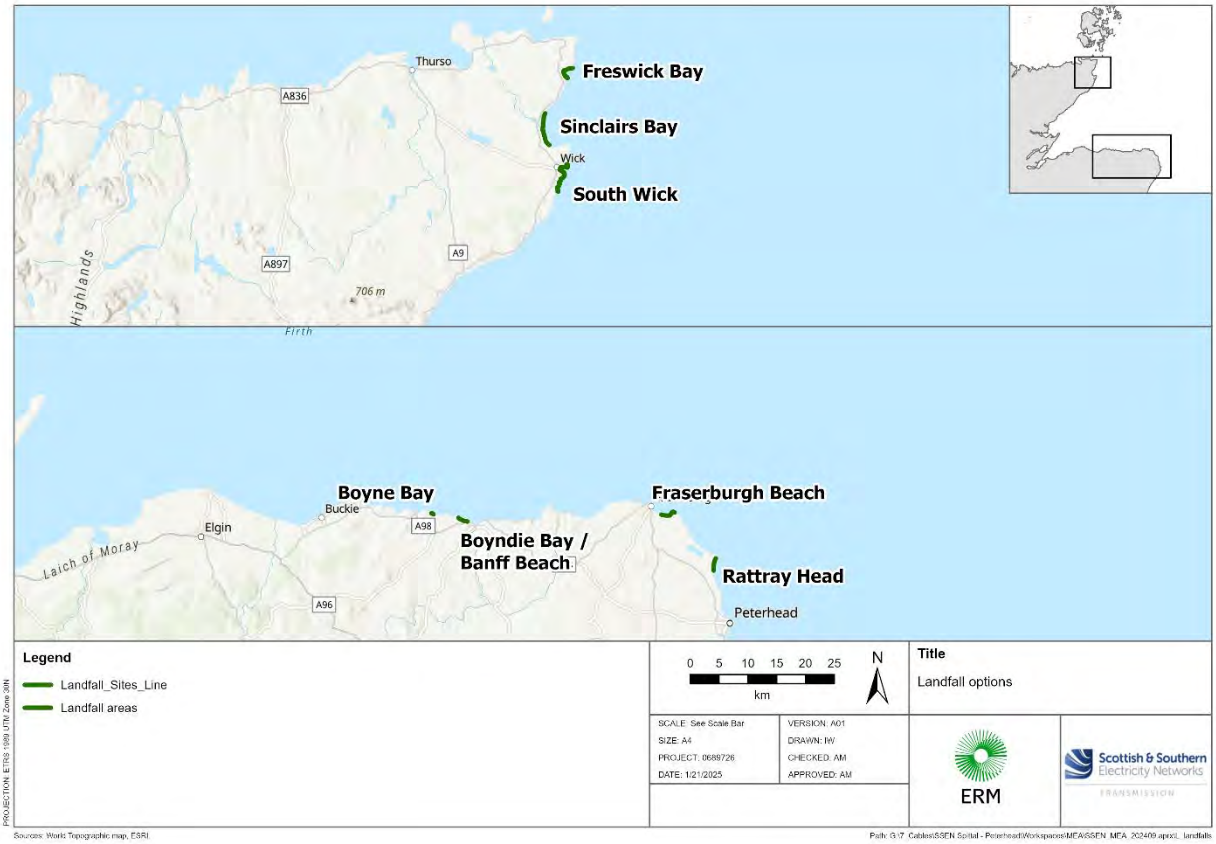
Northern Landfall Option:

- Sinclair’s Bay: The landfall was split into three landfall options; north, central and south of the bay.

Southern Landfall Options:

- Boyne Bay;
- Banff Beach;
- Boyndie Bay;
- Fraserburgh Beach; and
- Rattray Head.

FIGURE 4-1: LANDFALL OPTIONS: TOP PANEL SHOWING THE NORTHERN LANDFALL OPTIONS AND BOTTOM PANEL SHOWING THE SOUTHERN LANDFALL OPTIONS



The assessment identified and assessed the key environmental, technical and consenting risks associated with each of the landfall options, and was informed by ERM's experience in undertaking offshore cable corridor optioneering and landfall assessments.

The assessment concluded that the least constrained landfall locations were a landfall within the northern extent of Sinclair's Bay in the north, and Rattray Head in the south.

4.5 SUBSEA CABLE CORRIDOR SELECTION

In May 2023, ERM undertook a further assessment to determine the least constrained subsea cable corridor for the Project. This assessment took into account the initial assessments within the Preliminary Landfall Options Identification (LT000360-MRS-ENV-RPT-001).

The main objective of the route selection was to identify a subsea cable corridor between the landfalls identified by ERM, and agreed with SSENT as part of the Preliminary Landfall Options Identification stage of the Project, with the least technical, environmental and consenting constraints.

To inform the assessment, a set of key principles was used to determine the constraints criteria outlined later in this document. These key principles included:

- Efforts were made to identify the shortest subsea cable corridors between the shortlisted landfalls, subject to avoiding key constraints;

- Engineering factors affecting cable laying feasibility and cost effectiveness were considered as much as possible at this stage of the process;
- Mitigation of interactions with designated sites and sensitive habitats, primarily via total avoidance, or, where this was not possible, aiming to minimise interactions; and
- Minimising disruption/interactions with other marine infrastructure and sea users including shipping, commercial fishers, cables, pipelines, and oil and gas stakeholders.

This report built upon the work conducted within the Preliminary Landfall Options Identification, and added two additional northern landfall locations for assessment. These were:

- Freswick Bay; and
- South Wick.

The Preliminary Corridor Option Assessment included potential additional landfall options to ensure that the subsea cable corridor options identified provided the greatest opportunity to select a final cable corridor that minimises environmental and technical impacts. A total of nine potential cable corridors options were assessed:

- Freswick Bay– Boyndie Bay;
- Freswick Bay – Fraserburgh/Cairnbulg Point;
- Freswick Bay – St Fergus;
- Sinclair’s Bay – Boyndie Bay;
- Sinclair’s Bay – Fraserburgh/Cairnbulg Point;
- Sinclair’s Bay – St Fergus;
- South Wick – Boyndie Bay;
- South Wick – Fraserburgh/Cairnbulg Point; and
- South Wick – St Fergus.

Table 4-1 provides an overview of the nine potential subsea corridors in terms of key constraints identified.

TABLE 4-1: KEY CONSTRAINTS FOR SUBSEA CABLE CORRIDOR OPTIONS IDENTIFIED

Cable Corridor Option	Technical	Environmental/Consenting
Freswick Bay – Boyndie Bay	Length: 133.81 km. Outcropping bedrock present at Freswick Bay poses risk to open cut trenching (OCT). Cable corridor bathymetry has ≥ 15 m water depth, a low slope angle (<3 degrees) and no obstructions.	Navigational aid identified <1000 m to landfall at Boyndie Bay. Cable corridor overlaps with military practice area. Anchorage identified <1000 m to landfall at Freswick Bay. Cable corridor has potential for 2 electrical cable and 1 communication cable crossing.

Cable Corridor Option	Technical	Environmental/Consenting
Freswick Bay – Fraserburgh/ Cairnbulg Point	Length: 158.81 km. Outcropping bedrock present at Freswick Bay poses risk to open cut trenching (OCT). Cable corridor bathymetry has ≥ 15 m water depth, a low slope angle (<3 degrees) and no obstructions.	Additional site designations at Fraserburgh (Fraserburgh to Rosehearty GCR). Cable corridor overlaps with military practice area. Anchorage identified <1000 m to landfall at Freswick Bay. Cable corridor has 1 electrical cable and 1 communication cable crossing.
Freswick Bay – Rattray Head	Length: 163.81 km Outcropping bedrock present at Freswick Bay poses risk to open cut trenching (OCT). Provides the longest cable corridor length of the 9 potential options. Cable corridor bathymetry has ≥ 15 m water depth, a low slope angle (<3 degrees) and no obstructions.	Cable corridor overlaps with military practice area. Anchorage identified <1000 m to landfall at Freswick Bay. Cable corridor has 1 electrical cable and 1 communication cable crossing.
Sinclair's Bay – Boyndie Bay	Length: 133.45 km Provides the second shortest cable corridor length of the 9 potential options. Very soft strata or significant gravelly material along the cable corridor. Cable corridor bathymetry has ≥ 15 m water depth, a low slope angle (<3 degrees) and no obstructions.	Navigational aid identified <1,000 m to landfall at Boyndie Bay. Cable corridor overlaps with military practice area. Cable corridor has potential for 2 electrical cable and 1 communication cable crossing.
Sinclairs Bay – Fraserburgh/ Cairnbulg Point	Length: 158.81 km. Very soft strata or significant gravelly material along the cable corridor. Cable corridor bathymetry has ≥ 15 m water depth, a low slope angle (<3 degrees) and no obstructions.	Additional site designations at Fraserburgh (Fraserburgh to Rosehearty GCR). Cable corridor has 1 electrical cable and 1 communication cable crossing.
Sinclair's Bay – Rattray Head	Length: 163.78 km. Very soft strata or significant gravelly material along the cable corridor. Cable corridor bathymetry has ≥ 15 m water depth, a low slope angle (<3 degrees) and no obstructions.	Cable corridor overlaps with military practice area. Cable corridor has 1 electrical cable and 1 communication cable crossing.

Cable Corridor Option	Technical	Environmental/Consenting
South Wick – Boyndie Bay	Length: 126.24 km Outcropping bedrock present at South Wick poses risk to open cut trenching (OCT). Provides the shortest overall cable corridor of the 9 potential options. Cable corridor bathymetry has ≥ 15 m water depth, a low slope angle (<3 degrees) and no obstructions.	Navigational aid identified <1000 m to landfall at Boyndie Bay. Cable corridor overlaps with military practice area. Cable corridor has potential for 2 electrical cable and 1 communication cable crossing
South Wick – Fraserburgh/ Cairnbulg Point	Length: 151.58 km. Outcropping bedrock present at South Wick poses risk to open cut trenching (OCT). Cable corridor bathymetry has ≥ 15 m water depth, a low slope angle (<3 degrees) and no obstructions.	Additional site designations at Fraserburgh (Fraserburgh to Rosehearty GCR). Cable corridor overlaps with military practice area. Cable corridor has 1 electrical cable and 1 communication cable crossing.
South Wick – Rattray Head	Length: 156.57 km. Outcropping bedrock present at South Wick poses risk to open cut trenching (OCT). Cable corridor bathymetry has ≥ 15 m water depth, a low slope angle (<3 degrees) and no obstructions.	Cable corridor overlaps with military practice area. Additional site designations at Fraserburgh (Fraserburgh to Rosehearty GCR). Cable corridor has 1 electrical cable and 1 communication cable crossing.

4.6 ROUTE DEVELOPMENT SUMMARY

The northern section of Sinclair’s Bay, near Keiss Beach, was identified as the least constrained landfall as a result of low predicted local environmental impacts and potentially suitable geotechnical conditions for landfall/installation.

Through mitigating against marine environmental impacts, the least constrained southern landfall is Rattray Head, despite the potential challenges of the significant dune environment at the site. This landfall provides the longest subsea cable length; however, it offers a less-complex and shorter land-based route to the onshore grid connection.

As a result, the least constrained subsea cable corridor runs from Keiss Beach in the north of Sinclair’s Bay to a site at Rattray Head; avoiding crossing the existing infrastructure, with the less-preferred options of a southern landing at Boyndie Beach or Fraserburgh.

4.6.1 PREFERRED SUBSEA CABLE CORRIDOR – SINCLAIR’S BAY TO RATTRAY HEAD

Through the assessments within the Preliminary Landfall Options Assessment and the Preliminary Subsea Cable Corridor Assessment, a 1 km wide (500 m either side of a centreline) less constrained subsea cable corridor was identified. The landfalls for the proposed cable corridor were:

- Northern landfall at Sinclair’s Bay; and

- Southern landfall at Rattray Head.

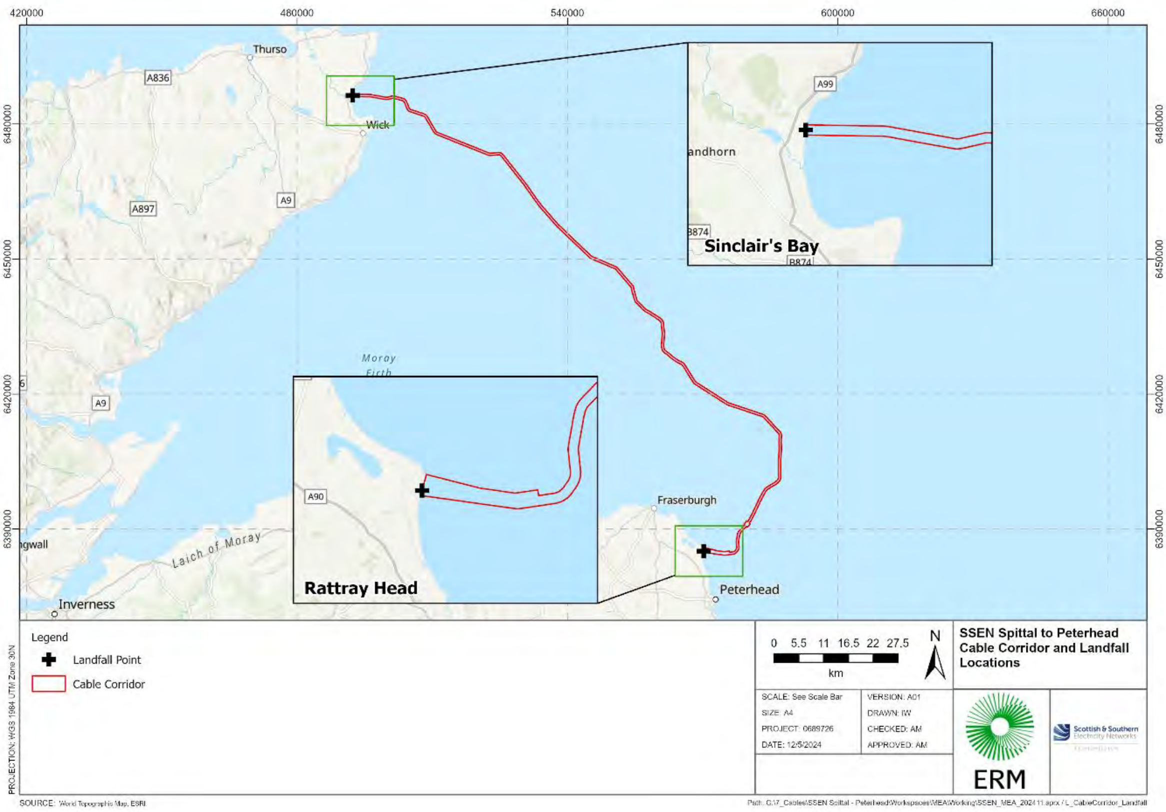
Sinclair's Bay North was chosen as the preferred northern landfall option, as it offers unobstructed beach access near Keiss Sands, with no rock adjacent to the site. Limited residential housing minimises the risk of disruption during installation. The area from the beach to access road is free of dunes, and the extensive drainage channels evident in aerial imagery would indicate that there is sufficient depth to the soil to facilitate OCT as a methodology. Potential interactions with the Subsea7 cable were further investigated, to inform the cable routing of the marine section.

To mitigate against the human and physical marine environment impacts as far as possible, Rattray Head was selected as the least constrained landfall location. Rattray Head is preferred due to the less constrained nature of this landfall, in addition to a less-complex and shorter land-based route to the onshore grid connection, together with a potential for open-cut through a dune habitat.

A desktop exercise was undertaken to select a corridor between the two aforementioned preferred landfalls, which avoided offshore wind farms, enabled 90° crossings with other linear infrastructure, routed through areas of soft sediment, and avoided significant seabed slopes. The corridor identified from this exercise was less constrained than other corridor options, albeit not completely free of constraints.

Despite OCT being the preferred initial landfall cable installation method, HDD has subsequently been selected as the preferred methodology to avoid intertidal impacts. The identified subsea cable corridor and preferred landfalls, where marine surveys were focused, are presented in **Figure 4-2**.

FIGURE 4-2: IDENTIFIED SUBSEA CABLE CORRIDOR AND LANDFALL LOCATIONS



4.6.2 LESS PREFERRED SUBSEA CABLE CORRIDOR – SINCLAIR'S BAY TO BOYNDIE BAY

The less preferred corridor shares a subsea corridor from Sinclair's Bay, up to approximately 68 km along the cable corridor, where the corridor turns south, to the western end of the Southern Trench and the less preferred landfall option of Boyndie Bay.

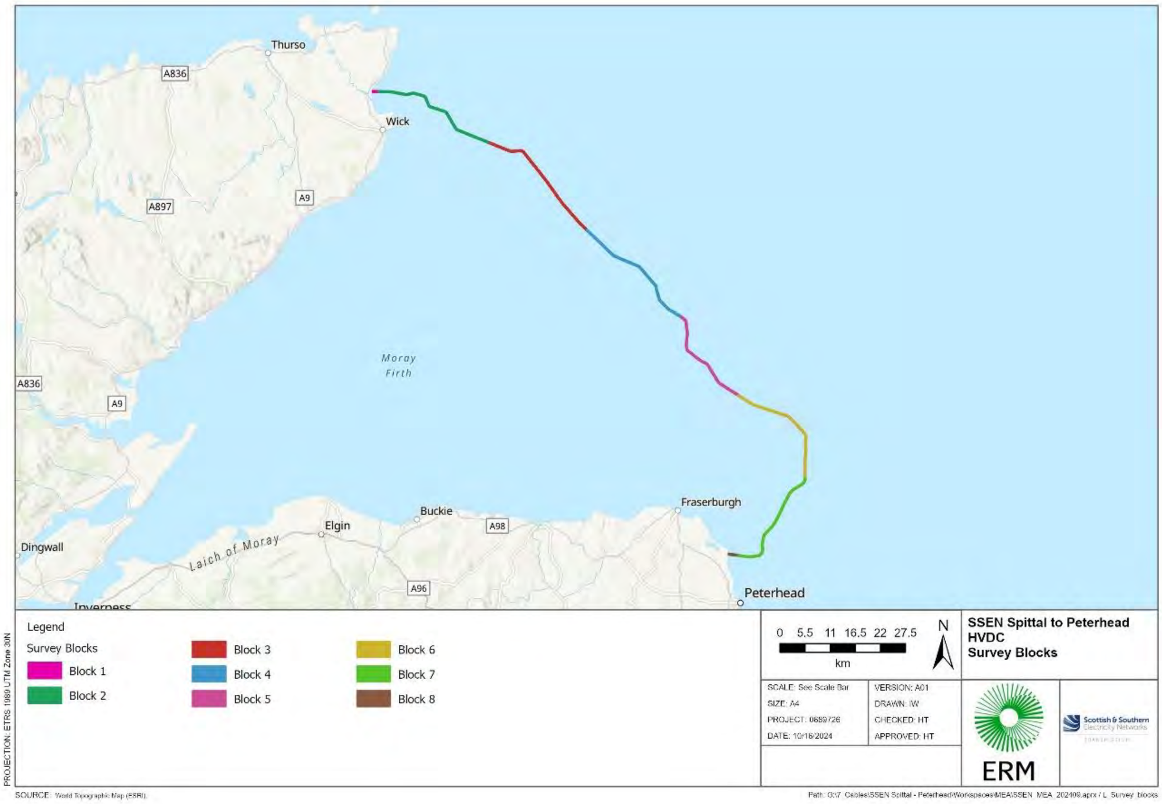
Boyndie Bay offers the potential for the shortest corridor crossing of the Southern Trench MPA, avoiding the bathymetric trough. The presence of rock towards the west end of the beach may have caused potential issues for the initially preferred OCT methods, and the proximity to residential properties poses a potential risk for disruption to the local community. Boyndie Bay presents the longest onshore cable corridor of all the landfall options assessed. As a result, any gains made with a slightly shorter subsea section will likely be lost when routing the cable onshore. Surveys Undertaken

4.6.3 GEOPHYSICAL SURVEY

Project-specific geophysical surveys were undertaken by REACH Subsea with Blocks 2-7 (offshore) acquired between 18 December 2023 and 31 January 2024, Block 1 (nearshore at Brough Head) acquired between 30 October 2023 and 22 November 2023, and Block 8 (nearshore at Rattray Head) acquired between 02 December 2023 and 01 March 2023 (**Figure 4-3**).

After indications of *Sabellaria* reef formations within the survey corridor in Block 7, additional geophysical and visual survey was completed between 13-20 March 2024, extending the original survey corridor width from +/- 250 m either side of the route corridor centreline, to + 500 m on the northern side of the route corridor at the southern end of Block 7.

FIGURE 4-3: GEOPHYSICAL SURVEY BLOCKS



Geophysical data collected included multibeam echosounder (MBES), sidescan sonar (SSS), sub-bottom profiler (SBP) and gradiometer/magnetometer. The geophysical data cover the 172 km long route with a 500 m survey corridor, achieved by 17 survey lines at 30 m spacing, and crosslines along the corridor at 5 km intervals.

The nearshore landfalls were surveyed in different directions depending on the sensor; SSS and MBES were surveyed parallel to the beach, whereas SBP and magnetometers were surveyed as grids. A wider section was surveyed near to Rattray Head to provide some route-engineering choices, depending on the existing local infrastructure constraints.

4.6.4 GEOTECHNICAL SURVEY

A geotechnical investigation was undertaken and consisted of a paired sampling and *in situ* testing programme, incorporating Vibrocore (VC) sampling and *in situ* testing via Cone Penetration Test (CPT), with pore pressure measurement using a standard 10 cm^2 cone.

VC sampling was undertaken using an appropriate, polyvinyl chloride (PVC) lined, core diameter for the anticipated soil conditions and subsequent laboratory testing.

Sampling and *in situ* testing locations were distributed at a nominal spacing across the proposed survey area. The nominal spacing, depth of investigation and testing criterion, were as follows:

- Approximately every 1 km, with potential for spacing to be widened to up to a maximum distance apart of 2 km; and
- The CPT rig penetration was undertaken to a minimum depth of 5 m penetration depth.
- The precise location of investigations was determined by review of the geophysical and benthic data, to ensure ground characteristics were suitably investigated and understood prior to geotechnical commencement.

4.6.5 INTERTIDAL SURVEY

Intertidal surveys were undertaken to map habitats at the two landfall locations: Sinclair’s Bay and Rattray Head. Intertidal data were acquired using a handheld Global Positioning System (GPS) device, digital camera, and sampling quadrat to capture habitat and sediment changes, covering approximately 3 km of investigation in total, in addition to seabed sampling in the upper to lower eulittoral zone.

Further intertidal survey details are provided in **Section 7.2.3** and in Benthic Solutions Limited (BSL) (2024a, 2024b).

4.6.6 BENTHIC SAMPLING

A detailed benthic survey was undertaken to ground-truth data obtained in the geophysical survey, and to characterise and map habitats found throughout the entire proposed HVDC cable corridor. The survey identified and classified habitats, biotopes, and benthic species diversity for further evaluation of the area.

Bathymetric and SSS data from the geophysical survey were used to aid site and transect positioning for ground-truthing.

Intrusive benthic sampling was undertaken to ground-truth seabed feature interpretation from geophysical data, to assess the presence of any contaminants, and to determine seabed faunal composition and particle size distribution.

Subtidal seabed sediment samples were acquired using a Dual Van Veen (DVV) grab sampler, while seabed video footage was acquired using either a Work Class Remote Operated Vehicle (WROV) supplied by REACH Subsea, or a Seabug/HD camera and BSL MOD 4.4 camera system supplied by BSL.

Further subtidal survey details are provided in Section 7.2.3 and in BSL (2024c, 2024d).

4.7 CABLE BURIAL RISK ASSESSMENT (CBRA)

Following the Preliminary Landfall Options Assessment and Preliminary Subsea Cable Corridor Options Assessment, combined with marine survey data, a Cable Burial Risk Assessment (CBRA) was carried out for the refined subsea cable corridor (**APPENDIX I**). The CBRA objective was to ensure that cable burial could be achieved along the preferred cable corridor option, providing the depth values needed to achieve the minimal target Depth of Lowering (DoL) for the different subsurface sections of the corridor. This value for DoL is essential to prevent any natural or anthropogenic threats to the cable, such as fishing gear or errant anchoring from large shipping vessels. Where burial is not possible, alternative options such as cable protection (see **Section 5.5**) will be utilised.

The CBRA reviewed all available geophysical and geotechnical survey data to build an understanding of the expected ground conditions along the proposed cable corridor. Once the expected ground conditions were understood, AIS data were used to understand vessel and shipping traffic in the vicinity of the proposed corridor. The AIS data are important to analyse the anthropogenic risks that the cable might be exposed to, in areas where cable lay/burial is planned.

Cargo vessels and fishing vessels are the most frequent category of vessel along the corridor. Fishing gear penetration is assumed to be a maximum of 0.6 m (Polet and Despestele, 2010), which is deeper than anchor penetration for the typical anchor size for fishing vessels. Based on AIS data, anchor penetration estimates for the remaining vessels likely to cross the corridor, indicate that an average weight of anchor is approximately 7,100 kg (within the 90th percentile of vessel sizes). In locations where sand is anticipated within the top 1.0 m of seabed along the cable corridor, anchor penetration for a 16,000 kg anchor (the maximum anchor size identified within the 90th percentile of vessel sizes) is estimated to be approximately 1.26 m (including a minimal factor of safety). Where clay is anticipated within the top 1.0 m of seabed, a DoL of 1.18 m (including factor of safety) is required, allowing for a minimal factor of safety.

Following review of the factor of safety conditions, and updated geotechnical reporting, a minimum DoL of 0.6 m to account for fishing activity, and a maximum of 1.8 m for anchor penetration, are recommended along different sections of the corridor. Where rock is likely at the seabed, the cable is likely to be surface laid, and protected appropriately (**Section 5.5**).

To support this risk analysis, the CBRA also considered the metocean conditions and natural hazards that the cable might be exposed to.

4.8 PRELIMINARY BURIAL ASSESSMENT STUDY

A preliminary Burial Assessment Study (BAS) was carried out for the refined subsea cable corridor to inform future stages of the subsea cable design. The preliminary BAS report provides a data gap analysis, report on the sediments to be expected, and indications of difficulty that might be expected in opening a trench to bury the cables, together with suggestions for mitigations.

The approximate 172 km subsea cable traverses some areas of challenging seabed conditions, consisting of sand, extremely low to very low strength clay, and low to medium strength clay, underlain in places by rock. The seabed contains several locations where surface contacts are too numerous to route around, and these locations may require pre-lay intervention (boulder clearance).

Jet-trenching is likely to be the most appropriate methodology to bury the cable for the majority of the corridor, although several locations where sediments may be unsuitable for jetting, may require alternative protection to achieve sufficient protection.

4.9 SEABED MOBILITY ASSESSMENT

Areas of potential seabed mobility that were highlighted in the preliminary BAS and CBRA were investigated further as part of a seabed mobility assessment. The aim of the seabed mobility review was to assess the potential risk of the cable being exposed or significantly buried (potentially causing overheating) as a result of natural sediment movement over the lifetime of the cable.

The regional geological and hydrodynamic conditions were investigated using relevant literature and publicly available sources of data, to determine regional patterns of sediment transport. Bedforms analysis was undertaken using publicly available and site-specific data (including SSS, MBES and grab-samples). The bedform dimensions and geometries were used to identify areas of potential mobility and the direction of bedform migration. Bed-level change (BLC) analysis was undertaken by comparing bathymetric data acquired in different years. Newer datasets were subtracted from older datasets to highlight areas of sediment accumulation and loss.

In the nearshore region, BLC highlighted active scour patches, where sediment cover may be reduced over the lifetime of the cable. However, the cable will not interact with the seabed in these areas, as they are situated inshore of the HDD exits, where the cable will be encased in a duct drilled through underlying bedrock.

Very large subaqueous dunes were identified in two areas within the cable corridor. In both areas the bedform migration rates and directions mean that the very large subaqueous dunes are unlikely to affect the cable over the cable lifetime. However, the possibility of significant short term events, such as a storm, shifting the dunes significantly towards the corridor centreline cannot be ruled out.

Rippled scour depressions and 'ridge and runnel' features were identified in discrete locations over a wide area. These are active features, with BLC generally within ±1 m over both an 11-year time-step and a 17.5-year time-step. It is hard, however, to predict how and where these will grow and evolve in the future. In some areas the ridges have moved progressively to the southeast over time. Elsewhere, they are relatively static. It is not clear whether these features form by storm activity, or gradual sediment movement. Regular review of depth of cover, as part of a 'Bury and Maintain' philosophy, would appear to be appropriate to ensure cable protection along this section.

5. PROJECT DESCRIPTION

5.1 INTRODUCTION

The purpose of this section is to summarise the offshore works associated with the HVDC cable installation of the Project. The following sections describe the cable corridor and anticipated key subsea construction works required to lay and protect the cable between landfalls.

Note: This project description provides an indicative overview of the anticipated subsea installation and intervention works, including rock placement areas and quantities, based on early-stage engineering reviews and consideration of how an installation contractor may execute the work scope. As such, this overview can be expected to be subject to variation following detailed engineering, and through execution of offshore operations. However, to ensure that the realistic worst-case scenario is considered in this impact assessment, estimates presented in this project description tend towards those that could result in greatest environmental risk.

It is anticipated that construction and cable installation activities will take place over a period of approximately 3 years and 7 months. Indicative timelines are presented in **Section 5.11**.

It should be noted that as part of the onshore cable route, there will be a crossing under the river Wester which, as a tidal inlet, is not subject to a Marine Licence as it is a bored tunnel wholly within the seabed, but does require notification. The crossing will be installed via HDD, and as a result is covered under The Marine Licensing (Exempted Activities) (Scottish Inshore Region) Order 2011 (Scottish Statutory Instruments 2011 No. 204, Part 3, Article 33) (Scottish Government, 2011b) which states the following:

(1) This article applies to a deposit or works activity carried on wholly under the sea bed in connection with the construction or operation of a bored tunnel;

(2) This article is subject to conditions 1 and 2;

(3) Condition 1 is that notice of the intention to carry on the activity must be given to the Scottish Ministers before the activity is carried on;

(4) Condition 2 is that the activity must not adversely affect any part of the environment of the UK marine area or the living resources that it supports; and

(5) This article does not apply to a deposit carried on for the purpose of disposal.

The activity does relate to an activity carried out wholly under the seabed in connection with the construction of a bored tunnel. Notice will be given to the Scottish Ministers prior to the commencement of activity. The activity will not adversely affect any part of the environment of the UK marine area, or the living resources that it supports, as there is no pathway to impact with marine receptors. Finally, the activity is not being undertaken for the purpose of disposal.

It is also noted that emergency cable inspection and repair works are exempt from the marine licensing regime with approval by Scottish Ministers under the Marine Licensing Exempted Activities Order 2011 (Scottish Government, 2011b).

5.2 CABLE ROUTING

The proposed marine cable corridor is located within the Moray Firth, off the east coast of Scotland and will comprise approximately 172 km of cable, linking two landfall sites: Sinclair's Bay in the north and Rattray Head in the south. The cable length is planned to be between approximately 170 km and 172 km, comprising a minimum length of 165 km * 1.02, + 2 km contingency; and a maximum length of 166.5 km * 1.02, + 2 km contingency.

5.3 CABLE LANDFALLS

The northern landfall site, Sinclair's Bay, is characterised by a long, wide, soft-sediment bay, with a limited sand dune system. There are no reported environmental designations at the bay, and currently few engineering constraints for cable installation purposes. There are also no major offshore constraints.

The landing site at the south end of the cable corridor at Rattray Head is characterised by a wide soft-sediment bay with a more extensive dune system. Potential sites along this stretch of coast are limited by existing and planned third-party installations of pipelines, etc.

5.4 CABLE SPECIFICATION

The project proposal for the 2 GW bi-pole, 525 kV HVDC link will consist of:

- An HVDC link including approximately 172 km of subsea cable;
- A new HVDC Converter Station at Spittal; and
- A new HVDC Converter Station at Peterhead.

Electricity will be transmitted using HVDC submarine cable technology, where the system is designed for bipole operation. The proposed design consists of a four-cable bundle: two pole cables (positive and negative pole), one dedicated metallic return (DMR) cable, and one fibre optic cable. In the event of a fault on one of the pole cables, the dedicated metallic return allows the system to continue operating, at reduced capacity, as an asymmetric monopole, until the fault on the affected pole cable is rectified. The transmission cable is anticipated to have an operational life span of 40 years.

The fibre optic cable within the HVDC bundle will be used to:

- Provide communication (telegraphic) between equipment within the HVDC system and wider network;
- Provide Distributed Thermal Sensing (DTS) of the cable, which will be used to monitor the condition of the cable; and
- Provide Distributed Acoustic Sensing (DAS) of the cable, which will be used to monitor, cable burial, cable movement, cable damage, anthropogenic activity, environmental monitoring, and any other pertinent use.

The submarine pole cables will have a stranded copper core conductor, cross-linked polyethylene (XLPE) conductor screen, insulation layer, and insulation screen (applied via a triple-extrusion process), water blocking tape, and a metal sheath consisting of lead alloy. An inner sheath of semi-conductive polyethylene is extruded over the lead sheath, with a semi-conductive tape applied helically over the inner sheath which forms the armour bed. A single layer of galvanized steel wires is wound helically around the submarine cable, and the armour layer is flooded with bitumen. Finally, the outer serving consists of two layers of black polypropylene yarn, where the inner layer is flooded with bitumen.

The bundling methodology minimises the impact of the electric and magnetic fields produced by the cable during operation. Each pole cable is approximately 152.6 mm in diameter, and weighs approximately 62.3 kg/m. The proposed cable design has been provided by the SSENT's chosen cable Original Equipment Manufacturer (OEM) along with all cable design parameters, as shown in **Figure 5-1**.

FIGURE 5-1: HVDC CABLE STRUCTURE (TOP) AND FIBRE OPTIC CABLE STRUCTURE (RIGHT) (FROM: NKT, 2024)

The dedicated metallic return cable will consist of the same construction (number and make-up of layers) as the pole cable, though different material types and thicknesses are used as this cable will not be exposed to the same electrical stresses as the pole cables.

To ensure efficiency when connecting into the existing transmission network, the sites of the new HVDC converter stations will be located within close proximity to:

- A new Spittal 400 kV Substation; and
- A new Peterhead 400 kV Substation.

5.5 CABLE PROTECTION

5.5.1 OFFSHORE CABLE PROTECTION INSTALLATION

Cable routing, using a combination of desk-based constraint assessment and review of site-specific data collected via marine surveys, is the principal method of avoiding hazards and sensitive features. However, it is not always possible to avoid all constraints, and areas of insufficient sediment cover are a particular issue for many subsea cable routes. In such areas, burial of the cable to an acceptable DoL cannot be achieved and additional external cable protection is required for depth of cover to ensure the cable is suitably protected and meets the required DoL value. The DoL will be informed by the CBRA as described in **Section 4.7** of this report.

A similar scenario arises at cable crossings, where burial to an acceptable DoL is not possible and the newly installed cable must be laid over an existing cable and then covered with additional external cable protection. Options for external cable protection include:

- Rock placement: this is one of the most established methods of cable protection and is typically suitable in the areas of cable crossings, subject to detailed design. This procedure can also be utilised along lengths of unburied/shallow buried cables. Rock placement for shallow buried cables is used as a remedial protection methodology to provide depth of cover in case of partially unsuccessful trenching efforts where trenching depth is not reached.
- Concrete mattresses: Concrete mattresses to be used as a pre-lay methodology for third party crossings to provide a minimum separation between assets. These are used extensively in UK waters but can be problematic in areas with energetic hydrodynamic regimes, for example, strong tidal flows and/or high wave energy, and/or areas subject to heavy trawling activity.
- Gabion/rock bags: Flexible bags filled with small-grade rock that can be deployed over areas of unburied/shallow-buried cables.
- Cable Protection Systems (CPS): There are a wide range of CPS available for the subsea cable market including cast-iron shells or polyurethane (PU) bend restrictors that are typically attached to sections of cable, for deployment in areas where it is already known that burial is not possible or extra protection within the trench is required. Usually this is identified and managed prior to, or during installation, however it can also be completed post-installation.

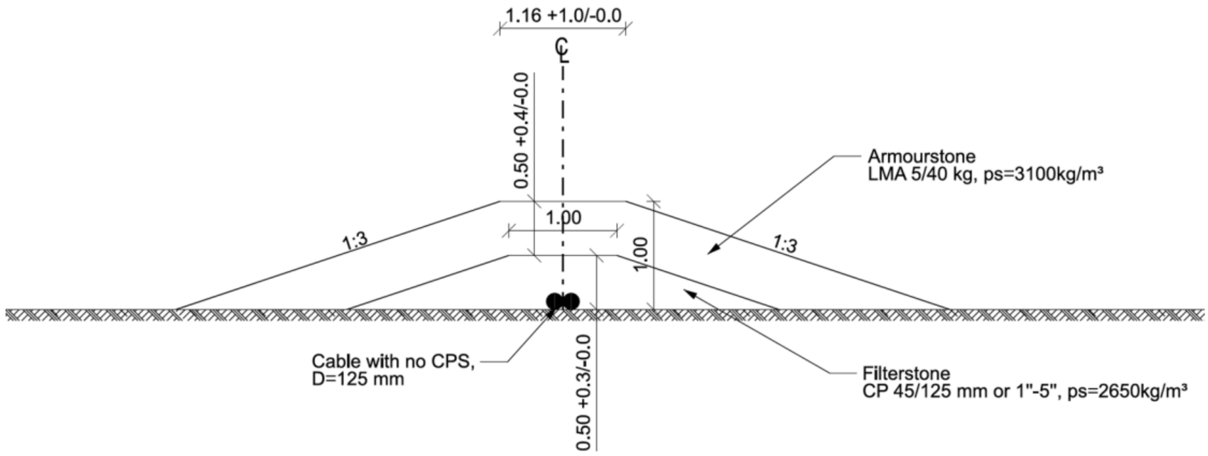
5.5.1.1 ROCK PLACEMENT

Where the cable cannot be trenched, or the required depth of lowering cannot be achieved, rock is likely to be placed to protect the cable from damage, including from natural and anthropogenic threats.

Depending on the water depth and the site-specific environmental data, the rock berm designs will vary. Aspects such as depth of cover, top width, slope, and requirement for single (layer made up of a single rock grade) or multi-layer (more than one rock grade used e.g. finer grade filter layer and capped with coarser grade armour layers) berms, will all be determined during detailed design performed by the chosen installation contractor. Rock placement may also be required to establish crossing arrangements, and to level seabed features.

A typical berm structure includes a single layer of rock and is used in deeper water where waves have lesser influence over the structure than in the nearshore areas. **Figure 5-2** represents a reinforced rock berm structure commonly utilised in harsher environmental conditions associated with shallow water depth.

FIGURE 5-2: ROCK VOLUME SCHEMATIC (FROM: NKT, 2024)



Rock material produced for offshore installation generally follows the EN-13383-1 'Armourstone – Part1: Specification' regarding material quality requirements. This standard specifies that the material "*shall not contain any foreign matter in a quantity that will cause damage to the structure or the environment in which it is used*". It is proposed that Class CP 45/125 mm or 1-5" filterstone and LMA 5/40 kg armourstone will be used on standard berms (Figure 5-2) throughout the cable route. In areas likely to be affected by strong wave forces (e.g. Rattray Head HDD exit), additional LMA 60/300 kg armourstone is likely to be applied in order to protect the HDD exits and cable against the effects of 100-year storms. All rock protection will be free from fines. The proportion of filter and armourstone rock classes deposited will be refined as the Principal Contractor's completes their design process.

Rock placement will occur from a rock placement vessel, using one of the following standard deployment techniques:

- Flexible fall pipe – in deeper water, a retractable chute will be deployed from the vessel to control the placement of rock on the seabed. A remotely operated vehicle is mounted at the end of the chute to enable accurate control of the chute, and to survey rock placement locations
- Side placement – in shallower water where a fall pipe cannot be used, rock is placed over the side of the vessel in a controlled manner, using either grabs or a side placement unit.

Wherever possible, rock placement will be undertaken using a targeted placement method, e.g. a fall pipe vessel, rather than side-discharge methods.

5.5.1.2 CONCRETE MATTRESSES

Concrete mattresses are frequently used to protect subsea cables and can also be used to construct crossings over existing subsea cables and pipelines. They are flexible and thus follow the contours of the seabed. They are supplied at a standard size of 6 m x 3 m, and at a variety of thicknesses depending on requirement. Typically, concrete mattresses are deployed using a crane and positioned using either divers or a Remotely Operated Vehicle (ROV). As such, they are not designed for coverage of long routes.

5.5.1.3 PLACEMENTS OF BULK ROCK AND ROCK BAGS

Rock placement, or smaller bags filled with either sand or grout (which sets in water to the profiled shape), can be used to provide very localised protection on sections where trenching is restricted, or in areas where the backfilling has provided insufficient cover. These items typically range from 25 kg (~0.3 x 0.5 m) to 1,000 kg (~1 x 1 m) in weight (and dimension) and are normally placed by divers and/or ROV, to provide fill-in protection.

5.5.1.4 CABLE PROTECTION SYSTEMS (CPS)

Cable protection systems, PU bend restrictors or cast-iron shells (CIS) can be fitted to protect the cable from the mass and type of rock protection berm installed at the HDD exit. PU bend restrictors are generally installed for a short length, of approximately 10-15 m from the HDD exit. Cast iron shells (CIS) are installed where required for any specific reason to protect the cable. CPS will be required spanning the length of the Subsea7 tow route crossing, in addition to trenching, as outlined in **Section 5.7.3** below, and may possibly be used in areas where *Sabellaria* reefs have been identified.

5.5.1.5 ALTERNATIVE SOLUTIONS

Nature inclusive designs for mattresses or reef blocks are being investigated for use in the final detailed design, particularly in areas where the cable is required to cross sensitive hard-bottom habitats. Nature inclusive designs are possible, but only where most engineering appropriate and lowest footprint solution, determined by an appropriate engineering stability assessment and will be further detailed in the Cable Burial Plan (CBP).

In Sinclair's Bay there is potential for the HDD pop-out to be trenched then buried to minimise the need for rock placement.

Areas along the cable corridor where cable burial may be difficult and the proposed mitigation to rectify this are highlighted in **Table 5-1** below.

TABLE 5-1: ROUTE-SPECIFIC HAZARDS AND MITIGATION (BASED ON ROUTE REV A)

Kilometre Point (KP)[2] from	KP to	Route Section Length (km)	Burial Method	Burial Consideration	Mitigation Measures
0	1.502	1.3	N/A	Rock close to surface	HDD with CPS (e.g. cast-iron shells (CIS)) from bell-mouth to trenching grading-in point
1.502	9.886	8.2	Jet-trenching	Rock close to surface to KP 2.0	Rock placement/CIS
9.886	12.606	2.77	Jet-trenching	Potentially till close to surface/within trench depth	Half-berm rock placement in case burial not achieved

[2] The KPs are based on the length of 167 km between the two HDD exit points, rather than the approximate total length of 172 km between MHWS at each landfall location

Kilometre Point (KP)[2] from	KP to	Route Section Length (km)	Burial Method	Burial Consideration	Mitigation Measures
12.606	12.606	-	N/A	Potential Crossing	Potential mattressing/rock placement
12.606	19.180	6.57	Jet-trenching	Deeper burial requirements. Increased risk to cable	Multiple passes
19.180	19.250	-	N/A	Shetland HVDC crossing	Mattressing/rock placement
19.250	20.523	1.31	Jet-trenching	Deeper burial requirements. Increased risk to cable	Multiple passes
19.354	20.722	1.368	Jet-Trenching	S7 Tow Route	Burial depth as agreed with 3rd party, plus cable protection system
20.523	23.932	3.40	Jet-trenching	Deeper burial requirements. Increased risk to cable	Multiple passes
23.932	27.558	3.65	Jet-trenching	Deeper burial requirements. Increased risk to cable	Multiple passes
27.558	30.701	3.10	Jet-trenching		
30.701	30.701	-	Jet-trenching	Potential crossing	Potential mattressing/rock placement
30.701	36.616	6.0	N/A	Deeper burial requirements. Increased risk to cable. Potential till within trench depth.	Multiple passes. Half-berm if burial not reached.
36.616	36.686	-	Jet-trenching	SHEFA crossing	Potential mattressing/rock placement

Kilometre Point (KP)[2] from	KP to	Route Section Length (km)	Burial Method	Burial Consideration	Mitigation Measures
37.946	47.761	9.75	Jet-trenching	Much deeper burial requirements. Increased risk to cable. Stiff clay at base of trench from KP 41 to KP42.5, and KP46.6 to KP47.0.	Multiple passes almost certainly required. Potentially some rock required if DoL not achieved.
47.761	48.762	1.0	Jet-trenching	Stiff high strength clay likely.	Potentially some rock required
48.762	56.332	7.5	Jet-trenching	Potentially till within trench depth KP52.2 and KP53.9 and KP55.7 to KP55.9. Very deep trench recommended in CBRA.	Half-berm rock placement. Multiple passes almost certainly required to reach Target Trench Depth (TTD).
56.332	64.863	8.5	Jet-trenching	Very deep trench recommended in CBRA. SBP data indicates till above 1.5 m bsb from KP56.3 to KP58.4 and KP59.7 to KP60.1	Multiple passes almost certainly required to reach TTD. Half-berm rock placement.
64.863	87.776	23.0	Jet-trenching	SBP indicates till above 1.5 m bsb from KP71.8 to KP72.3	In case of surface laid cable and no trenching, a berm will be installed as a post-lay protection measure.
87.776	95.366	7.5	Jet-trenching	Very deep trench recommended in CBRA	Multiple passes almost certainly required to reach TTD

Kilometre Point (KP)[2] from	KP to	Route Section Length (km)	Burial Method	Burial Consideration	Mitigation Measures
95.366	98.789	3.45	Jet-trenching	Very deep trench recommended in CBRA	Multiple passes almost certainly required to reach TTD
98.789	102.649	3.85	Jet-trenching	Deep target trench depth	Multiple passes may be required to reach TTD
102.649	116.801	14.2	Jet-trenching	-	-
116.801	118.301	1.5	Jet-trenching	-	Potentially multiple passes to reach TTD
118.301	119.801	1.5	Jet-trenching	-	-
119.801	121.801	2.0	Jet-trenching	Deep TTD	Multiple passes may be required
121.801	124.297	2.5	Jet-trenching	SBP data indicates till above 1.5 m bsb from KP121.9 to KP122.2	Rock placement may be required in half-berm if TTD not reached
124.297	139.397	15.0	Jet-trenching	SBP indicates till above 1.5 m bsb from KP126.8 to KP129.4	Rock placement may be required in half-berm if TTD not reached.
139.397	149.974	10.5	Jet-trenching	Till may be above 1.5 m bsb from KP146 to KP146.4	Rock placement may be required in half-berm if TTD not reached
149.974	155.000	5.0	Jet-trenching	1.98 m TTD. Potentially, till in trench from KP152.25 to KP152.5	Multiple passes may be required. Rock placement may be required in half-berm if TTD not reached
155.000	155.915	1.0	Jet-trenching	Medium to high strength clay reported in sampling, with no associated lab testing to confirm	May require rock to increase protection if burial not achieved

Kilometre Point (KP)[2] from	KP to	Route Section Length (km)	Burial Method	Burial Consideration	Mitigation Measures
155.915	157.377	1.5	Jet-trenching	Localised short penetrations indicate till may be within trench depth	May require rock to increase protection if burial not achieved
157.377	159.415	2.0	Jet-trenching	SBP data indicate rock/till within trench depth, rising to outcrop, from KP156.8. Sampling indicates high strength clay	May require rock to increase protection if burial not achieved
159.415	164.092	4.7	Surface lay and post-lay cable protection	Rock may be close to surface – unlikely to achieve burial targets for most of this section	Some burial may be possible in channels within rock; this area will be primarily designated for surface lay and post-lay rock.
167.490	HDD Entry		NA	Rock at or close to surface	HDD with CPS (e.g. CIS) from HDD exit to trenching grading-in

5.5.1.6 TYPICAL CABLE PROTECTION SPECIFICATIONS

Specific detail relating to the cable protection and associated works are listed below in **Table 5-2**.

TABLE 5-2: CABLE PROTECTION ESTIMATED SPECIFICATION

Cable Protection and Associated Works Feature	Estimate Value
Cable protection material (type)	HDD exit and crossings: Rock type and grain size - 70 mm based on a rock density of 2,650 kg/m^3 (grading 1-5"); Mattresses: Standard design mattresses will be planned for all crossings. Nature-inclusive designs will be utilised in areas requiring specific protection.
Length of cables requiring cable protection (m) CPS PE Uraduct (length 1.7 m roughly)	2,000 m

Cable Protection and Associated Works Feature	Estimate Value
Length of cables requiring cable protection (m) CPS Cast Iron shells (CIS)[3] (length 0.4 m approximately)	600 m (3 duct exits x 100 m CIS x 2 HDD = 600 m)
Length of cables requiring cable protection (m) Mattresses (6 m x 3 m x 0.3 m)	2,610 m (2,466 m at reef + 144 m at crossings and HDD exits)
Length of cables requiring cable protection (m) rock placement	25,090 m
Cable protection max height (m) (for standard offshore berm)	1.125 m
Cable protection max width (m) (for standard offshore berm)	11.4 m
Cable protection max height (m) (for berm at Rattray Head)	3.65 m
Total cable protection footprint (m^2)	• HDD exits: 6400 m^2 • Remedial rock placement: 25,090 m x 11.4 m = 286,026 m^2; • Crossings: 5 x 150 m x 11.4 m = 8,550 m^2; • Mattresses at reef: 3 m x 2,466 m = 7,398 m^2. • **Total 308,374 m^2**
Total cable protection volume (m^3)	• Rock placement at HDD exits: 18,400 m^3 • Remedial rock placement: 200,000 m^3 • Crossings: 2,700 m^3 • Mattresses: 2,829.6 m^3 • **Total 223,929.6 m^3**

5.6 CABLE LANDFALL INSTALLATION

For cable landfall installation, HDD will be employed, drilling first under the potential obstructions, such as dunes, sea defences, etc., at a relatively shallow angle of less than 20 degrees, curving upwards to reach the seabed. A duct is then pushed through from the landfall, and this provides a conduit for the cables to be pulled through.

HDD drilling operations will be 12 hours per day or 24 hours per day, resulting in a best-case duration of 9 months for Sinclair’s Bay and 12 months for Rattray Head, or a realistic worst case drilling duration of 12 months for Sinclair’s Bay and 21 months for Rattray Head.

HDD pop outs emerge at 7.5 m and 10.5 m depth at Rattray Head and Sinclair’s Bay, respectively. At Rattray Head the seabed is largely exposed bedrock with a veneer of sediment, so trenching may be more limited here. Alternatively, there is potential in Sinclair’s Bay for the popout to be trenched, then buried, to reduce the need for rock placement.

[3] Where CIS is used, quantity could be interchangeable with PE Uraduct

5.7 OFFSHORE CABLE INSTALLATION

SSEN Transmission intends to bury the subsea cable along the majority of the corridor, approximately 85% of the marine cable corridor, apart from where this is not possible, for example at crossings with existing cables, or where the seabed characteristics are inappropriate for burial. The exact installation methodologies throughout the corridor will be confirmed when the contract for installation is awarded. It is envisaged that a variety of pre-installation works, installation and burial techniques will be required, due to the variable nature of the seabed along the proposed cable corridor. The key elements expected to be required are summarised below. As far as possible, these details will be refined using specific survey data from the 2023/24 marine survey and related outputs of any completed early-stage route engineering studies in the final detailed design.

5.7.1 PRE-LAY SURVEY

The 2023 geophysical survey campaign found in excess of 24,000 boulder contact points along the corridor with greatest density at the two landfalls, but particularly from Kilometre Point (KP) 120 to KP 170. Contact points larger than 0.3 m were picked where the boulders were individual, however, where there was a boulder field, only boulders larger than 1 m were identified.

Prior to offshore cable installation, contractors will clear seabed obstacles from the planned cable corridor. This will be undertaken via a combination of the following:

- Pre-Lay Grapnel Run (PLGR) which will utilise a series of grapnels of varying sizes to clear small-scale, relatively light weight obstructions such as old cable fragments; discarded fishing gear etc; and
- Boulder clearance to remove obstructions to trenching or reduce freespans in sections where trenching is not feasible. This may be undertaken with a boulder plough in areas where larger boulders/high density of boulders exist which may damage cable installation tools/prevent burial, or a grab, to relocate boulders on an individual basis, as appropriate.

5.7.2 VESSELS

5.7.2.1 INSTALLATION VESSELS

The cable will likely be installed by one of a number of Cable Laying Vessels (CLV) on the market. Achievable lay speeds are dependent on cable specification, lay system, seabed and weather conditions. The typical laying speed can vary between 200 m/hr to 600 m/hr (~4 m/min to ~10 m/min).

The vessel will lay the cable from the storage turntable/carousel, through a series of radius controllers and tensioners and over a chute. The vessel’s lay supervisor will communicate with carousel and tensioner operators to control the cable pay-out, whilst instructing the operator to perform vessel moves along the subsea cable. Monitoring at the seabed touchdown point of the cable will be undertaken, to confirm that the cable is being laid as planned.

5.7.2.2 GUARD VESSELS

Guard vessels will be placed at 10–15 km intervals along the cable corridor for each campaign, and will communicate, track and observe marine traffic activities to prevent any damage to the cable or interference with other planned vessel operations. It is anticipated that 8–9 guard vessels can be in operation per every 90 km of cable corridor, with a total maximum of 17 guard vessels expected along the entire route. A Notice to Mariners will be issued for all offshore activities, to inform marine users of planned operations. Guard vessels will be released from the cable corridor once the required cable protection has been completed for the relevant sections.

5.7.2.3 OFFSHORE CABLE TRENCHING AND LAYING/BURIAL

The ability to trench the cable is heavily dependent upon the soils encountered within the proposed trench depth. The main options available for cable burial are:

- Separate cable lay and burial campaigns: In this approach, the subsea cable is pre-laid onto the seabed, where it is left in situ for a period of time. A second operation is then undertaken to bury the cable using a cable trencher (post-lay burial); and
- Separate trenching and burial campaigns: A seabed trench is pre-cut using a large hybrid plough or trencher. Cable is then laid into the open trench, followed by backfill via a cable plough, a ROV, via natural backfill, or with rock placement.

There is also a range of cable protection techniques, including:

- Rock placement; and
- The use of mattresses to cover surface lay at crossings. Mattresses will be utilised where considered the best engineering solution for the hydrodynamic environment, habitats and lowest footprint.

Any of these techniques may be used during the installation phase of this Project, therefore the environmental assessments undertaken will assess the potential impacts of all these techniques, or the realistic worst case for the receptor. This will be assessed for each area where protection is required, with respect to local hydrodynamics. Simultaneous cable lay with post lay trenching is the basis for design, however the other options set out in this MEA may need to be considered. This is, as yet, unconfirmed, so this MEA considers the realistic worst case relevant to each topic. Following detailed design, installation methodologies will be set out in a Cable Burial and Protection Plan

The subsea cable will be connected to the onshore cable via a Transition Jointing Bay (TJB) buried above the mean high-water mark.

5.7.3 CABLE CROSSINGS

At the time of writing this report, the proposed cable corridor has nine crossings:

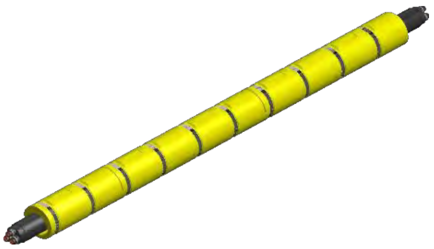
- Two active cable crossings (Shetland HVDC Link and SHEFA 2 Segment 9);
- Six Out-of-Service (OoS) cable crossings (to be cut, not crossed); and
- One Subsea7 towed pipeline bundle crossing.

The Project crosses the SHEFA-2 telecommunications cable, operational since March 2008, and will interact with the 320 kV Shetland HVDC Link, operational since June 2024 . The Shetland

HVDC cable is an SSENT owned asset, and crossing agreements will be put in place for all third-party assets. At the Subsea7 towed pipeline bundle crossing, a PU CPS of 2,000 m length will be installed and buried to 1.5 m DoL. The cable will be designed for a trefoil cable bundle and will be a round design (**Figure 5-3**).

Out of service crossings will be cut and peeled back with their ends secured with clump weights.

FIGURE 5-3: SUBSEA 7 TOWED BUNDLE PIPELINE CROSSING (FROM: NKT, 2024)



5.8 POST-LAY SURVEY

Post-construction surveys are generally required and prescribed by the regulator as part of the Marine Licence. These, as-built, surveys are carried out to ensure desired cable burial and to verify the position of the cable, by providing as-built drawings, images and video evidence ensuring safe installation as intended. An ROV would be utilised with video, MBES, SBP, SSS etc., as part of the survey to inspect the cable corridor, alongside a Teledyne TSS pipe tracker and/or sub-bottom imager (SBI).

5.9 OFFSHORE OPERATION AND REMEDIAL WORKS

While emergency remedial activities are not assessed as a component of this MEA, a description of potential remedial works has been included for completeness.

Once buried to agreed DoL and fully commissioned and operational, submarine cables do not require routine maintenance. However, as part of routine asset management procedures, regular cable surveys will likely be undertaken using standard geophysical survey equipment and/or ROVs to monitor the lowering depth of the cable. If such surveys and/or other sources of monitoring data indicate areas of shallow burial, exposures, and/or freespans, then maintenance activities may be required to ensure that the integrity of the cable is maintained. Maintenance activities are typically focused on ensuring that sufficient depth of lowering is re-established. This can be achieved by:

- Undertaking cable remediation/reburial operations, using jetting tools/ROVs; and/or
- Installation of additional cable protection such as rock or mattress placement.

Situations may also arise where a cable fault occurs, which requires a cable repair to be undertaken. Such cable faults can arise as a result of damage via the installation process and/or anthropogenic damage, i.e. from fishing gear and/or anchor strikes/dragging anchors.

Where a cable repair is required, the recommended practice set out in DNV-GL-RP-360 will be followed. This process would usually involve recovery of a section of cable, either side of the fault, of sufficient length to enable a repair. The repair comprises two new joints, connecting a new section of cable with the ends of the original cable. Recovery of the damaged cable is, typically, performed by means of a suitable dynamic positioning (DP) vessel (offshore), or anchor barge if in the nearshore or shallow water <10 m). These vessels will have restricted maneuverability. A suitable dive spread/platform may also be needed, dependent upon the operation.

The exact length of cable exposed and recovered to a cable handling vessel is typically proportional to 1.5 times the deepest tidal water depth at the location of the fault on either side of the fault, totaling 3 times the overall water depth. This ensures sufficient slack in the cable system to prevent unnecessary strain on the component parts during repair and reburial.

Once the damaged section of cable is cut, it is sheathed and buoyed, with the buoyed end recovered onto a cable handling vessel so that cable jointing can commence. The new section of cable is jointed on the deck of a cable-handling vessel before being re-laid/lowered back to the seabed and re-buried. Where re-burial is not possible, rock protection may be required. The cable repair will involve additional cable length being added to the existing cable and, as such, it is unlikely to be returned to its exact previous position.

Upon completion of repair works and the surface cable lowering operation from the repair vessel, the resting cable will be assessed to ensure it is in the correct position and sufficient slack is available. The newly repaired cable will be placed on, or as close to the original cable/trench as practicably possible. A repair bight may be required, as set out in DNV-GL-RP-360. This process is likely to take several weeks or months depending on the extent of the damage and type of repair needed, whilst factoring in other constraints such as weather.

5.10 OFFSHORE DECOMMISSIONING WORKS

Within the 12 nm limit, the seabed is managed by the Crown Estate Scotland (CES). Developers of subsea cables in Scottish Territorial Waters are required to enter into a fixed-term lease with CES, of an agreed 40 year duration. As required by this lease, an Initial Decommissioning Plan (IDP) will be developed and appended to the CES licence agreement entered into by SSENT for the Project.

This report contains a preliminary assessment of the impacts from decommissioning. MD-LOT will likely impose conditions for the submission of a decommissioning plan two years prior to cable end of life, or immediately if works are halted before completion and in the case of a cable fault.

The actual process of decommissioning, which in the context of this Project could require recovery of the cable, will be subject to environmental and economic assessments in the years leading up to decommissioning and will follow industry best practice at that time.

5.11 INSTALLATION SCHEDULE

An indicative installation schedule is provided in **Table 5-3** below.

TABLE 5-3: INDICATIVE INSTALLATION SCHEDULE

Activity	Indicative Duration	Window
HDD Drilling Operations (Sinclair's Bay and Rattray Head)	24 months[4]	Q1 2026 to Q4 2027
Pre-lay and UXO Survey	4 months	Q2 to Q3 2027
Route Clearance	6 months	Q1 to Q3 2028
HDD Marine Nearshore Works	2 months	Q3 2028 to Q1 2029
Cable Lay	6 months	Q3 2028 to Q2 2029
Post Lay Trenching	6 months	Q4 2028 to Q3 2029
Post Lay Rock Placement	6 months	Q2 to Q4 2029

5.12 ACTIVITY DURATION

An indicative list of durations for each activity associated with the pre-lay and cable lay and protection works is provided in **Table 5-4** below, and the proposed vessels which will be utilised to complete these works. Note that estimated durations exclude weather allowance. Actual durations will be determined by the installation contractor during detailed engineering. Furthermore, durations below may be split across more than one campaign or vessel.

TABLE 5-4: INDICATIVE ACTIVITY DURATION SCHEDULE

Activity	Vessels	Approximate Duration	Justification
Pre-lay Works			
HDD offshore support - Sinclair's Bay	Multicat (diver support vessel, barge/pontoon), anchor handler support vessel	60 days	Support for HDD installation, including HDD pull-through, messenger wire installation, and survey.
HDD offshore support - Rattray Head	Multicat (diver support vessel, barge/pontoon), anchor handler support vessel	60 days	Support for HDD installation, including HDD pull-through, messenger wire installation, and survey.

[4] At the time of writing this report, current schedule proposed for HDD drilling operations by the Principal Contractor is 751 days; 751 days at Rattray Head and 402 days at Sinclair's Bay.

Activity	Vessels	Approximate Duration	Justification
Route clearance	DP2 Multipurpose Light Construction Support Vessel	70 days	Pre-lay grapnel run, clearance of boulders, fishing gear, debris, etc. and associated survey
Seabed Preparation	DP2 Multipurpose Light Construction Support Vessel	300 days	General Seabed preparation
Pre-lay crossing preparation	DP2 multipurpose light Construction Support Vessel, or Cable lay vessel	2 days	Only two crossings with concrete mattress; included in CLV scope
Cable lay and Protection Works			
Pre-works survey	Survey vessel(s) - nearshore and offshore	70 days	Clear seabed obstacles from the planned cable corridor
Cable lay	Cable lay vessel, crew transfer vessel	140 days	Cable laying
Cable pull-in support	Small construction support vessels for pull-ins prep, pull-ins and duct sealing works	40 days	20 days per landfall
Trenching	Trenching support vessel, crew transfer vessel	120 days	Cable post trenching and survey starting after the CLV, increase duration during to working Nov-Apr
Post-lay rock placement (crossings)	Fall pipe rock placement vessel, rock placement vessel (with crane), crew transfer vessel	100 days	Only two crossings with concrete mattress: two days
Post-lay rock placement (non-trenched sections) and post-trenching remedial rock placement			100 days based on 300,000 te rock

Activity	Vessels	Approximate Duration	Justification
Guard vessels	8-9 Guard vessels, per CP, max 17	300 days	Vessels based on 10-15 km spacing in areas of temporarily unprotected cable

6. IMPACT ASSESSMENT METHODOLOGY

6.1 OVERVIEW

This MEA assesses whether the Project is likely to result in any significant impacts on the environment. The assessment methodology uses a standardised methodology to assess the environmental risk of the proposed activity across all topics scoped into the assessment and aligns with best practice rationale and underpinning principles for an EIA:

- Avoidance: consider options that will avoid harm to ecological features;
- Potential environmental impacts: identify significant effects which could result from the Project;
- Mitigation: significant effects will be avoided or minimised through mitigation measures that are either designed into the Project or are later applied;
- Assessment of the level of significance of residual effects: significant effects will be assessed taking account of committed mitigation measures; and
- Compensation: where there are residual significant effects despite mitigation measures in place, compensatory measures will be implemented.

Although an EIA is not required alongside this Marine Licence application, this MEA has been carried out using similar EIA terms and definitions for clarity and simplicity.

6.2 IMPACTS REQUIRING FURTHER ASSESSMENT

Topics have been assessed and either scoped in or scoped out of this MEA. The potential impacts that may arise from the development of the Project and their effects on receptors within each topic have been considered when reaching a scoping decision for each. **Table 6-1** outlines the scoping decision and provides a justification where topics are scoped out.

TABLE 6-1: TOPICS SCOPED OUT OF THE ASSESSMENT

Topic	Scoping Decision	Justification For Topics Scoped Out
Aviation and Radar	Scoped Out	Given the nature of the Project and that there will be no infrastructure above sea level, aviation and radar impacts have been scoped out.
Noise and Vibration	Scoped Out	This topic has been scoped out of the assessment in terms of an individual chapter topic, however the impacts of noise and vibration have been considered within other topic chapters (**Section 7.3: Fish and Shellfish Ecology and Section 7.4: Marine Megafauna**). Onshore noise impacts will be assessed as part of the onshore environmental assessment.
Seascape, Landscape & Visual Amenity (SLVIA)	Scoped Out	Given the nature of the Project and that there will be no

Topic	Scoping Decision	Justification For Topics Scoped Out
		infrastructure above sea level, SLVIA impacts have been scoped out. Onshore landscape impacts will be assessed as part of the onshore environmental assessment.

6.3 ASSESSMENT METHODOLOGY FOR IMPACTS REQUIRING FURTHER CONSIDERATION

Topics which have been scoped into the assessment as outlined above have undergone further consideration following key stages:

- Stage 1 - A Study Area has been identified for each scoped in topic which will account for the spatial extent which the Project activities may have an impact on sensitive receptors;
- Stage 2 - The baseline environment within the Study Area has been described and key receptors identified;
- Stage 3 - The project activities which may result in impacts to the key receptors at any stage of the Project have been identified; and
- Stage 4 - The activities and resulting potential effects have been assessed, determining the sensitivity of the receptors and magnitude of effects to conclude an overall impact (risk) significance.

This MEA provides an assessment of the potential impacts resulting from the Project's effects on receptors in the marine environment. The terms effect and impact are different, as one drives the other. Effects are measurable physical changes in the environment (e.g. volume, time and area) arising from project activities, while impacts consider the response of a receptor to an effect. Impacts can be defined as direct or indirect, beneficial or adverse.

In order to implement a systematic assessment of impacts between the different receptors, an overall approach to the assessment of impacts to determine their significance has been implemented. The process considers:

- Sensitivity and value of the receptor;
- Magnitude of effect; and
- Determination and qualification of the significance of impact.

Whilst it is important to have a common approach to impact assessment across a project, there are definitions and issues specific to each topic that the corresponding assessments must take into account. To that end, and to ensure that this section does not become a lengthy description of the specifics of each impact, the method for assessing significance is outlined in more detail in the relevant impact assessment section of this report.

6.3.1 SENSITIVITY

The sensitivity of a receptor is defined by how susceptible it may be to an impact with consideration to its resilience (tolerance, adaptability and recoverability) and, where applicable, its value (conservation significance, ecological importance and/or quality).

Sensitivity of a receptor is based on the following factors:

- Tolerance to change;
- Recoverability;
- Adaptability; and
- Value.

The scale of sensitivity is as follows: negligible, low, medium and high, defined in **Table 6-2**. It is important to note that the quality, value, rarity or importance of the receptor can vary and, where applicable, this is discussed in the respective receptor assessment chapters.

TABLE 6-2: DEFINITION OF SENSITIVITY RATINGS

Sensitivity	Definition
Negligible	The receptor is generally tolerant and can accommodate a particular effect without the need to recover or adapt.
Low	The receptor has some tolerance to accommodate a particular effect or will be able to recover or adapt
Medium	The receptor has a low tolerance to accommodate a particular effect with a low ability to recover or adapt
High	The receptor has a very low/no tolerance to accommodate a particular effect with a low/no ability to recover or adapt

6.3.2 MAGNITUDE

The magnitude of an effect can be characterised by considering the following factors:

- Spatial extent;
- Duration;
- Likelihood;
- Frequency;
- Intensity; and
- Reversibility.

Categorisation of the magnitude of effect will vary for specific topics. The magnitude categories used are negligible, low, medium and high, as defined in **Table 6-3**.

TABLE 6-3: DEFINITIONS OF MAGNITUDE

Magnitude	Environmental impact
Negligible	The effect is highly localised and short term, with full rapid recovery expected to result in very slight or imperceptible changes to baseline conditions or a receptor population.
	The effect is very unlikely to occur; if it does, it will occur at a very low frequency or intensity.
Low	The effect is localised and temporary or short term, leading to a detectable change in baseline conditions or a noticeable effect on a small proportion of a receptor population.
	The effect is unlikely to occur or may occur but at low frequency or intensity
Medium	The effect occurs over a local to medium extent with recovery likely within 1-2 years following cessation of activities, or localised medium term degradation with recovery in 2-5 years, OR the impact affects a moderate proportion of a receptor population.
	The effect is likely to occur and/or will occur at a moderate frequency or intensity.
High	Occurs over a large spatial extent, resulting in widespread, long term (>5 years following cessation of activity) or permanent changes of the baseline conditions, OR the effect affects a large proportion of a receptor population.
	The effect is very likely to occur and/or will occur at a high frequency or intensity.

6.3.3 IMPACT ASSESSMENT MATRIX

Once the sensitivity and magnitude have been determined using the scoring above, they are combined to conclude the significance of impact as detailed in the impact assessment matrix shown in **Table 6-4**.

TABLE 6-4: OVERALL IMPACT ASSESSMENT MATRIX

		Sensitivity			
		Negligible	**Low**	**Medium**	**High**
Magnitude	**Negligible**	Negligible	Negligible	Negligible	Minor
	Low	Negligible	Negligible	Minor	Minor
	Medium	Negligible	Minor	Moderate	Moderate
	High	Minor	Minor	Moderate	Major

The outcome of the overall risk assessment equates to a significance rating. An overall risk determined to be **Negligible** or **Minor** is 'Not Significant', and an overall risk determined to be **Moderate** or **Major** is 'Significant' and will require further mitigations to be implemented to minimise or remove the risk.

6.4 MITIGATION AND RESIDUAL RISK

Mitigation measures have been identified within this MEA to avoid, minimise or remove potential environmental impacts, or improve environmental benefits.

There are two types of mitigation measures that can be applied, these are either embedded into the project design or are additional measures implemented by the Project to reduce environmental impact and residual risk.

6.4.1 EMBEDDED MITIGATION

Certain measures are incorporated into the Project design as adherence to best practices or embedded mitigation/management measures in accordance with standard industry practice. Details on these types of mitigation are presented in **Table 6-5**.

TABLE 6-5: EMBEDDED MITIGATION

Measure	Details
Production of a Construction Environmental Management Plan (CEMP).	Measures will be adopted to ensure that the potential for environmental impact from construction is minimised through the implementation of appropriate mitigation.
All project personnel will be trained and informed of their responsibility to implement the environmental and ecological mitigation outlined in the CEMP.	Toolbox talks, inductions, and awareness notices will be used to disseminate this information among all relevant project personnel.
Production of an Emergency Spill Response Plan (ESRP).	An Emergency Spill Response Plan will help to ensure that the potential for release of pollutants from construction, operation and decommissioning is minimised.
Control measures and shipboard oil pollution emergency plans (SOPEP) will be in place and adhered to under The International Convention for the Prevention of Pollution from Ships (MARPOL) Annex I requirements for all vessels. In the event of an accidental fuel release occurring appropriate standard practice management procedures will be implemented accordingly.	As per the MARPOL 73/78 requirement under Annex I, all ships of 400 Gross Tonnes (GT) and above must carry an oil prevention plan as per the norms and guidelines laid down by International Maritime Organization under Marine Environmental Protection Committee act. Production of this plan will help to ensure that the potential for release of pollutants from vessel operations is minimised.
Vessels will be equipped with waste disposal facilities (sewage treatment or waste storage) to International Maritime Organisation (IMO) MARPOL Annex IV Prevention of Pollution from Ships standards.	Measures will be adopted to ensure that the potential for release of pollutants from vessel operations is minimised.
Ballast water discharges from vessels will be managed under International Convention for the Control and Management of Ships' Ballast Water and Sediments, 2004 (BWM Convention).	The BWM Convention, adopted in 2004, aims to prevent the spread of harmful aquatic organisms from one region to another, by establishing standards and procedures for the management and control of ships' ballast water and sediments. Measures will be adopted to ensure that the risk of Marine Non-Native Species (MNNS) introduction during vessel operations is minimised.
Vessels will adhere to the IMO guidelines for the control and management of ships' biofouling to minimise the transfer of invasive aquatic species (Biofouling Guidelines) (resolution MEPC.207(62).	The Biofouling Guidelines provide a consistent approach to minimising the risk of MNNS introduction via biofouling on ship's hulls.
Production of a Marine Non-Native Species (MNNS) Plan.	A document detailing how the risk of potential introduction and spread of MNNS will be minimised is to be produced. The plan will outline measures to ensure vessels comply with the International Maritime Organization (IMO) ballast water management guidelines. It will consider the origin of vessels and contain standard

Measure	Details
	housekeeping measures for such vessels as well as measures to be adopted in the event that a high alert species is recorded.
Marine Mammal Protection Plan (MMPP)	Proposed for the cable lay activities in order to minimise the potential for impacts on marine mammals occurring in the area. It is applicable to all marine mammal species occurring in the Moray Firth.
All vessels will adhere to the Scottish Marine Wildlife Watching Code (SMWWC).	NatureScot (formally SNH) developed the Code as part of its duties under the Nature Conservation (Scotland) Act 2004. The Code was first published in 2006 and was revised in 2017. The code aims to: Help minimise disturbance to marine wildlife; Help to enjoy watching marine wildlife; Improve chances of seeing wildlife; Provide a standard for the wildlife watching industry; and Help to stay within the law.
All vessels will adhere to the Basking Shark Code of Conduct.	Under Schedule 9 of the Wildlife and Countryside Act (1981) it is illegal to kill, injure or recklessly disturb Basking Sharks in British waters. By following the Code of Conduct boat handlers reduce the risk of killing, injuring or harassing basking sharks.
Project operations will adhere to Marine Scotland's (2014) Guidance on the Offence of Harassment at Seal Haul-out Sites.	Seals at designated haul-outs garner strict protection under Section 117 of the Marine (Scotland) Act 2010, with the Protection of Seals (Designation of Haul-Out Sites) (Scotland) Order 2014 (as amended) specifying the sites, and it is an offence to cause disturbance to any seal hauled-out at such a designated site.
Crew will be made aware of all protected species within the marine environment, and their responsibility to implement all proposed mitigation	Toolbox talks will be held to communicate all relevant information to ensure staff understand their responsibility to implement the mitigation measures proposed for the Project.
Lighting on board all vessels will be kept to a minimum.	Lighting on-board all vessels will be kept to the minimum level required to ensure safe operations.
Deployment of anchor chains on the seabed will be kept to a minimum.	Reduces the potential for disturbance to benthic habitats and species including any commercial fish species which utilise the seabed.
Vessels will travel at a slow speed during active survey, installation and protection works.	The slow speed of installation vessels during active survey, installation protection works will minimise disturbance impacts to

Measure	Details
	seabird and marine mammal receptors. Slow speeds will not be required during transit to the work site.
Initial route design has avoided sensitive ecological areas and designated sites wherever possible.	Minimising ecological impacts.
Cables will be installed in a bundled configuration (except at landfalls).	This will minimise the footprint of the project and impacts resulting from electromagnetic fields.
The duration of cable installation and protection will be minimised as much as possible.	This reduces magnitude and duration of impacts on all receptors and particularly disruption in relation to commercial fisheries and other sea users
The use of external cable protection including rock berms and/or mattresses will be minimised, and only be deployed where adequate protection of the cables cannot be achieved through burial.	Cable burial is the first choice for protection, as this minimises impacts on the environment and other sea users. However, when this is not possible due to existing subsea assets, or seabed conditions, other cable protection measures will be utilised to ensure the cable is adequately protected.
All rock berms and external cable protection will be designed to minimise snagging, with slopes of 1:3 or less where possible, and of suitable construction to prevent snagging risk.	Minimising disruption to commercial fisheries resulting from the installation and operation of the cables.
A Fisheries Liaison Officer will be employed to manage interactions between cable installation vessels, personnel, equipment and fishing activity. This will be managed through a Fisheries Liaison Mitigation Action Plan (FLMAP).	Employment of a FLO will ensure all commercial fisheries operators in the vicinity of the Project will be proactively and appropriately communicated with in terms of proposed Project operations including exclusions, dates and durations.
Implementation of a 500 m radius safety zone around vessels.	A 500 m exclusion zone will remain in place during installation activities and applies to all vessels to ensure navigational safety.
Notice to Mariners (including local), Kingfisher bulletins, Radio Navigational Warnings, NAVTEX, and/or broadcast warnings will be promulgated in advance of any proposed works. The notices will include the time and location of any work being carried out, and emergency event procedures.	Ensure navigational safety and minimise the risk and equipment snagging.
Compliance with International Regulations for the Prevention of Collision at Sea (IMO, 1972) and the International Regulations for the Safety of Life at Sea (SOLAS).	SOLAS is an international maritime treaty which sets minimum safety standards in the construction, equipment and operation of merchant ships. The convention requires signatory flag states to ensure that ships flagged by them comply with at least these

Measure	Details
	standards. In relation to the Project its compliance will ensure navigational safety and minimise the risk of equipment snagging.
A Cable Burial Plan (CBP) will be produced outlining the proposed method statement and cable protection requirements for approval by the Regulator and discussion with fisheries stakeholders.	A CBRA was conducted to determine the level of cable protection required to ensure that the operations of existing and future sea users can continue throughout the installation corridor, without increased risk to them or the cables. The CBP will outline how the required levels of protection are achieved and ensure that relevant stakeholders are aware of installation activities.
As built survey data will be provided to the UK Hydrographic Office (UKHO) and Kingfisher for inclusion on Admiralty Charts and KIS-ORCA Awareness Charts.	Ensure navigational safety and minimise the risk and equipment snagging.
A Safety Management System (SMS) will be in place throughout the Project.	Ensures that vessels comply with mandatory safety rules and regulations and follows appropriate codes, guidelines and standards.
Equipment and Training for Site Personnel.	Site personnel will be suitably equipped and trained for work offshore including in firefighting, first aid and offshore survival.
There will be adverse weather working policies and procedures for periods of construction and operational investigations.	This will ensure preparations are in place for adverse weather conditions.
Crossing and Proximity agreements will be established with relevant cable and pipeline operators of other assets.	These agreements will include the ability of a cable or pipeline operator to access their asset during construction if required. If such works are required to occur simultaneously, consultation with the cable or pipeline operator will be undertaken.
A communications strategy will be developed for the Project.	To outline communication protocols between the Project and other marine stakeholders.
Avoidance of known Marine Historic Assets.	Avoidance of anthropogenic contacts and anomalies is feasible, and the installation corridor is designed to do this.
Protocol for Accidental Discoveries of Marine Historical Assets	The Protocol will define procedures to be taken in the event of a discovery in order to avoid impact to any marine historic assets.
Regular Cable Surveys	As part of routine asset management procedures, regular cable surveys will likely be undertaken using standard geophysical survey equipment and/or ROVs to monitor the Depth of Burial of the cable

6.4.2 ADDITIONAL MITIGATION

Additional mitigation has been suggested on a receptor specific basis. In the receptor specific assessments, all proposed mitigation is taken into account when assessing the significance of an impact.

6.5 CUMULATIVE IMPACT ASSESSMENT

The cumulative impact assessment considers the combined impacts of the Project with the impacts from other projects, on the same single receptor/resource.

To identify the cumulative impacts, a two-staged approach has been followed:

- Stage 1 – Identify activities, receptors and pressures from other projects which share a pressure-receptor pathway with the Project; and
- Stage 2 – Define and assess the interactions of receptor-pressure pathways identified in Stage 1 to individual topic chapters scoped in this MEA.

6.5.1 STAGE ONE

Projects included in the cumulative impact assessment have been identified according to how likely they are to exert similar pressures on the same receptors potentially impacted by this Project.

A cumulative impact is determined to arise if the receptors and pressures between the Project and other projects share a pressure-receptor pathway which overlaps spatially or temporally. Projects included in the cumulative impact assessment must be located within the assessment area for each topic and are considered where planned activities are similar to those proposed for the Project (e.g. cable burial activities).

6.5.2 STAGE TWO

In line with the impact assessment methodology outlined above in **Section 6.3**, the receptor-pressure pathways with other planned projects that have been identified in Stage One of the Cumulative Impact Assessment (**Section 6.5.1**) are then applied and assessed for individually for each technical topic (**Sections 7.1 – 7.9**) scoped into this MEA.

6.6 TRANSBOUNDARY EFFECTS

Given the location and nature of the Project, the Project's effects are not expected to result in significant impact to any receptor in a different country to that in which the activities will take place. On this basis, no further assessment of transboundary impact is presented.

6.7 SUMMARY OF IMPACT ASSESSMENT PARAMETERS

Based on the details of the proposed works during all phases of the Project, as described in **Section 5.11**, the parameters defined in **Table 6-6** detail the realistic worst-case Project Design Envelope (PDE) associated with the proposed works. These parameters will inform the environmental assessment conducted within **Section 7**, and the Habitats Regulations Appraisal (HRA) in **APPENDIX A: Habitats Regulations Appraisal**, that forms this MEA.

The parameters in **Table 6-6** have been defined in accordance with the Precautionary Principle, and therefore represent a highly conservative estimate of the extent of the proposed works. The Precautionary Principle is a core EU environmental principle, now enshrined in domestic legislation (UK Withdrawal from the European Union (Continuity) (Scotland) Act 2021) as a guiding principle that the Scottish Ministers must have regard to when making policies. The Precautionary Principle is utilised in **Table 6-6**, as parameters are not yet final as the detailed design and refinement of the project is ongoing. As such, it is highly likely that the as-built PDE will be more refined and smaller in magnitude to the PDE described in this report.

TABLE 6-6: PROJECT DESIGN ENVELOPE (PDE) PARAMETERS

Parameter	Unit	Value
GENERAL SITE INFORMATION		
Total Duration of Landfall Works	Months	33
Offshore Project Programme	Years and Months	3 years 7 months (43 months)
Operational Lifetime	Years	40
Expected Daily Working Hours	Time (hours)	24
Number of Active Vessels (during construction)	Number	7
Types of Installation Vessel	-	• Survey vessel (nearshore); • Survey Multicat; • Support workboat; • Anchor Handler Support Vessel; • DP2 Multipurpose Light Construction support vessel; • Cable Lay Vessel; • Jack-up Vessel; • Trenching Support Vessel; • Fallpipe Rock Placement Vessel (FFPV); • Rock Placement vessel (with Crane); • Cargo Vessel; • Guard Vessel; • Multicat (Diver Support Vessel); • Barge / Pontoon; and • Crew Transfer Vessel
Number of Active Vessels (during operation)	Number	1-3 vessels
Guard Vessels	Number	8–9 per CP (max 17)

Parameter	Unit	Value
Total Project Area	km^2	86
Total Area of Intertidal Works	m^2	0
CABLES		
Cable Characteristics		
Cable Voltage	kV	525
Number of Cables	Number	2 HVDC + 1 Fibre Optic + 1 Dedicated Metallic Return
Total Cable Length	km	Min: 165 x 1.02 = 168 km + 2 km = 170 km Max: 166.65 x 1.02 = 170 km + 2 km = 172 km
Cable Outer Diameter	mm	2 HVDC: 152.6 1 Fibre Optic: 22 1 Dedicated Metallic Return: 115.7
Cable Bundle Diameter	mm	306 mm (DC 153 mm x 2/MR 116 mm x 1/FOC 22 mm (in recess))
Installation Characteristics		
Burial Technique (offshore)	-	Trenching tools (e.g. Jet trencher and/ or cutting tool) (6 months)
Burial Technique (< 1 km offshore)	-	HDD CPS
Burial Technique (intertidal)	-	HDD
Minimum Depth of Lowering	m	0.6

Parameter	Unit	Value
Maximum Depth of Lowering	m	1.8
Trench Width	m	0.5-1
Width of seabed disturbance from installation tool	m	5-10
Total area of seabed predicted to be subject to temporary disturbance via cable installation	m^2	Max. length of cable (172 km) x max. width (0.01 km) = 1,720 m^2
Duration of installation	hours	408 hours per campaign (2 campaigns) 408 x 2 x 1.1 = 898 hours (total)
Exclusion Zone of vessel during installation	m	500
Pre-lay techniques	-	Pre-Lay Grapnel Run (PLGR); Boulder clearance using boulder plough; and Boulder clearance using grab Duration: 10 months in total (techniques can be undertaken simultaneously)
Post-Lay Work Techniques	-	List of base case protection methods: • Trenching (jetting); • Trenching (cutting); and • Rock berm installation. List of contingency cable protection method tools which could be installed via multicat, or construction/support vessel: • Concrete mattress installation; • Controlled flow excavation; • Nearshore backhoe dredging; • Shallow water trenching tool (and ancillary tools fitted, e.g. grabber or backhoe dredging tool, excavation pump); • ROV dredger tool/zip pump;

Parameter	Unit	Value
		• Diving works; • Diving operated airlifting; • Diving hydrainer pump; • CPS installation (either during or post laying) (uraduct, cast-iron shells); and • Rock filter unit / rock bag installation via crane. Should the Nature Inclusive Design (NID) limitations be imposed at the approaches to Rattray Head landfall then this would add 185 matts/km + 10% contingency, should the NID mattress be the solution. (185 matts/km is 6 m length mattresses installed at max 0.3 m tolerance overlap for conservatism. 10% contingency should be in addition to this.)
Cable Protection		
Protection Material	Material Type (including grain size)	HDD exit and crossings: • Rock type and grain size - 70 mm based on a rock density of 2,650 kg/m3 (grading 1-5"); and • Mattresses: (6 x 3 x 0.3 m) or (6 x 3 x 0.5 m).
Length of cables requiring cable protection (m) plastic CPS (length 1.7 m approximately)	m	2,000 m CPS, S2P 1,000 m x 1.5 = 1,500 m (prior to Shetland crossing past Subsea7 crossing)
Length of cables requiring cable protection (m) CPS Cast Iron shells (CIS)- PE Uraduct (length 0.4 m approximately)	m	600 m (3 duct exits x 100 m CIS x 2 HDD = 600 m)
Length of cables requiring cable protection (m) Mattresses (6 m x 3 m x 0.3 m)	m	2,610 m (2,466 m at reef + 144 m at crossings and HDD exits)
Length of cables requiring cable protection rock placement	m	24,640 m and 150 m x 3 crossings = 25,090 m
Cable protection max height	m	1.125

Parameter	Unit	Value
Cable protection max width	m	11.4
HDD Berm max height	m	3.65
Total cable protection footprint (including cable crossings)	m^2	• HDD exits: 6400 m^2 • Remedial rock placement: 25,090 m x 11.4 m = 286,026 m^2; • Crossings: 5 x 150 m x 11.4 m = 8,550 m^2; • Mattresses at reef: 3 m x 2,466 m = 7,398 m^2. **Total 308,374 m^2**
Total cable protection volume	m^3	• Rock placement at HDD exits: 18,400 m^3 • Remedial rock placement: 200,000 m^3 • Crossings: 2,700 m^3 • Mattresses: 2,829.6 m^3 **Total 223,929.6 m^3**
Temporary Seabed Deposits	-	Temporary Deposits: • Ultra-short Baseline (USBL) position transponders.
Permanent Seabed Deposits	-	Substantive Permanent Deposits (for the purposes of this MEA): • Rock placement; • Concrete mattresses; • Rock Reef Cubes; • Submarine HVDC Cable; • Submarine Fibre Optical; • DMR; • Rigged Sea joint (cast-iron casing) (7 m x 1.5 m x 1.5 m); and • CPS including CIS. • Bellmouth; • Bellmouth cover plate; • Clump weights; • Chain anchors; • Mooring anchor weights; • Rock bags; and • Grout bags.

Parameter	Unit	Value
		Additional Permanent deposits: • HDD steel ducts; • Fibre Optical Joint; • HDD Roxtec Sealing Units; and • CPS (PU bending restrictors, bending stiffener), cable installation rigging, shackles (Wire cable stocking).

7. ENVIRONMENTAL ASSESSMENT

7.1 PHYSICAL ENVIRONMENT

7.1.1 INTRODUCTION

This section characterises the baseline Physical Environment within the Physical Environment Study Area. A more detailed baseline is included in the **APPENDIX D: Physical Processes Technical Appendix**. This chapter has been informed by a desk-based literature review which has included collation and review of open-source bathymetric and geology data, as well as analysis of site-specific geophysical and geotechnical data collected to inform engineering and environmental aspects of this Project (REACH Subsea, 2024). The physical environment includes the bathymetry, regional geology, superficial sediments, hydrodynamic processes, sediment transport, coastal characteristics, and those designated nature conservation sites that are designated for geological or geomorphological features.

The baseline characterisation is used to inform the Physical Environment Marine Environment Assessment in **Section 7.1.4**.

The relevant legislation and policy relating to Physical Environment include:

- National Marine Plan: Chapter 4 (GEN8, GEN9, GEN21, CABLES1, CABLES2);
- Marine (Scotland) Act 2010; and
- Marine and Coastal Access Act 2009.

7.1.2 PHYSICAL ENVIRONMENT STUDY AREA

The preferred subsea cable corridor is located within the Moray Firth, which is a large inlet opening to the northern North Sea. For the purpose of this report, the Physical Environment Study Area includes the coastline (below Mean High Water Springs (MHWS)) at the northern landfall (Sinclair’s Bay) and southern landfall (Rattray Head) sites, as well as the proposed cable corridor with a minimum buffer of 15 km.

The Physical Environment Study Area is determined by regional marine and coastal hydrodynamic processes and other local, project-specific influences. At the southern landfall site (Rattray Head), the Physical Environment Study Area extends from Fraserburgh (~15 km to the northwest) to Cruden Bay (~20 km to the south). At the northern landfall site (Sinclair’s Bay), the Physical Environment Study Area extends from Invershore (~15 km to the south) to Gills Bay (~25 km to the north).

7.1.2.1 DATA SOURCES

Table 7-1 summarises key Physical Environment data sources used to characterise the baseline environment.

TABLE 7-1: KEY BASELINE DATA SOURCES FOR THE PHYSICAL ENVIRONMENT

Source	Summary	Coverage
The European Marine Observation and Data Network (EMODnet) for thematic mapping of bathymetry, seabed substrate and geology	Baseline mapping of bathymetry, seabed substrate and sub-surface geology to provide an overview of seabed	Full Study Area

	conditions, complementing site-specific surveys	
British Geological Survey (BGS)	Quaternary geology, bedrock geology, and seabed sediments	Full Study Area
Copernicus Marine	Baseline mapping of (amongst other things) wind, wave and temperature characteristics	Global coverage
Cefas	Wavenet - Hourly timeseries of metocean data including wave height, period, peak direction, and sea temperature	Nearest buoy is Moray Firth Wavenet, in the inner Firth
ABPmer - Seastates	Long term (back to 1979) wave hindcast hourly model of wave parameters, including significant wave height, maximum wave height, wave period and wave direction	Full Study Area
United Kingdom Hydrographic Office (UKHO) seabed mapping service	Recent and historic seabed bathymetry data	Coverage over most of the area at 4 m resolution. Coverage of KP1 to 10 at 2 m resolution
Various scientific literature	Papers include those relating to the bedrock and Quaternary geology, past sea-level and ice sheets, metocean conditions, sediment transport, and coastal systems	Various

7.1.2.2 SITE-SPECIFIC SURVEY DATA

Project-specific geophysical and environmental surveys were undertaken by REACH Subsea with Blocks 2-7 (offshore) acquired between 18 December 2023 and 31 January 2024, Block 1 (nearshore at Brough Head) acquired between 30 October 2023 and 22 November 2023, and Block 8 (nearshore at Rattray Head) acquired between 02 December 2023 and 01 March 2023. After indications were noted of *Sabellaria* reef formations within the survey corridor in Block 7, additional geophysical and visual survey was completed between 13-20 March 2024.

Phase 1 intertidal surveys were carried out between the 26-30 October 2023, followed by Phase 2 surveys between the 09-13 February 2024 (to address a corridor extension requested by SSENT). A map of the survey coverage is included in **Section 4.6.3**.

Geophysical data collected included multibeam echosounder, sidescan sonar, sub-bottom profiler, and magnetometer/gradiometer. Geophysical data were acquired over the 172 km long route with a 500 m wide survey corridor. Coverage of the offshore survey blocks was achieved by 17 survey lines at 30 m spacing and crosslines along the route at 5 km intervals. The nearshore landfalls were surveyed in different directions depending on the sensor; sidescan sonar and multibeam bathymetry were surveyed parallel to the beach, whereas sub-bottom profiler and magnetometers were surveyed as grids.

Environmental seabed sampling and video assessment was carried out at intervals along the cable corridor. Intertidal data were acquired over approximately 3 km total[5] shoreline length, in addition to seabed sampling in the upper to lower eulittoral zone (REACH Subsea, 2024a).

The results of the geophysical and environmental surveys are presented in the following reports:

- SSEN Transmission Spittal to Peterhead Marine Cable Route Survey Geophysical Interpretation Report (REACH-7506-SR-001) (REACH Subsea, 2024b); and
- SSEN Transmission Spittal to Peterhead Habitat Assessment and Environmental Baseline Report REACH-7506-SR-EBS-02 (REACH Subsea, 2024a).

Geotechnical data were collated via a geotechnical site investigation conducted by Atlantis Geoservices Ltd, between 22 January 2024 to 19 February 2024. Multiple geotechnical testing and sampling techniques were used throughout the campaign. This included:

- 89 Seabed CPT locations and 21 bumpover locations; and
- 83 VC locations and 16 bumpover locations.

The results from the geotechnical site investigation are presented in:

- SSEN Transmission Spittal to Peterhead Geotechnical Results Report REACH-7506-SR-003-R01;
- SSEN Transmission Spittal to Peterhead Geotechnical Laboratory Test Report REACH-7506-SR-004-02; and
- SSEN Transmission Spittal to Peterhead Integrated Report REACH-7506-SR-002 Integrated Report_Rev2.

7.1.3 BASELINE ENVIRONMENT

7.1.3.1 BATHYMETRY

Publicly available and site-specific data were used to investigate the bathymetry in the Moray Firth area (**Section 7.1.2.1**; **Section 7.1.2.2**).

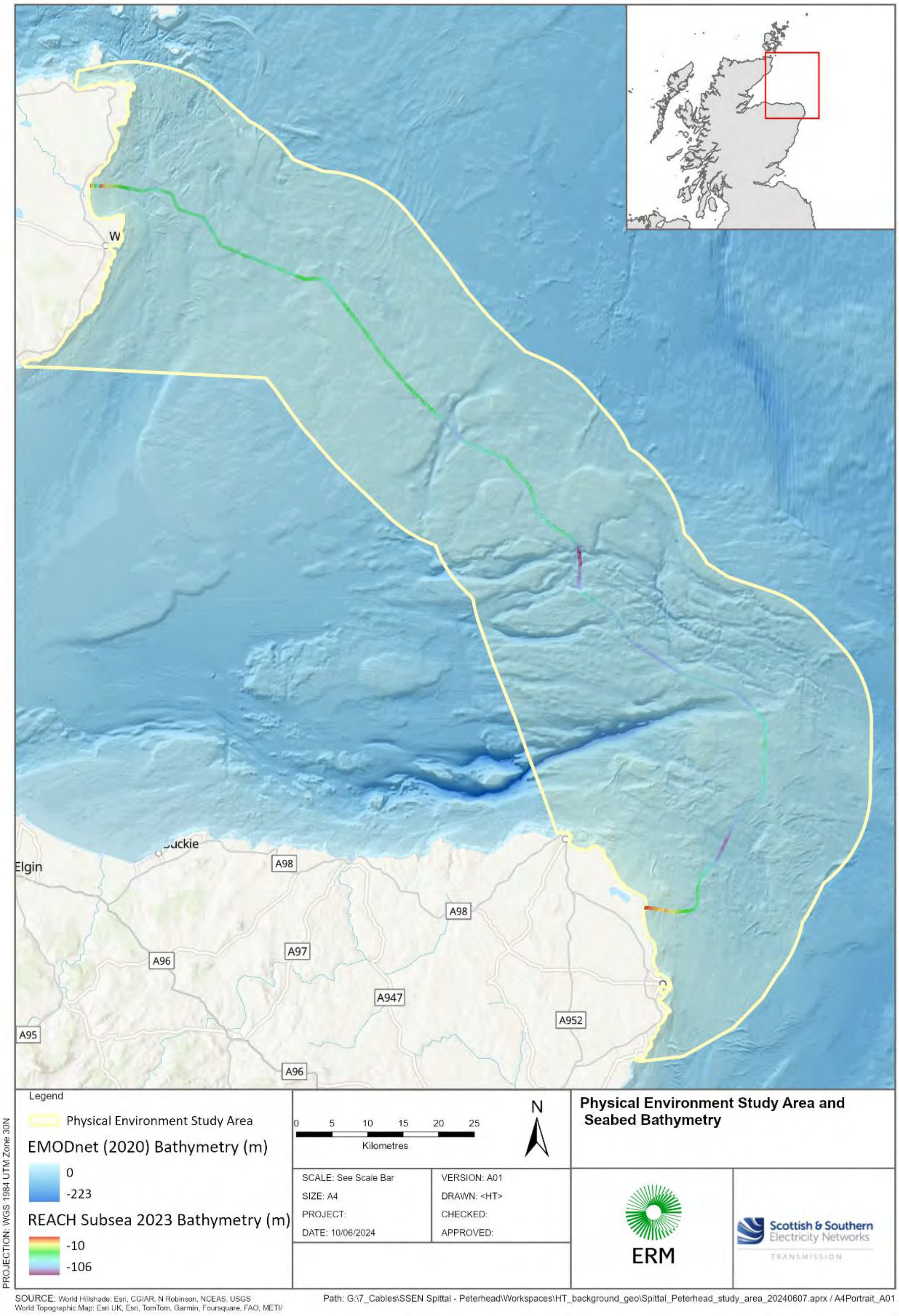
The deepest point of the Moray Firth is within the Southern Trench, a west to east orientated channel, lying off the southern shoreline of the Firth, to the west of the cable corridor, where depths of more than 220 m are encountered. Depths shoal to approximately 40 m in the centre of the Firth, on Smith Bank, to the west of the northern section of the proposed cable corridor.

According to the 2023 REACH Subsea geophysical survey (REACH Subsea, 2024), which provided 0.2 m coverage over a 500 m corridor, water depths across the Spittal to Peterhead cable corridor range from -1.2 m to 105.65 m below lowest astronomical tide (LAT) (REACH Subsea, 2024) (**Figure 7-1**). Seabed gradients of >5° were observed in the areas of bedrock outcrop and bedforms.

[5] A total of 24 transects were completed along approximately 1.5 km of shoreline at Sinclair's Bay and 1.4 km of shoreline at Rattray Head

FIGURE 7-1: BATHYMETRY DATA IN THE MORAY FIRTH AREA (SOURCE: EMODNET, 2020 AND REACH SUBSEA, 2024)

Image can be electronically zoomed for greater detail



7.1.3.2 SEABED GEOMORPHOLOGY

There are a number of active and relict bedforms and geomorphological features in the Physical Environment Study Area, reflecting contemporary seabed processes and past glacial and geological activity. Potentially mobile ripples and megaripples were identified throughout the corridor, with crest orientations ranging from east-west to north-south. Other notable features include rippled scour depressions, sand ribbons, boulders, and mounds associated with hard substrate (as identified by BGS, 2023b) (see **APPENDIX D: Physical Processes Technical Appendix** for further details). It should be noted that since there was no time-step multibeam bathymetry data, the mobility of these bedforms has not been assessed as part of this report.

Given the dimensions of the bedforms, sandwave levelling will not be required prior to the cable installation. Therefore, sandwave levelling has not been assessed within this MEA. Boulder clearance and Pre-Lay Grapnel Run (PLGR) are likely to be undertaken and have, therefore, been assessed within this MEA.

7.1.3.3 REGIONAL GEOLOGY

Bedrock Geology

The structure of the bedrock beneath the Moray Firth is characterised by a complex pattern of faulted half-grabens (basins) and fault block highs (platforms) that developed during crustal extension (Andrews *et al*., 1990). A geological map of the bedrock is shown in the **APPENDIX D: Physical Processes Technical Appendix**.

The bedrock geology in the Moray Firth predominantly consists of interbedded sedimentary units. Areas of hard substrate (BGS, 2023b) that correspond to bedrock outcrop are identified within the Old Red Sandstone conglomerate, and Argyll Metasedimentary deposits near the southern landfall site at Rattray Head; and in the Devonian mudstone and sandstone rocks at the northern landfall site (Sinclair's Bay). There are also localised areas of bedrock outcrop of chalk and siliciclastic argillaceous units in the north.

Quaternary Geology

The Quaternary evolution of the Inner Moray Firth Basin is linked to a complex interplay between climactic variation, ice sheet dynamics, and sea level change. Thick Quaternary deposits reflect early deltaic sedimentation, followed by predominantly glacial and glaciomarine conditions. These are buried by a thin cover of Holocene sediments. Within the broader Moray Firth area, Quaternary sediments thin westwards, from over 400 m thick in the Witch Ground Basin to <20 m thick, or absent, in the inner Firth, except for a number of localised basins with thicker deposits along the southern shore of the Moray Firth (Andrews *et al*., 1990). The thickest Quaternary deposits along the proposed cable corridor are at the easternmost points of the corridor, where there is >50 m thickness (BGS, 2022). Along most of the corridor the Quaternary thickness is 5-20 m. There is <5 m Quaternary thickness near both the northern (Sinclair's Bay) and southern (Rattray Head) landfall sites, and at local areas where hard substrate has been identified.

Glaciations are responsible for both the erosion and deposition of sediment. During the Quaternary glaciations, the Moray Firth was the location of a large ice-stream that flowed west to east, into the North Sea basin (Bradwell *et al.*, 2008). Products of the ice streaming include:

- West-east, streamlined, ridges and groves (identified east of the proposed cable corridor (Finlayson *et al.*, 2008);
- East-west trending trenches, interpreted to be tunnel valleys (including the Southern Trench), associated with meltwater release; and
- Glacial moraines, associated with ice sheet retreat (Graham *et al.*, 2008).

The glacial features are scientifically important, as they provide insight into the nature of the glaciation and glacial retreat in eastern Scotland. Therefore, some of the tunnel valleys and moraines are protected as part of the Southern Trench MPA. For further details see **Section 7.1.3.6** and **APPENDIX D: Physical Processes Technical Appendix**.

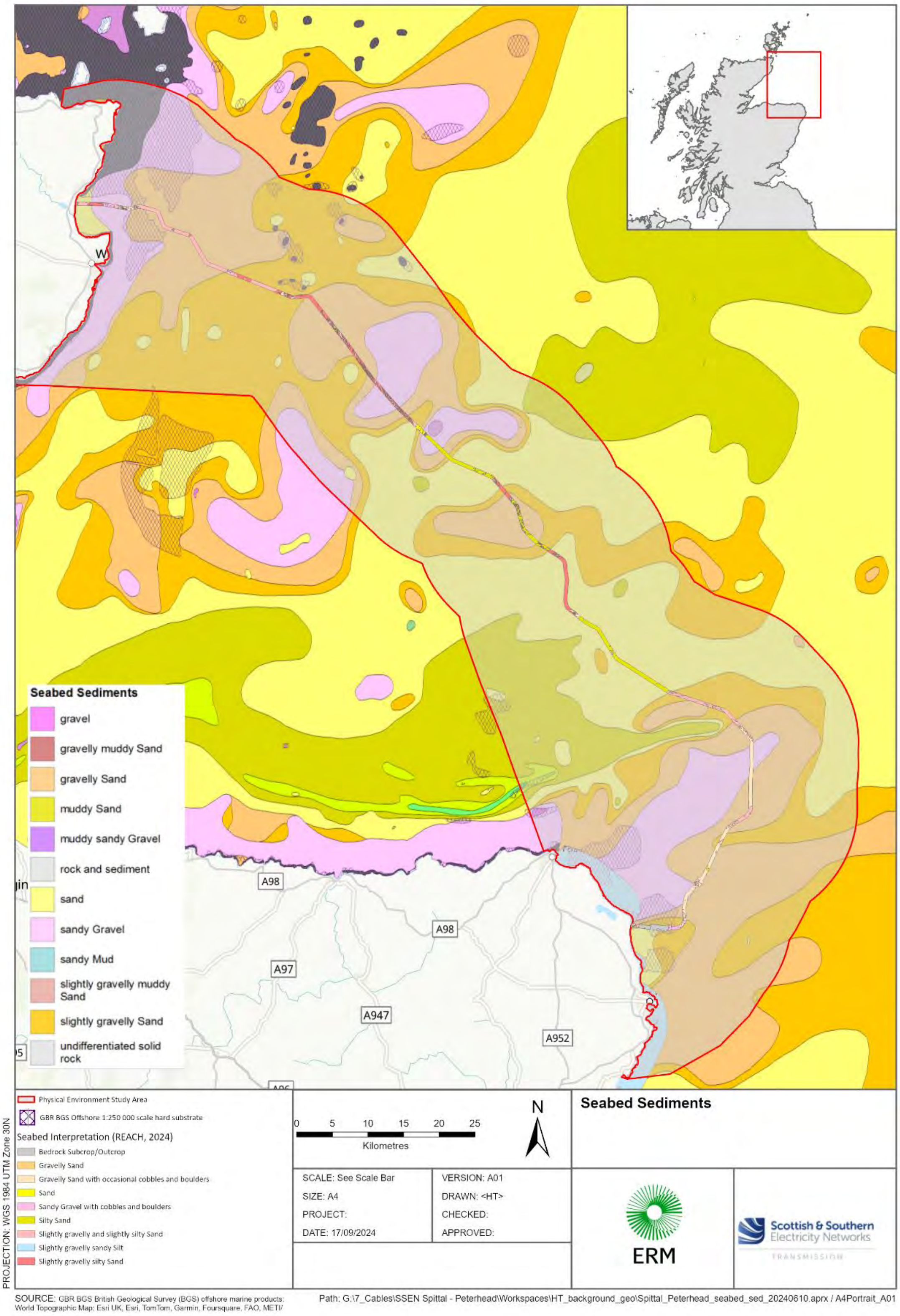
Superficial Sediments

The Moray Firth seafloor predominantly consists of Holocene sediments, whose distribution reflects the glacial and sea-level history of the area, as well as the present hydrodynamic regime (**Figure 7-2**). The primary source of seabed sediments is the reworking of offshore Pleistocene deposits, with negligible sediment input from the land (Andrews *et al.*, 1990).

Regional seabed sediments along the proposed cable corridor range from sand to sandy gravel (see **APPENDIX D: Physical Processes Technical Appendix** for further details). Sandy gravel is identified at, or near, both the northern and southern landfall sites at Sinclair's Bay and Rattray Head, respectively, and also in the centre of the proposed cable corridor where it cuts across the edge of Smith Bank (**Figure 7-2**). The seabed sediments and geology identified by the Project-specific survey (REACH Subsea, 2024) include silt, silty sand, sandy gravel, gravelly sand, sand, outcropping rock, and boulders. According to survey interpretation (REACH Subsea, 2024), the HDD exits are in an area of bedrock outcrop/subcrop at the Rattray Head landfall site; and slightly gravelly, slightly silty, sand at the Sinclair's Bay landfall site.

Particle Size Analysis (PSA) data indicate that the seabed along the length of the corridor predominantly consists of sand (>80%) (REACH Subsea, 2024a). The nearshore regions (Blocks 1 and 8) contained >99% sand, whereas offshore stations showed more variability, with higher proportion of fines (>15%) generally found in the deepest regions (>70 m) (REACH Subsea, 2024a). Gravel content was variable, with high proportions between KP 127 to KP 139 and KP 144 to KP 159, correlating with seabed areas identified as 'gravelly sand' (REACH Subsea, 2024a).

FIGURE 7-2: SEABED SEDIMENTS IN THE MORAY FIRTH AREA (SOURCE: BGS, 2023B)



7.1.3.4 HYDRODYNAMICS

Tidal Currents

The tidal environment within the Moray Firth is semi-diurnal. Mean Spring Peak Flows are greatest near both the landfall sites; up to approximately 1.5 m/s near the Rattray Head landfall site, and 0.9 m/s near the Sinclair's Bay landfall site (ABPmer *et al.*, 2008). Mean Spring peak flows are lower in the centre of the proposed cable corridor, at around 0.3 m/s. The strongest tides within the Study Area are north of the Sinclair's Bay landfall site, in the Pentland Firth, where the Mean Spring tidal flow is 3.72 m/s (ABPmer *et al*., 2008).

With respect to tidal range in the Moray Firth, this generally increases from east to west, with a Spring tidal range along most of the cable corridor of 2.7-2.9 m (ABPmer *et al*., 2008). At the Rattray Head landfall, the spring tidal range is approximately 3.3 m, with a MHWS of 4 m, and Mean Low Water Spring (MLWS) of 0.7 m (UHKO, 2023).

The tidal axis (the long-axis orientation of the tidal ellipse) along most of the proposed cable corridor is, generally, aligned approximately north to south (ABPmer *et al*., 2008). This results in a generally southerly flood tide and northerly ebb tides. The tidal currents are, generally, aligned approximately parallel to the adjacent coastlines.

Storm Surges

Storm surges are produced when high winds build up a wall of water, which is exacerbated by the effects of atmospheric pressure (Prichard, 2013). Storm surge propagation has been extensively studied in the North Sea and is generally well understood. The estimated extreme sea level (generated by storm surge and astronomical tides), with a 10-year return period, is 3.08 m above Ordnance Datum Newlyn (ODN) in the Moray Firth, 2.71 m above ODN near the northern landfall site (Sinclair's Bay), and 3.00 m above ODN near the southern landfall site (Rattray Head) (EA, 2018). For further information regarding potential future changes to the hydrodynamic environment, as a result of climate change, see **Section 7.1.3.8**.

Waves

Waves within the Physical Environment Study Area are a combination of waves locally generated by wind, and waves generated elsewhere in the North Sea. Long term hindcast records of wave data have been derived from ABPmer's SEASTATES model (ABPmer, 2018).

At the northern landfall site (Sinclair's Bay), the mean wave height is 0.9 m and the predominant wave directions are from the northeast and southeast (each >30% of the time). At the southern landfall site (Rattray Head), the mean wave height is 1.4 m and the predominant wave directions are southeast (approximately 30% of the time) and northeast (approximately 20% of the time). Mean wave height generally increases with distance from the coast and is recorded as being up to 1.9 m along the proposed cable corridor. The wave directions are more variable within the middle of the Moray Firth, but the predominant wave directions are south, southwest, and west (approximately 15-20% of the time each).

For further information regarding potential future changes to the hydrodynamic environment, as a result of climate change, see **Section 7.1.3.8**.

Stratification

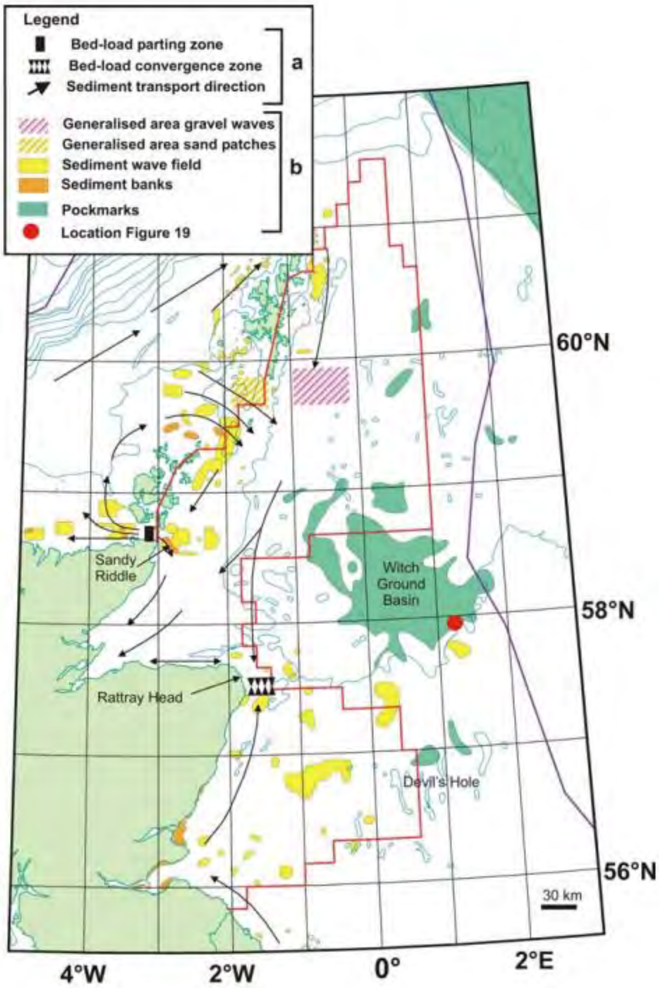
Stratification relates to the vertical and horizontal distribution of sea water temperature and salinity. The gradient corresponds to a gradient in water density, which can act as a barrier to vertical mixing, resulting in vertical stratification. This influences the availability of nutrients and, thus, the distribution and growth rates of pelagic flora and fauna. Stratification is greater during the summer due to increased heat input preferentially warming the upper part of the water column, resulting in a steep vertical gradient between warmer surface waters and colder bottom waters (Simpson and Bowers, 1984). However, strong tides and/or shallower water can lead to vertically mixed conditions-maintained year-round (Sharples *et al*., 2022). Temperature and salinity data are available from a high-resolution 3D ocean model covering the European North-West Shelf, accessed through the Copernicus data portal (Copernicus, 2023). These data show that close to the coast, waters are well mixed throughout the year, but there is evidence of vertical stratification further offshore in summer months, which is weaker (or absent) in winter months. The front separating well-mixed from stratified waters varies in location and position throughout the year.

7.1.3.5 SEDIMENT TRANSPORT

Tidal and wind-driven currents in the Moray Firth region induce a sufficiently high shear stress to exceed the critical bed stress and initiate sediment movement. There is a general net sediment transport to the southwest, towards the inner Moray Firth (**Figure 7-3**; Holmes *et al.,* 2004). Longitudinal sand ribbons ~80 km east of Sinclair’s Bay are evidence of this southwesterly transport direction. However, greater complexity in sediment transport exists near both landfall sites, due to the effects of local currents. These are noted in a sediment mobility study by ERM. The drift direction is northwards at the southern landfall site (Rattray Head), but comparable data do not exist for the northern landfall site (Sinclair’s Bay) (Dynamic Coasts, 2024).

There are east-west oriented bedforms in gravelly sand ~17 km offshore from the northern landfall site (Sinclair’s Bay), which are consistent with a net southerly sediment transport direction (**Figure 7-3**). Sandy Riddle, ~30 km to the northeast of the cable corridor, is identified as one of the most active areas of bedload transport in the Physical Environment Study Area, and is indicative of a complex bedload transport environment. Sediment transport is also complex to the south of the Study Area, with a bedload convergence zone identified off the southern landfall site (Rattray Head), to the south of which there is northerly net sediment transport (**Figure 7-3**).

FIGURE 7-3: SEDIMENT TRANSPORT DIRECTION FROM HOLMES *ET AL.*, (2004)



7.1.3.6 COASTAL CHARACTERISTICS

The coastline included in the Physical Environment Study Area around the southern landfall site (Rattray Head), extends ~15 km to the northwest of the landfall site and ~20 km to the south, from Fraserburgh to Cruden Bay.

The coastline at the southern landfall (Rattray Head) includes extensive sandy beaches, backed by dune systems, that are part of a more extensive geomorphological assemblage that includes Loch Strathbeg, the UK's largest paramaritime freshwater lake (Soulsby *et al.*, 1997). The Rattray Head dune system is cut by multiple pipelines which are buried in trenches. These trenches were re-vegetated to facilitate stability (Ritchie and Gimingham, 1989). Soulsby *et al*. (1997) concluded that the construction of the pipeline landfalls had "*no major effect*" on the hydrogeology of the dune system. Most of the coastline is undefended, which is due to a combination of sparse population and low rates of erosion. Localised artificial defences are in place, particularly around Peterhead. South of Peterhead the coastline is rocky/cliffed with no clear evidence of significant marine erosion. According to the Dynamic Coast research, at the southern landfall site (Rattray Head), the MHWS moved ~50 m landward between 1890s and 1970s, before retreating ~25 m to its present location (Dynamic Coasts, 2024).

The coastline included in the Physical Environment Study Area around the northern landfall site (Sinclair's Bay) extends ~15 km to the north of the landfall site and ~25 km to the south, from

Invershore to Gills Bay. The coastline is predominantly rocky, with the longest stretch of beach being at Sinclair's Bay, where the proposed northern landfall site (Sinclair's Bay) is located. This area includes dune environments, which become less extensive to the south. Development has occurred in the vicinity of the dunes, as part of the Subsea7 pipeline launch facility, located in Westerloch, Wick. The facility fabricates and launches sections of pipeline up to 7.7 km long, with indication that there will be numerous pipeline bundle launches planned for between 2025-28. There are some sea defences, indicating this coastline is subject to erosion. Additionally, World War II coastal defences are collapsing onto the beach as a result of the sand dunes around the structures being eroded. According to the Dynamic Coast research, at the northern landfall site (Sinclair's Bay), the MHWS moved ~30 m landwards between the 1890s and 1970s (Dynamic Coasts, 2024).

7.1.3.7 DESIGNATED SITES

The Physical Environment Study Area includes nationally and internationally designated nature conservation sites. Many of the sites are primarily designated for habitats rather than the presence of geological or geomorphological features, however changes to the physical environment at these sites may impact the habitats they support, and are considered in their relevant chapters. A full summary of the Nature Conservation Sites designated for Physical Environment features is included in the **APPENDIX D: Physical Processes Technical Appendix**.

The most significant protected site to note is the Southern Trench Nature Conservation Marine Protected Area (NCMPA). The Southern Trench is a deep, glacial, feature which is protected for its geological and biological diversity. The physical environment contributes to the biological diversity of this area. It is a mixing zone of warm and cold waters, and contains soft sands and thick muds that provide important habitats. These habitats may be affected by changes in the physical environment, and their impacts are discussed further in their respective chapters (**Sections 7.2: Benthic Ecology**, **7.3: Fish and Shellfish Ecology** and **7.4: Marine Megafauna**).

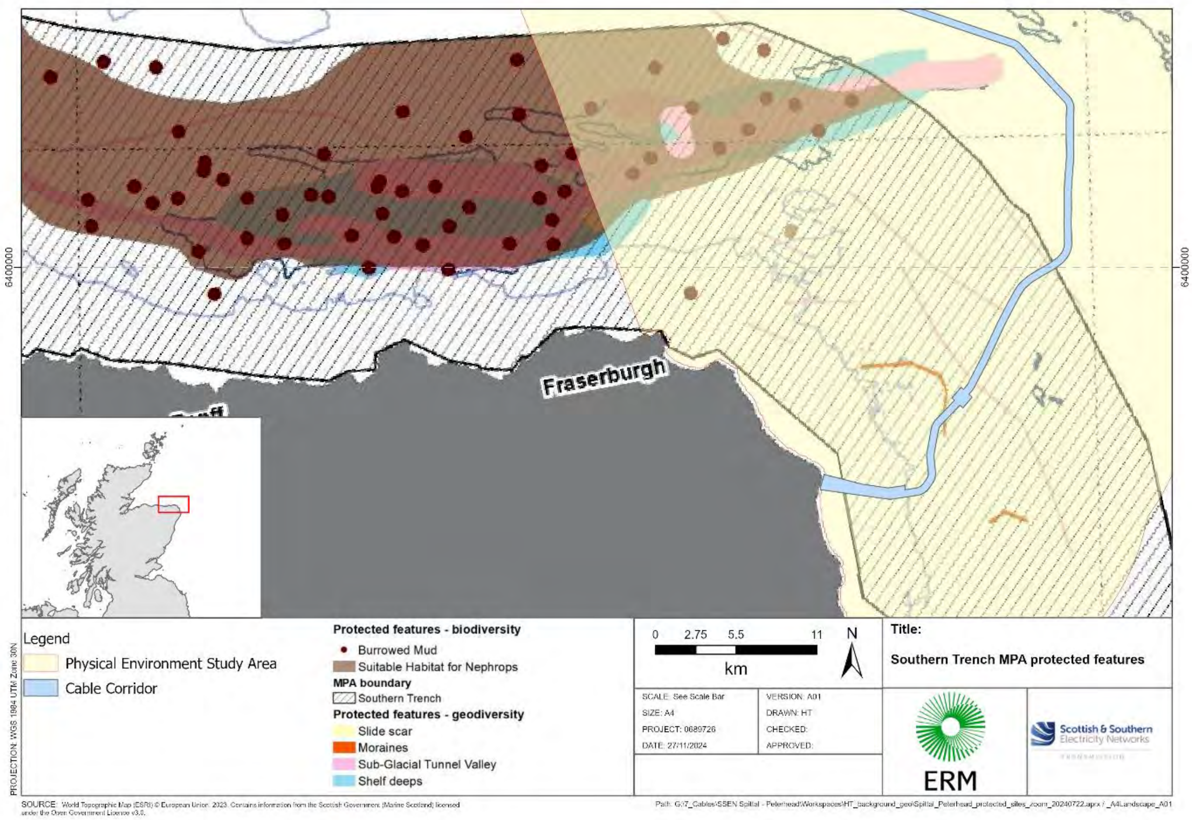
Protected geological features within the Southern Trench NCMPA include sub-glacial tunnel valleys, moraines, slide scar, shelf deep, and burrowed mud. Two previously identified sub-glacial tunnel valleys intersect the cable corridor at KP 145.3 and KP 149.9 (NatureScot, 2020) (**Figure 7-4**). The mapped features correspond to an area of deeper bathymetry (up to 96 m depths). NatureScot (2020) states that "*Subglacial tunnel valleys are highly resistant to human activities…and are either considered not sensitive or to have a low sensitivity to pressures arising from human activities".* The slide scar is found on, or below, the flanks of sub-glacial tunnel valleys which are >20 km from the cable corridor, and outside of the Physical Environment Study Area, and will not be considered further in this report.

Within the Southern Trench NCMPA, NatureScot (2020) mapped a moraine that intersects the cable corridor at around KP 152.1 (**Figure 7-4**). The moraine is largely buried in the more recent sediment and, thus, is not a distinctive feature in the bathymetric data. It reaches a maximum of 5 m above the surrounding seafloor, which is comparable to other irregular topography in the area. This feature can be seen in sub-bottom data as an asymmetric ridge.

Regarding moraines, NatureScot (2020) states that: "*Their resistance to erosion is highly variable and depends upon the composition and level of consolidation of the till. Overall, moraines are considered to have a medium sensitivity to sub-surface abrasion and changes in* *tidal flow, and a high sensitivity to physical removal"*. At the nearest VC locations (KP 152 and KP 154) there was short penetration and limited recovery (1.5 and 1 m, respectively), which is likely to be the result of the VC hitting the buried portion of the moraine and the associated till (e.g., dense sand, cobbles, stiff clay *etc.*). At the nearest cone penetration test (CPT) location (KP 153) the material is interpreted to be very dense gravelly sand to sand, which is consistent with consolidated till. This material is likely to be resistant to erosion from changes in the hydrodynamic regime, but will be locally trenched for cable burial.

There is potential for Annex I Reef (as designated under the Habitats Directive; see **Section 2.4**) to be present near both landfall sites. This is discussed further in the Benthic Ecology Chapter (**Section 7.2**).

FIGURE 7-4: PROTECTED FEATURES IN THE SOUTHERN TRENCH MARINE PROTECTED AREA



7.1.3.8 FUTURE CHANGES

According to the UKCP Marine Projections report (Palmer *et al.,* 2018), a number of aspects described in this Physical Environment section are expected to evolve during the lifetime of the Project. By 2060, it is predicted that mean sea-level will rise by approximately 0.3 m above present levels (based on the Representative Concentration Pathway (RCP) 8.5[6]; 95th percentile) at the southern landfall site (Rattray Head), with rates of change increasing over time.

Sea-level rise may result in larger waves which, in turn, may cause an increase in erosion at the coastline. Sea-level rise may also result in the loss of intertidal habitats. The southern landfall site (Rattray Head) is largely unprotected by sea defences, but some defences exist at

[6] RCP 8.5 is considered to represent a realistic worse case.

the northern landfall site (Sinclair's Bay), where marine erosion is evident (see **Section 7.1.3.6** and **Section 7.1.3.6**).

Some studies indicate there is evidence for an increase in North Atlantic storms at the end of the 20th Century (Wolf *et al*., 2020), whereas other studies state that there is currently little or no global observational evidence for systematic long term changes in storminess, or any detectable change in storm surge magnitude (IPCC, 2012; Horsburgh *et al*., 2020). Despite the increase in storminess observed, Wolf *et al.* (2020) indicate that projections show an overall reduction in the frequency of storms and in mean wave height throughout the 21st Century, but an increase in the most-severe wave heights. These projections, however, have substantial uncertainty associated with them.

Recent studies have indicated that changes in the tidal range may result from future changes in the mean sea level (Pickering *et al.*, 2012; Ward *et al.*, 2012; Pelling *et al.*, 2013). All of the modelling suggests that changes in the tidal range would be of the order of ±10% of the change in mean sea-level, with significant spatial variability. Despite these changes being small in comparison to mean sea level changes, variations in the tidal regime could have implications for sediment transport dynamics.

According to the Dynamic Coast research, at the southern landfall site (Rattray Head) approximately 20 m of coastal erosion is predicted under a future high emissions 2050 scenario, and 100 m under the 2100 future high emissions scenario (Dynamic Coasts, 2024). At the northern landfall site (Sinclair's Bay), approximately 20 m of erosion is predicted under a future high emissions 2050 scenario, and 100 m under the 2100 future high emissions scenario (Dynamic Coasts, 2024).

7.1.4 MARINE ENVIRONMENTAL ASSESSMENT

7.1.4.1 OVERVIEW

The proposed works could have the potential to result in effects on the Physical Environment. It is noted that in most cases the Physical Environment is not, in itself, a receptor. Physical Environment changes are, instead, pathways that have the potential to indirectly impact other environmental receptors. The magnitude of effect on these pathways is considered in this Section. The sensitivity of associated (non-Physical Environment) receptors to these changes, and the determination of the significance of those effects, are not assessed in this Section, but are addressed in the relevant, receptor-specific, sections of this MEA.

The Project comprises a 172 km long 525 kV High Voltage Direct Current (HVDC) transmission cable system, and 2 landfall areas (Sinclair's Bay – northern landfall, and Rattray Head – southern landfall) comprising a 400 kV substation and a HVDC station each, located in the proximity of Spittal and Peterhead, respectively.

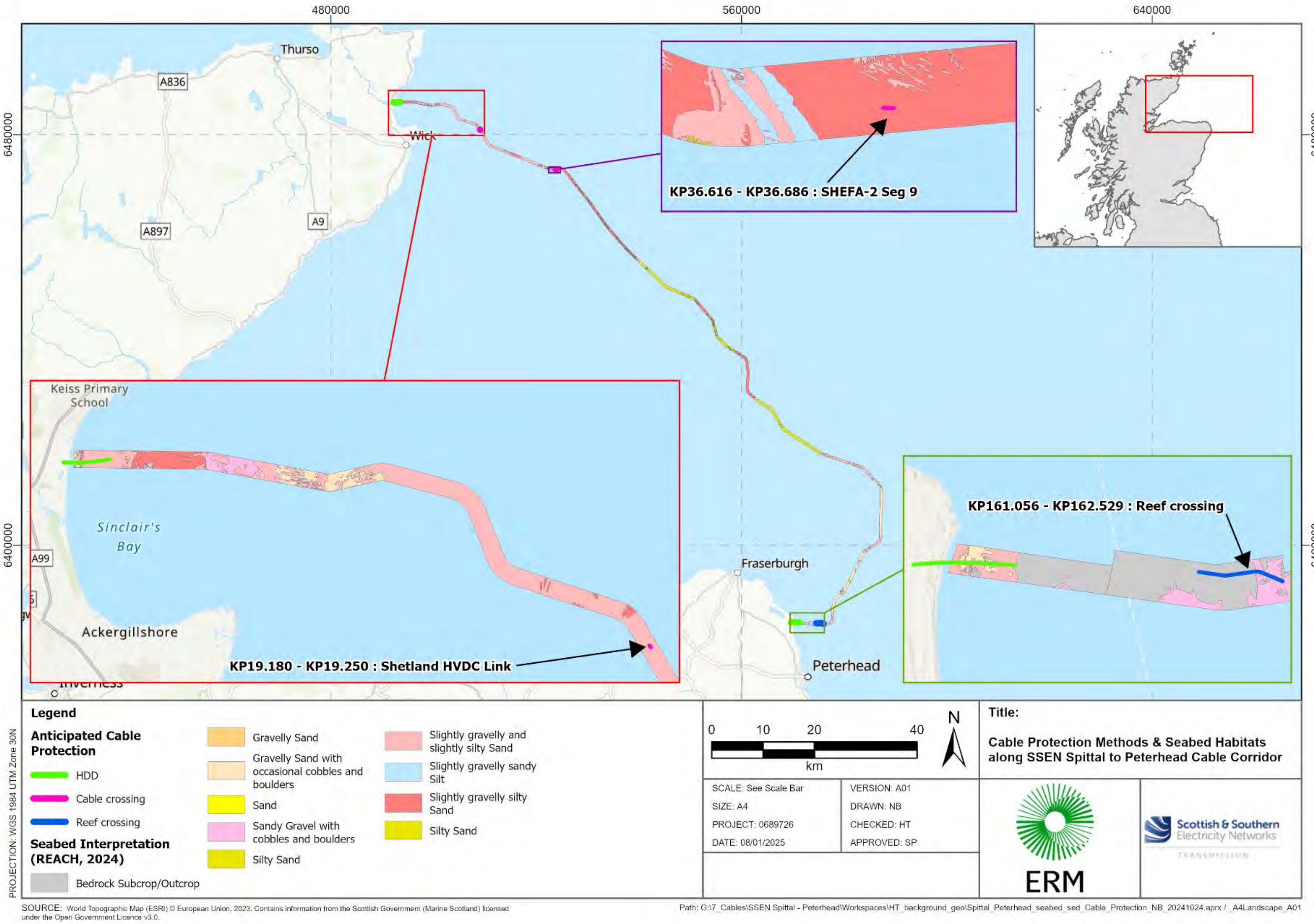
Key Project design information relevant to the Physical Environment is summarised in **Table 7-2** with realistic worst-case parameters outlined within **Table 7-3**. **Figure 7-5** shows the location of potential additional protection (as realistic worst-case scenario) including rock protection due to bedrock outcrop or subcrop, and protection required for cable crossings.

TABLE 7-2: PROJECT DESIGN ENVELOPE (PDE) PARAMETERS RELEVANT TO THE PHYSICAL ENVIRONMENT

Parameter	Unit	Value
Total Duration of Construction Works	Months	45 - Total, land and offshore (running in parallel) 33 – Land-based works 43 – Offshore-based works
Total Duration of Offshore Construction Works	Months	3 years 7 months
Operational Lifetime	Years	40
Types of Installation Vessel	-	• Cable lay vessel • Trench support vessel • Subsea Rock Installation Vessel • DP Construction Support Vessel (CSV) – Mattress installation, PLGR, MFE, Mechanical Cutting etc. • Guard vessels (8–9 spaced at 10–15 km intervals, maximum 17) • Multi cat vessels (Spud can and anchor spread) • Survey Vessels (nearshore and offshore)
Installation characteristics		
Burial Technique (offshore)	-	• PLGR • Boulder clearance • Trenching tools (e.g. Jet trencher, chain cutting trencher) • Potential use of a hybrid tool to simultaneously do boulder clearance and pre-cutting
Burial Technique (nearshore – 1 km)	-	HDD Cable protection installation: rock placement, trench and if not trenched mattress to cover surface lay
Burial Technique (intertidal)	-	HDD
Maximum Depth of Lowering	m	1.8
Minimum Depth of Lowering	m	0.6
Trench Width	m	0.5–1
Width of seabed disturbance from installation tool	m	10
Duration of installation	hours	40 hours per campaign (2 campaigns (potentially fewer if boulder clearance and pre-cutting done simultaneously)) 408 x 2 x 1.1 = 898 hours (total)
Cable Protection		

Parameter	Unit	Value
Length of cable protection	m	• Rock berm = 25,090 • Crossings = 150 • Mattress at reef = 3
Area of cable protection	m^2	• Rock berm = 25,090 x 11.4 = 286,026 m^2 • Crossings: 5 x 150 m x 11.4 m = 8,550 m^2; • Mattresses at reef: 3 m x 2,466 m = 7,398 m^2. •
Maximum height of cable protection	m	1.125
Volume of rock between HDD punch out and location where cables are fully bundled		Estimated based on similar project (Noss Head) 3,800 m^3 (no vertical tolerance) and 9,200 m^3 (with vertical tolerance).

FIGURE 7-5: ANTICIPATED LOCATION OF CABLE PROTECTION AND SEABED SUBSTRATE (SOURCE: REACH, 2024; BAS)



7.1.4.2 ASSESSMENT METHODOLOGY

Effects are assessed for the construction, operation and decommissioning phases. Effects and impacts are often used interchangeably, but for the purpose of this report they have different meanings; an effect is a physical change resulting from project activities, and an impact is the resultant change on a receptor. Therefore, an effect does not result in an impact if there is no sensitive receptor.

The relevance of these potential effects is considered against the baseline conditions, which would be expected to occur if no development took place.

The following potential pathway changes, that may affect marine physical processes (and associated receptors) during the construction, operation and decommissioning phases have been assessed:

- Change in wave regime and tidal currents;
- Increase in suspended sediment concentration;
- Change to sediment transport system;
- Change in geomorphology of protected features; and
- Change in coastal morphology.

TABLE 7-3: REALISTIC WORST-CASE PARAMETERS FOR PHYSICAL ENVIRONMENT

Potential Impact	**Realistic Worst-case Parameters**	**Phase**
Change in wave regime and tidal currents	• HDD exits: 6400 m^2 • Remedial rock placement: 25,090 m x 11.4 m = 286,026 m^2; • Crossings: 5 x 150 m x 11.4 m = 8,550 m^2; • Mattresses at reef: 3 m x 2,466 m = 7,398 m^2. **Total 308,374 m^2**	Construction Operation Decommissioning

Area of seabed disturbance leading to increase in suspended sediment concentration	Comprises seabed disturbance by burial in seabed sediments, plus seabed disturbance by installation of cable protection associated with seabed sediments i.e. increases in suspended sediment concentration (SSC) are not expected to arise where mattresses are installed on non-sediment seabed habitats. Length of seabed disturbance by burial = Total (max.) cable length (172,000 m) – length of cable requiring protection (rock berm/crossings = 25,090 m) = 146,910 m Width of seabed disturbance from installation tool = 10 m Area of seabed disturbance by burial = 146,910 x 10 = **1,469,100 m²** (1.4691 km²) Length of seabed disturbance by rock berm/crossings = 25,090 m Width (max.) of rock berm/crossings = 11.4 m Area of seabed disturbance as a result of rock berm/crossings = 25,090 x 11.4 = **286,026 m²** Total potential area of seabed disturbance = 1,469,100 + 286,026 = **1,755,126 m²** (1.7551 km²)	Construction Decommissioning
Increased suspended sediment concentration - maximum plume advection from source	Coarse sediment (>2 mm) = 100 m Sand (0.062 mm–2 mm) = 700 m Silt and clay (at a level above 1 mg/l) = up to 2 km Estimated based on North Sea projects occurring under similar hydrodynamic and seabed sedimentary conditions	Construction Decommissioning
Change in sediment transport system	Rock berm/Crossings (25,090 m length) Mattress at reef (2,400 m length) Maximum height of cable protection = 1.125 m Potential blockage effects by infrastructure extending above current seabed level	Construction Operation Decommissioning
Change in geomorphological volume of protected features (pathway)	Maximum depth of trenching (1.8 m) x maximum width of trenching effect (10 m) x maximum width of protected geomorphological feature where it is within maximum depth of lowering of the surface (300 m) = **5,400 m³**	Construction Operation Decommissioning
Change in coastal morphology (pathway)	**9,200 m³** rock volume (with vertical tolerance) between HDD punch out and location where cable is fully bundled. Estimated based on similar project (Noss Head).	Construction Operation Decommissioning

7.1.5 CONSTRUCTION PHASE

Seabed preparation activities such as boulder clearance and PLGR are likely to be required, prior to installation of the subsea cable. Pre-sweeping of sandwaves has been ruled out, given the magnitude of the bedforms along the cable corridor. Therefore, it is not considered as part of this assessment as the realistic worst-case scenario is being considered. Cable installation will be undertaken in two campaigns. Cable installation will occur predominantly via trenching (approximately 85% of the route), including jetting and mechanical cutting.

At the landfall sites, HDD will be undertaken, therefore potential impacts of open-cut trenching and cofferdams have not been assessed. The HDD exit is proposed to be at around 10 m LAT at Sinclair's Bay and at around 7.5 m LAT at Rattray Head. The drill punch-out at both landfalls will be below LAT. During drilling, water-based drilling fluid, which consists of bentonite clay suspended in water, is released at the punch-out location into coastal waters and may cause a temporary sediment plume. The concentration of bentonite is typically low (typically between 13 litres (30 kg) and 35 litres (80 kg) of dry bentonite clay per m³ of water (30,000 to 80,000 mg/l)).

As a realistic worst-case scenario, rock placement will be used at the bell mouth exit point, on top of cast iron shells and at rock placement crossings. The volume of the rock placement has been estimated based on a previous similar project (**Table 7-3**) to provide a realistic worst-case, however it should be noted that there is potential in Sinclair's Bay for the HDD punchout to be buried, which would further minimise the volume of rock placement needed.

7.1.5.1 CHANGE IN WAVE REGIME AND TIDAL CURRENTS

Temporary infrastructure in the inter-tidal/shallow sub-tidal areas (such as jack-up barges or flat-bottom vessels) during the construction phase may result in indirect changes to the physical environment including causing the blockage of waves, tides and sediment transport processes and, potentially, resulting in localized scour. The Project plans to use HDD methods at both landfall sites, with the punch out location being below LAT. This reduces the impact on the nearshore and coastal region compared with open-cut trenching and the use of cofferdams. The magnitude of effect to the hydrodynamic regime during the construction phase is **Negligible**, since any effects are highly localised and small-scale.

7.1.5.2 TEMPORARY INCREASE IN SUSPENDED SEDIMENT CONCENTRATION

The proposed works involve the laying and burial of a cable within the seabed substrate, resulting in direct physical disturbance of the seabed from construction activities. Sediment dispersion modelling studies have not been undertaken as part of this assessment. Nevertheless, previous studies are used to estimate the theoretical zone of influence for sediment dispersions resulting from Project activities which have the potential to disturb the seabed and produce sediment plumes. These activities may include:

- Cable burial by ploughing, jetting and trenching;
- HDD installation; and
- Installation of cable protection.

Further detail about the activities that cause seabed disturbance is included in **APPENDIX D: Physical Processes Technical Appendix**.

The total area of seabed potentially impacted by burial and cable installation (the source for suspended sediment) is 1.7551 km² (**Table 7-3**). Suspended sediment concentrations (SSC) will be locally elevated within this area, and advected from the location by local hydrodynamics. Sediment of different particle size behave differently after being brought into suspension by mechanical disturbance. Coarse material settles to the seabed relatively quickly (in the order of seconds to tens of seconds for sand or gravel), whereas fine particles may produce a more persistent plume. Depending on the height to which the material is ejected, and the current speed at the time of release, changes in SSC and deposition will be spatially limited.

Modelling studies undertaken for other offshore development projects in the North Sea, with similar seabed substrate and hydrodynamic conditions can be used to estimate the distance that sediment may travel in suspension as a result of being disturbed via cable installation. These studies indicate that sand (0.062 mm–2 mm) and coarse sediment (>2 mm) could disperse up to a maximum of 700 m and 100 m, respectively, from the source of seabed disturbance, whereas silt and clay (at a level above 1 mg/l) may travel over a distance of up to 2 km (Royal Haskoning, 2011; Scira Offshore Energy Ltd, 2006; Intertek, 2017).

In situ monitoring that has been undertaken during cable installation shows that cable-laying activities do not create a major or long term change in the SSC levels (BERR, 2008; EMU, 2005; SeaScape Energy, 2008). The monitoring also showed that sediment is largely deposited immediately adjacent to the cable corridor; even changes associated with relatively fine sediment were only measurable within a few hundred metres (BERR, 2008; EMU, 2005; SeaScape Energy, 2008).

The cable corridor is characterised by a range of different seabed sediment types. The PSA data indicate that the corridor predominately consists of sand (>80%; see **Section 7.1.3.3**), with variable amounts of gravel, and a greater proportion of fines in the deeper waters (>70 m). In the nearshore region the proportion of sand exceeds 99% (REACH Subsea, 2024). Given the sediment composition, an increase in SSC during cable installation along the cable corridor will be short-lived, and is likely to localised to within a few hundred metres of the cable corridor. The magnitude of the effect is, therefore, **Negligible**.

There may also be an increase in the SSC due to HDD drilling fluid, which consists of bentonite clay grains (see **APPENDIX D: Physical Processes Technical Appendix** for further details). Bentonite clay grains are small and thus may remain suspended in the water column for a long period of time (days to weeks).The sediment will be advected away from the release location by the prevailing tidal current, but will be subject to rapid dispersion, both laterally and vertically, to near-background levels (tens of mg/l) within hundreds to a few thousands of metres of the point of release. It will not accumulate on the seafloor in measurable thickness in any location beyond a few tens of metres from the punch-out location.

As a consequence of the low concentrations of suspended sediment, the rapid dispersion to background levels, the temporary nature of HDD installation, the limited depositional thickness, and the fact that it is a natural material with no chemical constituents, the magnitude of effect on the suspended sediment pathway and the physical environment will be **Negligible**. The impacts of drilling fluid on water quality are discussed further in **APPENDIX C: Water Framework Directive Compliance Assessment**.

The SSC has been assessed as a pathway (i.e. an effect), rather than a receptor for the Physical Environment chapter. This is because pathways (effects) are simply changes resulting from project activities, and in order for an effect to have an impact, there needs to be a sensitive receptor present. In most cases, the physical environment is not sensitive to changes in physical parameters (e.g. seawater is not, in itself, sensitive to how much sediment is suspended within it). Impacts may occur, however, where changes to SSC affect a sensitive receptor, such as designated sites, benthic ecology, archaeology, fish and shellfish ecology, marine mammals, and commercial fisheries. For example, the Southern Trench MPA is protected for biological habitats that depend on the geologic and hydrodynamic conditions; therefore, changes in the SSC have the potential to impact sensitive receptors related to the Southern Trench MPA. Impacts on these receptors are assessed within the respective sections of the MEA report and are not discussed further in this chapter. It should be noted that SSC is also considered a parameter in defining one of the quality elements of a water body receptor in the Water Framework Directive assessment (**APPENDIX C: Water Framework Directive Compliance Assessment**) Change to Sediment Transport System

Changes to the sediment transport system occur when temporary or permanent infrastructure block the waves, tides, and sediment transport processes, potentially causing sediment accumulation or depletion (e.g. scour). Temporary infrastructure in the inter-tidal/shallow sub-tidal areas, such as jack-up barges or flat-bottomed vessels during installation and decommissioning phases may result in indirect changes to the physical environment including causing the blockage of waves, tides and sediment transport processes, potentially resulting in seabed scour. The Project plans to use HDD methods at both landfall sites. As discussed in **APPENDIX D: Physical Processes Technical Appendix**, this results in a lower impact compared to open-cut trenching and the use of a cofferdam, which temporarily blocks longshore sediment transport. Since open-cut trenching and cofferdams have been ruled out as part of the Project, these effects have not been assessed. Even in the realistic worst case, the changes to the sediment transport system due to blockage effects are likely to be **Negligible** because of the short timescale and localised area.

Blockage effects may arise from the installation of cable protection which, for the Project, includes an estimated 25,090 m of rock berm and, potentially, up to 2,400 m of mattress, extending approximately 1.125 m above the surrounding seabed (**Table 7-3**). At the HDD bell mouth exit, cable protection will also be used. The effect of rock placement on the sediment transport system during the construction phase of this Project is **Low**, since the rock placement occurs within a 6-month timeframe and the effects from the installation of cable protection, and the presence of vessels associated with construction, are small-scale and temporary. The rock berms will remain *in situ* for the duration of the Project and long term effects are assessed in the Operation section (**Section 7.2.6**).

The sediment transport system is a key pathway in the marine environment. Changes in sediment transport processes may, potentially, impact other sensitive receptors. Only receptors in the Physical Environment (such as the coastline and seabed morphology) are assessed within this section. Impacts of changes in sediment transport on other receptors, such as benthic ecology, are assessed in the respective sections of this MEA.

7.1.5.3 CHANGE IN GEOMORPHOLOGY

Seabed preparation works and cable installation activities have the potential to create direct and indirect effects that may cause changes to seabed geomorphological features (offshore and nearshore sub-tidal sandbanks or sandwaves, including designated glacial features).

Route clearance

The Project plans to undertake boulder clearance and PLGR. Boulder clearance activities are limited to the seafloor, with no significant penetration of the subsurface. Where possible, boulders will be avoided via micro-routing, to reduce the necessity of boulder clearance. Where boulder density is low, it is anticipated that route clearance will be undertaken with an orange peel grab. Where boulder density is medium, a boulder clearance tool may be used, although it is not currently confirmed whether this will be necessary. Pre-lay grapnel run (PLGR) may also be used to clear obstructions – this has a potential width of 3 m (approximately). Both activities may potentially cause permanent changes to the seafloor, however, given the localised nature of the activities, the magnitude of effect is considered to be **Low**.

Trenching activities

Trenching will cause localised areas of abrasion and changes may occur to the topography of the seabed as a result of sediment settling and/or the compaction of the seabed strata. Berms either side of the trench may persist, even after the cable has been laid and backfilled.

Given that the maximum depth of lowering of 1.8 m and trench width is 1 m, the area affected by direct abrasion will be 309,600 m^3 over the length of the cable (maximum cable length = 172 km). In addition, the seabed either side of the trench will be impacted, due to the skids and berms. The total width of seabed disturbance from installation tool is estimated to be 10 m (**Table 7-2**), potentially affecting a total surface area of 1.4691 km^2. Trenching activities may result in a change in the seabed compared to the baseline conditions, as different bedforms develop following the infill of the trench. However, the area affected will be highly localised and the changes will be largely temporary, with pre-installation conditions likely to return following natural sediment transport processes. The magnitude of effect is considered to be **Low**

There is the potential for any effects to extend to sensitive receptors identified as part of Designated Sites in proximity to the cable corridor (**Section 7.1.3.7**). Notably, the cable corridor crosses through the Southern Trench NCMPA, which is a large-scale geological feature protected for its geological diversity and which provides important biological habitats. The geological protected features are the focus of this chapter and, within the Physical Environment Study Area, include tunnel valleys and moraines. Tunnel valleys are interpreted to have low sensitivity due to their resistance to erosion (NatureScot, 2020), however, moraines have previously been identified as having a "*high sensitivity to physical removal*" (NatureScot, 2020).

The cable corridor avoids the deepest portion of the Southern Trench MPA and most of the associated features; however, it does intersect a previously mapped moraine. Given that the moraine is largely buried, and the site-specific data only cover the cable corridor, it is difficult to estimate the proportion of the moraine that would be affected by cable burial. Significant assumptions are made in the consideration, below, and result in a highly conservative assessment of the magnitude of effect.

Where it intersects with the cable corridor, the moraine is mostly buried. Measured from the sub-bottom data, the width of the moraine, where it is within 1.8 m of the surface (the maximum depth of lowering), is approximately 300 m. Assuming the total length of the feature as mapped by NatureScot (2020) is correct, the moraine is estimated to be approximately 10 km long. As the total depth of the moraine cannot be determined from the site-specific data, only the upper 1.8 m of the moraine will be considered. While the width of the moraine varies with depth, and likely also varies along its length, a conservative estimate of its width at 1.8 m depth (the maximum depth being considered), based on the sub-bottom data, is 300 m. Assuming a simplified (conservative) triangular-cross-section of moraine, the volume of that section of the moraine above 1.8 m depth, for the total length of 10 km, is calculated as 2,700,000 m^3.

Assuming a realistic worst-case scenario, of the entire removal of moraine, within the maximum trench depth of up to 1.8 m, along the 300 m width of the moraine, and assuming a highly conservative 10 m width footprint of impact[7] for the trenching tool and corridor clearance, the volume of moraine potentially affected would be 5,400 m^3. This equates to 0.2% of the moraine volume within 1.8 m of the surface. If the subsurface removal is considered, using the maximum trench width of 1 m, then the realistic worst-case magnitude of effect will be to remove 0.02% of the upper 1.8 m of the moraine. These are highly conservative calculations of magnitude of effect, as the proportions would be significantly less than these if the full vertical extent and, hence, volume of the feature[8] is considered.

The magnitude of effect of trenching activities on morphological features is considered to be **Low**, given the localised footprint of impact, and the overall extents of those features.

The significance of the impact on the moraine as a designated feature is considered in **Appendix B: Nature Conservation Marine Protected Area Assessment**.

Horizontal Directional Drilling installation

HDD installation minimises the effects on the seabed morphology in the intertidal zone during cable installation. The main effects relate to the seabed disturbance punch-out location, and the deployment of a realistic worst-case estimate of 9,200 m^3 of rock protection. Given the localised nature of the works, the magnitude of the effect is considered to be **Low**.

Anchor deployment

Nearshore effects may result from anchors used to maintain the position of vessels in shallow water during nearshore installation works. The number of vessels active during construction will be approximately seven plus support vessels, estimated from a similar project. The area of seabed disturbed by anchors will, therefore be highly localised and limited in number. The magnitude of effect is considered to be **Low**.

7.1.5.4 CHANGE IN COASTAL MORPHOLOGY

There is potential for morphological change to the coast in response to the construction of temporary landfall infrastructure. The scale of the effect is dependent on the landfall cable installation methodology and the physical characteristics of the coastline, including the presence of any coastal defence structures. HDD methods are anticipated, resulting in minimal effects, compared to open-cut trenching.

Changes in coastal morphology may arise as a result of changes in the sediment transport regime in the nearshore region during the installation (or decommissioning) of the cable. However, changes to the sediment transport are considered to be **Negligible** in magnitude, temporary, and spatially restricted (see **Section 0**).

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[7] Berr (2008) indicates that the footprint of effect is generally restricted to 2-3 m width. Any effects beyond this are restricted to the surface and therefore highly unlikely to affect the moraine beneath the surface. Nevertheless, 10 m has been used as a realistic worst-case scenario.

[8] This is a highly conservative estimate. This methodology does not consider spatial variations in the moraine beyond the limits of the data coverage, and assumes the mapped length of the moraine by NatureScot (2020) is maximum total length.

7.1.6 OPERATION PHASE

Key potential effects on the physical environment during the operation phase relate to the presence of permanent cable protection measures in certain parts of the proposed cable corridor, and protection around the HDD exit. Therefore, the following assessments focus on this aspect. Effects associated with cable remedial works are not included as part of this report.

Cable protection is anticipated to be required at various locations along the corridor due to cable crossings, HDD exits and areas of shallow burial/non-burial (due to substrate type). Bedrock is also encountered close to the surface in the nearshore region at both landfalls. 25,090 m of the proposed cable corridor is currently predicted to require cable protection in the form of rock berms (maximum height of 1.125 m and width of 11.4 m). This includes cable protection, along 150 m lengths of the cable corridor, at known cable crossings. Three crossings are included in the Project Design Envelope. Additionally, mattresses have been proposed to be deployed where reef has been identified, along a further 2,400 m of the cable corridor (nature inclusive protection methods are being considered for use but only where it is the most engineering appropriate and lowest footprint solution).

7.1.6.1 CHANGE TO THE HYDRODYNAMIC REGIME

There is the potential for long term changes to tidal currents, waves and the associated patterns of sediment transport arising from blockage caused by cable protection measures (Deltares, 2023). Cable protection measures, in the form of rock berms and mattresses, can cause localised disturbances to flow however the cable protection measures proposed have limited elevation in the context of the depth of the water column within the majority of the Study Area. Given the scale of the protection methods, the magnitude of effect on the hydrodynamic regime itself is assessed to be **Low**.

7.1.6.2 CHANGE TO SEDIMENT TRANSPORT SYSTEM

Cable protection methods have the potential to block sediment transport, potentially resulting in scour. Although the height of the rock berm is limited in the context of the water depth, their interaction with the currents may cause the acceleration of water around the edges of the structures, potentially above the critical velocity for sediment transport.

Changes in the sediment transport system could potentially result in changes in the seabed morphology (offshore and nearshore sub-tidal sandbanks or sandwaves). Seabed features indicative of natural scour processes have been identified along the corridor, such as scour associated with boulders and rippled scour depressions (see **Section 7.1.3.2**). The areas where rock berm will be used, however, generally correspond to areas where bedrock is exposed at or near the seafloor, or coarse sediment is encountered (**Figure 7-5**). The lack of significant mobile sediment in these areas means that the potential for changes in sediment transport processes and scour is limited. As such, while the effects will last for duration of the Project, the overall magnitude of effect on the sediment transport system is assessed as **Low**.

Out of service cables were detected at KP 5.2, KP 10.6, KP 12.6, KP 132.5, KP 143.1, and KP 158.9. These will be cleared prior to laying. Three protected crossings, each of 150 m length, are, however, included in the Project Design Envelope. These will be protected using pre-lay mattress and post-lay rock (**Table 7-2**). Additionally, reef rock berm will be used between KP 161.1 and KP 162.5 in an area of *Sabellaria spinulosa* reef.

The known crossings are all in areas where the seabed substrate comprises slightly gravelly and slightly silty sand, with no notable bedforms within 1 km of the cable corridor, but large scale bedforms in the wider Study Area, indicating some possible seabed mobility. The seabed in the area surrounding the reef rock berm consists predominantly of bedrock subcrop/outcrop and sandy gravel. Given the localised nature of these cable crossings the magnitude of the potential effect is **Low**.

7.1.7 DECOMMISSIONING PHASE

The effects caused by decommissioning will mirror the effects caused by installation if the cable and protection are removed. However, the magnitude of the effects are expected to be lower, for example, if the cable and protection is left *in situ*.

7.1.8 ASSESSMENT SUMMARY

Physical Environment changes are pathways that have the potential to indirectly impact other environmental receptors. The magnitude of effect on these pathways has been considered in this Section and, overall, the Physical Environment assessment has concluded **Negligible** and **Low** magnitudes for all effects on physical process pathways, as a result of the construction, operation and decommissioning phases of the Project.

The sensitivity of associated (non-Physical Environment) receptors to these changes, and the determination of the significance of those effects, have not been assessed in this Section, but are instead addressed in the following, receptor-specific, sections of this MEA.

7.2 BENTHIC ECOLOGY

7.2.1 INTRODUCTION

This section provides detail on benthic and intertidal habitats and species located along, and in the vicinity of, the proposed cable corridor and landfall locations. An assessment of potential impacts on key sensitive habitats and species is presented in **Section 7.2.4** to assess the likely expected effects resulting from the Project.

The relevant legislation and policy relating to Benthic Ecology include:

- National Marine Plan: Chapter 4 (GEN9, GEN13, GEN21, CABLES1, CABLES2)
- Marine (Scotland) Act 2010;
- Marine and Coastal Access Act 2009;
- The Conservation of Habitats and Species Regulations 2017;
- The Conservation of Offshore Habitats and Species Regulations 2017; and
- Nature Conservation (Scotland) Act 2004.

7.2.2 BENTHIC ECOLOGY STUDY AREA

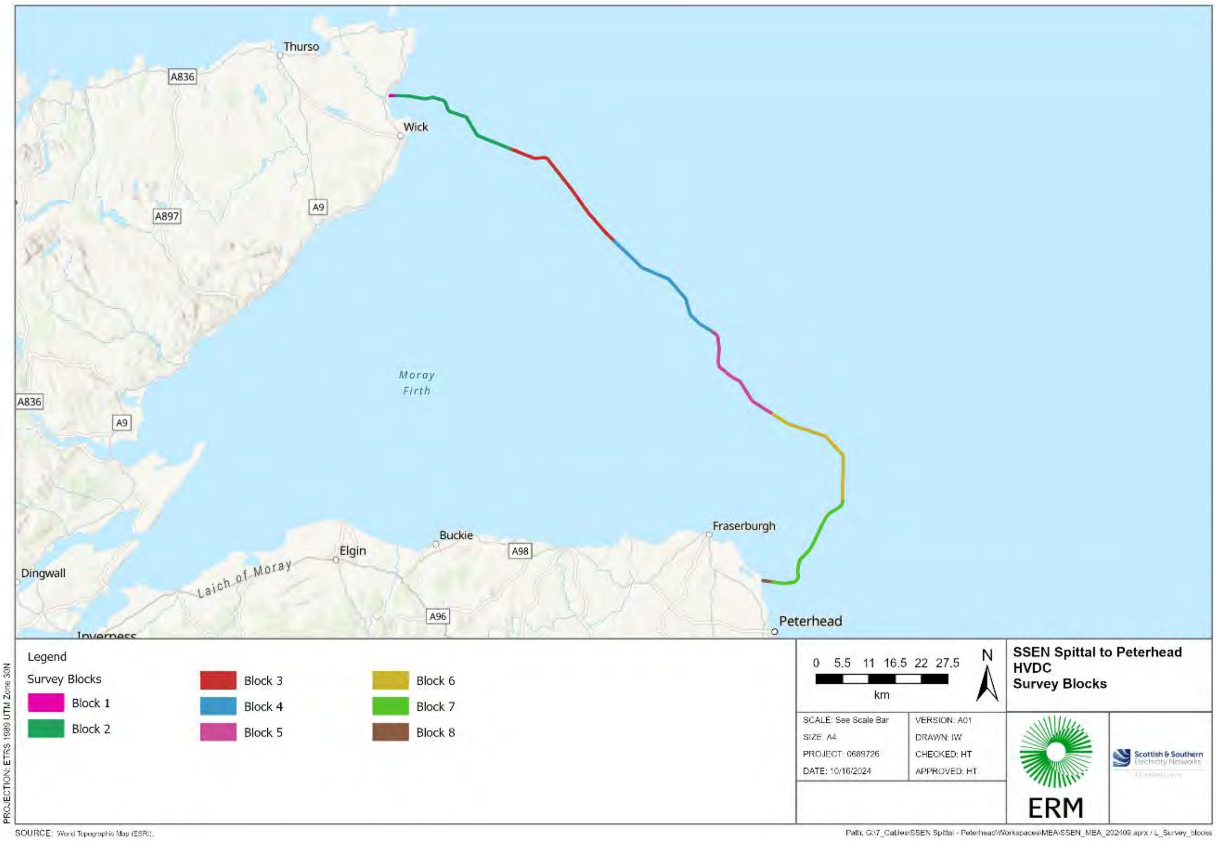
The Benthic and Intertidal Ecology Study Area described in this MEA, comprises the area that may be directly impacted by the development (near-field), and the adjacent area that may be affected by indirect effects (far-field). The near-field includes the proposed subsea cable corridor, and the intertidal area at the northern (Sinclair's Bay) and southern (Rattray Head) landfalls, between Mean High Water Springs (MHWS) and Mean Low Water Springs (MLWS). The far-field is defined as the area around the cable corridor where suspended sediment plumes may be advected. This area has been defined in a precautionary manner by a 10 km buffer around the proposed cable corridor.

7.2.3 BASELINE ENVIRONMENT

Intertidal and subtidal baseline surveys were conducted by Benthic Solutions Ltd (BSL, 2024a-e). The surveys were commissioned by REACH Subsea Ltd. The objective of the surveys was to characterise the benthic habitats throughout the proposed subsea cable corridor. The characterisation has been used to inform this MEA and the associated Habitats Regulations Appraisal (HRA) and Nature Conservation Marine Protected Area (NCMPA) assessments.

The offshore subsea cable corridor was divided into Blocks 1 to 8, from Sinclair's Bay to Rattray Head, with Blocks 1 and 8 representing the nearshore, and Blocks 2 to 7 representing the offshore region (**Figure 7-6**).

FIGURE 7-6: SURVEY BLOCKS ALONG THE PROPOSED SUBSEA CABLE CORRIDOR



The first phase of the intertidal survey was conducted between 26-30 October 2023, and the second phase between 09-14 February 2024 (BSL, 2024a; 2024b).

Intertidal surveys were conducted at both landfall locations, namely, Sinclair's Bay (north) and Rattray Head (south). The subtidal area was divided into nearshore and offshore survey campaigns, which were conducted along the proposed subsea cable corridor between the two proposed landfalls. The nearshore survey was conducted between the 13-26 February 2024 (BSL, 2024c), whilst the offshore survey was conducted between 18 December 2023 to 31 January 2024 (BSL, 2024d).

Results of the intertidal, nearshore, and offshore surveys are reported in BSL (2024e). In addition, a survey was conducted in March 2024. The survey's aim was to collect additional data to characterise potentially protected features in Block 7; based on potential Annex I Reefs (H1170) identified from the nearshore and offshore surveys (Ocean Infinity, 2024). This survey targeted two Priority Areas (Pri) within Block 7; Pri 1 and Pri 2 (**Figure 7-7**). Results of this survey were reported separately by Ocean Infinity (2024).

The intertidal survey consisted of walking transects to follow sediment changes. Photographs were taken to determine species, habitats and likely sediment changes in the survey area, with each change recorded in an observation log sheet. Sediment samples (particle size analysis and macrofauna) and physicochemical samples were also collected at locations positioned on the shoreline. The aim of the survey was to aid identification of the likely variation observed across sedimentary habitats.

The number of samples collected varied, per landfall, due to the heterogeneity observed across sedimentary habitats. A total of 15 transects and 8 samples were collected at the northern landfall (Sinclair's Bay), and 11 transects and 9 sediment samples were collected at the southern landfall (Rattray Head) (**Figure 7-8**).

Aerial photography using an unmanned aerial vehicle (UAV) captured high resolution images of both landfall locations to produce orthomosaics for topography and site overview. Results of the UAV survey are presented in (REACH Subsea, 2024).

The nearshore subtidal survey successfully investigated 23 camera transects, ranging from 50-200 m in length, with three co-located grab samples. Three camera transects, and two grab samples were conducted off the northern landfall (Sinclair's Bay), within Block 1. The remaining camera transects and grab sample were conducted off the southern landfall (Rattray Head), within Block 8 (**Figure 7-9**). The focus of the transects was located off the southern landfall, owing to the presence of sensitive habitats identified nearby.

The offshore subtidal survey campaign successfully recorded 47 sampling stations , and 87 camera transects, ranging from 50-250 m in length(**Figure 7-9**). Between Blocks 2 and 7, both camera and grab stations were spaced at approximately 3 km intervals along the cable corridor. In areas of interest identified from review of the geophysical (acoustical) data, additional transects and grabs were conducted.

Multibeam echosounder (MBES) and sidescan sonar (SSS) data, together with extensive pseudo-video transects were acquired along all survey lines for Pri 1 and Pri 2. These data were used to identify presence of Annex I features (e.g., Annex I Reef). Based on this preliminary determination of areas of potential interest, a total of 11 x 100 m long transects were selected for Pri 1, and 7 x 100 m long transects for Pri2, for assessment.

FIGURE 7-7: PRIORITY AREA 1 AND PRIORITY AREA 2 SURVEY AREAS

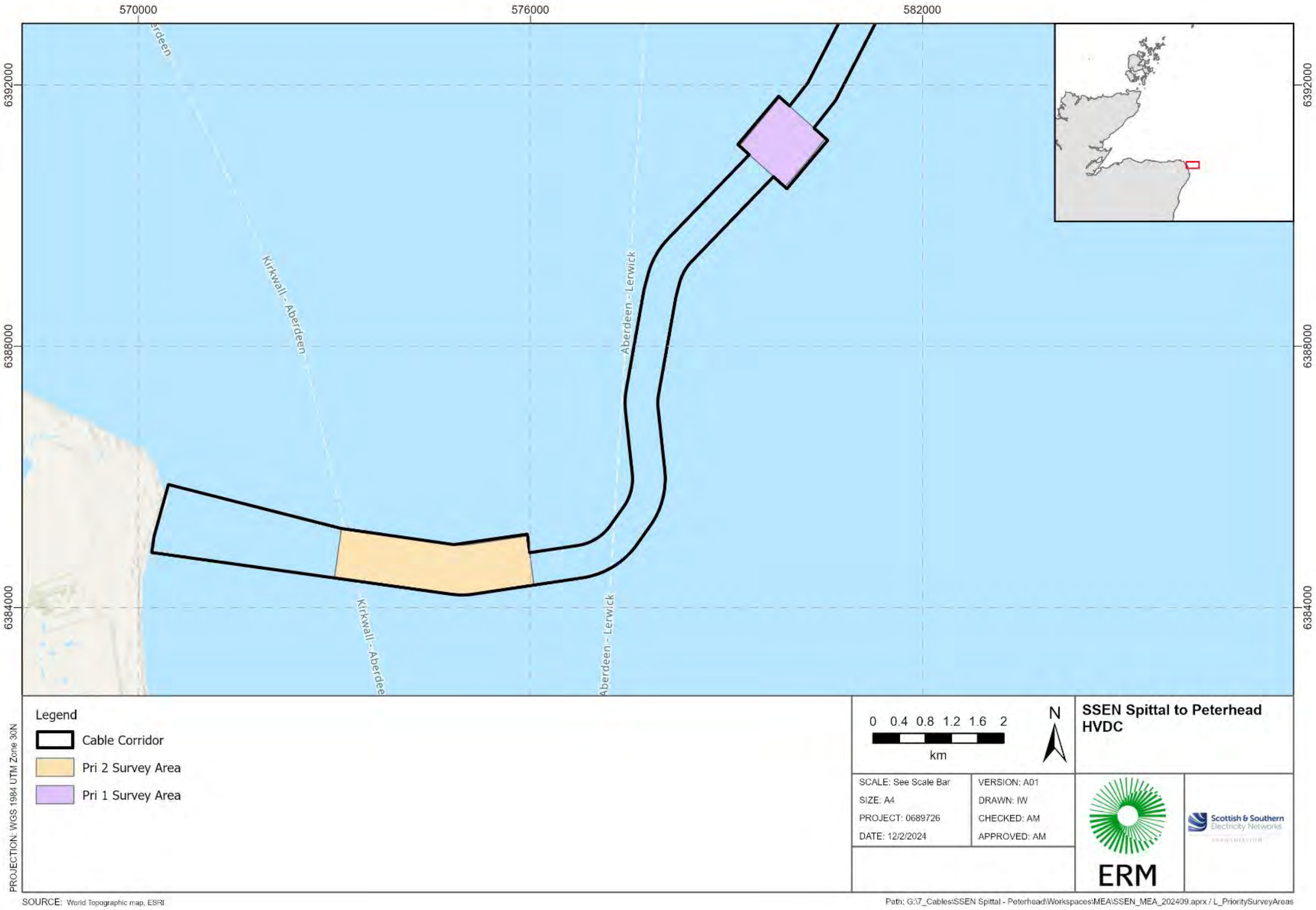


FIGURE 7-8: NEARSHORE AND INTERTIDAL TRANSECTS AND SAMPLING ACQUIRED (SOURCE: BSL, 2024AB)

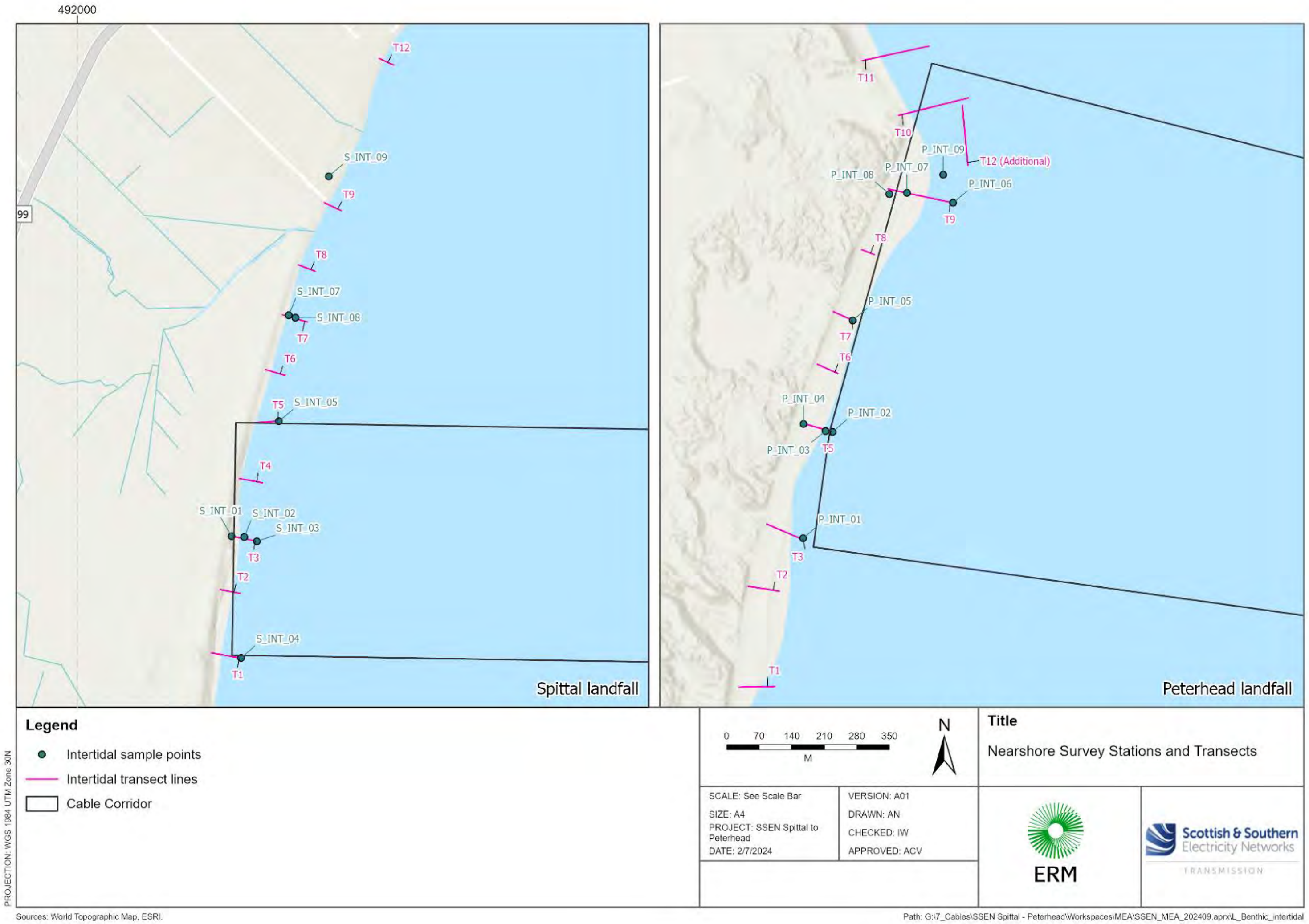
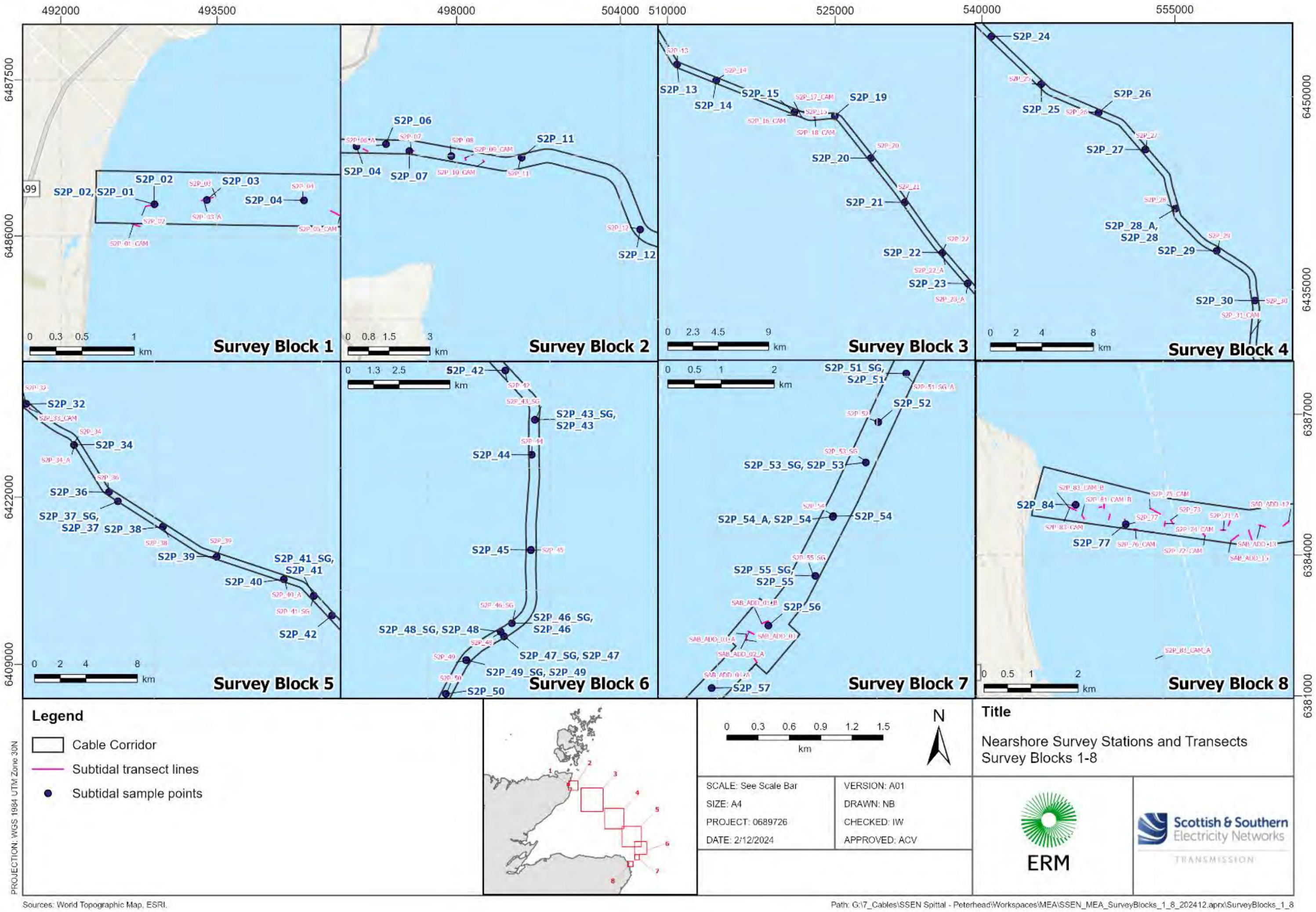


FIGURE 7-9: SUBTIDAL TRANSECT AND SAMPLING LOCATIONS ALONG THE PROPOSED SUBSEA CABLE CORRIDOR (SOURCE: BSL, 2024CD)



7.2.3.1 SITE CHARACTERISTICS – LANDFALL AREAS

Biological Environment

The intertidal habitats at Sinclair's Bay displayed sediment changes from north to south, with hard substrate in the north, and soft sediments along the rest of the landfall. The northern area included pebbles, cobbles, boulders and exposed bedrock. The hard substrate in the upper eulittoral supported little presence of flora or fauna, while the mid-lower eulittoral supported species of fucoid and red seaweeds. A kelp zone was observed just below the low water mark.

Soft sediments found on the middle and southern sections of the northern landfall, were generally characterised as medium sand, dominated with occasional pebbles. No visible fauna were observed. Subsequent macrofaunal analyses of the recovered intertidal samples identified one sample with no fauna. Sample S_INT_03 was collected in the lower shore and recorded one individual, this was the amphipod *Pontocrates arenarius*.

Figure 7-10 presents example images of the different intertidal habitats observed within the northern (Sinclair's Bay) landfall.

FIGURE 7-10: EXAMPLE IMAGES OF SINCLAIR'S BAY (SOURCE: BSL, 2024a; 2024b)

(TOP LEFT) North upper-mid low shore comprising of pebbles with low faunal abundance; (TOP RIGHT) north mid-lower shore comprising cobbles colonised by fucoids and red algae; (BOTTOM LEFT) southern upper shore comprising pebbles and cobbles backed by sand dunes; (BOTTOM RIGHT) southern mid to lower shore comprising clean mobile sand

The southern landfall (Rattray Head) intertidal area was primarily covered by mobile sediments, with medium sand dominating all zones from the supralittoral to the low water mark, and with no visible fauna. In addition, organic debris was observed across the landfall, including marram grass and kelp debris.

Macrofaunal analysis of the intertidal samples identified the sediments as impoverished, with low numbers of individuals ranging from 1-2 individuals/0.04 m². Multivariate analysis found the macrofauna community across all samples to be significantly similar. The most abundant taxum was the amphipod *Pontocrates arenarius*. This amphipod is considered tolerant to disturbance, is widely distributed across the Northeast Atlantic region, and is a key characterising species of the biotope '*Pontocrates arenarius* in littoral mobile sand' (JNCC, 2015).

In the northern area of the Rattray Head landfall, between the shore and the Rattray Head lighthouse, there was a large area of fucoid-covered rocks in the lower eulittoral, and a patch of barren rocks at the top of the shore below the sand dunes. The hard substrate supported *Fucus vesiculosus* and *F. serratus*, and other species of red algae. The presence of kelp debris and dune-derived marram grass debris were found in the lower and upper eulittoral zone, respectively.

Figure 7-11 presents example images of the different intertidal habitats observed at the northern landfall (Rattray Head).

FIGURE 7-11: EXAMPLE IMAGES OF RATTRAY HEAD (SOURCE: BSL, 2024a; 2024b)

(LEFT) upper shore comprising barren mobile sand with marram grass debris; (RIGHT) bottom shore comprising barren mobile sand

Biotope Mapping

The intertidal areas at both landfall sites support sedimentary and littoral rock habitats. A total of 16 different habitats were recorded during the intertidal inspections. Of these, 13 were recorded at the northern landfall (Sinclair's Bay), whilst 5 habitat types were recorded at the southern landfall (Rattray Head).

The northern half of the north landfall comprised a variety of biotopes, with MA1243 '*Fucus vesiculosus* and barnacle mosaics on moderately exposed mid eulittoral rock' and MA12441 '*Fucus serratus* and red seaweeds on moderately exposed lower eulittoral rock' dominating the mid and lower shore, respectively. In contrast, in the southern half of the intertidal zone there was a dominance of MA423 'Unvegetated Atlantic littoral mixed sediment'.

The southern landfall (Rattray Head) was generally characterised by MA523 'Barren or amphipod-dominated Atlantic littoral mobile sand', which was distributed across the whole length of the landfall (**Figure 7-12**).

Figure 7-12 presents the distribution of European Nature Information System (EUNIS) biotopes at each landfall, and **Table 7-4** provides a list of them and the broad scale habitats they each represent.

FIGURE 7-12: INTERTIDAL EUROPEAN NATURE INFORMATION SYSTEM BIOTOPES (SOURCE: BSL, 2024AB)

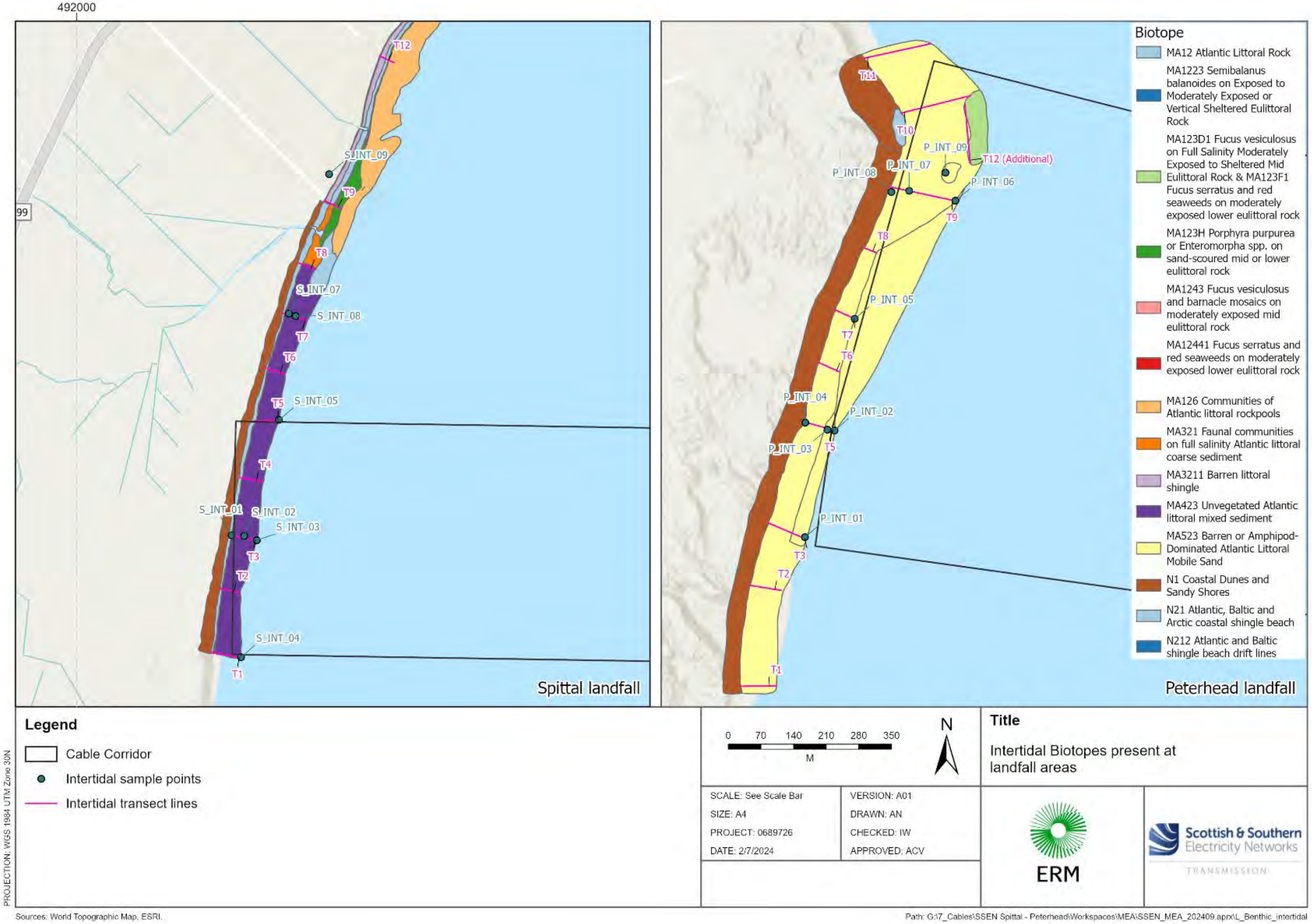


TABLE 7-4: EUROPEAN NATURE INFORMATION SYSTEM (EUNIS) BIOTOPES RECORDED AT THE LANDFALL LOCATIONS

EUNIS Broad Scale Habitat	EUNIS Code	Description	Norther Landfall (Sinclair's Bay)	Southern Landfall (Rattray Head)
MA12	MA12	Atlantic Littoral Rock	✓	-
MA12	MA1223	*Semibalanus balanoides* on Exposed to Moderately Exposed or Vertical Sheltered Eulittoral Rock	✓	-
MA12	MA123H	*Porphyra purpurea* or *Enteromorpha* spp. on Sand-Scoured Mid or Lower Eulittoral Rock	✓	-
MA12	MA123D1	*Fucus vesiculosus* on Full Salinity Moderately Exposed to Sheltered Mid Eulittoral Rock	-	✓
MA12	MA123F1	*Fucus serratus* on Full Salinity Sheltered Lower Eulittoral Rock	-	✓
MA12	MA1243	*Fucus vesiculosus* and Barnacle Mosaics on Moderately Exposed Mid Eulittoral Rock	✓	-
MA12	MA12441	*Fucus serratus* and Red Seaweeds on Moderately Exposed Lower Eulittoral Rock	✓	✓
MA12	MA12621	Coralline Crusts and *Corallina officinalis* in Shallow Eulittoral Rockpools	✓	-
MA12	MA1263	Fucoid and Kelp in Deep Eulittoral Rockpools	✓	-
MA32	MA321	Faunal Communities on Full Salinity Atlantic Littoral Coarse Sediment	✓	-
MA32	MA3211	Barren Littoral Shingle	✓	-
MA42	MA423	Unvegetated Atlantic Littoral Mixed Sediment	✓	-
MA52	MA523	Barren or Amphipod-Dominated Atlantic Littoral Mobile Sand	-	✓
N1	N1	Coastal Dunes and Sandy Shores	✓	✓

EUNIS Broad Scale Habitat	EUNIS Code	Description	Norther Landfall (Sinclair’s Bay)	Southern Landfall (Rattray Head)
N21	N21	Atlantic, Baltic and Arctic Coastal Shingle Beach	✓	-
N21	N212	Atlantic and Baltic Shingle Beach Drift Lines	✓	-

7.2.3.2 SITE CHARACTERISTICS – SUBTIDAL

Biological Environment

Infauna

A diverse subtidal community was identified along the proposed cable corridor from the grab sampling and drop-down video (DDV) surveys (BSL, 2024e).

A total of 372 taxa were recorded along the cable corridor from the 52 grab samples analysed. Taxa ranged from 9 to 88 per station, with a mean of 32 taxa. Of the taxa identified, 58 were colonial epifauna, 9 were solitary epifauna, and 305 were infauna.

Analysis of the grab samples recorded a total of 6,488 individuals, with a mean of 125 individuals per grab. Abundance of individuals was highly variable overall. For example, individual abundances at Station S2P_53_SG, within Block 7, was notably high (733 individuals), largely attributed to the relatively high abundance of the annelid *Sabellaria spinulosa* (321 individuals) which contributed to 44% of the total number of individuals at this station. Whereas at Station S2P_03, the total number of individuals was only 5.

The most abundant species sampled overall, was the annelid *S. spinulosa,* which accounted for 12% of the total abundance. Average abundance was 41 individuals, with the species having a reported patchy distribution. Of the 52 grab stations sampled, *S. spinulosa* had only been reported from 19 stations.

By comparison, the sea urchin *Echinocyamus pusillus*, recorded across 39 grab stations, accounted for 10% of the total abundance. This species was sub-dominant to *S. spinulosa* in terms of abundances.

The wide range in taxa and abundances recorded are likely to be a natural artefact of the heterogenous sediment and depths encountered along the proposed cable corridor. The spatial variation in abundance and species richness correlated with depth, and the percentage of gravels, sands and fines ($p < 0.05$).

Diversity indices showed a similar variability, with a Margalef's Index ranging from 1.34 at S2P_03, to 13.19 at S2P_53_SG, with a more diverse community in the offshore region compared to the nearshore.

The observed values for Pielou's evenness indices were lowest at 0.538 and highest at maximum value of 1.000.

Diversity values represented by Shannon's H(log2) ranged from moderate (2.08) to high (5.10) diversity, following the threshold values outlined in Dauvin *et al.* (2012). Simpsons diversity indices varied from 0.648 t to 1.000.

Overall, the data showed a moderate to high diversity community across all stations, with slight variations in spatial patterns relating to natural variation along the cable corridor.

Multivariate analysis (SIMPROF (Similarity Profiles) Cluster analysis and SIMPER (Similarity Percentages) routines) produced 25 statistically distinct community clusters from the 52 grab samples. The large number of clusters reflects the large spatial extent of the Project, and the variety of communities present. To understand the community patterns along the proposed subsea cable corridor, a slice at 31.5% Bray-Curtis similarity was overlaid, which reduced the number of clusters to 7. A summary description of each group cluster is presented in

Table 7-5. This includes positions along the proposed cable corridor based on Kilometre Points (KPs) from the start of the proposed cable corridor at the northern landfall (Sinclair’s Bay).

A RELATE test (correlation routine) revealed that the particle size analysis (PSA) explained some of the differences observed in the community composition observed at the site.

Features of conservation interest, and other notable taxa identified from the grab samples, are described separately in **Section 7.2.3.3**.

TABLE 7-5: SUMMARY DESCRIPTION OF THE INFAUNAL MACROBENTHIC GROUPS SAMPLES ALONG THE PROPOSED CABLE CORRIDOR

SIMPROF Cluster	No. Stations	Block	KP(s)	Depth (m)	Sediment Classification (Folk, 1954)	Characterising Taxa
A	1	8	165.5	8.9	Sand	*Nephtys cirrosa*, *Scolelepis bonnieri*, *Paraonis fulgens*, *Bathyporeia pelagica*, *Pontocrates altamarinus*
B	1	4	62.0	59.2	slightly gravelly Sand	*Aglaophamus agilis*, *Eteone longa*, *Spio armata*, *Terebellides*, *Scoloplos armiger*, *Galathowenia*, *Nototropis vedlomensis*, *Pontocrates*, *Harpinia antennaria*, *Euspira nitida*
C	1	2	26.2	56.2	slightly gravelly Sand	*Syllis pontxioi*, *Asbjornsenia pygmaea*, *Goodalia triangularis*, Nemertea, *Glycera lapidum, Nephtys cirrosa*, *Sthenelais limicola, Scoloplos armiger*, *Owenia*, *Abra prismatica*
D	25	2, 6-7	5.5-159.7	54.0-96.5	gravelly Sand, gravelly muddy Sand or sandy Gravel	*Echinocyamus pusillus*, Nemertea, Nematoda, *Glycera lapidum*, *Nephasoma* (*Nephasoma*) *minutum*, *Sabellaria spinulosa*, *Polycirrus*, *Verruca stroemia*, *Eulalia mustela*, *Hydroides novergica*
E	21	3-6	3.1-125.4	35.3-100.8	Sand, slightly gravelly Sand or muddy Sand	*Owenia*, *Echinocyamus pusillus*, *Galathowenia*, *Antalis entails*, *Phoronis*, *Sthenelai limicola*, *Abra prismatica*, *Astrorhiza*, *Scoloplos rmiger*, *Urothoe elegans*
F	1	2	2.0	23.3	Sand	*Fabulina fabula*, *Chochlodesma praetenue*, *Travisia forbesii*, *Bathyporeia elegans*, *Ampelisca brevicornis*, *Poecilochaetus serpens*, *Leucothoe incisa*, *Gari fervensis*, *Leiochone*, *Antalis entails*
G	2	1	0.6-1.1	7.5-13.0	Sand	*Abra prismatica*, *Sthenelais limicola*, *Euspira nitida*, *Owenia*, *Antalis entails*, *Bathyporeia elegans*, *Echinocyamus pusillus*, *Leiochone*, *Scoloplos armiger*, *Ampelisca brevicornis*

Epifauna

From the DDV, the sandier nearshore waters of Sinclair's Bay (KP 0.3 to KP 1.01) were generally sparse in conspicuous fauna; however, coralline algae and Rhodophyta were observed at S2P_01. The nearshore waters of Rattray Head (KP 164 to KP 166) were inhabited by algae and kelp communities (*Laminaria hyperborea*, Rhodophyta sp., and coralline algae) on bedrock and hard substrate.

In the offshore region (KP 2 to KP 164), rocky outcrops were less dominated by kelp and were primarily characterised by *Spirobranchus* polychaetes, dead man's fingers *Alcyonium digitatum*, and hornwrack *Flustra foliacea*. Other fauna included the common sea star *Asterias rubens*, edible sea urchin *Echinus esculentus*, and the hermit crab *Pagurus* sp. Squat lobster *Munida rugosa*, and *Sabellaria spinulosa* aggregations, were associated with boulders and outcrops across the corridor.

Sand dominated areas had less conspicuous fauna, whilst areas with greater amounts of fines often had more habitat-specific fauna; including the burrow dwelling Norway lobster *Nephrops norvegicus*, and the phosphorescent sea pen *Pennatula phosphorea*.

Grab sampling of sedimentary habitats recorded several epifaunal taxa belonging to the phyla Cnidaria, Porifera, Ectoprocta, and Bryozoa. Colonial epifauna were more prevalent within the southern extent of the site, between KP 127 and KP 160, where sediment alternated between 'gravelly Sand' and 'sandy Gravel', providing an increase in potential attachment points for the epifauna.

Additional camera footage was collected for ground-truthing at Pri 1 (KP 160.6 to KP 163.6), and revealed a change in a gradient from east to west, from mixed sediments with boulders and cobbles, to bedrock. The composition of taxa consisted mainly of Flustridae, *S. spinulosa*, the hydroid *Tubularia indivisa* and echinoderms such as *E. esculentus* and Asteroidea. Along the east to west gradient, the occurrence of *S. spinulosa* decreased and the occurrence of Flustridae increased.

Additional ground-truthing at Pri 2 (KP 51.8 to KP 152.7), revealed the substrate to be more homogeneous than Pri 1; mainly comprising mixed sediments consisting of sand and gravel with occasional boulders and cobbles and intermittent outcropping bedrock. Prevalent fauna included Flustridae, *A. digitatum*, *L. ciliaris*, Pectinidae and Actinaria.

Mobile fauna observed from DDV included several species of fish including flatfish (Pleuronectiformes), haddock *Melanogrammus aeglefinus*, and ray species such as the cuckoo ray *Leucoraja naevus*.

Biotope Mapping

Biotope classification was derived from a combination of geophysical data and still/video ground-truthing. A total of 11 level 4, two level 3, and 10 level 5 EUNIS habitats were recorded along the corridor, which are tabulated in **Table 7-6**.

The nearshore waters of Sinclair's Bay (Block 1) are mostly characterised by MB523 'Faunal communities of full salinity Atlantic infralittoral sand', with small areas of MB323 'Faunal communities in full salinity Atlantic offshore infralittoral coarse sediment' and MB12 'Atlantic infralittoral rock' present.

Rock outcropping near Sinclair's Bay was ground-truthed by a camera transect at around KP 2.3. The area was characterised by MC1224 'Faunal and algal crusts on exposed to moderately wave-exposed Atlantic circalittoral rock'. Rock areas were also present in shallower waters but were not ground-truthed. Observations of kelp below the low watermark during the intertidal survey suggested these areas were likely to be characterised by MB121 (BSL, 2024a).

Further offshore, water depths increase, and the sediment becomes sandier, transitioning to MD521 'Faunal communities in Atlantic offshore circalittoral sand'. Blocks 4 and 5 are characterised by MD521 and its shallower counterpart MC521 'Faunal communities of Atlantic circalittoral sand'. At KP 127.0 to KP 161.1, within Block 6 and 7, sediments become coarser and are characterised by MD321 'Faunal communities in Atlantic offshore circalittoral coarse sediment'.

Across Block 7 sub-cropping rock is present between KP 161.1 to KP 165.3. This area is characterised as MC12 'Atlantic circalittoral rock', which transitions to its shallower counterpart MB12 at around KP 163.7.

The nearshore waters of Rattray Head are dominated largely by MB12 and, to a smaller extent, MB523 and MB323.

Ground-truthing of the sub cropping rock near Rattray Head, identified the following level 5 rock biotopes:

- MC1224 'Faunal and algal crusts on exposed to moderately wave-exposed Atlantic circalittoral rock';
- MC1216 '*Flustra foliacea* and colonial ascidians on tide-swept moderately wave-exposed Atlantic circalittoral rock';
- MC1281 '*Sabellaria spinulosa* encrusted Atlantic circalittoral rock';
- MB121B 'Dense foliose red seaweeds on moderately exposed Atlantic infralittoral silty rock'; and
- MB1218 '*Laminaria hyperborea* on tide-swept Atlantic infralittoral rock'.

Additional data collected at Pri1 and Pri2 in Block 7, identified a total of 21 and 11 EUNIS habitats and habitat complexes, respectively (**Table 7-7** and **Table 7-8**, respectively).

The most prevalent habitat within Pri 1 was the habitat complex MC521 'Faunal communities of Atlantic circalittoral sand', with MC12241 '*Flustra foliacea* on slightly scoured silty Atlantic circalittoral rock', covering a total area of 0.44 km², contributing to 19.3% (**Table 7-7**).

The most prevalent habitat within Pri 2 was MC2211 '*Sabellaria spinulosa* on stable Atlantic circalittoral mixed sediment' with MC3216 'Scallops on Atlantic circalittoral shell gravel and sand with some sand scour'. Habitat complex MC2211/ MC3216 covered an area of 0.60 km² contributing to 62.7% (**Table 7-8**).

The spatial distribution of each biotope type is illustrated in **Figure 7-12** to **Figure 7-16**, while biotopes recorded at Pri1 and Pri2 are presented in **Figure 7-18**.

TABLE 7-6: HABITATS RECORDED ALONG THE PROPOSED CABLE CORRIDOR

EUNIS Code	EUNIS Name
MB121	Kelp and Seaweed Communities on Atlantic Infralittoral Rock
MB121A	*Laminaria hyperborea* and Foliose Red Seaweeds on Moderately Exposed Atlantic Infralittoral Rock
MB121B	Dense Foliose Red Seaweeds on Moderately Exposed Atlantic Infralittoral Silty Rock
MC121	Faunal Turf Communities on Atlantic Circalittoral Rock
MC1216	*Flustra foliacea* and Colonial Ascidians on Tide-Swept Moderately Wave-Exposed Atlantic Circalittoral Rock
MC122	Echinoderms and Crustose Communities on Atlantic Circalittoral Rock
MC1224	Faunal and Algal Crusts on Exposed to Moderately Wave-Exposed Atlantic Circalittoral Rock
MC1281	*Sabellaria spinulosa* Encrusted Atlantic Circalittoral Rock
MB323	Faunal Communities in Full Salinity Atlantic Infralittoral Coarse Sediment
MD321	Faunal Communities in Atlantic Offshore Circalittoral Coarse Sediment
MD3211	*Glycera lapidum*, *Thyasira* spp. and *Amythasides macroglossus* in Offshore Circalittoral Gravelly Sand
MC421	Faunal Communities of Atlantic Circalittoral Mixed Sediment
MD421	Faunal Communities in Atlantic Offshore Circalittoral Mixed Sediment
MB523	Faunal Communities of Full Salinity Atlantic Infralittoral Sand
MB5233	*Nephtys cirrosa* and *Bathyporeia* spp. in Atlantic Infralittoral Sand
MB5231	Sparse Fauna in Atlantic Infralittoral Mobile Clean Sand
MC521	Faunal Communities of Atlantic Circalittoral Sand
MC5211	*Echinocyamus pusillus*, *Ophelia borealis* and *Abra prismatica* in Circalittoral Fine Sand
MD521	Faunal Communities in Atlantic Offshore Circalittoral Sand
MD5212	*Owenia fusiformis* and *Amphiura filiformis* in Deep Circalittoral Sand or Muddy Sand

TABLE 7-7: IDENTIFIED HABITATS AND HABITAT COMPLEXES WITHIN PRIORITY AREA 1

EUNIS Code	EUNIS Name	Area (km²)	Percentage Distribution (%)
MC521/MC12811	Faunal communities of Atlantic circalittoral sand/*Sabellaria spinulosa* with a bryozoan turf and barnacles on silty turbid Atlantic circalittoral rock	0.0004	0.0186
MC121	Faunal turf communities on Atlantic circalittoral rock	0.0007	0.0296
MC122	Echinoderms and crustose communities on Atlantic circalittoral rock	0.0014	0.0610
MC321/MC521	Faunal communities of Atlantic circalittoral coarse sediment/Faunal communities of Atlantic circalittoral sand	0.0016	0.0709
MC12244/MC12241	Brittlestars on faunal and algal encrusted exposed to moderately wave-exposed Atlantic circalittoral rock/*Flustra foliacea* on slightly scoured silty Atlantic circalittoral rock	0.0020	0.0861
MC321	Faunal communities of Atlantic circalittoral coarse sediment	0.0062	0.2741
MC122/MC12244	Echinoderms and crustose communities on Atlantic circalittoral rock/Brittlestars on faunal and algal encrusted exposed to moderately wave-exposed Atlantic circalittoral rock	0.0080	0.3508
MC12244/MC2211	Brittlestars on faunal and algal encrusted exposed to moderately wave-exposed Atlantic circalittoral rock/*Sabellaria spinulosa* on stable Atlantic circalittoral mixed sediment	0.0084	0.3706
MC2211/MC12241	*Sabellaria spinulosa* on stable Atlantic circalittoral mixed sediment/*Flustra foliacea* on slightly scoured silty Atlantic circalittoral rock	0.0184	0.8115
MC2211	*Sabellaria spinulosa* on stable Atlantic circalittoral mixed sediment	0.0189	0.8297
MC521/MC122	Faunal communities of Atlantic circalittoral sand	0.0205	0.9012
MC122/MC12241	Echinoderms and crustose communities on Atlantic circalittoral rock/*Flustra foliacea* on slightly scoured silty Atlantic circalittoral rock	0.0277	1.2188
MC122/MC2211	Echinoderms and crustose communities on Atlantic circalittoral rock/*Sabellaria spinulosa* on stable Atlantic circalittoral mixed sediment	0.0301	1.3256
MC12241	*Flustra foliacea* on slightly scoured silty Atlantic circalittoral rock	0.0918	4.0401

MC12811/MC12244	*Sabellaria spinulosa* with a bryozoan turf and barnacles on silty turbid Atlantic circalittoral rock / Brittlestars on faunal and algal encrusted exposed to moderately wave-exposed Atlantic circalittoral rock	0.1215	5.3426
X33	Mosaics of mobile and non-mobile substrata in the circalittoral zone	0.2203	9.6906
MC421	Faunal communities of Atlantic circalittoral mixed sediment	0.2661	11.7055
MC12811	*Sabellaria spinulosa* with a bryozoan turf and barnacles on silty turbid Atlantic circalittoral rock	0.2932	12.8978
MC12811/MC12241	*Sabellaria spinulosa* with a bryozoan turf and barnacles on silty turbid Atlantic circalittoral rock/*Flustra foliacea* on slightly scoured silty Atlantic circalittoral rock	0.2970	13.0655
MC12241/MC122	*Flustra foliacea* on slightly scoured silty Atlantic circalittoral rock/Echinoderms and crustose communities on Atlantic circalittoral rock	0.4008	17.6324
MC521/MC12241	Faunal communities of Atlantic circalittoral sand/*Flustra foliacea* on slightly scoured silty Atlantic circalittoral rock	0.4382	19.2770
Total		**2.2733**	**100**

TABLE 7-8: IDENTIFIED HABITATS AND HABITAT COMPLEXES WITHIN PRIORITY AREA 2

EUNIS Code	EUNIS Name	Area (km^2)	Percentage Distribution (%)
MC122	Echinoderms and crustose communities on Atlantic circalittoral rock	0.0010	0.1093
MC2211	*Sabellaria spinulosa* on stable Atlantic circalittoral mixed sediment	0.0011	0.1159
MC321/MC2211	Faunal communities of Atlantic circalittoral coarse sediment	0.0062	0.6424
MC521/MC12811	Faunal communities of Atlantic circalittoral sand/*Sabellaria spinulosa* with a bryozoan turf and barnacles on silty turbid Atlantic circalittoral rock	0.0065	0.6789
MC121	Faunal turf communities on Atlantic circalittoral rock	0.0068	0.7126
MC521/MC122	Faunal communities of Atlantic circalittoral sand/Echinoderms and crustose communities on Atlantic circalittoral rock	0.0095	0.9914
MC521/MC1223	Faunal communities of Atlantic circalittoral sand/*Urticina felina* and sand-tolerant fauna on sand-scoured or covered Atlantic circalittoral rock	0.0162	1.6869
MC12811	*Sabellaria spinulosa* with a bryozoan turf and barnacles on silty turbid Atlantic circalittoral rock	0.0246	2.5607
MC12811/MC1212	*Sabellaria spinulosa* with a bryozoan turf and barnacles on silty turbid Atlantic circalittoral rock/*Tubularia indivisa* on tide-swept Atlantic circalittoral rock	0.0483	5.0429
MC321/MC521	Faunal communities of Atlantic circalittoral coarse sediment/Faunal communities of Atlantic circalittoral sand	0.2371	24.7292
MC2211/MC3216	*Sabellaria spinulosa* on stable Atlantic circalittoral mixed sediment/Scallops on Atlantic circalittoral shell gravel and sand with some sand scour	0.6014	62.7299
Total		**0.9588**	**100**

FIGURE 7-13: SPATIAL DISTRIBUTION OF BIOTOPES ALONG THE PROPOSED CABLE CORRIDOR: KP0 TO KP47

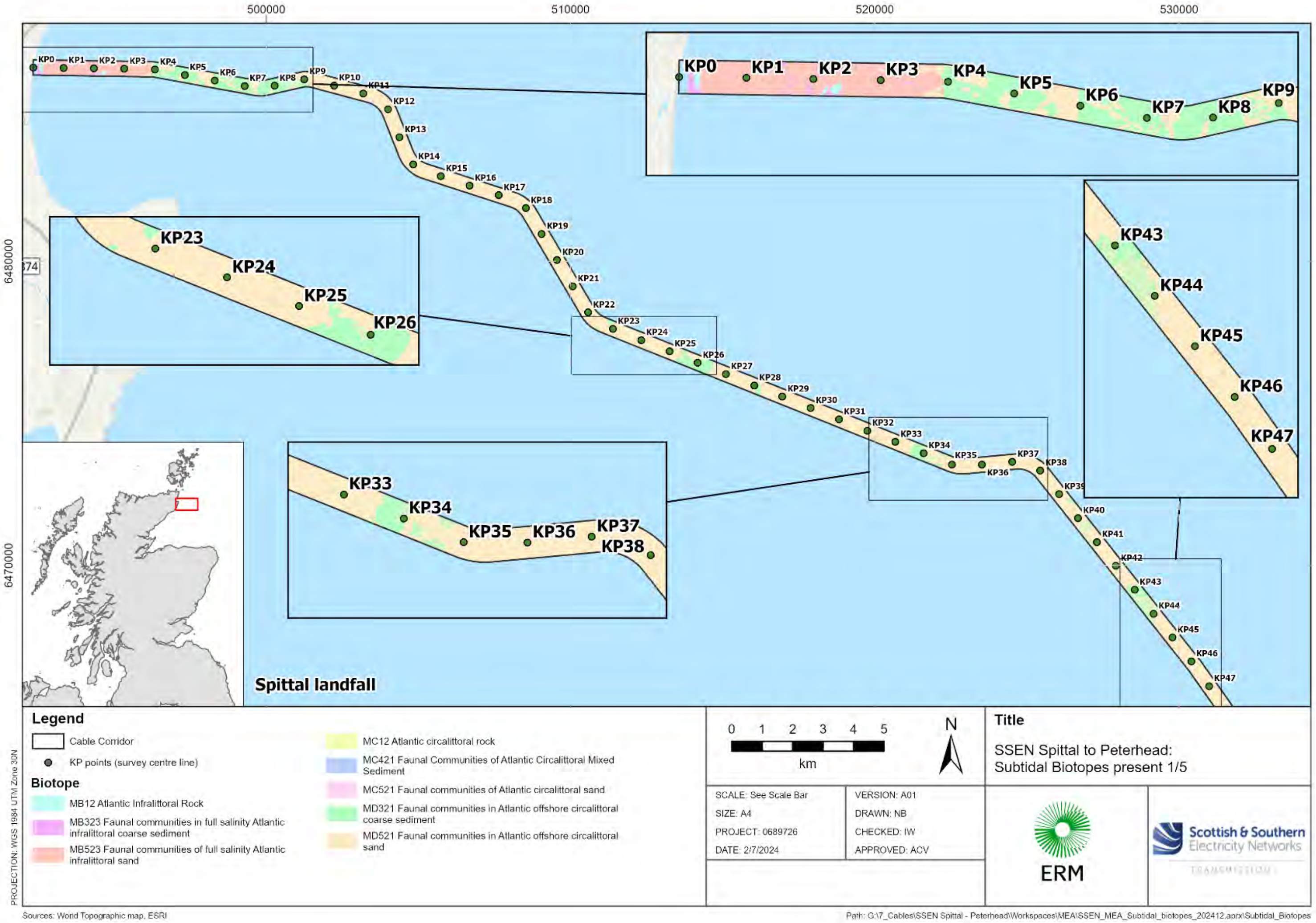


FIGURE 7-14: SPATIAL DISTRIBUTION OF BIOTOPES ALONG THE PROPOSED CABLE CORRIDOR: KP48 TO KP80

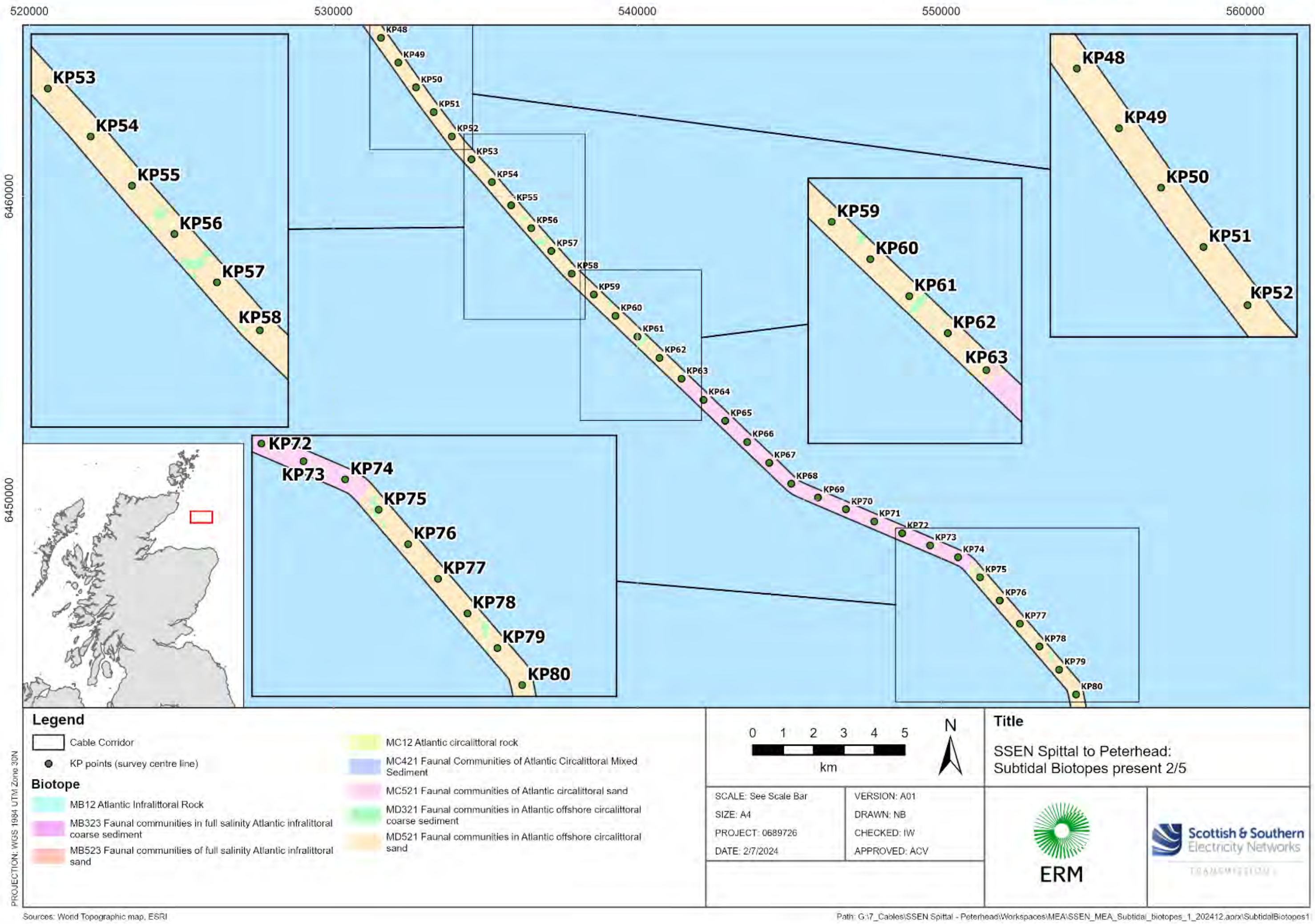


FIGURE 7-15: SPATIAL DISTRIBUTION OF BIOTOPES ALONG THE PROPOSED CABLE CORRIDOR: KP81 TO KP110

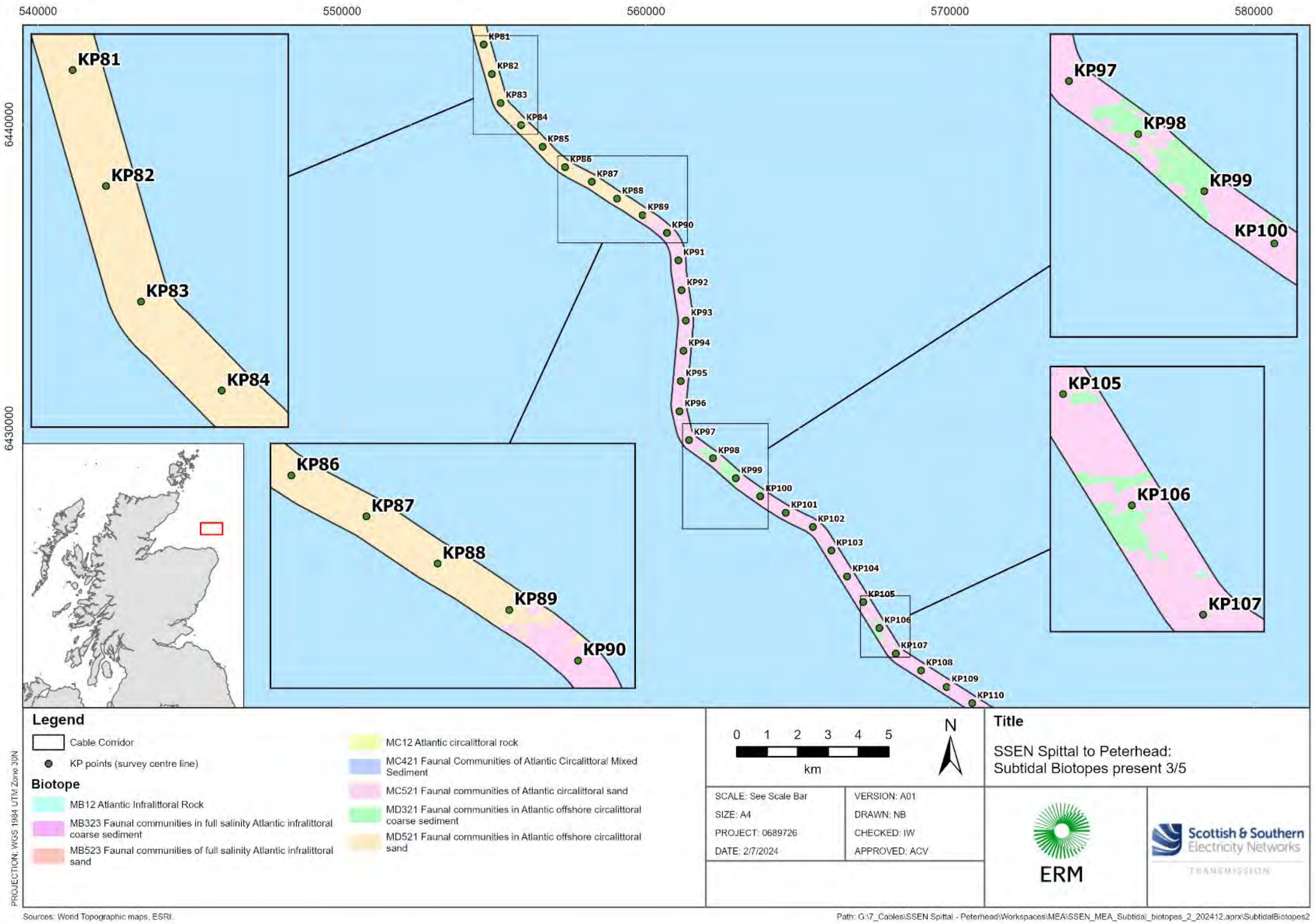


FIGURE 7-16: SPATIAL DISTRIBUTION OF BIOTOPES ALONG THE PROPOSED CABLE CORRIDOR: KP111 TO KP144

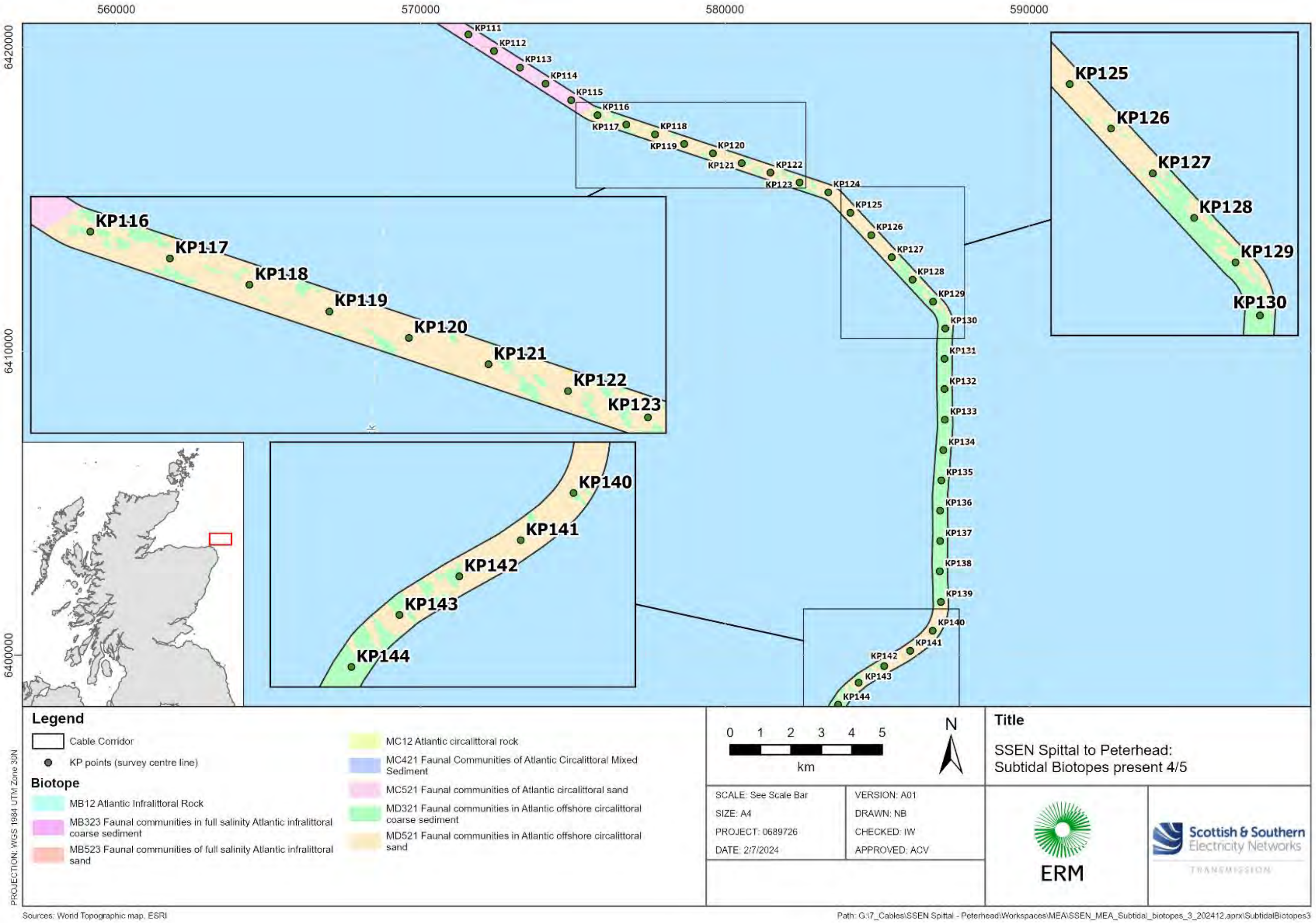


FIGURE 7-17: SPATIAL DISTRIBUTION OF BIOTOPES ALONG THE PROPOSED CABLE CORRIDOR: KP145 TO KP167

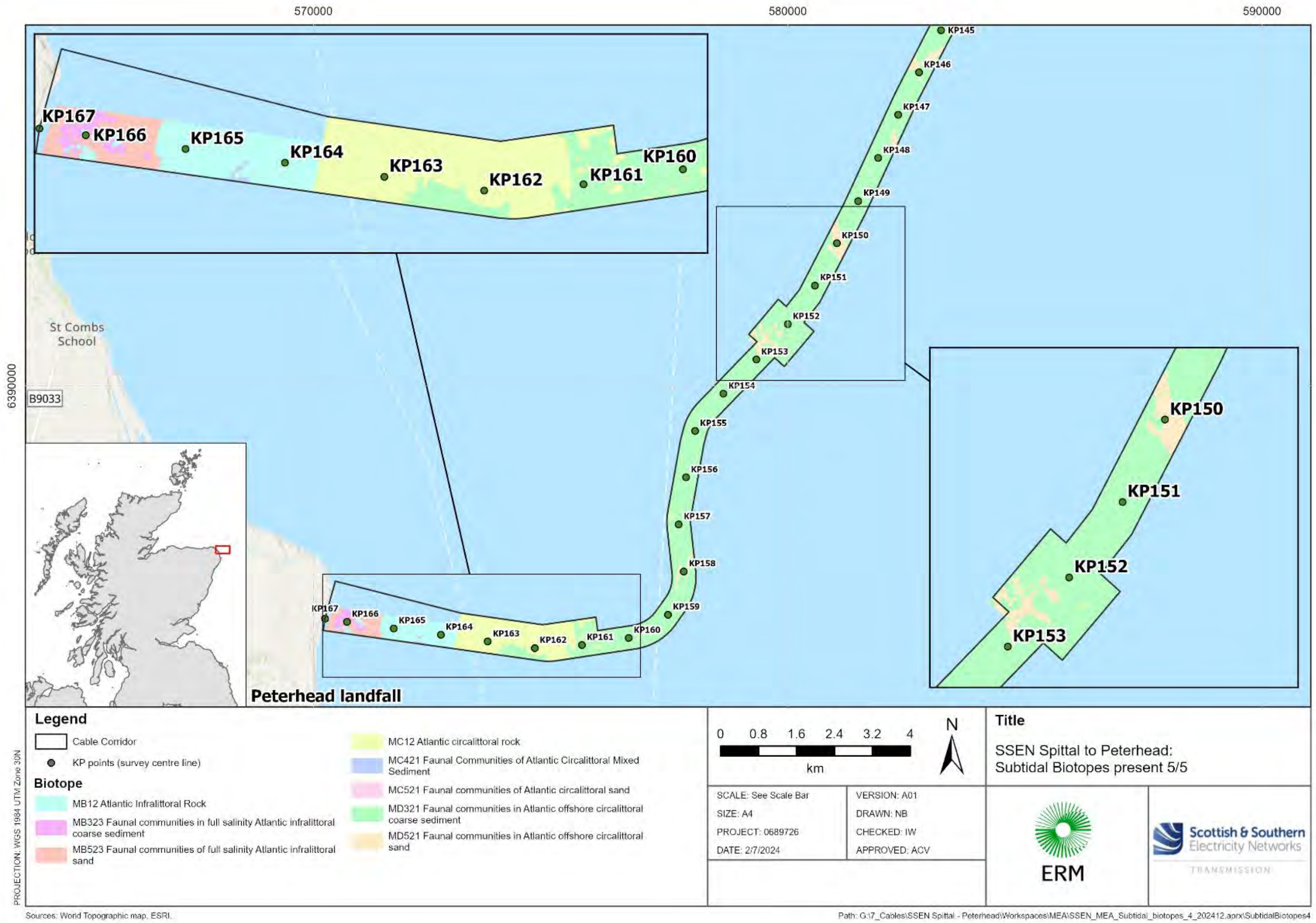
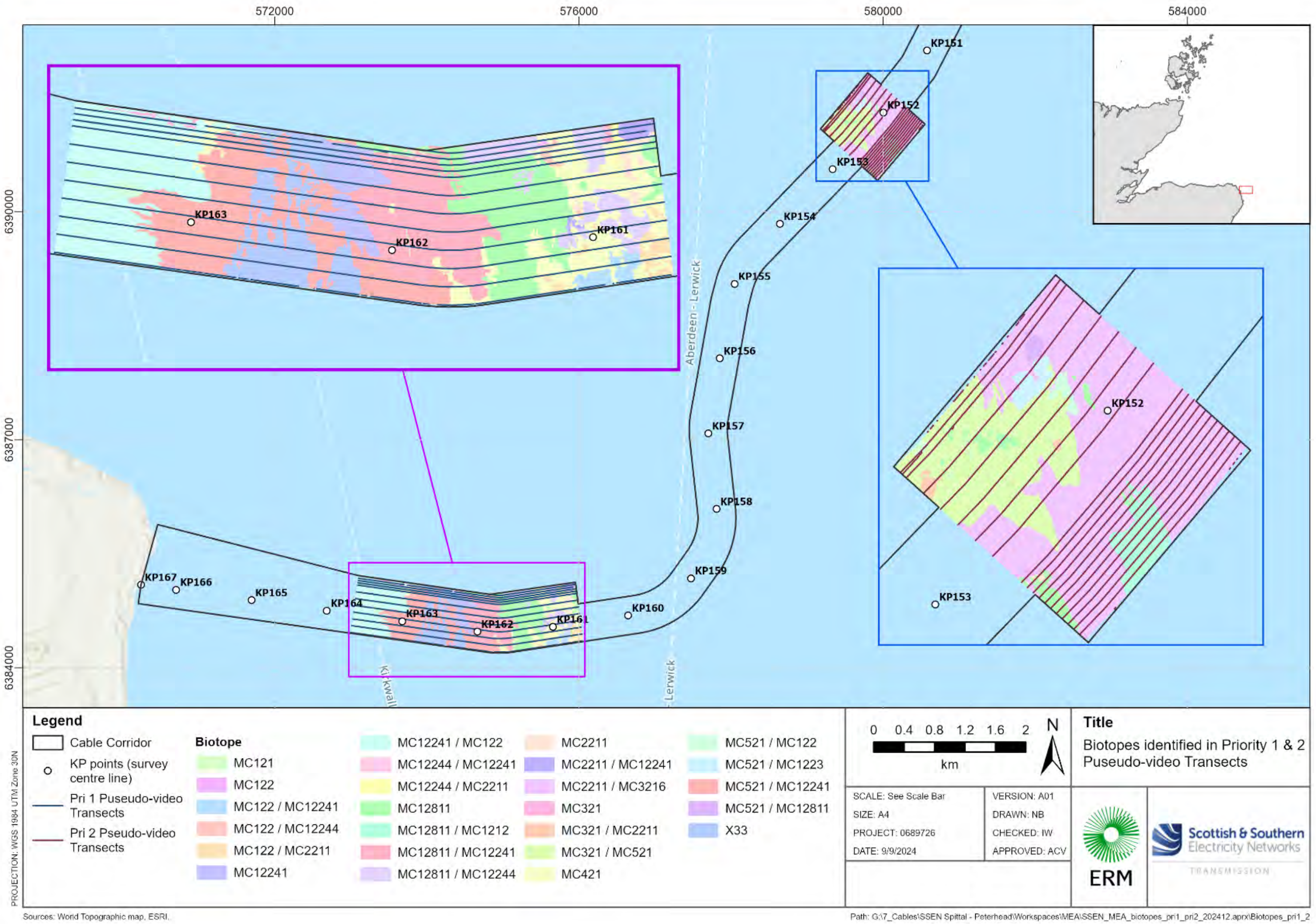


FIGURE 7-18: SPATIAL DISTRIBUTION OF BIOTOPES WITH PRI 1 AND PRI 2



7.2.3.3 NATURE CONSERVATION FEATURES

Protected Sites

The Benthic and Intertidal Ecology Study Area overlaps three Nature Conservation Marine Protected Areas (NCMPAs) (**Figure 7-19**):

- Southern Trench;
- Noss Head; and
- East Caithness Cliffs NCMPAs.

The East Caithness Cliffs NCMPA is not protected for benthic features (NatureScot, 2024a) and as such, is not considered in this section, but is discussed in further detail in **Section 7.5.3.3: Ornithology (Designated Sites)** and **APPENDIX A: Habitats Regulations Appraisal (HRA)**.

The Benthic and Intertidal Ecology Study Area does not overlap Special Areas of Conservation (SACs).

Southern Trench NCMPA

Both the far-field and near-field Study Areas overlap with the Southern Trench NCMPA. The NCMPA stretches from Buckie in the west, to beyond Peterhead in the east. The NCMPA takes its name from the 58 km long, 9 km wide, and 250 m deep trench running parallel to the coastline. The benthic protected feature of the NCMPA is burrowed mud. The trench is covered by thick, soft mud inhabited by the Norway lobster *Nephrops norvegicus*, crabs, sea pens, and tube anemones (NatureScot, 2024b).

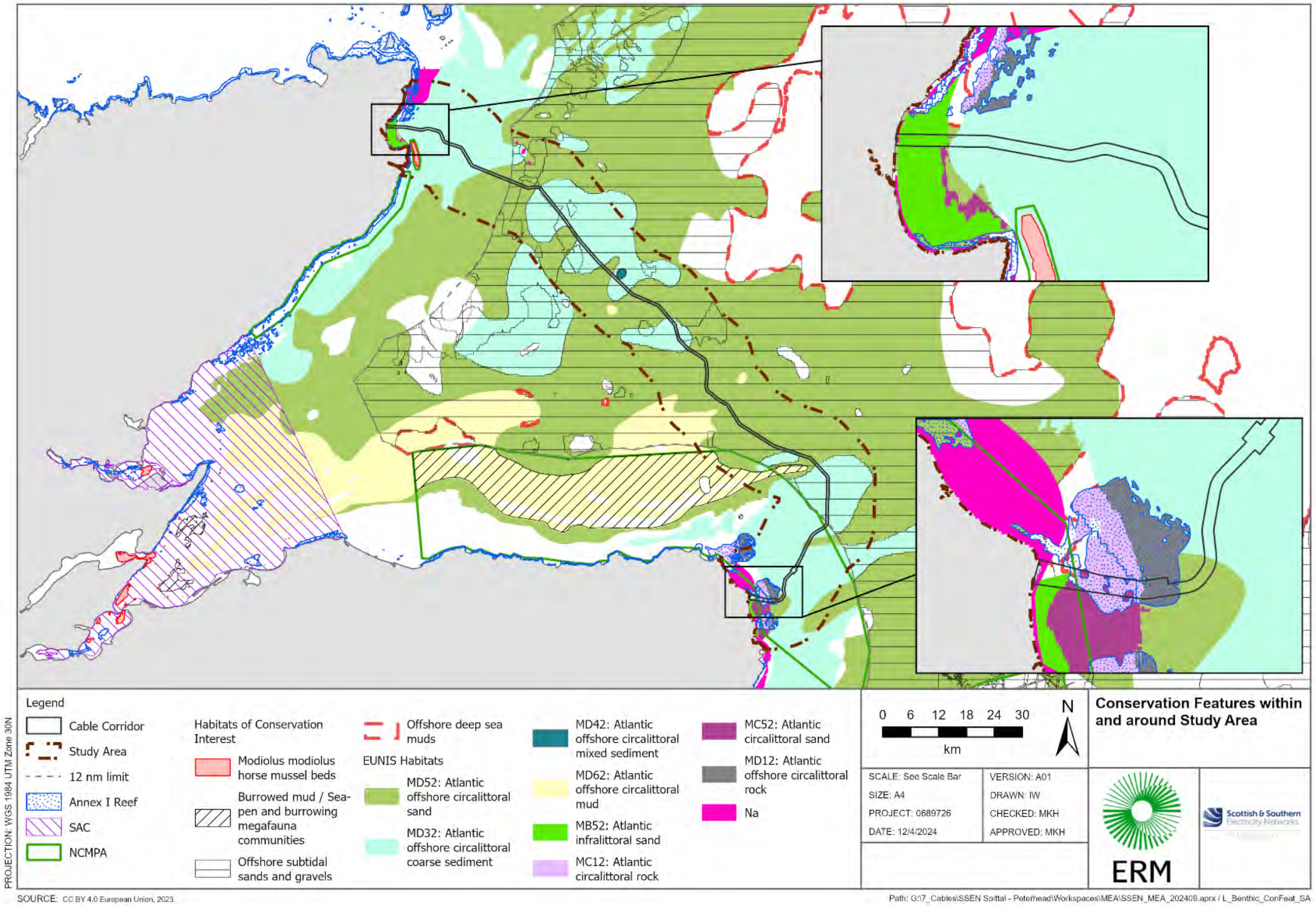
Burrowed mud across the Southern Trench NCMPA is shown in **Figure 7-19** and shows a distribution to the west of the cable corridor. The burrowed mud feature is located approximately 1.5 km from the near-field Study Area, but is overlapped by the far-field Study Area. Therefore, there is potential for interaction between far-field effects of the proposed activities and this protected benthic habitat. The impacts of the proposed works on the Southern Trench NCMPA and its designated features are as assessed in the NCMPA assessment presented in **APPENDIX B: Nature Conservation Marine Protected Area Assessment**.

Noss Head NCMPA

The Noss Head NCMPA overlaps partially within the far-field Study Area only, and is approximately 2.1 km south of the near-field Study Area. The Noss Head NCMPA is located off the coast at Wick, and covers an area of 8 km² (NatureScot, 2024c). The NCMPA supports the largest known horse mussel *Modiolus modiolus* bed in Scottish waters. The bed lies in depths of 35-45 m, and the large mussel shells provide a solid foundation for many other animals, including soft corals, tubeworms, barnacles, sea firs, and sea mats. In between the shells, and inside dead ones, brittlestars, crabs, worms, molluscs and many other small animals find shelter and provide food for juvenile fish.

The distribution of the horse mussel bed within the Noss Head NCMPA is shown in **Figure 7-19** and shows the feature located entirely within the far-field Study Area. The impacts of the proposed works on the Noss Head NCMPA and its designated features are as assessed in the NCMPA assessment presented in **APPENDIX B: Nature Conservation Marine Protected Area Assessment.**

FIGURE 7-19: CONSERVATION FEATURES WITHIN AND AROUND THE BENTHIC AND INTERTIDAL ECOLOGY STUDY AREA



Habitats and Species of Conservation Interest

For methodology of the assessments undertaken, refer to the habitat assessment and environmental baseline report (BSL, 2024e), and the environmental habitat assessment report (Ocean Infinity, 2024).

Annex I Reefs – Bedrock

The subsea cable corridor displayed areas of 'outcropping' and 'subcropping' rock amongst sandy gravel. These areas were assessed to determine if they could be classified as Annex I(H1170) geogenic reefs, which encompasses both Stony and Rocky Reefs (Annex I habitats are designated under the Habitats Directive; see **Section 2.4**). The geogenic reefs assessment was based on high definition (HD) underwater stills taken along the sub/outcropping rock, which was especially prevalent in the southern region of the corridor (KP 161.1 to KP 165.3).

The results revealed the area of sub/outcropping in the southern region showed characteristics of a 'Rocky Reef with Low Biodiversity', with some small patches of 'Rocky Reef with High Biodiversity'. A large majority of the stills along 10 transects in Block 7, between KP 163.5 to KP 165.5, had bedrock with epifaunal coverage over 50%, but with a lack of key species at high coverage indicating a lower biodiversity. Approximately 80% of the total stills were classified as 'Rocky Reef with Low Biodiversity', with instances of 'Rocky Reef with High Biodiversity'.

Figure 7-20 illustrates example images for 'Rocky Reef with Low Biodiversity' and 'Rocky Reef with High Biodiversity' recorded along the proposed cable corridor', while **Figure 7-23** represents the reef assessment per still image.

FIGURE 7-20: EXAMPLE IMAGES OF BEDROCK FOUND ALONG THE PROPOSED CABLE CORRIDOR (SOURCE: BSL, 2024E).

(LEFT) Rocky Reef with Low Biodiversity; (RIGHT) Rocky Reef with High Biodiversity

A more detailed assessment was conducted following further data collection in Block 7. The shallower seabed at Pri 1 was overall described as being highly dynamic, composed mainly of bedrock, but also of boulders, and cobbles. At the deeper depths of Pri 2, the seabed was represented by mixed sediments.

Results showed that most of the outcropping rocky bedrock present in Pri 1 was characterised by an extensive feature dominating the western to central sections. Bedrock was occasionally exposed in the eastern sections, as well as within Pri 2. Where the bedrock was covered, the surface composition was variable, from veneers of sand and gravel to aggregations of cobbles and boulders.

Species composition indicates the presence of three main habitats MC121 'Faunal turf communities on Atlantic circalittoral rock', MC122 'Echinoderms and crustose communities on Atlantic circalittoral rock', and MC12811 '*Sabellaria spinulosa* with a bryozoan turf and barnacles on silty turbid Atlantic circalittoral rock'.

Annex I Reef– Stony

The seabed stills showing less than 50% visible rock outcrop were also assessed for potential Annex I (H1170) Stony Reefs, using the criteria proposed by Irving (2009).

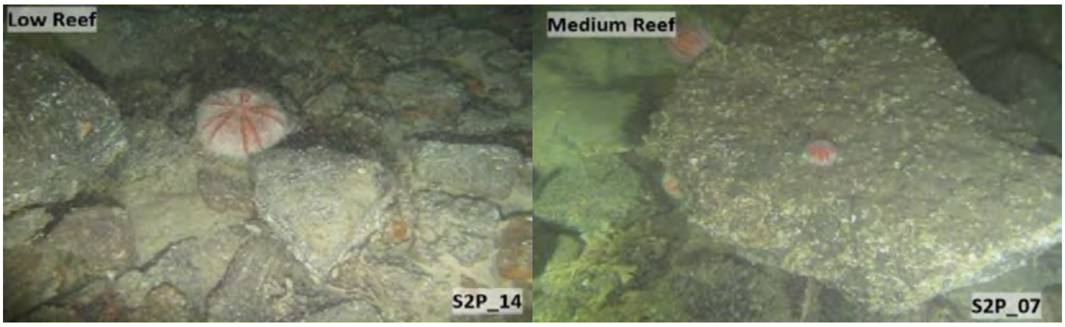
In total, 2,504 stills were analysed, across 54 transects, in areas that contained potential Stony Reef. Of these, 707 stills (28.3%) contained no evidence of stony reef, with 210 stills (8.4%) showing visibility too poor to be assessed. Of the remaining stills (by examining reef structure (composition vs elevation) vs epifaunal coverage vs extent):

- 21 patches were classified as 'No Reef';
- 218 patches were classified as 'Not a Reef';
- 68 patches were identified as 'Low Reef; and
- 6 patches were classed a 'Medium Reef'; with no patches identified as 'High Reef'.

Figure 7-21 illustrates example images for 'Low Reef' and 'Medium Reef'.

FIGURE 7-21: EXAMPLE IMAGES OF STONY REEFINESS RECORDED ALONG THE PROPOSED CABLE CORRIDOR (SOURCE: BSL, 2024E).

(LEFT) Low Reefiness; (RIGHT) Medium Reefiness



Following further data collection, the central and eastern sections of Pri 1 were characterised by mixed sediments with scattered cobbles and boulder, supporting a matrix of Low to Medium Stony Reefs in combination with Bedrock and Biogenic Reefs (**Figure 7-24**).

Fauna noted as present were encrusting *S. spinulosa* with *A. digitatum*, Flustridae, *T. indivisa*, Hydroid and Bryozoan turf with frequent presence of echinoderms. Species composition indicated the presence of four main habitats:

- MC421 'Faunal communities of Atlantic circalittoral mixed sediment';
- MC12244 'Brittlestars on faunal and algal encrusted exposed to moderately wave-exposed Atlantic circalittoral rock';
- MC12241 '*F. foliacea* on slightly scoured silty Atlantic circalittoral rock'; and
- MC12811 '*S. spinulosa* with a bryozoan turf and barnacles on silty turbid Atlantic circalittoral rock'.

The seabed at Pri 2 was characterised by mixed sediments with scattered cobbles and boulders with occasional outcropping bedrock, supported a matrix of Low to Medium Stony Reefs in combination with Bedrock and Biogenic Reefs (**Figure 7-24**).

Recorded fauna comprised encrusting *S. spinulosa* with *A. digitatum*, Flustridae, *T. indivisa*, Hydroid and Bryozoan turf, with frequent presence of echinoderms much similar to the findings within Pri 1. Species composition indicates the presence of four main habitats:

- MC121 'Faunal turf communities on Atlantic circalittoral rock';
- MC122 'Echinoderms and crustose communities on Atlantic circalittoral rock';
- MC12811 *S. spinulosa* with a bryozoan turf and barnacles on silty turbid Atlantic circalittoral rock'; and
- MC1212 '*T. indivisa* on tide-swept Atlantic circalittoral rock'.

Annex I Reef – Biogenic (**Sabellaria spinulosa*****)***

Aggregations of *S. spinulosa* were observed in 20 transects located within Block 6 and Block 7 (KP 112-164.4) These transects were assessed to determine whether any areas have the potential to be classified as Annex I (H1170) Biogenic Reefs. An assessment of '*reefiness*' using Gubbay (2007) was performed to describe the habitat, focusing on transects where *S. spinulosa* was recorded during review of video footage and stills photographs. **Figure 7-22** presents example images for 'Not a reef', 'Low' reef, 'Medium' reef and 'High' reef.

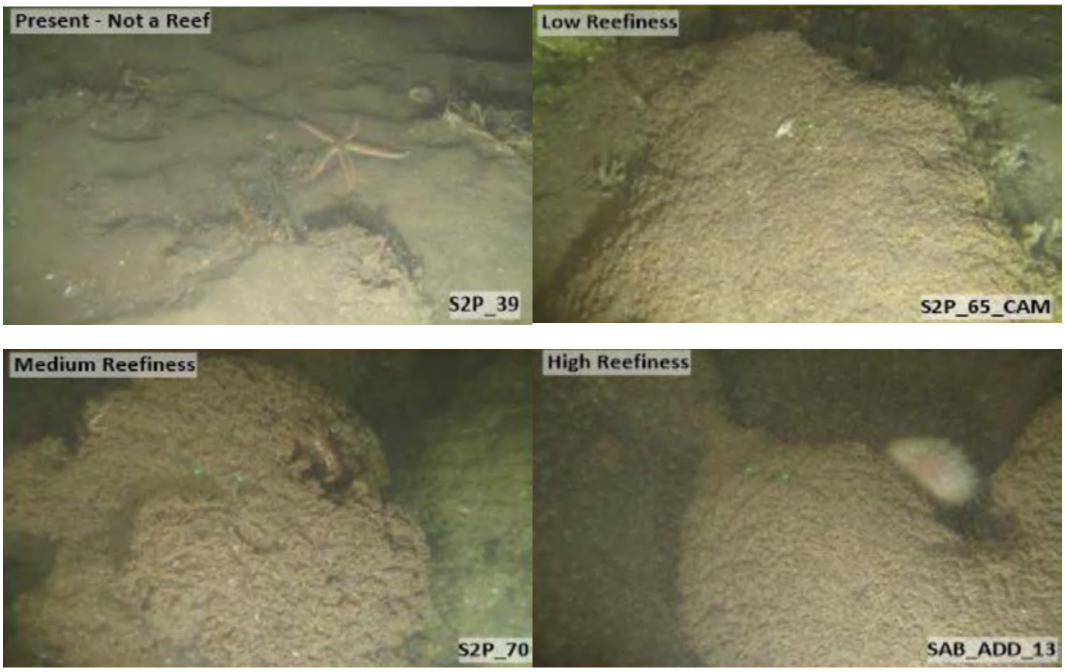
Of the 711 images assessed across 20 transects, a small number (21) were screened out for analysis due to image quality (2.9%), whilst 395 (55.5%) images were classed as 'No reef'. The remaining 295 images (41.5%) showed *S. spinulosa* presence.

A total of 8 images (1.3%) were classified as 'High' reefiness, 164 (23.5%) as 'Medium' reefiness, 76 (10.7%) as 'Low' reefiness and 47 as 'Not a Reef'.

Figure 7-23 represents the reef assessment per still image, highlighting two main areas of *S. spinulosa* aggregations - approximately between KP 160 to KP 162, and KP 153 to KP 152. These areas were further investigated by a shallow water ROV to collect additional data for a protected features assessment (Ocean Infinity, 2024).

FIGURE 7-22: EXAMPLE IMAGES OF *SABELLARIA SPINULOSA* REEFINESS RECORDED ALONG THE PROPOSED CABLE CORRIDOR (SOURCE: BSL, 2024e).

(TOP LEFT) Not a Reef; (TOP RIGHT) Low Reefiness; (BOTTOM LEFT) Medium Reefiness; (BOTTOM RIGHT) High Reefiness



Following further ground-truthing at Block 7, *S. spinulosa* aggregations observed in individual stills acquired at Pri 1 were assessed as having 'Low' to 'Medium' reefiness, whereas aggregations observed at Pri 2 were assessed as having 'Low' reefiness.

The reefiness assessment, combined with the interpretation of geophysical data, and the high-level review of the pseudo video, resulted in the delineation of extensive areas of *S. spinulosa* aggregations (**Figure 7-24**). Reef formations were mainly concentrated in the central and eastern sections of Pri 1, while appearing more scattered and associated with areas of rocky substrates in Pri 2.

The Annex I habitats identified within Pri 1 and Pri 2, with surface area coverage, are presented in **Table 7-9** and their distribution illustrated in **Figure 7-24**.

It is important to note that *S. spinulosa* reefs are not currently listed as Priority Marine Features (PMF) in Scotland. However, the habitat has been identified as a priority habitat of conservation interest, or importance, in legislative and policy instruments that are applicable to the whole of the UK, as well as those that apply only to Scotland (Pearce and Kimber, 2020).

FIGURE 7-23: ROCKY REEF AND SABELLARIA REEF ASSESSMENT

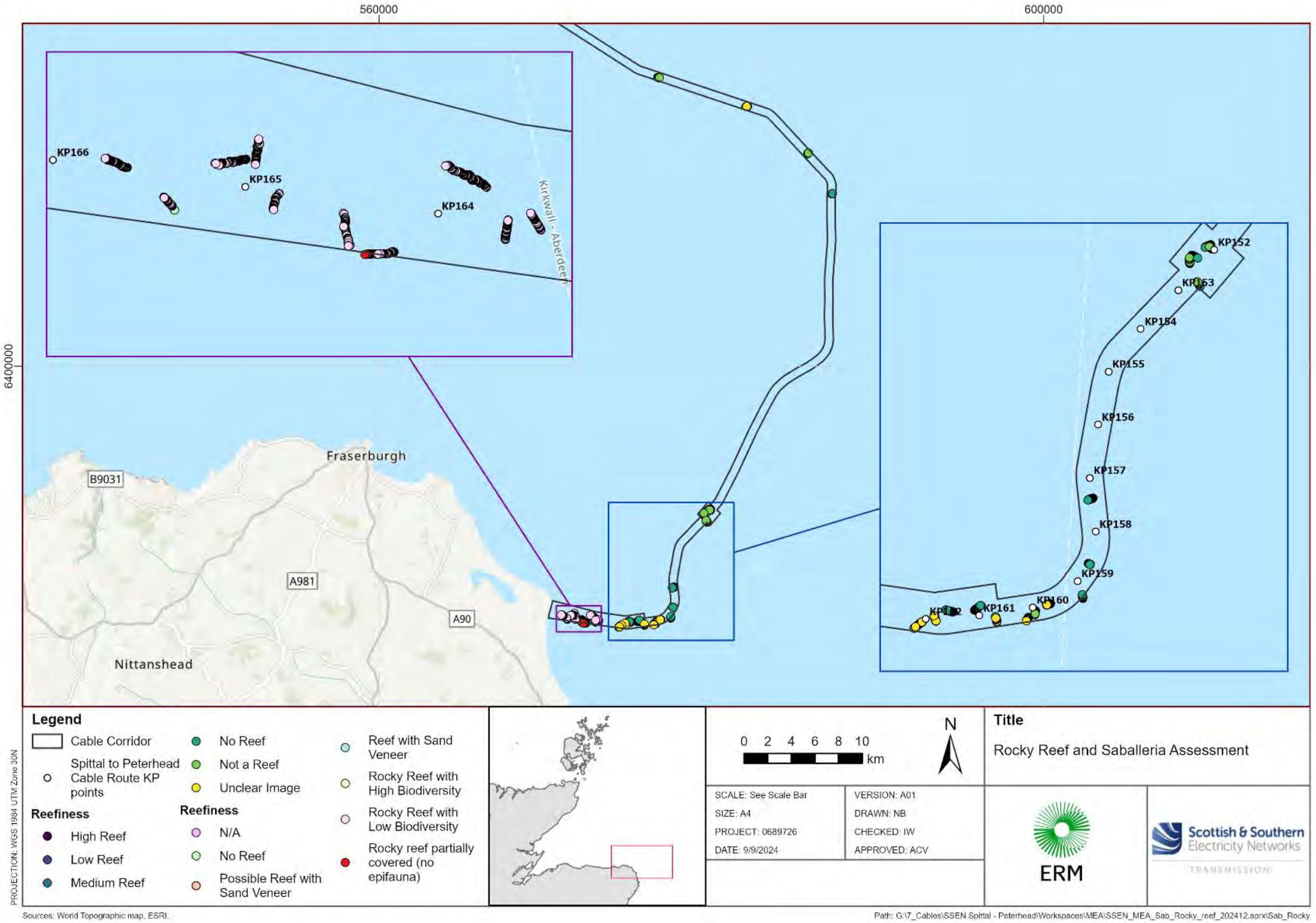


FIGURE 7-24: ANNEX I REEF PRESENT WITHIN PRI 1 AND PRI 2

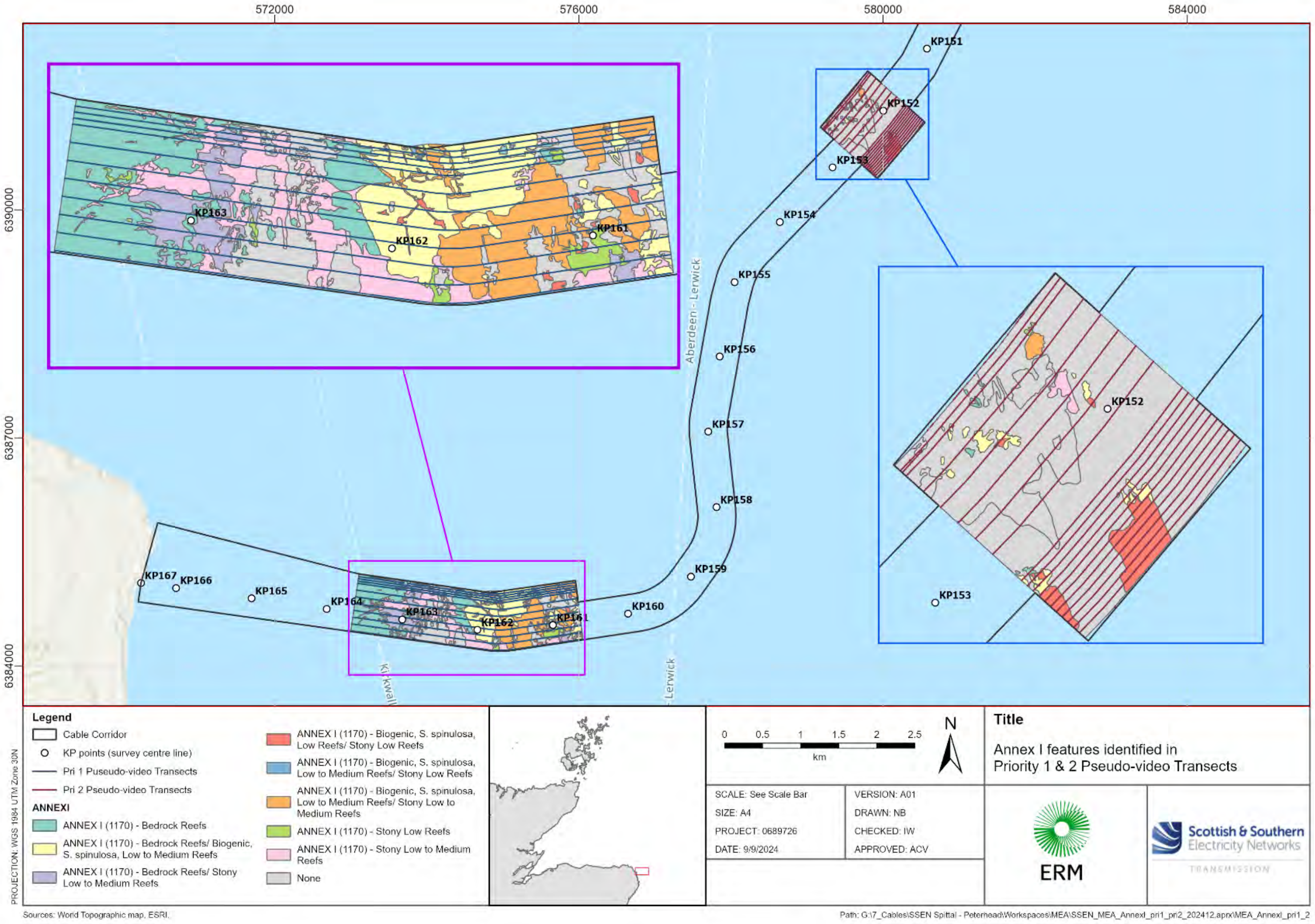


TABLE 7-9: CUMULATIVE SURFACE COVERAGE OF ANNEX I HABITATS WITHIN PRIORITY AREA 1 AND 2

Habitat of Conservation Interest	Priority Area 1		Priority Area 2	
	Area km²	Percentage Distribution (%)	Area km²	Percentage Distribution (%)
Low to Medium Biogenic Reefs (*S. spinulosa*) / Low Stony Reefs	0.0042	0.1829	0.0001	0.0122
Low Biogenic Reefs (*S. spinulosa*) / Low Stony Reefs	0.0183	0.8070	0.0563	5.8729
Low Stony Reefs	0.0499	2.1960	0.0009	0.0959
Bedrock Reefs / Low to Medium Stony Reefs	0.1688	7.4233	-	-
Low to Medium Biogenic Reefs (*S. spinulosa*) / Low to Medium Stony Reefs	0.3467	15.2529	0.0056	0.5830
Low to Medium Stony Reefs	0.3490	15.3532	0.0075	0.7802
Bedrock Reefs / Low to Medium Biogenic Reefs (*S. spinulosa*)	0.4034	17.7465	0.0221	2.3088
Bedrock Reefs	0.5058	22.2496	0.0022	0.3474
Not a Reef	0.4271	18.7886	0.8629	89.9996
Total	2.2733	100	0.9588	100

Annex I Reef – Biogenic (Modiolus modiolus)

Horse mussel *Modiolus modiolus* beds are protected in 12 locations around Scotland as important features of multiple MPAs. The Noss Head NCMPA, which is located 2.1 km south of the subsea cable corridor, supports the largest known horse mussel bed in Scottish waters. This mussel bed is classified as a likely Annex I (H1170) Reef and overlaps with the far-field Study Area (**Figure 7-19**). Horse mussel beds are also classed as a PMF and an OSPAR threatened and / or declining habitat.

No horse mussels were observed within macrofaunal samples, or following review of the acquired video footage and photographic stills.

Burrowed Mud

The far-field Study Area in the southern region, overlaps areas associated with the PMF Burrowed Mud (**Figure 7-19**). This is a designated feature in the Southern Trench NCMPA as discussed above.

Within the near-field Study Area, burrowed areas were observed along the subsea cable corridor. To determine if these areas should be classified as OSPAR 'Seapen and burrowing megafauna communities' or Burrowed Mud PMF, a combination of environmental factors and faunal information was considered in the assessment, as outlined in JNCC (2014).

The seapen *P. phosphorea* was observed at 13 transects, with most of those transects also possessing noticeable burrows. JNCC has set a working threshold of 0.2/m² of mean burrow densities to represent 'Seapens and burrowing megafauna communities', based on Norway lobster *Nephrops norvegicus* fishery data and Department for Environment, Food and Rural Affairs (Defra) habitat advice.

Overall, the burrows did not meet the JNCC threshold. Furthermore, the small burrow density was also below the 'Frequent' threshold required for classification as an OSPAR 'Seapen and Burrowing Megafauna Communities' habitat.

Norway lobster was observed within burrows on a single transect (S2P_30; KP 92.4), at sizes of approximately 12 cm in length. At this station, the mean density of large burrows exceeded this 0.2/m² threshold, suggesting that this section of the subsea cable corridor qualifies as an OSPAR habitat. The presence of OSPAR habitat 'Sea pen and burrowing megafuna communities', therefore, denotes the presence of the PMF Burrowed Mud.

Offshore Deep Sea Muds

The PMF 'Offshore Deep Sea Muds' is present within the region (**Figure 7-19**). This PMF is widespread in the offshore to the north and west of Scotland, and is one of the most common deep water habitats in the UK offshore marine environment (Tyler-Walters *et al.*, 2016).The PMF was not recorded within the near-field or far-field Study Area and therefore, will not be assessed.

Offshore Subtidal Sands and Gravels

The far-field Study Area overlaps areas associated with the PMF 'Offshore Subtidal Sands and Gravels' (**Figure 7-19**). Sand and gravel sediments are the most common habitat types found around the coast of the British Isles and are abundant in the offshore of Scotland (Tyler-Walters *et al*., 2016).

The biotopes MC32 'Atlantic circalittoral coarse sediment', MC52 'Atlantic circalittoral sand, MD32 'Atlantic offshore circalittoral coarse sediment', and MD52 'Atlantic offshore circalittoral sand' are component biotopes representative of the PMF 'Offshore Subtidal Sands and Gravels' (Tyler-Walters *et al*., 2016). All four component biotopes were observed along the proposed cable corridor (**Figure 7-19**).

Kelp Beds

Kelp beds composed of *Laminaria hyperborea* are a PMF in Scottish seas. This feature supports food chains comprising species of commercial importance, and play a crucial role in the recycling of coastal nutrients (NatureScot,2023).

The level 5 biotope MB12A '*Laminaria hyperborea* and Foliose Red Seaweeds on Moderately Exposed Infralittoral Rock' is listed as a component of PMF 'Kelp Beds' (Tyler-Walters *et al*., 2016). This biotope was identified at two transects - S2P_79 (KP 165) and S2P_80_A (KP 165.1).

Ocean Quahog

The Ocean Quahog *Arctica islandica* is a bivalve species with a protected status under the OSPAR Commission; due to its inclusion on the OSPAR List of Threatened and/or Declining Species in the Greater North Sea area as a priority (OSPAR, 2009).

Aggregations of Ocean Quahog are also protected as a PMF in Scotland Seas (Tyler-Walters *et al*., 2016). The species prefers sand and muddy sands, ranging from fine to coarse grains, and live buried vertically within the top few centimetres of the sediment, with retractable inhalant and exhalant siphons occasionally visible at the surface.

One adult Quahog (shell diameter >5 cm) was recovered during the grab sampling at station S2P_23 (KP 56.6). This specimen was recorded, photographed, and returned to the sea. No other sightings of potential Ocean Quahog siphons were observed following review of the acquired video footage and photographic stills.

As no aggregations were recorded, the PMF 'Ocean Quahog Aggregations' is not expected to occur along the proposed subsea cable corridor.

Dog Whelk

The dog whelk *Nucella lapillus* was observed at the northern (Sinclair's Bay) landfall. This species is listed as an OSPAR (2008) threatened and/or declining species, and in OSPAR Region II (Greater North Sea), its populations are reported to be under threat and/or in decline.

Sandeel

Sandeel *Ammodytes* sp. is a taxon of commercial importance. *A. marinus* and *A. tobianus* are considered to comprise a mobile species PMF. A total of one Ammodytidae individual was recorded at S2P_17_CAM.

Impacts relating to sandeel from the Project are addressed in **Section 7.3.6: Fish and Shellfish**. Sandeel are considered important biological components as they provide food for higher trophic groups known to inhabit the area, see **Section 7.3.6: Fish and Shellfish,** and **Section 7.6.4: Commercial Fisheries**.

7.2.4 MARINE ENVIRONMENTAL ASSESSMENT

7.2.4.1 OVERVIEW

The proposed works have the potential to result in environmental impacts upon benthic ecology receptor groups. Whilst a formal EIA is not required as part of this MLA, the MEA has been conducted using similar EIA terms and definitions for transparency and ease of understanding.

Definition of Significance

This MEA will assign a level of significance to each receptor-impact pathway, in line with that provided within a formal EIA. **Table 7-10** defines the various levels of significance used within this assessment.

TABLE 7-10: DEFINITIONS OF SIGNIFICANCE FOR APPLICATION WITHIN THE MARINE ENVIRONMENTAL ASSESSMENT

Significance	Definition
Major Adverse/Beneficial Impact	Major Adverse results in an unacceptable level of impact, at sufficient importance to call for serious consideration of changes to the Project (Significant in formal EIA terms)

Significance	Definition
Moderate Adverse/Beneficial Impact	Moderate Adverse results in an unacceptable level of impact, at sufficient importance to call for consideration of changes to the Project (Significant in formal EIA terms)
Minor Adverse/Beneficial Impact	Acceptable level of impact, and unlikely to be sufficiently important to warrant mitigation measures (Non-significant in formal EIA terms)
Negligible Impact	Acceptable level of impact, of such low significance that they are not considered relevant for the decision-making process (Non-significant in formal EIA terms)

Scoping of Potential Impacts

The following potential impacts relevant to Benthic Ecology are assessed for the construction, operation, and decommissioning phases of the proposed Spittal to Peterhead Cable:

- Temporary localised disturbance of seabed habitats;
- Long term loss to benthic habitats and species via placement of hard substrates on the seabed;
- Temporary disturbance via increased Suspended Sediment Concentrations (SSC) and associated deposition;
- Hydrodynamic changes leading to scour around subsea structures;
- Impacts to habitats or species as a result of pollution or accidental discharge;
- Increased risk of introduction and spread of Marine Non-Native Species (MNNS)[9]; and
- Colonisation of hard structures.

These potential impacts have been assessed based on the realistic worst-case parameters outlined within the Project design. For Benthic Ecology these realistic worst-case parameters are outlined within **Table 7-11**.

On review of the baseline description, the following sensitive features were identified within the Intertidal and Benthic Ecology Study Area:

- Annex I Bedrock Reefs;
- Annex I Stony Reefs;
- Annex I Biogenic (*Sabellaria spinulosa*) Reefs;
- Annex I Biogenic (*Modiolus modiolus*) Reefs;
- PMF Burrowed Mud;
- PMF Offshore Subtidal Sands and Gravels;
- PMF Kelp Beds;
- PMF Ocean Quahog (*Arctica islandica*); and
- Dog whelk (*Nucella lapillus*).

As Horizontal Directional Drilling (HDD) will prevent any impacts to the intertidal, the potential effects of disturbance on the dog whelk *N. lapillus* have not been considered further.

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[9] Also known as Invasive Non-Native Species (INNS).

Furthermore, Annex I Bedrock Reefs and Annex I Stony Reefs are expected to have similar sensitivities as they are both represented by similar biotopes. As such these two features have been combined into Annex I Geogenic Reefs.

TABLE 7-11: REALISTIC WORST-CASE PARAMETERS FOR BENTHIC ECOLOGY

Potential Impact	Realistic Worst-case Parameters	Phase	Receptors
Temporary localised disturbance of seabed habitats	Length of seabed sediment disturbance by burial =Total (max.) approximate cable length (172,000 m) – length of cable requiring protection (rock berm/crossings) = 25,090 m) = 146,910 m Width of seabed disturbance from installation tool = 10 m *Area of seabed disturbance by burial* *= 146,910 m x 10 m = 1,469,100 m^2 (1.4691 km^2)* Length of seabed disturbance by rock berm/crossings = 25,090 m Width (max.) of rock berm/crossings = 11 4 m *Area of seabed disturbance as a result of rock berm/crossings* *= 25,090 m x 11.4 m = 286,026 m^2* **Total potential area of seabed disturbance:** = 1,469,100 m + 286,026 m = **1,755,126 m^2 (1.76 km^2)**	Construction, Decommissioning	PMF Burrowed Mud PMF Offshore Subtidal Sands and Gravels PMF Ocean Quahog (*Arctica islandica*)
Temporary disturbance via increase suspended sediment concentrations (SSC) and associated deposition	The far-field Benthic and Intertidal Ecology Study Area encompasses a 10 km buffer from the cable corridor, covering a total area of 3,342 km^2. This is precautionary for assessment of indirect impacts on benthic ecology from temporary disturbance. It is anticipated that increases in SSC and associated deposition will be predominantly localised. Estimations based on North Sea projects occurring under similar hydrodynamic and seabed sedimentary conditions indicate the following transport distances for sediments: • Coarse sediment (>2 mm) = 100 m • Sand (0.062 mm–2 mm) = 700 m • Silt and clay (at a level above 1 mg/l) = up to 2 km	Construction, Decommissioning	Annex I Geogenic Reefs Annex I Biogenic (*Sabellaria spinulosa*) Reefs Annex I Biogenic (*Modiolus modiolus*) Reefs PMF Burrowed Mud PMF Offshore Subtidal Sands and Gravels PMF Kelp Beds PMF Ocean Quahog (*Arctica islandica*)
Impact to habitats or species as a result of pollution or accidental discharge	Total of 7 active vessels Duration: 408 hours per campaign (2 campaigns) 408 x 2 x 1.1 = 898 hours (total)	Construction, Operation, Decommissioning	

Potential Impact	Realistic Worst-case Parameters	Phase	Receptors
Increase risk of introduction and spread of MNNS	Most vessel activity will occur during construction and decommissioning, with some routine inspection works during operation. The below outlines expected activities during construction phase, and thus risk of introduction: • Total of 7 active vessels • Duration: 408 hours per campaign (2 campaigns) 408 x 2 x 1.1 = 898 hours (total) Installed rock berm and mattresses during operation can provide new habitat for MNNS: • HDD exits: 6400 m^2 • Remedial rock placement: 25,090 m x 11.4 m = 286,026 m^2; • Crossings: 5 x 150 m x 11.4 m = 8,550 m^2; • Mattresses at reef: 3 m x 2,466 m = 7,398 m^2. **Total potential footprint of available habitat for MNNS: = 308,374 m^2 (3 km^2)**	Construction, Operation, Decommissioning	Annex I Geogenic Reefs Annex I Biogenic (*Saballeria spinulosa*) Reefs PMF Burrowed Mud PMF Offshore Subtidal Sands and Gravels PMF Kelp Beds PMF Ocean Quahog (*Arctica islandica*)
Long term loss to benthic habitats and species via placement of hard substrates on the seabed	• HDD exits: 6400 m^2 • Remedial rock placement: 25,090 m x 11.4 m = 286,026 m^2; • Crossings: 5 x 150 m x 11.4 m = 8,550 m^2; • Mattresses at reef: 3 m x 2,466 m = 7,398 m^2. **Total potential footprint of long term habitat loss: = 308,374 m^2 (3 km^2)**	Operation	
Hydrodynamic changes leading to scour around subsea infrastructure	• HDD exits: 6400 m^2 • Remedial rock placement: 25,090 m x 11.4 m = 286,026 m^2; • Crossings: 5 x 150 m x 11.4 m = 8,550 m^2; • Mattresses at reef: 3 m x 2,466 m = 7,398 m^2. **Total potential footprint of subsea infrastructure: = 308,374 m^2 (3 km^2)**	Operation	
Colonisation of hard structures	• HDD exits: 6400 m^2 • Remedial rock placement: 25,090 m x 11.4 m = 286,026 m^2; • Crossings: 5 x 150 m x 11.4 m = 8,550 m^2; • Mattresses at reef: 3 m x 2,466 m = 7,398 m^2. **Total potential footprint of available habitat for colonisation: = 308,374 m^2 (3 km^2)**	Operation	

7.2.5 CONSTRUCTION PHASE

7.2.5.1 TEMPORARY LOCALISED DISTURBANCE OF SEABED SEDIMENTS

The proposed works involve the laying and burial of cable within the seabed substrate, thereby resulting in temporary disturbance to benthic habitats and species. Temporary habitat disturbance will occur from installation of the cable, placement of anchors and boulder clearance. Cable burial activities will be limited to soft sediments and will not occur over hard substrata, including any areas identified as Annex I (H1170) Reefs. Impacts from cable protection are considered long term, localised, disturbance and are assessed separately in **Section 7.2.6.**

Table 7-10 lists the receptors present within the near-field Study Area that may overlap and be subject to temporary localised disturbance of seabed sediment from cable laying activities.

Embedded mitigation, as listed in **Section 6.4**, includes laying the cable in a bundle configuration - as such, only a single trench will be required, resulting in a smaller footprint. Furthermore, deployment of anchor chains on the seabed will be kept to a minimum.

Sensitivity of Receptors

The Scottish Government's Feature Activity Sensitivity Tool (FeAST) includes a matrix which provides information on the sensitivity of key marine habitats and species (e.g. interest features of NCMPAs) to pressures in the marine environment (FeAST, 2024). Much of the evidence presented within FeAST has been derived from sensitivity assessments originally undertaken by the Marine Evidence based Sensitivity Assessment (MarESA) (Tyler- Walters *et al*., 2023). For features not listed in FeAST, MarESA was referred to. Where relevant, sensitivity to the pressures surface abrasion, subsurface/penetration, and physical removal (extraction of substratum) was determined for each sensitive receptor.

Although no biotope representing **PMF Burrowed Mud** was recorded, it was determined that the OSPAR habitat 'Seapen and burrowing megafauna communities' was present along at least one part of the proposed subsea cable corridor, based on burrow density (see **Section 7.2.3**). Sensitivity of Burrowed Mud was determined from FeAST (2024).

Disturbance of surface and subsurface by cable laying activities is likely to affect mobile and sessile epifauna, and deep burrowers. The seapen species *Virgularia mirabilis* and *Pennatula phosphorea* can avoid abrasion to some extent by withdrawing into the sediment. However, if damaged individuals are likely to die. As such, tolerance and adaptability are considered to be low. Overall, FeAST determined the PMF Burrowed Mud as having **Medium** sensitivity to temporary, localised disturbance of seabed sediments.

The sensitivity of the **PMF Offshore Subtidal Sands and Gravels** is represented on FeAST by both 'continental shelf sands' and 'continental shelf coarse sediment' (FeAST, 2024). However, as sensitivity is largely determined by the species present, the most sensitive biotope recorded within the near-field Study Area representing PMF Offshore Subtidal Sands and Gravels was used for the assessment: namely MD5212 '*Owenia fusiformis* and *Amphiura filiformis* in deep circalittoral sand or muddy sand' (De-Bastos, 2023).

The key species in this biotope are shallow burrowers, found close to the sediment surface and as such, are subject to removal/damage from cable laying activities. Brittlestars can resist considerable damage and can regenerate arms and some of their disc (Sköld, 1998); as such, PMF Offshore Subtidal Sands and Gravels are considered to have **Medium** sensitivity to temporary localised disturbance of seabed sediments.

PMF Ocean Quahog *Arctica islandica* bivalve species is afforded protected status under the OSPAR Commission due to its inclusion on the OSPAR List of Threatened and/or Declining Species in the Greater North Sea area as a priority.

Despite having a thick, solid heavy shell, *A. islandica* are known to be vulnerable to physical abrasion. The damage to this species is related to their body size, with larger specimens being more vulnerable than smaller ones (Klein and Witbaard, 1993). As a result, this species is considered to have no resistance, resilience, or adaptability to this pressure.

Consequently, *A. islandica* was determined by FeAST as having **High** sensitivity to temporary localised disturbance of seabed sediments.

Magnitude of Effect

The magnitude of temporary localised disturbance of seabed habitats is determined using the maximum extent of seabed footprint associated with the burial of the cable that directly interacts on and/or within the seabed. Additional cable protection and crossings laid on the seabed are considered long term localised disturbance.

The total footprint extent of temporary, localised disturbance of seabed habitats is calculated as 1,755,126 m² (1.76 km²).

The total near-field Study Area is 83.2 km² and including the far-field, the overall Benthic and Intertidal Study Area is approximately 3,342 km².

Therefore, the realistic worst-case construction scenario design would result in the temporary disturbance of 2.113% of habitats if only considering the near-field; and 0.05% of the entire Study Area.

The duration of installation is estimated to take 1,350 hours (56.25 days). However, a particular area will only experience acute localised disturbance, rather than continuous disturbance from installation.

PMF Burrowed Mud was recorded at just one camera transect (S2P_30). Compared to the extent of similar habitat within the region, this habitat within the proposed subsea cable corridor is considered to be highly localised.

In contrast, **PMF Offshore Subtidal Sands and Gravels** was widely recorded along the proposed subsea cable corridor. However, as illustrated in **Figure 7-19**, this feature is present across the wider region. As such cable burial activities will impact a low proportion of the total extent of the feature.

Only one **PMF Ocean Quahog** was observed along the proposed subsea cable corridor; as such, the likelihood of encountering **PMF Ocean Quahog** aggregation along the corridor is low. Furthermore, the total area of temporary habitat loss or disturbance is considered to represent a very small percentage loss of the total area of the OSPAR Region II (Greater North Sea) within which **PMF Ocean Quahog** is listed as being threatened and/or declining.

For these reasons, Magnitude has been considered **Low** for all receptors.

Assessment Conclusion

PMF Burrowed Mud, **PMF Offshore Subtidal Sands and Gravels** and **PMF Ocean Quahog** are of **Medium** to **High** sensitivity, and are subject to a **Low** magnitude of impact. Potential impact from temporary localised disturbance of seabed sediments has been assessed as having a **Minor Adverse** effect. As such, the impact of temporary localised disturbance of seabed sediments on these receptors is considered **Not Significant**.

7.2.5.2 TEMPORARY DISTURBANCE VIA INCREASE SUSPENDED SEDIMENT CONCENTRATION AND ASSOCIATED DEPOSITION

Temporary increase in Suspended Sediment Concentration (SSC) is expected to arise from construction activities such as seabed preparation (including boulder clearance), cable burial (ploughing, cutting, trenching and jetting) and drilling fluid release during HDD.

Disturbance of the seabed from these activities can release sediment into the water column as a plume, increasing SSC and water turbidity. The suspended sediment will settle downwards at a rate depending upon its grain size. During settling, the sediment plume will be advected away from the point of release by currents and will disperse laterally through turbulent diffusion.

Deposition of sediment may cause indirect impacts on marine organisms via smothering, while increased SSC may affect primary production of primary producers such as kelp through an increase in turbidity.

Modelling studies undertaken for other offshore development projects in the North Sea, with similar seabed substrate and hydrodynamic conditions, can be used to estimate the distance that sediment may travel in suspension as a result of being disturbed via cable installation. These studies indicate that sand (0.062 mm–2 mm) and coarse sediment (>2 mm) could disperse up to a maximum of 700 m and 100 m, respectively, from the source of seabed disturbance. Silt and clay (at a level above 1 mg/l) may travel over a distance of up to 2 km (Royal Haskoning, 2011; Scira Offshore Energy Ltd, 2006; Intertek, 2017).

In situ monitoring that has been undertaken during cable installation, shows that cable-laying activities do not create a major or long term change in SSC levels (BERR, 2008; EMU, 2005; SeaScape Energy, 2008). The monitoring also demonstrated that sediment is largely deposited immediately adjacent to the cable corridor, and relatively fine sediments were only measurable within a few hundred metres (BERR, 2008; EMU, 2005; SeaScape Energy, 2008).

The cable corridor is characterised by a range of different seabed sediment types. The PSA data indicates that the corridor predominately consists of sand (>80%; see **Section 1.7.4.3**), with variable amounts of gravel, and a greater proportion of fines in the deeper waters (>70 m). In the nearshore region the proportion of sand exceeds 99% (REACH Subsea, 2024).

Given the sediment composition, an increase in SSC during cable installation along the cable corridor will be short-lived, and is likely to be localised to within a few hundred metres of the cable corridor.

There may also be an increase in the SSC due to limited volumes of HDD drilling fluids being released in the instant that the drill head exits out onto the seabed. Drilling fluids will consist of bentonite clay grains (see **APPENDIX D: Physical Processes Technical Appendix** for further details).

The release of fluids will be occurring only over a short time period and in small volumes. Bentonite clay grains are small and thus may remain suspended in the water column for a long period of time (days to weeks). However, any associated plume will be advected away from the release location by the prevailing tidal current, and subject to rapid dispersion; both laterally and vertically to near-background levels (tens of mg/l) within hundreds to a few thousands of metres of the point of release. Therefore, no accumulation on the seafloor in measurable thickness in any location more than within a few tens of metres from the punch-out location can be detectable.

As a consequence of the low concentrations of suspended sediment, the rapid dispersion to background levels, and the temporary nature of HDD installation, the limited depositional thickness, and the fact that it is a natural material with no chemical constituents, the magnitude of effect to the suspended sediment pathway and the physical environment are likely to be **Negligible**. However, on a precautionary basis all sensitive features have been considered for assessment (**Table 7-11**).

Embedded mitigation, as listed in **Section 6.4** includes laying the cable in a bundle configuration; as such, only a single trench will be required, resulting in a smaller area being disturbed.

Sensitivity of Receptors

Where relevant, sensitivity to water clarity, siltation rate changes (light) and siltation rate changes (heavy) were determined for each sensitive feature.

The sensitivity of **Annex I Geogenic Reefs** has been based on the most sensitive biotope recorded within the stony and bedrock reefs areas: namely, MC12244 'Brittlestars on faunal and algal encrusted exposed to moderately wave-exposed Atlantic circalittoral rock'. Dense beds of brittlestars tend not to persist in areas of excessive sedimentation, because high levels of sediment foul the brittlestars feeding apparatus (tube feet and arm spines) and, ultimately, suffocates them (Schäfer, 1962; cited in Aronson, 1992). As such, this biotope has low resistance to increases in SSC (De-Bastos *et al*., 2023).

The MC12244 biotope is exposed to moderate energy hydrodynamics and as such, dispersion of fine sediment may be rapid. Therefore, Annex I Geogenic Reefs are considered to have **Medium** sensitivity to temporary disturbance via increase in SSC and associated deposition.

Sensitivity of **Annex I Biogenic (*S. spinulosa*) Reefs** has been based on the most sensitive biotope recorded: MC2211 '*Sabellaria spinulosa* on stable Atlantic circalittoral mixed sediment'. It is likely that a large deposition of fine and coarse material will block feeding apparatus of *S. spinulosa* and, therefore, the biotope is considered to have no tolerance to this pressure (Tillin *et al*., 2023). However, recovery is likely to be rapid given that larval dispersal is not interrupted, and new reefs are likely to be able to establish themselves over old, buried ones, as postulated by Fariñas-Franco *et al*. (2014). As such Annex I Biogenic (*S. spinulosa*) Reefs are considered to have **Medium** sensitivity to temporary disturbance via increase in SSC and associated deposition.

The sensitivity of **Annex I Biogenic (*Modiolus modiolus*) Reefs** has been based on the biotope MC2232 '*Modiolus modiolus* on open coast Atlantic circalittoral mixed sediment' (Tillin *et al*., 2024). Changes in light penetration or attenuation associated with this pressure are not relevant to *M. modiolus* biotopes. However, the species' inability to actively emerge from sediments, if buried, means that it will have a low tolerance and adaptability to the deposition of additional sediments.

Cable laying activities are expected to be short term, and the characterising taxa are expected to survive short term burial (Hutchinson *et al*., 2016). Annex I Biogenic (*M. modiolus*) Reefs has been deemed to have **High** sensitivity to temporary disturbance via increase in SSC and associated deposition.

The **PMF Burrowed Mud** is assessed by FeAST as having **Medium** sensitivity to temporary disturbance via increase in SSC and associated deposition (FeAST, 2024). The majority of species recorded as representing this feature are burrowing megafauna (*Maxmuelleria lankesteri*, bivalves and thalassinidean crustaceans) living in the sediment.

Burrowing species will be able to burrow through the additional layer of sediment in hours to days. An increase in suspended sediment may affect the feeding efficiency of suspension filters, such as *V. mirabilis*. Colonies will produce an increased amount of mucus to aid sediment removal, or individual colonies may retract into the sediment.

Cable laying activities are expected to be short term, and the characterising taxa are expected to survive short-term burial. As such recoverability is considered high, while adaptability and tolerance are considered medium to low, depending on currents and time of the year with an overall sensitivity of **Medium**.

Sensitivity of the **PMF Offshore Subtidal Sand and Gravels** was determined based on the sensitivity review of biotope MD5212. The characterising species of this biotope are species that are likely to be able to burrow upwards. For example, the brittlestar *Ophiura ophiura* can tolerate short term (32 days) burial events, largely attributed to the species' ability to re-emerge from a variety of depths (De-Bastos, 2023).

Material in suspension can affect the efficiency of filter and suspension feeding (Sherk, 1971; Morton, 1977). Effects can include abrasion and clogging of gills, impaired respiration, clogging of filter mechanisms, and reduced feeding and pumping rates. As such, tolerance is considered low, with adaptability as medium.

Cable laying activities are expected to be short term, and the characterising taxa are expected to survive short term burial. Furthermore, the characterising taxa reproduce annually, so recovery through juvenile recruitment may occur within two years. As such, sensitivity to temporary disturbance via SSC and associated deposition has been determined as **Medium**.

The **PMF Kelp Beds** were represented by the biotope MB121 'Kelp and Seaweed communities on Atlantic infralittoral rock' and its sub-biotope MB121A '*Laminaria hyperborea* and foliose red seaweeds on moderately exposed Atlantic infralittoral rock' (Stamp *et al.*, 2023). Light availability and water turbidity are principal factors that determine the depth range of *Laminaria hyperborea* (0-47 m Below Sea Level) (Birkett *et al*., 1998).

An increase in water turbidity will likely affect the photosynthetic ability of *L. hyperborea* and decrease its abundance and density (Stamp *et al*., 2023). As such, tolerance and adaptability is considered low.

Cable laying activities are expected to be short term, and the characterising taxa are expected to survive short term reduction in water clarity and increased deposition. As such, recoverability is considered high. Overall sensitivity of PMF Kelp Beds to temporary disturbance via increase in SSC and associated deposition was determined as **Medium**.

PMF Ocean Quahog is assessed by FeAST as **High** sensitivity to temporary disturbance via increase in SSC and associated deposition. Although **PMF Ocean Quahog** lives within the sediment, they respire and feed through a short inhalant siphon which protrudes just above the sediment surface. As such, the feature is thought to have no tolerance and low recovery to the pressure and, therefore, a **High** sensitivity (Tillin *et al*., 2010).

Magnitude of Effect

The scale of this impact will vary spatially across the consenting corridor and will depend on the installation activity, the sediment type, and local hydrodynamics and geomorphology processes.

Sediment plume dispersal is expected to be localised, with considerable sediment deposition likely to be limited to within the near-field Study Area, and persist over a limited temporal period. The construction period is expected to run over 1,350 hours (56.25 days); however, each disturbance event, occurring at any one location within the near-field Study Area, will not be continuous during this period, and will be short term.

PMF Offshore Subtidal Sands and Gravels are common and widespread throughout the wider region and significantly overlap the near-field Study Area. **PMF Burrowed mud** and **PMF Ocean Quahog** are also common throughout the wider region. However, the site-specific surveys had not reported them as significantly present within the near-field Study Area .Whilst deposition is expected to be highest in the near-field Study Area, the impact of increased SSC and associated deposition is expected to be short term, intermittent and of localised extent (within one tidal excursion). As such, magnitude for these receptors is assessed as **Negligible**.

Annex I Geogenic Reefs, **Annex I Biogenic (*Sabellaria spinulosa*) Reefs**, and **PMF Kelp Beds** are less widespread throughout the wider region and occur within the near-field Study Area where deposition is expected to be highest. However, the impact of increased SSC and associated deposition is expected to be short term, intermittent and of localised extent (within one tidal excursion). However, this will be dependent on the hydrodynamic regime at the time of operations. As such magnitude for these receptors is assessed as **Low**.

Annex I Biogenic (*Modiolus modiolus*) Reefs occur within the far-field Study Area only, where deposition is expected to be low, and with intermediate values of SSC. The impact of increased SSC and associated deposition is expected to be short term, intermittent and of localised extent (within one tidal excursion). **Annex I Biogenic (*Modiolus modiolus*) Reefs** are less widespread throughout the region and therefore, magnitude is assessed as **Low**.

Assessment Conclusion

Annex I Geogenic Reefs, **Annex I Biogenic (*Sabellaria spinulosa*) Reefs** and **PMF Kelp Beds** are of **Medium** sensitivity and will be subjected to a **Low** magnitude of impact, so potential impact from temporary disturbance via increase suspended sediment concentration and associated deposition has been assessed as having **Minor Adverse** effect. As such, the impact of increased suspended sediment concentration and associated deposition on these receptors is considered **Not Significant**.

Annex I Biogenic (*Modiolus modiolus*) Reefs is of **High** sensitivity and will be subjected to a **Low** magnitude of impact, so potential impact from temporary disturbance via increased suspended sediment concentration and associated deposition has been assessed as having a

Minor Adverse effect. As such, the impact of increased suspended sediment concentration and associated deposition on these receptors is considered **Not Significant**.

PMF Burrowed Mud and **PMF Offshore Subtidal Sands and Gravels** are of **Medium** sensitivity and will be subjected to a **Negligible** magnitude of impact, so potential impact from temporary disturbance via increased suspended sediment concentration, and associated deposition, has been assessed as having a **Negligible** effect. As such, the impact of increased suspended sediment concentration and associated deposition on these receptors is considered **Not Significant**.

Lastly, **High** sensitivity of **PMF Ocean Quahog** combined with **Negligible** magnitude of impact, temporary disturbance via increase suspended sediment concentration, and associated deposition has been assessed as having a **Negligible** effect. As such, the impact of increased suspended sediment concentration and associated deposition on **PMF Ocean Quahog** is considered **No Significant Effect.**

7.2.5.3 IMPACT TO HABITATS OR SPECIES AS A RESULT OF POLLUTION OR ACCIDENTAL DISCHARGE

Throughout the construction phase of the Project, the increased vessel activity during cable laying activities may increase the risk of fuel release, or of cleaning fluids, oils and hydraulic fluids on board the vessels.

All receptors have been assessed because of potentially far-reaching impacts from pollution or accidental discharge (**Table 7-11**).

The following embedded mitigation measures, as listed in **Section 6.4**, will reduce the risk of impact to habitats or species as a result of pollution or accidental discharge:

- Ballast water discharges from vessels will be managed under International Convention for the Control of Ship's Ballast Water and Sediments;
- Vessels will be equipped with waste disposal facilities (sewage treatment or waste storage) to IMO MARPOL Annex IV Prevention of Pollution from ships standards;
- Implementation of safety zones (500 m) around the cable lay vessel;
- Notice to Mariners (including local), Kingfisher bulletins, Radio Navigational Warnings, NAVTEX, and/or broadcast warnings will be promulgated in advance of any proposed works. The notices will include the time and location of any work being carried out, and emergency event procedures; and
- HDD drilling muds will consist of water-based muds instead of oil-based muds.

Sensitivity of Receptors

Relevant sensitivity to nitrogen and phosphorous enrichment, organic enrichment, synthetic (including pesticides, antifoulants, pharmaceuticals), transition elements and organo-metal (e.g. chromium, copper, tributyltin (TBT)) contamination, and hydrocarbon and Polycyclic Aromatic Hydrocarbons (PAH) contamination was determined for each feature. The realistic worst-case was determined as overall sensitivity to disturbance of contaminated sediments. A consideration of the Water Framework Directive (WFD) 'higher' and 'lower' sensitivity habitats has been implemented where relevant (Environment Agency, 2017).

The sensitivity of **Annex I Geogenic Reefs** has been based on the most sensitive biotopes recorded within the stony and bedrock reefs areas: namely, MC12244 (De-Bastos *et al.*, 2023). Only organic,, nitrogen, and phosphorous enrichment was assessed by MarESA, and was determined as not sensitive. However, as subtidal rocky reef is considered a lower sensitivity habitat as defined by the WFD, Annex I Geogenic Reefs has been assessed as having **Low** sensitivity to pollution or accidental discharge.

The sensitivity of **Annex I Biogenic (*S. spinulosa*) Reefs** has been based on the most sensitive biotope recorded: namely, MC2211 (Tillin *et al.*, 2023). The characterising species, *S. spinulosa*, is likely not sensitive to synthetic and non-synthetic compounds, as the species has been observed in polluted areas (Hoare and Hiscock, 1974). However, only the sensitivity of *S. spinulosa* to organic enrichment and nitrogen and phosphorous enrichment were assessed by MarESA and was determined as not sensitive. Under the WFD polychaete reefs habitats are deemed to be of higher sensitivity; as such, the overall sensitivity of this habitat to pollution or accidental discharge has been considered **Medium**.

The sensitivity of **Annex I Biogenic (*Modiolus modiolus*) Reefs** has been based on the biotope MC2232 (Tyler-Walters *et al*., 2024). *M. Modiolus* is regarded as not sensitive to organic, nitrogen and phosphorous enrichment, but highly sensitive to synthetic and non-synthetic compound contamination. Furthermore, mussel beds including *M. modiolus* beds are considered, under the WFD, as higher sensitivity habitats. As such, overall sensitivity to pollution or accidental discharge is regarded as **High**.

PMF Burrowed Mud was not assessed for sensitivity to nitrogen and phosphorous enrichment in FeAST, but was assessed as sensitive to organic enrichment, as well as to synthetic and non-synthetic compound contamination (FeAST, 2024). As such, overall sensitivity to pollution or accidental discharge was deemed to be **Medium**.

Sensitivity of the **PMF Offshore Subtidal Sand and Gravels** was determined based on the biotope MD5212 (De-Bastos, 2023). MarESA only assessed sensitivity of the biotope to nitrogen, phosphorous and organic enrichment. It was determined as not sensitive to the nitrogen and phosphorous, and of medium sensitivity to organic enrichment. Furthermore, the WFD determined 'cobbles, gravels, and shingles' and 'subtidal soft sediments' to be lower sensitivity habitats. Based on the realistic worst-case, the overall sensitivity of this PMF to pollution or accidental discharge was deemed as **Medium**.

PMF Kelp Beds were represented by the biotope MB121 'Kelp and Seaweed communities on Atlantic infralittoral rock' and its sub-biotope MB121A (Stamp *et al.*, 2023). MarESA only assessed nitrogen and phosphorus enrichment, and organic enrichment, and determined no sensitivity to the former and low sensitivity to the latter. The WFD identifies 'subtidal kelp beds' as higher sensitivity habitats. As such, overall sensitivity to pollution or accidental discharge has been deemed to be **Medium**.

PMF Ocean Quahog sensitivity to nitrogen and phosphorous contamination was not assessed by FeAST (2024). However, sensitivity to all other contaminants, determined **PMF Ocean Quahog** as sensitive. Although **PMF Ocean Quahog** is not sensitive to contaminants at Environmental Quality Standards (EQS) levels (Tyler-Walters and Sabatini, 2017), above this baseline some contaminants may impact the conservation status of **PMF Ocean Quahog** depending on the nature of the contaminant (UKTAG, 2008; EA, 2014). Liehr *et al*. (2005) recorded lower densities of **PMF Ocean Quahog** at contaminated historical dumping sites compared to a reference site. As such, overall sensitivity to pollution or accidental discharge was deemed to be **Medium**.

Magnitude of Effect

Considering the level of vessel traffic in the region, including in the operations area, the proposed operations will be unlikely to cause measurable change in the risk to pollution or accidental discharge. The risk will be limited to a restricted period for each individual vessel movement, and all movements will occur over the short duration of the construction period (898 hours). Furthermore, in consideration with embedded mitigation adoption of best practice, and the relatively strong currents in the region, the magnitude of the impact is assessed to be **Negligible** for all receptors.

Assessment Conclusion

Impacts to **Annex I Geogenic Reefs**, **Annex I Biogenic (*Sabellaria spinulosa*) Reefs**, **PMF Burrowed Mud**, **PMF Offshore Subtidal Sands and Gravels** and **PMF Kelp beds** are considered of **Negligible** effect because of the **Medium** sensitivity and **Negligible** magnitude of the impact. As such, the impact of pollution and accidental discharge on these receptors is considered **Not Significant**.

Impacts to **Annex I Biogenic (*Modiolus modiolus*) Reefs** and **PMF Ocean Quahog** are considered of **Negligible** effect because of the high sensitivity and the **Negligible** magnitude of the impact. As such, the impact of pollution and accidental discharge on these receptors is considered **Not Significant**.

7.2.5.4 INCREASED RISK OF INTRODUCTION AND SPREAD OF MARINE NON-NATIVE SPECIES

The site-specific survey did not record any Marine Non-Native Species (MNNS) within the subsea cable corridor (BSL, 2024e). However, there is a risk that invasive non-native species INNS will be introduced and/or spread during the construction period. The risk of INNS introduction and spread is equivalent to the sum of the likelihood of introduction (a suitable vector) and the likelihood of establishment and spread (ecological preference and spread), multiplied by the severity of the potential impact (Macleod *et al*, 2016).

An increase in vessel density from project related vessel activities will increase the number of vectors for MNNS. It is not currently known which port(s) these vessels may transit between. In any port there exists the risk that INNS of concern, as listed by NatureScot (2024), may be present and could be transported to the wider marine environment. Non-native biofouling species including the skeleton shrimp *Caprella mutica* and the barnacle *Austrominius modestus* have been recorded from the hulls of commercial vessels using Scottish dry docks and harbours (McCollin and Brown, 2014).

The placement of cable protection during construction will introduce new hard substrata in the marine environment that may be colonised by MNNS. Artificial structures have been demonstrated to be more frequently colonised by MNNS than natural reefs (Glasby *et al*., 2007; Dafforn *et al*., 2012). The risk of MNNS spread from long term placement of such structures is assessed separately in **Section 7.2.6.3** for the operation phase, alongside any additional risk of the introduction of MNNS from operation vessel activities.

Table 7-11 lists the receptors present within the near-field Study Area that may overlap with construction activities and, thus, be exposed to the potential risk of MNNS introduction.

Sensitivity of Receptors

With reference to the MarESA review for **Annex I Geogenic Reefs** representative biotope MC12244 'Faunal and algal crusts on exposed to moderately wave-exposed Atlantic circalittoral rock' there is no current evidence of a threat from MNNS (De-Bastos *et al*., 2023). Tillin *et al*. (2020) suggested that the MNNS *C. fornicata* could colonise circalittoral rock due to its presence on tide-swept rough grounds in the English Channel. However, no evidence was found of the effect of populations on faunal turf-dominated habitats.

It is to be noted that the distribution of *C. fornicata* is not yet reported to have extended into Scottish waters. However, it may be concluded that as faunal turfs are dominated by suspension feeders, larval predation is probably high, which may prevent colonisation by new MNNS recruits. Furthermore, faunal turf species actively compete for space, and many are fast growing and opportunistic, so may out-compete MNNS for space, even if it gained a foothold in the community.

The sensitivity of Annex I Geogenic Reefs to the introduction and spread of MNNS has, in a precautionary manner, been determined to be **Low**.

MarESA concludes no evidence of threat from MNNS to the representative biotope MC2211 ('Worm reefs in the Atlantic circalittoral zone') of **Annex I Biogenic (*Sabellaria spinulosa*) Reefs** (Tillin *et al.*, 2023). No direct evidence relating to the impacts of the introduction of non-indigenous species on *S. spinulosa* reefs were found to support this assessment by Gibb *et al*. (2014). For many of the non-indigenous species that are found in UK seabed habitats, there are no records to suggest that their distribution overlaps with these biogenic habitats. It has been reported, however, that the Pacific oyster *Magallana gigas* exhibits interspecific pressures on the conspecific *Sabellaria alveolata* reef-building species (Tillin *et al*., 2023).

As such, in a precautionary manner, the introduction or spread of MNNS to biotope MC2211 has been assigned **Medium** sensitivity.

Sensitivity of **PMF Burrowed Mud** and **PMF Ocean Quahog** to introduction or spread of MNNS has not been assessed by FeAST or MarESA. As such, a precautionary sensitivity of **Low** to introduction or spread of MNNS has been considered for both receptors.

The MarESA review for the **PMF Offshore Subtidal Sands and Gravels** representative biotope, MD5212, deemed the biotope as not sensitive to the introduction and spread of MNNS (De-Bastos, 2023). There are no records of the introduction or spread of MNNS in this biotope. Sensitivity of the PMG Offshore Subtidal Sands and Gravels, is therefore, assessed as **Negligible**.

PMF Kelp Beds were assessed as having **Medium** sensitivity to introduction or spread of MNNS based on its representative biotope MB121A '*Laminaria hyperborea* and foliose red seaweeds on moderately exposed Atlantic infralittoral rock' (Stamp *et al.*, 2023). Competition with invasive macroalgae may be a potential threat to this biotope. Potential invasive species include wakame *Undaria pinnatifida* and Japanese wireweed *Sargassum muticum*. *S. muticum* is considered an MNNS that is widespread and well established in Scotland, while *U. pinnatifida* is found in patchy locations within Scotland (NatureScot, 2024).

Magnitude of Effect

Considering the level of vessel traffic in the region, including in the area of the Works, the proposed operations will be unlikely to cause measurable change in the risk to introduction and spread of MNNS. The risk will be limited to a restricted period for each individual movement, and all movements will occur over the short duration of the construction period (898 hours). Furthermore, in consideration of embedded mitigation and adoption of best practice, the magnitude of the impact is assessed as **Negligible** for all receptors.

Assessment Conclusion

Annex I Geogenic Reefs, **PMF Burrowed Mud** and **PMF Ocean Quahog** are of **Low** sensitivity and will be subjected to a **Negligible** magnitude of impact, so potential impact from increased risk of introduction and spread of MNNS has been assessed as having a **Negligible** effect. As such, the impact of increased risk of introduction and spread of MNNS on these receptors has been considered **Not Significant**.

Annex I Biogenic (*Sabellaria spinulosa*) Reefs and **PMF Kelp Beds** are of **Medium** sensitivity and will be subject to a **Negligible** magnitude of impact, so potential impact from increased risk of introduction and spread of MNNS has been assessed as having a **Negligible** effect. As such, the impact of increased risk of introduction and spread of MNNS on these receptors has been considered **Not Significant**.

PMF Offshore Subtidal Sand and Gravels are of **Negligible** sensitivity and will be subject to a **Negligible** magnitude of impact, so potential impact from increased risk of introduction and spread of MNNS has been assessed as having a **Negligible** effect. As such, the impact of increased risk of introduction and spread of MNNS on PMF Offshore Subtidal Sands and Gravels has been considered **Not Significant**.

7.2.6 OPERATION PHASE

7.2.6.1 LONG TERM LOSS TO BENTHIC HABITATS AND SPECIES

Placement of cable protection will result in long term loss of benthic habitats and species. Should there be the requirement for additional cable protection to be installed during operation (as part of remedial works) and, therefore, an additional marine licence application, a consideration of temporary disturbance and long term loss of seabed habitats will be assessed through a separate consent application process.

Table 7-11 lists the receptors present within the near-field Study Area that may be subject to long term loss from the placement of cable protection.

Primary mitigation, as listed in **Section 6.4** includes planning the cable corridor to minimise the footprint of any cable potential and avoid Annex I (H1170) Reefs where possible. Furthermore, materials developed with nature inclusive design (NID) principles will be used where possible. For example, this may include marine matt ®, recently tested and developed by ArcMarine (2024). This style of mattress shows rapid colonisation by epifauna through the inclusion of lobster arches and surface textures that promotes larval settlement.

Experimental studies on similar material deployed offshore, recorded an enhancement of benthic invertebrates, evidenced by environmental DNA analysis (Hickling *et al.,* 2023).

The Project is still considering the cable protection material to be used. While cable stability is the primary criteria for selection of cable protection, priority will also be given to the type of protection that minimises the footprint of seabed impact, whilst also providing adequate cable stability in the local hydrodynamic regime.

Sensitivity of Receptors

Where relevant, sensitivity to the pressures of physical change (to another seabed type), and surface abrasion, was determined for each feature. The realistic worst-case was determined as overall sensitivity to long term loss to benthic habitats and species.

The sensitivity of **Annex I Geogenic Reefs**, **Annex I Biogenic (*Sabellaria spinulosa*) Reefs** and **PMF Kelp Beds** to long term loss from the placement of the cable and associated cable protection has been assessed as **High**. The addition of rock or artificial hard substrate is likely to cause damage to species immediately within the footprint. However, in time it may also provide additional substrate on which species could recolonise.

The cable protection will employ, where possible, NID design that includes features and textures that promote settlement by epifaunal species. It is noted that *S. spinulosa* can colonise bedrock and artificial structures (Gibb *et al.,* 2018). An increase in the availability of hard substrate may, therefore, be beneficial in areas where sedimentary habitats were previously unsuitable for colonisation by *S. spinulosa* and *L. hyperborea*.

The sensitivity of **PMF Burrowed Mud**, **PMF Offshore Subtidal Sands and Gravels** and **PMF Ocean Quahog** from the placement of cable protection has been assessed as **High**. If the soft sediments that characterises these features were replaced by hard substrata, this would represent a fundamental changed to the physical character. Furthermore, the biological community that occurs and characterises these would no longer be supported and as such, these features would be lost.

Magnitude of Effect

The anticipated magnitude of long term localised disturbance to seabed habitats is based on the seabed footprint loss associated with cable corridor and associated rock protection. This equates to 293,226 m^2 (approximately 0.29 km^2). The total near-field Study Area is 83.2 km^2 and including the far-field, the overall Benthic and Intertidal Study Area is approximately 3,342 km^2. Therefore, if only considering the Near-field, the placement of cable protection will result in 0.35% of habitats being impacted from long term habitat loss; and 0.01% if the entire Study Area is considered.

Of the 293,226 m^2 (0.29 km^2) habitat loss expected from cable protection, 9,540 m^2 (0.01 km^2) will be placed over **Annex I Geogenic Reefs**, **Annex I Biogenic (*Sabellaria spinulosa*) Reefs** and **PMF Kelp Beds**. Within the near-field Study Area, and based on the EuSeaMap (2023), a total of 3.7 km^2 has been mapped as infralittoral and circalittoral rock and these areas are expected to be widely spread across the wider area. As such, magnitude for these receptors has been considered **Low**.

PMF Burrowed Mud, **PMF Offshore Subtidal Sands and Gravels** and **PMF Ocean Quahog** are widely distributed across the wider area; as such magnitude for these receptors are considered **Negligible**.

Assessment Conclusion

Annex I Geogenic Reefs, **Annex I Biogenic (*Sabellaria spinulosa*) Reefs** and **PMF Kelp Beds** are of **High** sensitivity and are subject to a **Low** magnitude of impact, so potential impact from long term loss to benthic habitats and species has been assessed as having a **Minor Adverse** effect. As such the impact of long term loss to benthic habitats and species on these receptors has been considered **Not Significant**.

PMF Burrowed Mud, **PMF Offshore Subtidal Sands and Gravels** are of **High** sensitivity and are subject to a **Negligible** magnitude of impact, so potential impact from long term loss to benthic habitats and species has been assessed as having a **Minor Adverse** effect. As such the impact of long term loss to benthic habitats and species on these receptors has been considered **Not Significant.**

7.2.6.2 HYDRODYNAMIC CHANGES LEADING TO SCOUR AROUND SUBSEA INFRASTRUCTURE

The presence of cable protection during the operation phase has the potential to cause hydrodynamic changes leading to scour. Scour and increases in flow rates can result in a loss of sediments, which directly impact the physical structure of the adjacent habitats, and may indirectly affect resident benthic communities. The degree of scour that can occur is influenced by local sediment type and hydrodynamics. In sandy sediments, scour can increase over years, while over mixed gravelly sediments the fractions moved will depend on strength of tidal currents (Whitehouse *et al*., 2011). Buried cables will not have any potential to impact seabed morphology unless exposed.

Embedded mitigation, as listed in **Section 6.4**, includes only deploying cable protection where adequate cable burial cannot be achieved, or as required by crossing agreements.

Sensitivity of Receptors

Where relevant, sensitivity has been considered for the pressures of physical change (to another sediment type)[10], and surface abrasion, and the realistic worst-case has been determined as the overall sensitivity to hydrodynamic changes leading to scour.

Annex I Geogenic Reefs, and **PMF Kelp Bed** were assessed as having **Medium** sensitivity to abrasion/disturbance, while physical change to another sediment type is considered not relevant to the rock habitats.

PMF Burrowed Mud, **PMF Offshore Subtidal Sands and Gravels, Annex I Biogenic (*Sabellaria spinulosa*) Reefs** and **PMF Ocean Quahog** all have **High** sensitivity to physical change (to another sediment type); as such, overall sensitivity to hydrodynamic changes leading to scour around subsea infrastructure is assessed as **High**.

A change in sediment type would probably represent a fundamental change in the character of these features, and a change in the abundance of the characteristic species, resulting in the loss of these features.

[10] FeAST does not present sensitivity to physical change (to another sediment type), where relevant sensitivity to physical change (to another sediment type) was referenced from MarESA.

Magnitude of Effect

The total footprint of cable protection equates to 293,226 m² (approximately 0.29 km²), which is approximately 0.35% of the 83.2 km² near-field Study Area and 0.01% of the 3,342 km² far-field Study Area.

Scouring around the cable protection is likely to result in a slight increase in coarse particles by winnowing finer sediment particles over time. However, cable protection is designed to minimise the risk of scour associated with the cable and the protection itself. As such overall magnitude is considered **Low**.

Assessment Conclusion

Annex I Geogenic Reefs and **PMF Kelp Beds** are of **Medium** sensitivity and are subject to a **Low** magnitude of impact, so potential impact from hydrodynamic changes leading to scour around subsea infrastructure has been assessed as having **Minor Adverse** effect. As such the impact from hydrodynamics changes leading to scour on these receptors is considered **Not Significant**.

Annex I Biogenic (*Sabellaria spinulosa*) Reefs, **PMF Burrowed Mud**, **PMF Offshore Subtidal Sands and Gravels** and **PMF Ocean Quahog** are of **High** sensitivity and are subject to a **Low** magnitude, so potential impact from hydrodynamic changes leading to scour around subsea infrastructure has been assessed as having **Minor Adverse** effect. As such the impact from hydrodynamics changes leading to scour on these receptors is considered **Not Significant**.

7.2.6.3 INCREASED RISK OF INTRODUCTION AND SPREAD OF MARINE NON-NATIVE SPECIES

The long term placement of subsea hard infrastructure (mattress, rock placement) may provide artificial habitats for MNNS settlement and/or further risk the introduction to the area from operation vessels undertaking routine survey inspection works. The impact of 'colonisation of hard infrastructure' by native, non-MNNS taxa during the operation phase, that may in part be beneficial, is assessed separately to the assessment presented here for MNNS.

Table 7-11 lists the receptors present within the near-field Study Area that may be subject to the introduction and spread of MNNS.

Embedded mitigation is expected to be the same as for the construction phase. In addition, cable protection will only be deployed where adequate cable burial cannot be achieved, or as required by crossing agreements.

Sensitivity of Receptors

Sensitivity of receptors are the same as assessed under the construction phase. In summary, **Annex I Geogenic Reefs**, **PMF Burrowed Mud**, and **PMF Ocean Quahog** are assessed as having **Low** sensitivity to the introduction and spread of MNNS, while **Annex I Biogenic (*Sabellaria spinulosa*) Reefs** and **PMF Kelps Beds** are determined to have **Medium** sensitivity. In contrast **PMF Offshore Subtidal Sands and Gravels** were determined to have **Negligible** sensitivity to the introduction and spread of MNNS.

Magnitude of Effect

The total area available for colonisation equates to 293,226 m² (approximately 0.29 km²), which is approximately 0.35% of the 83.2 km² near-field Study Area, and 0.01% of the 3,342 km² far-field Study Area.

The opportunity for the accidental introduction of MNNS into the area as a result of marine operation activities, may be expected to be less than during the construction phase, due to the less frequent vessel activity. However, there is a risk of introduction for the duration of the operation period. The risk of introduction and spread of MNNS from vessels, and routine operation survey works, can be reduced through incorporation of best practice measures. Measures will include (but not be limited to): adherence to IMO Biofouling Guidelines, all ballast water discharges from vessels will be managed under the International Convention for the Control and Management of Ships' Ballast Water and Sediments, 2004, and the production of a MNNS Plan (see **Section 6.4.1**; **Table 6-5**).

As a result of the large presence of rock biotopes in the area, there is expected to be native epifauna larvae in the water column, that will quickly colonise any newly introduced hard substrata and, by doing so, prevent the colonisation by MNNS through long term competition.

Overall, the magnitude has been assessed as **Negligible**.

Assessment Conclusion

Annex I Geogenic Reefs, **PMF Burrowed Mud** and **PMF Ocean Quahog** are of **Low** sensitivity and are subject to a **Negligible** magnitude of impact, so potential impacts from increased risk of introduction and spread of MNNS was assessed as having **Negligible** effect. As such the impact of increased risk of introduction and spread of MNNS on these receptors is considered **Not Significant**.

Annex I Biogenic (*Sabellaria spinulosa*) Reefs and **PMF Kelp Beds** are of **Medium** sensitivity and are subject to a **Negligible** magnitude of impact, so potential impact from increased risk of introduction and spread of MNNS was assessed as having **Negligible** effect on these receptors. As such, the impact of increased risk of introduction and spread of MNNS on these receptors is considered **Not Significant**.

Lastly, due to the **Negligible** sensitivity of **PMF Offshore Subtidal Sands and Gravels**, combined with a **Negligible** magnitude of impact, increased risk of introduction and spread of MNNS was assessed as having **Negligible** effect. As such, the impact of increased risk of introduction and spread of MNNS on these receptors is considered **Not Significant**.

7.2.6.4 COLONISATION OF HARD STRUCTURES

The introduction and long term placement of artificial hard subsea structures into the marine environment can provide novel, newly available, substrates for both MNNS and native species. The potential impact may be assessed as both beneficial and adverse on adjacent benthic communities. For example, there may be localised increases in habitat complexity and biomass, scour protection offering an artificial 'reef' effect, attracting other benthic species such as large mobile decapods, and localised increases in food availability via faecal deposition to the surrounding seafloor (Degraer *et al*., 2020; Langhamer, 2012).

However, assemblages on such structures may not necessarily be more diverse than those communities of the underlying sediments that are lost through placement of infrastructure.

This may subsequently cause indirect changes to the functioning of adjacent communities. For the purpose of this assessment, where the negative impact from introduction and spread of MNNS during operation is assessed separately, the potential balance between beneficial and adverse impacts of colonisation by native species of hard structures will primarily be considered here.

Table 7-11 lists the receptors present within the near-field Study Area that may be subject to the colonisation of hard structures.

Embedded mitigation, as listed in **Section 6.4**, includes only deploying cable protection where adequate cable burial cannot be achieved, or as required by crossing agreements.

Sensitivity of Receptors

Soft sediments may potentially benefit from the establishment of newly localised, distinct hard bottom communities. These can indirectly provide organic enrichment of sediments, increasing food availability for deposit and filter feeding species. This in turn may increase macrofaunal density and diversity (Degraer *et al*., 2020).

Depending on the habitat requirements of residents, changes in sediments, with increases in fines and organic matter, may conversely cause localised changes in community assemblages. As such, where possible the realistic worst-case sensitivity to organic enrichment, siltation rate changes (light) and siltation rates changes (heavy) was determined for each receptor.

The realistic worst-case sensitivity of **PMF Ocean Quahog** was for siltation rate changes (heavy) determined as **High**. In contrast **PMF Burrowed Mud** was most sensitive to organic enrichment and siltation rate changes (heavy), and determined as **Medium** for both pressures. **PMF Offshore Sands and Gravels**, **Annex I Geogenic Reefs**, and **Annex I Biogenic (*Sabellaria spinulosa*) Reefs** were most sensitive to siltation rate changes (heavy), and were determined as **Medium** for overall. **PMF Kelp Beds** were the least sensitive, with realistic worst-case as **Low** for siltation rate changes (heavy).

Magnitude of Effect

The total area available for colonisation equates to 293,226 m² (approximately 0.29 km^2), which is approximately 0.35% of the 83.2 km² near-field Study Area, and 0.01% of the 3,342 km² far-field Study Area. Overall, the spatial extent of novel surfaces made available as a result of the addition of cable protection is small, relative to the overall distribution of the receptor groups in the near-field Study Area, and beyond, within the wider Study Area. It is, therefore, concluded that the magnitude of colonisation of hard structures during the operation phase is **Low**.

Assessment Conclusion

Annex I Geogenic Reefs, **Annex I Biogenic (*Sabellaria spinulosa*) Reefs**, **PMF Burrowed Mud**, and **PMF Offshore Subtidal Sands and Gravels** are of **Medium** sensitivity and are subject to a **Low** magnitude of impact, so potential impact from colonisation of hard structures has been assessed as having **Minor Adverse** effect. As such, the impact of colonisation of hard structures on these receptors is considered **Not Significant**.

PMF Kelps Beds is of **Low** sensitivity and is subject to a **Low** magnitude of impact, so potential impact from colonisation of hard structures has been assessed as having **Negligible**

effect. As such, the impact of colonisation of hard structures on PMF Kelps Beds is considered **Not Significant**.

PMF Ocean Quahog is of **High** sensitivity as is subject to a **Low** magnitude of impact, so impact from colonisation of hard structures has been assessed as having **Minor Adverse** effect. As such, the impact of colonisation of hard structures on **PMF Ocean Quahog** is considered **Not Significant**.

7.2.7 DECOMMISSIONING PHASE

Impacts associated with the decommissioning phase of the Project are unknown at the time of drafting this assessment. However, some of the expected impacts will be similar to those described under the construction phase. However, the magnitude of effects will be expected to be lower than those during the construction phase. For example, if it is determined that infrastructure such as cable protection is to be left *in situ*, there will be a notable reduction in the potential for seabed habitat disturbance during the decommissioning phase.

7.2.8 ASSESSMENT SUMMARY

Overall, the Benthic Ecology assessment concluded **No Significant Effects** throughout the construction, operation, and decommissioning phases of the proposed Spittal to Peterhead Cable. As a result of the assessment concluding **No Significant Effects** to Benthic Ecology receptors, no additional mitigation is proposed.

Table 7-12 shows the receptors that have been assessed as part of the MEA for Benthic Ecology.

Any overall risk determined to be **Negligible** or **Minor** is '**Not Significant**' i.e. no significant impact results. Any overall risk determined to be **Moderate** or **Major** is '**Significant**' and will require further mitigation(s) to be implemented to minimise or remove the significance of impact to become '**Not Significant**'.

TABLE 7-12: SUMMARY OF IMPACTS TO BENTHIC ECOLOGY RECEPTORS

Potential Impact	Receptor	Sensitivity	Magnitude	Overall Risk	Significance
Construction					
Temporary (short term) localised disturbance of seabed habitats	PMF Burrowed Mud	Medium	Low	Minor	Not Significant
	PMF Offshore Subtidal Sands and Gravels	Medium	Low	Minor	Not Significant
	PMF Ocean Quahog	High	Low	Minor	Not Significant
Temporary (short term) disturbance via increase suspended sediment concentrations and associated deposition	PMF Burrowed Mud	Medium	Negligible	Negligible	Not Significant
	PMF Offshore Subtidal Sands and Gravels	Medium	Negligible	Negligible	Not Significant
	PMF Kelp Beds	Medium	Low	Minor	Not Significant
	PMF Ocean Quahog	High	Negligible	Negligible	Not Significant
	Annex I Geogenic Reefs	Medium	Low	Minor	Not Significant
	Annex I Biogenic (*S. spinulosa*) Reefs	Medium	Low	Minor	Not Significant
	Annex I Biogenic (*M. modiolus)* Reefs	High	Low	Minor	Not Significant
Impact to habitats or species as a result of pollution or accidental discharge	PMF Burrowed Mud	Medium	Negligible	Negligible	Not Significant
	PMF Offshore Subtidal Sands and Gravels	Medium	Negligible	Negligible	Not Significant
	PMF Kelp Beds	Medium	Negligible	Negligible	Not Significant
	PMF Ocean Quahog	High	Negligible	Negligible	Not Significant
	Annex I Geogenic Reefs	Medium	Negligible	Negligible	Not Significant

Potential Impact	Receptor	Sensitivity	Magnitude	Overall Risk	Significance
	Annex I Biogenic (*S. spinulosa*) Reefs	Medium	Negligible	Negligible	Not Significant
	Annex I Biogenic (*M. modiolus)* Reefs	High	Negligible	Negligible	Not Significant
Increase risk of introduction and spread of MNNS	PMF Burrowed Mud	Low	Negligible	Negligible	Not Significant
	PMF Offshore Subtidal Sands and Gravels	Negligible	Negligible	Negligible	Not Significant
	PMF Kelp Beds	Medium	Negligible	Negligible	Not Significant
	PMF Ocean Quahog	Low	Negligible	Negligible	Not Significant
	Annex I Geogenic Reefs	Low	Negligible	Negligible	Not Significant
	Annex I Biogenic (*S. spinulosa*) Reefs	Medium	Negligible	Negligible	Not Significant
Operation					
Long term loss to benthic habitats and species via placement of hard substrates on the seabed	PMF Burrowed Mud	High	Negligible	Minor	Not Significant
	PMF Offshore Subtidal Sands and Gravels	High	Negligible	Minor	Not Significant
	PMF Kelp Beds	High	Negligible	Minor	Not Significant
	PMF Ocean Quahog	High	Low	Minor	Not Significant
	Annex I Geogenic Reefs	High	Low	Minor	Not Significant
	Annex I Biogenic (*S. spinulosa*) Reefs	High	Low	Minor	Not Significant
Hydrodynamic changes leading to scour	PMF Burrowed Mud	High	Low	Minor	Not Significant
	PMF Offshore Subtidal Sands and Gravels	High	Low	Minor	Not Significant

Potential Impact	Receptor	Sensitivity	Magnitude	Overall Risk	Significance
around subsea infrastructure	PMF Kelp Beds	Medium	Low	Minor	Not Significant
	PMF Ocean Quahog	Medium	Low	Minor	Not Significant
	Annex I Geogenic Reefs	Medium	Low	Minor	Not Significant
	Annex I Biogenic (*S. spinulosa*) Reefs	High	Low	Minor	Not Significant
Colonisation of hard structures	PMF Burrowed Mud	Medium	Low	Minor	Not Significant
	PMF Offshore Subtidal Sands and Gravels	Medium	Low	Minor	Not Significant
	PMF Kelp Beds	Low	Low	Negligible	Not Significant
	PMF Ocean Quahog	High	Low	Minor	Not Significant
	Annex I Geogenic Reefs	Medium	Low	Minor	Not Significant
	Annex I Biogenic (*S. spinulosa*) Reefs	Medium	Low	Minor	Not Significant

7.3 FISH AND SHELLFISH ECOLOGY

7.3.1 INTRODUCTION

This section describes the baseline for Fish and Shellfish Ecology within a defined Fish and Shellfish Ecology Study Area. This has been informed by a desk-based literature review and has been used to inform the Fish and Shellfish Ecology Marine Environmental Assessment in **Section 7.3.4**.

The relevant legislation and policy relating to Fish & Shellfish Ecology include:

- National Marine Plan: Chapter 4 (GEN9, GEN13, GEN21, CABLES1, CABLES2);
- Marine (Scotland) Act 2010;
- Marine and Coastal Access Act 2009;
- The Conservation of Habitats and Species Regulations 2017;
- The Conservation of Offshore Habitats and Species Regulations 2017; and
- Nature Conservation (Scotland) Act 2004.

7.3.2 FISH AND SHELLFISH ECOLOGY STUDY AREA

The Fish and Shellfish Ecology Study Area has been defined as the collective area of International Council for the Exploration of the Sea (ICES) Rectangles 44E7, 44E8, 45E7, 45E8, 46E6, and 46E7 (**Figure 7-25**), encompassing the Primary Impact Zone (PIZ) for direct habitat disturbance effects and the Secondary Impact Zone (SIZ) for indirect sediment plume and smothering effects. The proposed cable corridor passes through at least part of each of these ICES Rectangles, therefore, fish and shellfish habitats and/or species in the Fish and Shellfish Ecology Study Area may be impacted by the proposed works.

7.3.3 BASELINE ENVIRONMENT

7.3.3.1 SPECIES PRESENCE

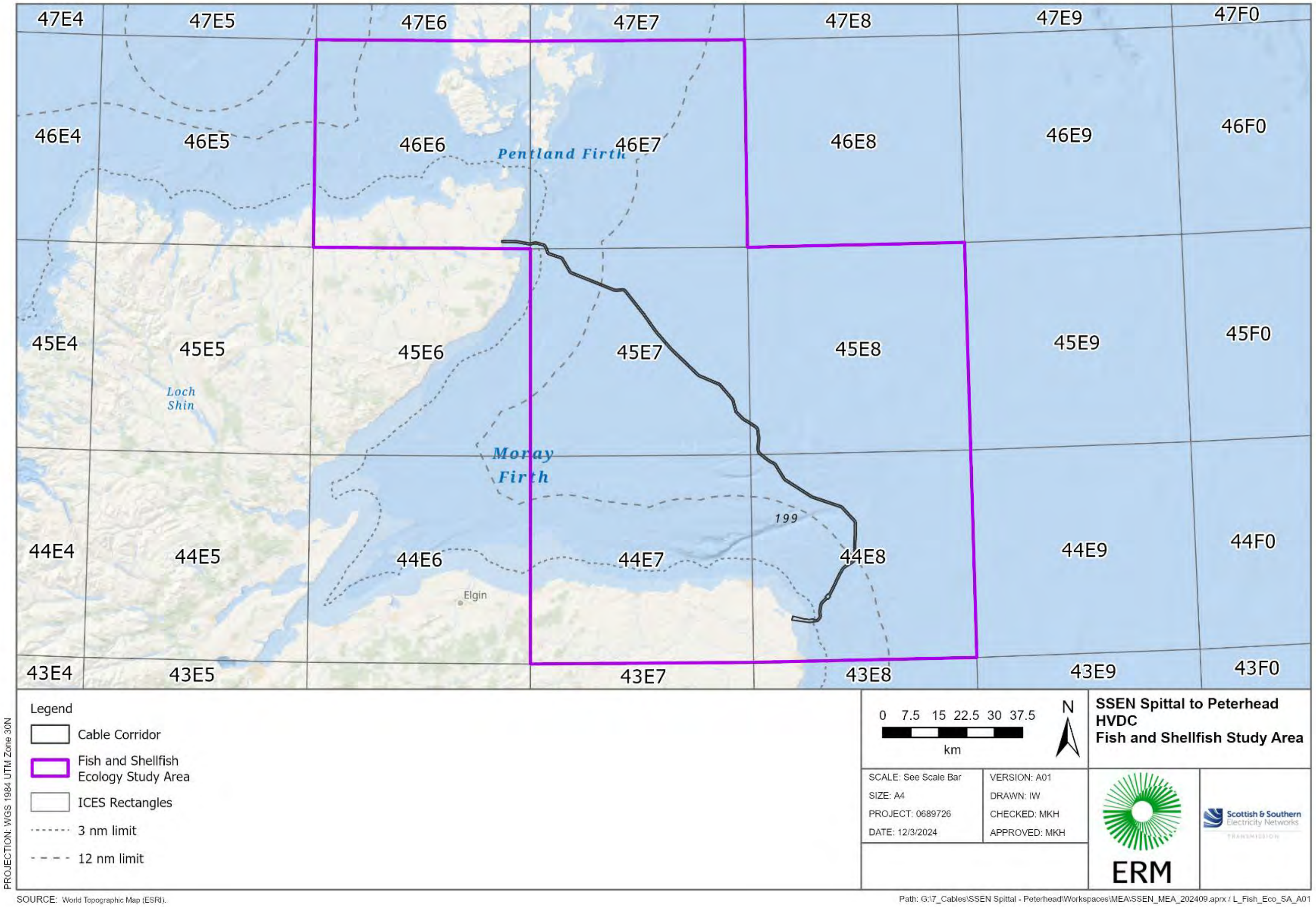
A desk-based review of fish and shellfish species present within the Fish and Shellfish Ecology Study Area has been undertaken, using International Bottom Trawl Survey (IBTS) data, and Marine Management Organisation (MMO) landings data (MMO, 2023) within ICES Rectangles 44E7, 44E8, 45E7, 45E8, 46E6, and 46E7, as the main sources of information. The Fish and Shellfish Ecology Study Area incorporates the entire extent of the proposed works, has been deemed an appropriate scale for consideration within this MEA, and is consistent with methods used to identify species presence within marine Environmental Impact Assessments (EIAs).

Species present within the Fish and Shellfish Ecology Study Area have been classified into the following receptor groups, which have varying degrees of sensitivity to potential impacts associated with cable laying projects:

- Elasmobranchs;
- Demersal Fish;
- Pelagic Fish;
- Diadromous Fish; and
- Shellfish.

Species of conservation importance, particularly Priority Marine Features (PMFs), have been identified where relevant. Sandeel Ammodytidae spp. (hereby referred to as sandeel) and Atlantic herring *Clupea harengus* have been assessed separately, within the overarching demersal fish and pelagic fish groups, due to heightened sensitivity to impacts and effects associated with cable laying activities (Reach *et al*., 2024; Kyle-Henney *et al*., 2024).

FIGURE 7-25: FISH AND SHELLFISH ECOLOGY STUDY AREA



Elasmobranchs

The Moray Firth supports a number of demersal shark, skate and ray species including small spotted catshark *Scyliorhinus canicula*, nursehound *Scyliorhinus stellaris*, starry smoothound *Mustelus asterias*, common smoothound *Mustelus mustelus*, Arctic skate *Amblyraja hyperborea*, cuckoo ray *Leucoraja naevus*, long-nosed skate *Dipturus oxyrinchus*, thornback ray *Raja clavata*, spotted ray *Raja montagui*, starry ray *Amblyraja radiata*, sandy ray *Leucoraja circularis*, blonde ray *Raja brachyura*, white skate *Rostroraja alba*, and common skate complex *Dipturus batis/intermedius* (MMO, 2023). These species are characteristic of the sand-dominated sediments (**Section 7.1: Physical Environment**) that characterise the Fish and Shellfish Study Area.

Larger shark species potentially present include basking shark *Cetorhinus maximus*, thresher shark *Alopias vulpinus*, and tope shark *Galeorhinus galeus*. However, these species are likely to be infrequent visitors to the Moray Firth at certain times of the year and are, primarily, benthopelagic and pelagic and, as such, are likely to have limited interaction with the proposed works.

Demersal Fish

Cable laying projects have the potential to span numerous seabed habitat types and, therefore, may interact with diverse demersal fish communities within the landfall, inshore, and offshore parts of the Fish and Shellfish Study Area. The key demersal fish species of note are those with high conservation status (e.g., PMFs), or commercial value, within the Study Area (MMO, 2023), and include haddock *Melanogrammus aeglefinus*, monkfish and anglerfish *Lophius* spp. (PMF), whiting *Merlangius merlangus* (PMF), Atlantic cod *Gadus morhua* (PMF), Atlantic halibut *Hippoglossus hippoglossus* (PMF), gobies Gobiidae spp. (PMF), ling *Molva molva* (PMF), Norway pout *Trisopterus esmarkii* (PMF), blue whiting *Micromesistius poutassou*, saithe *Pollachius virens* (PMF), and sandeel (PMF).

Some demersal fish species have been identified as having additional reliance on the Fish and Shellfish Study Area as spawning and/or nursery grounds (Coull *et al*., 1998; Ellis *et al*., 2012). These species include Atlantic cod, haddock, whiting, monkfish and anglerfish, European plaice *Pleuronectes platessa*, blue whiting, sandeel, ling, and hake.

Sandeel

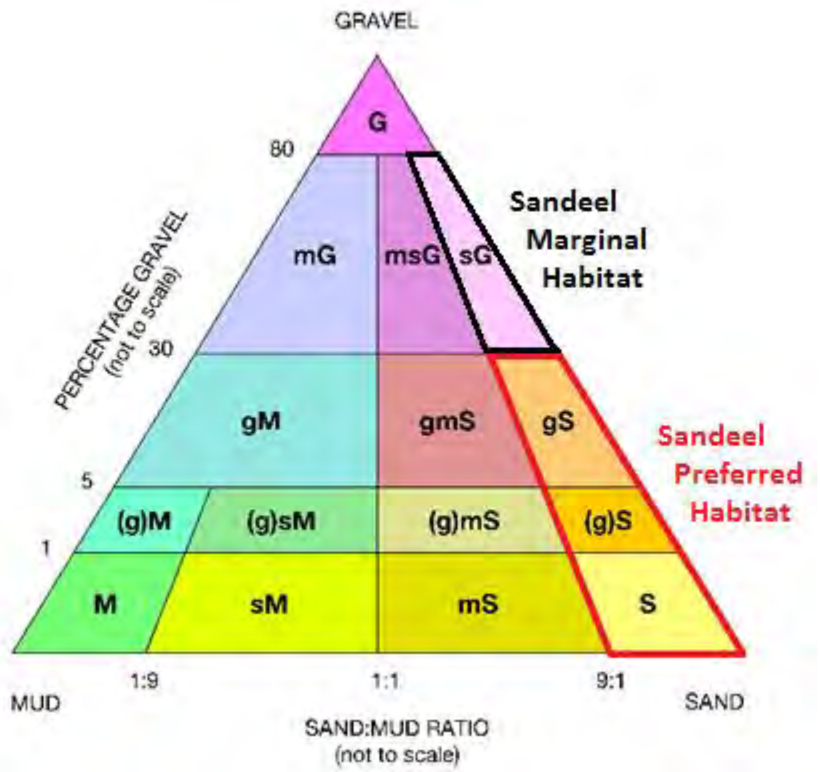
In line with best practice and for the purposes of identifying key potential impacts within this MEA, sandeel are described in more detail in this section than the overarching demersal fish group. This is for the following reasons:

- Sandeel are key prey species for marine mammals, seabirds, and piscivorous fish species;
- Sandeel are dependent on sand-dominated seabed substrates and are, therefore, at an increased risk of seabed disturbance effects associated with cable laying activities; and
- Sandeel are classified as PMFs in Scottish Waters.

Reach *et al*. (2024) describe potential supporting habitat for sandeel as preferred ('Sand', 'slightly gravelly Sand', and 'gravelly Sand') and marginal ('sandy Gravel') habitats, in accordance with the Folk sediment classification (Folk, 1954). The classification of preferred and marginal sediments within the Folk sediment classification is shown in **Figure 7-26.**

Seabed sediments that do not qualify within the preferred and marginal categories in **Figure 7-26** are deemed unsuitable for sandeel, due to poor oxygen permeability in burrows (in the case of high 'Mud' content), or limited burrowing potential (in the case of high 'Gravel' content).

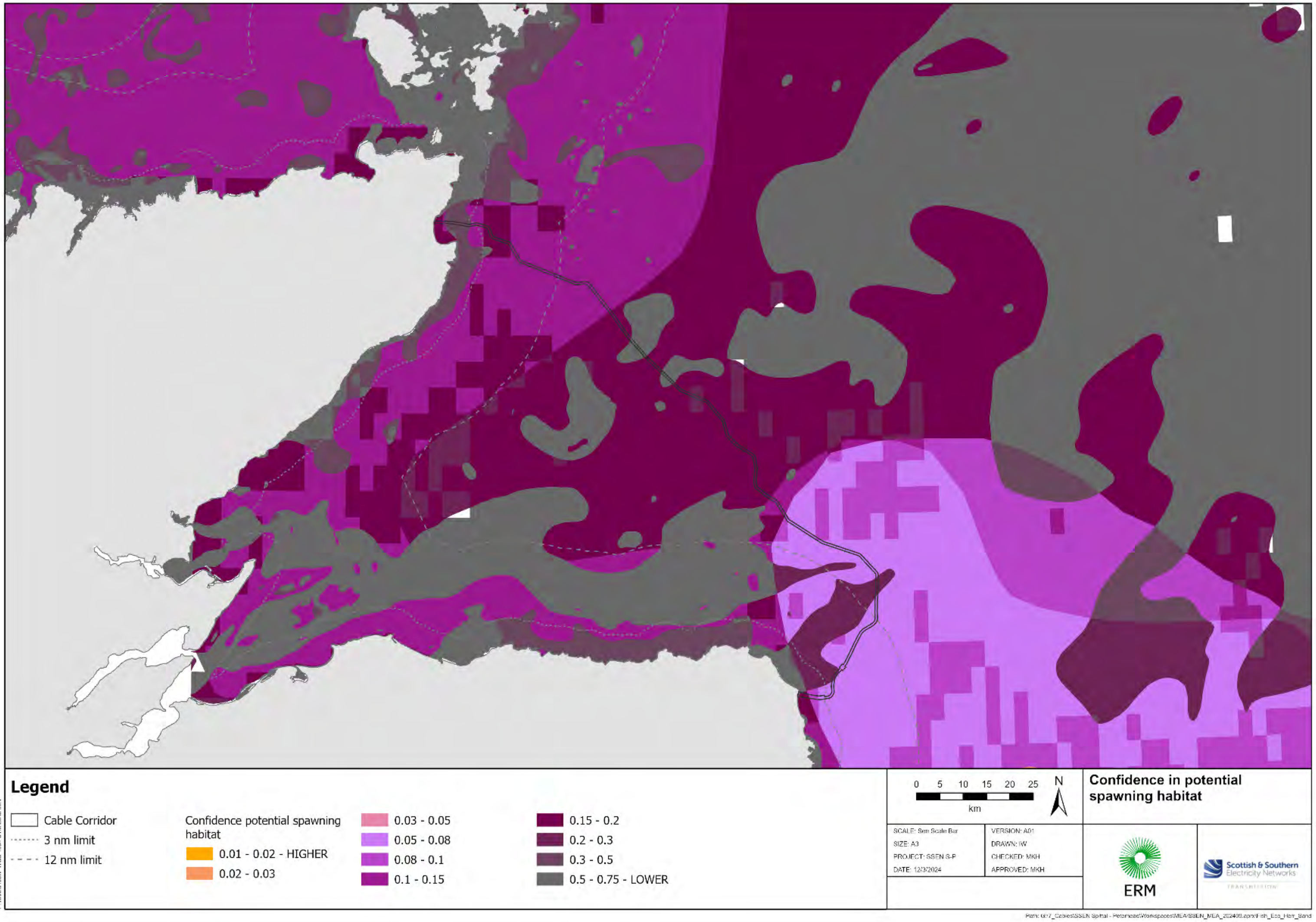
FIGURE 7-26: FOLK TRIANGLE WITH PREFERRED AND MARGINAL SANDEEL HABITAT INDICATED. (FROM: REACH *ET AL*., 2024)



Whilst it is known that other factors may affect the suitability of sediments as potential supporting habitat for sandeel, such as water depth and seabed slope angle (Langton *et al*., 2021), there are limited data available, to date, that identify specific criteria for these factors, with sufficient confidence to be implemented into a site-specific model. The heat-mapping methodology described by Reach *et al*. (2024) does not take such factors into account and, therefore, incorporates a precautionary approach into identifying the extent of potential supporting habitat for sandeel.

Potential supporting habitat modelling for sandeel has, therefore, been undertaken for the Project using the Reach *et al*. (2024) methodology, and identifies that the Fish and Shellfish Ecology Study Area contains preferred and marginal potential supporting habitat for sandeel. This is confirmed by the identification of an extent of the proposed cable corridor as being of medium confidence for buried sandeel (Langton *et al*., 2021). **Figure 7-27** shows the extent of potential supporting habitat for sandeel within the Fish and Shellfish Ecology Study Area and the wider region, indicating that the Project Area represents a limited proportion of available habitat to the Moray Firth sandeel population, and a limited extent of available habitat to populations extending into the Central North Sea.

FIGURE 7-27: SANDEEL SUPPORTING HABITAT POTENTIAL (REACH *ET AL.*, 2024)



Due to the overlap of the Project Area with medium potential supporting habitat for sandeel, the sandeel receptor group will be assessed separately to the overarching Demersal Fish receptor group within the Fish and Shellfish Ecology MEA in **Section 7.3.4**.

Pelagic Fish

Pelagic fish are considered important prey items for marine mammals, seabirds, and large fish species (e.g. sharks), in addition to being commercially fished. Such key pelagic species present within the Fish and Shellfish Ecology Study Area include Atlantic herring (PMF), Atlantic mackerel *Scomber scombrus* (PMF), Atlantic horse mackerel *Trachurus trachurus* (PMF), European anchovy *Engraulis encrasicolus*, and European sprat *Sprattus sprattus* (MMO, 2023).

Some pelagic fish target specific seabed substrates to facilitate spawning activity and egg laying. As such, they are at an increased risk of interaction with cable laying projects during the spawning season. Atlantic herring, Atlantic mackerel, and sprat have been identified as having spawning and/or nursery grounds within the Fish and Shellfish Ecology Study Area (Coull *et al*., 1998; Ellis *et al*., 2012); of which, Atlantic herring is particularly dependent on the seabed substrate for egg laying (Kyle-Henney *et al*., 2024).

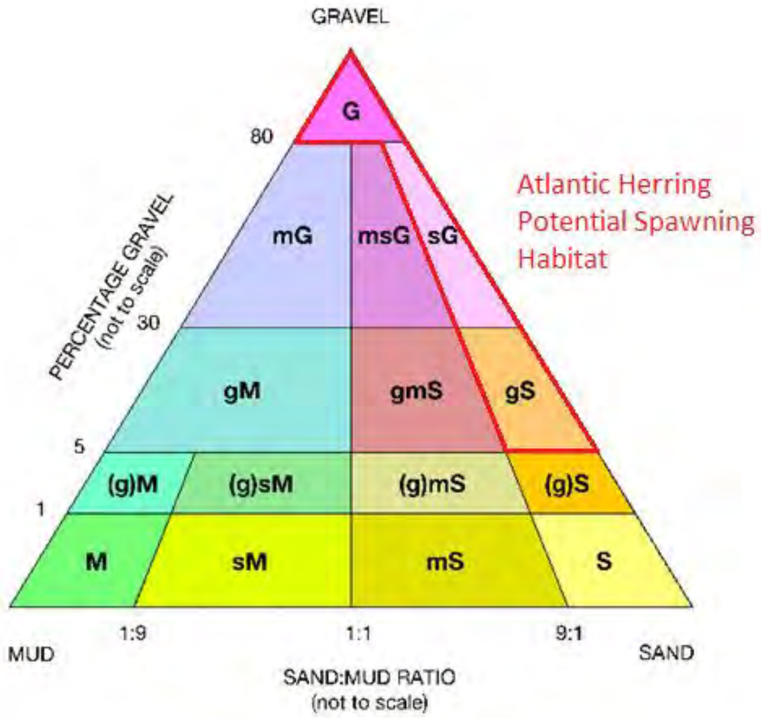
Atlantic Herring

In line with EIA best practice and for the purposes of identifying key potential impacts within this MEA, Atlantic herring are described in more detail in this section than the overarching pelagic fish group. This is for the following reasons:

- North Sea Atlantic herring populations have experienced sustained decline and poor recruitment as a result of overfishing and insufficient management of gravid females;
- Atlantic herring are key prey species for marine mammals, seabirds, and piscivorous fish species;
- Atlantic herring are dependent on gravel-dominated seabed substrates, and are therefore at an increased risk of seabed disturbance effects associated with cable laying activities; and
- Atlantic herring are classified as PMFs in Scottish Waters.

Kyle-Henney *et al*. (2024) describes potential supporting habitat for Atlantic herring as preferred (‘Gravel’ and ‘sandy Gravel’) and marginal (‘gravelly Sand’) habitats, in accordance with the Folk sediment classification (Folk, 1954). The classification of sediments with potential for spawning for Atlantic herring is shown in **Figure 7-28.**

FIGURE 7-28: FOLK SEDIMENT TRIANGLE WITH ATLANTIC HERRING POTENTIAL SPAWNING HABITAT INDICATED. (FROM: KYLE-HENNEY *ET AL*., 2024)



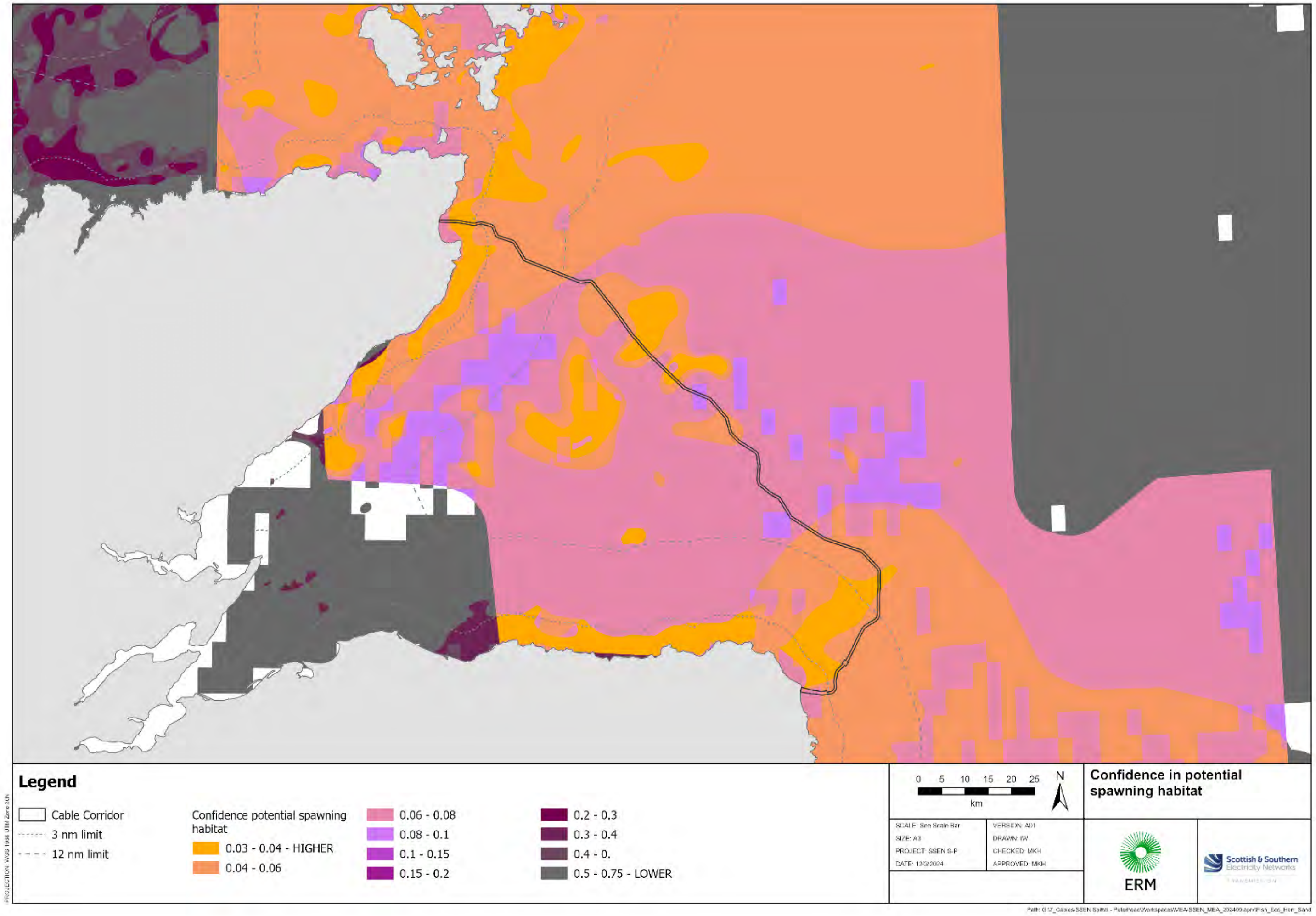
Seabed sediments that do not fall within these categories are deemed unsuitable for Atlantic herring. The Fish and Shellfish Ecology Study Area consists of predominantly sand-dominated seabed substrate; however, isolated areas of 'sandy Gravel' and 'gravelly Sand' occur along the proposed cable corridor.

Similar to the Reach *et al*. (2024) methodology for sandeel, the heat-mapping methodology described by Kyle-Henney *et al*. (2024) does not take seabed features and other environmental factors into account and, therefore, incorporates a precautionary approach into identifying the extent of potential spawning habitat for Atlantic herring.

Figure 7-29 indicates that the proposed cable corridor is located within areas of moderate and higher potential spawning habitats for Atlantic herring, particularly around the approaches to landfall at Sinclair's Bay and Peterhead. These areas are separated by a large area of low potential and, therefore, it is considered that these higher potential areas are key for spawning activity within the wider Moray Firth region.

As a result of the overlap of the Project Area with medium to high potential spawning habitat for Atlantic herring, the Atlantic herring receptor group will be assessed separately to the overarching Pelagic Fish receptor group within the Fish and Shellfish Ecology MEA in **Section 7.3.4**.

FIGURE 7-29: HERRING SPAWNING HABITAT POTENTIAL (KYLE-HENNEY *ET AL.*, 2024)



Diadromous Fish

Diadromous fish are defined as species that migrate between freshwater and marine environments to spawn. Anadromous species spawn in freshwater environments, whilst catadromous species spawn in the marine environment. Particular emphasis is placed upon the conservation of anadromous salmonid species, such as Atlantic salmon *Salmo salar* and sea trout *Salmo trutta*; and catadromous European eel *Anguilla anguilla*, which are likely to undertake spawning migrations within the immediate vicinity of the proposed works (Malcolm *et al.*, 2010; McIlvenny *et al.*, 2021; Cauwelier *et al.*, 2015; Downie *et al.*, 2018; Armstrong *et al.*, 2018).

In addition, sea lamprey *Petromyzon marinus* are a feature of the River Spey SAC, to the southwest of the proposed works and are, therefore, likely to be present within the Fish and Shellfish Ecology Study Area. Other diadromous fish species identified as potentially present within the Fish and Shellfish Ecology Study Area include:

- River lamprey *Lampetra fluviatilis*;
- Allis shad *Alosa alosa*;
- Twaite shad *Alosa fallax*; and
- Three-spined stickleback *Gasterosteus aculeatus*.

Shellfish

Most shellfish species have commercial value within the Fish and Shellfish Ecology Study Area, including brown crab *Cancer pagurus*, velvet crab *Necora puber*, European lobster *Homarus gammarus*, Norway lobster *Nephrops norvegicus*, king and queen scallop *Pecten maximus* and *Aequipecten opercularis*, pencil squid Loliginidae spp., and flying squid Ommastrephidae spp. (MMO, 2023). Further information regarding non-commercially important shellfish species present within the Fish and Shellfish Ecology Study Area is presented in **Section 7.2: Benthic Ecology**; whilst commercially important species are presented in **Section 7.6: Commercial Fisheries**.

European spiny lobster *Palinurus elephas*, , and fan mussel *Atrina fragilis* are shellfish species of conservation importance as Priority Marine Features (PMFs); and are likely to be present within the Fish and Shellfish Ecology Study Area.

Horse mussel *Modiolus modiolus* beds are listed as PMFs and are considered present within the vicinity of the Preferred Subsea Cable Corridor at Sinclair's Bay. No flame shell *Limaria hians* beds are considered present within the vicinity of the proposed works.

PMF Ocean Quahog *Arctica islandica* (a PMF) is described within **Section 7.2.3.3**.

7.3.3.2 DESIGNATED SITES

There are a number of designated sites within the Fish and Shellfish Ecology Study Area that have qualifying fish and shellfish features. As a result of the migration ranges exhibited by diadromous fish, SACs with qualifying diadromous fish features within 100 km of the Project Area have also been included in the baseline, on a highly precautionary basis. These sites are listed in **Table 7-13**.

TABLE 7-13: NATURE CONSERVATION SITES DESIGNATED FOR FISH AND SHELLFISH ECOLOGY FEATURES

Site	Qualifying Feature
Special Areas of Conservation (SACs)	
River Dee	Atlantic salmon, freshwater pearl mussel, and otter *Lutra lutra*.
Moray Firth	No designated fish and/or shellfish species. Marine Scotland Science identifies the Moray Firth SAC as an important migratory pathway for Annex II species (e.g. Atlantic salmon) and, therefore, this site has been included on a precautionary basis.
River Spey	Atlantic salmon, freshwater pearl mussel, otter, and sea lamprey *Petromyzon marinus*.
Marine Protected Areas (MPAs)	
Noss Head	Horse mussel beds, inshore sublittoral sediment.
Southern Trench	Minke whale *Balaenoptera acutorostrata*; burrowed mud (an indicator of Norway lobster *Nephrops norvegicus*; fronts; shelf deeps; and geological features representative of the Quaternary of Scotland and submarine mass movement.

7.3.4 MARINE ENVIRONMENTAL ASSESSMENT

7.3.4.1 OVERVIEW

The proposed works have the potential to result in environmental impacts upon the receptor groups described in **Section 7.3.3**. Whilst a formal EIA is not required as part of this MLA, the MEA has been conducted using similar EIA terms and definitions for transparency and ease of understanding.

Definition of Significance

This MEA will assign a level of significance to each receptor-impact pathway, in line with that provided within a formal EIA. **Table 7-14** defines the various levels of significance used within this assessment.

TABLE 7-14: DEFINITIONS OF SIGNIFICANCE FOR APPLICATION WITHIN THE MARINE ENVIRONMENTAL ASSESSMENT

Significance	Definition
Major Adverse/Beneficial Impact	Major Adverse results in an unacceptable level of impact, at sufficient importance to call for serious consideration of changes to the Project (Significant in formal EIA terms)
Moderate Adverse/Beneficial Impact	Moderate Adverse results in an unacceptable level of impact, at sufficient importance to call for consideration of changes to the Project (Significant in formal EIA terms)
Minor Adverse/Beneficial Impact	Acceptable level of impact, and unlikely to be sufficiently important to warrant mitigation measures (Non-significant in formal EIA terms)
Negligible Impact	Acceptable level of impact, of such low significance that they are not considered relevant for the decision-making process (Non-significant in formal EIA terms)

Scoping of Potential Impacts

The potential impacts outlined in **Table 7-15** below have been identified as relevant to each receptor group described in **Section 7.3.3**, and form the basis for assessment within the MEA.

TABLE 7-15: POTENTIAL IMPACTS ASSOCIATED WITH THE PROPOSED WORKS

Topic	Impact	Project Phases	Scoped In/Out
Fish and Shellfish Ecology	Temporary localised disturbance of seabed habitats	Construction Operation Decommissioning	Scoped In
	Temporary disturbance via suspended sediment concentration	Construction Operation Decommissioning	Scoped In
	Temporary disturbance via underwater noise and vibration	Construction Operation Decommissioning	Scoped In
	Accidental release of pollutants	Construction Operation Decommissioning	Scoped Out This impact pathway is unlikely to result in a significant effect due to the development and implementation of control measures such as the Marine Pollution Contingency Plan and Environmental Monitoring Plan
	Introduction of Marine Non-native Species/Invasive Non-native Species	Construction Operation Decommissioning	Scoped Out This impact pathway is unlikely to result in a significant effect due to the development and implementation of control measures such as IMO Ballast Water Management Guidelines 2019, and the terrestrial-based sources of hard substrate
	Long term localised disturbance of seabed habitats	Operation	Scoped In
	Electromagnetic fields (EMFs) and localised heating	Operation	Scoped In This impact pathway is unlikely to occur due to the proposed bipole system

Topic	Impact	Project Phases	Scoped In/Out
			embedded within the proposed cable design. Electrical current will be transmitted in opposing directions along two separate cables in close proximity, resulting in a cancellation of the magnetic fields surrounding the cables. It is anticipated that EMF will not exceed background levels beyond a few metres from the cables. However, given uncertainty and evidence gaps relating to EMF, this impact has been scoped in on a precautionary basis.
	Fish aggregation effects	Operation	Scoped In
	Ghost fishing	Operation	Scoped Out The likelihood of sufficient quantities of fishing gear being trapped upon cable protection and, therefore, resulting in ghost fishing, is exceedingly low. Therefore, this impact pathway has highly limited potential to result in a significant effect and has been scoped out from further assessment.

Further assessment work for fish and shellfish ecology is required to support the Marine Licence application. The following potential impacts relevant to fish and shellfish ecology are assessed for the construction, operation, and decommissioning phase of the proposed Spittal to Peterhead Cable:

- Temporary localised disturbance of seabed habitats;
- Temporary disturbance via suspended sediment concentration and smothering;
- Temporary disturbance via underwater noise and vibration;
- Long term localised disturbance to seabed habitats;
- Electromagnetic fields (EMFs) and localised heating; and
- Fish aggregation effects.

These potential impacts have been assessed based on the realistic worst-case parameters outlined within the Project design. For fish and shellfish ecology these realistic worst-case parameters are outlined within **Table 7-16**.

TABLE 7-16: REALISTIC WORST-CASE PARAMETERS FOR FISH AND SHELLFISH ECOLOGY

Potential Impact	Realistic Worst-case Parameters	Phase
Temporary localised disturbance of seabed habitats	Length of seabed sediment disturbance by burial =Total (max.) approximate cable length (172,000 m) – length of cable requiring protection (rock berm/crossings) = 25,090 m) = 146,910 m Width of seabed disturbance from installation tool = 10 m *Area of seabed disturbance by burial* *= 146,910 m x 10 m = 1,469,100 m² (1.4691 km²)* Length of seabed disturbance by rock berm/crossings = 25,090 m Width (max.) of rock berm/crossings = 11 4 m *Area of seabed disturbance as a result of rock berm/crossings* *= 25,090 m x 11.4 m = 286,026 m²* **Total potential area of seabed disturbance:** = 1,469,100 m + 286,026 m = **1,755,126 m² (1.76 km²**)	Construction, Operation, Decommissioning
Temporary disturbance via suspended sediment concentration and smothering	Cable laying activities are undertaken during the spawning period for Atlantic herring (August and September)	Construction, Operation, Decommissioning
Temporary disturbance via underwater noise and vibration	N/A – vessel noise is lower than the sensitivity threshold for fish beyond a few metres of the vessel (Popper *et al.*,2014)	Construction, Operation, Decommissioning
Long term localised disturbance to seabed habitats	• HDD exits: 6400 m^2 • Remedial rock placement: 25,090 m x 11.4 m = 286,026 m^2; • Crossings: 5 x 150 m x 11.4 m = 8,550 m^2; • Mattresses at reef: 3 m x 2,466 m = 7,398 m^2.	Operation

	Total potential footprint of long term localised disturbance to seabed habitats: = 308,374 m² (3 km²)	
Fish aggregation effects	Dimension of structures above the seabed are estimated as follows: • Total potential footprint of HDD exits, rock berm, crossings and mattress = **308,374 m² (3 km²)** • Maximum height of rock berm above the seabed: 1.125 m • Maximum width of rock berm and crossings: 11.4 m	Operation

7.3.5 CONSTRUCTION PHASE

7.3.5.1 TEMPORARY LOCALISED DISTURBANCE OF SEABED HABITATS

Sensitivity of Receptors

The proposed works involve the laying and burial of cable within the seabed substrate, thereby resulting in localised disturbance to habitat available to fish and shellfish species within the PIZ. Temporary direct disturbance will occur within the footprint of the cable laying equipment in areas of seabed that are not bolstered by cable stabilisation/protection/crossings, where existing habitat is able to recover over time. Temporary indirect disturbance will occur within the footprint of the SIZ surrounding the installed cable, where suspended sediments may settle on existing habitats, resulting in a temporary shift in dominant substrate type that is expected to return to baseline conditions within the short term.

Elasmobranch species are tolerant of, and adaptable to, temporary localised disturbance of seabed habitats, as they have high mobility and a varied diet. Within their home range, elasmobranchs will encounter a range of different benthic habitats and, as such, the likelihood of secondary impacts, such as a reduction of prey availability, occurring on individuals is reduced. Therefore, elasmobranch species are considered to have a **Low** sensitivity to temporary localised disturbance of seabed habitats.

Most pelagic and diadromous fish species are not considered sensitive to temporary disturbance of seabed habitat as a result of their ability to relocate or avoid disturbance events, and lack of association with the seabed. Atlantic herring have a greater sensitivity due to their demersal spawning strategy (Kyle-Henney *et al*., 2024) and will be assessed separately below. Sensitivity of pelagic and diadromous fish to temporary localised disturbance of seabed habitats is considered **Low**.

Demersal fish species are considered to have a generally lower tolerance of disturbance than pelagic and diadromous fish species due to their greater dependence on seabed habitats. Sandeel have a greater sensitivity due to their burying nature dependent on specific sediment type (Reach *et al*., 2024) and will be assessed separately below. Adaptability is considered moderate due to the availability of suitable seabed habitats in the region, and recoverability is high due to the ability for most species to quickly return to the disturbed area. Sensitivity of demersal fish to temporary localised disturbance of seabed habitats is considered **Low**.

Shellfish are reliant upon the seabed when settling following their pelagic larval stage. Some crustacean species are less mobile during breeding seasons such as female brown crab (Neal and Wilson, 2008; Last *et al*., 2011); furthermore, there are many shellfish species which are sessile. As such, the habitats used by these species can be disturbed or damaged by construction. However, most of the shellfish receptors are considered to be more tolerant of temporary localised disturbance of seabed habitats due to high rates of fecundity and fast growth rates and, as such, the adaptability and recoverability of these species is considered to be high. Sensitivity of shellfish species to temporary localised disturbance of seabed habitats is considered **Low**.

Atlantic Herring

Atlantic herring is an exception due to their demersal spawning strategy, where eggs and hatching larvae remain associated with the seabed and are, therefore, at risk of impact from temporary disturbance of seabed habitat (Kyle-Henney *et al*., 2024). The proposed cable-laying activities are expected to occur within an area of medium-high potential spawning grounds at the approaches to the landfall sites. Atlantic herring is considered to have a moderate adaptability to temporary disturbance due to the availability of moderate-high potential spawning habitat within the region outside of the SIZ. Recoverability is considered moderate, as cable laying activities may occur within one spawning season and, therefore, recovery of seabed habitat to pre-construction conditions will enable spawning to continue in future seasons. Sensitivity of Atlantic herring to temporary localised disturbance of seabed habitats is considered **Medium**.

Sandeel

Sandeel are considered of high ecological value as they act as an ‘umbrella species’ by linking primary production to higher trophic levels (e.g. larger fish, seabirds, and marine mammals) (Reach *et al*., 2024). Sandeel inhabit burrows within the seabed and are, therefore, considered at greater risk of impact through temporary disturbance of seabed habitat than other demersal fish species. For the purposes of this assessment, it is assumed that sandeel may be present within burrows year-round. Sandeel prefer a wide range of sand-dominated sediment types present within the region, and are, therefore, expected to have a moderate recoverability.

The footprint of the cable corridor will overlap with low-medium potential spawning habitat for sandeel, which is widespread within the Study Area. Sensitivity to temporary localised disturbance of seabed habitats during construction activities is, therefore, considered **Low**.

Priority Marine Features

The PMFs, excluding Atlantic herring and sandeel which have been assessed above, potentially impacted by temporary localised disturbance of seabed habitats include European spiny lobster, fan mussel, and horse mussel.

European lobsters create burrows where berried females take shelter, which may be disrupted or damaged by construction activities, potentially reducing the fecundity of a few individuals during a single breeding event. While individual lobsters may be more sensitive to seabed disturbances in their immediate surroundings, the extensive habitat available to the UK population suggests that the population-level sensitivity is Low. Fan mussel and horse mussel have a low tolerance, adaptability, and recoverability, by virtue of their restricted ranges in eastern Scottish waters and, therefore, are considered to have a High sensitivity.

Consequently, PMFs are considered to have **High** sensitivity to temporary localised disturbance of seabed habitats.

Magnitude of Effect

The magnitude of temporary localised disturbance of seabed habitats is determined using the maximum extent of seabed footprint associated with the burial of the cable that directly interacts on and/or within the seabed. Additional cable protection and crossings laid on the seabed are considered long term localised disturbance. As such, the total footprint extent of temporary localised disturbance of seabed habitats is 1,755,126 m² (1.76 km²):

Compared to the extent of similar habitat available within the region, 1.76 km² is considered highly localised, and the duration of cable installation and protection will be minimised as much as possible (see **Section 6.4.1, Table 6-5** for full list of embedded mitigation measures).. Disturbed fish and shellfish populations are expected to recover quickly (<1 year), whereas biogenic habitats (e.g. horse mussel beds) are expected to recover in short-medium timescales (1-5 years) if disturbed. No horse mussel beds were identified in the benthic survey (BSL, 2024cd). As such, the magnitude of effect is considered **Low**.

Assessment Conclusion

As result of the low sensitivity of pelagic fish, demersal fish (including sandeel), diadromous fish, and shellfish, combined with the low magnitude of impact, temporary localised disturbance of seabed habitats has been assessed as having a **Negligible** effect. As such, the impact of temporary localised disturbance of seabed habitats on pelagic fish, demersal fish (including sandeel), diadromous fish, and shellfish is considered **Not Significant**.

As a result of the medium sensitivity of Atlantic herring, combined with the low magnitude of impact, temporary localised disturbance of seabed habitats has been assessed as having a **Minor Adverse** effect. As such, the impact of temporary localised disturbance of seabed habitats on Atlantic herring is considered **Not Significant**.

As a result of the high sensitivity of PMFs, combined with the low magnitude of impact, temporary localised disturbance of seabed habitats has been assessed as having a **Minor Adverse** effect. As such, the impact of temporary localised disturbance of seabed habitats on PMFs is considered **Not Significant**.

7.3.5.2 TEMPORARY DISTURBANCE VIA SUSPENDED SEDIMENT CONCENTRATION AND SMOTHERING

Sensitivity of Receptors

Disturbance to seabed habitats associated with the proposed works has the potential to mobilise sediments into the water column and, therefore, increase suspended sediment concentrations. This can have a detrimental impact on all fish and shellfish receptors as it has the potential to reduce visibility which can impair hunting behaviours, but also cause smothering.

Elasmobranch species are highly mobile and utilise electromagnetic sensory organs, such as Ampullae of Lorenzini, supplemented by visual cues, as the primary sense when hunting. As a result of their mobility, and the spatial extent of hunting grounds, elasmobranch species are considered tolerant to temporary disturbance via increased suspended sediment concentration and smothering, which they are able to avoid if necessary. As such, adult elasmobranch species have a **Low** sensitivity to temporary disturbance via increased suspended sediment concentration and smothering.

Most pelagic, demersal and diadromous fish species are highly mobile and are expected to avoid sediment plumes associated with cable burial activities and, as such, have a high adaptability and recovery. The adult stages of species identified in **Section 7.3.3** generally have a high tolerance of increased suspended sediment concentrations due to their mobility and/or presence in fine substrate-dominant environments. Therefore, adult life stages of pelagic, demersal and diadromous fish are considered to a have a **Low** sensitivity to temporary disturbance via increased suspended sediment concentration and smothering.

Eggs and larvae of some fish and shellfish species may be at a greater risk due to smothering and inhibition of gas exchange processes. As a result, these receptors have a **Medium** sensitivity to temporary disturbance via increased suspended sediment concentration and smothering.

Shellfish species, including PMFs, may be subject to smothering or accumulation of sediment in feeding and/or respiratory appendages. Some species, such as berried female brown crab, are sensitive to effects associated with increased suspended sediment concentration and smothering during the breeding season (Neal and Wilson, 2008; Last *et al*., 2011). Some sessile species, such as blue mussel, have the ability to clear respiratory appendages to mitigate against the effects of increased suspended sediment concentration and/or smothering. These species have a degree of tolerance of smothering and a low adaptability (Last *et al*., 2011). Therefore, shellfish species have a **Medium** sensitivity to temporary disturbance via increased suspended sediment concentration and smothering.

Atlantic Herring

Smothering is likely to result in full mortality of Atlantic herring eggs and larvae within the footprint of the effect, due to inhibition of gas exchange processes. Atlantic herring do not necessarily spawn in the same location in subsequent spawning years, and the spatial extent of egg mats on the seabed is acutely overrepresented by the spatial extent of potential spawning grounds (Kyle-Henney *et al*., 2024). As a result, Atlantic herring are considered to have a degree of adaptability and recoverability through selection of alternative spawning locations during spawning events, and potential to return to suitable sediments to spawn in subsequent spawning periods. Subsequently, Atlantic herring are considered have a **Medium** sensitivity to temporary disturbance via increased suspended sediment concentration and smothering.

Sandeel

There is no expected impact pathway for smothering on sandeel species, as these species regularly bury themselves in sand-dominated sediments. This is in alignment with evidence presented in Reach *et al*. (2024).

Magnitude of Effect

Temporary disturbance via increased suspended sediment concentration and smothering as a result of the installation and burial of a cable will be highly localised in the context of the Fish and Shellfish Ecology Study Area, and will be a short term process, wherethe duration of cable installation and protection will be minimised as much as possible (see **Section 6.4.1, Table**

6-5 for full list of embedded mitigation measures). As such, the magnitude of temporary disturbance via increased suspended sediment concentration and smothering is considered **Low**.

Assessment Conclusion

As result of the low sensitivity of pelagic fish, demersal fish, and diadromous fish, combined with the low magnitude of impact, temporary disturbance via suspended sediment concentration has been assessed as having a **Negligible** effect. As such, the impact of temporary disturbance via suspended sediment concentration on pelagic fish, demersal fish, and diadromous fish is considered **Not Significant**.

As a result of the to the medium sensitivity of pelagic fish eggs and larvae, Atlantic herring, shellfish, and PMFs, combined with the low magnitude of impact, temporary disturbance via suspended sediment concentration has been assessed as having a **Minor Adverse** effect. As such, the impact of temporary disturbance via suspended sediment concentration on pelagic fish eggs and larvae, Atlantic herring, shellfish, and PMFs is considered **Not Significant**.

7.3.5.3 TEMPORARY DISTURBANCE VIA UNDERWATER NOISE AND VIBRATION

Sensitivity of Receptors

Underwater noise produced by construction activities has the potential to disturb fish and shellfish species, however the extent of noise will be attributable to vessels and cable burial equipment only. Vessel noise is related to vessel size, speed, load, condition, age and engine, and can range from <150 dB re. 1 μPa, to >190 dB re. 1 μPa (Hawkins *et al*., 2014).

Vessel noise is received by receptors as a low-level chronic exposure, which can result in sound masking within the sea soundscape (Popper and Hastings, 2009; Popper and Hawkins, 2016). Sound allows some fish and shellfish species to communicate, navigate, and to detect predators and prey. Therefore, vessel noise may also result in short term behavioural changes to sensitive species (Popper *et al*., 2003; Popper and Hawkins, 2019). Whilst underwater noise effects on shellfish are relatively understudied, shellfish are considered more tolerant of potential impacts associated with underwater noise than fish with a swim bladder-inner ear connection used in hearing. All fish and shellfish receptors are considered tolerant, adaptable, and capable of recovery from underwater noise and vibrations produced by vessels (Popper *et al*., 2014) and, therefore, sensitivity for all receptors is considered **Low**.

Magnitude of Effect

Underwater noise levels associated with the construction phase are expected to be consistent with other vessel-related noise within the Moray Firth and, therefore, represent a short term and localised increase in existing background levels. Considering the high baseline level of underwater noise associated with vessel activity in the Moray Firth, it is likely that fish and shellfish receptors will have the capacity to be desensitised to noise from vessels (McCormick *et al*., 2019). Furthermore, mobile species would be able to flee the immediate area surrounding vessels but return within a short time period.

Vessel-related noise is not considered to result in a magnitude of underwater noise that exceeds thresholds for recoverable injury for sensitive fish species, beyond a few metres from the source (Popper *et al*., 2014). Therefore, temporary disturbance via underwater noise and vibration are considered to be short term, localised, and reversible; and, therefore, of **Negligible** impact upon all receptors.

Assessment Conclusion

As a result of the low sensitivity of all fish and shellfish receptors, combined with the negligible magnitude of impact, temporary disturbance via underwater noise and vibration has been assessed as having a **Negligible** effect. As such, the impact of temporary disturbance via underwater noise and vibration on all fish and shellfish receptors is considered **Not Significant**.

7.3.6 OPERATION PHASE

7.3.6.1 TEMPORARY LOCALISED DISTURBANCE OF SEABED HABITATS

Sensitivity of Receptors

Similar to the construction phase, temporary seabed habitat loss during the operational phase via any necessary routine surveys may reduce resource and spawning/nursery ground availability within the subsea cable corridor, which could have a detrimental impact on fish and shellfish species.

Elasmobranchs, pelagic, demersal, and diadromous fish are considered to have a **Low** sensitivity, with the exception of Atlantic herring that have a **Medium** sensitivity, and PMFs that have a **High** sensitivity to temporary localised disturbance of seabed habitats.

Magnitude of Effect

The magnitude of temporary localised disturbance of seabed habitats is expected to be less than that of the construction phase, being limited to any routine surveys. Any impacts from remedial works during operation phase is to be assessed separately to this MEA. Emergency inspection and repair to cables are exempt from marine licensing, however approval must be sought from the Scottish Ministers (see Article 32 of the Marine Licensing (Exempted Activities)(Scottish Inshore Region) Order 2011 and Article 23 of the Marine Licensing (Exempted Activities) (Scottish Offshore Region) Order 2011).

Assessment Conclusion

As the sensitivity of receptors is not expected to vary between the construction phase and operation phase, but the magnitude of potential effect is reduced, temporary localised disturbance of seabed habitats is considered to have a **Minor Adverse** effect, which is **Not Significant**.

7.3.6.2 LONG TERM LOCALISED DISTURBANCE OF SEABED HABITATS

The addition of cable protection has the potential to result in long term alteration of sediment type, from which the pre-construction sediment type is unlikely to recover. The total seabed footprint (assuming no overlap) of this infrastructure equates to 293,226 m² (0.29 km²).

Sensitivity of Receptors

Most demersal and pelagic fish species within the Fish and Shellfish Ecology Study Area have high mobility and, as such, can avoid areas where disturbance has occurred. Furthermore, these species could return in the future once the disturbance has stopped. As such, demersal and pelagic fish species can be considered to have high adaptability and recoverability. Fish species which employ a demersal spawning strategy, such as sandeel and Atlantic herring, are not tolerant to habitat loss during the breeding season at a localised scale; however, at a population scale, there is a degree of flexibility. This is due to the plethora of spawning grounds within the North Sea. As a result, demersal and pelagic fish can be considered to have a **Low** sensitivity to long term localised disturbance of seabed habitats.

Diadromous fish species are typically pelagic predators and/or parasitic, and are not usually associated with the seabed during the marine portion of their lifecycle (Hansen and Quinn, 1998; Quintella *et al*., 2021; Gillson *et al*., 2022). As such, diadromous fish species are considered to have a **Low** sensitivity to long term localised disturbance of seabed habitats.

Shellfish are reliant upon the seabed following their pelagic larval stage. Some crustacean species are less mobile during breeding seasons such as female brown crab (Neal and Wilson, 2008; Last *et al*., 2011). Most of the shellfish receptors are considered to be tolerant of long term localised disturbance of seabed habitats due to high rates of fecundity, fast growth rates, and availability of suitable substrate outside of affected areas. As such the adaptability and recoverability of these species is considered to be high. Sensitivity of shellfish species to temporary localised disturbance of seabed habitats is considered **Low**.

Atlantic Herring

Atlantic herring employ a demersal spawning strategy, where eggs and hatching larvae remain associated with the seabed and are, therefore, at risk of impact from long term localised disturbance of seabed habitats (Kyle-Henney *et al*., 2024). The proposed cable-laying activities are expected to occur within an area of moderate-higher potential spawning grounds at the approaches of the landfall sites. Atlantic herring is considered to have a moderate adaptability to long term disturbance, due to the availability of suitable spawning habitat within the region and outside of the SIZ. Recoverability is considered moderate, as the footprint of the cable will only cover a limited portion of the potential spawning habitat available to Atlantic herring (**Figure 7-29**). As such, the sensitivity of Atlantic herring to long term localised disturbance of seabed habitats is considered **Medium**.

Sandeel

Sandeel are considered of high ecological value as they act as an 'umbrella species' by linking primary production to higher trophic levels (e.g. larger fish, seabirds, and marine mammals) (Reach *et al*., 2024). Sandeel inhabit burrows within the seabed and are, therefore, considered at greater risk of impact through long term localised disturbance of seabed habitats than other demersal fish species. Sandeel prefer a wide range of sand-dominated sediment types present throughout the region (refer to **Section 7.3.3**), and are therefore expected to have a Moderate recoverability. The footprint of the cable corridor will overlap with lower-medium potential supporting habitat for sandeel, which is extensive within the Study Area. Sensitivity to long term localised disturbance of seabed habitats during the operation phase is therefore considered **Low**.

Priority Marine Features

The PMFs, excluding Atlantic herring and sandeel which have been assessed above, potentially impacted by long term localised disturbance of seabed habitats include European spiny lobster, fan mussel, and horse mussel.

European lobsters create burrows where berried females take shelter, which may be disrupted or damaged by construction activities, potentially reducing the fecundity of a few individuals during a single breeding event. While individual lobsters may be more sensitive to seabed disturbances in their immediate surroundings, the extensive habitat available to the Scottish population suggests that the population-level sensitivity is **Low**. Fan mussel and horse mussel have a low tolerance, adaptability, and recoverability by virtue of their restricted ranges in eastern Scottish waters and, therefore, are considered to have a **High** sensitivity. Consequently, PMFs are considered to have **High** sensitivity to long term localised disturbance of seabed habitats.

Magnitude of Effect

The anticipated magnitude of long term localised disturbance of seabed habitats is based on the seabed footprint loss associated with the installed cable protection of 308,374 m^2 (3 km^2)**.**The use of external cable protection will be minimised, and only be deployed where adequate protection of the cables cannot be achieved through burial (see **Section 6.4.1 Table 6-5** for full list of embedded mitigation measures).

This footprint is limited in the context of the available habitat within the Fish and Shellfish Ecology Study Area, therefore the magnitude of long term localised disturbance of seabed habitats is considered **Low.**

Assessment Conclusion

As a result of the low sensitivity of pelagic fish, demersal fish, sandeel, diadromous fish, and shellfish, combined with the low magnitude of impact, long term localised disturbance of seabed habitats has been assessed as having a **Negligible** effect. As such, the impact of long term localised disturbance of seabed habitats on pelagic fish, demersal fish, sandeel, diadromous fish, and shellfish is considered **Not Significant**.

As a result of the medium sensitivity of Atlantic herring, combined with the low magnitude of impact, long term localised disturbance of seabed habitats has been assessed as having a **Minor Adverse** effect. As such, the impact of long term localised disturbance of seabed habitats on Atlantic herring is considered **Not Significant**.

As a result of the high sensitivity of PMFs, combined with the low magnitude of impact, long term localised disturbance of seabed habitats has been assessed as having a **Minor Adverse** effect. As such, the impact of long term localised disturbance of seabed habitats on PMFs is considered **Not Significant**.

7.3.6.3 TEMPORARY DISTURBANCE VIA SUSPENDED SEDIMENT CONCENTRATION AND SMOTHERING

Direct interaction with the seabed during routine surveys has the potential to release sediments into the water column, which may resettle across a wider area.

Sensitivity of Receptors

For all fish and shellfish receptors, an increase in suspended sediment concentration can result in impaired visibility as well as the smothering of respiratory organs.

The sensitivity of receptors is proportionate to the body size of each receptor, their dependence on visual hunting strategies, and the potential for spawning within the Fish and Shellfish Ecology Study Area (Cloern, 1987; Henley *et al*., 2000).

As described above, the sensitivity of pelagic and diadromous fish to smothering is considered **Low**, with the exception of pelagic fish eggs and larvae, Atlantic herring, and shellfish which have a **Medium** sensitivity.

Magnitude of Effect

The magnitude of temporary disturbance via suspended sediment concentration and smothering is expected to be less than that of the construction phase, being limited to any routine surveys that cannot be foreseen at this stage.

Assessment Conclusion

As the sensitivity of receptors is not expected to vary between the construction phase and operation phase, but the magnitude of potential effect is reduced, temporary disturbance via suspended sediment concentration is considered to have a **Minor Adverse** effect, which is **Not Significant**.

7.3.6.4 TEMPORARY DISTURBANCE VIA UNDERWATER NOISE AND VIBRATION

Sensitivity of Receptors

Migrating anadromous and diadromous fish may be displaced, and fish and shellfish may experience physiological damage by the introduction of noise and/or vibration during routine surveys, and increased vessel traffic.

As described above, all receptors are considered tolerant of underwater noise associated with vessel traffic, and sensitivity is considered **Low**.

Magnitude of Effect

The magnitude of temporary disturbance via underwater noise and vibration is expected to be less than that of the construction phase, and limited to vessels conducting infrequent operation phase investigations surveys. Magnitude of effect is therefore considered **Negligible**.

Assessment Conclusion

As the sensitivity of receptors is not expected to vary between the construction phase and operation phase, but the magnitude of potential effect is reduced, temporary disturbance via underwater noise and vibration is considered to have a **Negligible** effect, which is **Not Significant**.

7.3.6.5 ELECTROMAGNETIC FIELDS (EMFS) AND LOCALISED HEATING

Transmission of electricity through a conductive material (such as a subsea cable) will produce an electric field and a magnetic field around the cable, collectively termed an Electromagnetic field (EMF). Whist subsea cables are insulated to prevent electric fields entering the marine environment, movement of conductive material (e.g. an organism or salt water) within the magnetic field will induce electric fields (called iE-fields). iE-fields are utilised by some species to detect prey, and may therefore alter the behaviour of sensitive species within the vicinity of the subsea cable.

Sensitivity of Receptors

Elasmobranchs are considered the most sensitive receptor group due to the presence of Ampullae of Lorenzini, a physiological adaptation to detect iE-fields from prey. Several studies have identified behavioural changes of elasmobranchs in response to EMF, however the magnitude of such effects is not well understood (Sims and Quale, 1998; Kempster and Collin, 2011). Behavioural changes are therefore expected within the vicinity of the subsea cable, however the area of effect is negligible compared to the natural range of elasmobranch species in UK waters. As such, elasmobranchs are considered to have a **Low** sensitivity to EMF.

Demersal and pelagic fish generally have a limited ability to detect EMFs, and significant effects of EMFs are not generally observed (Cresci *et al*., 2022a; Kilfoyle *et al*., 2018; Woodruff *et al*., 2012). However, some species do utilise biogenic magnetite to assist orientation (Formicki *et al*., 2019) and may be influenced by EMF. As such, demersal and pelagic fish are considered to have a **Negligible** sensitivity to EMF.

Diadromous fish have been shown to respond to EMF of 13,000 – 70,000 µT (Formicki and Winnicki, 1998; Formicki, 1992), however the magnitude of EMF used within these studies are substantially higher than would be expected from a subsea cable (35 µT at the surface of a ~320 kV cable at a burial depth of 1 m; Moray Offshore Renewables Ltd, 2012). A review of literature conducted by ERM (2023) identified no observed significant effects from EMF associated with offshore wind transmission cables, including a lack of barrier effects to migration. Therefore, diadromous fish are considered to have a **Negligible** sensitivity to EMF.

Similarly to diadromous fish, shellfish species have been shown to respond to EMF at greater field strengths than would be expected in the vicinity of a transmission cable (Chapman *et al*., 2023; Scott *et al*., 2021; Taormina *et al*., 2020; Scott *et al*., 2018). Therefore, shellfish (including PMFs) are considered to have a **Negligible** sensitivity to EMF.

Magnitude of Effect

Cables are expected to be buried at 1.8 m within the seabed, limiting the extent of EMF within the water column and seabed surface layers. Where sufficient DoL cannot be achieved, cable protection material will be used to cover and ensure the safety of the cable, in addition to providing a similar degree of separation of receptors and the cable. In these locations, it is possible that magnitudes of EMF can increase to ~600 µT at the surface of the cable, however it is expected that EMF will propagate to less than 1.5 µT within approximately 5 m of the seabed (Moray Offshore Renewables Ltd, 2012). No cable will be exposed within the water column.

As a result of the increased voltage of the HVDC cable associated with the proposed Project (525kV), the magnitude of effect would be considered slightly greater than that of the ~320kV cable modelled by Moray Offshore Renewables Ltd (2012). However, the spatial extent of potential impact is expected to remain low. In addition, the HVDC cable uses a bipole manufacturing technique, which cancels out EMF produced by opposing cables within the bundle. In a precautionary manner, the magnitude of effect is considered **Low**.

Assessment Conclusion

As a result of the low or negligible sensitivity of all fish and shellfish receptors, combined with the low magnitude of impact, EMF and localised heating has been assessed as having a

Negligible effect. As such, the impact of EMF on all fish and shellfish receptors is considered **Not Significant**.

7.3.6.6 FISH AGGREGATION EFFECTS

Infrastructure on the seabed (i.e. cable protection) may result in artificial reef effects, and as such, may act as an enhanced habitat that may attract fish and shellfish species over time (Broadhurst *et al*., 2014).

Sensitivity of Receptors

Pelagic, demersal and diadromous fish are generally highly mobile and agile, and are likely to aggregate in high productivity areas or areas of a high habitat quality. Additionally, diadromous fish are highly likely to transit through the cable corridor area and are not likely to aggregate around it. Therefore, the sensitivity of pelagic, demersal and diadromous fish to fish aggregation effects caused the placement of the cable and its associated protection is **Low**.

Some shellfish species and PMFs have limited mobility and are restricted to the area where they initially settle. However, the introduction of structures into the marine environment provides a new habitat for encrusting species, such as blue mussels, to establish themselves (Wilhelmsson *et al*., 2006). For mobile crustaceans, the addition of complex structure within the cable protection provides additional shelter that is expected to benefit some species (e.g. European lobster). Since most shellfish species are suspension feeders or detritivores, they stand to benefit from the nutrient accumulation resulting from fish aggregation. Although the presence of tertiary consumers around these hard substrates may lead to localised reductions in population density due to predation, it is unlikely to have population-level impacts within the Fish and Shellfish Ecology Study Area. Therefore, shellfish are considered to have a **Low** sensitivity to fish aggregation effects.

Magnitude of Effect

Fish aggregation effects resulting from the presence of infrastructure on the seabed are restricted to the artificial reef effect associated with cable protection (including cable crossings). The realistic worst-case footprint of rock that may be present on the seabed for extended periods is 308,374 m^2 (3 km^2). The protection will have a maximum height above the seabed of 1.125 m and maximum width of 11.4 m. In the context of the wider Fish and Shellfish Ecology Study Area, the additional ecological opportunities (increased shelter and food availability) resulting from cable protection are unlikely to result in substantial changes in fish and shellfish ecology, but rather have minimal effects in highly localised areas. As such, the magnitude of effect is considered **Low**.

Assessment Conclusion

As a result of the low sensitivity of all fish and shellfish receptors, combined with the low magnitude of impact, fish aggregation effects has been assessed as having a **Negligible** effect. As such, the impact of fish aggregation effects on all fish and shellfish receptors is considered **Not Significant**.

7.3.7 DECOMMISSIONING PHASE

Impacts associated with the decommissioning phase of the Project are expected to mirror impacts associated with the construction phase, however, the magnitude of effects are expected to be lower than those during the construction phase. For example, if it is determined that infrastructure such as cable protection is to be left *in situ*, there will be a notable reduction in the potential for seabed habitat disturbance during the decommissioning phase.

7.3.8 ASSESSMENT SUMMARY

Overall, the Fish and Shellfish assessment concluded **No Significant Effects** throughout the construction, operation, and decommissioning phases of the proposed Spittal to Peterhead Cable. As a result of the assessment concluding **No Significant Effects** to Fish and Shellfish receptors, no additional mitigation is proposed.

Table 7-17 shows the receptors that have been assessed as part of the MEA for Fish and Shellfish Ecology.

Any overall risk determined to be **Negligible** or **Minor** is '**Not Significant**' i.e. no significant impact results. Any overall risk determined to be **Moderate** or **Major** is '**Significant**' and will require further mitigation(s) to be implemented to minimise or remove the significance of impact to become '**Not Significant**'.

TABLE 7-17: SUMMARY OF IMPACTS TO FISH AND ECOLOGY RECEPTORS

Potential Impact	Receptor	Sensitivity	Magnitude	Overall Risk	Significance
Construction					
Temporary (short term) localised disturbance of seabed habitats	Pelagic Fish	Low	Low	Negligible	Not Significant
	Demersal Fish (including sandeel)	Low	Low	Negligible	Not Significant
	Diadromous Fish	Low	Low	Negligible	Not Significant
	Shellfish	Low	Low	Negligible	Not Significant
	Atlantic Herring	Medium	Low	Minor	Not Significant
	PMFs	High	Low	Minor	Not Significant
Temporary (short term) disturbance via suspended sediment concentration	Pelagic Fish	Low	Low	Negligible	Not Significant
	Demersal Fish	Low	Low	Negligible	Not Significant
	Diadromous Fish	Low	Low	Negligible	Not Significant
	Shellfish	Medium	Low	Minor	Not Significant
	Atlantic Herring	Medium	Low	Minor	Not Significant
	PMFs	Medium	Low	Minor	Not Significant
	Pelagic Fish eggs and larvae	Medium	Low	Minor	Not Significant
Temporary disturbance via underwater noise and vibration	All receptors	Low	Negligible	Negligible	Not Significant
Operation					
Long-term localised disturbance to seabed habitats	Pelagic Fish	Low	Low	Negligible	Not Significant
	Demersal Fish (including sandeel)	Low	Low	Negligible	Not Significant

Potential Impact	Receptor	Sensitivity	Magnitude	Overall Risk	Significance
	Diadromous Fish	Low	Low	Negligible	Not Significant
	Shellfish	Low	Low	Negligible	Not Significant
	Atlantic Herring	Medium	Low	Minor	Not Significant
	PMFs	High	Low	Minor	Not Significant
Fish aggregation effects	All receptors	Low	Low	Negligible	Not Significant

7.4 MARINE MEGAFAUNA

7.4.1 INTRODUCTION

The baseline is defined as the present nature of the marine megafauna communities within the vicinity of the project, against the likely expected and/or predicted changes resulting from the project. The current records of sightings have shown that more than 20 different species of marine mammals are found in UK waters, of which 12 are permanent residents (JNCC, 2023). As a result of their ability to remain submerged for long periods of time, and travel great distances, the monitoring of marine mammal species is often difficult. Gathering population data and distribution information is based on infrequent and opportunistic observations, which are subsequently used to generate educated estimations of numbers and range over certain locations.

A desk-based review of literature and existing data sources was undertaken, with the following data sources covering the area of the project:

- Gilles *et al*., 2023. Estimates of cetacean abundance in European Atlantic waters in summer 2022 from the SCANS-IV aerial and shipboard surveys;
- Waggitt *et al*., 2019. Distribution maps of cetacean and seabird populations in the North-East Atlantic; and
- SCOS (Special Committee on Seals), 2022. Scientific Advice on Matters Related to the Management of Seal Populations: 2022.

The relevant legislation and policy relating to Marine Megafauna include:

- National Marine Plan: Chapter 4 (GEN9, GEN13, GEN21, CABLES1, CABLES2);
- Marine (Scotland) Act 2010;
- Marine and Coastal Access Act 2009;
- The Conservation of Habitats and Species Regulations 2017;
- The Conservation of Offshore Habitats and Species Regulations 2017; and
- Nature Conservation (Scotland) Act 2004.

7.4.2 MARINE MEGAFAUNA STUDY AREA

Marine megafauna are typified by high mobility and broad distribution, which varies across species. The Marine Megafauna Study Area is defined by the cable corridor, to which impacts are localised, that encompasses the SCANS-IV survey blocks CS-K, NS-E and NS-D (SCANS-IV; Gilles *et al*., 2023) between the southern coast of the Orkney Isles, the outer limits of the Moray Firth and making landfall on the northeast coast of Aberdeenshire. In some cases, it may also be necessary to assess impacts at the population level. The wider Study Area is defined for each receptor species separately, and is defined by the management unit (MU) for that receptor species

7.4.3 BASELINE ENVIRONMENT

7.4.3.1 PINNIPEDIA

There are two pinnipedian species considered as residents to the UK, these are the harbour seal *Phoca vitulina vitulina* and grey seal *Halichoerus grypus*. There are about 100,000 harbour seals in Europe, with approximately 30% of Europe's population found in UK waters. Of these, 80% are found in Scottish waters.

Grey seal are one of the rarer seal species worldwide; the species' entire population is around 400,000 individuals. About 40% of this population lives in UK waters, and about 90% of this number breed at colonies in Scotland (NatureScot, 2023).

The project area is encompassed within Seal Management Unit (SMU) 6 (Moray Firth), with some slight overlap into SMU 7 (East Scotland), as defined by the Special Committee on Seals (SCOS) in 2022 (SCOS, 2022). Most recent August counts (between 2016-2021) of harbour seal at haul-out sites within the Moray Firth SMU and the East Scotland SMU, resulted in a count of 690 individuals and 262 individuals, respectively. Most of the counts in the Moray Firth were from haul outs between Loch Fleet and Findhorn. Within the East Scotland SMU the population is mainly concentrated in the Firth of Tay and Eden Estuary Special Area of Conservation (SAC), and in the Firth of Forth. Harbour seal counts for both SMUs show recent declines (SCOS, 2022). The most recent August counts of grey seal at haul-out sites within the Moray Firth SMU and the East Scotland SMU, resulted in a count of 1,856 individuals and 2,712 individuals, respectively. Most of the counts in the Moray Firth were from haul outs between Loch Fleet and Findhorn. Grey seal have shown an increasing trend in the Moray Firth SMU and a stable trend in the East Scotland SMU (SCOS, 2022).

7.4.3.2 CETACEA

The cetacean species most commonly recorded in Scottish waters are:

- Minke whale Balaenoptera acutorostrata;
- Harbour porpoise Phocoena phocoena;
- Common bottlenose dolphin Tursiops truncatus;
- White-beaked dolphin Lagenorhynchus albirostris;
- Common dolphin Delphinus delphis;
- Risso's dolphin Grampus griseus; and
- killer whale Orcinus orca.

The project area is encompassed within Block CS-K of the SCANS IV surveys (Gilles *et al*., 2023), with some slight overlap into Block NS-D and Block NS-E. Abundances and densities of these species within survey Block CS-K are presented in **Table 7-18**. Block CS-K has been used, rather than Blocks NS-D or NS-E, as it is more representative of the project area. Species that were not sighted during SCANS surveys in this block have no displayed density or abundance. **Table 7-18** also includes cetacean abundances for the seven most common UK cetaceans from the Inter-Agency Marine Mammal Working Group (IAMMWG) (2023), within the UK portion of their agreed Management Units (MUs). MUs provide the population scale at which impacts of proposed plans (and cumulative impacts with other projects) need to be assessed. Other cetacean species, such as humpback whale *Megaptera novaeangliae*, pilot whale *Globicephala melas*, and killer whale have been sighted in the area (Waggitt *et al*., 2019; Hague *et al.*, 2020; Hebridean Whale and Dolphin Trust, 2023). However, these species lack an associated MU within UK waters, as defining an MU at the scale of UK waters is not appropriate to the larger population (IAMMWG, 2023).

TABLE 7-18: CETACEAN DISTRIBUTION FROM SCANS IV REPORT (GILLES *ET AL.*, 2023)

Species	Abundance in SCANS IV Data Block CS-K	Species Density (animals/km^2) SCANS IV Data Block CS-K	Abundance by UK portion of Management Unit (MU) (IAMMWG, 2023)
Minke whale *Balaenoptera acutorostrata*	467	0.012	10,288 (Celtic and Greater North Seas (CGNS))
Harbour porpoise *Phocoena phocoena*	11,357	0.281	159,632 (NS)
Common dolphin *Delphinus delphis*	N/A	None recorded in SCANS IV in Block CS-K, Block NS-D, or Block NS-E	57,417 (CGNS)
Common bottlenose dolphin *Tursiops truncatus*	N/A	None recorded in SCANS IV in Block CS-K, Block NS-D, or Block NS-E	224 (CES)/1,885 (Greater North Sea (GNS))
White-beaked dolphin *Lagenorhynchus albirostris*	862	0.023	34,025 (CGNS)
Risso's dolphin *Grampus griseus*	1,519	0.038	8,687 (CGNS)

There is a population of common bottlenose dolphin resident in the Moray Firth, with high-use areas concentrated at the mouths of the inner firths (Wilson *et al*., 1997). Minke whale are present within the Moray Firth, and the Southern Trench Nature Conservation Marine Protected Area (NCMPA) is designated for their conservation. However, they are present in higher densities in Blocks NS-D and NS-E. The density for Block CS-K has been used as it is the most representative of the project area.

Sightings of killer whale in Scottish waters are most frequently of individuals from either the West Coast community (a small resident population off the west coast of the UK and Ireland) or from the North Atlantic community (Hague *et al.*, 2020). The North Atlantic community likely encompasses sightings of killer whale around the Northern Isles, with the population extending offshore to Iceland and the wider North Atlantic. Killer whale are sighted with reasonable frequency in the Scottish offshore waters of the North Sea during the winter months, coinciding with a greater occurrence of prey species such as Atlantic mackerel *Scomber scombrus* and Atlantic herring *Clupea harengus* (Luque *et al.*, 2006). In summer months (May to September) there is an increase in coastal sightings in the Northern Isles, particularly Shetland (Hague *et al.*, 2020).

Humpback whale, long-finned pilot whale, fin whale *Balaenoptera physalus*, beluga whale *Delphinapterus leucas*, and sperm whale *Physeter macrocephalus* have been sighted during land-based shore watch surveys, performed by Whale and Dolphin Conservation between 2005-2019 (Hague *et al*., 2020). However, these species are very rare compared to the marine mammals mentioned above.

Humpback whale, for example, may be resident year-round in Scottish waters, but in such low numbers that there are insufficient data to establish a population trend or determine a detailed distribution or seasonality (e.g., Hague *et al.*, 2020; Waggitt *et al.*, 2020). In a total of 241 photo-identification surveys conducted between 2002-2016, the University of Aberdeen Lighthouse Field Station recorded only one humpback whale encounter and one sperm whale encounter in the Inner Moray Firth (Hague *et al*., 2020). Similarly, Evans *et al*. (2011) reported one humpback whale sighting, two beluga whale sightings, and three sperm whale sightings in the Moray Firth (between Dunbeath and Lybster) across 30 years (1980-2010).

Long-finned pilot whale have occasionally been sighted in low numbers within the Inner Moray Firth (Reid *et al*., 2003; Hague *et al*., 2020), but their preference for deep waters along the continental shelf edge suggests they are unlikely to consistently overlap with the project area. Beaked whale species, which also prefer deep offshore waters, have no recorded sightings within the Moray Firth (Rogan *et al*., 2017; Gilles *et al*., 2023) and are, therefore, not predicted to overlap with the proposed project area.

7.4.3.3 OTHER MARINE MEGAFAUNA

Basking shark *Cetorhinus maximus* are the largest fish species found in UK waters and are assessed as Endangered on the International Union for Conservation of Nature (IUCN) Red List of Threatened Species (Rigby *et al*., 2023). They follow a seasonal distribution, with increased sightings in the summer months, as sharks feed on plankton in the coastal surface waters near tidal fronts (Sims and Quayle, 1998; Doherty *et al*., 2017). In the summer, they are most common around the southwest coast of England, throughout the Irish Sea, and off the west coast of Scotland (Shark Trust, 2022). In winter, basking shark in the northeast Atlantic inhabit the waters of continental shelf and shelf edge, but do not hibernate or exhibit prolonged movements into open-ocean regions (Sims *et al*., 2008).

The Sea of the Hebrides MPA is currently the only NCMPA in Scottish waters designated for the protection of basking shark, with hotspots recorded particularly around Coll, Tiree, Skerryvore, and Hyskier (Witt *et al*., 2016). Basking shark have also recently been recorded off the northeast coast of Scotland (Pentland Firth, Orkney, Shetland, and the northern North Sea), but in lower concentrations compared to the west coast (Fowler, 2000; Sims, 2008).

Basking shark are very rarely sighted in the Moray Firth, particularly outside of the peak season of April-September, during which they are sighted infrequently. Between 1980-2010, there were four recorded sightings of basking shark off the southeast coast of Caithness (Evans *et al*., 2011). Within the inner Moray Firth, there are only three recorded sightings of basking shark, all in 2022, with of a total of 12 individuals recorded (Hebridean Whale and Dolphin Trust, 2023). Basking shark density for all seasons, between 2000-2012, in the Moray Firth, on the National Marine Plan Interactive (NMPi) web tool, is recorded as between 0.00-0.11 individuals per 5 km-by-5 km grid (NMPi, 2023).

7.4.4 MARINE ENVIRONMENTAL ASSESSMENT

7.4.4.1 OVERVIEW

The proposed works have the potential to result in environmental impacts upon the receptor groups described in **Section 7.4.1**. Whilst a formal EIA is not required as part of this MLA, the MEA has been conducted using similar EIA terms and definitions for transparency and ease of understanding.

Definition of Significance

This MEA will assign a level of significance to each receptor-impact pathway, in line with that provided within a formal EIA. **Table 7-19** defines the various levels of significance used within this assessment.

TABLE 7-19: DEFINITIONS OF SIGNIFICANCE FOR APPLICATION WITHIN THE MARINE ENVIRONMENTAL ASSESSMENT

Significance	Definition
Major Adverse/Beneficial Impact	Major Adverse results in an unacceptable level of impact, at sufficient importance to call for serious consideration of changes to the Project (Significant in formal EIA terms)
Moderate Adverse/Beneficial Impact	Moderate Adverse results in an unacceptable level of impact, at sufficient importance to call for consideration of changes to the Project (Significant in formal EIA terms)
Minor Adverse/Beneficial Impact	Acceptable level of impact, and unlikely to be sufficiently important to warrant mitigation measures (Non-significant in formal EIA terms)
Negligible Impact	Acceptable level of impact, of such low significance that they are not considered relevant for the decision-making process (Non-significant in formal EIA terms)

Scoping of Potential Impacts

The potential impacts outlined in **Table 7-20** below have been identified as relevant to each marine megafauna receptor group and form the basis for assessment within the MEA.

TABLE 7-20: POTENTIAL IMPACTS ASSOCIATED WITH THE PROPOSED WORKS

Topic	Impact	Project Phases	Scoped In/Out
Marine Mammals	Temporary disturbance via suspended sediment concentration	Construction Operation Decommissioning	Scoped In
	Temporary disturbance via underwater noise and vibration	Construction Operation Decommissioning	Scoped In
	Risk of collision with works vessels	Construction Operation Decommissioning	Scoped In
	Variation in prey availability	Construction Operation Decommissioning	Scoped Out This impact pathway is unlikely to result in a significant effect due to the highly mobile nature of the receptor species, combined with the short term nature of the effects and availability of alternate foraging habitat.

Further assessment work for Marine Mammals is required to support the Marine Licence application. The following potential impacts relevant to Marine Mammals are assessed for the construction, operation, and decommissioning phases of the proposed Spittal to Peterhead Cable:

- Temporary disturbance via suspended sediment concentration;
- Temporary disturbance via underwater noise and vibration; and
- Vessel displacement and collision risk.

These potential impacts have been assessed based on the realistic worst-case parameters outlined within the Project Design Envelope. For Marine Mammals, these realistic worst-case parameters are outlined within **Table 7-21**.

TABLE 7-21: REALISTIC WORST-CASE PARAMETERS FOR MARINE MAMMALS

Potential Impact	Realistic Worst-case Parameters	Phase
Temporary disturbance via increased suspended sediment concentration	It is anticipated that increases in SSC will be predominantly localised along the maximum length of approximately172 km cable installation works. Estimations based on North Sea projects occurring under similar hydrodynamic and seabed sedimentary conditions indicate the following transport distances for sediments: • Coarse sediment (>2 mm) = 100 m • Sand (0.062 mm–2 mm) = 700 m • Silt and clay (at a level above 1 mg/l) = up to 2 km	Construction, Operation, Decommissioning
Temporary disturbance via underwater noise and vibration	7 vessels operating at the one time. USBL operating on vessels causing Temporary Threshold Shift (TTS) or Permanent Threshold Shift (PTS) on pipelayer trencher.	Construction, Operation, Decommissioning
Vessel displacement and collision risk	7 vessels operating at the same time in the same vicinity.	Construction, Operation, Decommissioning

7.4.5 CONSTRUCTION PHASE

7.4.5.1 TEMPORARY DISTURBANCE VIA INCREASED SUSPENDED SEDIMENT CONCENTRATION

The proposed works involve the laying and burial of cable within the seabed substrate with rock/mattress placement at cable crossings, which has the potential to cause indirect effects on foraging success of seals, cetaceans or basking shark, related to increased turbidity from sediment plumes making it more difficult to see and locate prey.

Sensitivity of Receptors

Pinnipedia

Harbour seal can use different foraging strategies to hunt in different environments. In dark, murky environments, evidence suggests that they use their *vibrissae* (whiskers) to detect fish generated water movements in order to locate prey (Schulte-Pelkum *et al*., 2007). Observations of harbour seal hunting schooling fish in daylight conditions, and in clear waters, suggest they favour visual hunting under these circumstances (Kilian *et al*., 2015). Therefore, harbour seal may be affected by the sediment plume arising from cable works of the project, as sediment plumes may decrease foraging and capture success during visual hunting.

Grey seal typically hunt in deeper waters, and hunt more exclusively on benthic prey, than harbour seal (McConnell *et al*., 1999). Grey seal are, therefore, well adapted to using their *vibrissae* to detect prey species. However, it cannot be ruled out that grey seal also use visual cues when the environment allows, i.e. in daylight and clear waters, as with harbour seals (Kilian *et al*., 2015). Therefore, as a precautionary measure, grey seal have been assessed for effects from the sediment plume arising from cable installation works of the project, as sediment plumes may decrease foraging and capture success during visual hunting. Prey may also be smothered by sediment deposition within the plume footprint (Newell *et al.*, 1998). However, studies have suggested that Pinnipeds are tolerant to increased sediment suspension concentrations, they are able to forage within, and outside, the operation area as they are highly mobile (Kilian *et al*., 2015). Furthermore, the operations area is only a small percentage of the total foraging range available to pinnipeds. Therefore, they can easily adapt to, and recover from, any project specific disturbance caused by sediment plumes.

As a result, the overall sensitivity of pinnipeds to temporary disturbance via suspended sediment concentration is **Low**.

Cetacea

It has been determined that for all Odontoceti, including harbour porpoise, common dolphin, common bottlenose dolphin, white-beaked dolphin, and Risso's dolphin, the effects of the pressures associated with the sediment plume can be scoped out. All of those species forage using echolocation, where the animal emits a series of clicks, and utilises the echoes to determine the location of the prey item (Jones, 2005). These species rely on acoustic, as opposed to visual, sensors to detect prey, meaning that a change in the turbidity due to sediment plumes will not affect their foraging success (Jones, 2005). This exposure pathway can, therefore, be scoped out for the aforementioned species.

There may be a potential for indirect effects on foraging success of minke whale, related to increased turbidity from sediment plumes during installation making it more difficult to locate prey. Also, prey may be smothered by sediment deposition within the plume footprint (Newell *et al.*, 1998).

Having alternate methods to foraging for prey results in cetacean species being highly tolerant of, and adaptable to, changes during installation, with fast recovery times and large areas of alternate habitat.

As a result, the overall sensitivity of cetaceans to temporary disturbance via suspended sediment concentration is **Low**.

Basking Shark

There may be a potential for indirect effects on foraging success of basking shark related to increased turbidity from sediment plumes during installation reducing prey availability. Basking shark feed on zooplankton and small crustaceans, including copepods, decapod larvae, fish eggs and shrimp (Shark Trust, 2023a), species that are found closer to the seabed or lower in the water column maybe at risk from smothering although this is very unlikely. However, as basking shark are mostly found within the shallow surface water during the summer, there is likely to be little interaction with the sediment plume associated with the cable trenching (Sims *et al.*, 2003).

Plume effects are likely to be slightly measurable above baseline conditions. However, due to the wide-ranging nature of basking shark and availability of habitat outside the operations area, basking shark are considered tolerant of, and adaptable to plume effects, and are able to recover quickly (<1 year).

As a result, the overall sensitivity of basking shark to temporary disturbance via suspended sediment concentration is **Low.**

Magnitude of Effect

Temporary disturbance via increased suspended sediment concentration and smothering as a result of the installation of the cable will be highly localised in the context of the Marine Mammal Ecology Study Area and will be a short term process, where the duration of cable installation and protection will be minimised as much as possible (see **Section 6.4.1, Table 6-5** for full list of embedded mitigation measures). As such, the magnitude of temporary disturbance via increased suspended sediment concentration is considered **Low**.

Assessment Conclusion

A Low sensitivity and Low magnitude mean that risk of temporary disturbance via increased suspended sediment concentration is **Negligible**. Overall, the assessment concluded **No Significant Effect** from temporary disturbance via increased suspended sediment concentration throughout the construction phase of the proposed Spittal to Peterhead Cable.

7.4.5.2 TEMPORARY DISTURBANCE VIA UNDERWATER NOISE AND VIBRATION

Sensitivity of Receptors

Pinnipedia and Cetacea

Underwater noise produced by vessel operation and cable burial and rock/mattress placement during the construction phase has the potential to disturb marine mammal species. Underwater noise levels associated with the construction phase are expected to be consistent with other vessel-related noise within the Moray Firth and, therefore, represent a short term and localised increase in existing background levels.

Cable trenching and laying are predicted to result in only a slight elevation of underwater noise above ambient levels, and are not expected to produce noise levels above any marine mammal injury thresholds. Measurements of cable trenching from available literature, recorded during installation at the North Hoyle OWF site, indicate a source power level of 178 dB re 1 µPa @ 1 m, only 10-15 dB above the background noise level (Nedwell *et al.*, 2004).

Vessel noise is related to vessel size, speed, load, condition, age and engine, and can range from <150 dB re. 1 µPa, to >190 dB re. 1 µPa (Hawkins *et al*., 2014). Underwater noise can lead to varied direct effects on marine mammals, including mortality, physiological injury, and auditory injury, the latter of which can be classified as Permanent Threshold Shift (PTS) or Temporary Threshold Shift (TTS) (Todd *et al*., 2015). There is also potential for indirect effects, such as masking of communication signals (Todd *et al*., 2015). Disturbance effects may lead to displacement from the area, which may have associated negative impacts on the affected individuals (e.g., reduction in habitat quality or prey availability) (Nowacek *et al.*, 2007;

Weilgart, 2007). The level of effect from underwater noise (either through physical injury or disturbance) is related to the frequency, sound levels, and duration of the noise, as well as variation in the individual receptor.

Ultra-short Baseline (USBL) equipment may be used during the construction phase. The frequency range of this equipment can overlap with the auditory range of those Low frequency cetacean species which may be present within the operations area. Therefore, there is the possibility of auditory injury to occur (Southall *et al*., 2019). An individual is at greater risk when exposed directly below the sound source. However, cetaceans are more likely to be displaced than attracted to the sound source; thus the likelihood of a cetacean being affected is low (Southall *et al*., 2019).

Since marine mammals are highly mobile, they are able to move away from an area of elevated underwater noise levels, thereby reducing potential for physical injury. Displacement may have associated negative impacts, however receptors are likely to return to the area once operations have ceased (Todd *et al*., 2015).

As a result, the overall sensitivity of pinnipeds and cetaceans to temporary disturbance via underwater noise and vibration is **Low**.

Basking Shark

For basking shark, the effects from the pressures associated with noise and vibration can be scoped out. The species' sensitivity to underwater noise is known to be **Negligible** (Popper *et al*., 2014), therefore it is not considered likely that noise associated with construction activities will cause disturbance.

Basking sharks are mobile, and have a wide foraging range. The impact pathway for underwater noise on basking shark will therefore be limited temporally and spatially, as they must be within the relatively small area of effect to be impacted, their presence in wider UK waters is seasonal (summer months), and even during this period they are rarely present within the Moray Firth. Basking sharks are considered to be tolerant and adaptable to underwater noise exposure, and are able to recover quickly after the construction activities have stopped. The presence of vessels and engine noise has a limited effect on basking shark (Bloomfield and Solandt, 2006; Speedie *et al*., 2009). Additionally, there is a lack of evidence to suggest basking sharks are susceptible to injuries, stress or mortality as a result of the underwater noise and vibration (Wilding *et al*., 2020).

Magnitude of Effect

Any impact to the receptor is likely to be small and within the range of natural variation, considering the number of individual receptors that utilise the area and the sublethal level of effect. Considering the level of vessel traffic in the region, including in the operations area, the proposed operations will be unlikely to cause a substantial change in the level of underwater sound above the current baseline. The magnitude of impacts is therefore considered **Low**.

Vessel-related noise is not considered to result in a magnitude of underwater noise that exceeds thresholds for recoverable injury for sensitive cetacean species beyond several metres from the source (Southall *et al*., 2019). Embedded mitigation measures reduce the risk of exposure, with the development of a Marine Mammal Protection Plan (MMPP), adherence to the Scottish Marine Wildlife Watching Code (SMWWC), and Basking Shark Code of Conduct (see **Section 6.4.1, Table 6-5** for full list of embedded mitigation measures).Therefore, temporary disturbance via underwater noise and vibration are considered to be short term, localised, and reversible, and therefore of **Low** impact upon all receptors.

Assessment Conclusion

A low sensitivity and low magnitude mean that risk of vessel-related disturbance is **Negligible**. Overall, the assessment concluded **No Significant Effect** from pressures associated with noise and vibration throughout the construction, operation, and decommissioning phases of the proposed Spittal to Peterhead Cable.

7.4.5.3 VESSEL DISPLACEMENT AND COLLISION RISK

Sensitivity of Receptors

Pinnipedia

There is potential that harbour and grey seal may collide with vessels deployed for cable works, or may be displaced from the area, potentially prompting a behavioural and/or stress related response, injury or mortality. Seals are inquisitive animals and have been known to approach vessels. As a result of this they are considered to have a high tolerance to vessel presence, as well as a high adaptability due to their ability to avoid the vessel by moving away (ERM Ltd, 2010).

Furthermore, Wilson *et al*. (2017) noted that seal collisions with vessels were rare in relation to the frequency of seal encounters, and identified a significant reduction in the number of seal collisions for vessels travelling at <4 knots. As such, it is considered unlikely that the behavioural and physical responses of grey and harbour seals to vessel displacement and collision associated with the project vessels will result in impacts to individuals. As such, any impacts to the wider populations of these species are also considered to be unlikely.

As a result, the overall sensitivity of pinnipeds to vessel-related disturbance and collision risk is **Low**.

Cetacea

There is potential that harbour porpoise and common dolphin, may collide with vessels deployed for installation of the cable, or may be displaced from the area, potentially prompting a behavioural or stress related response, injury or mortality. A common response to vessel activity by marine mammals, especially timid species such as harbour porpoise, is to avoid the vessel either by diving or swimming away (ERM Ltd, 2010). Marine mammals are most susceptible to collision where vessels display erratic behaviour and/or operate at high speeds. Risk of collision between vessels and marine mammals is considered to be very low when vessels are travelling at slow speed. For example, Laist *et al*. (2001) concluded that large vessels (>80 m), travelling at speeds in excess of 14 knots, may represent a threat to marine mammals. Furthermore, Anderwald *et al*. (2013) stated that minke whale off the coast of Ireland avoided areas of high construction vessel traffic during installation of a gas pipeline, further reducing risk of collision. Harbour porpoise are considered at a higher risk of collision with vessels that are travelling at speeds of 13-14 knots or more (IAMMWG, 2015).

However, it is considered unlikely that the behavioural and physical responses of cetacean species to vessel displacement and collision associated with the project vessels will result in impacts to individuals. As such, any impacts to the wider populations of these species are also considered to be unlikely

As a result, the overall sensitivity of cetaceans to vessel-related disturbance and collision risk is **Low.**

Basking Shark

Since basking shark commonly feed at the surface, there is potential for collision with additional vessels deployed for cable installation works to displace individuals from the area or, potentially, prompting serious injury (Shark Trust, 2023b). As basking shark very rarely show a response to approaching vessels, the risk of vessel collision is greater than the risk of disturbance (Speedie *et al*., 2009). Vessels should slow to 6 kn if basking shark are identified within 1 km. If a shark is identified within 300 m radius of a vessel (the 'caution zone'), the vessel should avoid direct approach and maintain a minimum approach distance of 100 m, in accordance with the Scottish Marine Wildlife Watching Code.

As a result, the overall sensitivity of basking shark to vessel-related disturbance and collision risk is **Low.**

Magnitude of Effect

Any impact to the receptor is likely to be small and within the range of natural variation, considering the number of individual receptors that utilise the area and the sublethal level of effect. Considering the level of vessel traffic in the region (see **Section 7.7: Shipping and Navigation**), including within the cable corridor, the proposed installation works will be unlikely to cause measurable change in the level of vessel-related disturbance above the current baseline. Embedded measures (e.g., adherence to Basking Shark Code of Conduct), will reduce the risk of displacement and risk of collision (refer to **Section 6.4.1, Table 6-5** for full list of embedded mitigation measures). The magnitude of impacts is therefore considered **Low**.

Assessment Conclusion

A Low sensitivity and Low magnitude mean that risk of vessel-related disturbance is **Negligible**. Overall, the assessment concluded **No Significant Effect** from vessel-related disturbance throughout the construction, operation, and decommissioning phases of the proposed Spittal to Peterhead Cable.

7.4.6 OPERATION PHASE

7.4.6.1 TEMPORARY DISTURBANCE VIA UNDERWATER NOISE AND VIBRATION

Sensitivity of Receptors

Similar to the construction phase, temporary disturbance via underwater noise and vibration during investigation surveys in the operational phase may have a detrimental impact on marine mammal species in instances where routine cable surveys or repairs are required. However, the impact pathway will only potentially exist during infrequent operational investigation surveys during the 40year operational lifespan of the Project. This extended timeframe means that activities related to disturbance via underwater noise and vibration will be less intense (spatially and temporally) than the construction phase, but may have the potential to occur over a prolonged period of time (~40 years).

Pinnipeds, cetaceans and basking shark are considered to have a **Low** sensitivity to temporary localised disturbance via underwater noise and vibration.

Magnitude of Effect

The magnitude of temporary disturbance via underwater noise and vibration is expected to be less than that of the construction phase, being limited to any routine surveys.

Assessment Conclusion

As the sensitivity of receptors is not expected to vary between the construction phase and operation phase, but the magnitude of potential effect is temporary, disturbance via underwater noise and vibration is considered of **Negligible** impact, which is **Not Significant**.

7.4.6.2 VESSEL DISPLACEMENT AND COLLISION RISK

Sensitivity of Receptors

Similar to the Construction phase, vessel displacement and collision risk during the operational phase may have a detrimental impact on marine mammal species. However, the impact pathway will only potentially exist during infrequent survey or repair events during the 40 year operational lifespan of the Project. This extended timeframe means that activities related to vessel displacement and collision risk will be less intense (spatially and temporally) than the construction phase, but may have the potential to occur over a prolonged period of time (~40 years).

Pinnipeds, cetaceans and basking shark are considered to have a **Low** sensitivity to temporary vessel displacement or collision risks.

Magnitude of Effect

The magnitude of vessel displacement and collision risk is expected to be less than that of the construction phase, being limited to any routine surveys that cannot be foreseen at this stage.

Assessment Conclusion

As the sensitivity of receptors is not expected to vary between the construction phase and operation phase, but the magnitude of potential effect is temporary and localised, disturbance of individuals within proximity of vessels and increased collision risk is considered of **Negligible** impact, which is **Not Significant**.

7.4.7 DECOMMISSIONING PHASE

Impacts associated with the decommissioning phase of the Project are expected to mirror impacts associated with the construction phase, however, the magnitude of effects are expected to be lower than those during the construction phase. For example, if it is determined that infrastructure such as cable protection is to be left *in situ*, there will be a notable reduction in the potential for seabed habitat disturbance during the decommissioning phase.

7.4.8 ASSESSMENT SUMMARY

Overall, the Marine Mammal assessment concluded **No Significant Effects** throughout the construction, operation, and decommissioning phases of the proposed Spittal to Peterhead Cable. As a result of the assessment concluding **No Significant Effects** to Marine Mammals receptors, no additional mitigation is proposed.

Table 7-22 shows the receptors that have been assessed as part of the MEA for Marine Megafauna.

Any overall risk determined to be **Negligible** or **Minor** is '**Not Significant**' i.e. no significant impact results. Any overall risk determined to be **Moderate** or **Major** is '**Significant**' and will require further mitigation(s) to be implemented to minimise or remove the significance of impact to become '**Not Significant**'.

TABLE 7-22: SUMMARY OF IMPACTS TO MARINE MEGAFAUNA RECEPTORS

Potential Impact	Receptor	Sensitivity	Magnitude	Overall Risk	Significance
Construction					
Temporary (short term) disturbance via increased suspended sediment concentration	Pinnipedia	Low	Low	Negligible	Not Significant
	Cetacea	Low	Low	Negligible	Not Significant
	Basking Shark	Low	Low	Negligible	Not Significant
Temporary (short term) disturbance via underwater noise and vibration	Pinnipedia	Low	Low	Negligible	Not Significant
	Cetacea	Low	Low	Negligible	Not Significant
	Basking Shark	Low	Low	Negligible	Not Significant
Vessel displacement and collision risk	Pinnipedia	Low	Low	Negligible	Not Significant
	Cetacea	Low	Low	Negligible	Not Significant
	Basking Shark	Low	Low	Negligible	Not Significant
Operation					
Temporary disturbance via underwater noise and vibration	Pinnipedia	Low	Low	Negligible	Not Significant
	Cetacea	Low	Low	Negligible	Not Significant
	Basking Shark	Low	Low	Negligible	Not Significant
Vessel displacement and collision risk	Pinnipedia	Low	Low	Negligible	Not Significant
	Cetacea	Low	Low	Negligible	Not Significant
	Basking Shark	Low	Low	Negligible	Not Significant

7.5 ORNITHOLOGY

7.5.1 INTRODUCTION

This section describes the baseline for Ornithology within a defined Ornithology Study Area. This has been informed by a desk-based literature review using a range of data sources, including published literature and reports, as well as data collected through the Seabird Monitoring Programme (SMP) and the Wetland Bird Surveys (WeBS). The baseline has been used to inform the Ornithology Marine Environmental Assessment in **Section 7.5.4**.

The relevant legislation and policy relating to Ornithology include:

- National Marine Plan: Chapter 4 (GEN9, GEN21);
-
- Marine (Scotland) Act 2010;
- Marine and Coastal Access Act 2009;
- The Conservation of Habitats and Species Regulations 2017;
- The Conservation of Offshore Habitats and Species Regulations 2017; and
- Nature Conservation (Scotland) Act 2004.

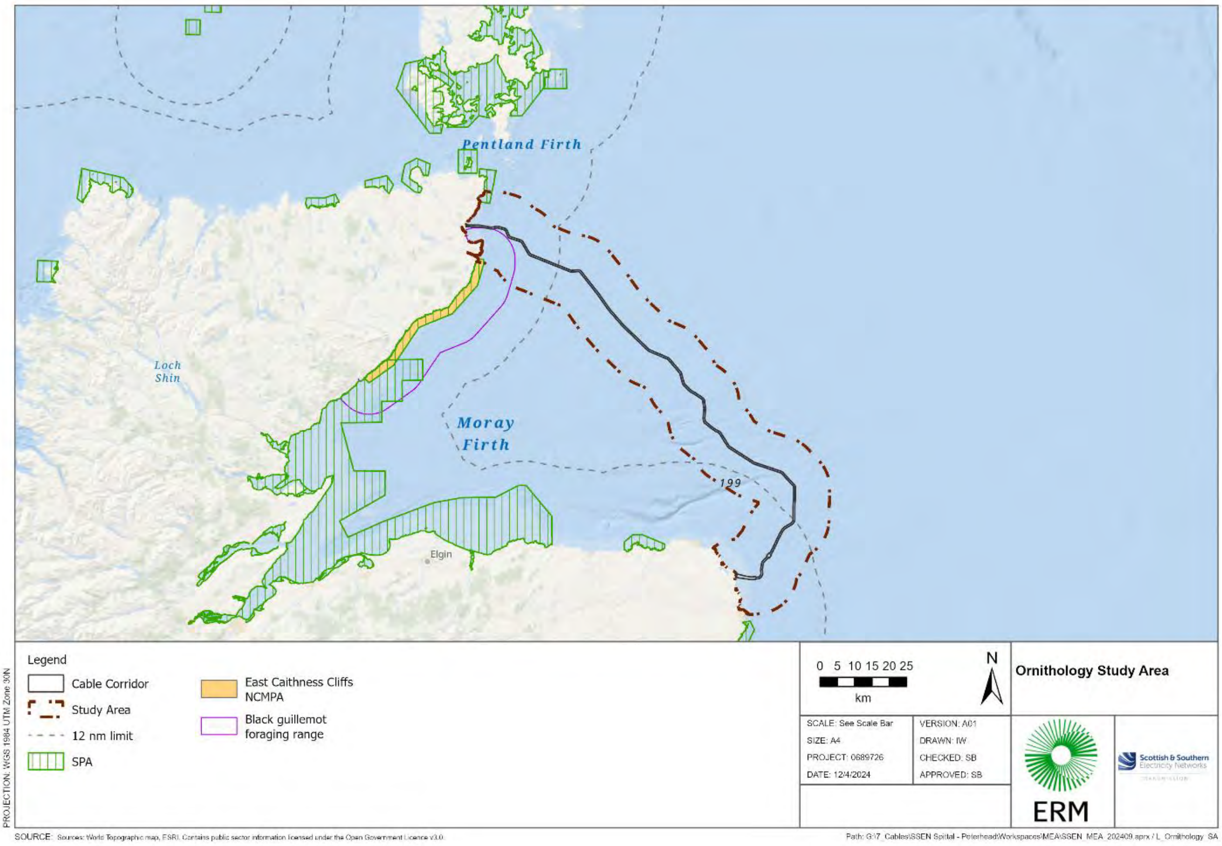
7.5.2 ORNITHOLOGY STUDY AREA

The Ornithology Study Area is divided into two main sub-areas, however it is recognised that species discussed under each are not bound geographically by these sub-areas.

- Marine Ornithology Study Area. This Study Area is delineated by a 10 km buffer applied to either side of the proposed Subsea Cable Corridor. As a result of the highly mobile nature and variable distribution of seabirds, species which make use of the Moray Firth are also considered where it is expected that these species may also interact with the cable corridor during transit.
- Intertidal Ornithology Study Area. The marine Study Area does not cover the intertidal zone. As a result of the differences in species presence and usage of such areas, landward of Mean Low Water Springs (MLWS), up to Mean High Water Springs (MHWS), is covered by the Intertidal Ornithology Study Area. This Study Area is comprised of two components: Sinclair’s Bay, at the northern landfall, and Rattray Head at the southern landfall.

Figure 7-30 presents the extent of the Marine and Intertidal Ornithology Study Areas. This figure also shows designated sites with classified populations/designated bird features that have the potential to interact with impact pathways associated with the proposed development. The sites presented in **Figure 7-30** are detailed in **Table 7-24**. Several additional designated sites (not shown in **Figure 7-30**) are also detailed in **Table 7-24**. These are designated sites with boundaries which are outside the vicinity of the landfalls, and the associated 10 km sediment plume-related buffer. These sites are designated for intertidal or coastal features, or for non-breeding (over-wintering) population features. For the purposes of impact assessment, the features are determined to be associated exclusively within the boundary of the site e.g. either exclusively using the intertidal area or seabirds which do not forage beyond the boundary of the site due to their over-wintering use of the site. These sites have no spatial or temporal overlap with the impact pathways assessed for ornithology receptors in this MEA.

FIGURE 7-30: THE MARINE AND INTERTIDAL ORNITHOLOGY STUDY AREA (DESIGNATED SITES SHOWN HAVE SEABIRD FEATURES WITH THE POTENTIAL TO INTERACT WITH IMPACT PATHWAYS BEING ASSESSED)



7.5.3 BASELINE ENVIRONMENT

7.5.3.1 DATA SOURCES USED

Publicly available data sources were reviewed, including baseline data and surveys at nearby developments, seabird abundance and distribution modelling studies, and scientific articles and reports. Sources used to inform the baseline include:

- SMP data collected from 2017 2015 to 2023 2021 (Burnell et al., 2023);
- Production of Seabird and Marine Mammal Distribution Models for the East of Scotland (Paxton et al., 2022);
- Distribution maps of cetacean and seabird populations in the North-East Atlantic (Waggitt et al., 2019);
- An analysis of the numbers and distribution of seabirds within the British Fishery Limit aimed at identifying areas that qualify as possible marine SPAs (Kober et al., 2010);
- Identifying important at-sea areas for seabirds using species distribution models and hotspot mapping (Cleasby et al., 2020);

- Breeding density, fine-scale tracking, and large-scale modelling reveal the regional distribution of four seabird species (Wakefield et al., 2017); and
- SiteLink (NatureScot, 2024) combined with seabird foraging ranges (Woodward, et al., 2019).

TABLE 7-23: OVERVIEW OF MARINE ORNITHOLOGY DENSITY MODELLING, TRACKING STUDIES, SEABIRD MONITORING PROGRAMME (2017-2023) RECORDS, AND DESIGNATED SITES WITH DIRECT OVERLAP WITH STUDY AREA

(Key Receptors Bold/Shaded; N/A = Not Assessed; N/R = Not Recorded)

Common Name	Paxton *et al.* (2022) Density (indv. per km²)	Waggitt *et al.* (2019) Density (indv. per km²)	Kober *et al.* (2010) Density (indv. per km²)	Cleasby *et al.* (2020) and Wakefield *et al.* (2017) Getis-Ord* hotspots	Seabird Monitoring Programme (Burnell *et al.*, 2023) Count (indv.), with years present in parenthesis	Designated Sites
Black-legged kittiwake *Rissa tridactyla*	Up to 100 per km² in Apr-Sep (breeding), reducing to up to 10 per km² in non-breeding season. Hotspot on the southern side of Moray Firth, expanding around Peterhead to the south to landfall.	Hotspot of activity, up to 2 per km² in July along northern and southern sides of Moray Firth, extending eastwards and around the coast away from the Study Area. January density around 0.5 per km², with no discernible hotspots.	Patchy areas of density 35-70 per km² within Moray Firth during the breeding season, with more consistent density spots along southern and northeastern edges of Moray Firth. No notable hotspots in winter season.	Tracking data show hotspots of activity in north and southeast of Study Area, associated with Caithness Cliffs and south of Peterhead. Study Area overlaps with top 1% Getis-Ord* hotspots.	Average: 12,770 Range: 990-22,406 (5) Sites: 7	Total: 4 SPA: 4 Ramsar: 0 SSSI: 0 NCMPA: 0
Black-headed gull *Chroicocephalus ridibundus*	N/A	N/A	No notable increase in modelled density in Study Area.	N/A	Average: 65 Range: 24-168 (5) Sites: 7	Total: 0
Common gull *Larus canus*	No notable increase in density within the Moray Firth and Study Area.	N/A	No notable increase in modelled density in Study Area.	N/A	Average: 54 Range: 2-150 (4) Sites: 10	Total: 0
Great black-backed gull *Larus marinus*	0-5 per km² in Moray Firth, up to 10 per km² in southern area in Oct-Jan (wintering).	N/A	Density in Moray Firth up to around 1 per km² in breeding and winter season.	N/A	Average: 4 Range: 2-8 (3) Sites: 9	Total: 1 SPA: 1 Ramsar: 0 SSSI: 0 NCMPA: 0

Common Name	Paxton *et al.* (2022) Density (indv. per km²)	Waggitt *et al.* (2019) Density (indv. per km²)	Kober *et al.* (2010) Density (indv. per km²)	Cleasby *et al.* (2020) and Wakefield *et al.* (2017) Getis-Ord* hotspots	Seabird Monitoring Programme (Burnell *et al.*, 2023) Count (indv.), with years present in parenthesis	Designated Sites
European herring gull *Larus argentatus*	Up to 500 per km² in localised hotspot on southern edge of Moray Firth, in Nov and Jan (wintering), density reducing with distance from this area.	Density around 1.2 per km² on southern side of Moray Firth in Jan, with much lower densities in July.	Patchy density hotspots within Moray Firth during breeding season, with density up to 45 per km². Winter density lower, although hotspots on southern edge of Moray Firth, with up to 10 per km².	N/A	Average: 395 Range: 22-928 (6) Sites: 24	Total: 3 SPA: 3 Ramsar: 0 SSSI: 0 NCMPA: 0
Lesser black-backed gull *Larus fuscus*	Not modelled - abundance too low.	No notable increase in modelled density in Study Area.	No notable increase in modelled density in Study Area.	N/A	Average: 8 Range: 8 (1) Sites: 3	Total: 0
Sandwich tern *Thalasseus sandvicensis*	N/A	N/A	No notable increase in modelled density in Study Area.	N/A	N/R	Total: 1 SPA: 1 Ramsar: 0 SSSI: 0 NCMPA: 0
Little tern *Sternula albifrons*	N/A	N/A	N/A	N/A	N/R	Total: 1 SPA: 1 Ramsar: 0 SSSI: 0 NCMPA: 0
Common tern *Sterna hirundo*	Very low density in Moray Firth and Study Area (up to 0.02 per km²).	N/A	No notable increase in modelled density in Study Area.	N/A	Average: 81 Range: 57-128 (5) Sites: 12	Total: 3 SPA: 3 Ramsar: 0 SSSI: 0 NCMPA: 0

Common Name	**Paxton *et al.* (2022) Density (indv. per km²)**	**Waggitt *et al.* (2019) Density (indv. per km²)**	**Kober *et al.* (2010) Density (indv. per km²)**	**Cleasby *et al.* (2020) and Wakefield *et al.* (2017) Getis-Ord* hotspots**	**Seabird Monitoring Programme (Burnell *et al.*, 2023) Count (indv.), with years present in parenthesis**	**Designated Sites**
Arctic tern *Sterna paradisaea*	N/A	N/A	No notable increase in modelled density in Study Area.	N/A	Average: 162 Range: 86-315 (6) Sites: 19	Total: 0
Great skua *Stercorarius skua*	No notable increase in density within the Moray Firth and Study Area.	Low density in Jan, and generally low in Moray Firth and Study Area in July. However, area of increased density (up to 0.5 per km²) at Caithness, associated with Orkney.	Low density in Moray Firth and Study Area, with exception of Caithness Cliffs during breeding season, where density increases to up to 0.5 per km², associated with Orkney population.	N/A	N/R	Total: 0
Arctic Skua *Stercorarius parasiticus*	N/A	N/A	Small increase in density in northernmost portion of Study Area in breeding season (up to 0.2 per km²) and in south and west in migration season (Sep-Nov; up to 1.1 per km²).	N/A	Average: 4 Range: 4 (1) Sites: 2	Total: 0

Common Name	Paxton *et al.* (2022) Density (indv. per km²)	Waggitt *et al.* (2019) Density (indv. per km²)	Kober *et al.* (2010) Density (indv. per km²)	Cleasby *et al.* (2020) and Wakefield *et al.* (2017) Getis-Ord* hotspots	Seabird Monitoring Programme (Burnell *et al.*, 2023) Count (indv.), with years present in parenthesis	Designated Sites
Common guillemot *Uria aalge*	Patchy density up to 1,500 per km² in Jun-Sep (breeding), decreasing in other months with low or no records Oct-Feb. Breeding season hotspot on southern and northwest bank of Moray Firth.	Hotspots on northeastern and southeastern sides of Moray Firth, with up to 6 per km² in July, decreasing to around 3 per km² within Moray Firth itself. 2-3 per km² around Peterhead in Jan.	Two hotspots within Study Area, one to north (Caithness Cliffs) and one to south (Peterhead), where modelled density is up to around 700 per km² in the breeding season. Additional season (post-breeding moult, Aug-Sep), density in these areas decreases to 250 per km², but remain as notable hotspots. Density hotspots also present in the winter season, further inshore within the Moray Firth, where density is up to 60 per km².	Tracking data show hotspots of activity in north and southeast of Study Area, associated with Caithness Cliffs and west and south of Peterhead. Study Area overlaps with top 1% Getis-Ord* hotspots.	Average: 26,096 Range: 23,626-30,663 (3) Sites: 5	Total: 4 SPA: 4 Ramsar: 0 SSSI: 0 NCMPA: 0

Common Name	Paxton *et al.* (2022) Density (indv. per km²)	Waggitt *et al.* (2019) Density (indv. per km²)	Kober *et al.* (2010) Density (indv. per km²)	Cleasby *et al.* (2020) and Wakefield *et al.* (2017) Getis-Ord* hotspots	Seabird Monitoring Programme (Burnell *et al.*, 2023) Count (indv.), with years present in parenthesis	Designated Sites
Razorbill *Alca torda*	Similar distribution as guillemot, but lower density (up to 100 per km² in Apr-Jun; up to 5 per km² in Jul-Oct; and up to 1 in other months). Breeding season average up to 5 per km² throughout Moray Firth, increasing to up to 100 per km² in discrete spot on southern edge.	Hot spot of activity, up to 3 per km² in Jul on north/northeast of Moray Firth, potential for interaction with northern landfall.	Hotspots of increased density modelled in southeast and west of Study Area, within the Moray Firth, with densities up to around 20 per km² in the breeding season. Post-breeding moult period densities increased, notably at Caithness with up to 65 per km². Winter distribution similar to guillemot, although lower density (up to 15 per km²).	Tracking data show hotspots of activity in north and southeast of Study Area, associated with Caithness Cliffs and west and south of Peterhead. Study Area overlaps with top 1% Getis-Ord* hotspots.	Average: 3,096 Range: 130-4,812 (4) Sites: 5	Total: 3 SPA: 3 Ramsar: 0 SSSI: 0 NCMPA: 0
Black guillemot *Cepphus grylle*	N/A	N/A	N/A	N/A	Average: 43 Range: 15-70 (2) Sites: 6	Total: 1 SPs: 0 Ramsar: 0 SSSI: 0 NCMPA: 1

Common Name	Paxton *et al.* (2022) Density (indv. per km²)	Waggitt *et al.* (2019) Density (indv. per km²)	Kober *et al.* (2010) Density (indv. per km²)	Cleasby *et al.* (2020) and Wakefield *et al.* (2017) Getis-Ord* hotspots	Seabird Monitoring Programme (Burnell *et al.*, 2023) Count (indv.), with years present in parenthesis	Designated Sites
Atlantic puffin *Fratercula arctica*	Low density in Moray Firth (0-0.1 per km²), however, up to 100 per km² around southern and northern landfalls (Oct-Mar), and up to 1 per km² at northern landfall in June.	N/A	No notable increase in modelled density in Study Area.	N/A	Average: 30 Range: 30 (1) Sites: 5	Total: 1 SPA: 1 Ramsar: 0 SSSI: 0 NCMPA: 0
Red-throated diver *Gavia stellata*	N/A	N/A	N/A	N/A	N/R	Total: 1 SPA: 1 Ramsar: 0 SSSI: 0 NCMPA: 0
Great northern diver *Gavia immer*	N/A	N/A	N/A	N/A	N/R	Total: 1 SPA: 1 Ramsar: 0 SSSI: 0 NCMPA: 0
Northern fulmar *Fulmarus glacialis*	2-4 per km² in easternmost area in Sep-Jan (non-breeding), up to 6 per km² in Sep and Oct (post breeding).	Around 2 per km² in eastern portion of Study Area, increasing to 4 per km² in northeast toward Shetland and Orkney (July). Low density in January.	No notable increase in modelled density in Study Area.	N/A	Average: 2,005 Range: 200-4,108 (3) Sites: 9	Total: 3 SPA: 3 Ramsar: 0 SSSI: 0 NCMPA: 0

Common Name	Paxton *et al.* (2022) Density (indv. per km²)	Waggitt *et al.* (2019) Density (indv. per km²)	Kober *et al.* (2010) Density (indv. per km²)	Cleasby *et al.* (2020) and Wakefield *et al.* (2017) Getis-Ord* hotspots	Seabird Monitoring Programme (Burnell *et al.*, 2023) Count (indv.), with years present in parenthesis	Designated Sites
Northern gannet *Morus bassanus*	1-2 per km² in Moray Firth, down to 0.75-1 per km² in eastern edge (breeding season).	Generally low density within Study Area, no hotspots with overlap with Study Area. Minor increase in density in July (up to around 1 per km²) in highly localised area near northern landfall.	No notable increase in modelled density in Study Area.	N/A	Average: 6,216 Range: 246-9,650 (3) Sites: 1	Total: 0
Great cormorant *Phalacrocorax carbo*	N/A	N/A	Low density throughout the year (up to 0.2 km²).	N/A	Average: 61 Range: 30-122 (3) Sites: 2	Total: 3 SPA: 2 Ramsar: 0 SSSI: 1 NCMPA: 0
European shag *Gulosus aristotelis*	N/A	Generally low density throughout, with small increase to around 1 per km² on northern side of Moray Firth in July. Highly localised and coastal.	Highly localised hotspot of increased density on northern side of Moray Firth, with modelled densities of up to around 370 per km² in breeding season and up to 100 per km² in winter.	Tracking data show hotspot in north of Moray Firth, although this is highly localised. Study Area overlaps with top 1% Getis-Ord* hotspots.	Average: 240 Range: 45-618 (4) Sites: 4	Total: 3 SPA: 3 Ramsar: 0 SSSI: 0 NCMPA: 0

* Cleasby *et al.* (2022) used Getis-Ord to map hotspots, where "*Getis-Ord, Gi* analysis compares the value of a variable in a given cell and its neighbouring cells to all cells within the analysis field in order to measure the intensity of clustering of high or low values*".

Through review of the data sources and information presented in **Table 7-23**, a list of key receptors within the Marine Ornithology Study Area were identified. The following species are considered key receptors:

- Black-legged kittiwake *Rissa tridactyla*, hereafter referred to as 'kittiwake';
- European herring gull *Larus argentatus*, hereafter referred to as 'herring gull';
- Terns, to include:
  - Common tern *Sterna hirundo*;
  - Arctic tern *Sterna paradisaea*;
- Auks, to include:
  - Common guillemot *Uria aalge*, hereafter referred to as 'guillemot';
  - Black guillemot *Cepphus grylle*;
  - Razorbill *Alca torda*;
  - Atlantic puffin *Fratercula arctica*, hereafter referred to as 'puffin';
- Northern fulmar *Fulmarus glacialis*, hereafter referred to as 'fulmar';
- Northern gannet *Morus bassanus*, hereafter referred to as 'gannet'; and
- European shag *Gulosus aristotelis*, hereafter referred to as 'shag'.

7.5.3.2 INTERTIDAL ORNITHOLOGY STUDY AREA

Northern Landfall

The proposed northern landfall is Sinclair's Bay. WeBS data for nearby sites, including Freswick Bay, Sinclair's Bay and River Wester, Wick Harbour, and Loch Sarclet were reviewed to identify key intertidal receptors at the northern landfall.

Southern Landfall

The proposed southern landfall is Rattray Head. WeBS data for the following nearby sites were reviewed to identify key intertidal ornithology receptors: Boyndie Bay, Deveron Estuary, Fraserburgh to Rosehearty, Fraserburgh Bay (Philorth Estuary), Rattray head to St. Combs, Loch of Strathbeg, Ugie to Rattray head, and Ugie Estuary.

7.5.3.3 DESIGNATED SITES

There are a number of designated sites within the Study Area that have ornithological qualifying features. These sites are listed in **Table 7-24**.

TABLE 7-24: PROTECTED SITES DESIGNATED FOR MARINE AND INTERTIDAL ORNITHOLOGY FEATURES

(Features which utilise areas outside of the boundary of designated sites are emboldened; b = Breeding; nb = Non-breeding)

Site	Qualifying Feature(s)
Special Protection Areas (SPAs)	
North Caithness Cliffs	**Black-legged kittiwake** *Rissa tridactyla* (b), **common guillemot** *Uria aalge* (b), **razorbill** *Alca torda* (b), **Atlantic puffin** *Rissa tridactyla* (b), **northern fulmar** *Fulmarus glacialis* (b), and **seabird assemblage** (b)

Site	Qualifying Feature(s)
East Caithness Cliffs	**Black-legged kittiwake** (b), **great black-backed gull** *Larus marinus* (b), **European herring gull** *Larus argentatus* (b), **common guillemot** (b), **razorbill** (b), **great cormorant** *Phalacrocorax carbo* (b), **European shag** *Gulosus aristotelis* (b), and **seabird assemblage** (b)
Moray Firth	Greater scaup *Aythya marila* (nb), common eider *Somateria mollissima* (nb), velvet scoter *Melanitta fusca* (nb), common scoter *Melanitta nigra* (nb), long-tailed duck *Clangula hyemalis* (nb), common goldeneye *Bucephala clangula* (nb), red-breasted merganser *Mergus serrator* (nb), Slavonian grebe *Podiceps auritus* (nb), red-throated diver *Gavia stellata* (nb), great northern diver *Gavia immer* (nb), and **European shag** (b, nb)
Dornoch Firth and Loch Fleet*	Greylag goose *Anser anser* (nb), Eurasian wigeon *Mareca penelope* (nb), Eurasian teal *Anas crecca* (nb), greater scaup (nb), Eurasian oystercatcher *Haematopus ostralegus* (nb), Eurasian curlew *Numenius arquata* (nb), bar-tailed godwit *Limosa lapponica* (nb), dunlin *Calidris alpina* (nb), common redshank *Tringa totanus* (nb), and waterfowl assemblage (nb)
Cromarty Firth	Greylag goose (nb), whooper swan *Cygnus cygnus* (nb), Eurasian wigeon (nb), northern pintail *Anas acuta* (nb), greater scaup (nb), red-breasted merganser (nb), Eurasian oystercatcher (nb), Eurasian curlew (nb), bar-tailed godwit (nb), red knot *Calidris canutus* (nb), dunlin (nb), common redshank (nb), **common tern** *Sterna hirundo* (b), and waterfowl assemblage (nb)
Inner Moray Firth	Greylag goose (nb), Eurasian wigeon (nb), Eurasian teal (nb), greater scaup (nb), common goldeneye (nb), common merganser *Mergus merganser* (nb), red-breasted merganser (nb), Eurasian oystercatcher (nb), Eurasian curlew (nb), bar-tailed godwit (nb), common redshank (nb), **common tern** (b), **great cormorant** (nb), and waterfowl assemblage (nb)
Moray and Nairn Coast*	Greylag goose (nb), pink-footed goose *Anser brachyrhynchus* (nb), Eurasian wigeon (nb), red-breasted merganser (nb), Eurasian oystercatcher (nb), bar-tailed godwit (nb), dunlin (nb), common redshank (nb), and waterfowl assemblage (nb)
Troup, Pennan and Lion's Head	**Black-legged kittiwake** (b), **European herring gull** (b), **common guillemot** (b), **razorbill** (b), **northern fulmar** (b), and **seabird assemblage** (b)
Buchan Ness to Collieston Coast	**Black-legged kittiwake** (b), **European herring gull** (b), **common guillemot** (b), **northern fulmar** (b), **European shag** (b), and **seabird assemblage** (b)
Ythan Estuary, Sands of Forvie and Meikle Loch	Pink-footed goose (nb), common eider (nb), northern lapwing *Vanellus vanellus* (nb), common redshank (nb), **Sandwich tern** *Thalasseus sandvicensis* (b), **little tern** *Sternula albifrons* (b), **common tern** (b), and waterfowl assemblage (nb)
Ramsar Sites	
Dornoch Firth and Loch Fleet*	Greylag goose (nb), Eurasian wigeon (nb), Eurasian teal (nb) Greater scaup (nb), Eurasian oystercatcher (nb), Eurasian curlew (nb), bar-tailed godwit (nb), dunlin (nb), common redshank (nb), and waterfowl assemblage (nb)
Cromarty Firth*	Greylag goose (nb), bar-tailed godwit (nb), and waterfowl assemblage (nb)
Inner Moray Firth*	Greylag goose (nb), red-breasted merganser (nb), bar-tailed godwit (nb), common redshank (nb), and waterfowl assemblage (nb)
Moray and Nairn Coast*	Pink-footed goose (nb), bar-tailed godwit (nb), common redshank (nb), and waterfowl assemblage (nb)

Site	Qualifying Feature(s)
Sites of Special Scientific Interest	
Loch Fleet*	Common eider (nb), and bird assemblage (b)
Dornoch Firth*	Whooper swan (nb), Eurasian wigeon (nb), and bar-tailed godwit (nb)
Morrich More*	Eurasian wigeon (nb), Eurasian teal (nb), Eurasian curlew (nb), bar-tailed godwit (nb), and bird assemblage (b)
Cromarty Firth*	Whooper swan (nb), Eurasian wigeon (nb), red-breasted merganser (nb), bar-tailed godwit (nb), and common redshank (nb)
Munlochy Bay*	Greylag goose (nb), and Eurasian wigeon (nb)
Beauly Firth*	Greylag goose (nb), and common merganser (nb)
Longman and Castle Stuart Bays*	Eurasian wigeon (nb), common goldeneye (nb), red-breasted merganser (nb), common redshank (nb), and **great cormorant** (nb)
Whiteness Head*	Bar-tailed godwit (nb), and red knot (nb)
Rosehearty to Fraserburgh Coast*	Curlew (nb)
Protected Areas (NCMPAs)	
East Caithness Cliffs	**Black guillemot** *Cepphus grylle* (b)
* Sites with boundaries which are outside the vicinity of the landfalls, and the associated 10 km sediment plume-related buffer, and which are designated for intertidal or coastal features, or for non-breeding features. The features are known to be associated only within the boundary of the site for assessment processes e.g. either exclusively using the intertidal area or seabirds which do not forage beyond the boundary of the site due to over-wintering use of the site.	

7.5.4 MARINE ENVIRONMENTAL ASSESSMENT

7.5.4.1 OVERVIEW

The proposed works have the potential to result in environmental impacts upon ornithology receptor groups. Whilst a formal EIA is not required as part of this MLA, the MEA has been conducted using similar EIA terms and definitions for transparency and ease of understanding.

Definition of Significance

This MEA will assign a level of significance to each receptor-impact pathway, in line with that provided within a formal EIA. **Table 7-25** defines the various levels of significance used within this assessment.

TABLE 7-25: DEFINITIONS OF SIGNIFICANCE FOR APPLICATION WITHIN THE MARINE ENVIRONMENTAL ASSESSMENT

Significance	Definition
Major Adverse/Beneficial Impact	Major Adverse results in an unacceptable level of impact, at sufficient importance to call for serious consideration of changes to the Project (Significant in formal EIA terms)

Significance	Definition
Moderate Adverse/Beneficial Impact	Moderate Adverse results in an unacceptable level of impact, at sufficient importance to call for consideration of changes to the Project (Significant in formal EIA terms)
Minor Adverse/Beneficial Impact	Acceptable level of impact, and unlikely to be sufficiently important to warrant mitigation measures (Non-significant in formal EIA terms)
Negligible Impact	Acceptable level of impact, of such low significance that they are not considered relevant for the decision-making process (Non-significant in formal EIA terms)

Scoping of Potential Impacts

The following potential impacts relevant to Ornithology are scoped into assessment for the construction, operation, and decommissioning phase of the proposed Spittal to Peterhead Cable:

- Vessel-related disturbance and displacement;
- Reduced foraging success due to decreased visibility;
- Short term habitat loss (e.g. via cable burial), where the seabed type will remain similar; and
- Long term habitat loss or alteration (e.g. due to installation of rock protection).

Reduced foraging success due to impacts to prey species, and impacts to habitats supporting prey species have been scoped out of further assessment. This is supported by the impact assessments presented in **Sections 7.2.5**, **7.2.6**, **0**, and **7.3.6**.

The potential impacts have been assessed based on the realistic worst-case parameters outlined within the Project design. For Ornithology these realistic worst-case parameters are outlined within **Table 7-26**.

TABLE 7-26: REALISTIC WORST-CASE PARAMETERS FOR ORNITHOLOGY

Potential Impact	Realistic Worst-case Parameters	Phase
Vessel-related disturbance and displacement	7 vessels operating at one time at the same location/close proximity to each other.	Construction, Operation, and Decommissioning
Reduced foraging success due to decreased visibility	Approximately 172 km is the maximum length of cable installation works anticipated to be undertaken at the seabed, and thus which will result in increased turbidity in the water column. It is anticipated that increases in SSC will be predominantly localised along the cable corridor. Estimations based on North Sea projects occurring under similar hydrodynamic and seabed sedimentary conditions indicate the following transport distances for sediments: • Coarse sediment (>2 mm) = 100 m • Sand (0.062 mm–2 mm) = 700 m • Silt and clay (at a level above 1 mg/l) = up to 2 km	Construction, Operation, and Decommissioning

Potential Impact	Realistic Worst-case Parameters	Phase
Short term habitat loss (e.g. via cable burial), where the seabed type will remain similar	• Length of seabed sediment disturbance by burial =Total (max.) approximate cable length (172,000 m) – length of cable requiring protection (rock berm/crossings) = 25,090 m) = 146,910 m • Width of seabed disturbance from installation tool = 10 m *Area of seabed disturbance by burial = 146,910 m x 10 m = 1,469,100 m² (1.4691 km²)* • Length of seabed disturbance by rock berm/crossings = 25,090 m • Width (max.) of rock berm/crossings = 11 4 m *Area of seabed disturbance as a result of rock berm/crossings = 25,090 m x 11.4 m = 286,026 m²* **Total potential area of short term habitat loss:** = 1,469,100 m + 286,026 m = **1,755,126 m² (1.76 km²)**	Construction, Operation, and Decommissioning
Long term habitat loss or alteration (e.g. due to installation of scour protection)	• HDD exits: 6400 m² • Remedial rock placement: 25,090 m x 11.4 m = 286,026 m²; • Crossings: 5 x 150 m x 11.4 m = 8,550 m²; • Mattresses at reef: 3 m x 2,466 m = 7,398 m². **Total potential footprint of long term habitat loss or alteration: 308,374 m² (3 km²)**	Operation

Each species is assessed for its sensitivity to potential impacts and the magnitude of those potential impacts on the species and/or species group. A combined assessment of sensitivity and magnitude will determine the outcome of the overall risk assessment equating to a significance rating; 'Not Significant' or 'Significant'. If the result of the risk assessment is determined to be 'Significant', mitigation measures are required to be implemented to reduce the residual risk to an acceptable level ('Not Significant'). Detailed guidance for this assessment can be found in **Section 6: Assessment Methodology**.

7.5.5 CONSTRUCTION PHASE

7.5.5.1 VESSEL-RELATED DISTURBANCE AND DISPLACEMENT

Disturbance during the installation of the cable due to vessel presence and activity may temporarily displace birds from the area, resulting in a loss of habitat. Vessel movements can directly disturb and displace birds from their foraging areas. This can result in a reduction in foraging success, and an associated increase in energy expenditure in order to access alternative foraging areas. For the Project, the disturbance will be restricted to the cable installation corridor and the immediate vicinity of the Project vessels when they are operating. The effects are considered to last only for the duration of the cable installation at any single location, and therefore will be direct, temporary, reversible and short term in nature. Once the cable installation is complete and vessel activity ceases at that location, birds are likely to return to these areas.

Sensitivity of Receptors

Kittiwake

Kittiwake are considered to have a low sensitivity to direct vessel-related disturbance and displacement (Cook and Burton, 2010). A wide range of habitat is available to kittiwake. Garthe and Hüppop (1999) found that gull species were attracted to vessel presence, as activities that disturb the seabed can result in benthic organisms being released into the water column where they can be preyed upon. Tolerance is considered very high as gull species are largely insensitive to disturbance and may be attracted to foraging vessels (Cook and Burton, 2010).

Any individuals disturbed by vessel presence are expected to have a short recovery period as they can return to the area once operations have ceased, and vessels have moved away from that location. In addition, kittiwake have a foraging range of 156.1±144.5 km (Woodward *et al.,* 2019) and, therefore, have a large extent of alternative foraging habitat that they can utilise, meaning they are adaptable. As Project vessel-related disturbance is limited to the construction area, and to existing shipping routes/channels, alternative foraging areas are available should individuals be displaced during location-specific operations. Therefore, sensitivity of kittiwake to vessel-related disturbance and displacement is considered **Low**.

Herring Gull

Herring gull are considered to have a low sensitivity to vessel-related disturbance and displacement (Cook and Burton, 2010). They have a wide range of habitat available, with a foraging range of 58.8±26.8 km (Woodward *et al.,* 2019) and, therefore, alternative foraging areas are available should individuals be displaced during cable burial activities. They are considered to have high adaptability and tolerance to increased traffic and disturbance from vessel presence, as gull species are largely insensitive to disturbance (Cook and Burton, 2010; Furness and Wade, 2012; Furness *et al.,* 2013) and are possibly attracted to operating vessels (Cook and Burton, 2010). Any individuals disturbed by vessel presence are expected to have a short recovery period as they can return to the area once operations have ceased, and vessels have moved away from that location. Therefore, sensitivity of herring gull to vessel-related disturbance and displacement is considered **Low**.

Terns

Terns are generally insensitive to vessel disturbance (Cook and Burton, 2010; Fliessbach *et al.,* 2019). A wide range of habitat is available in the region. The area in which vessels will be operating is not of primary usage by terns, particularly as terns typically forage close to their colony and the construction activities are remote from these locations (Urmy and Warren, 2018). Sensitivity of terns to vessel-related disturbance and displacement is considered **Negligible**.

Auks

Auk species (guillemot, black guillemot, razorbill, and puffin) are all similar in ecology and phenology, feeding predominantly on sandeel species and clupeids, such as Atlantic herring (Cook and Burton, 2010). Cook and Burton (2010) state that the three species have similar sensitivities to the effects of vessel-related disturbance (black guillemot were not considered in the Cook and Burton (2010) report). Garthe and Hüppop (2004) and King *et al.* (2009)

reported that auks, including guillemot, black guillemot, razorbill, and puffin, are highly sensitive to disturbance effects associated with shipping traffic (Cook and Burton, 2010). Some auk species have been known to fly from approaching boats hundreds of metres away (Bellefleur *et al.,* 2009). Furness *et al.* (2013) assessed guillemot and razorbill as having moderate sensitivity to disturbance from ship and helicopter traffic, with a sensitivity rating of 3 out of 5 (where 5 is highly sensitive). In the same study puffin was found to be slightly less sensitive, with a rating of 2 out of 5.

Auks generally have a low tolerance to vessel-related disturbance (Cook and Burton, 2010; Furness and Wade, 2012). However, they are considered to have moderate adaptability. This is due to the wide range of suitable habitat available to them outside of the Project disturbance footprint, at any one location during construction phase. This relates to their extensive foraging ranges (Woodward *et al.,* 2019 found the foraging ranges for guillemot to be 73.2±80.5 km; razorbill 88.7±75.9 km; puffin 137.1±128.3 km). Within the species-specific foraging ranges of the Project Area, there are four SPAs for guillemot, three for razorbill, and one for puffin.

Black guillemot are a designated feature of the East Caithness Cliffs NCMPA. Unlike the other three auk species, black guillemot have a highly restricted foraging range of 9.1 Km during the breeding season (Woodward *et al.,* 2019). There is a small area of overlap with this restricted colony foraging area and the nearshore cable installation location and landfall at Rattray Head (128.02 km^2 overlap of foraging range within the installation corridor, out of total foraging range available to the designated population of 915.26 km^2). If construction activity occurs in this area of overlap during the breed season period when the designated population is present, then it is reasonable to assess that some interaction may occur with Project-related vessels.

Auks have a short recovery period to disturbance, as they are able to return to the area in a short timeframe following disturbance events. Sensitivity of auks to vessel-related disturbance and displacement is considered **Medium**.

Fulmar

Fulmar have a wide range of foraging habitat available in the region (Cook and Burton, 2010). They are expected to be present in the Moray Firth in moderate abundances. Fulmar are considered to have a high tolerance and adaptability to vessel disturbance as they are known to have a low sensitivity to vessel-related disturbance (Furness and Wade, 2012; Furness *et al.,* 2013).The species is highly flexible in habitat use and have an extensive foraging range (542.3±657.9 km: Woodward *et al.,* 2019). Consequently, the species is unlikely to be disturbed by vessels associated with construction activities and are also able to easily occupy alternative sea-space. Therefore, sensitivity of fulmar to vessel-related disturbance and displacement is considered **Negligible**.

Gannet

Gannet have a wide range of foraging habitat available in the region and Study area (Cook and Burton, 2010). Gannet are considered to have a high tolerance and adaptability to vessel disturbance as they are highly flexible in habitat use and have an extensive foraging range (315.2±194.2 km based on the study conducted by Woodward *et al.,* 2019).

Additionally, the recovery period is very short, as disturbance and displacement effects will cease immediately once the operation vessels vacate the area. Several other assessments of gannet (Garthe and Hüppop 2004; King *et al.,* 2009) showed the species to have limited sensitivity to disturbance effects; and Cook and Burton (2010) found the species to have a low sensitivity to impacts such as vessel-related disturbance. Therefore, sensitivity of gannet to vessel-related disturbance and displacement is considered **Negligible**.

Shag

Shag are known to be highly sensitive to vessel-related disturbance (Cook and Burton, 2010). However, individuals that had been exposed to habitual anthropogenic environments were less susceptible to disturbance (Morgan, 2017). The species is considered to have low tolerance for vessel presence, and to be somewhat unadaptable to potential impacts due to a short foraging range. Shag have a foraging range of 13.2±10.5 km (Woodward *et al.,* 2019), which includes the East Caithness SPA, approximately 9 km from a component of the cable installation route. Shag are a classified population of the East Caithness SPA. Therefore, sensitivity of shag to vessel-related disturbance and displacement is considered **Medium**.

Magnitude of Effect

Vessel-related disturbance and displacement as a result of the installation of the cable will be highly localised in the context of the Ornithology Study Area, and will be a short term, temporary activity. Increases in vessel traffic is unlikely to be measurable against background levels, as seven vessels will be working during the operations, and there is already a level of vessel traffic in the region. As such, the magnitude of vessel-related disturbance and displacement is considered **Low**.

Assessment Conclusion

A **Negligible** sensitivity for fulmar, gannet, and terns and a **Low** sensitivity for kittiwake and herring gull, along with **Low** magnitude means that risk of vessel-related disturbance and displacement is **Negligible**.

A **Medium** sensitivity for shag and auks and **Low** magnitude means that risk of vessel-related disturbance and displacement is **Minor**.

Overall, the assessment concludes **No Significant Effect** from vessel-related disturbance and displacement throughout the construction phase of the proposed Spittal to Peterhead Cable.

7.5.5.2 REDUCED FORAGING SUCCESS DUE TO DECREASED VISIBILITY

The proposed works involve the laying and burial of cable within the seabed substrate. Due to associated increases in turbidity from sediment plumes the activity has the potential to cause indirect effects on the foraging success of birds. Increased suspended sediment concentrations (increased turbidity) in the water column can make it more difficult for birds to see and locate prey where these increases occur within water depths that seabird species can dive/hunt within.

Any increases in suspended sediment are expected to be temporary, with the sediment quickly settling back onto the seabed. Therefore, the four-dimensional footprint of this potential impact pathway (surficial extent (x and y area), water column depth, and the period of plume presence) will only affect a very limited area associated with the actual cable installation activity (i.e. at the location where the activity is actually occurring at any one point in time).

Sediment dispersion modelling studies have not been undertaken as part of this assessment, but modelling studies from similar North Sea projects suggest that dispersed sediment from cable installation locations can travel up to 700 m for sand, 100 m for coarse sediment, and 2 km for silt and clay (Royal Haskoning, 2011; Scira Offshore Energy Ltd, 2006; Intertek, 2017). These values are well-contained within the realistic worst-case increased turbidity scenario envelope; considered as a 10 km buffer around the proposed cable corridor.

Monitoring from similar relatable projects/activities shows cable-laying causes no major or long term changes in suspended sediment concentrations. Sediments liberated into the water column are shown to settle close to the cable corridor, and measurable impacts are only detectable within a few hundred metres (BERR, 2008; EMU, 2005; SeaScape Energy, 2008).

Given the extensive foraging ranges (and associated areas of habitat space) of the seabird species being assessed it is unlikely that the construction activities will have a significant impact on seabird foraging. Additionally, most sediment disturbance will occur near the seabed, limiting its vertical extent and making it less likely to interact with seabird species. Approximately 93.6% of the cable corridor is situated >25 m water depth (**APPENDIX C: Water Framework Directive Compliance Assessment**). Therefore, promulgation of turbidity increases from near seabed disturbance (associated with cable installation activities) upwards into the water column is highly unlikely to result in significant interactions with seabird foraging behaviours/diving depth thresholds.

Where HDD popouts emerge at 7.5 m and at 10.5 m depth at Rattrey Bay and at Sinclair's bay, respectively, minimal/no sediment disturbance will occur inshore of these points. Additionally, at Rattray Bay the seabed is largely exposed bedrock with a veneer of sediment. This means that trenching will be limited at these locations. These factors, along with the fact that most seabird species forage further offshore means that impact pathways, at these locations, will be reduced in vicinity of/nearshore to Rattray Head.

The evidence base, considering the preceding context of increased turbidity/suspended sediment plumes, and the sensitivity of relevant species/species-groupings in relation to the 'Reduced foraging success due to decreased visibility' impact pathway is presented below.

Sensitivity of Receptors

Kittiwake

Kittiwake are pelagic foragers, relying on vision to locate prey in the top 1 m of the water column (RPS, 2011). Whilst increases in turbidity can affect their ability to detect prey items during foraging, this is unlikely to be the case here, as sediment disturbance will occur near the seabed, limiting its vertical extent. Therefore, kittiwake sensitivity to reduced foraging success due to decreased visibility is considered **Negligible**.

Herring Gull

Herring gull are shallow divers, generally remaining within the top 5-6 m of the water column and are both a predator and scavenger species (RPS, 2011). The Project is in waters predominantly deeper than the species generally dives. In addition, any sediment plumes will be short term and highly localised. Therefore, this also reduces the impacts to their foraging behaviour.

Additionally, herring gull feed on a wide variety of food sources; therefore, the species has a high tolerance to the expected increase in turbidity. The sensitivity of herring gull to reduced foraging success due to decreased visibility is considered **Negligible**.

Terns

Most of the cable corridor exceeds the depth at which terns forage (the top 1 m of the water column: RPS, 2011), therefore it is unlikely to be a primary foraging area for the listed tern species, except at the landfall areas. The foraging range of Arctic tern is 25.7 km±14.8 km, whilst the foraging range of common tern is 18.0 km±8.9 km (Woodward *et al.,* 2019). This means that only the classified population from the Ythan Estuary, Sands of Forvie and Meikle Loch SPA is within foraging range. Terns predominantly prey upon small and young pelagic fish, undertaking shallow dives in relatively clear water to locate prey (Essink, 1999).

Terns have medium tolerance to the increase in turbidity expected from the cable installation activities. Although they require relatively clear water for successful foraging, suspended sediment is expected to return to baseline levels shortly after any cable burial activities. Therefore, the sensitivity of terns to reduced foraging success, due to decreased visibility, is considered **Low**.

Auks

Auks are pursuit divers, relying on their vision in order to locate and pursue prey items in the water, predominantly preying on sandeel species (Harris and Wanless, 1986; Wanless *et al*., 1998; Furness and Tasker, 2000). An increase in turbidity within their species-specific diving range can result in reduced vision and foraging success. This results in increased energy expenditure as individuals may have to spend longer foraging underwater, or even relocate to alternative foraging grounds.

Auks generally have extensive foraging ranges (guillemot 73.2±80.5 km; razorbill 88.7±75.9 km; puffin 137.1±128.3 km; Woodward *et al*., 2019). Black guillemot have a significantly reduced foraging range in comparison to the other auk species (4.8±4.3 km; Woodward *et al*., 2019). Regardless of foraging ranges, auk species are limited in their prey choice. Thus, adaptability is considered medium for the purpose of this assessment.

Auks have a low tolerance to the increased turbidity expected from the operations, as clear water is required for successful foraging. Suspended sediment is expected to return to baseline levels shortly after any cable burial activities, and not promulgate high into the water column. Therefore, recovery from an increase in turbidity will be rapid. The sensitivity of all auk species to reduced foraging success, due to decreased visibility, is considered **Medium**.

Fulmar

Fulmar are known to rely on vision to locate prey as they feed in the top 3 m of the water column (Garthe and Furness, 2001). Increases in turbidity can affect their ability to detect prey items during foraging. However, due to the extensive foraging range of fulmar (542.3±657.9 km; see Woodward *et al.,* 2019), there is a wide spatial extent of habitat available to the species in the region. Therefore, the species has a high adaptability to increases in turbidity as a result of construction activities.

Additionally, the Project is in water depths of -1.2 m to 105.6 m below LAT, which is deeper than fulmar typically dive (REACH Subsea, 2024). Sediment plumes will be short term, reducing potential impacts on their foraging behaviour. Therefore, sensitivity of fulmar to reduced foraging success due to decreased visibility is considered **Low**.

Gannet

Gannet is a plunge diving species, relying on its underwater vision to locate prey (Green *et al*., 2009). Increases in turbidity can affect its ability to detect prey items during foraging, potentially requiring individuals to increase energy expenditure searching for prey items underwater or foraging in alternative areas.

Gannet can target a variety of prey items and have an extensive foraging range (e.g. 315.2±194.2 km; Woodward *et al*., 2019), providing access to a wide range of habitat space in the region. Therefore, they have a high adaptability to localised increases in turbidity, meaning they can avoid areas of increased turbidity until the environment returns to background levels.

The average depth for diving gannet is 8.8 m (NE, 2012), however, they have been recorded diving to depths of up to 25 m (Brierley and Fernandes, 2001). As the Project is located in depths of -1.2 m to 105.6 m below LAT (REACH Subsea, 2024), it is in waters deeper than gannet typically dive, reducing potential impacts on their foraging behaviour. Approximately 93.6% of the cable corridor is situated >25 m water depth (**APPENDIX C: Water Framework Directive Compliance Assessment**).

Gannet are only likely to be impacted if the sediment plumes extend vertically into the top 8.8 m of the water column (NE, 2012); where trenching is the chosen installation methodology.

The species is also considered to have a medium tolerance to increased levels of turbidity as, although they are visual predators that rely on water clarity for efficient foraging, there is a wide range of alternative foraging habitat available within the region. Therefore, sensitivity of gannet to reduced foraging success due to decreased visibility is considered **Low**.

Shag

Shag are predominantly demersal feeders and pursuit-diving predators that rely on visual cues to catch prey on, or close to, the seabed (Wanless *et al*., 1993). They prey on items such as sandeels, particularly *Ammodytes marinus* (Morgan, 2017).

Shag occupy two distinct foraging habitats, rocky sediments and sandy sediments (Wanless *et al*., 1998; Watanuki *et al*., 2008). They may be attracted to areas with large shellfish concentrations (Roycroft *et al*., 2004). Over rocky sediments, they forage at a wide range of depths, feeding on bottom living fish and shellfish whilst over sandy sediments they are more restricted in their range, tending to probe the sand for species such as sandeel (Watanuki *et al*., 2008).

Shag are considered to have medium adaptability to changes in prey availability. Further, shag feed on a wide variety of food sources. Therefore, the species has tolerance to the expected increase in turbidity. Therefore, the sensitivity of shag to reduced foraging success due to decreased visibility is considered **Low**.

Magnitude of Effect

As a result of cable installation, reduced foraging success in relation to decreased visibility will be highly localised in the context of the Ornithology Study Area. The associated effects will also be short term and temporary. As such, the magnitude of reduced foraging success, due to decreased visibility, is considered to be **Low**.

An exception to this will be in relation to a consideration of the landfall locations, and potential localised increases in turbidity, overlapping with the foraging ranges of the designated species. Little tern and common tern, designated features of the Ythan Estuary, Sands of Forvie and Meikle Loch SPA, that is near to the landfall, have foraging ranges that overlap the Project. As such, due to the location and potential localised increases in turbidity, the magnitude is assessed as **Medium**. The East Caithness Cliffs NCMPA that it designated for the auk species black guillemot, is approximately 9 km from the Project, however, only overlaps approximately 0.3 km of its maximum foraging range and, therefore, magnitude is considered to be **Low.**

Assessment Conclusion

A **Negligible** sensitivity for kittiwake and herring gull, and a **Low** sensitivity for fulmar, gannet, shag, along with **Low** magnitude mean that risk of reduced foraging success due to decreased visibility is **Negligible**.

A **Low** sensitivity for terns along with a **Medium** magnitude mean that risk of reduced foraging success due to decreased visibility is **Minor**.

A **Medium** sensitivity for auks and **Low** magnitude means that risk of reduced foraging success due to decreased visibility is **Minor**.

Overall, the assessment concludes **No Significant Effect** from reduced foraging success due to decreased visibility throughout the construction phase of the proposed Spittal to Peterhead Cable.

7.5.5.3 TEMPORARY HABITAT LOSS

The proposed works involve the laying and burial of cable within the seabed substrate, which may cause short term habitat loss, or alteration of benthic and fish communities in areas where the cable will be buried e.g. potentially leading to loss or disruption of fish spawning grounds. This can indirectly affect the foraging success of birds by limiting prey resources, leading to a reduction in foraging success and increased energy expenditure as birds may need to access alternative foraging areas.

While the seabed type will largely remain similar where the cable is buried, there may also be impacts in areas of rocky seabed where Nature Inclusive Design (NID) mattressing or rock are placed to protect the cable. However, the overall impact area is expected to be very small on either side of the cable.

These potential impacts are largely considered to represent a realistic worst-case scenario, as the seabed will generally remain similar to baseline conditions after the works are completed. In some areas, such as crossings across rocky substrate, matressing or the use of rock protection will be required, which may result in more localised changes to the seabed.

Sensitivity of Receptors

Kittiwake

Unlike other gull species, kittiwake show some sensitivity to effects on prey species, as they are more constrained in their prey choice. The species predates sandeel, sprat, and young

Atlantic herring (JNCC, 2021); although they predominantly target lesser sandeel *Ammodytes marinus* (Furness and Tasker, 2000).

Changes at the seabed, due to cable burial activities, may reduce prey availability to kittiwake, as prey may have reduced habitat availability, or may be disturbed or displaced due to the Project operations. Removal of prey species habitat, or alteration of the habitat so that it no longer supports prey species means that individual kittiwake may be required to find alternative foraging habitat, increasing their energy expenditure.

Kittiwake have a wide foraging range (156.1±144.5 km: Woodward *et al.,* 2019), but their dependence on specific prey species gives them a low adaptability to changes in prey availability. However, the prey species are expected to tolerate changes from cable burial in the Project Area. This is indicated by the assessment for fish and shellfish which determined **No Significant Effect** to sandeel Ammodytidae, sprat *Sprattus sprattus* and young Atlantic herring *Clupea harengus* (**Section 7.3 Fish and Shellfish Ecology**).

Recovery from any impacts is expected to occur within a short timeframe, in line with recovery of benthic habitats and fish communities. Impacts to prey resources are likely to be minimal, and no population level effects to kittiwake are predicted. Recovery of seabed habitats will remain similar to the baseline conditions after works have been conducted (**Section 7.2 Benthic Ecology** and **Section 7.3 Fish and Shellfish Ecology**). Therefore, the sensitivity of kittiwake to short term habitat loss is considered **Negligible**.

Herring Gull

Herring gull are expected to be present in the Moray Firth in moderate to high numbers. Herring gull are shallow divers, generally remaining within the top 5-6 m of the water column and are both a predator and scavenger species (RPS, 2011). Changes in seabed due to cable burial activities may reduce prey availability to herring gull, as prey may have reduced habitat availability, or may be disturbed or displaced due to the Project operations. However, they have a foraging range of 58.8±26.8 km (Woodward *et al.,* 2019) and, therefore, have a wide range of foraging habitat available. This includes wider areas within foraging distance of the East Caithness SPA. Furthermore, the species can feed on a wide range of food sources and, therefore, has a high tolerance and adaptability to changes in prey availability.

Given that the Project Area is in waters deeper than herring gull typically dive and forage, they are considered tolerant to the expected changes to the seabed due to cable burial activities at the Project Area.

The benthic biotope and fish and shellfish assessments (**Section 7.2 Benthic Ecology** and **Section 7.3 Fish and Shellfish Ecology,** respectively) have concluded No Significant Effect on these communities. Prey availability for herring gull is unlikely to be significantly impacted. While short term habitat loss or alteration may occur due to the works, the seabed is expected to largely return to baseline conditions after works have been carried out.

Therefore, the sensitivity of herring gull to short term habitat loss is considered **Negligible**.

Terns

Terns are plunge diving species that forage on fish in the upper 1 m of the water column (RPS, 2011). The species in the Study Area forage close to their colonies to reduce energy expenditure (Urmy and Warren, 2018). This means they would only have the potential to be affected by impacts close to the landfall locations.

Terns are highly adaptable and tolerant to temporary habitat loss and alteration due to their ability to target a variety of prey items (Furness *et al.,* 2013; Garthe and Huppop, 2004).

The foraging range of Arctic tern is 25.7 km±14.8 km, while the foraging range of common tern is 18.0 km±8.9 km (Woodward *et al.,* 2019). This means that Ythan Estuary, Sands of Forvie and Meikle Loch SPA is within their foraging range. However, there is a wide area available for foraging outside the vicinity of the operations; particularly in inshore areas where the species preferably forage. Therefore, any short term habitat loss is unlikely to result in any significant interaction or impact on the classified population.

Whilst cable burial activities could reduce prey availability for terns by disturbing or displacing prey species and reducing habitat availability, the burial will be occurring at a depth of 7.5 m at Rattray Head, beyond the typical foraging depth of terns. Therefore, it is unlikely to have a significant effect on the foraging success of terns.

In addition, short term habitat loss or alteration is the realistic worst-case scenario as the seabed will remain similar to the baseline conditions after works have been carried out (within the foraging range and spatial overlap with the Project footprint).

Recovery is expected to occur within a short timeframe, in line with recovery of benthic habitats and fish communities. Habitat removal and impacts to benthic biotopes, and fish and shellfish receptors (as a result of operations within the Project Area) are assessed to have No Significant Effect (**Section 7.2: Benthic Ecology** and **Section 7.3: Fish and Shellfish Ecology** respectively). Therefore, the sensitivity of terns to short term habitat loss is considered **Low**.

Auks

Auks are pursuit divers, meaning the species actively chase prey items underwater. They are considered to have a relatively constrained diet, preying on a limited selection of fish species, predominantly sandeel (Cook and Burton, 2010).

Guillemot, and black guillemot, can dive between 50-180 m; razorbill have a dive depth of 35-120 m, and puffin generally forage between 40-68 m deep (Barrett and Furness, 1990; Burger and Simpson, 1986; Piatt and Nettleship, 1985; RPS, 2011).

Although auks are somewhat specialised in their prey choice, they have an extensive foraging range (guillemot 73.2±80.5 km; razorbill 88.7±75.9 km; puffin 137.1±128.3 km; Woodward *et al.,* 2019) and, therefore, have a wide availability of alternative suitable habitat space in the region. Black guillemot have a significantly reduced foraging range in comparison to the other auk species (4.8±4.3 km; Woodward *et al*., 2019).

Adaptability is considered to be **Medium**. As the seabed is within reach of the maximum diving depths, auks are considered to have a **Medium** tolerance to the expected changes in prey availability.

The benthic and fish and shellfish risk assessments determined **No Significant Effect** to benthic biotopes or fish and shellfish receptors (**Section 7.2: Benthic Ecology** and **Section 7.3: Fish and Shellfish Ecology,** respectively). The seabed is likely to remain similar, or recover rapidly, to the baseline conditions after works have been carried out. Therefore, the sensitivity of auks to short term habitat loss is considered **Medium**.

Fulmar

Changes to seabed habitats due to cable burial activities such as trenching, boulder clearance, laying of mattress rock, and scour protection may have an impact upon the prey species of fulmar. However, fulmar have an extensive foraging range of 542.3±657.9 km (Woodward *et al.,* 2019). There is an extensive amount of foraging habitat available to the species outside of the Project Area. Further to this, the Project Area exceeds the species diving depths, since fulmar typically feed from the surface via scavenging and surface seizing, or via short pursuit dives at depths of up to 3 m (Garthe and Furness, 2001).

It is expected that fulmar will be highly tolerant of, and adaptable to, temporary habitat loss and alteration, due to its ability to target a variety of prey items and use alternative foraging habitats (Cook and Burton, 2010). Any impacts to the benthos and habitats supporting prey species will be temporary, as the seabed will remain similar to the baseline conditions after works have been carried out (**Section 7.2: Benthic Ecology** and **Section 7.3: Fish and Shellfish Ecology**).

Recovery is expected to occur within a short timeframe, in line with recovery of benthic habitats and fish communities, as impacts to prey resources are likely to be minimal and no population level effects to fulmar are predicted. Therefore, the sensitivity of fulmar to short term habitat loss is considered **Negligible**.

Gannet

Changes to seabed habitats due to cable burial activities such as trenching, boulder clearance and laying of mattress protection which impacts benthic communities may reduce the foraging of pelagic fish such as Atlantic herring and sandeel which gannet predate upon. However, gannet are considered to be very tolerant and adaptable to habitat loss and alteration due to their ability to use alternative foraging habitats, owing to their extensive foraging range (e.g. 315.2±194.2 km; Woodward *et al.,* 2019).

Although alteration of the seabed may impact the ability of the habitat to support the prey species of gannet, impacts are likely to be temporary, as the seabed is expected to return to conditions similar to the baseline following installation.

The average diving depth of gannet is 8.8 m (NE, 2012) however, they have been recorded diving to depths of up to 25 m (Brierley and Fernandes, 2001). Therefore, it is likely that they could forage in the deeper waters where installation activities will occur, however the impacts of short term changes to seabed habitats will be highly localised and are will not affect gannet prey species at the scale of their available foraging range/sea habitat accessibility.

The impacts to Atlantic herring and sandeel are determined as having No Significant Effect (Fish and Shellfish Ecology) thus there is no impact on primary prey availability for gannet during the construction period.

As gannet can target a variety of prey items, some of which are pelagic fish, adaptability is considered high.

Recovery is expected to occur within a short timeframe, in line with recovery of benthic habitats and fish communities, as impacts to prey resources are likely to be minimal and no population level effects to gannet are predicted. Therefore, the sensitivity of gannet to short term habitat loss is considered **Negligible**.

Shag

Shag primarily feed on demersal fish and shellfish and have been observed foraging in waters up to 45 m deep, although they are not considered pursuit feeders (Cook and Burton, 2010).

Changes to the seabed due to cable burial activities such as trenching, boulder clearance and laying of mattress protection may reduce prey availability to shag, however, the majority of the construction operations including trenching and the placement of the cable will be in waters exceeding 45 m depth, which is unlikely to directly impact their feeding. The requirement to find alternative foraging habitat would have implications on energy expenditure, and shag have been noted to be relatively inflexible to such needs, due to their shorter foraging range (e.g. 13.2±10.5 km; see Cook and Burton, 2010; Woodward *et al.,* 2019)

The species is less able to utilise alternative foraging areas and, as such, shag is expected to show medium tolerance and adaptability to habitat removal and alteration. Although alteration of the seabed may impact the ability of the habitat to support the prey species of shag, these impacts are likely to be temporary, as the seabed will remain similar to the baseline conditions after works have been carried out.

Recovery of the seabed habitat from trenching is expected to occur within a short timeframe, in line with recovery of benthic habitats and fish communities (**Section 7.2: Benthic Ecology** and **Section 7.3: Fish and Shellfish Ecology**). Impacts to prey resources are likely to be minimal. Therefore, the sensitivity of shag to short term habitat loss is considered **Low**.

Magnitude of Effect

Temporary term habitat loss as a result of the construction of the subsea cable will be highly localised in the context of the Ornithology Study Area and will be a short term, temporary process. As such, the magnitude of short term habitat loss is considered **Low**.

Assessment Conclusion

A **Negligible** sensitivity for kittiwake, herring gull, fulmar, and gannet, and a **Low** sensitivity for shag and terns, along with **Low** magnitude mean that risk of short term habitat loss is **Negligible**.

A **Medium** sensitivity for auks and **Low** magnitude mean that risk of short term habitat loss is **Minor**.

Overall, the assessment concluded **No Significant Effect** from short term habitat loss throughout the construction phase of the Project.

7.5.6 OPERATION PHASE

7.5.6.1 VESSEL-RELATED DISTURBANCE AND DISPLACEMENT

Similar to the Construction phase, vessel-related disturbance during the operational phase may temporarily displace birds from the affected area, resulting in individuals having to travel to other areas to forage. Vessel-related disturbance during the operational phase is expected to be highly infrequent and short term, much less frequent than during the installation phase. There may be no vessel presence on site for several consecutive years, aside from occasional operational surveys every few years. As such, any disturbance or displacement of seabirds due to vessel activity will be minimal, periodic, and temporary in nature, with no constant impact over the 40-year project lifespan.

Sensitivity of Receptors

Operation survey works on the subsea cable, which may occur periodically over the 40-year lifespan of the project, are expected to be highly localised, affecting only small sections of the seabed at any given time. These activities, such as vessel presence during any operational investigation survey activities are unlikely to impact the entire area, and any disturbances are anticipated to have a short recovery period, minimising, the potential effects on bird foraging success in the region.

Kittiwake, fulmar, and gannet are considered to have a **Negligible** sensitivity. Herring gull and terns are considered to have a **Low** sensitivity, while shag and auks are considered to have a **Medium** sensitivity.

Magnitude of Effect

The magnitude of vessel-related disturbance and displacement is expected to be much less than that of the construction phase, being limited to occasional routine surveys.

Assessment Conclusion

As the sensitivity of receptors is not expected to vary between the construction phase and the operation phase, but the magnitude of potential effect is reduced, vessel-related disturbance and displacement is considered of **Negligible** impact, which is **Not Significant**.

7.5.6.2 LONG TERM HABITAT LOSS OR ALTERATION

The proposed works include the laying and burial of cables within the seabed. Such changes may indirectly affect bird foraging success by altering benthic and fish communities where cable stabilisation/protection/crossings are required. In a realistic worst-case scenario, the shift in seabed composition could lead to a reduction in prey availability, forcing birds to expend more energy seeking alternative foraging areas.

Sensitivity of Receptors

Potential impacts resulting from the operation phase are expected to be similar to those assessed for the construction phase. The operational phase are expected to be highly localised, affecting only small sections of the seabed (**Section 7.2: Benthic Ecology** and **Section 7.3: Fish and Shellfish Ecology**). The presence of cable stabilisation/protection/crossings will not impact the entire Ornithology Study Area, minimising the potential effects on bird foraging success in the region.

Kittiwake and herring gull are considered to have a **Negligible** sensitivity. Fulmar, gannet, shag, and terns are considered to have a **Low** sensitivity, whilst auks are considered to have a **Medium** sensitivity.

Magnitude of Effect

The anticipated magnitude of long term habitat loss or alteration is expected to be minimal in the context of the total available sea space/habitat available to all seabird species. Therefore, the magnitude of long term habitat loss or alteration is considered to be **Low**.

Assessment Conclusion

A Negligible sensitivity for fulmar, gannet, and herring gull, and a Low sensitivity for kittiwake, shag, and terns, along with Low magnitude mean that risk of reduced foraging success due to impacts to prey species is **Negligible**.

A Medium sensitivity for auks and Low magnitude means that risk of reduced foraging success due to impacts to prey species is Minor.

Overall, the assessment concludes **No Significant Effect** from reduced foraging success due to impacts to prey species throughout the operation phase of the Project.

7.5.7 DECOMMISSIONING PHASE

Impacts associated with the decommissioning phase of the Project are expected to mirror impacts associated with the construction phase. However, the magnitude of effects are expected to be lower than those during the construction phase. For example, if it is determined that infrastructure such as cable protection is to be left *in situ*, there will be a notable reduction in the potential for seabed habitat disturbance during the decommissioning phase.

Overall, the assessment concludes **No Significant Effect** for all potential impact pathways assessed for construction phase of the Project.

7.5.8 ASSESSMENT SUMMARY

Overall, the Ornithology assessment concludes **No Significant Effects** throughout the construction, operation, and decommissioning phases of the Project.

Due to the assessment concluding no significant effects to ornithology receptors, no additional mitigation is proposed.

Table 7-27 shows the receptors that have been assessed as part of the MEA for Ornithology.

Any overall risk determined to be **Negligible** or **Minor** is '**Not Significant**' i.e. no significant impact results. Any overall risk determined to be **Moderate** or **Major** is '**Significant**' and will require further mitigation(s) to be implemented to minimise or remove the significance of impact to become '**Not Significant**'.

TABLE 7-27: SUMMARY OF IMPACTS TO ORNITHOLOGY RECEPTORS

Potential Impact	Receptor	Sensitivity	Magnitude	Overall Risk	Significance
Construction					
Vessel-related disturbance and displacement	Auks	Medium	Low	Minor	Not Significant
	Fulmar	Negligible	Low	Negligible	Not Significant
	Gannet	Negligible	Low	Negligible	Not Significant
	Herring Gull	Low	Low	Negligible	Not Significant
	Kittiwake	Low	Low	Negligible	Not Significant
	Shag	Medium	Low	Minor	Not Significant
	Terns	Negligible	Low	Negligible	Not Significant
Reduced foraging success due to decreased visibility	Auks	Medium	Low	Minor	Not Significant
	Fulmar	Low	Low	Negligible	Not Significant
	Gannet	Low	Low	Negligible	Not Significant
	Herring Gull	Negligible	Low	Negligible	Not Significant
	Kittiwake	Negligible	Low	Negligible	Not Significant
	Shag	Low	Low	Negligible	Not Significant
	Terns	Low	Medium	Minor	Not Significant
Short term habitat loss (e.g. via cable burial), where the seabed type will remain similar	Auks	Medium	Low	Minor	Not Significant
	Fulmar	Negligible	Low	Negligible	Not Significant
	Gannet	Negligible	Low	Negligible	Not Significant
	Herring Gull	Negligible	Low	Negligible	Not Significant
	Kittiwake	Negligible	Low	Negligible	Not Significant
	Shag	Low	Low	Negligible	Not Significant

Potential Impact	Receptor	Sensitivity	Magnitude	Overall Risk	Significance
	Terns	Low	Low	Negligible	Not Significant
Operation					
Vessel-related disturbance and displacement	All receptors	Low	Low	Negligible	Not Significant
Long term habitat loss or alteration (e.g. due to installation of scour protection)	Auks	Medium	Low	Minor	Not Significant
	Fulmar	Negligible	Low	Negligible	Not Significant
	Gannet	Negligible	Low	Negligible	Not Significant
	Herring Gull	Negligible	Low	Negligible	Not Significant
	Kittiwake	Low	Low	Negligible	Not Significant
	Shag	Low	Low	Negligible	Not Significant
	Terns	Low	Low	Negligible	Not Significant

7.6 COMMERCIAL FISHERIES

7.6.1 INTRODUCTION

This section describes the baseline for Commercial Fisheries within a defined Commercial Fisheries Study Area. This has been developed via a desk-based literature review utilising a range of data sources, including vessel traffic datasets, fisheries landings statistics, vessel activity data and consultation with key stakeholders and has been used to inform the Commercial Fisheries Marine Environmental Assessment in **Section 7.6.4 .** Specific data sources used are below:

- MMO landings data (2016-2022);
- ICES data (2016-2022); and
- Vessel activity data (2017-2020).

The Commercial Fisheries chapter of this MEA Report should be read alongside **Section 7.3: Fish and Shellfish Ecology** and **Section 7.7: Shipping and Navigation**.

The relevant legislation and policy relating to Commercial Fisheries include:

- National Marine Plan: Chapter 6 & 7;
- Marine (Scotland) Act 2010; and
- Marine and Coastal Access Act 2009.

7.6.2 COMMERCIAL FISHERIES STUDY AREA

The Commercial Fisheries Study Area has been defined on the basis of the ICES Rectangles within which at least part of the Cable Corridor passes (as per the Fish and Shellfish Ecology Study Area, **Section 7.3.2**). ICES statistical rectangles standardise the division of sea areas, each are 30 x 30 nautical miles (nm), the smallest spatial units recognised by the MMO and the EU for the calculation of fisheries statistics and stock estimates. The Commercial Fisheries Study Area therefore comprises five ICES Rectangles, including: 46E6, 46E7, 45E7, 45E8 and 44E8. However, the majority of the Cable Corridor lies within ICES rectangles 45E7 and 44E8.

7.6.3 BASELINE ENVIRONMENT

7.6.3.1 OVERVIEW

The Commercial Fisheries Study Area supports a range of commercial fisheries activity, from nearshore potting/creeling vessels, predominantly targeting shellfish (crab, lobster) to offshore fisheries deploying mobile gear (dredges; otter trawls; beam trawls) and targeting fish species such as mackerel, whiting and various flatfish, and shellfish, predominantly king scallop.

7.6.3.2 COMMERCIAL FISHERIES OVERVIEW AND TRENDS

In general, landed weights from ICES Rectangles 44E8, 46E6, 45E7 and 46E7 ranged between 500 tonnes to just under 3,000 tonnes throughout the study period (2016-2022) (**Figure 7-31**) (MMO, 2023).

ICES Rectangle 45E8 showed the greatest variability between years, peaking during 2016 and 2019 at 6,868 tonnes and 6,159 tonnes, respectively, and fell to a minimum landed weight of 1,152 tonnes in 2021.

Landed values exhibited a corresponding trend to that of landed weights (**Figure 7-32**). The total landed value of fish and shellfish across the period (2016-2022) was estimated at over £135 million for ICES Rectangles 46E6, 46E7, 45E7, 45E8 and 44E8 comprising the Commercial Fisheries Study Area, with seasonality not providing a major consideration.

The main landing ports within the Commercial Fisheries Study Area are Wick near the northern landfall and Peterhead and Fraserburgh near the southern landfall. Data from smaller ports that receive landings from vessels fishing within the Commercial Fisheries Study Area have also been considered.

FIGURE 7-31: LANDED WEIGHT (TONNES) THROUGH THE TIMESERIES FOR EACH ICES RECTANGLE WITHIN THE COMMERCIAL FISHERIES STUDY AREA

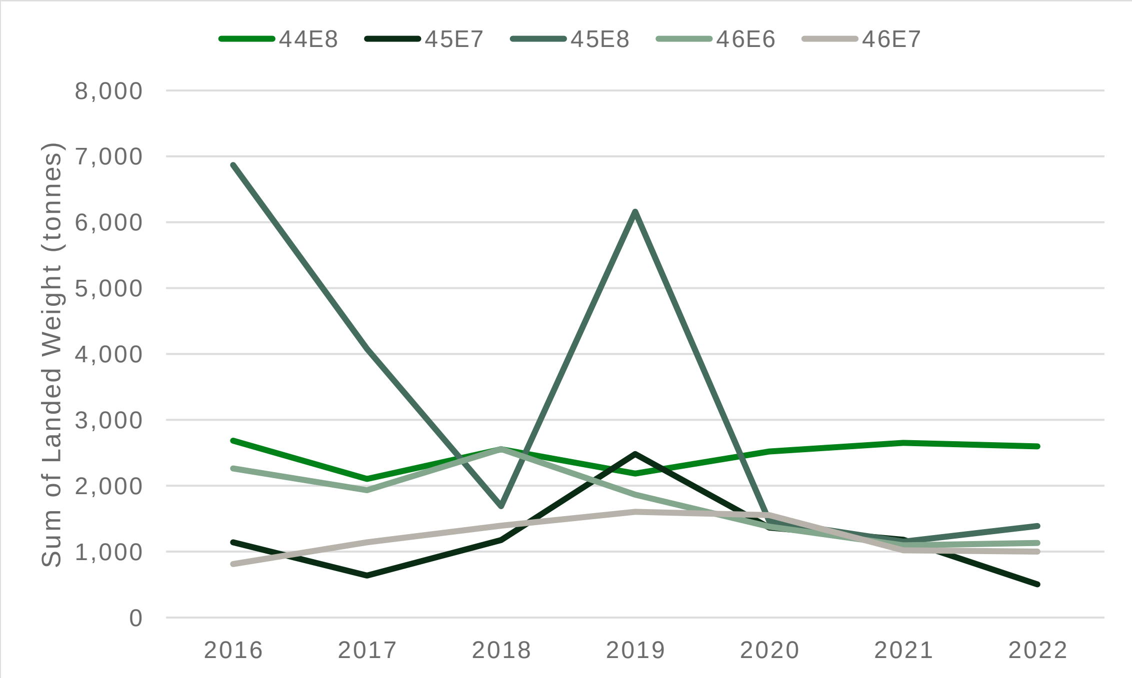
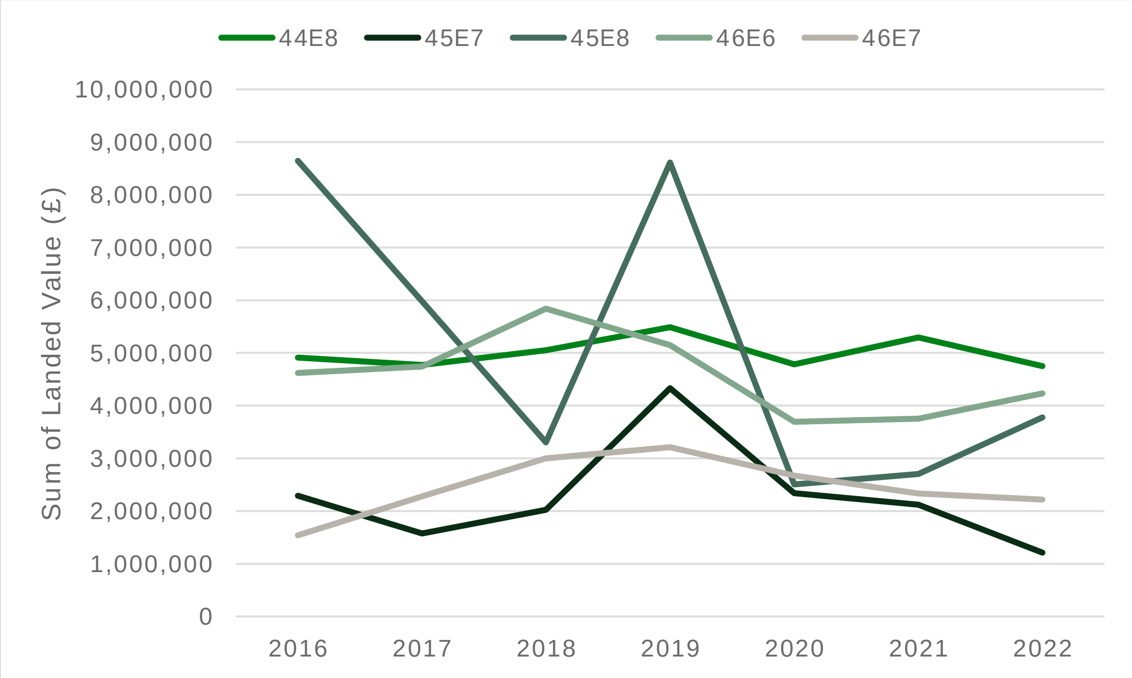


FIGURE 7-32: VALUE OF LANDINGS (£) THROUGH THE TIMESERIES FOR EACH ICES RECTANGLE WITHIN THE COMMERCIAL FISHERIES STUDY AREA



Seasonal landings across the Commercial Fisheries Study Area are largely below 6,000 tonnes each month, with minimum total landings recorded during April at 2,500 tonnes (**Figure 7-33**). Maximum landings were recorded during October, totalling 17,094 tonnes, the majority of which were landed within ICES 45E8 at 11,778 tonnes. Seasonal landed weights correspond to the seasonal landed values, whereby minimum total values were recorded during April, at £6,030,369, and maximum values were recorded in October, at £22,954,409. Highest values during October were recorded within ICES 45E8 at £13,759,753 (**Figure 7-34**).

FIGURE 7-33: TOTAL SEASONAL LANDINGS BY WEIGHT (TONNES) FOR EACH ICES RECTANGLE WITHIN THE COMMERCIAL FISHERIES STUDY AREA (2016-2022)

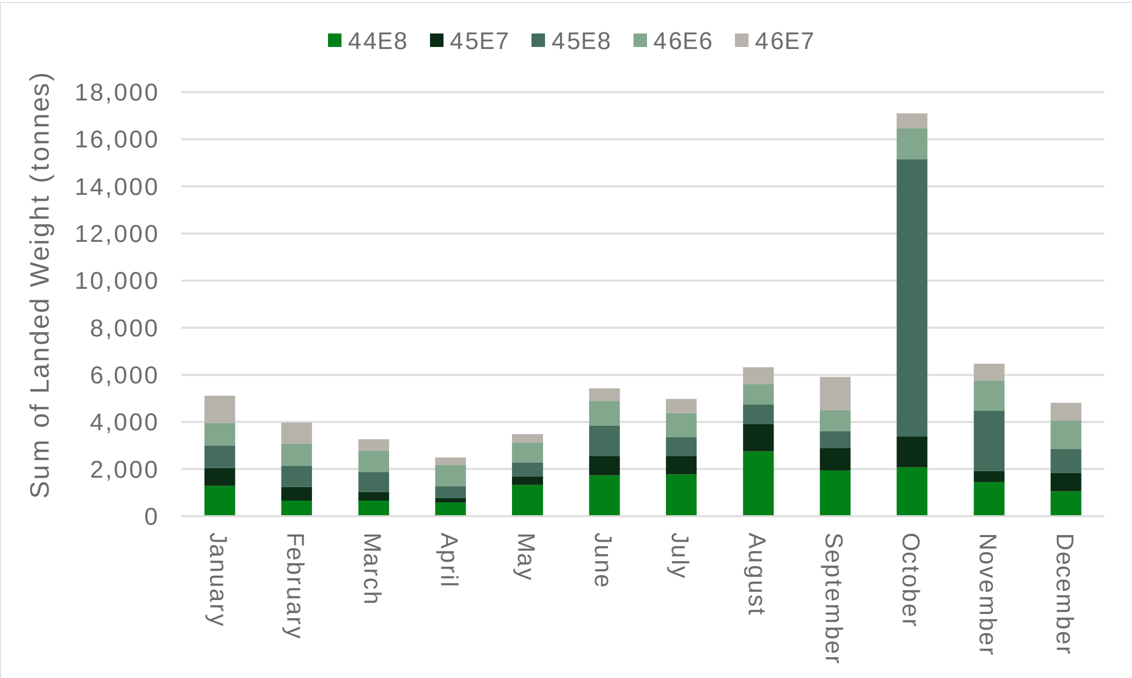
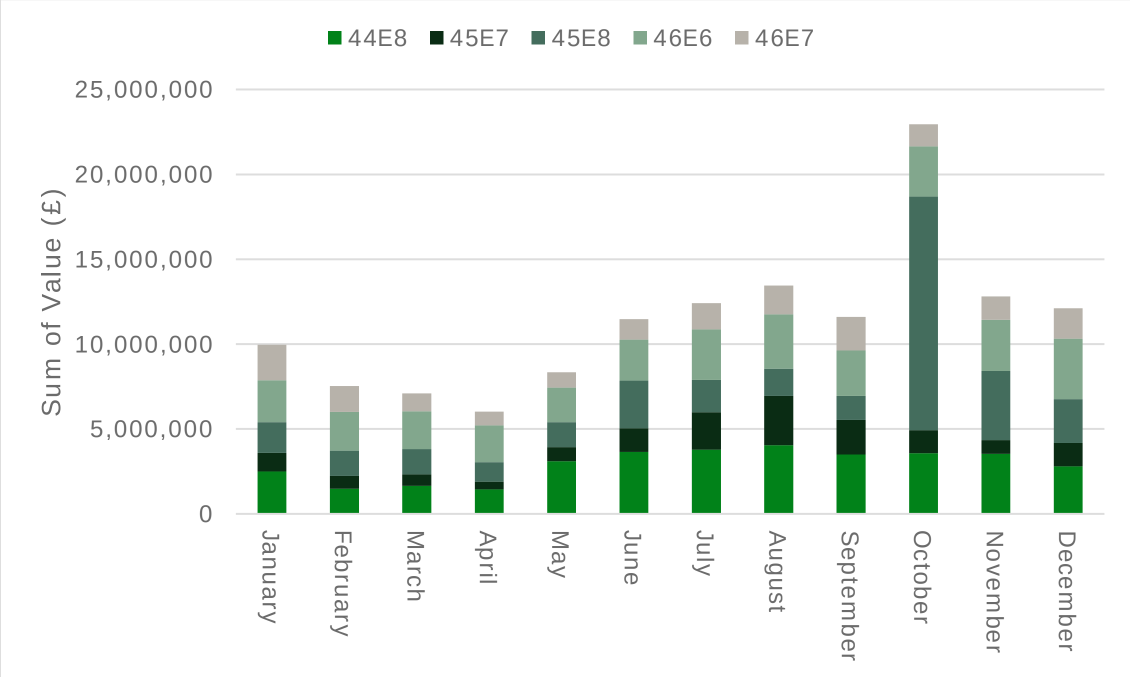
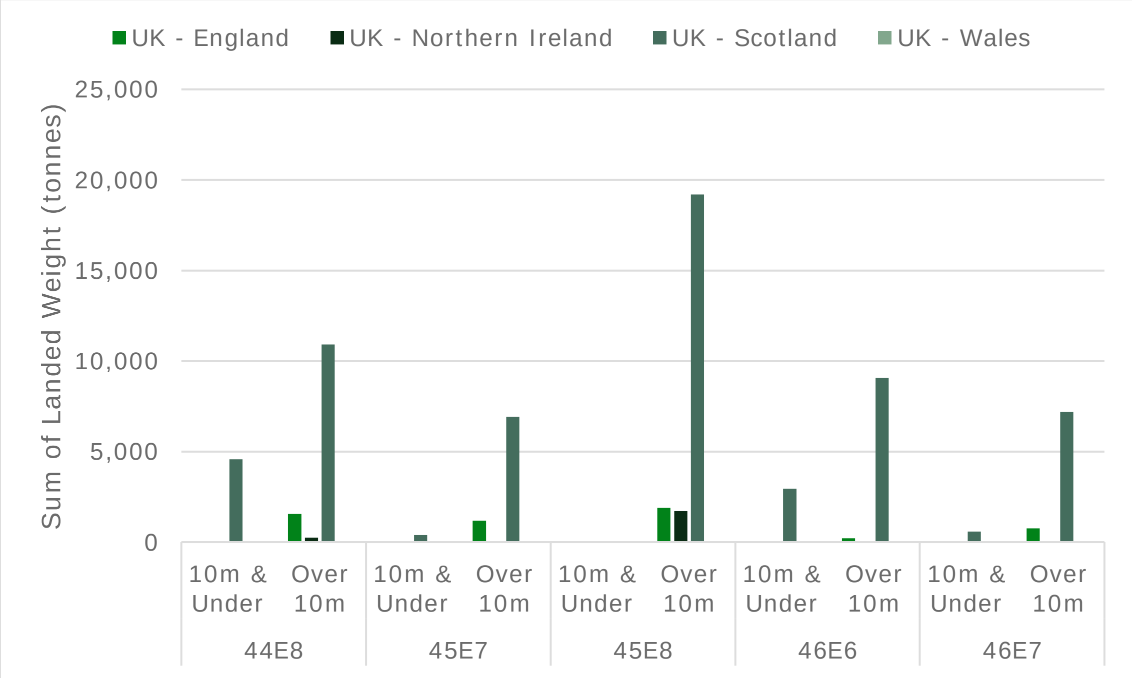


FIGURE 7-34: TOTAL SEASONAL VALUE OF LANDINGS (£) FOR EACH ICES RECTANGLE WITHIN THE COMMERCIAL FISHERIES STUDY AREA (2016-2022)



The majority of landings within the Commercial Fisheries Study Area are made by Scottish vessels, which landed a total of 61,784 tonnes throughout 2016 to 2022 across the Commercial Fisheries Study Area (**Figure 7-35**). Of these landings, Scottish vessels over 10 m accounted for the majority of landings (86% = 53,292 tonnes). Overall, vessels over 10 m accounted for the majority of landings within each ICES Rectangle, where highest landings were recorded within ICES 45E8, and lowest landings were recorded within ICES 45E7. Some landings from English and Northern Irish vessel were also observed. Again, these were mainly by the over 10 m vessel size class and were much lower than landings by Scottish vessels. Landings by Welsh vessels were also recorded within ICES 46E6 by vessels 10 m and under, however these landings had a negligible weight in comparison to Scottish vessels.

FIGURE 7-35: LANDINGS BY VESSEL NATIONALITY AND VESSEL SIZE CLASS ACROSS THE COMMERCIAL FISHERIES STUDY AREA (2016-2022)



Landings of demersal species accounted for the greatest weight, totaling 27,425 tonnes across the Commercial Fisheries Study Area between 2016 to 2022 (**Figure 7-36**). This corresponds to the highest landed weights and values landed by otter trawls, a fishing method which generally targets demersal species (**Figure 7-37**).

Across all species groups, vessels over 10 m accounted for the highest landings (**Figure 7-37**). Landed weights by vessels 10 m and under were below 1,200 tonnes for demersal and pelagic species, while the total landed weight of shellfish species by vessels 10 m and under was 7,073 tonnes. For demersal species, the greatest landed weights were recorded within ICES Rectangles 44E8 and 45E8. For pelagic species greatest landings were from ICES 4548 and for shellfish species the greatest landings were recorded within ICES 44E8 and 46E6.

FIGURE 7-36: LANDINGS BY SPECIES GROUP AND VESSEL SIZE CLASS ACROSS THE COMMERCIAL FISHERIES STUDY AREA (2016-2022)

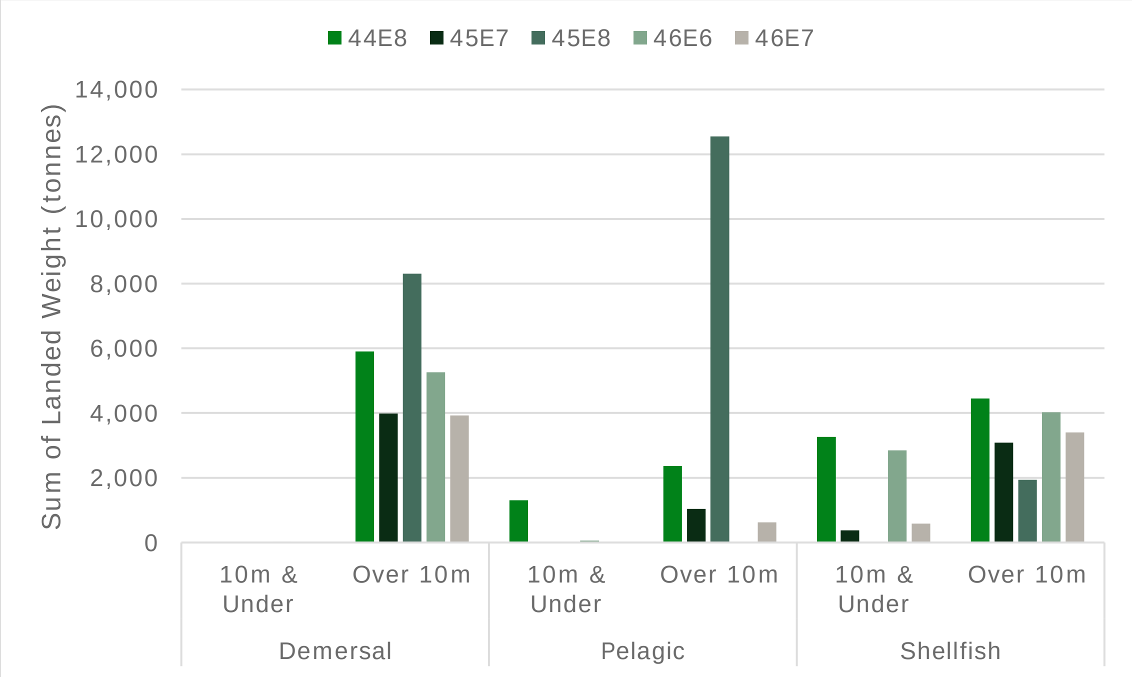
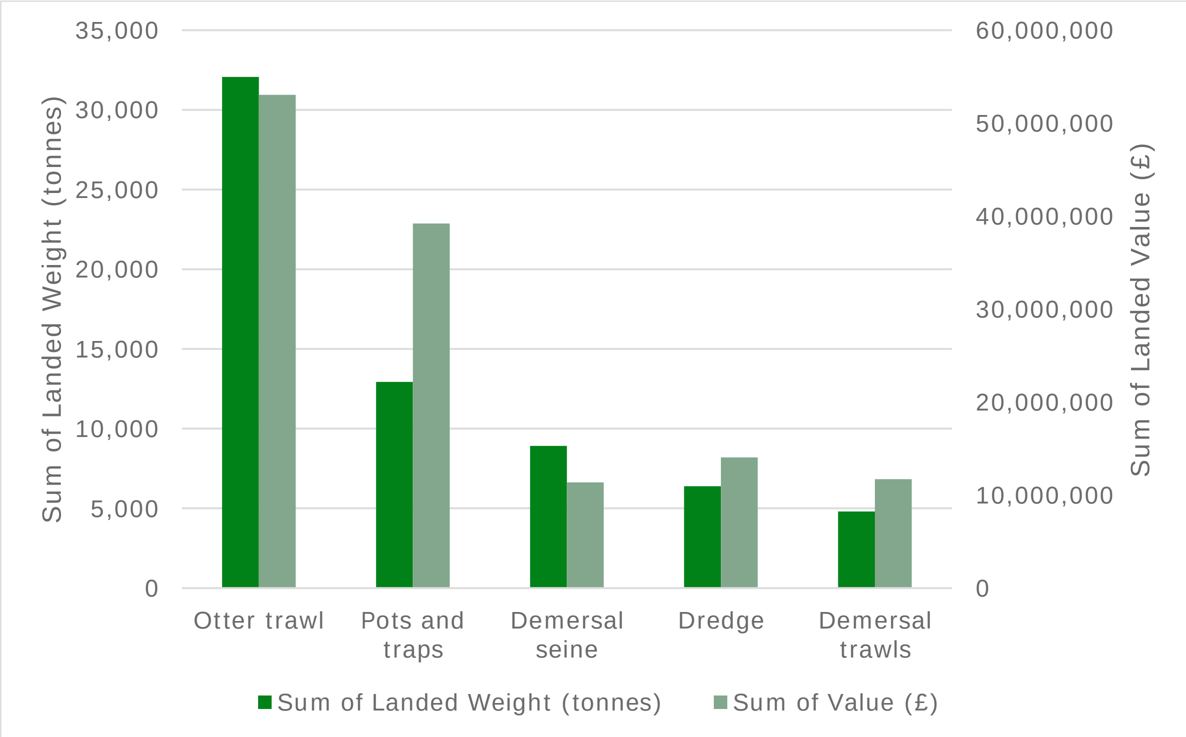


FIGURE 7-37: TOP 5 FISHING METHODS IN TERMS OF LANDED WEIGHT (TONNES) AND VALUE (£) ACROSS THE COMMERCIAL FISHERIES STUDY AREA (2016-2022)



Given the low resolution of ICES fisheries data, it is recognised that descriptors of fishing within each ICES Rectangle represents an average value. This data does not truly capture the heterogeneity of activity level and type within the rectangle and throughout the Commercial Fisheries Study Area.

7.6.3.3 CONSULTATION

Consultation with commercial fisheries stakeholders was undertaken throughout the development process. Public consultations in May and June 2023 took place in fishing ports in proximity to the proposed subsea cable corridor and landfalls in Fraserburgh, Peterhead, and Wick. Fisheries organisations, including the Scottish Fishermen's Federation (SFF), were specifically invited to attend, and were provided with consultation information booklets.

Following, a dedicated meeting between the project, Scottish Fisherman's Federation, and Scottish White Fish Producer's Association was held on the 25 August 2023.

Further face to face meetings held between SSEN Transmission and fishers in Fraserburgh and Peterhead, facilitated by FLO Blackhall and Powis, was held from the 13-15 September 2023.

Blackhall and Powis (FLO) continued dedicated one-to-one meetings with Wick/Keiss Fishers on behalf of SSEN Transmission, from the 18-19 September 2023. Blackhall and Powis FLO held a dedicated meeting between SSEN Transmission and Aberdeenshire creel fishers, on the 08 December 2023.

On the 05 September 2023, within the PAC consultation window, a dedicated meeting with representatives of the SFF and the Scottish White Fish Producers Association (SWFPA) was held.

Pre-Application consultation events were also sited such that most affected fishers would be able to attend, at Keiss, Wick, Fraserburgh, throughout the Project development process.

There was strong attendance from members of the fishing community at the preliminary public consultation events held in 2023, particularly in Fraserburgh. At these events, fishers were keen to understand the programme of works, whether survey activities would restrict fishing in certain areas, and how it would affect their business. They also provided high-level information about where they fished. Some fishers shared their concerns about the emission of electromagnetic fields from subsea cables, which have addressed within our MEA (**Section 7.7.6.7**).

The project maintained regular communication with the fishing community throughout 2023 and 2024. This communication included details of marine survey activities and any necessary collaboration agreements and associated reimbursement of lost income associated with project activities. Where appropriate, the project met with fishers in-person.

The project also held meetings with the SFF and the SWFPA in 2023 and 2024. The meetings were informative and mitigations to minimise disruptions to the fishing community were discussed. The tone of these engagements was generally collaborative.

SSEN Transmission engages on a regular basis with SFF and SWFPA at a portfolio level, where the Project is discussed, and have agreed to meet every 6 months throughout the Project development process.

7.6.3.4 INSHORE FISHERIES

The following section refers largely to inshore fisheries, however, there may be some instances where fishing activity is observed to overlap between inshore and offshore zones within the Commercial Fisheries Study Area.

Inshore fisheries, defined as occurring within 6 nautical miles (nm) from the shore, are dominated by <10 m vessels (MMO, 2023) as presented in **Table 7-28**. Spatial activity data highlights pots (creels) to be the key gear used and the most valuable method (in terms of landings) in the inshore fishery within the Commercial Fisheries Study Area. These vessels primarily target shellfish species.

TABLE 7-28: THE RELATIVE PROPORTION OF VESSEL LENGTHS OF POTTERS IN EACH ICES RECTANGLE ACROSS THE COMMERCIAL FISHERIES STUDY PERIOD (2016-2022)

	44E8	45E7	45E8	46E6	46E7	Grand Total
<10 m	77.01%	64.65%	18.42%	65.99%	37.96%	61.52%
>10 m	22.99%	35.35%	81.58%	34.01%	62.04%	38.48%

In 2018, the greatest intensity of pots and traps activity was located within inshore waters at the southernmost extent of the cable corridor, whilst in 2020 the greatest intensity was located within inshore waters at the northernmost section of the cable corridor (**Figure 7-39**). Approximately 66% of potting vessels in the inshore area at the northern landfall, Sinclair's Bay, are <10m, yielding a regional landed value >£27 million across the study period (2016-2022). The efforts range from approximately 0 to >12,800 kilowatt hour (kwh), and a total landed value of >£39 million across the Commercial Fisheries Study Area.

Around the southern landfall at Rattray Head (located within ICES Rectangle 44E8), approximately 77% of potting vessels in the area are <10 m yielding a regional landed value >£30 million across the study period. They are also responsible for 55% of the value of catches within 46E6.

Potting vessels are active throughout the year, with marginal increases in catch in the summer and autumn months.

There are no active, inactive or deregistered aquaculture sites in the vicinity of the Commercial Fisheries Study Area (Marine Scotland, 2023).

7.6.3.5 OFFSHORE FISHERIES

The following Section refers largely to offshore fisheries, however, there may be some instances where fishing activity is observed to overlap between inshore and offshore zones within the Commercial Fisheries Study Area.

Offshore fisheries (defined as more than 6 nm from the shore), are dominated by UK vessels >10 m (MMO, 2023). In terms of landed weight, landings statistics from the MMO (2021) highlight otter trawling, demersal seine and scallop dredging as the primary offshore fishing methods within the Commercial Fisheries Study Area.

Vessel Monitoring System (VMS) data indicates otter trawls (> 10 m) targeting demersal and shellfish species focus much of their fishing efforts in the northern and southern parts of the Commercial Fisheries Study Area, overlapping the proposed cable corridor in 44E8, 45E7 and 45E8 (**Figure 7-38**). The efforts range from approximately 2,000 to >48,000 kwh and a total landed value of >£42 million across the overlapped area. Otter trawls are most active in the latter half of the year, from June onwards with peaks in catches seen in August, September and October.

Scallop dredging is identified to occur across the proposed cable corridor, with greatest intensity over the southernmost section of the corridor in ICES rectangle 44E8. In this area, efforts of approximately 48,000->96,000 kwh have been recorded with a total landed value of >£5 million across the overlapped area (**Figure 7-41**). A similar area of activity is also identified of comparable effort and value throughout 45E7; however, effort fluctuates within this region across the study period.

Demersal seine effort is generally low across the Study Area (**Figure 7-40**). Seine fishing efforts are predominantly located north of the cable corridor with some overlap in the northwestern region of 45E7, at efforts of approximately 3,000-12,000 kwh and a total landed value of >£2 million across the overlapped area.

Pots and traps effort outside 6 nm is generally low across the Commercial Fisheries Study Area; however, this effort is variable along the proposed cable corridor, between 2017-2020 (**Figure 7-39**).

Demersal trawl effort is variable along the proposed cable corridor and across the Commercial Fisheries Study Area, however overall effort is considered to be low (**Figure 7-42**). Demersal trawl effort is greatest along the northernmost section of the cable corridor, overlapping with inshore waters. Generally, the greatest demersal trawling activity is observed to the east of the proposed cable corridor within the wider Commercial Fisheries Study Area. The efforts range from <2,500 to 100,000 kwh, and a total landed value of >£11 million across the Commercial Fisheries Study Area.

FIGURE 7-38: OTTER TRAWL ACTIVITY WITHIN THE COMMERCIAL FISHERIES STUDY AREA

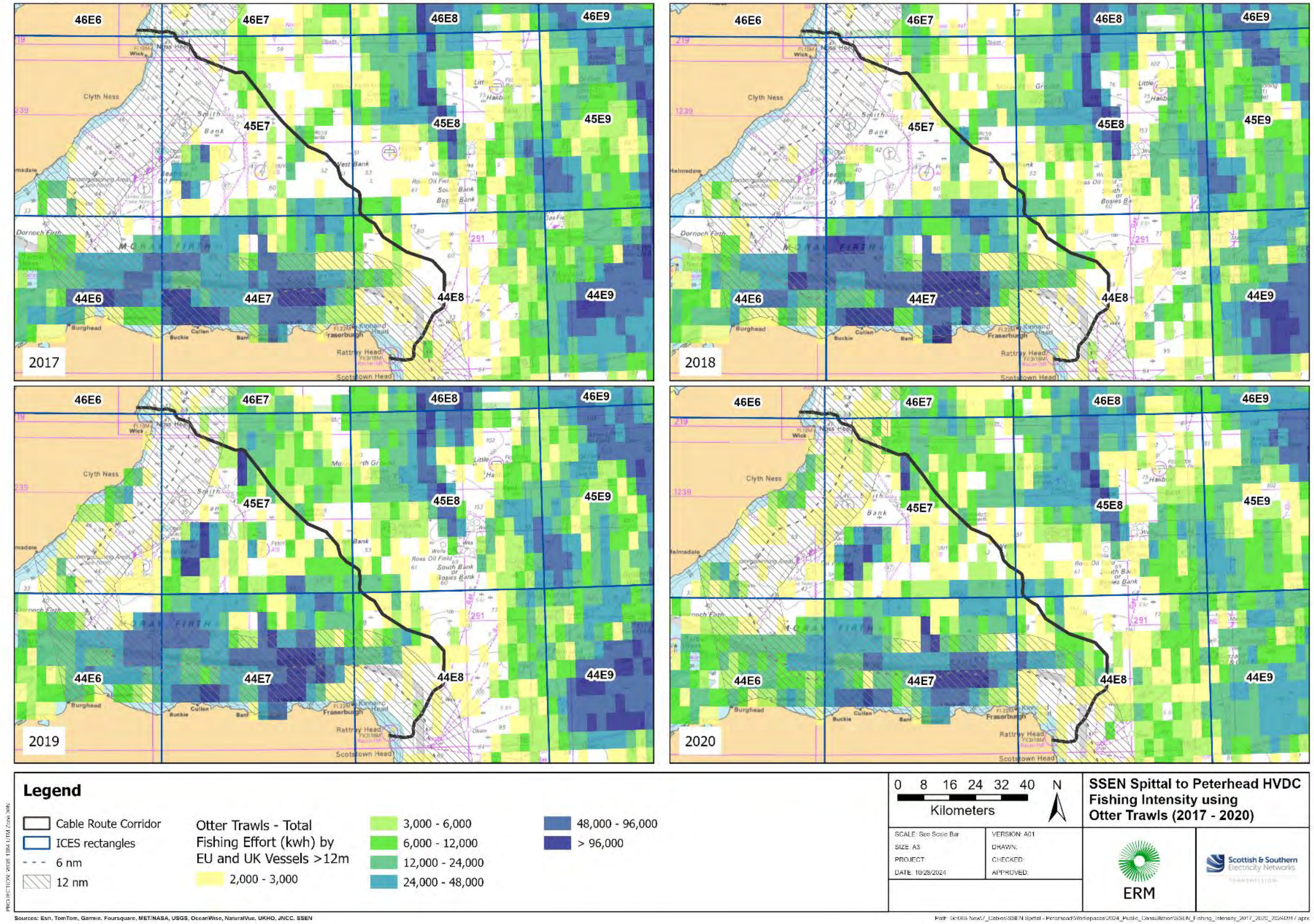
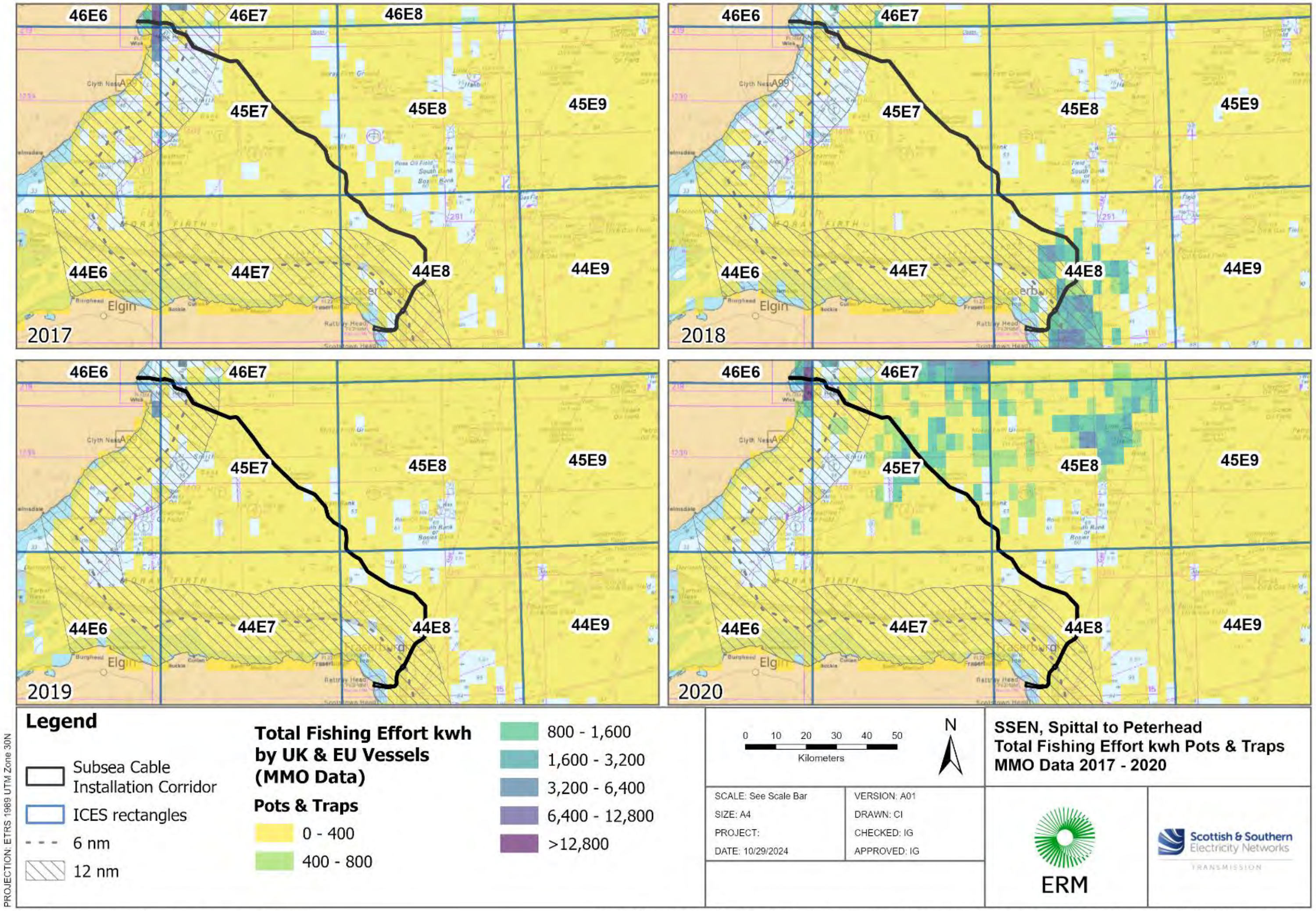


FIGURE 7-39: POTS AND TRAPS ACTIVITY WITHIN THE COMMERCIAL FISHERIES STUDY AREA



SOURCE: World Topographic Map: Esri UK, Esri, TomTom, Garmin, FAO, NOAA, USGS
2182C-0;
World Hillshade: Esri, CGIAR, N Robinson, NCEAS, USGSContains information from the MMO licensed under the Open Government Licence v3.0.

Path: G:\GIS New\7_Cables\SSEN Spittal - Peterhead\Workspaces\2024_Public_Consultation\SSEN_Spittal_Peterhead_PotsandTraps_2017_2020_20240902.aprx / FishingEffort

FIGURE 7-40: DEMERSAL SEINE ACTIVITY WITHIN THE COMMERCIAL FISHERIES STUDY AREA

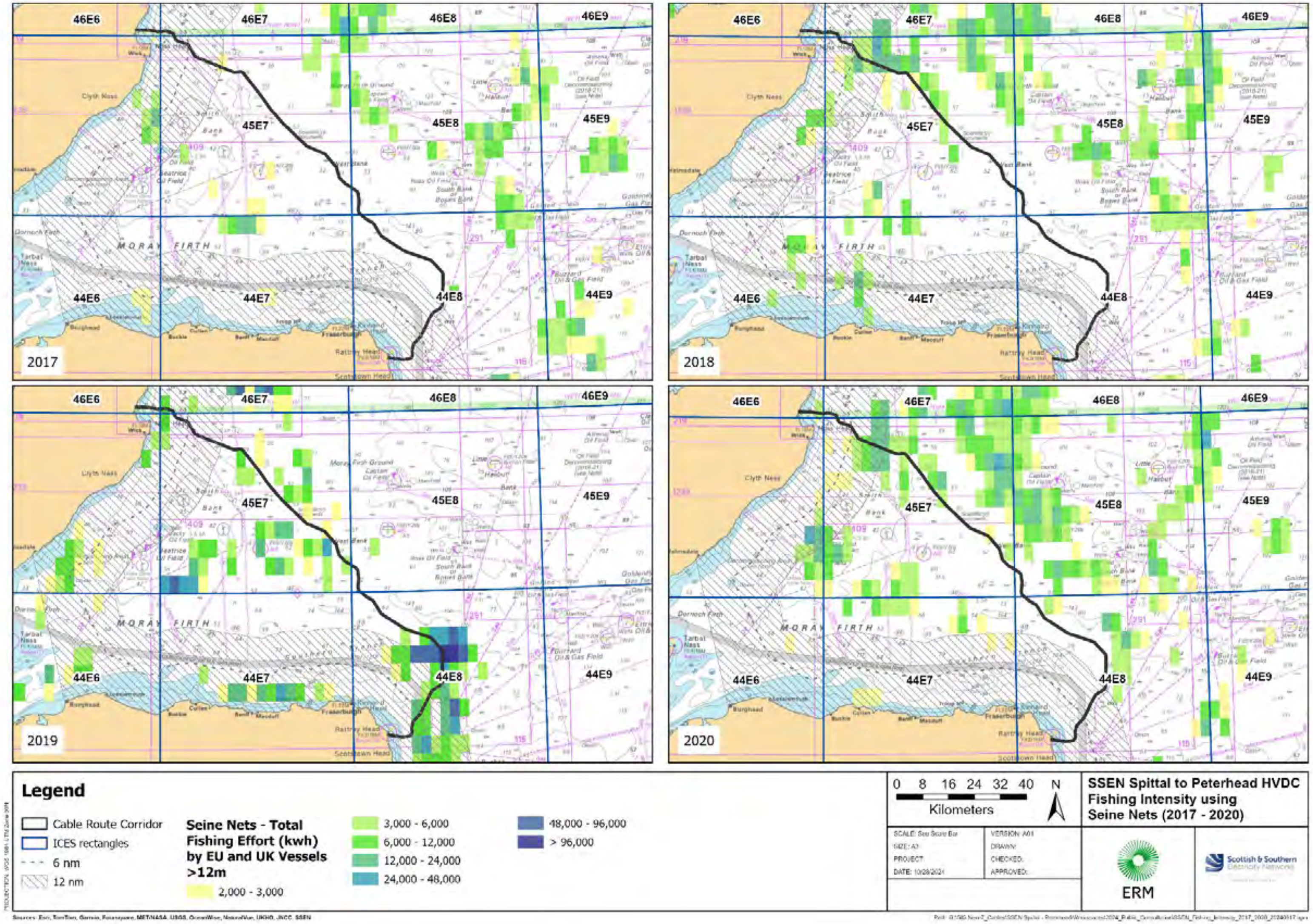


FIGURE 7-41: SCALLOP DREDGING ACTIVITY WITHIN THE COMMERCIAL FISHERIES STUDY AREA

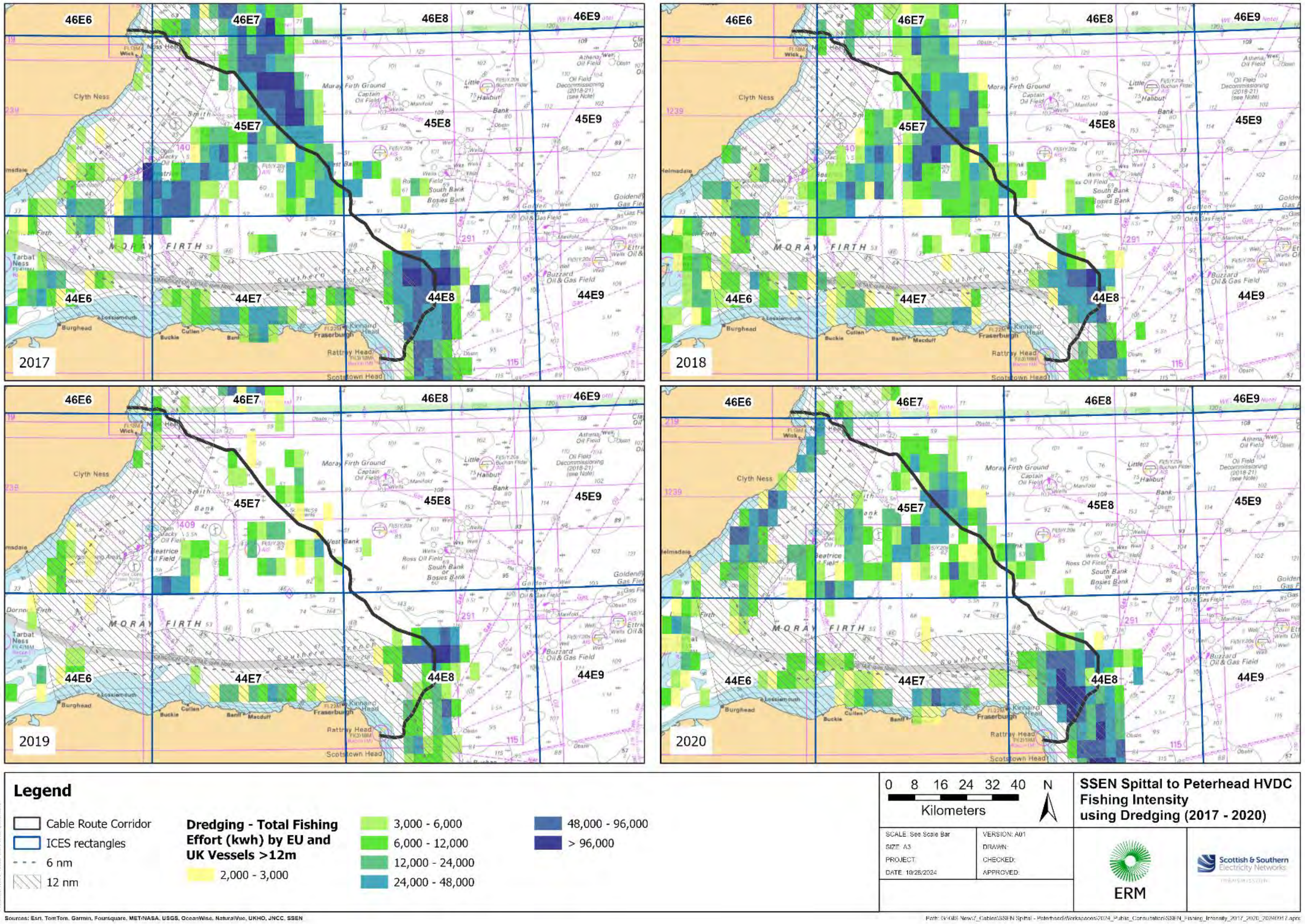
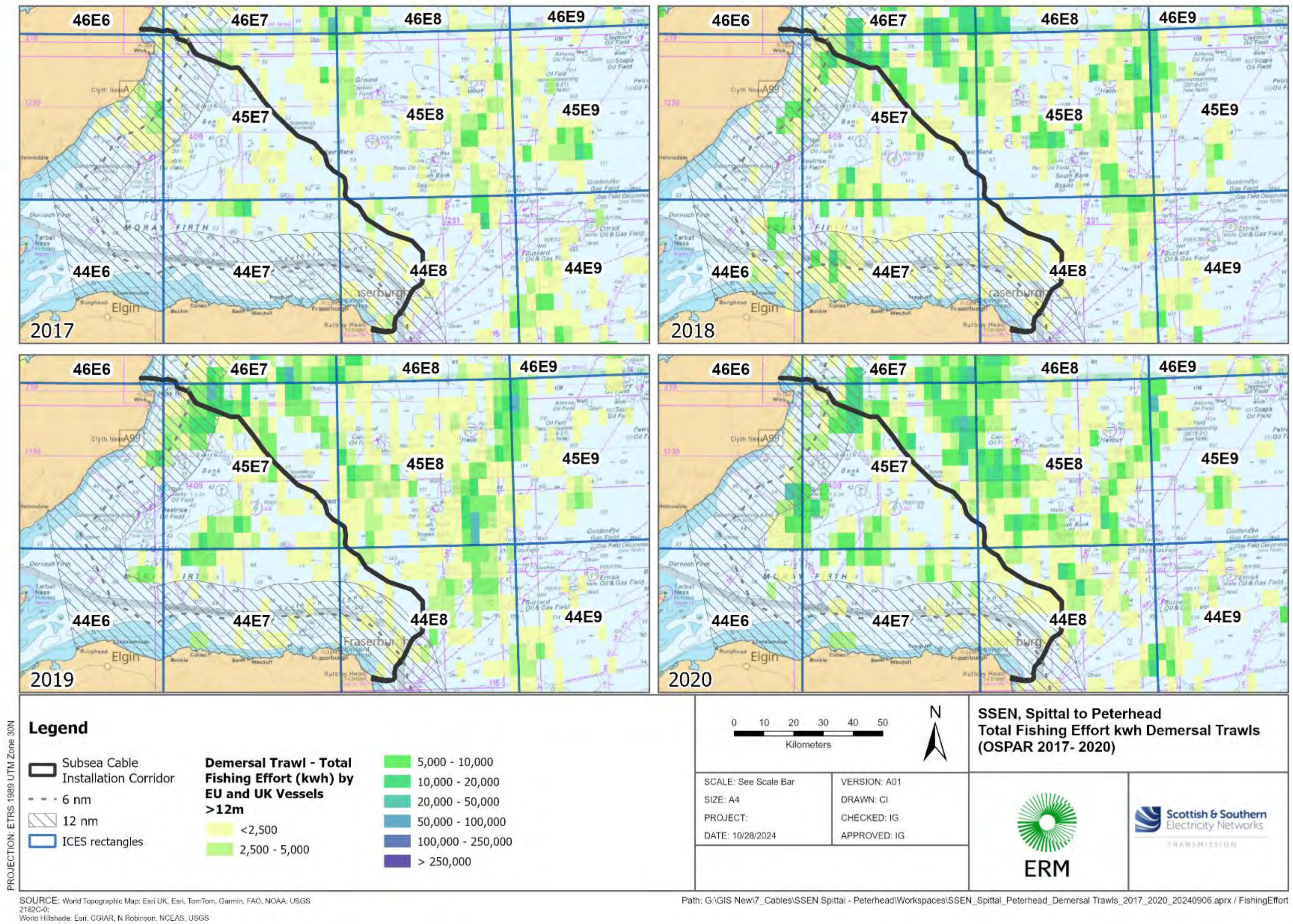


FIGURE 7-42: DEMERSAL TRAWL ACTIVITY WITHIN THE COMMERCIAL FISHERIES STUDY AREA



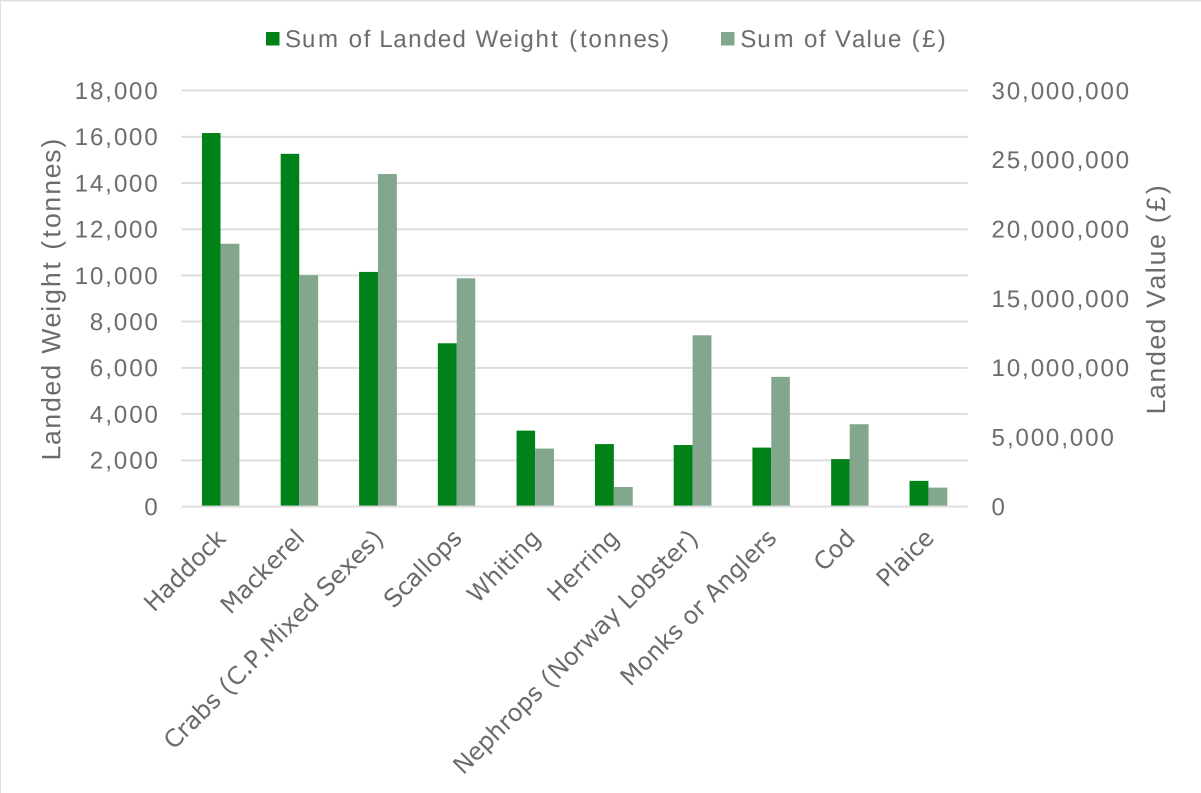
7.6.3.6 COMMERCIALLY IMPORTANT FISH SPECIES

Over the period 2016-2022, the top five commercial species, in terms of landed weights (MMO, 2023), were identified as:

- Haddock *Melanogrammus aeglefinus* (16,164 tonnes);
- Mackerel *Scomber scombrus* (15,256 tonnes);
- Crabs *Cancer pagurus* (C.P.) mixed sexes (10,156 tonnes);
- Scallops *Pectinidae* sp. (7,067 tonnes);
- Whiting *Merlangius merlangus* (3,292 tonnes).

Of these species, crabs accounted for the highest total landed value of £23,989,720 during 2016-2022, significantly exceeding the second highest value of £18,946,452 recorded for haddock.

FIGURE 7-43: SUM OF LANDED WEIGHT (TONNES) AND VALUE (£) OF THE TOP 10 MOST COMMERCIALLY IMPORTANT SPECIES LANDED WITHIN THE COMMERCIAL FISHERIES STUDY AREA



High landed weights of haddock and mackerel correspond to the high landings made by otter trawling vessels in offshore waters (**Figure 7-42** and **Figure 7-43**). Although lower than landings from otter trawls, landings of haddock are also made by vessels using demersal seines and demersal trawls. For shellfish species, crab (C.P. mixed sexes) are predominantly targeted by vessels 10 m and under using pots and traps, whereas scallops are generally targeted by vessels over 10 m using dredges (**Figure 7-42**). Whiting are targeted by a combination of otter trawls, demersal seines and demersal trawls.

7.6.3.7 AQUACULTURE

There are very few aquaculture facilities in the East Sectoral Marine Plan Region, covering both landfall areas and the cable corridor. There is a general presumption against aquaculture currently in place on the east coast of Scotland (Marine Directorate, 2024). Several inactive and de-registered sites are located within the inshore waters of the Moray Firth, however no active fishery, shellfish, finfish, or marine aquaculture sites are located within the Commercial Fisheries Study Area.

7.6.4 MARINE ENVIRONMENTAL ASSESSMENT

7.6.4.1 COMMERCIAL FISHERIES

The analysis of statistical landings data and VMS data has highlighted five key receptors based on their value and presence within the Commercial Fisheries Study Area.

- Otter Trawlers;
- Vessels setting Pots and Traps (Creels);
- Demersal Seine Netters;
- Dredgers; and
- Demersal Trawlers.

Throughout the Construction, Operation, and Decommissioning phases there is the potential for impacts to these receptor groups. These potential impacts have been assessed based on the realistic worst-case parameters outlined within the Project design. For Commercial Fisheries these realistic worst-case parameters are outlined in **Table 7-29**.

TABLE 7-29: REALISTIC WORST-CASE PARAMETERS FOR COMMERCIAL FISHERIES

Potential Impact	Realistic Worst-case Parameters
Construction and Decommissioning	
Temporary loss of access to fishing grounds and displacement of fisheries	Offshore construction programme = 3 years and 7 months Duration of installation = 56.25 days (1,350 hr) **Cable**: Max Total approximate cable length = 172 km Depth of Lowering = 0.6 m (min) - 1.8 m (max) Max height cable protection = 1.125 m Total cable protection footprint (including crossings) = 308,374 m^2 Total volume of cable protection (including crossings) = 223,929.6 m^3 **Installation Project Vessels**: 7 active vessels plus support vessels (8 – 9 guard vessels spaced at 10 – 15 km intervals for every 90 km of cable corridor; maximum 17). Temporary 500 m safety exclusion zone
Impacts to commercially important fish and shellfish species	The realistic worst-case parameters for impacts to fish and shellfish species are detailed fully within **Chapter 8.4 Fish and Shellfish Ecology**. As per impacts during construction for temporary loss of access to fishing grounds and displacement of fisheries.
Operation	

Potential Impact	Realistic Worst-case Parameters
Permanent loss of access to fishing grounds and displacement of fisheries	Operational lifetime = 40 years As per impacts during construction for temporary loss of access to fishing grounds and displacement of fisheries.
Impacts to commercially important fish species	The realistic worst-case parameters for impacts to fish and shellfish species are detailed fully within **Chapter 7.3 Fish and Shellfish Ecology.** The realistic worst-case parameters for impacts to fish and shellfish species are detailed fully within **Section 7.3 Fish and Shellfish Ecology.** As per impacts during operation for temporary loss of access to fishing grounds and displacement of fisheries.
Snagging risk	Operational lifetime = 40 years As per impacts during construction for temporary loss of access to fishing grounds and displacement of fisheries.

As outlined in Table 6-5, embedded mitigation measures for commercial fisheries include:

- All rock berms and external cable protection will be designed to minimise snagging, with slopes of 1:3 or less where possible, and of suitable construction to prevent snagging risk;
- Minimising disruption to commercial fisheries resulting from the installation and operation of the cables;
- A Fisheries Liaison Officer will be employed to manage interactions between cable installation vessels, personnel, equipment and fishing activity. This will be managed through a Fisheries Liaison Mitigation Action Plan (FLMAP);
- Employment of a FLO will ensure all commercial fisheries operators in the vicinity of the Project will be proactively and appropriately communicated with in terms of proposed Project operations including exclusions, dates and durations;
- Implementation of a 500 m radius safety zone around vessels. A 500 m exclusion zone will remain in place during installation activities and applies to all vessels to ensure navigational safety;
- Notice to Mariners (including local), Kingfisher bulletins, Radio Navigational Warnings, NAVTEX, and/or broadcast warnings will be promulgated in advance of any proposed works. The notices will include the time and location of any work being carried out, and emergency event procedures; and
- Ensure navigational safety and minimise the risk and equipment snagging.

7.6.5 CONSTRUCTION PHASE

7.6.5.1 TEMPORARY LOSS OF ACCESS TO FISHING GROUNDS AND DISPLACEMENT OF FISHERIES

During the construction phase, temporary loss of access to fishing grounds and displacement of fisheries has the potential to occur due to the presence of Project vessels with limited maneuverability and exclusion zones during the installation of approximately 172 km of cable and up to 30,403 m of cable protection material. Throughout the anticipated three years and seven months of construction, there may be up to seven active Project vessels (plus support vessels) present at any one time along the cable corridor. It should be noted that installation works will not be continuous throughout the three years and seven months. The installation duration is expected to total 56.25 days across the two campaigns during this period. Temporary exclusion zones of 500 m will be implemented around major installation works to maintain the operational safety of vessels with restricted maneuverability, and a maximum of 17 guard vessels (based on 8–9 guard vessels spaced at 10–15 km intervals for every 90 km of cable corridor) may be used throughout the construction phase to support installation activities.

In line with standard industry best practice measures information on construction activities will be promulgated via Notice to Mariners (NtMs) and locations of installed infrastructure will be marked on admiralty charts. Consultation with the commercial fisheries industry will also continue via the nominated Project Commercial Fisheries Liaison Officer (CFLO) and a dedicated engagement plan will be formalised within the Fisheries Liaison Mitigation and Action Plan (FLMAP).

The installation activities will occur at a low frequency (temporary across the 56.25 days of proposed construction period) throughout the construction phase across the approximate total 172 km cable length and will have a limited spatial extent, i.e. they will only be focused on the areas where cable installation is taking place at any given time. Coupled with the above embedded mitigations, the magnitude of impact for temporary loss of access to fishing grounds and displacement of fisheries is considered to be **Low**.

Otter Trawlers

High fishing effort by otter trawlers is observed along much of the cable corridor and wider Commercial Fisheries Study Area. Otter trawlers are a mobile receptor and due to their large range of fishing activity, are considered to have a high spatial tolerance and adaptability towards temporary loss of access to fishing grounds. Otter trawlers are also responsible for the highest landed weights and values across the Commercial Fisheries Study Area, targeting demersal species such as haddock, mackerel and whiting, making this area of key commercial importance to otter trawlers.

Therefore, otter trawlers are considered to be of a **Medium** sensitivity, due to their high spatial adaptability and tolerance within the region but also having a high commercial dependence on the area.

With a **Low** magnitude of impact and **Medium** sensitivity of receptor, the overall risk to otter trawlers is assessed to be **Minor**, **Not Significant**.

Pots and Traps

Substantial fishing effort by pots and traps is observed along areas of the proposed cable corridor and wider Commercial Fisheries Study Area, particularly in inshore areas. During construction, potting vessels will be required to remove pots from areas where construction is planned; potters may experience a potential loss of earnings due to both the time taken to relocate gear and not being able to fish the grounds under construction. However, it is unlikely that that all pots deployed by a single vessel will be impacted at one time as potting typically involves a number of fleets of pots being deployed across a range of areas. Pots and traps are responsible for the second highest landed weights and values across the Commercial Fisheries Study Area, targeting shellfish species such as crabs, lobsters, and whelks, making this area of high commercial importance to pots and traps. Engagement with affected vessels occurred throughout the Project's development phase and will continue as set out in the Fisheries Liaison Management Action Plan (FLMAP).

Pots and traps are considered to be of **Medium** sensitivity, given their limited ability to deploy different gear types and despite operating across the Commercial Fisheries Study Area are spatially restricted, particularly to inshore areas.

With a **Medium** sensitivity of receptor and **Low** magnitude of impact, the overall risk to pots and traps is assessed to be **Minor**, **Not Significant**.

Demersal Seine Netters

High fishing efforts by demersal seine netters are observed along areas of the proposed cable corridor and wider Commercial Fisheries Study Area, in both inshore and offshore areas. Demersal fisheries including seine netters are considered to have low vulnerability and high adaptability due to their mobile nature and large range of fishing activity. Demersal seine netter activity is variable each year across different regions of the Commercial Fisheries Study Area. Demersal seine netters are responsible for the third highest landed weights and values across the Commercial Fisheries Study Area, targeting demersal and pelagic species such as haddock, whiting, cod, and plaice, making this area of commercial importance to demersal seine netters.

Demersal seine netters are considered to have a **Low** sensitivity, due to their high spatial adaptability and tolerance within the region but also having a moderate commercial dependence on the area.

With a **Low** sensitivity of receptor and **Low** magnitude of impact, the overall risk to demersal seine netters is assessed to be **Negligible**, **Not Significant**.

Dredgers

Large fishing effort by dredgers is observed along areas of the proposed cable corridor and wider Commercial Fisheries Study Area, in both inshore and offshore areas. Dredging activities are undertaken by mobile fleets, which are considered to have a large operational range. UK fleets primarily target scallop species, however, and tend to operate across smaller spatial extents. In this instance, two key areas are located along the proposed cable corridor: inshore in the south and offshore overlapping the cable in the central northern section of the proposed corridor. Dredgers are responsible for the fourth highest landed weights and values across the Commercial Fisheries Study Area, targeting shellfish species consisting primarily of shellfish, making this area of commercial importance to dredgers.

Dredgers are considered to have **High** sensitivity, due to their centralised activity along the proposed cable corridor, specifically the presence of two areas of high fishing efforts, and reduced capabilities to exploit other fishing grounds in the wider site area.

With a **High** sensitivity of receptor and **Low** magnitude of impact, the overall risk to dredgers is assessed to be **Minor**, **Not Significant**.

Demersal Trawlers

Moderate fishing effort by demersal trawlers is observed along areas of the cable corridor and wider Commercial Fisheries Study Area, in both inshore and offshore areas. Demersal trawlers are responsible for the fifth highest landed weights and values across the Commercial Fisheries

Study Area, targeting demersal species such as haddock, Nephrops, monks/anglers, whiting, and cod, making this area of commercial importance to demersal trawlers.

Due to their varying extent in fishing effort across the Commercial Fisheries Study Area, demersal trawlers are considered to have **Medium** sensitivity.

With a **Medium** sensitivity of receptor and **Low** magnitude of impact, the overall risk to demersal trawlers is assessed to be **Minor**, **Not Significant**.

7.6.5.2 IMPACTS TO COMMERCIALLY IMPORTANT FISH AND SHELLFISH SPECIES

During the construction phase, the cable installation activities on the seabed have the potential to impact commercially important fish and shellfish species. The construction phase may lead to impacts through temporary localised disturbance on seabed habitats via suspended sediment concentration and smothering, and underwater noise and vibration. These pathways may generate subsequent impacts (as assessed in **Section 7.3: Fish and Shellfish Ecology** on commercially important fish and shellfish populations. As highlighted in **Section 7.3: Fish and Shellfish Ecology**, commercially important fish and shellfish species that have been identified as having an additional reliance on the Study Area as spawning and/or nursery grounds, or are considered important prey items include Atlantic cod, haddock, whiting, monkfish and anglerfish, European plaice, blue whiting, Atlantic herring, and Atlantic mackerel.

Several shellfish species have commercial value within the Commercial Fisheries Study Area, including brown crab, velvet crab, European lobster, *Nephrops*, king and queen scallop and squid. Of note, *Nephrops* use the Fish and Shellfish Ecology Study Area as low intensity spawning and nursey grounds. Potential effects on these species include behavioural changes or increases/declines in abundance, which could subsequently affect the commercial fisheries that target those species.

Consultation with the commercial fisheries industry will also continue via the nominated Project CFLO and a dedicated engagement plan will be formalised within the Fisheries Liaison Mitigation and Action Plan. It should be noted that no significant adverse effects on fish or shellfish species were assessed within **Section 7.3: Fish and Shellfish Ecology**. Due to the temporary nature of installation activities occurring at a low frequency throughout the construction phase across the approximate total 172 km cable length and in consideration of the above embedded mitigations, the magnitude of impact to commercially important fish and shellfish species is considered to be **Low**.

Otter Trawlers

As detailed in **Section 7.5.6.1** (Otter Trawlers), high fishing effort by otter trawlers is observed along much of the proposed cable corridor and wider Commercial Fisheries Study Area, recording the highest landed weight and value out of all receptor groups identified. Otter trawling methods primarily target demersal and benthic fish and invertebrate species, including gadoids (including whiting, haddock, pollock, cod), flatfishes and shrimps/prawns (FAO, 2024a). Mackerel was the highest landed species (by weight) by otter trawlers, followed by haddock, whiting, Nephrops, monkfish and anglerfish, cod, herring and plaice, respectively. As identified in **Section 7.3: Fish and Shellfish Ecology**, both the Fish and Shellfish Ecology Study Area and overlapping Commercial Fisheries Study Area host key species with high conservation status and commercial value, including haddock, whiting monkfish and anglerfish, Atlantic cod and *Nephrops*. Some of these species also utilise both Study Areas as spawning and/or nursery grounds; the proposed cable corridor is located specifically within areas of medium and high potential for Atlantic herring spawning grounds.

The pathways for impact previously described i.e. temporary disturbance via suspended sediment concentration and smothering and underwater noise and vibration, may result in an impact to the spawning and/or nursey grounds, or prey species, and a subsequent change in the distribution of landings identified.

Therefore, within the Commercial Fisheries Study Area, otter trawlers are considered to be of a **Medium** sensitivity, due to their high commercial dependence on the area.

With a **Medium** sensitivity of receptor and **Low** magnitude of impact, the overall risk to otter trawlers is assessed to be **Minor**, **Not Significant**.

Pots and Traps

As detailed in **Section 7.5.6.1** (Pots and Traps), substantial fishing effort by pots and traps is observed along areas of the cable corridor and wider Commercial Fisheries Study Area, with the highest densities observed in inshore areas. Potting and trapping methods primarily target crustaceans (including lobster, crabs and shrimp) and shellfish (FAO, 2024b,c). Crabs were the highest landed species by pots and traps, followed by whelks and lobster (*Nephrops*), respectively. As identified in **Section 7.3: Fish and Shellfish Ecology**, both the Fish and Shellfish Ecology Study Area and overlapping Commercial Fisheries Study Area, host key shellfish species, with high commercial value, including brown and velvet crabs, *Nephrops* and European lobster. Some of these species (of note, European lobster) are species of conservation importance and listed as Priority Marine Features (PMFs).

The pathways for impact previously described i.e. temporary disturbance via suspended sediment concentration and smothering from cable installation on the seabed and underwater noise and vibration, may result in an impact to the PMFs, and a subsequent change in the distribution of landings identified.

Therefore, within the Commercial Fisheries Study Area, pots and traps are considered to be of a **Medium** sensitivity, due to their high commercial dependence on the area.

With a **Medium** sensitivity of receptor and **Low** magnitude of impact, the overall risk to pots and traps is assessed to be **Minor**, **Not Significant**.

Demersal Seine Netters

As detailed in **Section 7.5.6.1** (Demersal Seine Netters), large fishing effort by demersal seine netters is observed along areas of the cable corridor and wider Commercial Fisheries Study Area, in both inshore and offshore areas. Demersal seine netting methods primarily target demersal species, but in some instances pelagic species too (FAO, 2024d). Haddock were the highest landed species by demersal seine netters, followed by whiting, cod, plaice and monkfish and anglerfish, respectively. As identified in **Section 7.3: Fish and Shellfish Ecology**, both the Fish and Shellfish Ecology Study Area and overlapping Commercial Fisheries Study Area, host key species with high conservation status and commercial value, including haddock whiting, Atlantic cod, and monkfish and anglerfish. Some of these species have an additional reliance to the Study Areas, as spawning and/or nursery grounds.

The pathways for impact previously described i.e. temporary disturbance via suspended sediment concentration and smothering from cable installation on the seabed and underwater noise and vibration, may result in an impact to the spawning and/or nursey grounds, or prey species, and a subsequent change in the distribution of landings identified.

Therefore, within the Commercial Fisheries Study Area, demersal seine netters are considered to be of a **Medium** sensitivity, due to their high commercial dependence on the area.

With a **Medium** sensitivity of receptor and **Low** magnitude of impact, the overall risk to demersal seine netters is assessed to be **Minor**, **Not Significant**.

Dredgers

As previously mentioned, (**Section 7.5.6.1** (Dredgers)), large fishing effort by dredgers is observed along areas of the cable corridor and wider Commercial Fisheries Study Area, in both inshore and offshore areas. Dredger methods primarily target shellfish and mollusc species, including mussels, oysters, scallops and clams (FAO, 2024e). Scallops were the highest landed species by dredges, followed by minor landings of sole, respectively. As identified in **Section 7.3: Fish and Shellfish Ecology**, both the Fish and Shellfish Ecology Study Area and overlapping Commercial Fisheries Study Area, host key shellfish species with a high commercial value, including scallops.

The pathways for impact previously described i.e. temporary disturbance via suspended sediment concentration and smothering from cable installation on the seabed and underwater noise and vibration, may result in an impact to the spawning and/or nursey grounds, or prey species, and a subsequent change in the distribution of scallop and mollusc landings identified.

Therefore, within the Commercial Fisheries Study Area, dredgers are considered to be of a **Medium** sensitivity, due to their high commercial dependence on the area.

With a **Medium** sensitivity of receptor and **Low** magnitude of impact, the overall risk to dredgers is assessed to be **Minor**, **Not Significant**.

Demersal Trawlers

As previously mentioned (**Section 7.5.6.1** (Demersal Trawlers)), large fishing effort by demersal trawlers is observed along areas of the cable corridor and wider Commercial Fisheries Study Area, in both inshore and offshore areas. Demersal trawling methods primarily target a range of bottom and demersal species (FAO, 2024f). Haddock were the highest landed species by demersal trawlers, followed by *Nephrops*, monkfish and anglerfish, whiting, cod and plaice, respectively. As identified in **Section 7.3: Fish and Shellfish Ecology**, both the Fish and Shellfish Ecology Study Area and overlapping Commercial Fisheries Study Area, host key demersal and shellfish species with a high commercial value, including haddock, *Nephrops*, monkfish and anglerfish, whiting and Atlantic cod.

The pathways for impact previously described i.e. temporary disturbance via suspended sediment concentration and smothering from cable installation on the seabed and underwater noise and vibration, may result in an impact to the spawning and/or nursey grounds, or prey species, and a subsequent change in the distribution of landings identified.

Therefore, within the Commercial Fisheries Study Area, demersal trawlers are considered to be of a **Medium** sensitivity, due to their high commercial dependence on the area.

With a **Medium** sensitivity of receptor and **Low** magnitude of impact, the overall risk to demersal trawlers is assessed to be **Minor**, **Not Significant**.

7.6.6 OPERATION PHASE

7.6.6.1 PERMANENT LOSS OF ACCESS TO FISHING GROUNDS AND DISPLACEMENT OF FISHERIES

The Project has committed to cable burial where possible and following completion of installation all permanent Project infrastructure locations will notified to the UK Hydrographic Office (UKHO) and Kingfisher Bulletin during and after construction works. Furthermore, the Project will not exclude commercial fishing activities from the cable corridor other than during operational investigation works. It is therefore expected that fishing will be able to resume where it is safe to do so. Even so, for certain vessels/gear types, the perceived risk associated with and the potential presence of areas of shallow buried cable, cable exposures and/or external cable protection could lead to parts of the proposed cable corridor becoming areas lost to fishing activity.

Therefore, commercial fishing activity may be affected via permanent loss of access to fishing grounds, across the operational lifetime of the cable over 40 years. An associated reduction in revenue may occur. Displacement of fishing vessels from such areas onto adjacent grounds may also arise, with the consequent potential impact on vessels that currently fish these adjacent grounds. The length of the cable corridor requiring external cable protection is minimal and, therefore, the spatial extent of the potential loss for bottom-contacting gear types is also minimal. The magnitude of impact for permanent loss of access to fishing grounds and displacement of fisheries is therefore considered to be **Low**.

Otter Trawlers

As bottom contacting vessels, otter trawls may lose access to discrete areas along the cable corridor where cable exposures, shallow burial and/or external cable protection is present, throughout the operational lifetime of the project. In instances where cable burial is not feasible, external cable protection is proposed to be used. Otter trawlers have large operational areas within the Commercial Fisheries Study Area, and therefore, areas along the cable corridor where cable protection is present, can be easily avoided. Therefore, otter trawlers are considered to be of a **Medium** sensitivity, due to their high spatial adaptability and tolerance within the region but also having a high commercial dependence on the area.

With a **Medium** sensitivity of receptor and **Low** magnitude of impact, the overall risk to otter trawlers is assessed to be **Minor**, **Not Significant**.

Pots and Traps

Pots and traps (creels) vessels will be able to continue to deploy gear along the entire cable corridor during the operational phase, including in areas where external cable protection exists. Therefore, pots and traps vessels are considered to be of a **Negligible** sensitivity.

With a **Negligible** sensitivity of receptor and **Low** magnitude of impact, the overall risk to pots and traps is assessed to be **Negligible**, **Not Significant**.

Demersal Seine Netters

As bottom contacting vessels, demersal seine netters may be impacted by discrete areas along the cable corridor where cable exposures, shallow burial and/or external cable protection is present, throughout the operational lifetime of the project. In instances where cable burial is not feasible, external seabed cable protection is proposed to be used. Demersal seine netters attain moderate activity within the Commercial Fisheries Study Area, however as they are a mobile receptor, spatial adaptability can be achieved where there is likely to be an impact with external cable protection during the operational phase. Therefore, demersal seine netters are considered to be of a **Medium** sensitivity, due to their high spatial adaptability and tolerance within the region but also having a high commercial dependence on the area.

With a **Medium** sensitivity of receptor and **Low** magnitude of impact, the overall risk to demersal seine netters is assessed to be **Minor**, **Not Significant**.

Dredgers

As bottom contacting vessels, dredgers may be impacted by discrete areas along the cable corridor where cable exposures, shallow burial and/or external cable protection is present, throughout the operational lifetime of the project. In instances where cable burial is not feasible, external seabed cable protection is proposed to be used. Dredgers are a mobile receptor, attaining moderate activity within the Commercial Fisheries Study Area. Due to their high spatial adaptability and tolerance within the region, dredgers are likely to be less disrupted by permanent loss of access to fishing grounds and displacement of fisheries. However, dredgers will be impacted by areas along the cable corridor where external cable protection is present as these vessels are unable to fish over these features. Therefore, dredgers are considered to be of a **Medium** sensitivity, due to their high spatial adaptability and tolerance within the region but also having a high commercial dependence on the area.

With a **Medium** sensitivity of receptor and **Low** magnitude of impact, the overall risk to dredgers is assessed to be **Minor**, **Not Significant**.

Demersal Trawlers

As bottom contacting vessels, demersal trawlers may be impacted by discrete areas along the cable corridor where cable exposures, shallow burial and/or external cable protection is present, throughout the operational lifetime of the project. In instances where cable burial is not feasible, external seabed cable protection is proposed. Due to their high spatial adaptability and tolerance within the region, demersal trawlers are likely to be less disrupted by permanent loss of access to fishing grounds and displacement of fisheries. Therefore, demersal trawlers are considered to be of a **Medium** sensitivity, due to their high spatial adaptability and tolerance within the region but also having a high commercial dependence on the area.

With a **Medium** sensitivity of receptor and **Low** magnitude of impact, the overall risk to dredgers is assessed to be **Minor**, **Not Significant**.

7.6.6.2 IMPACTS TO COMMERCIALLY IMPORTANT FISH AND SHELLFISH SPECIES

The operational lifetime of the cable is proposed to occur over the span of 40 years. Once operational, the cable corridor will adopt no exclusion zones for commercial fishing activities, with the exception of any investigation activities. Impacts to fish and shellfish species are assessed to be not significant during the operation phase in **Section 7.3: Fish and Shellfish Ecology**. As such the magnitude of impact to commercially important fish and shellfish species is considered to be **Negligible**.

Otter Trawlers

As per **Section 7.6.5.2**, otter trawlers are considered to have a **Medium** sensitivity.

With a **Medium** sensitivity of receptor and **Negligible** magnitude of impact, the overall risk to otter trawlers is assessed to be **Negligible**, **Not Significant**.

Pots and Traps

As per **Section 7.6.5.2**, pots and traps are considered to have a **Medium** sensitivity.

With a **Medium** sensitivity of receptor and **Negligible** magnitude of impact, the overall risk to pots and traps is assessed to be **Negligible**, **Not Significant**.

Demersal Seine Netters

As per **Section 7.6.5.2**, demersal seine netters are considered to have a **Medium** sensitivity.

With a **Medium** sensitivity of receptor and **Negligible** magnitude of impact, the overall risk to demersal seine netters is assessed to be **Negligible**, **Not Significant**.

Dredgers

As per **Section 7.6.5.2**, demersal seine netters are considered to have a **Medium** sensitivity.

With a **Medium** sensitivity of receptor and **Negligible** magnitude of impact, the overall risk to dredgers is assessed to be **Negligible**, **Not Significant**.

Demersal Trawlers

As per **Section 7.6.5.2**, demersal trawlers are considered to have a **Medium** sensitivity.

With a **Medium** sensitivity of receptor and **Negligible** magnitude of impact, the overall risk to demersal trawlers is assessed to be **Negligible**, **Not Significant**.

7.6.6.3 SNAGGING RISK

The subsea cable infrastructure including associated cable protection, present potential snagging points for fishing gear, and could lead to damage to, or loss of fishing gear. Bottom contacting vessels have a greater potential for snagging risk than vessels utilising static and mid-water gear. Potential loss of life and other safety aspects arising as a result of snagging risk are assessed within **Section 7.7: Shipping and Navigation**.

The Project has committed to cable burial where possible and following completion of installation all permanent Project infrastructure locations will be notified to the UKHO and Kingfisher Bulletin, during and after operational investigation works. The CBRA concluded that the sediment conditions along the cable corridor result in a potential fishing gear penetration depth of up to 0.5 m. The minimum DoL for the subsea cable is proposed to be 0.6 m, meaning the potential interference between fishing gear and the cable corridor is minimised. The magnitude of impact for snagging risk is therefore considered to be **Low**.

Otter Trawlers

As per **Section 7.6.6.1**, otter trawlers are a bottom contacting gear group and are considered to be of a **Medium** sensitivity, due to their high spatial adaptability and tolerance within the region but also having a high commercial dependence on the area.

With a **Medium** sensitivity of receptor and **Low** magnitude of impact, the overall risk to otter trawlers is assessed to be **Minor**, **Not Significant**.

Pots and Traps

As per **Section 7.6.6.1**, pots and traps are a static gear group and are considered to be of a **Negligible** sensitivity.

With a **Negligible** sensitivity of receptor and **Low** magnitude of impact, the overall risk to pots and traps is assessed to be **Negligible**, **Not Significant**.

Demersal Seine Netters

As per **Section 7.6.6.1**, demersal seine netters are a bottom contacting gear group and are considered to be of a **Medium** sensitivity, due to their high spatial adaptability and tolerance within the region but also having a high commercial dependence on the area.

With a **Medium** sensitivity of receptor and **Low** magnitude of impact, the overall risk to demersal seine netters is assessed to be **Minor**, **Not Significant**.

Dredgers

As per **Section 7.6.6.1**, dredgers are a bottom contacting gear group and are considered to be of a **Medium** sensitivity, due to their high spatial adaptability and tolerance within the region but also having a high commercial dependence on the area.

With a **Medium** sensitivity of receptor and **Low** magnitude of impact, the overall risk to dredgers is assessed to be **Minor**, **Not Significant**.

Demersal Trawlers

As per **Section 7.6.6.1**, demersal trawlers are a bottom contacting gear group and are considered to be of a **Medium** sensitivity, due to their high spatial adaptability and tolerance within the region but also having a high commercial dependence on the area.

With a **Medium** sensitivity of receptor and **Low** magnitude of impact, the overall risk to demersal trawlers is assessed to be **Minor**, **Not Significant**.

7.6.7 DECOMMISSIONING PHASE

Impacts associated with the decommissioning phase of the Project are expected to mirror impacts associated with the construction phase, however, the magnitude of effects are expected to be lower than those during the construction phase. As such the overall risk to fishing gear receptor groups during the decommissioning phase is assessed to be **Minor**, **Not Significant** for temporary loss of access or displacement to fishing grounds and impacts to commercially important fish and shellfish species.

7.6.8 ASSESSMENT SUMMARY

Any overall risk determined to be **Negligible** or **Minor** is '**Not Significant**' i.e. no significant impact results. Any overall risk determined to be **Moderate** or **Major** is '**Significant**' and will require further mitigation(s) to be implemented to minimise or remove the significance of impact to become '**Not Significant**'.

TABLE 7-30: SUMMARY OF IMPACTS TO COMMERCIAL FISHERIES

Potential Impact	Receptor	Sensitivity	Magnitude	Risk	Significance
Construction					
Temporary loss of access to fishing grounds and displacement of fisheries	Otter Trawlers	Medium	Low	Minor	Not Significant
	Pots and Traps	Medium	Low	Minor	Not Significant
	Demersal Seine Netters	Low	Low	Negligible	Not Significant
	Dredgers	High	Low	Minor	Not Significant
	Demersal Trawlers	Medium	Low	Minor	Not Significant
Impacts to commercially important fish and shellfish species	Otter Trawlers	Medium	Low	Minor	Not Significant
	Pots and Traps	Medium	Low	Minor	Not Significant
	Demersal Seine Netters	Medium	Low	Minor	Not Significant
	Dredgers	Medium	Low	Minor	Not Significant
	Demersal Trawlers	Medium	Low	Minor	Not Significant
Operation					
Permanent loss of access to fishing grounds and displacement of fisheries	Otter Trawlers	Medium	Low	Minor	Not Significant
	Pots and Traps	Negligible	Low	Minor	Not Significant
	Demersal Seine Netters	Medium	Low	Minor	Not Significant
	Dredgers	Medium	Low	Minor	Not Significant
	Demersal Trawlers	Medium	Low	Minor	Not Significant
	Otter Trawlers	Medium	Negligible	Negligible	Not Significant
	Pots and Traps	Medium	Negligible	Negligible	Not Significant

Potential Impact	Receptor	Sensitivity	Magnitude	Risk	Significance
Impacts to commercially important fish species	Demersal Seine Netters	Medium	Negligible	Negligible	Not Significant
	Dredgers	Medium	Negligible	Negligible	Not Significant
	Demersal Trawlers	Medium	Negligible	Negligible	Not Significant
Snagging Risk	Otter Trawlers	Medium	Low	Minor	Not Significant
	Pots and Traps	Negligible	Low	Negligible	Not Significant
	Demersal Seine Netters	Medium	Low	Minor	Not Significant
	Dredgers	Medium	Low	Minor	Not Significant
	Demersal Trawlers	Medium	Low	Minor	Not Significant

7.7 SHIPPING AND NAVIGATION

7.7.1 INTRODUCTION

This section describes the baseline environment for Shipping and Navigation within a defined Shipping and Navigation Study Area. This has been informed by a desk-based Navigation Risk Assessment (NRA) commissioned by ERM and undertaken by NASH Maritime in November 2023 (**APPENDIX G: Navigational Risk Assessment**). The NRA uses a range of data sources, including vessel traffic datasets (AIS), consultation with key Shipping and Navigation stakeholders, incident data and admiralty charts. The Shipping and Navigation section of this MEA should be read alongside **Section 7.6 Commercial Fisheries** and **Section 7.9 Offshore Infrastructure**.

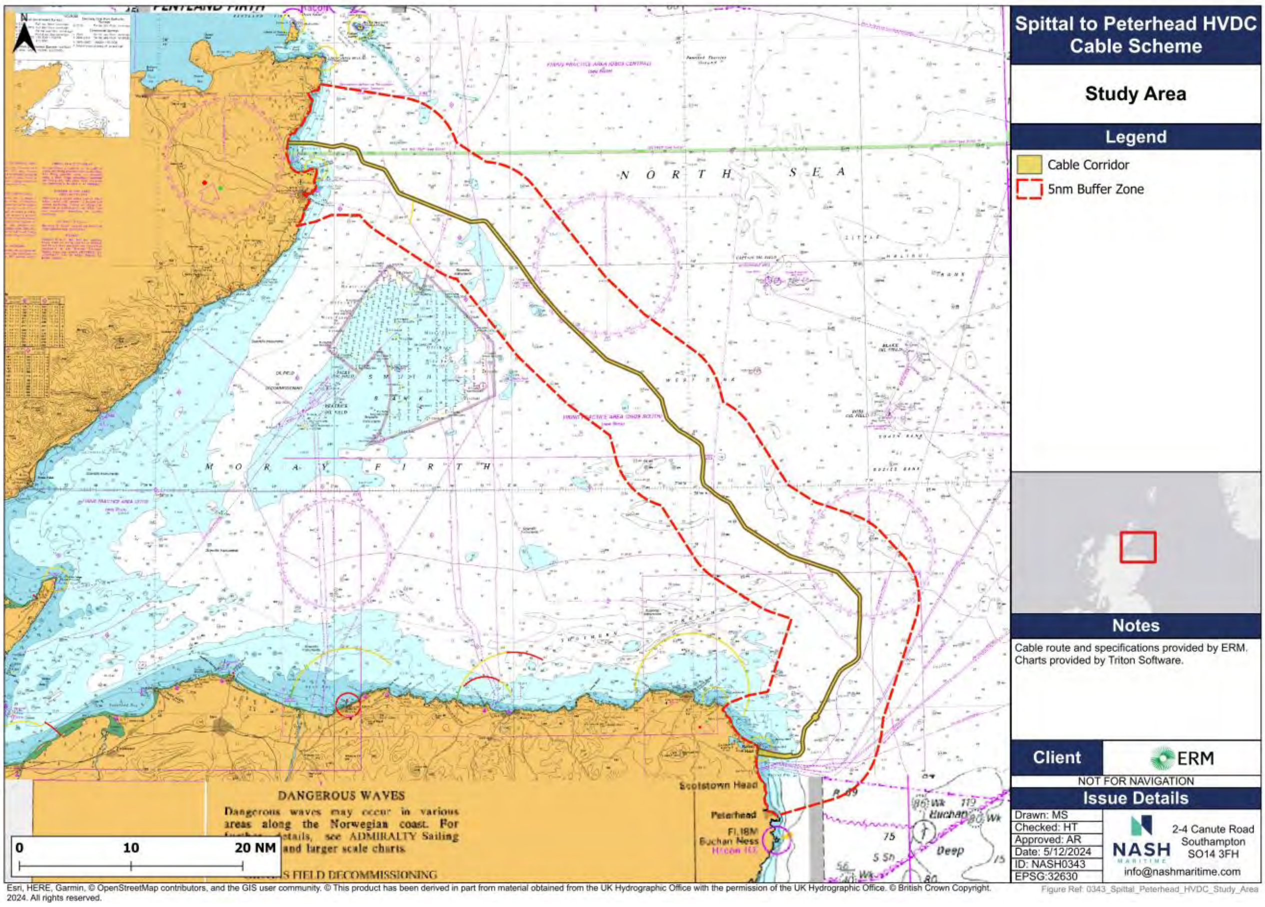
The relevant legislation and policy relating to Shipping and Navigation include:

- National Marine Plan: Chapter 13;
- Marine (Scotland) Act 2010; and
- Marine and Coastal Access Act 2009;

7.7.2 SHIPPING AND NAVIGATION STUDY AREA

The Shipping and Navigation Study Area is shown in **Figure 7-44** and comprises an area of 5 nm surrounding the cable corridor (NASH, 2024). This Study Area has been used within the NRA to assess shipping patterns in proximity to the Project. The proposed Shipping and Navigation Study Area has been agreed by NASH Maritime with consultees and is consistent with industry best practice for NRAs (NASH, 2024).

FIGURE 7-44: SPITTAL TO PETERHEAD HVDC CABLE CORRIDOR STUDY AREA (NASH, 2024)



7.7.3 BASELINE ENVIRONMENT

7.7.3.1 DESK STUDIES

A comprehensive desk-based review informed the baseline for Shipping and Navigation (**APPENDIX G: Navigational Risk Assessment**). The existing studies and datasets referred to as part of the desk-based review, as per **APPENDIX G: Navigational Risk Assessment**, are summarised in **Table 7-31** below.

TABLE 7-31: SUMMARY OF DESK STUDY SOURCES

Title	Source	Year
Marine Accident Investigation Branch (MAIB) accidents database	Marine Accident Investigation Branch - GOV.UK (www.gov.uk)	1991-2020
Automatic Identification System (AIS) Data	MarineTraffic	2019 & 2022
Royal Yachting Association (RYA) Costal Atlas	uk-coastal-atlas-of-recreational-boating (rya.org.uk)	
UK Vessel Monitoring System (VMS) Data	Marine Management Organisation (MMO): Fishing Activity for over 15 metre United Kingdom Vessels	2020
Department for Transport Shipping Statistics	Maritime and shipping statistics - GOV.UK (www.gov.uk)	2022

Royal National Lifeboat Institute (RNLI) Incident Data	Royal National Lifeboat Institution Open Data (arcgis.com)	2008-2022
Department for Transport (DfT) Search and Rescue (SAR) Helicopter Taskings	Search and rescue helicopter statistics: Year ending March 2022 - GOV.UK (www.gov.uk)	2022
Offshore Renewables (The Crown Estate)	Offshore Wind Report 2022 | The Crown Estate	2022
Admiralty Charts	British Crown and OceanWise	2022
Admiralty Sailing Directions	Sailing Directions (Pilots) (admiralty.co.uk)	NP54 (2018) & NP52 (2022)
North Sea Transition Authority (NSTA) Energy Map	Interactive Energy Map for the UK Continental Shelf (UKCS) - The North Sea Transition Authority (nstauthority.co.uk)	2023

7.7.3.2 SITE-SPECIFIC SURVEYS

The Shipping and Navigation MEA was primarily conducted using desk-based studies. An additional desk-based navigable depth study was undertaken by NASH to accompany the Shipping and Navigation Assessment. See **APPENDIX H: NRA Addendum**.

7.7.3.3 CONSULTATION AND ENGAGEMENT

Consultation was undertaken with relevant Shipping and Navigation stakeholders as part of the NRA, including consultation letter submissions and subsequent meetings. See **APPENDIX G: Navigational Risk Assessment**, **Section 3.4.1** for detail.

7.7.3.4 METHODOLOGY OVERVIEW

The International Maritime Organisation's (IMO) Formal Safety Assessment (FSA) methodology was followed throughout the NRA. The likelihood and consequence of the impacts identified (as per the FSA's definition of risk), are assessed based on the high-quality datasets used throughout the assessment, alongside suggestions raised through consultation. The International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA) Simplified Risk Assessment method (SIRA), utilises the FSA process, allowing maritime and navigation risk to be assessed, in order to meet obligations for the management of navigational safety (IALA, 2024). The principles of the SIRA approach have been adopted, in order to conduct the risk assessment within the NRA (**APPENDIX G: Navigational Risk Assessment**) and subsequent MEA.

7.7.3.5 LOCAL PORTS

Northern Landfall – Sinclair's Bay

The main local port near the northern landfall location (Sinclair's Bay) is Wick Harbour (NASH, 2024). Wick Harbour is situated at the head of Wick Bay and handles fishing, wind farm, leisure and commercial traffic, the latter being accommodated mainly in River Harbour (NASH, 2024). Wick Harbour Authority operates as the harbour authority (NASH, 2024). Pilot boarding typically takes place about 0.5 nm northeast of South Head. Pilotage is compulsory for vessels over 90 gross tonnes (GT), except fishing vessels and yachts (NASH, 2024).

Southern Landfall – Rattray Head

There are two major ports/harbours in the vicinity of the southern cable landfall site (Rattray Head): Peterhead and Fraserburgh (NASH, 2024).

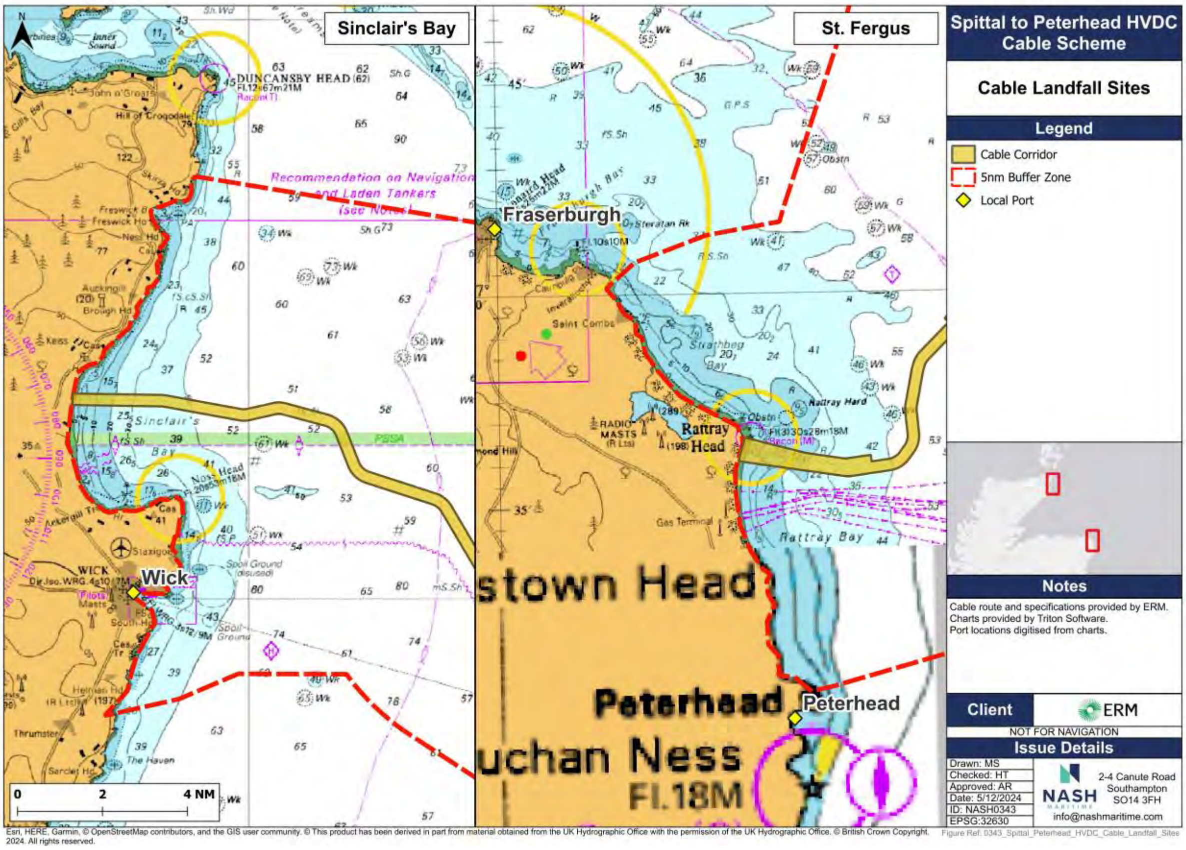
The port of Peterhead is a commercial port providing services for dry cargo, cruise, energy and the fishing sectors (NASH, 2024). The largest vessels that can be accommodated at the port are of 280 metres (m) length and 10.5 m draught (NASH, 2024). There is also a large recreational boating community at Peterhead with the Peterhead Leisure Marina providing pontoon berthing for 150 vessels (NASH, 2024).

Peterhead Port Authority requires pilotage for those vessels that meet the requirements laid out in its pilotage directions. The pilot boards within two miles southeast of the breakwater entrance, except in adverse weather when they board inside the breakwater (NASH, 2024).

Fraserburgh Harbour is primarily a busy fishing harbour providing for an extensive local fleet and also commercial vessel traffic. The maximum vessel size of Fraserburgh Harbour is 92 m length, 16 m beam or 6.2 m draught (NASH, 2024). The harbour provides services to the offshore renewables sector being the operations and maintenance base for the Moray East OWF and operates a Local Port Service and pilotage service for vessels meeting the requirements of its pilotage directions (NASH, 2024). Pilotage is compulsory for commercial vessels of 300 tonnes and over except for those exempt by law, with pilots typically boarding within Fraserburgh Bay but, by arrangement and in suitable weather, will do so within a two-mile radius of the harbour entrance (NASH, 2024).

Figure 7-45 highlights the proximity between the landfall locations and the major ports, for each northern and southern landfall.

FIGURE 7-45: CABLE LANDFALL SITES AT SINCLAIR'S BAY AND RATTRAY HEAD



7.7.3.6 ANCHORAGES

There is a charted anchorage located in the proximity of the northern landfall (Sinclair's Bay) which affords a fair anchorage in fine settled weather (**Figure 7-46**), but it is not safe in unsettled conditions (NASH, 2024). Wick Harbour to the north also has a sandy bottom outer uncharted anchorage, which is sheltered during south southwest through north winds (NASH, 2024). An area of foul ground on the northern side of Sinclair's Bay must be avoided as there is Unexploded Ordnance (UXO) on the seabed (NASH, 2024).

In the vicinity of the southern cable landfall (Rattray Head), there is an uncharted anchorage at Buchanhaven, which includes a jetty that extends 127 m from the shore and affords a landing for boats at all states of the tides (NASH, 2024). Vessels can also anchor in Fraserburgh Bay, east of the harbour entrance, at a depth of 11 m (NASH, 2024).

With the exception of the aforementioned cable landfall sites, there are no anchorages along the cable corridor (NASH, 2024).

7.7.3.7 OFFSHORE WIND FARMS

Two fully commissioned and operational OWFs are present in the vicinity of the Shipping and Navigation Study Area, including Moray East and Beatrice, which are situated approximately 17 nm to the southeast of the cable landfall (**Figure 7-46**); neither of their associated export cables are understood to intersect with the proposed subsea cable corridor (NASH, 2024). Moray West OWF lies to the west of Moray East; similarly, the associated export cable is not expected to intersect with the proposed cable corridor (NASH, 2024). Additional proposed OWF sites, including Caledonia OWF and Broadshore OWF are also located in the vicinity of the cable corridor; it is likely that more associated export cables will be installed in the future, posing the potential for future cable crossings to be agreed with SSENT.

7.7.3.8 SUBSEA INFRASTRUCTURE

The cable corridor will cross two subsea cables; these include the SHEFA-2 fibre-optic submarine cable (operational as of March 2008) and the 320 kV Shetland HVDC Link (operational as of June 2024).

7.7.3.9 OIL AND GAS

A number of offshore wells and oil fields are located within the Moray Firth, within the immediate vicinity to the proposed cable corridor, however safe distances from these sites can be maintained, as the majority of these wells are decommissioned and abandoned and occupy discrete spatial locations. Similarly, the proposed cable corridor does not enter any licenced blocks for petroleum exploration in the area. However, East of the Moray Firth there are several subsurface and surface infrastructures, primarily aggregated around the hydrocarbon fields in the region, most notably Captain oil field. Many of these service pipelines make landfall at Rattray Head.

7.7.3.10 PRACTICE AND EXERCISE AREAS

The practice and exercise areas (PEXAs) that intersect the Shipping and Navigation Study Area are the D809 Central area located 15 nm east of the cable landfall at Sinclair's Bay and the D809 South located 16 nm south-east of the cable landfall at Sinclair's Bay (NASH, 2024). The D809 North PEXA is located in the vicinity of the Study Area, 27 nm north-east of the cable landfall at Sinclair's Bay (NASH, 2024). All three areas are operated in accordance with a Clear Range Procedure (CRP) where exercises and firing only take place when the area is considered to be clear of all shipping (NASH, 2024).

7.7.3.11 OTHER ACTIVITIES

A Subsea7 pipeline fabrication facility is located 1 nm from the north cable landfall at Wick. The site launches pipeline bundles a few times a year, typically for a duration of 12 to 36 hours at a time (NASH, 2024).

FIGURE 7-46: KEY NAVIGATIONAL FEATURES IN PROXIMITY TO THE SHIPPING AND NAVIGATION STUDY AREA (NASH, 2024)

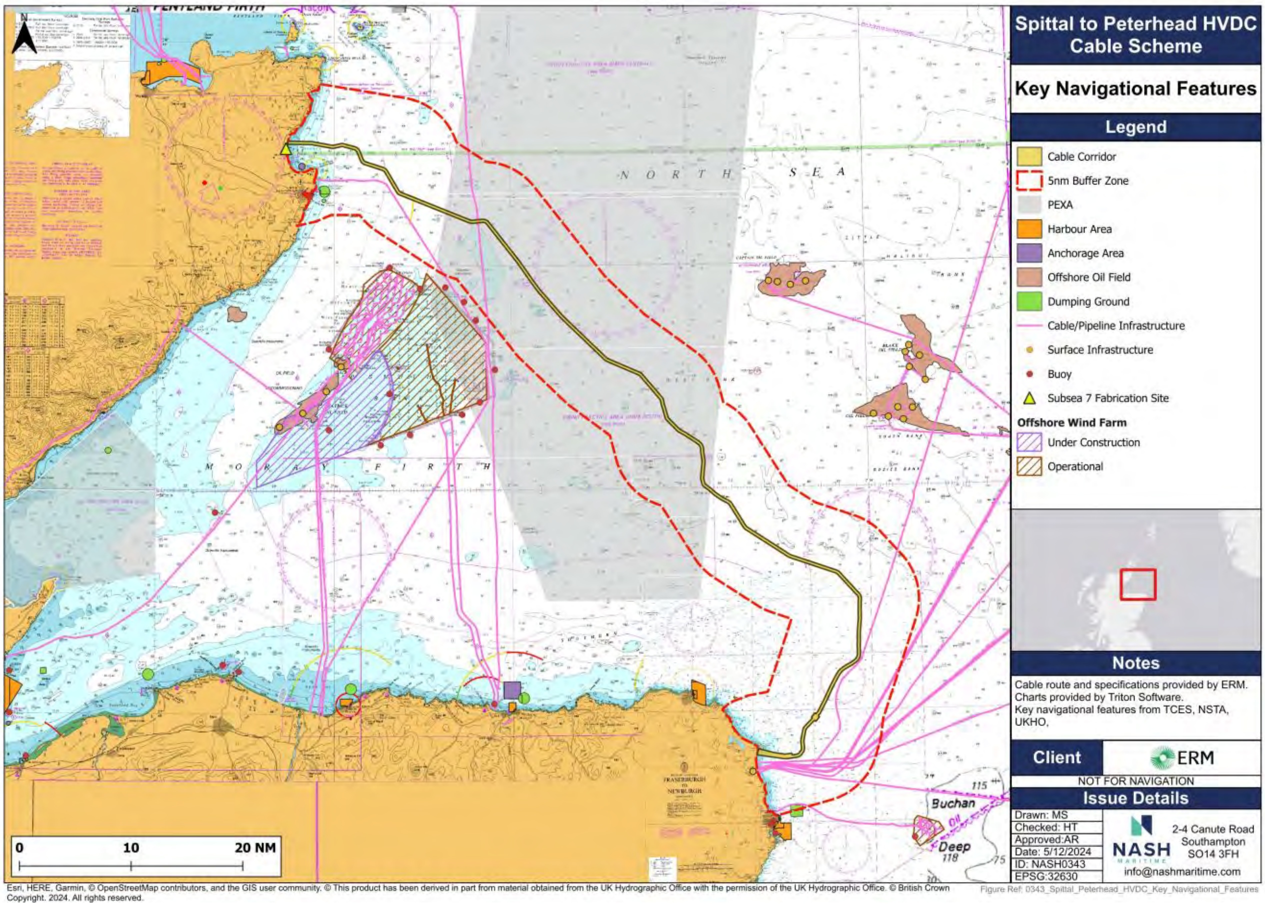


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Figure Ref: 0343_Spittal_Peterhead_HVDC_Key_Navigational_Features

7.7.3.12 SEARCH AND RESCUE OPERATIONS

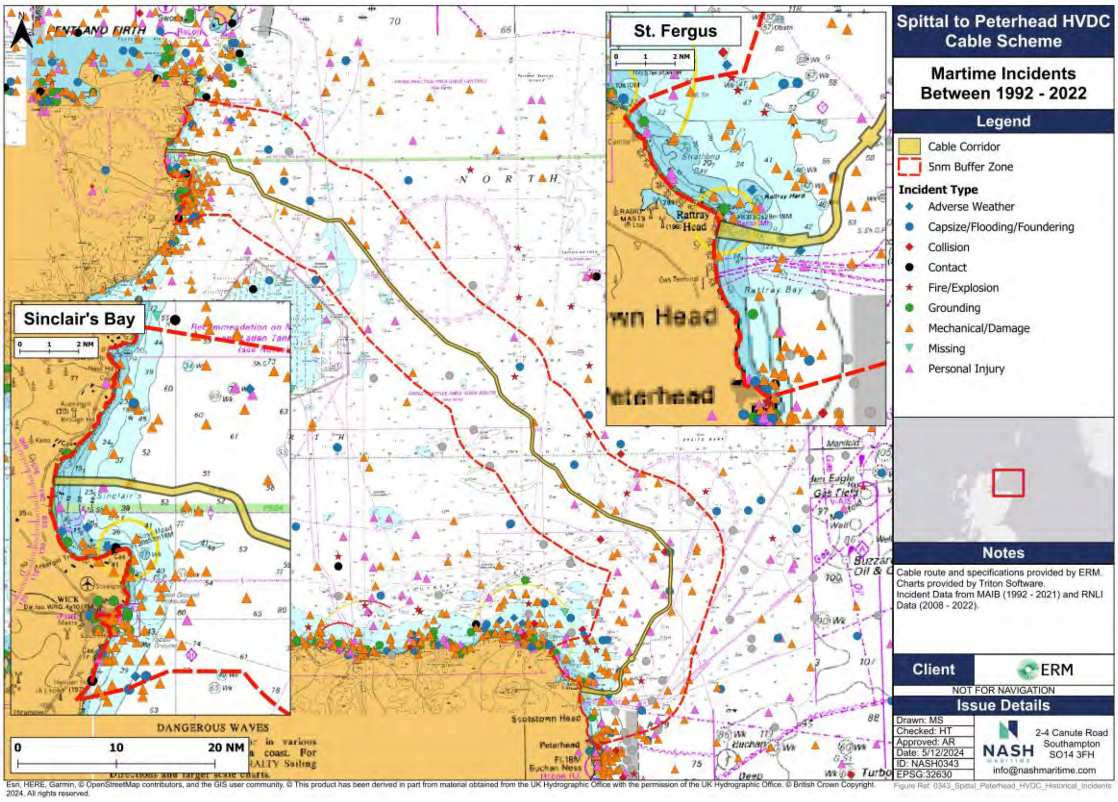
The Aberdeen Coastguard Operations Centre is located 28.4 nm from the cable landfall at Rattray Head and is responsible for the Search and Rescue (SAR) operations within the vicinity of the Shipping and Navigation Study Area (NASH, 2024). Additionally, the Inverness SAR helicopter base is located 65 nm from the cable corridor (NASH, 2024).

The closest RNLI stations are located at Wick, 3.7 nm from the landfall at Sinclair's Bay, and at Peterhead, 5.9 nm from the landfall at Rattray Head; all-weather lifeboats are located in Peterhead, Fraserburgh and Wick (NASH, 2024).

7.7.3.13 HISTORICAL MARITIME INCIDENTS

MAIB (1991-2021) and RNLI (2008-2022) databases were used to examine maritime incidents recorded in the Shipping and Navigation Study Area (**Figure 7-47**). Most incidents were recorded close to shore and around ports with reducing frequency further offshore (NASH, 2024). Notably there were no instances of passenger vessels, oil and gas service vessels or cargo vessels being involved in a collision, grounding or contact event outside of the harbour areas of Peterhead, Fraserburgh or Wick (NASH, 2024). Additional details on historical maritime incidents within the Shipping and Navigation Study Area are further outlined in **APPENDIX G: Navigational Risk Assessment**.

FIGURE 7-47: MAIB AND RNLI HISTORICAL INCIDENTS (NASH, 2024)



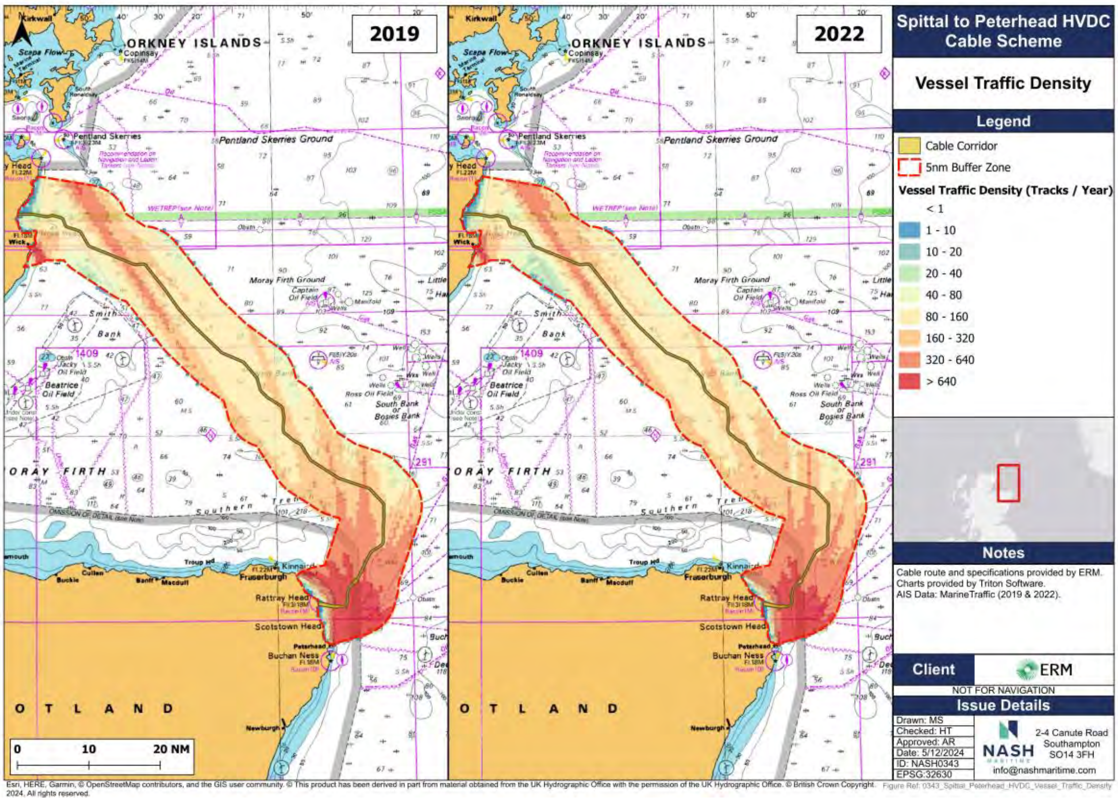
7.7.3.14 VESSEL TRAFFIC DENSITY

A summary of the baseline vessel activity within the Shipping and Navigation Study Area is presented below. Further information is presented in the NRA produced by NASH Maritime provided in **APPENDIX G: Navigational Risk Assessment**.

Annualised Vessel Traffic Density

Annualised Vessel Traffic Density, as highlighted in **Figure 7-48**, was shown to have a consistent distribution for both 2019 and 2022, with high-density vessel activity present surrounding the cable landfall site at Rattray Head, which is predominantly attributed to Peterhead and Fraserburgh ports (NASH, 2024). In contrast, relatively low-density vessel activity was observed around the cable landfall at Sinclair’s Bay, except for a high-density patch adjacent to Wick Harbour (NASH, 2024). Along the offshore section of the Study Area, vessel traffic density was observed to be low to moderate, apart from a high-density route between Aberdeen and the Pentland Firth (NASH, 2024).

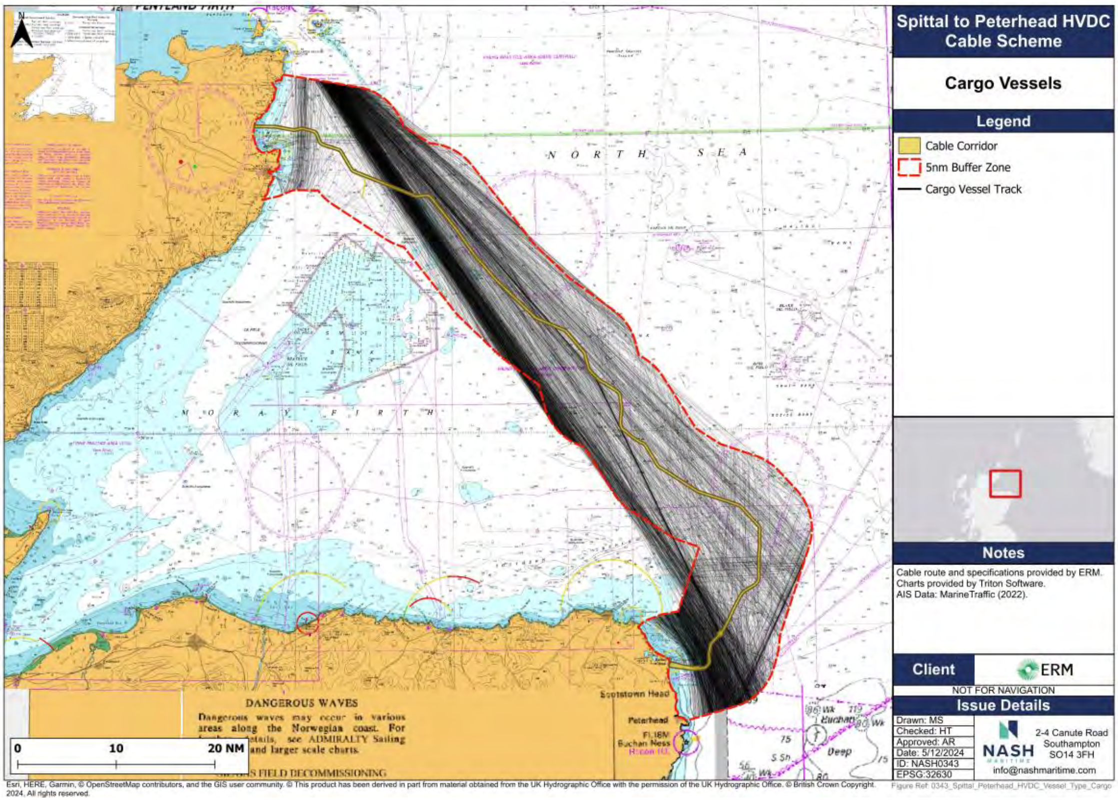
FIGURE 7-48: ANNUALISED VESSEL TRAFFIC DENSITY (NASH, 2024)



Cargo Vessels

There were 3,349 cargo ship transits through the Study Area during 2022, of which 2,631 crossed over the proposed cable corridor (NASH, 2024). The majority of cargo ship transits are by vessels of less than 150 m in length shown to be bound towards the Pentland Firth, navigating along the Shipping and Navigation Study Area and parallel to the proposed cable corridor (NASH, 2024). Cargo vessel traffic is shown in **Figure 7-49**.

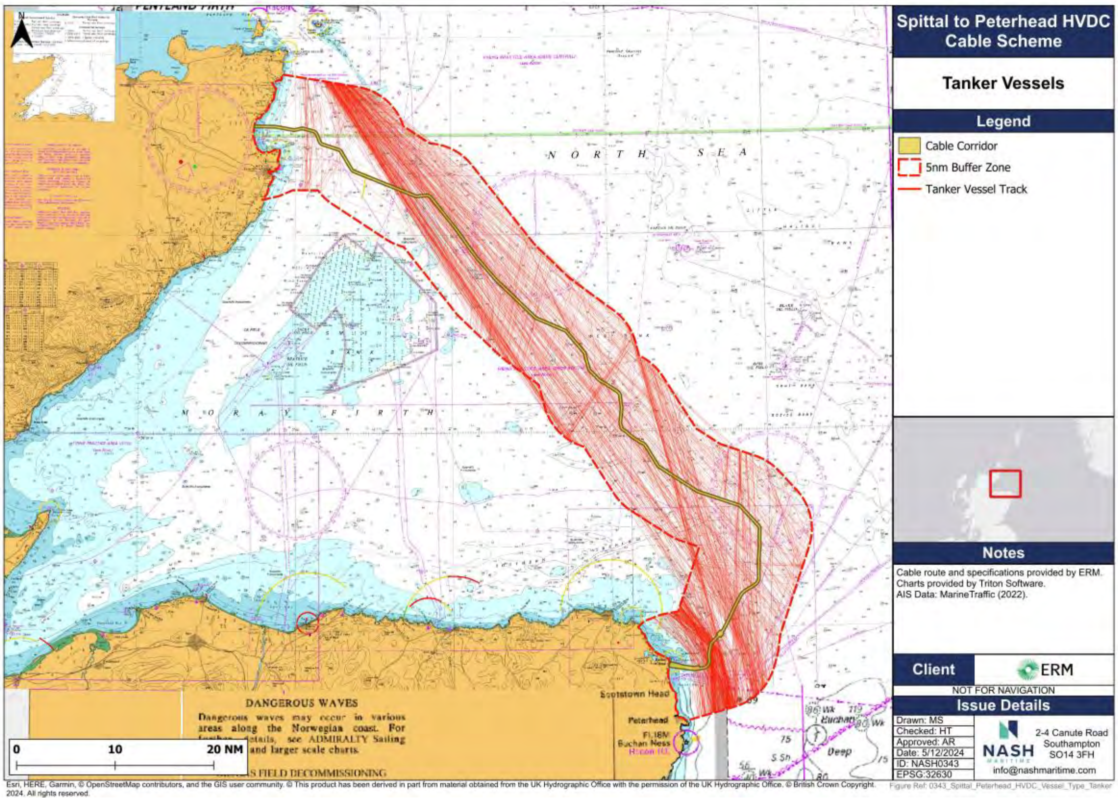
FIGURE 7-49: CARGO VESSEL TRACKS, 2022 (NASH, 2024)



Tanker Vessels

Tanker tracks are largely consistent with the shipping route identified for cargo ships, with lower frequency of 1,006 transits through the shipping and navigation Study Area in 2022 and 823 crossing over the cable corridor (**Figure 7-50**) (NASH, 2024). Of all the tanker vessels identified within the Study Area, the 79 m *Antares*, 91 m *Mersey Fisher*, 80 m *Thun Britain*, and 234 m *Petroatlantic* were the most frequent regular runners, typically navigating to and from the Orkney and Shetland Islands (NASH, 2024).

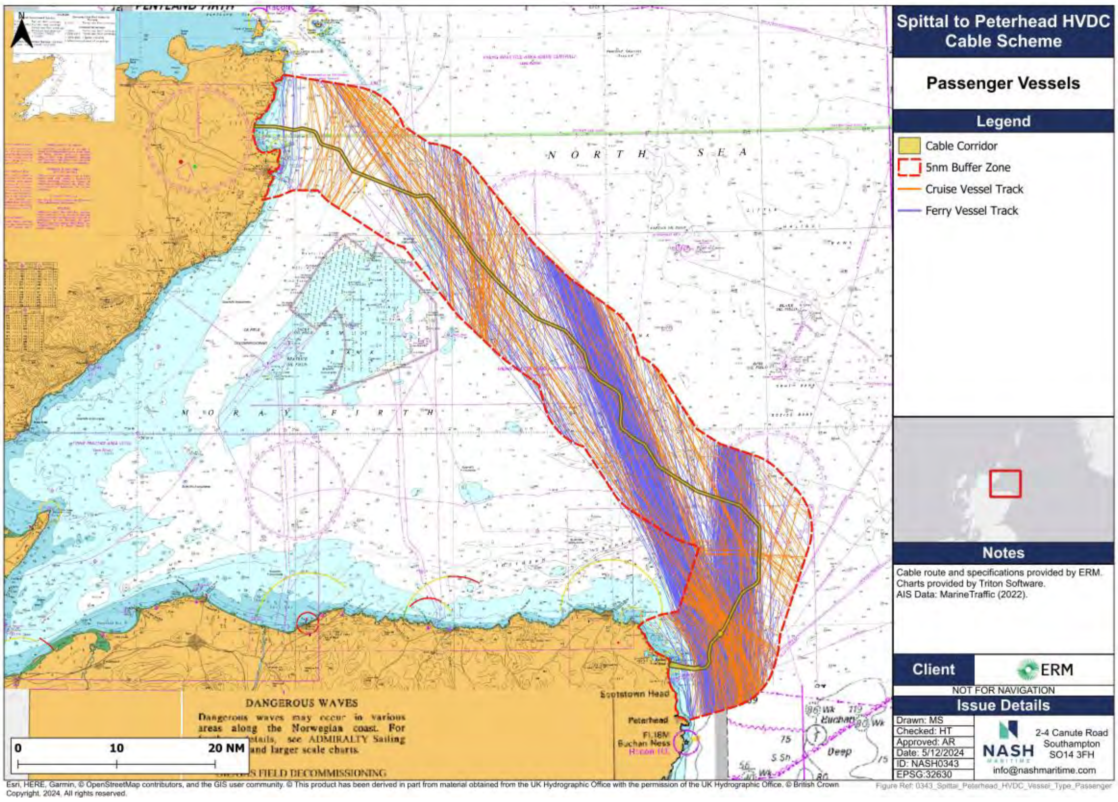
FIGURE 7-50: TANKER VESSEL TRACKS, 2022 (NASH, 2024)



Passenger Vessels

On average, 3.9 ferry transits per day crossed through the Shipping and Navigation Study Area, and a total of 1,432 ferry tracks in 2022 (NASH, 2024). Passenger vessel tracks are show in **Figure 7-51**. The principal operator within the Study Area was identified as NorthLink with four ferries sailing between Aberdeen and Lerwick/Kirkwall; those vessels accounted for 72% of all passenger vessels and 94% of ferries navigating within the Shipping and Navigation Study Area in 2022 (NASH, 2024). Additional details on ferry operators and routes within the Shipping and Navigation Study Area are further outlined in **APPENDIX G: Navigational Risk Assessment**.

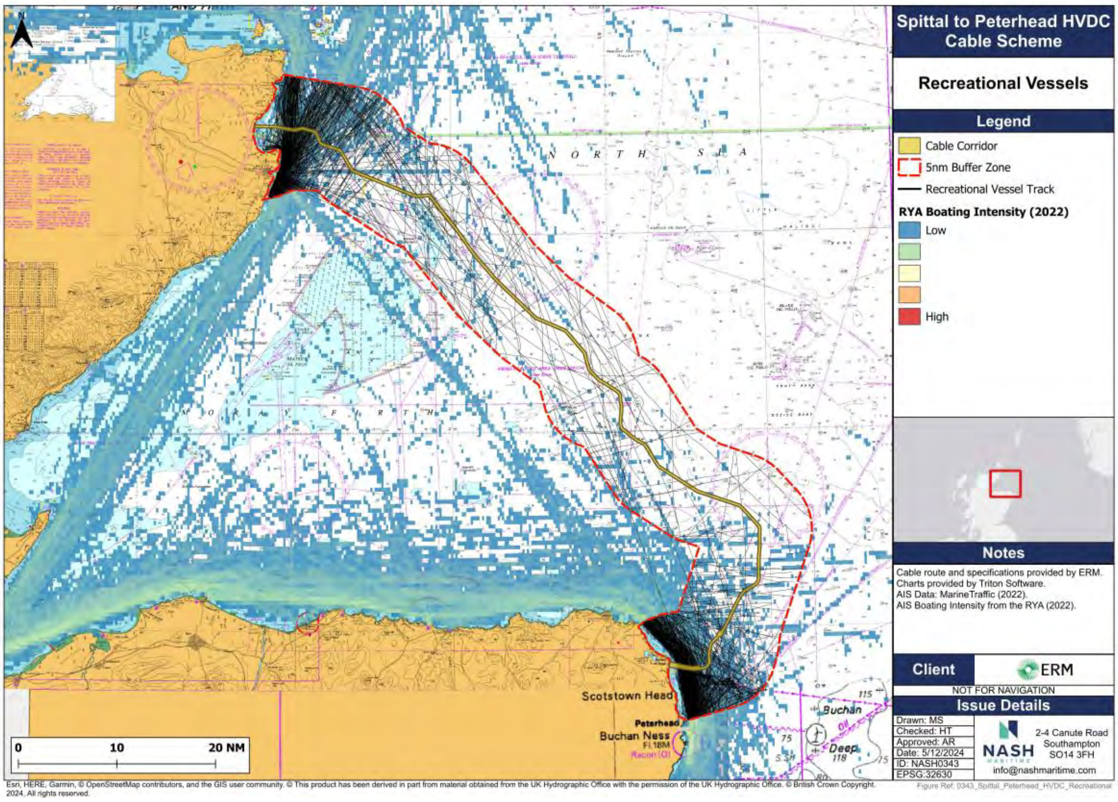
FIGURE 7-51 PASSENGER VESSEL TRACKS, 2022 (NASH, 2024)



Recreational Vessels

The recreational activity within the Study Area is mainly focused in proximity to the coast, particularly within 5 nm of the cable landfall sites at Sinclair's Bay and Rattray Head (NASH, 2024). There is little recreational activity throughout most of the offshore section of the Study Area, with no identified offshore cruising routes (NASH, 2024). On average, 3.9 recreational vessel transits crossed through the Study Area per day, with a total of 1,426 recreational vessel tracks in 2022 (NASH, 2024). It is noted that recreational activity is often under-represented in the AIS data due to AIS carriage requirements; however, it is not anticipated that the spatial pattern of recreational cruising routes would be substantially different than is presented in **Figure 7-52** (NASH, 2024).

FIGURE 7-52: RECREATIONAL VESSEL TRACKS, 2022 (NASH, 2024)

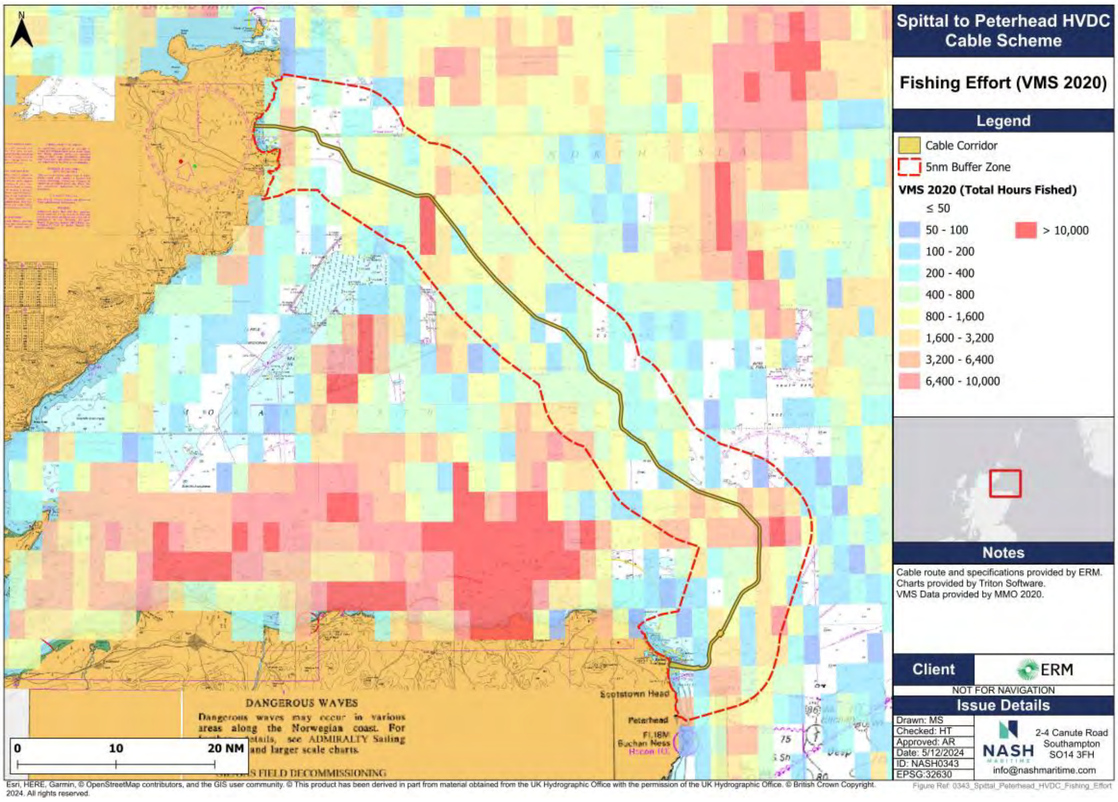


Fishing Vessels

As described in **Section 7.6: Commercial Fisheries**, the fishing activity within the broader region beyond the Study Area is characterized by its extensive reach and diverse catch portfolio. The fishing ports in the region with the highest fishing efforts are Peterhead and Fraserburgh, adjacent to the Rattray Head cable landfall site; Wick Harbour is a notable fishing port towards the cable landfall site at Sinclair's Bay (NASH, 2024). Considerable fishing vessel activity was identified within the Shipping and Navigation Study Area. A main transit route between the Orkney Islands and Peterhead/Fraserburgh was observed during all four seasons in the upper part of the Study Area, in a NW/SE direction (NASH, 2024). For the cells intersecting the Study Area, VMS data highlighted that 93% vessels recorded used demersal gears, particularly, bottom otter trawls, dredges, bottom twin trawls and bottom pair trawls; low levels of vessels using pots were recorded (NASH, 2023).

Additional details on fishing vessel activity within the Shipping and Navigation Study Area are further outlined in **APPENDIX G: Navigational Risk Assessment**.

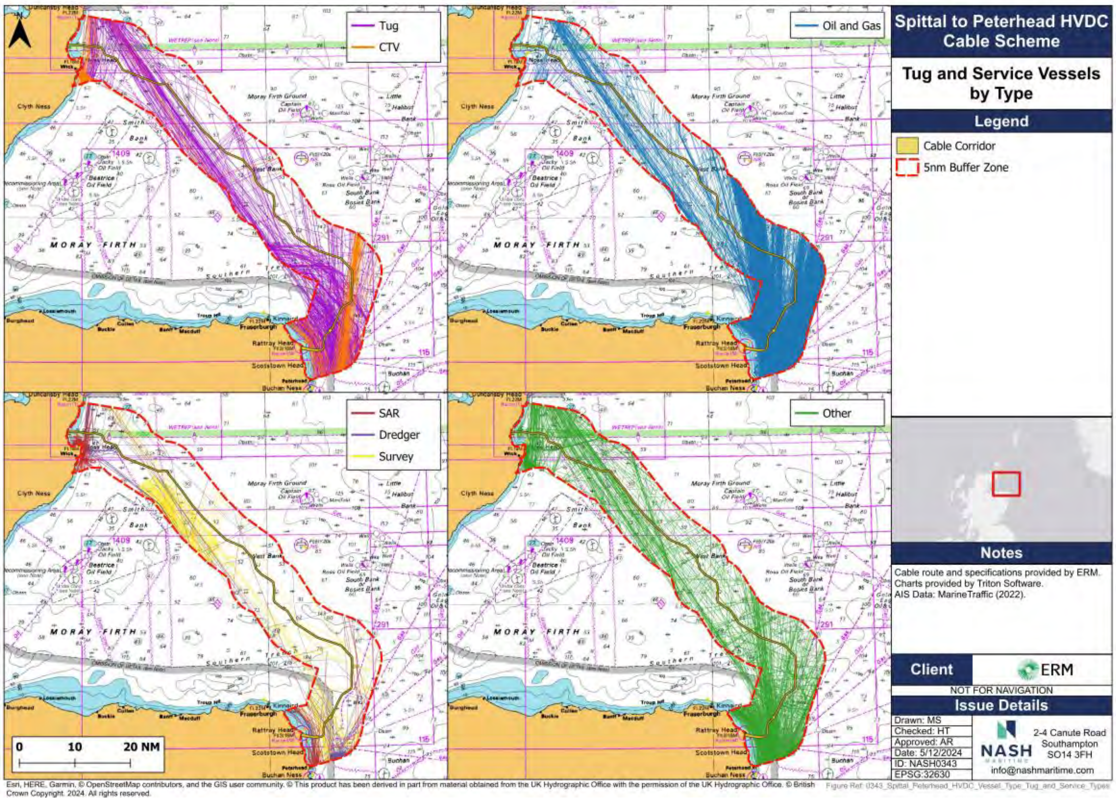
FIGURE 7-53: FISHING VMS (2020) (TOTAL TIME PER CELL) (NASH, 2024)



Other Vessel Types

Other vessel types largely comprised of tug and service vessels. Within the Shipping and Navigation Study Area, offshore supply vessels were recorded operating between Aberdeen/Peterhead and oil and gas field platforms across the southern section of the Study Area (NASH, 2024). Large oil and gas vessel activity was recorded, transiting between Peterhead port and nearby oil and gas field (NASH, 2024).

FIGURE 7-54: OTHER VESSEL TRACKS (NASH, 2024)



7.7.3.15 CABLE CORRIDOR ANALYSIS

A cable corridor analysis was conducted by Nash, to provide a detailed overview of the vessel activity along the cable corridor, identifying potential interactions between the subsea cable and vessels navigating within the region (NASH, 2024). Analysis showed a significant spike in vessel activity towards the southern cable landfall at Rattray Head, which was attributed to the adjacent busy ports of Fraserburgh and Peterhead (NASH, 2024). Vessel count remain relatively low along the rest of the cable corridor, with three notable sections which align with the main vessel routes identified previously. Further details on the cable corridor analysis for the Shipping and Navigation Study Area are further outlined in **APPENDIX G: Navigational Risk Assessment**.

7.7.3.16 FUTURE BASELINE ENVIRONMENT

Vessel traffic levels are largely dependent on market conditions, and potential fluctuations make the future baseline environment difficult to predict. Based on The Department for Transport (DfT) conclusions on projected commercial freight traffic, overall commercial port traffic is forecast to grow in the long term, with tonnage predicted to be 39% higher in 2050 compared to 2016, equating to an approximate 15% increase in national freight tonnage by 2035 (NASH, 2024). Further details on future projections for commercial traffic are further outlined in **APPENDIX G: Navigational Risk Assessment**.

As previously presented, NorthLink ferries were the principal ferry operator recorded within the Shipping and Navigation Study Area. During Q2 2023, the operator increased the frequency of transits for a specific route between Scrabster and Stromness due to increased demand (NASH, 2024). Although this route does not directly impact the Shipping and Navigation Study

Area, the increase in demand for ferry services between Aberdeen and Lerwick/Kirkwall, may produce increases in the frequency of ferry vessel transits on the routes which cross the Shipping and Navigation Study Area (NASH, 2024). Further details on future projections for ferry traffic are outlined in **APPENDIX G: Navigational Risk Assessment.**

There are many uncertainties in predicting future commercial fishing patterns due to a range of natural and management-controlled factors. Further information detailed in **APPENDIX G: Navigational Risk Assessment** concludes that fishing activity in the area is not anticipated to change significantly, with both local and foreign vessels continuing fishing activity in the Shipping and Navigation Study Area (NASH, 2024).

Similarly, it is unlikely that there will be a significant change in the number of recreational users and associated vessels within the Shipping and Navigation Study Area due to macrotrends; further details on future projections for recreational traffic are outlined in **APPENDIX G: Navigational Risk Assessment**.

7.7.4 MARINE ENVIRONMENTAL ASSESSMENT

7.7.4.1 OVERVIEW

The proposed works have the potential to result in environmental impacts upon the receptor groups described in **Section 7.7.3.** Whilst a formal EIA is not required as part of this MLA, the MEA has been conducted using similar EIA terms and definitions for transparency and ease of understanding.

7.7.4.2 DEFINITION OF SIGNIFICANCE

This MEA will assign a level of significance to each receptor-impact pathway, in line with that provided within a formal EIA. **Table 7-32** defines the various levels of significance used within this assessment.

TABLE 7-32:DEFINITIONS OF SIGNIFICANCE FOR APPLICATION WITHIN THE MARINE ENVIRONMENTAL ASSESSMENT

Significance	Definition
Major Adverse/Beneficial Impact	Major Adverse results in an unacceptable level of impact, at sufficient importance to call for serious consideration of changes to the Project (Significant in formal EIA terms)
Moderate Adverse/Beneficial Impact	Moderate Adverse results in an unacceptable level of impact, at sufficient importance to call for consideration of changes to the Project (Significant in formal EIA terms)
Minor Adverse/Beneficial Impact	Acceptable level of impact, and unlikely to be sufficiently important to warrant mitigation measures (Non-significant in formal EIA terms)
Negligible Impact	Acceptable level of impact, of such low significance that they are not considered relevant for the decision-making process (Non-significant in formal EIA terms)

7.7.4.3 SCOPING OF POTENTIAL IMPACTS

The potential impacts outlined in **Table 7-33** below have been identified as relevant to each receptor group described in **Section 7.7.3**, and form the basis for assessment within the MEA.

TABLE 7-33: POTENTIAL IMPACTS ASSOCIATED WITH THE PROPOSED WORKS

Impact	Project Phases	Scoped In/Out
Potential impact to recognised sea lanes essential to international navigation	Construction Operation Decommissioning	Scoped Out – there are no recognised sea lanes or routing measures in proximity to the Project.
Potential impact to commercial vessel and ferry vessel routing	Construction Operation Decommissioning	Scoped In
Potential impact to small craft routing/activities	Construction Operation Decommissioning	Scoped In
Potential impact to military exercises	Construction Operation Decommissioning	Scoped In
Potential impact on vessel-to-vessel collision risk	Construction Operation Decommissioning	Scoped In
Potential impact on allision risk	Construction Operation Decommissioning	Scoped Out – The project has no surface piercing structures that could result in allision events for vessels.
Potential impact on emergency response/search and rescue	Construction Operation Decommissioning	Scoped In
Potential impact on oil and gas activities	Construction Operation Decommissioning	Scoped In
Potential impact on electromagnetic interference and vessel compasses	Construction Operation Decommissioning	Scoped In

Impact	Project Phases	Scoped In/Out
Potential impact to risk of snagging of anchors and fishing gear	Construction Operation Decommissioning	Scoped In
Potential impact on under keel clearance	Construction Operation Decommissioning	Scoped In
Potential impact on access to ports and harbours	Construction Operation Decommissioning	Scoped In

7.7.5 CONSTRUCTION PHASE

7.7.5.1 POTENTIAL IMPACT TO COMMERCIAL VESSEL AND FERRY VESSEL ROUTING

During the construction period, commercial vessels and ferries may be required to deviate from their planned routes in order to maintain a safe passing distance with the cable lay vessel (CLV) (NASH, 2024). This is because during laying operations, the cable lay vessel will have very limited maneuverability. Given the low spatial footprint of the installation activities and the slow speed of the operational CLV, commercial vessel and ferry route deviations are expected to be only on the order of minutes (NASH, 2024). Passage planning can be utilized in advance of the construction activities to select the most efficient route for ferry vessels re-routing around the works (NASH, 2024).

Only a slight impact on commercial shipping is anticipated due to the available sea room around the cable corridor (NASH, 2024). Additionally, any impacts will be of temporary nature during the cable laying and installation process (NASH, 2024). Embedded mitigation measures including the promulgation of Notice to Mariners (NtMs) will ensure that commercial and ferry vessels are notified prior to construction works, to ensure planned deviations can be achieved, where necessary.

Due to the localized nature of the activities and infrequency of adverse weather routing occurring, it is not anticipated that adverse weather routes will be negatively affected by the cable installation. Gale force winds which might require some form of adverse weather routing, occur on less than 10% of days annually. Due to the adequate available sea room, safe vessel routing even in adverse weather conditions is achievable (NASH, 2024). Whilst there is a slight identified impact to commercial vessels during the construction phase due to re-routing, adequate sea room surrounding the cable corridor ensures that there will be no interaction between vessels due to re-routing, and deviations will be low. As this receptor has some tolerance to accommodate this particular effect or will be able to recover or adapt, the sensitivity is defined as **Low**.

With respect to the magnitude of effect, due to the temporary nature and activity of the construction works over the approximate 3 year-period, this is defined as **Low**.

The **Low** sensitivity combined with **Low** magnitude, means that the impact to commercial vessel and ferry vessel routing during construction of the project, is **Negligible**, **Not Significant**.

7.7.5.2 POTENTIAL IMPACT TO SMALL CRAFT ROUTING/ACTIVITIES

In order to maintain a safe passing distance, small craft may be required to alter their route during installation due to the presence of the cable laying vessels (NASH, 2024). Approximately 7% of the cable corridor passes through moderate to high recreational vessel activity near the coast; the recreational activity within the Study Area is mainly focused in proximity to the coast, particularly within 5 nm of the cable landfall sites (NASH, 2024). Cable installation activities are predicted to disrupt recreational activity within coastal waters, particularly if installation is carried out during the summer months when weather is more favourable for sailing (NASH, 2024). Additional potential for disruption to coastal recreational activities are anticipated due to the presence of vessels associated with HDD drilling at the landfalls (NASH, 2024).

Embedded mitigations such as the promulgation of information, including NtMs, and presence of guard vessels will notify sea users of the construction work. Promulgation of information of the schedule for cable lay activities to local ports, ship operators, fishermen and recreational sailing organisations should be notified of all installation works to ensure sufficient knowledge sharing is maintained specifically for recreational vessels who may be less aware of the proposed work, than larger commercial vessels (NASH, 2024).

Whilst there is a slight identified impact to small craft/routing activities during the construction phase due to installation activities and presence of vessels, particularly during summer months, embedded mitigation measures will ensure that there will be no interaction between vessels due to re-routing.

As this receptor has some tolerance to accommodate this particular effect or will be able to recover or adapt, the sensitivity is defined as **Low**.

With respect to the magnitude of effect, due to the temporary nature and activity of the construction works over the approximate 3 year-period, this is defined as **Low**.

The **Low** sensitivity, combined with **Low** magnitude, means that the impact to small craft routing and associated activities, during construction of the project, is **Negligible**, **Not Significant**.

7.7.5.3 POTENTIAL IMPACT TO MILITARY ACTIVITIES

No active firing is expected to be undertaken within the two PEXAs intersected by the Spittal-Peterhead cable routing during cable installation works, as the areas are operated in accordance with a CRP, by which exercises and firing only take place when the area is clear of all shipping (NASH, 2024).

It is likely that the installation work timetable will be taken into consideration if any exercises were scheduled to take place within the area, on the basis that embedded mitigation measures, including promulgation of information, are in place preceding the installation works (NASH, 2024).

During the construction phase there is a possibility for minor disruption to military exercises, although no active firing is expected to be undertaken during this period. Embedded mitigation measures will ensure that there will be no interaction between installation vessels and military activity. The Ministry of Defence will be notified of all activities prior to works.

As this receptor is generally tolerant and can accommodate without the need to recover or adapt, the sensitivity is defined as **Negligible**.

The magnitude of this effect is defined as **Negligible** due to the temporary and localised nature of the works over an approximate 3 year period.

The **Negligible** sensitivity, combined with **Negligible** magnitude, means that impact to military activities, during construction of the project, is **Negligible**, **Not Significant**.

7.7.5.4 POTENTIAL IMPACT ON VESSEL-TO-VESSEL COLLISION RISK

The presence of installation vessels along the route increases the risk of collision for all passing traffic during the construction phase (NASH, 2024). This is attributable to either direct risk of a passing vessel colliding with the cable installation vessels or to vessels altering their route due to the works and transiting in closer proximity to other passing vessels (NASH, 2024).

Cable laying vessels are limited in their maneuverability when laying cables, and so may not be able to avoid a collision with a passing vessel(NASH, 2024). Guard vessels are considered to pose a lesser risk of collision than the cable laying vessels, due to their smaller size and maneuverability in comparison (NASH, 2024). It is considered that there in adequate sea room should a passing vessel be required to undertake collision avoidance actions, given the assessed volume of traffic, distance between the cable corridor and existing navigational features in proximity (NASH, 2024).

Deviation of vessel routes regularly used by vessels within the Shipping and Navigation Study Area due to presence of the cable laying vessel has the potential to increase collision risks between passing vessels (NASH, 2024). In areas with higher density of vessel activity, collision risk for passing vessels with other vessels is greater. As outlined in **Section 7.7.3.14**, the area with the highest vessel density was in proximity to Peterhead Port (NASH, 2024). As previously mentioned, it is considered that there is adequate sea room should a vessel be required to undertake collision avoidance actions in all areas along the cable corridor, to avoid collisions between passing vessels and installation vessels (NASH, 2024).

Embedded mitigation measures, including promulgation of information through NtMs and the appropriate lighting and marking of installation vessels, will ensure that the majority of vessels will be aware of the cable installation works prior to encountering the Project vessels. Maritime regulations will be complied with throughout the installation works, and vessels will broadcast their status accurately through AIS to reflect the nature of activities being undertaken. As previously mentioned, adequate sea room is available along the cable corridor should any collision avoidance action be required (NASH, 2024).

Whilst there is an identified impact on vessel-to-vessel collision risk during the construction phase due to installation activities and an increased presence of vessels, adequate sea room and embedded mitigation measures will ensure that interaction will be highly unlikely between vessels due to re-routing and transiting in closer proximity to other vessels.

As this receptor has some tolerance to accommodate for this effect, or will be able to recover or adapt, the sensitivity is defined as **Low**.

The magnitude of this effect is defined as **Low** due to the temporary and localised nature of the works over an approximate 3 year period.

Low sensitivity, combined with **Low** magnitude, means that impact on vessel-to-vessel collisions, during construction of the project, is **Negligible**, **Not Significant**.

7.7.5.5 POTENTIAL IMPACT ON EMERGENCY RESPONSE/SEARCH AND RESCUE

There is potential for the presence of the cable laying vessel and guard vessels to inhibit search and rescue operations during the installation phase, should an incident occur in close proximity to installation activities and the requested minimum closest point of approach (CPA) for passing vessels (NASH, 2024). There is an additional risk that an emergency response could be required by the installation vessels themselves (NASH, 2024). The closest RNLI bases are located at Wick, Fraserburgh and Peterhead; the nearest search and rescue helicopter base is located at Inverness (NASH, 2024).

As outlined in **Section 7.7.3.13**, the rate of incidents in the vicinity of the proposed cable corridor has been low in recent years (NASH, 2024). Where incidents have occurred within 5 nm of the cable corridor, the most common type has been attributed to mechanical damage (NASH, 2024).

The embedded risk controls, including promulgation of Notice to Marines and broadcast warnings, will be implemented. An Emergency Response Cooperation Plan (ERCoP) will also be produced to safely manage operations of the cable installation. In the event of a nearby maritime accident, it is possible that an installation or a guard vessel may be the first vessel to respond (NASH, 2024).

There is an identified potential impact on emergency response/search and rescue during the construction phase, due to the potential to inhibit search and rescue operations in proximity to installation activities, and the increased need for emergency response should an incident occur on the construction vessels. Embedded mitigation measures will ensure that installation operations will be safely managed, and emergency response and search and rescue operators will be notified prior to works.

As this receptor has some tolerance to accommodate for this particular effect, or will be able to recover or adapt, the sensitivity is defined as **Low**.

The magnitude of this effect is defined as **Low** due to the temporary and localised nature of the works over an approximate 3 year period.

Low sensitivity, combined with **Low** magnitude, means that impact to emergency response and search and rescue, during construction of the project, is **Negligible**, **Not Significant**.

7.7.5.6 POTENTIAL IMPACT ON OIL AND GAS ACTIVITIES

There is potential for the presence of cable laying vessels and associated minimum requested CPAs for passing vessels to impact nearby oil and gas activities during construction (NASH, 2024). The Captain Oil Field is the nearest oil and gas field to the cable corridor, located 12 nm northeast of the cable corridor; hence, oil and gas facilities themselves are unlikely to be impacted (NASH, 2024). However, oil and gas vessels would regularly cross the cable corridor, particularly in proximity to Peterhead Port. These vessels may be required to adjust their route during the construction phase to avoid cable laying activities, but any deviations would be minor and in the order of minutes, as the works in any particular location will only occupy a small area at one time (NASH, 2024). The cable corridor does not cross any pipelines for oil and gas activities.

Embedded mitigation measures, including promulgation of information through NtMs, to ensure that vessel operators can carry out effective passing planning whilst taking the construction works into consideration.

Whilst there is an identified impact on vessel-to-vessel collision risk during the construction phase due to installation activities and an increased presence of vessels, adequate sea room and embedded mitigation measures will ensure that there will be no interaction between vessels due to re-routing and transiting in closer proximity to other vessels.

As this receptor has some tolerance to accommodate for this particular effect, or will be able to recover or adapt, the sensitivity is defined as **Low**.

With respect to the magnitude of effect, due to the temporary nature and activity of the construction works over the approximate 3 year-period, this is defined as **Low**.

Low sensitivity, combined with **Low** magnitude, means that impact to oil and gas activities, during construction of the project, is **Negligible**, **Not Significant**.

7.7.5.7 POTENTIAL IMPACT TO RISK OF SNAGGING OF ANCHORS AND FISHING GEAR

The assessed risk of anchor dragging across the cable corridor is low (NASH, 2024). Within the Shipping and Navigation Study Area, no designated or customary anchorages were identified with the exception of the chartered anchorage in proximity to Sinclairs Bay (NASH, 2024). Vessels moving at speeds less than 0.3 knots, reflected speeds where anchor dragging occurred during analysis. However, such vessel movements were low, and the few vessels exhibiting these speeds were mainly present within Sinclair's Bay and east of Wick and outside of Peterhead Port (NASH, 2024). However, there is a substantial separation between these activities and associated movements, and the cable corridor (NASH, 2024). There is vessel activity within Sinclair's Bay associated with the Subsea7 pipeline launch facility; SSEN have good engagement with the Subsea7 and operations will be coordinated.

Cable snagging could occur if commercial ships choose to deploy an anchor in an emergency and the anchor penetrates deep enough, although anchor deployment during an emergency is unlikely to occur (NASH, 2024). Snagging is more likely to occur where there is a higher risk of grounding and greater need for immediate action, i.e. in shallower coastal waters (NASH, 2024). On occasion, accidental deployment of an anchor may occur due to poor stowage or equipment failure, resulting in damage to subsea cables (NASH, 2024). The CBRA, including anchor penetration studies, has informed necessary target depths to protect vessels anchors that may be deployed within the Shipping and Navigation Study Area (NASH, 2024). In these instances, it is unlikely that the cable would pose a risk to the vessel and the most likely outcome would be cable damage (NASH, 2024).

As previously identified (**Section 7.7.3.14**), 93% of fishing by static and mobile gears utilized demersal gears which have the highest potential for interaction with subsea cables (NASH, 2024). Demersal gear including bottom trawlers and dredgers have the potential to penetrate into the seabed, however these penetration depths of fishing gear tend to be smaller than vessel anchors (NASH, 2024). The CBRA will consider fishing activity.

The risk of anchors or fishing gear snagging on subsea cables or associated cable protection is greater where cables are exposed during the installation process (NASH, 2024).

Embedded mitigation measures will ensure that fishermen and sea users are fully informed of the cable presence through NtMs during construction and markings on nautical charts post-construction. The cable burial will mitigate the risk of fishing gear snagging the cable, the minimum depth of lowering as outlined in the CBRA (0.6 m) will further minimise the potential for snagging. If snagging does occur, relevant procedures will be adopted for recovery of fishing gear, should snagging events occur (NASH, 2024).

Potential impacts were identified of risk of snagging of anchors and fishing gear during the construction phase due to presence of the HVDC cable. However sufficient cable burial where possible and embedded mitigation will reduce any potential for snagging risk; in instances where this may occur, relevant procedures will be adopted for fishing gear recovery.

As this receptor has some tolerance to accommodate for this particular effect, or will be able to recover or adapt, the sensitivity is defined as **Low**.

With respect to the magnitude of effect, activity of anchoring rarely occurring in the vicinity of the cable corridor, in combination with the aforementioned embedded mitigation measures and the duration of construction works over the approximate 3 year-period, this is defined as **Negligible**.

Low sensitivity, combined with **Negligible** magnitude, means that impact to snagging of anchors and fishing gear, during construction of the project, is **Negligible**, **Not Significant**.

7.7.5.8 POTENTIAL IMPACT ON UNDER KEEL CLEARANCE

The introduction of cable protection (along 25,090m of the cable corridor during the construction phase may impact vessels' under keel clearance along the cable corridor (NASH, 2024). Maximising cable burial and minimising areas where cable protection is required will minimise the risk of vessel grounding (e.g. areas where water depth reductions exist are minimised). As reduction in clearance is not as critical within deeper waters, the reductions primarily affect vessels active in nearshore areas; approximately 2.1 km of the cable corridor lies within waters less than 10 m in depth (NASH, 2024). Analysis of vessel draught (Navigational Risk Assessment, Section 6.3.3 and 6.3.4) showed that vessels with deeper draughts tend to transit further offshore (NASH, 2024).

An additional study on navigable depth will ensure that sufficient safety is maintained where water depth may be reduced surrounding HDD popouts and Rattray Head. Overall, it is considered that the risks associated with the HDD Pop Outs are Tolerable and that safe navigation is not compromised (Nash, 2024 (NASH-0343_HDD_PopUp_Safety_Justification-R02-00)).

The risk of vessels grounding will be mitigated through sufficient cable burial with protection where burial is not feasible, to be informed by the CBRA (NASH, 2024). Other mitigations include charting of the cable and promulgation of NtMs to inform sea users. The embedded mitigations include compliance with MGN 654, to ensure safe navigation is not compromised by a reduction in chartered depths. As mentioned, the HDD study concluded that the risks associated with the HDD Pop Outs are Tolerable and that safe navigation is not compromised. The study concluded that the coastal geography naturally keeps both shallow and deep draught vessels further off the coast, and well clear of the pop out locations. Additionally, given the sizes and types of vessels present within the Shipping and Navigation Study Area, there is sufficient depth of water to maintain an acceptable under keel clearance; there is at least twice the maximum draught available for vessels to navigate.

Potential impacts were identified of risk to under keel clearance during the construction phase due to introduction of cable protection. However sufficient cable burial where possible and embedded mitigation will reduce any risk to under keel clearance, and ensure safe navigation is not compromised.

As this receptor is generally tolerant and can accommodate without the need to recover or adapt, the sensitivity is defined as **Negligible**.

With respect to the magnitude of effect, due to the temporary nature and activity of the construction works over the approximate 3 year-period and where vessels cross the cable corridor, this is defined as **Negligible**.

Negligible sensitivity, combined with **Negligible** magnitude, means that impact to under keel clearance, during construction of the project, is **Negligible**, **Not Significant**.

7.7.5.9 POTENTIAL IMPACT ON ACCESS TO PORTS AND HARBOURS

During installation, disruptions to ports arrivals and departures are unlikely to occur as the approaches to the ports and harbours are unobstructed by cable activities and there is no expected impact on vessel-to-vessel collision risk; as the installation is a temporary activity, the impact is considered minimal (NASH, 2024).

Embedded mitigation measures include liaison with ports and harbours and the promulgation of Notice to Mariners prior to any installation activities.

As this receptor has some tolerance to accommodate for this particular effect, or will be able to recover or adapt, the sensitivity is defined as **Negligible**.

With respect to the magnitude of effect, due to the temporary nature and activity of the construction works over the approximate 3 year-period and with limited overlap of construction works to access routes, this is defined as **Negligible**.

Negligible sensitivity, combined with **Negligible** magnitude, means that impact to access of ports and harbours, during construction of the project, is **Negligible**, **Not Significant**.

7.7.6 OPERATION PHASE

7.7.6.1 POTENTIAL IMPACT TO COMMERCIAL VESSEL AND FERRY VESSEL ROUTING

No anticipated changes to commercial vessel and ferry routing post installation of the cable are likely to occur, due to the nature of the cable on the seabed and depth of water in proximity to commercial shipping routes, with the exception of operational investigation activities and post-installation operational surveys (NASH, 2024). Disruptions will be short term and localised only as investigation activities will be carried out at isolated points along the cable corridor that are affected (NASH, 2024).

Minor impacts were identified to commercial and ferry vessels during the operation phase due to re-routing, where investigation activities are predicted to occur. Otherwise, no anticipated changes to commercial vessel and ferry routing during operation of the cable are likely to occur, due to the nature of the cable on the seabed and depth of water in proximity to commercial shipping routes. The available sea room for re-routing during this period, and adaptability of commercial and ferry vessels through embedded mitigation measures, limits further interactions.

As this receptor has some tolerance to accommodate this particular effect or will be able to recover or adapt, the sensitivity is defined as **Low**.

With respect to the magnitude of effect, due to the temporary and localised nature of investigation works during operation, this is defined as **Negligible**.

Low sensitivity, combined with **Negligible** magnitude, means that impact to commercial vessel and ferry vessel routing during operation of the project, is **Negligible**, **Not Significant**.

7.7.6.2 POTENTIAL IMPACT TO SMALL CRAFT ROUTING/ACTIVITIES

There are no anticipated impacts on small craft routing and activities post-installation of the cable, with the exception of operational investigation surveys (NASH, 2024). However, operational investigation surveys and associated disruptions, will be temporary and localised to the site needing remediation (NASH, 2024).

Minor impacts were identified to small craft routing and activities during the operation phase, where investigation activities are predicted to occur. Otherwise, no anticipated changes to small craft routing and activities post-installation of the cable are predicted to occur.

As this receptor is generally tolerant and can accommodate without the need to recover or adapt, the sensitivity is defined as **Negligible**.

With respect to the magnitude of effect, due to the temporary and localised nature of operational investigation surveys, this is defined as **Negligible**.

Negligible sensitivity, combined with **Negligible** magnitude, means that impact to small craft routing and associated activities, during operation of the project, is **Negligible**, **Not Significant**.

7.7.6.3 POTENTIAL IMPACT TO MILITARY ACTIVITIES

There are no anticipated impacts on military exercises post-installation of the cable, with the exception of operational investigation surveys (NASH, 2024). Where operational investigation surveys occur, there is potential impact to military activities, but will be no larger than previously outlined, where embedded mitigation measures will be implemented to minimise potential impacts (NASH, 2024). Additionally, operational investigation surveys and associated disruptions, will be temporary and localised to the site needing remediation, further minimising potential impact (NASH, 2024).

Minor impacts were identified to military activities during the operation phase, where operational investigation surveys are required, but will be no larger than previously outlined in **Section 7.7.5.3**. Otherwise, no anticipated changes to military activities post-installation of the cable are predicted to occur.

As this receptor is generally tolerant and can accommodate without the need to recover or adapt, the sensitivity is defined as **Negligible**.

With respect to the magnitude of effect, due to the temporary and localised nature of operational investigation works during operation, this is defined as **Negligible**.

Negligible sensitivity, combined with **Negligible** magnitude, means that impact to military activities, during operation of the project, is **Negligible**, **Not Significant**.

7.7.6.4 POTENTIAL IMPACT ON VESSEL-TO-VESSEL COLLISION RISK

There are no anticipated changes to vessel routing post-installation of the cable, hence there is no expected impact on vessel-to-vessel collision risk (NASH, 2024).

There are no identified impacts or anticipated changes to vessel-to-vessel collision risk during the operation phase.

As this receptor is generally tolerant and can accommodate without the need to recover or adapt, the sensitivity is defined as **Negligible**.

With respect to the magnitude of effect, due to the temporary and localised nature of operational investigation works during operation, this is defined as **Negligible**.

Negligible sensitivity, combined with **Negligible** magnitude, means that impact on vessel-to-vessel collisions, during operation of the project, is **Negligible**, **Not Significant**.

7.7.6.5 POTENTIAL IMPACT ON EMERGENCY RESPONSE/SEARCH AND RESCUE

There are no anticipated effects on emergency response post-installation of the cable (NASH, 2024).

There are no identified impacts or anticipated changes to emergency response/search and rescue during the operation phase. The available sea room for re-routing during this period alongside embedded mitigation measures ensuring sufficient navigational safety is maintained during operational investigation surveys, limits any potential interactions.

As this receptor is generally tolerant and can accommodate without the need to recover or adapt, the sensitivity is defined as **Negligible**.

With respect to the magnitude of effect, due to the temporary and localised nature of operational investigation surveys, this is defined as **Negligible**.

Negligible sensitivity, combined with **Negligible** magnitude, means that impact to emergency response and search and rescue, during operation of the project, is **Negligible**, **Not Significant**.

7.7.6.6 POTENTIAL IMPACT ON OIL AND GAS ACTIVITIES

There are no anticipated impacts on oil and gas activities post-installation of the cable (NASH, 2024).

There are no identified impacts or anticipated changes to oil and gas activities during the operation phase. The available sea room for re-routing during this period where required and embedded mitigation measures, ensure sufficient navigational safety is maintained, specifically during operational investigation surveys.

As this receptor is generally tolerant and can accommodate without the need to recover or adapt, the sensitivity is defined as **Negligible**.

With respect to the magnitude of effect, due to the temporary and localised nature of operational investigation surveys, this is defined as **Negligible**.

Negligible sensitivity, combined with **Negligible** magnitude, means that impact to emergency oil and gas activities, during operation of the project, is **Negligible**, **Not Significant**.

7.7.6.7 POTENTIAL IMPACT ON ELECTROMAGNETIC INTERFERENCE AND VESSEL COMPASSES

Potential impact of electromagnetic interference by the cable is not considered to be a significant impact on navigational safety during operation (NASH, 2024).

There are no identified impacts or anticipated changes to electromagnetic interference and vessel compasses during the operation phase. The cable burial depth and external cable protection during operation will substantially reduce any potential effects.

As this receptor is generally tolerant and can accommodate without the need to recover or adapt, the sensitivity is defined as **Negligible**.

With respect to the magnitude of effect, due to the temporary and localised nature of operational investigation surveys, this is defined as **Negligible**.

Negligible sensitivity, combined with **Negligible** magnitude, means that impact to electromagnetic interference and vessel compasses, during operation of the project, is **Negligible**, **Not Significant**.

7.7.6.8 POTENTIAL IMPACT TO RISK OF SNAGGING OF ANCHORS AND FISHING GEAR

The appropriate level of protection and inspections will be determined within the CBRA to ensure the risk of snagging is minimised throughout operation (NASH, 2024).

Potential impacts were identified of risk of snagging of anchors and fishing gear during the construction phase due to presence of the HVDC cable. However sufficient cable burial where possible and embedded mitigation will reduce any potential for snagging risk; in instances where this may occur, relevant procedures will be adopted for fishing gear recovery.

As this receptor has some tolerance to accommodate this particular effect or will be able to recover or adapt, the sensitivity is defined as **Low**.

With respect to the magnitude of effect, due to the temporary and localised nature of operational investigation surveys during operation, this is defined as **Negligible**.

Low sensitivity, combined with **Negligible** magnitude, means that impact to snagging of anchors and fishing gear, during operation of the project, is **Negligible**, **Not Significant**.

7.7.6.9 POTENTIAL IMPACT ON UNDER KEEL CLEARANCE

There are no anticipated impacts under keel clearance post-installation of the cable (NASH, 2024).

There are no identified impacts or anticipated changes to under keel clearance during the operation phase above previously identified levels in the construction phase. Sufficient cable burial and embedded mitigation will have previously reduced any risk to under keel clearance during construction, ensuring safe navigation during operation is not compromised. An additional study on navigable depth will ensure that sufficient safety is maintained where water depth may be reduced surrounding HDD popouts and Rattray Head. As mentioned in **Section 7.7.5.8**, the HDD study concluded that the risks associated with the HDD Pop Outs are Tolerable and that safe navigation is not compromised. The study concluded that the coastal geography naturally keeps both shallow and deep draught vessels further off the coast and well clear of the pop out locations. Additionally, given the sizes and types of vessels present within the Shipping and Navigation Study Area, there is sufficient depth of water to maintain an acceptable under keel clearance; there is at least twice the maximum draught available for vessels to navigate.

As this receptor is generally tolerant and can accommodate without the need to recover or adapt, the sensitivity is defined as **Negligible**.

With respect to the magnitude of effect, due to the temporary and localised nature of vessels crossing the cable corridor, this is defined as **Negligible**.

Negligible sensitivity, combined with **Negligible** magnitude, means that impact to under keel clearance, during operation of the project, is **Negligible**, **Not Significant**.

7.7.6.10 POTENTIAL IMPACT ON ACCESS TO PORTS AND HARBOURS

There are no anticipated impacts to ports and harbours post installation of the cable (NASH, 2024).

There are no identified impacts or anticipated changes to access of ports and harbours during the operation phase. Where operational investigation surveys are expected to occur, ports and harbours will be notified prior, as per the embedded mitigation measures.

As this receptor is generally tolerant and can accommodate without the need to recover or adapt, the sensitivity is defined as **Negligible**.

With respect to the magnitude of effect, due to the temporary and localised nature of operational investigation surveys, this is defined as **Negligible**.

Negligible sensitivity, combined with **Negligible** magnitude, means that impact to access of ports and harbours, during operation of the project, is **Negligible**, **Not Significant**.

7.7.6.11 POTENTIAL IMPACT ON ELECTROMAGNETIC INTERFERENCE AND VESSEL COMPASSES

Particularly in shallow waters, static magnetic fields created by HVDC cables can interact with the earth's natural magnetic field, interfering with magnetic navigational equipment in the process (NASH, 2024). As per previous consultation, the MCA would be willing accept a three-degree deviation for 95% of the cable corridor; for the remaining 5% of the cable corridor no more than five-degree deviation in water depths of 5 m and deeper will be attained (NASH, 2024). It is considered unlikely that any created interference will have a significant impact on vessel navigation, as the vast majority of commercial traffic uses non-magnetic navigational equipment as the primary means of navigation (NASH, 2024). Through implementing a sufficient burial depth during construction, the effects of electromagnetic interference on magnetic compasses used for vessel navigations, will be reduced (NASH, 2024). External cable protection will counteract the effects, in areas along the cable corridor where burial is not possible (NASH, 2023). Where vessels cross the cable corridor, any residual effects will be highly localised and temporary (NASH, 2024). An additional EMF study will be undertaken better understand the effects of EMF on compass deviation.

As this receptor is generally tolerant and can accommodate without the need to recover or adapt, the sensitivity is defined as **Negligible**.

With respect to the magnitude of effect, due to the localised nature where vessels cross the cable corridor, this is defined as **Negligible**.

Negligible sensitivity, combined with **Negligible** magnitude, means that impact to electromagnetic interference and vessel compasses, during construction of the project, is **Negligible**, **Not Significant**.

7.7.7 DECOMMISSIONING PHASE

Potential impacts during decommissioning activities are likely to be similar to those previously outlined under construction, for all identified receptors (**Section 7.7.5.1 – Section 7.7.5.9**) (NASH, 2024).

7.7.8 NAVIGATION RISK ASSESSMENT

A Navigation Risk Assessment (NRA) was developed by NASH Maritime Ltd., following the International Maritime Organisation's Formal Safety Guidelines, with consideration given to Marine Guidance Note (MGN) 654. The NRA includes both a hazard log and a risk scoring process based on the data analysis and modelling outlined under the baseline assessment, to provide a quantitative overview. The full methodology and associated analysis are highlighted in **Section 9** of **APPENDIX G: Navigational Risk Assessment**.

Within the NRA, nine hazard types were assessed, of which six were scoped out.

7.7.8.1 NAVIGATION RISK ASSESSMENT SUMMARY

The results of the NRA concluded that no hazards were assessed as High Risk – Unacceptable; one hazard was assessed as Medium Risk – Tolerable (if as low as reasonably practicable (ALARP)); 15 hazards were assessed as Low Risk – Broadly Acceptable (NASH, 2024). **Table 7-34** summarises the top 10 hazards identified in the NRA; the full hazard log is available in Appendix A of **APPENDIX G: Navigational Risk Assessment.**

TABLE 7-34: TOP 10 HAZARDS ACROSS ALL IDENTIFIED RISKS (NASH, 2023)

ID	Rank	Phase	Area	Hazard title	Score	Rating
1	1	C/O/D	1/2/3	Snagging – Fishing	6.4	Medium Risk – Tolerable (if ALARP)
3	2	C/O/D	1/2/3	Snagging – Cargo/Tanker or Ferry/Passenger	6.0	Low Risk – Broadly Acceptable
13	2	C/D	1/2/3	Collision – Large Project Vessel in collusion with (ICW). Ferry/Passenger	6.0	Low Risk – Broadly Acceptable
12	4	C/D	1/2/3	Collision – Large Project Vessel ICW. Cargo/Tanker	5.8	Low Risk – Broadly Acceptable
8	5	C/D	1/2/3	Collision – Ferry/Passenger ICW. Cargo/Tanker or Ferry Passenger	5.3	Low Risk – Broadly Acceptable
9	6	C/D	1/2/3	Collision – Cargo/Tanker ICW. Cargo/Tanker	5.1	Low Risk – Broadly Acceptable
10	6	C/D	1/2/3	Collision – Small Craft ICW. Ferry/Passenger or Cargo/Tanker	5.1	Low Risk – Broadly Acceptable
14	6	C/D	1/2/3	Collision – Small Craft ICW. Large Project Vessel	5.1	Low Risk – Broadly Acceptable
16	6	C/D	1/2/3	Collision – Small Project Vessel ICW. Ferry/Passenger or Cargo/Tanker	5.1	Low Risk – Broadly Acceptable
11	10	C/D	1/2/3	Collision – Small Craft ICW. Small Craft	4.8	Low Risk – Broadly Acceptable

7.7.8.2 RISK OF COLLISION

The outputs for all nine collision hazards were assessed to be Low Risk - Broadly Acceptable (NASH, 2024). The highest scoring collision hazard was related to a large Project vessel in collision with a ferry or passenger vessel, however, this was deemed extremely unlikely in the most likely scenario and remote under the realistic worst-case scenario (NASH, 2024). Although the frequency was ranked low, the consequences were determined to be more severe than the other permutations, mainly driven by the potential for fatality and national adverse publicity (NASH, 2024). The second highest scoring collision hazard between a large Project vessel and a cargo vessel or tanker, whereby the same conclusion was deemed as for the highest scoring, with a lesser consequence deemed (NASH, 2024). Similarly, the third highest scoring collision hazard between a ferry or passenger vessel with either a cargo vessel or tanker or another ferry or passenger vessel, was ranked as extremely unlikely to occur at the Project site in its frequency (NASH, 2024).

The frequencies assigned had considered all embedded mitigation measures described in **Section 6.4.1**.

7.7.8.3 RISK OF SNAGGING

The outputs for one of the snagging hazards at its highest gave a rating of Medium Risk – Tolerable (if ALARP), whilst the remaining three produced a rating of Low Risk – Broadly Acceptable (NASH, 2024). The Medium Risk snagging hazard was identified as a risk to fishing vessels either through the use of anchors or fishing gear (NASH, 2024). The frequency of a most likely outcome was deemed to be unlikely to occur at the site, however, these incidents have reportedly occurred along other subsea cables (NASH, 2024). A frequency under the realistic worst-case scenario was determined to be extremely unlikely to reflect that this has rarely occurred in wider industry (NASH, 2024). The second highest ranked snagging hazard was identified for cargo vessels, tankers, passenger vessels or ferries snagging an anchor on the cable (NASH, 2024). The two remaining lower scoring snagging hazards relate to either a large Project vessel or a small craft vessel snagging their anchor on the cable; the frequencies for these outcomes were ranked lower than the aforementioned (NASH, 2024).

7.7.8.4 RISK OF GROUNDING

All three grounding hazards were identified as Low Risk – Broadly Acceptable (NASH, 2024). The highest grounding hazard relates to the grounding of a large Project vessel (NASH, 2024). The frequency assigned for all three grounding hazards was assessed to be extremely unlikely at the cable site, having rarely occurred in the wider industry (NASH, 2024).

7.7.9 ASSESSMENT SUMMARY

Overall, the Shipping and Navigation assessment concluded **No Significant Effects** throughout the construction, operation, and decommissioning phases of the Project. Due to the assessment concluding **No Significant Effects** to Shipping and Navigation receptors, no additional mitigation is proposed.

Table 7-35 shows the receptors that have been assessed as part of the MEA for Shipping and Navigation.

Any overall risk determined to be **Negligible** or **Minor** is '**Not Significant**' i.e. no significant impact results. Any overall risk determined to be **Moderate** or **Major** is '**Significant**' and will require further mitigation(s) to be implemented to minimise or remove the significance of impact to become '**Not Significant**'.

TABLE 7-35: SUMMARY OF IMPACTS TO SHIPPING AND NAVIGATION RECEPTORS

Potential Impact	Receptor	Sensitivity	Magnitude	Overall Risk	Significance
Construction					
Potential impact to commercial vessel and ferry vessel routing	Commercial vessel and ferry vessel routing	Low	Low	Negligible	Not Significant
Potential impact to small craft routing/activities	Small craft routing/activities	Low	Low	Negligible	Not Significant
Potential impact to military exercises	Military Exercises	Negligible	Negligible	Negligible	Not Significant
Potential impact on vessel-to-vessel collision risk	Vessels	Low	Low	Negligible	Not Significant
Potential impact on emergency response/search and rescue	Emergency response/search and rescue	Low	Low	Negligible	Not Significant
Potential impact on oil and gas activities	Oil and gas activities	Low	Low	Negligible	Not Significant
Potential impact on electromagnetic interference and vessel compasses	Electromagnetic instruments and vessel compasses	Negligible	Negligible	Negligible	Not Significant
Potential impact to risk of snagging of anchors and fishing gear	Anchors and fishing gear	Low	Negligible	Negligible	Not Significant
Potential impact on under keel clearance	Under keel clearance	Negligible	Negligible	Negligible	Not Significant

Potential Impact	Receptor	Sensitivity	Magnitude	Overall Risk	Significance
Potential impact on access to ports and harbours	Ports and harbours	Negligible	Negligible	Negligible	Not Significant
Operation					
Potential impact to commercial vessel and ferry vessel routing	Commercial vessel and ferry vessel routing	Low	Negligible	Negligible	Not Significant
Potential impact to small craft routing/activities	Small craft routing/activities	Negligible	Negligible	Negligible	Not Significant
Potential impact to military exercises	Military Exercises	Negligible	Negligible	Negligible	Not Significant
Potential impact on vessel-to-vessel collision risk	Vessels	Negligible	Negligible	Negligible	Not Significant
Potential impact on emergency response/search and rescue	Emergency response/search and rescue	Negligible	Negligible	Negligible	Not Significant
Potential impact on oil and gas activities	Oil and gas activities	Negligible	Negligible	Negligible	Not Significant
Potential impact on electromagnetic interference and vessel compasses	Electromagnetic instruments and vessel compasses	Negligible	Negligible	Negligible	Not Significant
Potential impact to risk of snagging of anchors and fishing gear	Anchors and fishing gear	Low	Negligible	Negligible	Not Significant
Potential impact on under keel clearance	Under keel clearance	Negligible	Negligible	Negligible	Not Significant

Potential Impact	Receptor	Sensitivity	Magnitude	Overall Risk	Significance
Potential impact on access to ports and harbours	Ports and harbours	Negligible	Negligible	Negligible	Not Significant

7.8 MARINE ARCHAEOLOGY

7.8.1 INTRODUCTION

Maritime archaeology is the study of past cultures' interaction with waterbodies. Such study may, logically, include submerged archaeological sites, hereafter referred to as assets. However, it may also include assets located in the intertidal zone, or even assets onshore as they relate to activities, transport, and trade by the sea, such as lighthouses and pill boxes (Historic Environment Scotland (HES), 2024). This section describes the baseline for Marine Archaeology and Cultural Heritage within a defined Marine Archaeology and Cultural Heritage Study Area. This has been informed by a desk-based analysis and survey results. Details on the baseline are provided in the following subsections, covering assets at both the northern (Sinclair's Bay) and southern (Rattray Head) landfall sites, as well as the full offshore section between.

This section concludes with an appraisal of the potential effects introduced by the Project on Marine Archaeology and Cultural Heritage.

A full geophysical survey along the 500 m wide cable corridor, with extensions where the installation corridor to consent is wider, was completed in 2023 by Reach Subsea AS (REACH Subsea). The survey data were assessed for cultural heritage purposes by MSDS Marine Ltd (MSDS). A summary of the results has been included within this report. The full assessment by MSDS is provided in **APPENDIX E: Marine Archaeology Technical Appendix**.

This assessment considers the potential impact on Marine Archaeology and Cultural Heritage assets, as designated, non-designated, or potential sites. Designated sites include World Heritage sites, registered battlefields, registered gardens and designed landscapes, scheduled monuments, listed buildings and conservation areas. Non-designated assets consist of known sites identified in national and local records, such as the United Kingdom Hydrographic Office (UKHO) and Canmore databases, and Historic Environment Records (HER), as well as from site-specific survey data. Potential sites will be assessed through an understanding of the area, the local history and the current known sites.

Potential impacts of the Project on Marine Archaeology and Cultural Heritage assets comprise:

- Direct physical damage to the fabric of an asset (i.e. damage or removal of asset); and
- Indirect physical effects to an asset (i.e. through burial and sediment dispersal).

To investigate sensitivity of receptors, magnitude of change and determination of effect, the assessment will use the methodology as outlined in **Section 6** of this MEA.

Effects on setting have been scoped out of this assessment as there is no infrastructure above Mean High Water Springs (MHWS) for the Project, therefore this MEA only considers impacts below MHWS. Any onshore setting impacts are considered in the Project's onshore environmental assessments.

The relevant legislation and policy relating to Marine Archaeology include:

- National Marine Plan: Chapter 4;
- Marine (Scotland) Act 2010; and
- Marine and Coastal Access Act 2009.

7.8.2 MARINE ARCHAEOLOGY STUDY AREA

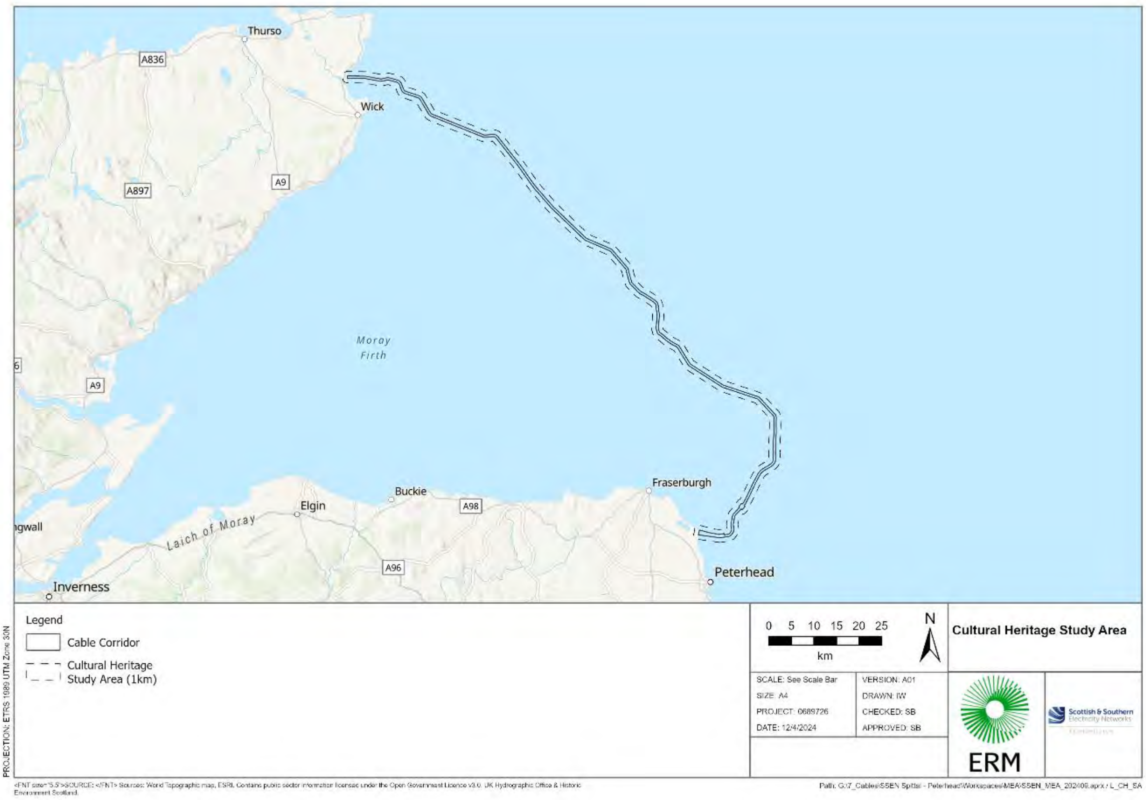
The Cable Corridor was defined by SSENT, as a 500 m wide corridor, with a widening at Rattray Head up to 1 km[11]. Reference is also made to a 500 m wide survey corridor, however for much of the corridor this does not extend further than 250 m either side of the centre line except where additional survey work was undertaken in areas where the installation corridor to consent is wider. For example, an additional survey campaign (nearshore and further offshore) was undertaken at Rattray Head to in-fill the widened corridor area (benthic imagery). The Marine Archaeology and Cultural Heritage Study Area includes a 1 km buffer to either side of the Cable Corridor, and up to MHWS at each landfall.

To assist in discussion, the Marine Archaeology and Cultural Heritage Study Area is divided into three sections:

- Northern Landfall – Sinclair's Bay Study Area. Extending from the landfall terminus at Mean High Water Springs (MHWS), east to the Mean Low Water Spring extent (MLWS);
- Southern Landfall – Rattray Head Study Area. Extending from MHWS, east to the MLWS extent; and
- Offshore Corridor. This connects the northern landfall to the southern landfall.

Figure 7-55 presents the Marine Archaeology and Cultural Heritage Study Area.

FIGURE 7-55: MARINE ARCHAEOLOGY AND CULTURAL HERITAGE STUDY AREA



[11] Originally the Cable Corridor extended up to MHWS, however, this has since been revised and ends offshore. The Study Area encompasses the full corridor, as there are available survey data, allowing an understanding of the area even if no direct impact is anticipated.

7.8.3 BASELINE ENVIRONMENT

7.8.3.1 PREHISTORY PERIOD

The prehistoric period in Scotland spans from the Palaeolithic Period to the arrival of the Romans in 78 AD. The environment within the Study Area varied considerably during the Palaeolithic, with glacial and marine advances and retreats. Although there may have been parts of the landscape that were sub-aerially exposed for short periods, the arctic conditions that would have been present at the time would have been unfavourable for human habitation. Subsequent glacial and marine processes are likely to have significantly reworked any remains that may be present, outside of sheltered areas.

There are uncertainties around the Relative Sea Level (RSL) after the Last Glacial Maximum, with a complex interplay between sea levels and isostatic rebound meaning a difference in model outputs of RSL. Within the Study Area, the Main Late Glacial Shoreline has been modelled at between -10-15 m Ordnance Datum (OD) (i.e. 10 to 15 m below OD); to up to ~15 m OD, or more (Shennan *et al*., 2018; Brooks *et al*., 2018). Between *c*. 8,000 to 2,000 years before present (BP), during a highstand phase, the relative sea level (RSL) may have been up to +5 m OD. From 2,000 BP onwards, the RSL tends to closely correlate with that of the present day.

The occupation/re-peopling of Scotland is believed to have taken place from *c*. 12,000 BP, controlled by these glacial advances and retreats which made the terrain difficult to navigate and support food for hunter-gatherer populations. As such, no Palaeolithic sites (pre-*c*. 12,000 BP) are known within the Study Area, nor are they expected in this region of northern Scotland.

In general, pastoralism, coastal and riverine occupation, and resource exploitation is well documented throughout the Palaeolithic and Mesolithic periods in Scotland, indicating a varied and mobile lifestyle of hunter-gatherer-fishers. Remains are often highly ephemeral, while coastal presence is often marked by shell middens or lithic scatters, that can imply sizeable processing centres. Transport via water is likely to have been primarily along rivers, coasts and inshore waters, using log or skin boats. Sheltered sea lochs, bay areas, archipelagos, submerged gullies, and locally thick sediments, permit a good potential for material survival. There is even suggestion of 'deep-sea' fishing from the early Holocene, although this, if active, would be marginal and likely occur where deep water is closer to shore (Pickard and Bonsall, 2004).

There are limited known Mesolithic sites in the region, and when identified, it is often the lithic remains that are found. However known, later, submerged prehistoric sites, mainly Neolithic, have been identified in Orkney, Shetland, Viking Bank, and Denmark. These sites demonstrate that archaeological material predating metallurgical use can survive the marine transgression in the region previously described, and have the potential to be identified in the nearshore and inshore areas of the region.

Hunting and gathering food sources near the coasts continued through the Neolithic into the Bronze Age. Coastal settlements from early sites have the potential to currently exist either onshore or within nearshore intertidal zones, as sea levels have changed, and coastal settlements potentially erode into the sea. Such sites may contain materials such as lithics, pottery and bronze finds, as well as potential mortuary monuments (Pickard and Bonsall, 2004; Noble, 2015).

As time went on, northeast Scotland saw progressively more inland utilisation of hilltop areas and lowland agriculture. This is matched by a reduction in reliance on marine resources, although the archaeological record still reflects the usage of log boats, nearshore and deep water fishing, and shoreline/beachcombing resource acquisition, as well as likely opportunistic exploitation of beached animals (Shulting *et al.*, 2002; Schmitt, 2008).

7.8.3.2 HISTORIC PERIOD

The historical period began in Britain with the arrival of the Romans in 43 AD, but they did not arrive in Scotland until 78 AD. The Romans had difficulty establishing strong cultural connections to Scotland (Society of Antiquities Scotland, 2014). Roman expansion north of the Forth primarily consisted of a series of forts and marching camps, from Camelon and Stirling, looping round the Grampian mountains, past Durno, north of Aberdeen, and on to Cawdor, approximately 17 km east of Inverness (Foster, 2011). It should be noted that the supply chain needed to manage, support and continue this expansionist/subduing/punitive endeavour would, most likely, include the transport of material equipment by land and sea. This would raise the potential for archaeological material to be present along the eastern Scottish coastline/nearshore Peterhead, where the Roman fleet maintained naval support lines.

In the early medieval period, following the period of the Roman withdrawal from Britain in the early 5th century AD, the native population of the Scottish domain, the Scots, Picts, Britons, Norse and Anglo-Saxons, exerted their dominion upon northern Britain (5th-10th centuries AD) (Rorke, 2005). All these cultures would have exploited coastal resources and used boats to facilitate trade.

The transition to the Anglo-Norman period, following the Norman invasion of England, saw the installation of a feudal monarchical system to the south of Scotland. In Scotland the rise of chieftainship and burgh settlement saw further population growth, and the development of established economies such as fishing. This, in time, led to the immense presence of Scotland in the European fish trade, as documented from 1470-1600 AD, where Scottish herring was supplied across Christian Europe (Rorke, 2005).

During the post-medieval period, construction of harbours and piers meant larger ships gained access to the Highlands (ScARF, 2017). Lighthouses were constructed to facilitate travel through the perilous Highland waters, but along the Scottish coasts, many ships were lost during this period.

The modern fishing industry is still a vital part of the Highlands economy, and maritime traffic still occurs along the Highland coasts and the North Sea, though massive advances in ship building techniques have occurred during the last 150 years, changing most ships from wind propulsion to internal combustion engines or electric vessels.

7.8.3.3 AVIATION AND CONFLICT ARCHAEOLOGY

During the 20th century, the two World Wars had a significant impact on the character and heritage of the eastern coast of Scotland. This was established through the installation of military infrastructure, and the transformation of commercial docks, ports, and similar facilities to military use (Scott, 2023). Both Sinclair’s Bay and Peterhead were fortified to protect against foreign incursion. Sinclair's Bay was also used as the drop location for the Royal Air Force to test highballs or 'bouncing bombs'.

In addition to military infrastructure being present in the area, there is also the possibility of aircraft wreckage or abandonment. One such plane crashed in Sinclair's Bay on 1st December 1943, when a plane practicing low flight level bomb practice was wrecked and, unfortunately, no survivors were located (Bureau of Aircraft Archives, 2023). Another aircraft, about which little is known, has been identified near the coast in Peterhead (Canmore ID 291694).

7.8.3.4 ARCHAEOLOGICAL ASSESSMENT

Within the archaeological assessment of 2023 geophysical data (MSDS, 2024), a number of assets were identified. Within the Cable Corridor, 2 anomalies of high archaeological potential and 3 anomalies of medium archaeological potential were identified. A total of 123 surface anomalies of Low archaeological potential were also identified.

Magnetic anomalies were also reviewed, with 384 records in total. Where these have surficial representation, they have been included in the totals above, however 365 of the magnetic anomalies did not correlate with any known or visible features or infrastructure.

7.8.3.5 MARINE ARCHAEOLOGY AND CULTURAL HERITAGE RECEPTORS

A summary of the current understanding of potential receptors within the Study Area has been provided below and is split into the 3 Study Area subsections. All Prehistoric, Marine, Aviation/Conflict and Historic archaeological assets have been summarised, where present. The results of the geophysical assessment (MSDS, 2024) have been included in the identification of receptors. Full descriptions of assets and anomalies can be found in **APPENDIX E: Marine Archaeology Technical Appendix**. **Figure 7-56** and **Figure 7-57** show an overview of these receptors.

Five designated assets are located within 1 km of the Northern and Southern Landfall Study Areas. They are all located on land above the MHWS and, as such, they are not assessed for impacts in this MEA and will be assessed, separately, in the onshore environmental assessment. However, all are listed here as they are indicative of potential archaeological periods and materials to be found in the area. One designated asset, a Scheduled Monument named 'Castle Linglas, broch, Keiss Links (SM540)', is located approximately 844 m to the southwest of the Cable Corridor in the Northern Landfall Study Area. In the Southern Landfall Area, there is a string of four related Scheduled Monuments: Rattray Line, pill box at Seatown; Rattray Line, pill box 55 m SE of Rattray Head Shore Station; Rattray Line, pill box 780 m ENE of Middleton of Rattray; and Rattray Line, pill box 650 m E of Rattray House (SM11319, SM11307, SM11308, and SM11309), running north to south, respectively; approximately 400 to 800 m from the Study Area. These scheduled monuments are all pill boxes and were all part of the Rattray Line of anti-tank coastal defences in the region during WWII.

Non-designated assets are outlined in detail in **Table 7-36**, and include the following:

- Northern Landfall Study Area;
    - 3 assets were identified within the Northern Landfall Cable Corridor;
    - 21 assets were identified within 1 km of the Northern Landfall Cable Corridor;
- Southern Landfall Study Area;

- No non-designated assets were identified within the Southern Landfall Cable Corridor;
- 107 assets were identified within 1 km of the Southern Landfall Cable Corridor;
- Offshore;
- 516 assets were identified within the Offshore Cable Corridor via indicative record locations from HER, Canmore, and UKHO, along with remotely sensed anomalies interpreted by MSDS in 2023; and
- 61 assets were identified within 1 km of the Offshore Cable Corridor via indicative record locations from HER, Canmore, and UKHO, along with remotely sensed anomalies interpreted by MSDS in 2023.

The archaeological assessment of the 2023 survey did not corroborate the locations of any previously identified archaeological sites in the UKHO, Canmore, HER, or HES datasets within the Cable Corridor. Therefore, the record locations can be interpreted as indicative of potential rather than physical confirmed sites.

TABLE 7-36: SUMMARY OF BASELINE ASSETS

Project Location	Site Type	Within Cable Corridor[12]	Wider Study Area[13]	Comments (where deemed necessary)
Northern Landfall	Marine	0	1 (HER and Canmore) 1 Brig indicative location (Canmore 328834) located above MHWS	n/a
	Aviation/Conflict	2 (MHG2015/Canmore 9126 and MHG30230) 20th century conflict sites (HER and Canmore)	2 (Canmore 172663; and MHG1643/Canmore 9350) 20th century conflict sites (HER and Canmore)	20th century conflict sites all located above MHWS on land and, as such, will not be impacted.
	Prehistoric	1 open peat bank (MHG2016/Canmore 9127) (HER and Canmore)	8 (MHG1639/Canmore 9346; MHG2020; MHG34549; MHG35614; MHG411/Canmore 9354; MHG42461; MHG42462; MHG42464) all located above MHWS	Open peat bank (MHG2016) location is a buffered area that extends into the Cable Corridor, but its exact boundaries are uncertain and may extend into the MHWS
	Historic	0	9 (MHG19222/Canmore 90944; MHG210/Canmore 9339; MHG211/Canmore 9340; MHG29217; MHG38858; MHG39861; MHG42463; MHG42465/Canmore 9131; and MHG61460) (HER and Canmore) 1 designated broch/castle(HES)	All located above MHWS

[12] All non-designated except when specified
[13] All non-designated except when specified

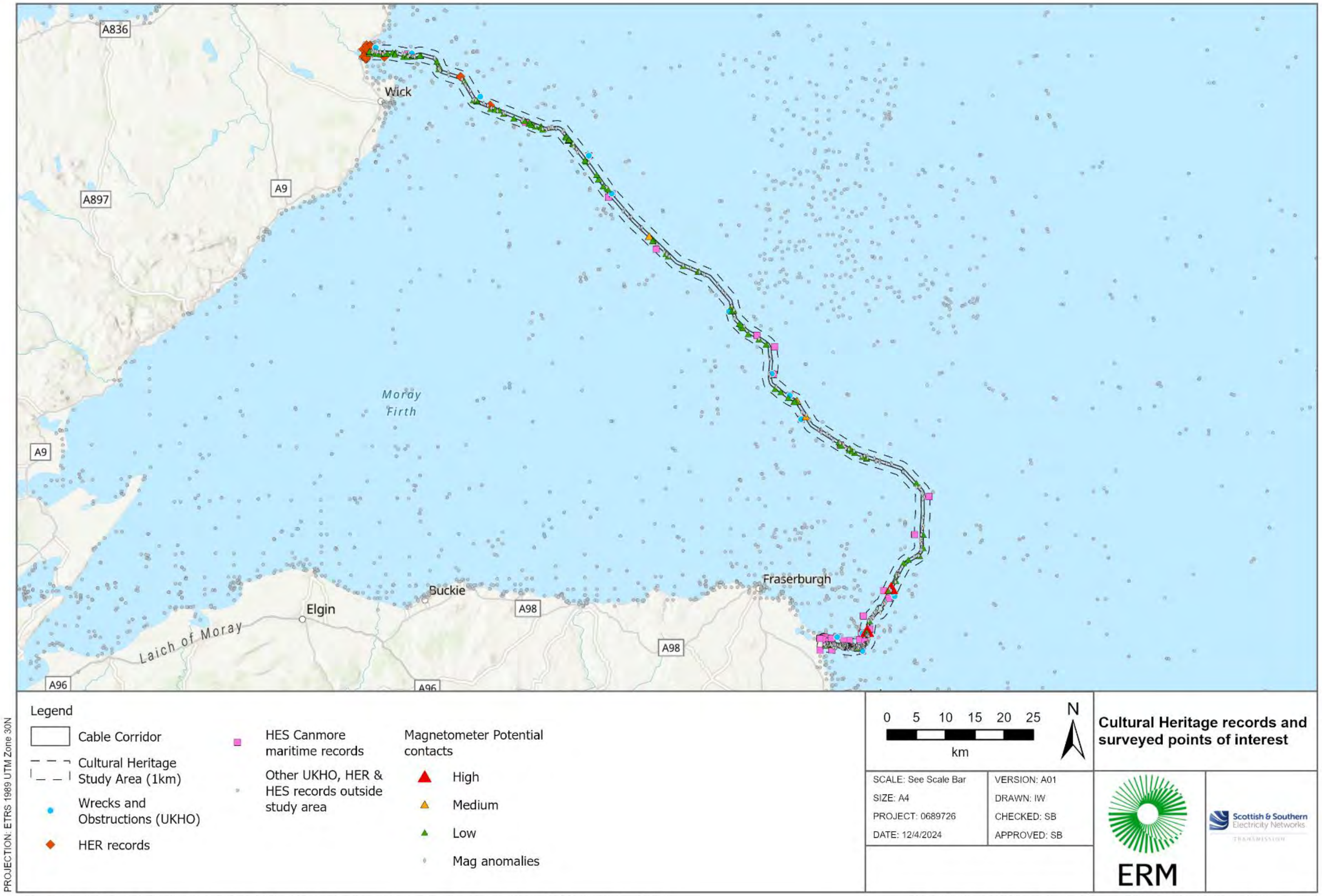
Project Location	Site Type	Within Cable Corridor[12]	Wider Study Area[13]	Comments (where deemed necessary)
Southern Landfall	Marine	0	92 (indicative Canmore shipwreck locations) 91 of which are located above MHWS. Only 1 (Canmore 207297) is located below MHWS	These locations, including Canmore 207297, were not identified during MSDS interpretation and are considered indicative locations.
	Aviation/Conflict	0	4 Designated assets (SM11319, SM11307, SM11308, SM11309); 9 non-designated assets (Canmore 203987; Canmore 203988; Canmore 203989; Canmore 203991; Canmore 249648; Canmore 367548; Canmore 81331; and 2 sites named Canmore 88838) (Canmore)	Designated assets are pillboxes at minimum 400 m inland from Cable Corridor. Similarly, the Project will not impact the 9 non-designated assets, as they are also located inland above MHWS.
	Historic	0	2 (Canmore 273002; and Canmore 275862) (Canmore)	Farmstead and rig and furrow located inland above MHWS. Will not be impacted by the Project.
Offshore Corridor[14]	Marine	2 shipwrecks (SP24_107 and SP24_115) (MSDS) 2 dead shipwreck locations (MHG14772/Canmore 101902; and UKHO 917) (Canmore, HER and UKHO)	1 live shipwreck (Canmore 101735) 8 dead shipwreck locations (Canmore 101846/UKHO 2290; UKHO 1170; UKHO 1204; UKHO 1308/Canmore 321581; UKHO 1340/Canmore 321600; UKHO 2293/Canmore 101734/Canmore	Locations confirmed for SP24_115 and SP24_107 (MSDS); and are of high potential.

[14] All Offshore Corridor receptors are located below MHWS

Project Location	Site Type	Within Cable Corridor[12]	Wider Study Area[13]	Comments (where deemed necessary)
		26 unknown or arbitrary shipwreck locations (Canmore and HER)	321929; UKHO 2306; UKHO 58924/Canmore 323808) 3 shipwrecks of currently unknown status but were live in 2012 (UKHO 2356/Canmore 321954; UKHO 2372/Canmore 321966; and Canmore 101728/UKHO 2319). 1 foul ground (UKHO 98200) 33 unknown status (UKHO and Canmore)	
		3 Medium potential assets (SP24_043, SP24_084, and SP24_092) (MSDS)	0	Potential Debris or Potentially geological
		107 Low potential assets (MSDS)	11 Low potential assets (SP24_067; SP24_089; SP24_091; SP24_101; SP24_102; SP24_103; SP24_003; SP24_005; SP24_009; SP24_113; SP24_114) (MSDS)	Within Cable Corridor: Chain cable or rope, Fishing gear, Likely geological, Linear debris, Potential debris, Potentially geological, or Seabed disturbance. Within Wider Study Area: Chain cable or rope, Fishing gear, Potential debris, or Potentially geological
		375 magnetic anomalies (MSDS)	3 magnetic anomalies (MSDS)	Magnetic anomalies with no surface representation – unable to assign potential (MSDS)

Project Location	Site Type	Within Cable Corridor[12]	Wider Study Area[13]	Comments (where deemed necessary)
	Aviation/Conflict	1 aircraft site (Canmore 328308) (Canmore)	1 site (Canmore 329743) (Canmore)	Indicative locations (Canmore)

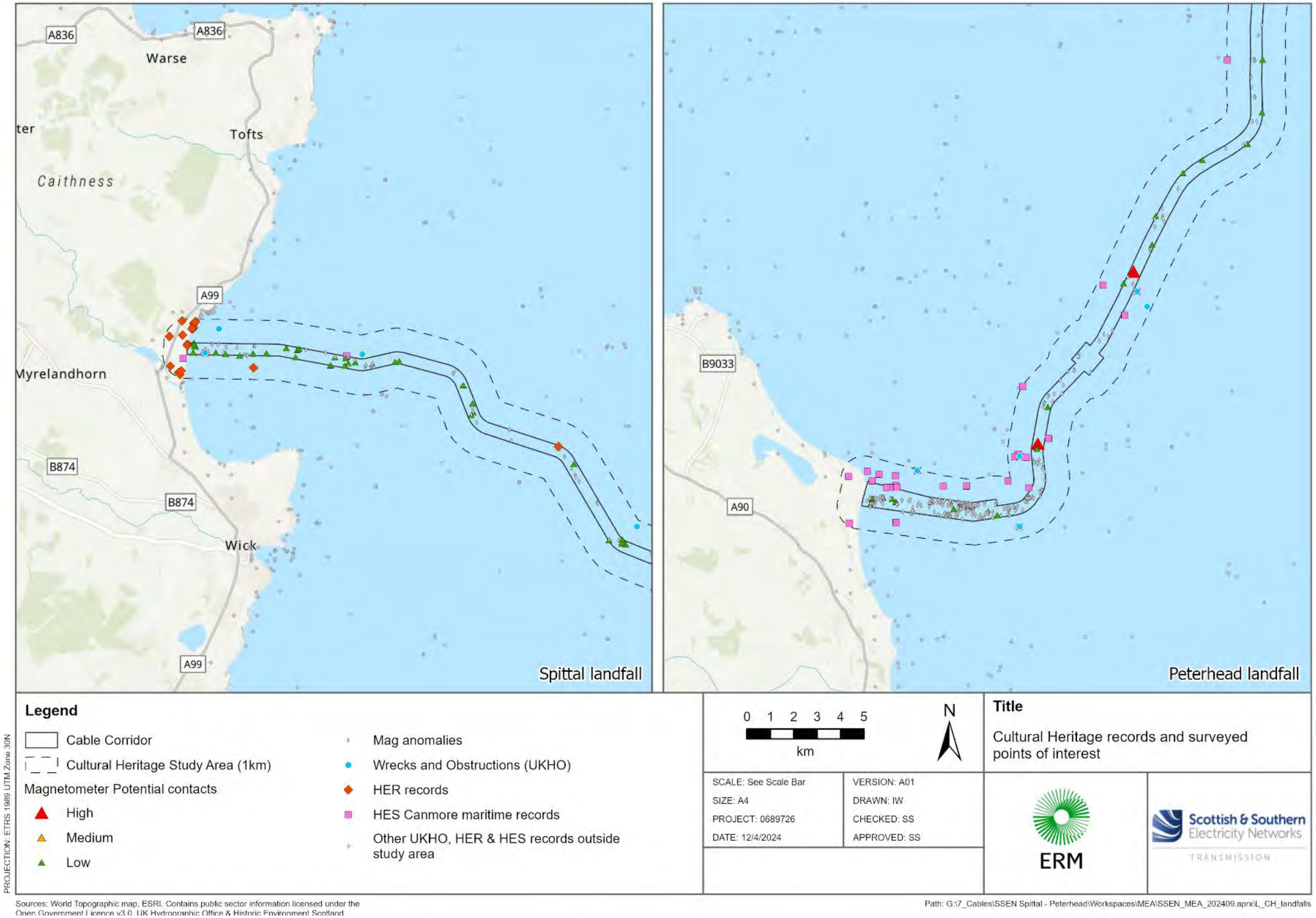
FIGURE 7-56: OVERVIEW OF MARINE ARCHAEOLOGY AND CULTURAL HERITAGE RECEPTORS



<FNT size="5.5">SOURCE: </FNT> Sources: World Topographic map, ESRI. Contains public sector information licensed under the Open Government Licence v3.0. UK Hydrographic Office & Historic

Path: G:\7_Cables\SSEN Spittal - Peterhead\Workspaces\MEA\SSEN_MEA_202409.aprx / L_CH_interest_SA

FIGURE 7-57: LANDFALL OVERVIEW OF MARINE ARCHAEOLOGY AND CULTURAL HERITAGE RECEPTOR



7.8.4 MARINE ENVIRONMENTAL ASSESSMENT

7.8.4.1 OVERVIEW

The proposed works have the potential to result in environmental impacts upon the receptor groups described in **Section 7.8.3**, and in **Table 7-36** that are located below or extend into the MHWS. Receptors located above MHWS, onshore, will be assessed in the onshore voluntary environmental impact assessment. Whilst a formal EIA is not required as part of this MLA, the MEA has been conducted using similar EIA terms and definitions for transparency and ease of understanding.

7.8.4.2 DEFINITION OF SIGNIFICANCE

This MEA will assign a level of significance to each receptor-impact pathway, in line with that provided within a formal EIA. **Table 7-37** defines the various levels of significance used within this assessment.

TABLE 7-37: DEFINITIONS OF SIGNIFICANCE FOR APPLICATION WITHIN THE MARINE ENVIRONMENTAL ASSESSMENT

Significance	Definition
Major Adverse/Beneficial Impact	Major Adverse results in an unacceptable level of impact, at sufficient importance to call for serious consideration of changes to the Project (Significant in formal EIA terms)
Moderate Adverse/Beneficial Impact	Moderate Adverse results in an unacceptable level of impact, at sufficient importance to call for consideration of changes to the Project (Significant in formal EIA terms)
Minor Adverse/Beneficial Impact	Acceptable level of impact, and unlikely to be sufficiently important to warrant mitigation measures (Non-significant in formal EIA terms)
Negligible Impact	Acceptable level of impact, of such low significance that they are not considered relevant for the decision-making process (Non-significant in formal EIA terms)

7.8.4.3 SCOPING OF POTENTIAL IMPACTS

The potential impacts outlined in **Table 7-38** below have been identified as relevant to each receptor group described in **Section 7.8.3**, and form the basis for assessment within the MEA.

TABLE 7-38 POTENTIAL IMPACTS ASSOCIATED WITH THE PROJECT

Topic	Impact	Project Phases	Scoped In/Out
Marine Archaeology	Direct physical impact via disturbance of the seabed on the archaeological/heritage features	Construction Operation Decommissioning	Scoped In
	Indirect physical impact via changes in hydrodynamics, sediment transport and suspended sediment concentrations (plumes)	Construction Operation Decommissioning	Scoped In
	Impact to settings	-	Scoped out

7.8.5 MARINE ARCHAEOLOGY IMPACTS

Impacts to marine archaeology are generally defined as

- Direct physical impacts from seabed disturbance;
- Indirect physical impacts from changes in hydrodynamics, sediment transport and suspended sediment (plumes); and
- Direct changes to setting (limited to above the waterline, therefore scoped out).

As there is no planned Project infrastructure above the water line, there are no proposed impacts to settings of any intertidal assets. Further assessment of onshore assets will be completed as part of an onshore assessment.

Direct and indirect physical impacts are not limited to the Construction phase of the Project, although the majority of the potential impacts occur within the Construction phase. The potential for impact during the Operations phase is present during once off, or on-going, cable surveys. Potential for impact via asset removal is present during the Decommissioning phase. Therefore, there remains the potential for impacts to marine archaeological assets across the Project lifecycle.

For the direct physical impacts, these are currently anticipated to be limited to the Cable Corridor, however, should this boundary alter, in the event of a design change, then additional assessment will be needed to understand the magnitude and effect on any known or potential marine archaeology. For heritage assets, direct physical impacts will be permanent and irreversible. However, indirect impacts such as changes to sedimentation may be reversible or subject to alteration following cessation of activity. Any loss of sediment and erosion of heritage assets will not be reversible, but where heritage assets are protected by the accumulation of deeper sediment, this may be considered a reversible change.

The nature of the marine archaeological resource is such that there is a high level of uncertainty concerning remains on the seabed. Often data regarding the nature and extent of sites are limited or out of date and, as such, the precautionary principle is applied to all aspects of archaeological impact assessments, and a conservative assessment of risk is applied.

7.8.5.1 IMPACT ASSESSMENT THROUGH THE PROJECT LIFE CYCLE

Table 7-40 below identifies the receptors that have the potential to be impacted by the Project, and summarises the impact type, provides the suggested mitigation measures and determines the residual impact following the implementation of mitigation.

For further information on these assets see **APPENDIX E: Marine Archaeology Technical Appendix**.

Direct physical impact - Seabed disturbance

Seabed disturbance due to installation of the cable, including from invasive surveys (cores), pre lay grapnel runs, trenching/ploughing, HDD, cable protection and anchoring, is the most likely source of direct physical impacts to known and unknown Marine Archaeology and Cultural Heritage assets, with the potential to damage, partially or wholly remove these assets.

The sensitivity of these known and unknown assets' is variable and depends on the archaeological potential and value, see **Table 7-40**. Direct physical impacts have the potential to be one off, non-reversible and permanent, equating to a **High** magnitude of effect. The only exception to this is from direct physical impacts on known and potential palaeogeographical receptors, where the rating of magnitude is lower, as the features are, generally, spatially more extensive and, therefore, the scale of the impact is relatively small.

Where mitigation is proposed, and the principle of avoidance is adopted in the first instance, through survey and assessment and identification, these mitigation measures will significantly reduce the predicted residual effect of this impact on the cultural heritage. Further details are provided in **Table 7-40**.

Indirect physical impact - Changes in hydrodynamics, sediment transport and plumes

Changes in hydrodynamics or sediment transport and the creation of sediment plumes are the main causes of indirect physical impact to known and unknown Marine Archaeology and Cultural Heritage assets.

The sensitivity of these assets varies, depending on the archaeological interest and value, see **Table 7-38**. Changes in hydrodynamics and sediment transport have the potential to destabilise any assets, causing potentially continued, non-reversible and, in the realistic worst case, permanent damage. As a result of these processes the asset may move out of its original context and association, or be damaged in this process, or be removed/dispersed (for smaller items or palaeolandscape features). With mitigations in place, the changes are proposed to be localised, and of negligible effect. However, given the sensitivity, **without mitigation**, these may equate to a **Major Adverse Effect**.

If a sediment plume is created, however, the area where the sediment settles may create an additional layer of protection over a cultural heritage asset and may, potentially, be recorded as a beneficial impact.

7.8.6 MITIGATION

Mitigation recommendations should be robust, but proportional. Pro-active mitigation of impacts to the historic environment using industry standard guidance can limit the direct and indirect physical impacts to any known or unknown Marine Archaeology and Cultural Heritage assets.

The preferred form of mitigation in the first instance is avoidance of known assets via survey and design. A geophysical survey of the corridor has been completed, and the data assessed by a competent marine archaeologist to identify assets of potential interest. Archaeological Exclusion Zones (AEZs) are recommended for known assets of high and medium archaeological potential, identified through the geophysical survey. Five of these are present within the Cable Corridor (**Table 7-39**).

An Area of Archaeological Potential (AAP) is recommended for a known potential prehistoric asset of high archaeological potential, although the full extent of the feature is not confirmed at present (**Table 7-39**). A further geoarchaeological assessment of the current data and cores is proposed, and may provide further definition, or refinement, of the current mitigation.

Operational Awareness is recommended for magnetic anomalies with no surficial representation identified within the geophysical assessment (potential known assets) - a total of 376 were identified within the Cable Corridor. Further details are provided in **APPENDIX E: Marine Archaeology Technical Appendix.**

Within the records across the wider Study Area, many non-designated assets have been identified, some as close as 5 m from the Cable Corridor Boundary. However, the position of the records may not always be accurate, and may be indicative, or an estimate based on information at the time. Should micrositing of the cable fall within 10 m of the Cable Corridor boundary, further review of the current data, and discussion on the appropriate risk and proportional mitigation for any unknown assets would be advised.

Given the potential for unknown archaeology, including buried assets within the Cable Corridor and proximity to known archaeology, a Protocol of Archaeological Discoveries (PAD) should be issued and approved by the local authority, through MD-LOT as required, and enforced before installation commences. This ensures that any identified archaeology can be suitably assessed and reported through the identified pathways to the local authority, with any further mitigation agreed where necessary[15].

Should any further geophysical or geotechnical surveys be undertaken for the Project, it is advised that the specifications (including locations) are, where possible, reviewed archaeologically for any practicable adjustment, or to confirm if of potential interest (e.g. unreviewed seabed). Where deemed so, the resulting data, including any ground-truthing data (e.g. ROV excavations), as appropriate, may be reviewed by a qualified archaeologist. A proportionate approach is required to enable reduction of risk of impact to any unknown archaeology, whilst maintaining continuation of the Project within planned timeframes. Any additional assets identified during further surveys should be reported (using the Written Scheme of Investigation (WSI)/PAD) and assessed for potential impacts, with any further mitigation agreed where necessary.

To ensure the above is all captured and managed for the duration of the Project (installation through to decommissioning), management through a Written Scheme of Investigation (WSI) is recommended, with further Method Statements completed as new tasks arise.

All mitigation should be approved by MD-LOT, in consultation with the Local Authority, before work commences.

TABLE 7-39: MARINE ARCHAEOLOGY EXCLUSION ZONES

ID	Location	Description	Record	Type	AEZ
MHG2016	Sinclair’s Bay	A peat-bank 7.8 m N-S by about 0.4 m deep, with 2.25 m of sand overburden. Located at the beach head [dry, top end of the beach] under shingle cover and exposed [by wave action] during [only] abnormally high tides.	HER; Canmore	Non-designated; Prehistoric	Area of Archaeological Potential (Point buffer, 50 m, from Canmore position)
SP24_043	Offshore	Medium potential anomaly. Potential debris measuring 0.4 m high; 3.3 m wide;	Geophysical data assessment	Non-designated; Maritime	Point buffer, 25.0 m

[15] All aircraft that crashed while in military service are automatically protected under the Protection of Military Remains Act 1986. If identified, such sites would represent statutory constraints upon the Proposed Development. This legislation means any activities impacting upon the aircraft remains must cease pending assessment by the Ministry of Defence (MoD).

ID	Location	Description	Record	Type	AEZ
		7.5 m long; and at a depth of 57.7 m.			
SP24_084	Offshore	Medium potential anomaly. Potential debris measuring 0.2 m high; 0.7 m wide; 4.4 m long; and at a depth of 84.4 m. An AEZ of 25.0 m is recommended	Geophysical data assessment	Non-designated; Maritime	Point buffer, 25.0 m
SP24_092	Offshore	Medium potential anomaly: Potential debris, may be geological. Measuring 1.5 m high, 4.8 m long and 3.8 m width. An AEZ of 25.0 m is recommended.	Geophysical data assessment	Non-designated; Maritime	Point buffer, 25.0 m
SP24_115	Offshore	High potential anomaly. Wreck measuring 0.7 m high; 4.1 m wide; 8.9 m long; and at a depth of 93.7 m. An AEZ of 50.0 m is recommended	Geophysical data assessment	Non-designated; Maritime	Point buffer, 50.0 m
SP24_107	Offshore	High potential anomaly. Potential wreck measuring 0.4 m high; 13.8 m wide; 26.0 m long; and at a depth of 6.1 m. An AEZ of 50.0 m is recommended	Geophysical data assessment	Non-designated; Maritime	Point buffer, 50.0 m

7.8.7 ASSESSMENT SUMMARY

As archaeological receptors cannot adapt, tolerate, or recover from physical impacts caused by a proposed development, for the purpose of assessment, the sensitivity of each asset is quantified by its value.

The nature of the marine archaeological resource is such that there is a high level of uncertainty concerning remains on the seabed. Often data regarding the nature and extent of sites are limited or out of date and, as such, the precautionary principle is applied to all aspects of archaeological impact assessments, and a conservative assessment of risk is applied.

Overall, the Marine Archaeology assessment concludes **Negligible** Risk, and **No Significant Effects** throughout the construction, operation, and decommissioning phases of the Project, following the mitigation proposed in **Table 7-39**.

Table 7-40 shows the receptors that have been assessed as part of the MEA for Marine Archaeology.

Any overall risk determined to be **Negligible** or **Minor** is '**Not Significant**' i.e. no significant impact results. Any overall risk determined to be **Moderate** or **Major** is '**Significant**' has mitigation(s) to be implemented to minimise or remove the significance of impact to become '**Not Significant**'.

TABLE 7-40: MITIGATION AND RESIDUAL IMPACTS OF THE PROJECT

Name	Impact Pathway	Location	Sensitivity	Magnitude	Overall Risk Pre-mitigation	Mitigation measures	Overall Risk Using Mitigation	Significance
Direct Physical Impacts – Seabed Disturbance								
Known assets of archaeological potential	Direct	Cable Corridor	High-Low	High - Medium	Major-Minor	Avoidance with an AEZ/AAP, Operational awareness of location, review of any further geophysical data, WSI and PAD	Negligible	Not Significant
Boundary Bank, Reiss Links (MHG2016)	Direct	Northern Cable Corridor	Medium	Medium	Moderate	Area of Archaeological potential	Negligible	Not Significant
3 x medium potential anomaly (SPTL_043, SPTL_084 and SPTL_092)	Direct	Offshore Cable Corridor	Medium	High	Major	25 m AEZ	Negligible	Not Significant

Name	Impact Pathway	Location	Sensitivity	Magnitude	Overall Risk Pre-mitigation	Mitigation measures	Overall Risk Using Mitigation	Significance
2 x high potential anomaly. Wreck (SPTL_115 and SPTL_107)	Direct	Cable Corridor	High	High	Major	50 m AEZ	Negligible	Not Significant
Low potential anomalies and magnetic contacts	Direct	Offshore Cable Corridor	Low	High	Minor	Operational awareness of location, review of any further geophysical data, PAD	Negligible	Not Significant
Unknown assets and features of archaeological potential	Direct	All Cable Corridor	Unknown	High	Moderate	Review of any further geophysical and geotechnical data, WSI and PAD to manage and monitor assets	Negligible	Not Significant
Known assets of archaeological potential	Indirect	Cable Corridor	High-Low	Medium-Low	Major-Minor	Avoidance with an AEZ	Negligible	Not Significant

Name	Impact Pathway	Location	Sensitivity	Magnitude	Overall Risk Pre-mitigation	Mitigation measures	Overall Risk Using Mitigation	Significance
Boundary Bank, Reiss Links (MHG2016)	Indirect	Northern Cable Corridor	Medium	Low	Moderate	Area of Archaeological potential	Negligible	Not Significant
3 x Medium potential anomaly (SPTL_043, SPTL_084 and SPTL_092)	Indirect	Offshore Cable Corridor	Medium	Low	Moderate	25 m AEZ	Negligible	Not Significant
2 x high potential anomaly. Wreck (SPTL_115 and SPTL_107)	Indirect	Cable Corridor	High	Low	Moderate	50 m AEZ	Negligible	Not Significant
Low potential anomalies and magnetic contacts	Indirect	Offshore Cable Corridor	Low	Low	Minor	Operational awareness of location, review of any further geophysical data, PAD	Negligible	Not Significant

Name	Impact Pathway	Location	Sensitivity	Magnitude	Overall Risk Pre-mitigation	Mitigation measures	Overall Risk Using Mitigation	Significance
Unknown assets and features of archaeological potential	Indirect	All Cable Corridor	Unknown	Medium	Moderate	Review of any further geophysical and geotechnical data, WSI and PAD to manage and monitor assets	Negligible	Not Significant
Known assets of archaeological potential	Indirect	Cable Corridor	High-Low	Negligible	Beneficial impact	Review of any further geophysical and geotechnical data, WSI and PAD to manage and monitor assets	Negligible	Not Significant
Unknown assets and features of archaeological potential	Indirect	All Cable Corridor	Unknown	Negligible	Beneficial impact		Negligible	Not Significant

7.9 OFFSHORE INFRASTRUCTURE

7.9.1 INTRODUCTION

This section describes the baseline for Offshore Infrastructure within a defined Offshore Infrastructure Study Area. This has been informed by a desk-based literature review utilising a range of data sources, including published data and reports.

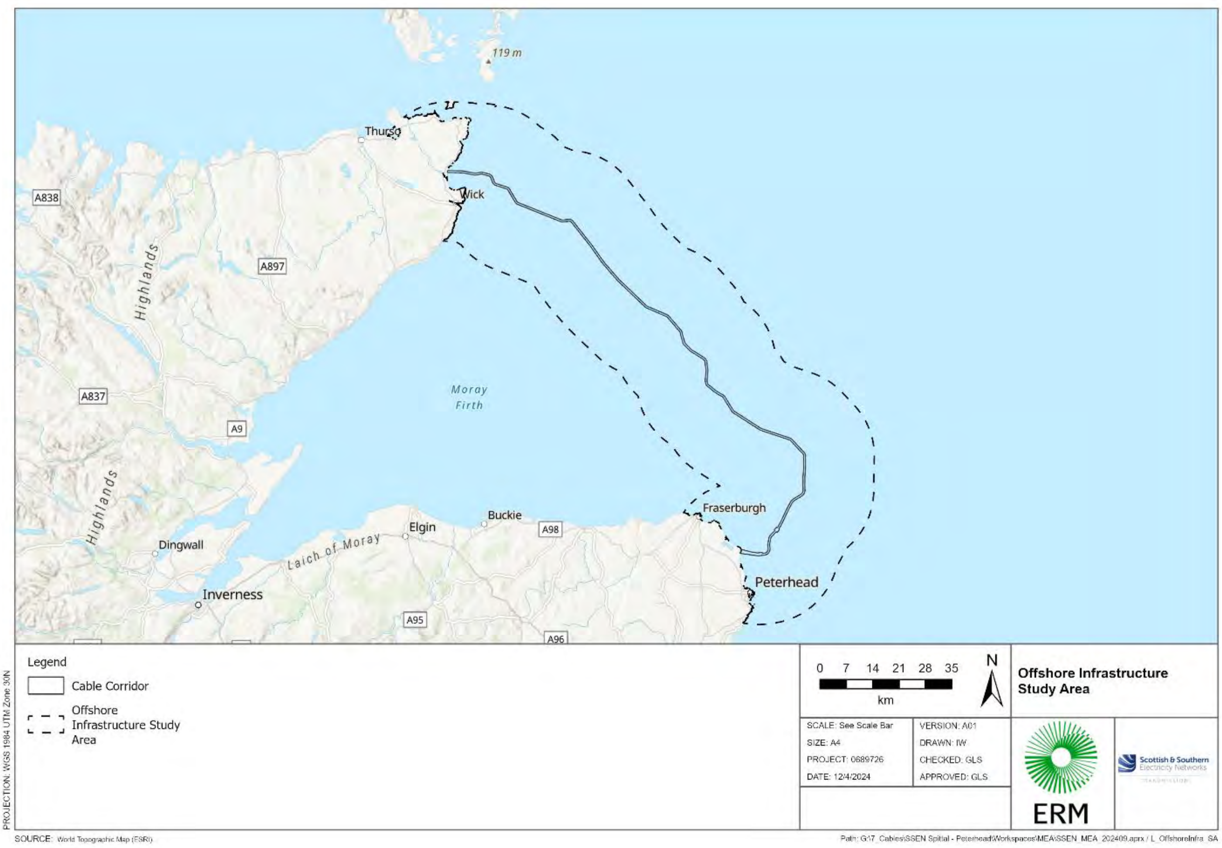
The relevant legislation and policy relating to Offfhshore Infrastructure include:

- National Marine Plan: Chapters 9-16;
- Marine (Scotland) Act 2010; and
- Marine and Coastal Access Act 2009.

7.9.2 OFFSHORE INFRASTRUCTURE STUDY AREA

The Offshore Infrastructure Study Area comprises an area of 10 nm, up to Mean High Water Springs (MHWS), surrounding the Project and is shown in **Figure 7-58**. This Study Area has been used within the Offshore Infrastructure baseline assessment to identify offshore projects present in the wider Moray Firth which may interact with the Project.

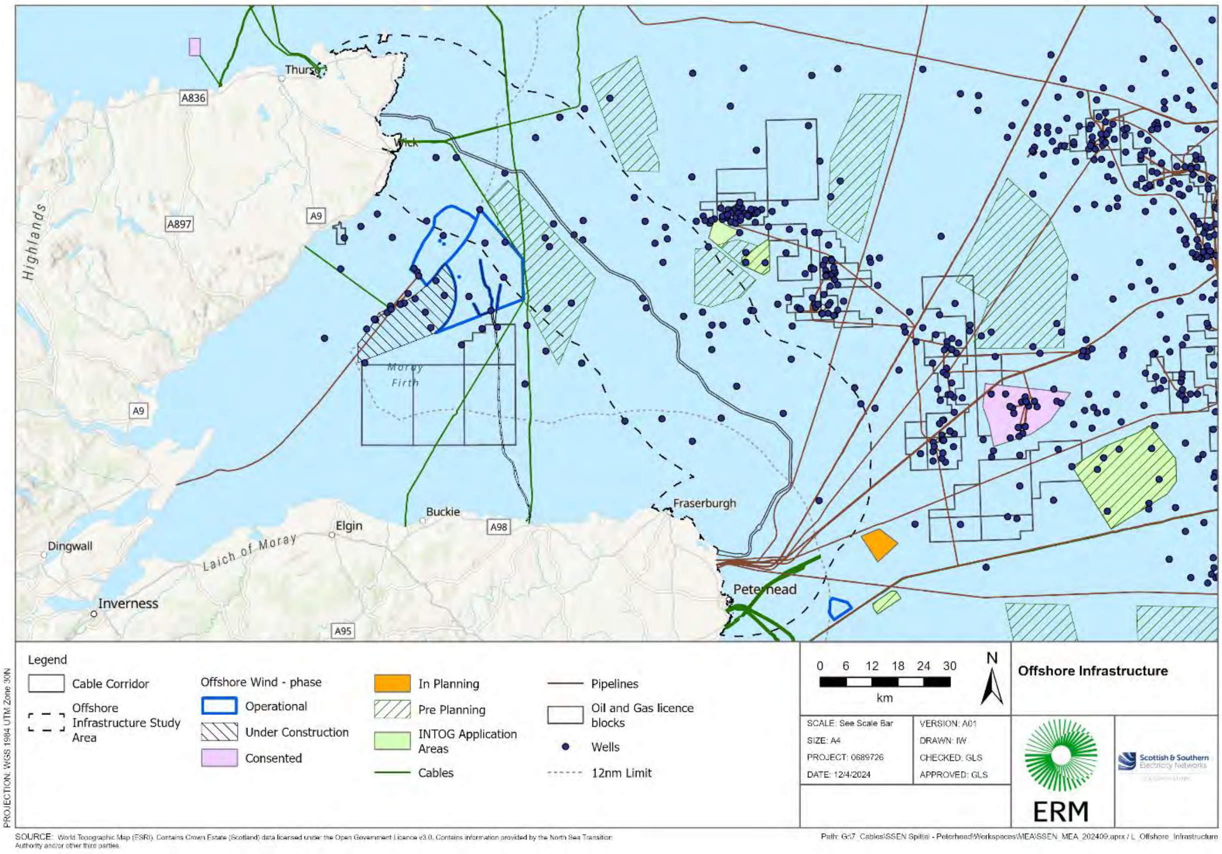
FIGURE 7-58: OFFSHORE INFRASTRUCTURE STUDY AREA



7.9.3 BASELINE ENVIRONMENT

Other users and infrastructure within the Offshore Infrastructure Study Area are presented below within **Figure 7-59**.

FIGURE 7-59: OTHER USERS AND INFRASTRUCTURE



7.9.3.1 OIL AND GAS

The Central North Sea region is a highly developed region for oil and gas exploitation (BEIS, 2016). Within the Moray Firth there are a number of offshore wells, three oil fields: Lybster, Beatrice and Jacky, and several extant licensed blocks for petroleum (NSTA, 2024).

The Project runs past a number of offshore wells within the Offshore Infrastructure Study Area (**Figure 7-59**). However, the majority of these wells are decommissioned and abandoned and occupy discrete spatial locations, so safe distances can be maintained from all offshore infrastructure.

Oil production has ceased at the Lybster, Beatrice and Jacky oil fields. Additionally, the three pipelines which served the Beatrice oil field are now abandoned or no longer in use. Furthermore, these oil fields are located outside of the Offshore Infrastructure Study Area.

Awarded during the 31st leasing round, blocks 17/5, 18/1, 18/2 and 12/27c are licensed for petroleum and administrated by Reabold North Sea Limited. The Project does not enter these licensed blocks.

Several provisional awards have been made for blocks under the 32nd leasing round, including blocks 12/16, 12/23, 12/24, 13/26b, 19/1 and 19/2 which the Project is identified to intersect.

Blocks 12/25 and 12/30 currently on offer under the most recent 33rd leasing round are also identified to intersect the Project.

East of the Moray Firth there are several subsurface and surface infrastructures, primarily aggregated around the hydrocarbon fields outside of the Offshore Infrastructure Study Area, which have been identified as (NSTA, 2024):

- Oil Fields – Captain, Blake, Buzzard, Ross and Golden Eagle;
- Gas Field – Cromarty; and
- Condensate Field – Atlantic.

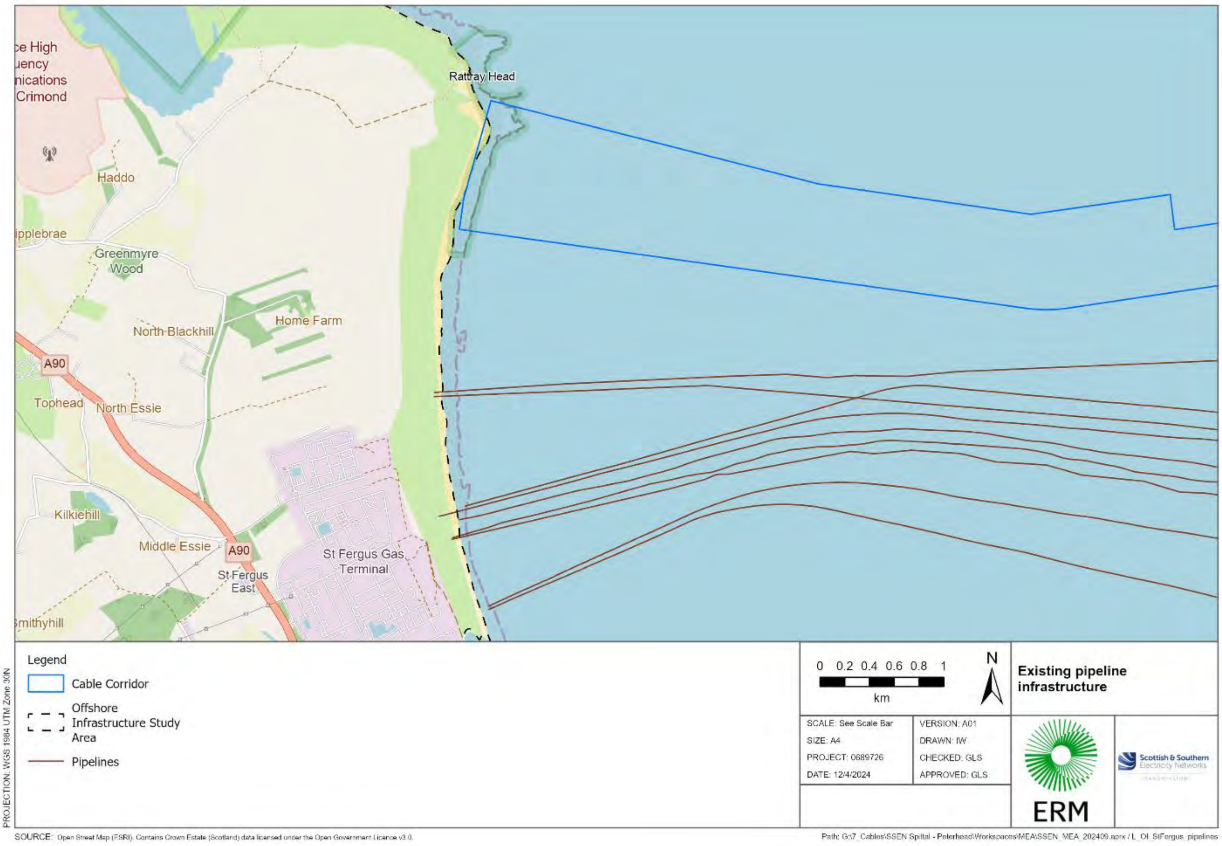
There are also a significant number of existing active and disused pipelines which service these fields, nine of which make landfall in proximity to the proposed southern landfall of the Project at Rattray Head (**Figure 7-60**).

The Project landfall at Rattray Head is within proximity to, but does not cross, the active pipelines summarised in **Table 7-41.** The Project is currently consulting with the operators of these pipelines to understand their requirements for separation between assets.

TABLE 7-41: ACTIVE GAS PIPELINES IN PROXIMITY TO THE PROJECT

Active Pipelines	Operator	Closest Distance from Cable Corridor (km)
36" Gas Brent A St. Fergus (FLAGS)	Shell PLC	0.58
HFC to St. Fergus South	GASSCO AS	1.37
32" MCP01 Bypass Bundle to St. Fergus Gas Plant	PX group	1.55
Britannia to St. Fergus	Harbour Energy PLC	1.17
Sage pipeline	Wood Group	0.70

FIGURE 7-60: EXISTING ACTIVE AND DISUSED PIPELINE LANDFALLS AT RATTRAY HEAD



7.9.3.2 OFFSHORE WIND FARMS

Operational and In Construction Offshore Wind Farms

Within the Moray Firth, west of the Project, there are two fully commissioned Offshore Wind Farms (OWFs): Beatrice and Moray East (Marine Scotland, 2024), which intersect the Offshore Infrastructure Study Area (**Figure 7-58**). The two export cables servicing the Beatrice OWF make landfall west of Portgordon (KIS-ORCA, 2024), outside of the Offshore Infrastructure Study Area.

The three export cables servicing the Moray East OWF make landfall at Inverboyndie Beach, west of Banff (Moray Offshore Renewables Limited, 2012 and KIS-ORCA, 2024), outside of the Offshore Infrastructure Study Area (**Figure 7-58**).

The Moray West OWF is currently under construction and expected to be in operation by 2025. Moray West has identified an export cable corridor (ECC) from the array site to a landfall area between Findlater Castle and Redhythe Point along the Aberdeenshire coast (Moray Offshore Windfarm (West) Limited, 2018). Both the array and ECC of Moray West are outside of the Offshore Infrastructure Study Area (**Figure 7-58**).

Outside of the Moray Firth, the operational Hywind Scotland Pilot Park has an export cable which makes landfall north of Peterhead Harbour within the Offshore Infrastructure Study Area (**Figure 7-58**).

These operational and in construction OWFs are summarised in **Table 7-42**.

TABLE 7-42 OPERATIONAL AND IN CONSTRUCTION OFFSHORE WIND FARMS

Offshore Wind Farm	Developer	Status	Closest Distance from Cable Corridor (km)
Beatrice Offshore Wind Farm	Beatrice Offshore Wind Farm	Operational	12.72
Hywind Scotland pilot park	Equinor	Operational	22.05
Moray East	Moray Offshore Wind Farm	Operational	10.69
Moray West	Moray Offshore Wind Farm (West)	Construction	26.51

Pre-Application and Consented Offshore Wind Farms

There are also a number of other OWFs which have either accepted option agreements within the ScotWind leasing round or have exclusivity agreements under the Innovation Targeted Oil and Gas (INTOG) leasing round. These OWFs are summarised in **Table 7-43.**

TABLE 7-43: PRE-APPLICATION AND CONSENTED OFFSHORE WIND FARMS

Offshore Wind Farm	Developer	Leasing Round	Status	Closest Distance from Cable Corridor (km)
Caledonia Offshore Wind Farm (NE4)	Caledonia Offshore Wind Farm	ScotWind	Pre-application	2.15
Stromar Floating Offshore Wind Farm (NE3)	Stroma Wind	ScotWind	Pre-application	18.85
Broadshore Offshore Wind Farm (NE6)	Broadshore Offshore Wind Farm	ScotWind	Pre-application	7.84
Ayre Floating Offshore Wind Farm (NE2)	Thistle Wind Partners	ScotWind	Offshore Scoping submitted June 2024	45.52
Muir Mhòr Floating Offshore Wind Farm	Muir Mhòr Offshore Wind Farm	ScotWind	Offshore Scoping submitted July 2023	56.91
Buchan Offshore Wind Farm (NE8)	Buchan Offshore Wind	ScotWind	Offshore Scoping submitted September 2023	43.24
MarramWind Floating Offshore Wind Farm (NE7)	MarramWind	ScotWind	Offshore Scoping submitted January 2023	48.11

Offshore Wind Farm	Developer	Leasing Round	Status	Closest Distance from Cable Corridor (km)
Salamander Floating Offshore Wind Farm	Salamander Wind Project Company	INTOG	Offshore EIA submitted April 2024	20.34
Green Volt Floating Offshore Wind Farm	Green Volt Windfarm	INTOG	Consented April 2024	45.1

Several of the OWFs listed in **Table 7-43** have export cables, or propose ECCs, which make landfall within proximity of the Project landfalls, particularly at the Rattray Head landfall location. These include:

- Ayre, which proposes landfall in Sinclair’s Bay;
- Muir Mhòr, which proposed landfall at Peterhead;
- Buchan, which proposed landfall at Rattray Head;
- MarramWind, which proposed to make landfall between Troup Head and Blackdog Beach;
- Salamander, which proposed to make landfall at Lunderton Beach; and
- Green Volt, which will make landfall at Rattray Head South.

7.9.3.3 CABLES

The Caithness-Moray HVDC power cable is located within proximity to the Project, making landfall at Wick. The Project cable corridor out of Sinclair’s Bay does not cross this cable.

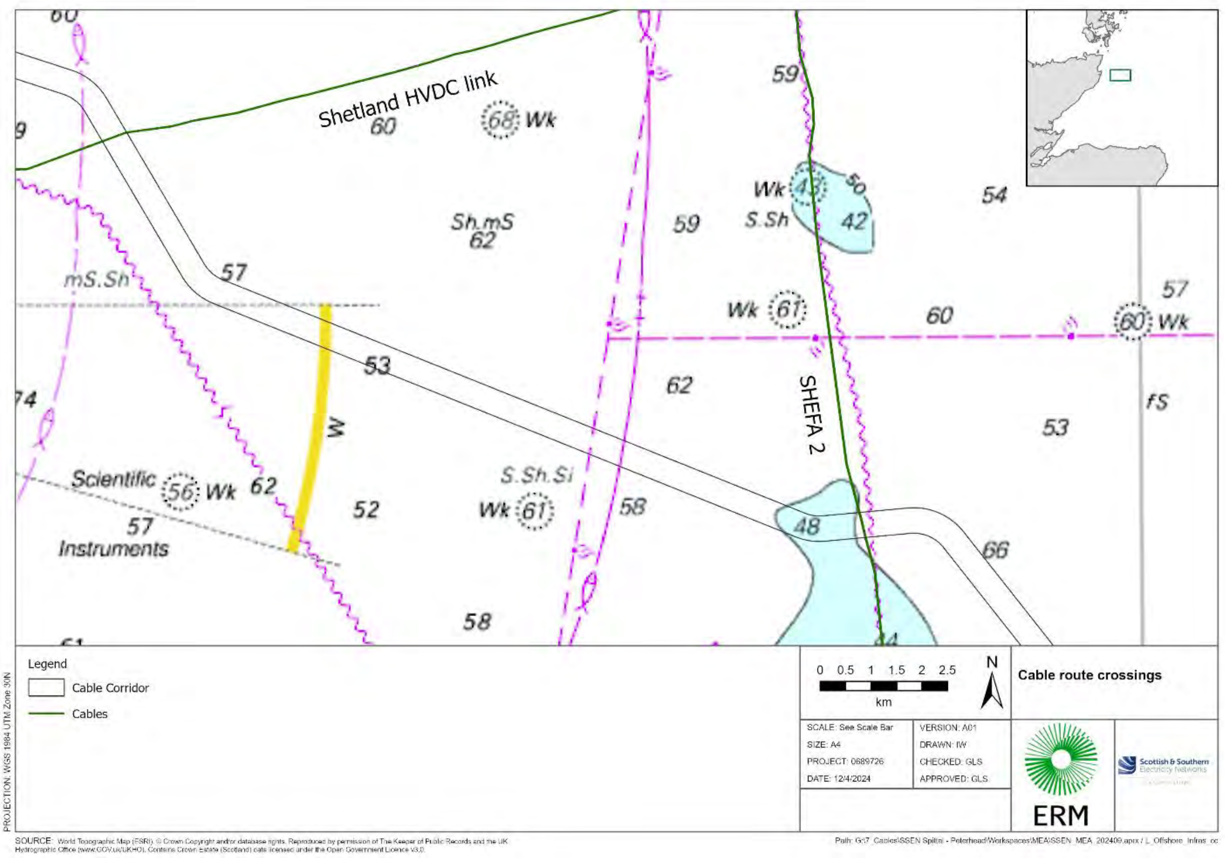
The Project crosses the SHEFA-2 telecommunications cable which runs from South Ronaldsay in Kirkwall to Banff (KIS-ORCA, 2024). The cable became operational in March 2008.

Additionally, the Project will cross with the 320kV Shetland HVDC Link. Installation of this cable has been completed from Weisdale Voe in Shetland to Noss Head in Caithness. Installation of the cable began in early 2023 and the cable has been operational since June 2024. The Shetland HVDC cable was energised and handover to ESO completed on 12 August 2024.

SSENT are currently in the progress of establishing a cable crossing agreement with the cable operators for both the SHEFA-2 telecommunications cable and the Shetland HVDC Link.

Potential cable crossing locations are displayed in **Figure 7-61**.

FIGURE 7-61: PROPOSED CABLE CROSSINGS WITH EXISTING SUBMARINE CABLES



7.9.3.4 SUBSEA7 WICK PIPELINE FABRICATION AND LAUNCH SITE

The Subsea7 site at Wick is a pipeline fabrication facility, located 1 nm from the north cable landfall at Sinclair's Bay (Nash, 2023). Pipeline bundles up to 7.7 km length are built on a length of railway track before being launched to sea and towed (Nash, 2023). Launches occur a few times a year and take between 12 and 36 hours to complete (Nash, 2023). Tow operations are conducted by two tugs, which tow the bundle out to sea (Nash, 2023). A guard boat is used to lead the convoy, accompanied by a survey vessel for checking the bundle enroute to its subsea destination (Nash, 2023).

SSENT have engaged with Subsea7 to gain a mutual understanding of both organisation's planned operations, in order to minimise any impacts.

7.9.4 MARINE ENVIRONMENTAL ASSESSMENT

7.9.4.1 OFFSHORE INFRASTRUCTURE

The Offshore infrastructure Study Area is defined as an area of 10 nm surrounding the Project. There are a number of offshore infrastructure elements in the vicinity of the Project. These include:

- Oil and gas pipelines;
- OWFs (operational / consented / pre-application);
- Cables including SSENT assets and telecommunications; and

- The Subsea7 Wick pipeline fabrication and launch site.

Throughout the Construction, Operation, and Decommissioning phase of the Project there is the potential for impacts to these receptor groups. These potential impacts have been assessed based on the realistic worst-case parameters outlined within the Project design, detailed within **Section 5: Project Description**. For Offshore Infrastructure these realistic worst-case parameters are outlined within **Table 7-44**.

The MEA follows the methodology provided within **Section 6: Impact Assessment Methodology**, and the definitions of sensitivity and magnitude set out within **Table 6-2** and **Table 6-3** of this Section, respectively.

TABLE 7-44: REALISTIC WORST-CASE PARAMETERS FOR OFFSHORE INFRASTRUCTURE

Potential Impact	Realistic Worst-Case Parameters
Construction and Decommissioning	
Temporary loss of access to other users during cable installation/ decommissioning due to the presence of project vessels.	Offshore construction programme = 3 years and 7 months Duration of installation = 56.25 days (1,350hr) **Cable:** Max Total approximate cable length = 172 km Min Burial depth = 0.6 m Total length of cable protection = 27,700 m (this comprises of 7,200 m mattress protection and 25,090 m rock placement) Max height cable protection = 1.125 m Total cable protection footprint (including crossings) = 308,374 m^2 Total volume of cable protection (including crossings) = up to 223,929.6 m^3 **Installation Project Vessels:** 7 active vessels plus support vessels (8 – 9 guard vessels spaced at 10 – 15 km intervals for every 90 km of cable corridor; maximum 17) Temporary 500 m exclusion zone
Collision risk between installation / decommissioning vessels with other sea users	As per impacts for loss of access to other users during cable installation/ decommissioning due to the presence of project vessels.
Direct damage to assets of other users	Two cable crossings **Cable:** Max Total approximate cable length = 172 km Min Burial depth = 0.6 m Total length of cable protection = 27,700 m (this comprises of 2,610 m mattress protection and 25,090 m rock placement) Max height cable protection = 1.125 m Total cable protection footprint (including crossings) = 308,374 m^2 Total volume of cable protection (including crossings) = up to 223,929.6 m^3
Operation	
Temporary loss of access to other users during operational investigation surveys due to the presence of project vessels.	Operational lifetime = 40 years **Cable Investigation Survey Vessels:** 7 active vessels plus support vessels Temporary 500 m exclusion zone

Potential Impact	Realistic Worst-Case Parameters
Collision risk between operational investigation survey vessels with other sea users	As per impacts for loss of access to other users during cable operational investigation surveys due to the presence of project vessels.

7.9.5 CONSTRUCTION PHASE

7.9.5.1 TEMPORARY LOSS OF ACCESS TO OTHER USERS DURING CABLE INSTALLATION DUE TO THE PRESENCE OF PROJECT VESSELS

Offshore construction will be conducted over a period of three years and seven months, during this time installation will last for a total duration of 56.25 days. It is anticipated that there will be up to seven active installation vessels plus support vessels, including a maximum total of 17 guard vessels (based on 8–9 guard vessels spaced at 10–15 km intervals per 90 km of cable corridor), at any one time. Where vessels are undertaking installation works, temporary 500 m exclusion zones will be implemented. Therefore, there is potential for temporary loss of access to other users, such as vessels servicing other plans and projects, where they are excluded from temporary exclusion zones and due to increased vessel presence. This may lead to increased vessel transit times associated with the construction phase of the Project.

In line with standard industry best practice, Notice to Mariners (NtMs) will be issued and updated on Kingfisher bulletins. These NtMs will be promulgated in advance of any proposed works and will include the time and location of works, and emergency event procedures. Once installed all permanent physical infrastructure on the seabed will be marked on Admiralty Charts issued by the UK Hydrographic Office (UKHO). Furthermore, engagement with other operators, like Subsea7, will continue.

Sensitivity of Receptors

Vessels servicing pipelines, OWFs, the Subsea7 site and other subsea cables are considered to be of a **Low** sensitivity as they are mobile receptors and are therefore considered to have a high tolerance and will have the ability to accommodate changes in vessel traffic.

The Subsea7 site is located 1 nm north of the Project where intense periods of works occur a few times a year during pipeline fabrication and launch. During these periods the Subsea7 site will have a low ability to tolerate any increases in vessel traffic and to recover from any impacts to the fabrication and launch schedule due to its short duration. The Subsea7 site is therefore considered to be of a **Medium** sensitivity.

Magnitude of Effect

Loss of access to other users will be temporary and short term. Installation of the Project will be broken down into several campaigns and therefore the potential for loss of access to other users will be localised to a particular section of the Project undergoing installation at any one time. Therefore, the magnitude is considered to be **Low**.

Assessment Conclusions

Due to the **Low** sensitivity of vessels servicing other plans and projects and the **Medium** sensitivity of the Subsea 7 site and **Low** magnitude, temporary loss of access to other users during cable installation due to the presence of Project vessels has been assessed as having a **Negligible** to **Minor** effect, and is **Not Significant**.

7.9.5.2 COLLISION RISK BETWEEN INSTALLATION VESSELS WITH OTHER SEA USERS

Due to the presence of up to seven active installation vessels plus support vessels, including a maximum total of 17 guard vessels (based on 8 – 9 guard vessels spaced at 10 – 15 km intervals per 90 km of cable corridor), at any one time there is the potential for increased collision risk between Project and third-party vessels. Where vessels are undertaking installation works, temporary 500 m exclusion zones will be implemented to minimise this risk, as well as NtMs and updated UKHO Admiralty Charts in line with standard industry practice.

Sensitivity of Receptors

In the unlikely event of a collision, the realistic worst-case scenario would include the potential for loss of life and damage to both the Project vessel and third-party party vessel involved. In this event the receptor would be unable to recover or adapt. Vessels servicing pipelines, OWFs, the Subsea7 site and other subsea cables are therefore considered to be of a **High** sensitivity in relation to collision risk.

Magnitude of Effect

Given the implementation of temporary 500 m exclusion zones and issuing of NtMs a collision is considered to be highly unlikely. If a collision were to occur, its effects would be localised and the risk of collision will be restricted to within the vicinity of working vessels (near the 500 m exclusion zone). Therefore, the magnitude is considered to be **Negligible**.

Assessment Conclusions

Due to the **High** sensitivity of vessels servicing other plans and projects and **Negligible** magnitude, collision risk between installation vessels with other sea users has been assessed as **Negligible** and is **Not Significant**.

7.9.5.3 DIRECT DAMAGE TO ASSETS OF OTHER USERS

Two cable crossings have been identified between the Project and the Shetland HVDC Link and the SHEFA-2 telecommunications cable. Additionally, five active gas pipelines and the Hywind Scotland Pilot Park export cable make landfall within the vicinity of the Project. Where cable crossings have been identified and there is the potential for interactions at the landfall, direct damage to assets of other users may occur.

In line with the International Cable Protection Committee (ICPC) Recommendations (ICPC, 2024), cable crossing and proximity agreements will be established between other operators of cables and pipelines where necessary.

Sensitivity of Receptors

Cables and pipelines (operational and proposed) are considered high value assets, unable to adapt or tolerate damage. Although these receptors can be repaired if damage occurs, this is highly costly, therefore cables and pipelines have a low recoverability. As such, the sensitivity of cables and pipelines is considered to be **High**.

Magnitude of Effect

Cable crossings occur over a small spatial extent in relation to the total length of the cable. Once established and subject to cable protection the cable crossing would be a permanent feature. Given the Project's commitment to cable crossing agreements and cable/pipeline proximity agreements, if required, the magnitude is considered to be **Low**.

Assessment Conclusions

Due to the **High** sensitivity of cables and pipelines and **Low** magnitude, the potential for direct damage to assets of other users has been assessed as **Minor** and **Not Significant**.

7.9.6 OPERATION PHASE

7.9.6.1 TEMPORARY LOSS OF ACCESS TO OTHER USERS DURING CABLE INVESTIGATION SURVEYS DUE TO THE PRESENCE OF PROJECT VESSELS.

The operational lifetime of the Project will be up to 40 years. Once constructed there would be no need for regular operational investigation activities, only occasional operational investigation surveys of the asset. For operational investigation surveys, temporary 500 m exclusion zones will be established surrounding the works. There is therefore potential for temporary loss of access to other users due to the presence of temporary exclusion zones and Project vessels undertaking operational investigation surveys.

As per the Construction phase (**Section 7.9.5**) NtMs will be issued, and permanent infrastructure will be updated on UKHO Admiralty Charts in line with standard industry practice.

Sensitivity of Receptors

As in **Section 7.9.5.1**, vessels servicing pipelines, OWFs, the Subsea7 site and other subsea cables are considered to be of a **Low** sensitivity and the Subsea 7 site is considered to be of a **Medium** sensitivity.

Magnitude of Effect

The potential for temporary loss of access to other users during operational investigation surveys due to the presence of Project vessels is considered to be less than that during the Construction phase in **Section 7.9.5.1**. If necessary, operational investigation surveys will be short term and temporary, spread out across the 40 year lifetime of the Project. As such the magnitude is considered to be **Negligible**.

Assessment Conclusions

Due to the **Low** sensitivity of vessels servicing other plans and projects and the **Medium** sensitivity of the Subsea 7 site and **Negligible** magnitude, temporary loss of access to other users during routine cable surveys due to the presence of Project vessels has been assessed as **Negligible**, and is **Not Significant**.

7.9.6.2 COLLISION RISK BETWEEN CABLE INVESTIGATION SURVEY VESSELS WITH OTHER SEA USERS

During the 40 year operational lifetime of the Project there will be up to 7 active vessels plus support vessels at any one time. When these vessels are on-site there is the potential for increased collision risk between Project and third-party vessels. Where vessels are undertaking operational investigation surveys, temporary 500 m exclusion zones will be implemented to minimise this risk, as well as NtMs and updated UKHO Admiralty Charts in line with standard industry practice.

Sensitivity of Receptors

As per **Section 7.9.5.2**, vessels servicing pipelines, OWFs, the Subsea7 site and other subsea cables are considered to be of a **High** sensitivity in relation to collision risk.

Magnitude of Effect

The potential for collisions between Project vessels and third-party vessels during operational investigation surveys is considered to be highly unlikely and the same as during the Construction phase in **Section 7.9.5.2**, given the localised nature of any works and the implementation of temporary 500 m exclusion zones and issuing of NtMs. Therefore, the magnitude is considered to be **Negligible**.

Assessment Conclusions

Due to the **High** sensitivity of vessels servicing other plans and projects and **Negligible** magnitude, collision risk between operational investigation surveys vessels and other sea users has been assessed as **Negligible** and is **Not Significant**.

7.9.7 DECOMMISSIONING PHASE

Impacts associated with the decommissioning phase of the Project are expected to mirror impacts associated with the construction phase, however, the magnitude of effects are expected to be lower than those during the construction phase. As such the overall risk to the offshore infrastructure receptor groups during the decommissioning phase is assessed to be **Minor, Not Significant**.

7.9.8 ASSESSMENT SUMMARY

Overall, the Offshore Infrastructure assessment concluded **No Significant Effects** throughout the construction, operation, and decommissioning phases of the Project. Due to the assessment concluding **No Significant Effects** to offshore infrastructure receptors, no additional mitigation is proposed.

Table 7-45 shows the receptors that have been assessed as part of the MEA for Offshore Infrastructure.

Any overall risk determined to be **Negligible** or **Minor** is '**Not Significant**' i.e. no significant impact results. Any overall risk determined to be **Moderate** or **Major** is '**Significant**' and will require further mitigation(s) to be implemented to minimise or remove the significance of impact to become '**Not Significant**'.

TABLE 7-45: SUMMARY OF IMPACTS TO OFFSHORE INFRASTRUCTURE RECEPTORS

Potential Impact	Receptor	Sensitivity	Magnitude	Overall Risk	Significance
Construction					
Temporary (short term) loss of access to other users during cable installation/ decommissioning due to the presence of project vessels.	Vessels servicing other plans and projects	Low	Low	Negligible	Not Significant
	Subsea 7 Area	Medium	Low	Minor	Not Significant
Collision risk between installation/ decommissioning vessels with other sea users	Vessels	High	Negligible	Negligible	Not Significant
Direct damage to assets of other users	Assets of other users	High	Low	Minor	Not Significant
Operation					
Temporary (short term) loss of access to other users during operational investigation surveys due to the presence of project vessels.	Vessels servicing other plans and projects	Low	Negligible	Negligible	Not Significant
	Subsea 7 Area	Medium	Negligible	Negligible	Not Significant
Collision risk between operational investigation survey vessels with other sea users	Vessels	High	Negligible	Negligible	Not Significant

7.10 CUMULATIVE IMPACT ASSESSMENT

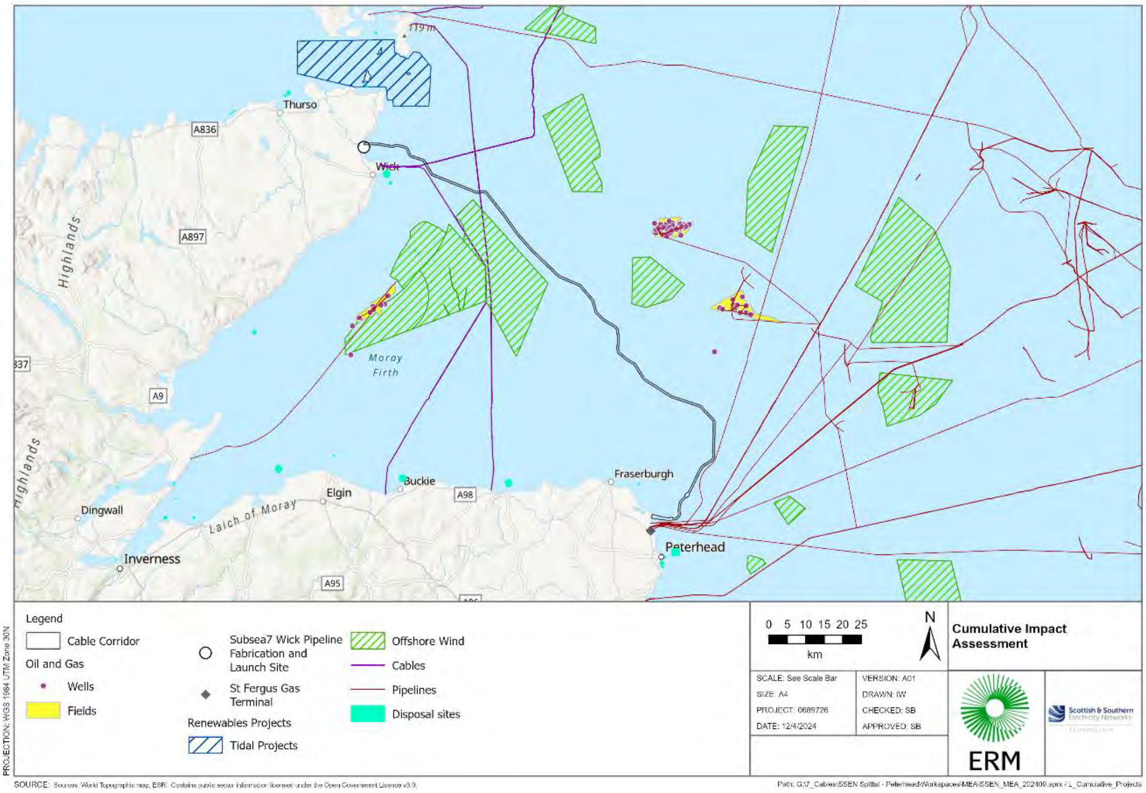
7.10.1 OVERVIEW

The Cumulative Impact Assessment (CIA) considers the combined impacts of the Project with the impacts from other plans and projects, where they share relevant pathways of effect on appropriate receptors.

7.10.2 SCREENING OF PROJECTS FOR CONSIDERATION

A long list of other plans and projects considered within the CIA, is provided within **APPENDIX F: Cumulative Impact Assessment Project List** of the MEA and shown in **Figure 7-62**.

FIGURE 7-62: OTHER PLANS AND PROJECTS INCLUDED WITHIN THE LONG LIST



The long list provides details of the relevant plans and projects within 50 km of the Project which have been considered within the CIA. Only plans and projects that are not yet operational or active, and that have the potential to overlap with the Project temporally and spatially are screened into the CIA long list. There are several categories of project not included in the long list, and therefore, are not considered further within the CIA. These are:

- Operational or active projects – these are considered within the baseline environment for each topic assessment; and
- Plans and projects at the pre-application stage that have not yet submitted a scoping report – these projects are in the early development stages and have not yet released

finalised options or project parameters, making it difficult to determine the potential impacts that may contribute to cumulative impacts.

The plans or projects screened into the CIA are detailed within **Table 7-46** below. The projects screened in all represent potential overlap with export cables of offshore renewable developments, either fixed or floating installations (FLOW).

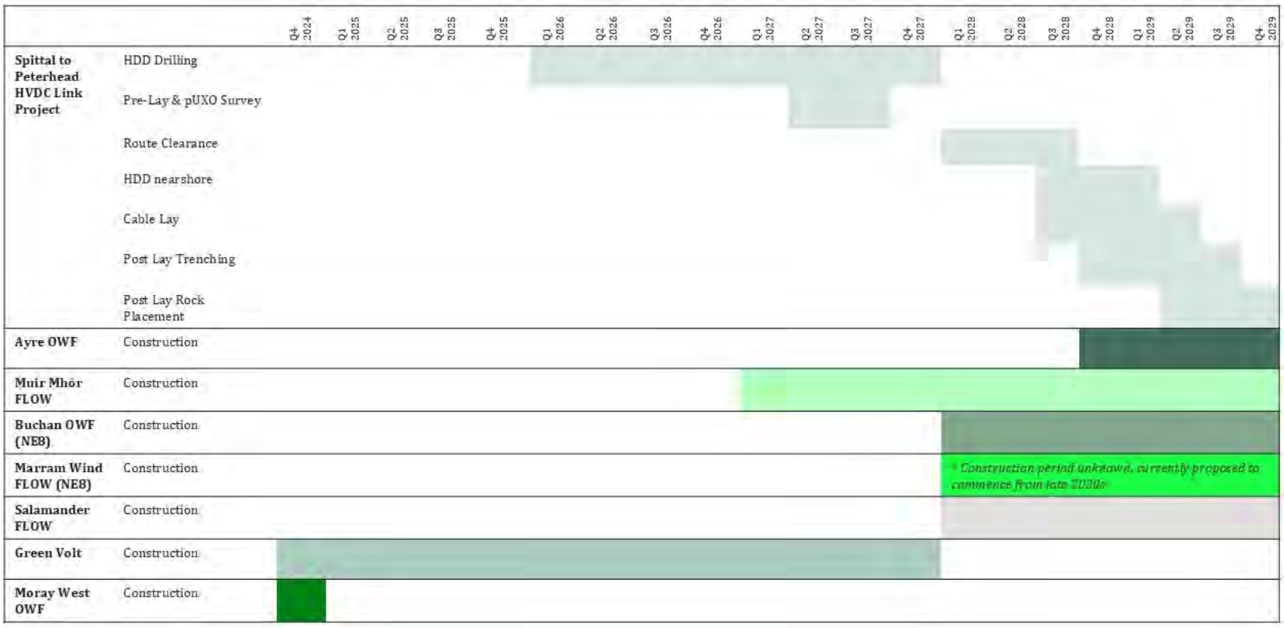
Figure 7-63 shows an indicative timeline for the construction phase of the Project, alongside the timelines of other Projects included in the CIA, showing the temporal overlap of these projects under consideration. The Moray West Offshore Wind Farm (OWF) is expected to be operational from 2025. However, its construction phase was only recently completed in Q4 2024, and these activities would have overlapped with the timings of the project-specific surveys and development of the baseline assessments for the Project. Therefore, whilst the construction phase of the OWF project has no spatial overlap with installation activities of the Project, it may be deemed possible that potential impacts from the OWF on sensitive species (e.g., common bottlenose dolphin) have not been incorporated into the baseline for the Project. Therefore, on a precautionary basis, the Moray West OWF project is screened in.Table 7-47: SUMMARY OF CUmulative IMPACT Assessment

TABLE 7-46: PLANS AND PROJECTS SCREENED INTO THE CUMULATIVE IMPACT ASSESSMENT

Name	Current Status	Potential for interaction	Justification for screening in
Ayre Floating Offshore Wind Farm (NE2)	Offshore Scoping submitted June 2024	Potential overlap of the Ayre Export Cable landfall in Sinclair's Bay	Construction planned 2028-2033 overlapping with the Project installation phase and potential spatial overlap of the cable corridor and at the landfall in Sinclair's Bay.
Muir Mhòr Floating Offshore Wind Farm	Offshore Scoping submitted July 2023	Potential overlap of the Muir Mhòr Export Cable landfall north of Peterhead	Construction planned between 2027-2030 overlapping with the Project installation phase and potential spatial overlap of the cable corridor near the landfall, north of Peterhead where Muir Mhòr proposes to make landfall.
Buchan Offshore Wind Farm (NE8)	Offshore Scoping submitted September 2023	Potential overlap of the Buchan Export Cable landfall east of Rattray Head	Construction planned 2028-2033 overlapping with the Project installation phase and potential spatial overlap of the cable corridor near the landfall, east of Rattray Head where Buchan proposes to make landfall.
MarramWind Floating Offshore Wind Farm (NE7)	Offshore Scoping submitted January 2023	Potential overlap of the MarramWind Export Cable landfall between Troup Head and Blackdog	Potential overlapping construction with the project installation phase and spatial overlap near the landfall, between Troup Head and Blackdog Beach where MarramWind proposes to make landfall.
Salamander Floating Offshore Wind Farm	Offshore EIA submitted April 2024	Potential overlap of the Salamander Export Cable landfall east of Lunderton Beach	Construction planned 2028-2029 overlapping with the Project installation phase and potential spatial overlap of the cable corridor near the landfall, east of Lunderton

Name	Current Status	Potential for interaction	Justification for screening in
			Beach where Salamander proposes to make landfall.
Green Volt Floating Offshore Wind Farm	Consented April 2024	Potential overlap of the Green Volt Export Cable landfall at St. Fergus South	Construction planned 2025-2027 overlapping with the Project installation phase and potential spatial overlap of the cable corridor and at the landfall in St. Fergus South.
Moray West Offshore Wind Farm	Fully operational from 2025	Limited potential spatial overlap between works at the north west array area, with the Project cable corridor.	The offshore construction works has only recently been completed in Q4 2024, partially overlapping with timings of the project-specific baseline surveys for the Project.

FIGURE 7-63: TIMELINE OF DEVELOPMENTS INCLUDED IN THE CIA



7.10.3 SCREENING OF POTENTIAL CUMULATIVE IMPACTS

Potential cumulative impacts are screened in here if they are assessed to have a significance of Minor or above for the Project alone. Impacts that are assessed to have a Negligible significance for the Project alone are not considered further within the CIA as they are not considered to provide significant cumulative impacts.

7.10.4 ASSESSMENT

7.10.4.1 PHYSICAL ENVIRONMENT

Potential pathway changes that may affect marine physical processes (and associated receptors) during the construction, operation and decommissioning phases of the Project are:

- Change in wave regime and tidal currents;

- Increase in suspended sediment concentration;
- Change to sediment transport system;
- Change in geomorphology of protected features; and
- Change in coastal morphology.

The Physical Environment chapter assesses the magnitude of these pathways in relation to the construction, operation and decommissioning phases of the Project, and determined **Negligible** and **Low** magnitude for all effects on physical process pathways. However, determination of the significance of these effects is addressed in the relevant receptor-specific sections of this MEA.

7.10.4.2 BENTHIC ECOLOGY

The following potential impacts that may affect benthic ecology during the construction, operation and decommissioning phases of the Project were considered for cumulative impact significance:

- Temporary localised disturbance of seabed habitats;
- Temporary disturbance via increased Suspended Sediment Concentrations (SSC) and associated deposition;
- Long term loss to benthic habitats and species via placement of hard substrates on the seabed;
- Hydrodynamic changes leading to scour around subsea structures; and
- Colonisation of hard structures.

Temporary localised disturbance of seabed habitats

During the construction phase of the Project, temporary localised disturbance of seabed habitats has the potential for cumulative impacts with the construction of OWF export cables. These cumulative impacts have the potential to arise through a variety of operations, including during laying and burial of cable within the seabed substrate, placement of anchors, and boulder clearance as well as other impacts not expected in this Project, such as seabed levelling.

The Project cable corridor does not overlap with the array areas of the proposed OWF developments (**Figure 7-62**) and so there is no expected spatial overlap of localised disturbance predicted to occur. The exact offshore export cable corridor (ECC) routes for the OWFs are not confirmed, however it is expected that there will only be limited areas where they will run close to the Project cable corridor, and this may be at the nearshore, southern region of the Project. Whilst there will be a temporal overlap in cable installation works for the Project and a number of OWFs in the region (see **Figure 7-63**), localised disturbance of seabed habitats will occur only when works are occurring at any one particular area. Therefore, activities will not be continuous throughout the construction phases for these to act cumulatively with installation works for the Project.

Benthic ecology receptors are assessed to be of **Medium** to **High** sensitivity to this pressure and are cumulatively subject to a **Low** magnitude of impact. This is assessed as a **Minor** effect. As such, the cumulative impact of temporary localised disturbance of seabed sediments on these receptors is considered **Not Significant**.

Temporary disturbance via increased Suspended Sediment Concentration (SSC) and associated deposition

Impacts originating from these pressures from the Project alone, are expected to be localised, with sediment deposition likely to be limited to the area of direct impacts (within a few hundred metres of the cable), and persisting over a limited temporal period (within one tidalcyle) (refer to **Section 7.1.5.2**). Suspended sediment plumes, and associated sediment deposition caused from construction of the OWF developments, may generate relatively larger plumes due to the greater relative footprint of disturbance expected from these projects.

Cumulative increases in SSC arises from construction activities such as seabed preparation (including boulder clearance), cable burial (ploughing, cutting, trenching and jetting) and drilling fluid release during HDD. Disturbance of the seabed from these activities is likely to release sediment into the water column as a plume, increasing SSC and water turbidity. During settling, the sediment plume is advected away from the point of release by currents and disperses laterally through turbulent diffusion. Deposition of sediment may cause indirect impacts on marine organisms via smothering, while increased SSC may affect primary producers such as kelp through an increase in turbidity.

As stated above, the Project cable corridor does not spatially overlap with the array areas of the proposed OWF developments, and is expected to have limited proximity with the associated offshore ECCs, with the exception of landfall areas (**Figure 7-62**). Any suspended sediment plumes extending from the array area boundaries and offshore ECCs, overlapping the Project, will be spatially limited and temporary. If occurring at the same time (see **Figure 7-63**), the net direction of plumes will be driven primarily by tidal patterns in the region, locally operating in a similar direction, limiting the risk of potential overlap between them. Furthermore, localised disturbance of seabed habitats and thus increases in SSC and deposition, will occur only when works for the Project are occurring at any one particular area, and therefore, will not be continuous and at the same time as installation works for the OWF developments.

The major habitats under assessment here have **Medium** sensitivity to the impact, and a cumulatively **Low** magnitude of impact. This is assessed as a **Minor** effect. As such, the cumulative impact of increased suspended sediment concentration and associated deposition on these receptors is considered **Not Significant**.

Long term loss to benthic habitats and species via placement of hard substrates on the seabed

Long term loss to benthic habitats and species via placement of hard substrates on the seabed during the operational phase of the Project (rock berm/crossings and mattresses) also has the potential for cumulative habitat loss/alteration with other OWF export cables. This is most likely to occur through placement of cable protection. The maximum footprint of habitat loss for the Project alone, is predicted to be 293,226 m² (2.9 km²), where the majority of the cable installation will be expected to achieve full burial and not require protection. This footprint reflects a very small proportion of seabed habitats;0.35% and 0.01% of the Near-field and Far-Field Benthic Ecology Study Area, respectively. The proposed OWF projects in the region will be a combination of fixed and FLOW foundation developments, and while the FLOW projects will not result in an equivalent footprint of loss compared to fixed foundation OWFs for the array areas, anchoring of the catenary chains will still result in a loss of habitat. At the time of writing, no known cable crossings will be required between the Project and the planned OWF projects (see **Section 5.7.3**), to result in a localised, increased footprint of protection installed on the seabed. Impacts from cable crossings for the Project, are currently assessed and considered for infrastructure that is already installed in the seabed. It is anticipated that the small footprint of the Project from installation of hard substrates, in combination with foundations and scour protection of the OWFs, will represent only small proportion of seabed habitats.

The major habitats under assessment have **High** sensitivity and a cumulatively **Low** magnitude of impact. This is assessed as a **Minor** effect. As such, the cumulative impact of long term habitat loss/alteration on these receptors is considered **Not Significant**.

Hydrodynamic changes leading to scour around subsea structures

Hydrodynamic changes may occur due to the long term presence of cable protection during the operational phase. Scour and increases in flow rates can result in a loss of sediments, which both directly impact the physical structure of the adjacent habitats and may indirectly affect resident benthic communities. The Project cable corridor does not intersect the array areas and is predominantly distant from associated OWF ECCs, but with some potential interaction around the landfall areas. However, as detailed above, only a small proportion of the cable corridor for the Project is predicted to require cable protection, with dimensions having limited elevation above the seabed (1.125 m) in the context of the depth of the water column within the majority of the Benthic Ecology Study Area. Any scour effects occurring will be highly localised, and cumulatively with the presence of subsea structures of the planned OWFs in the area are not expected to result in significant effects above baseline conditions.

The majority of benthic habitats and communities that could be scoured are of **High** sensitivity, however are cumulatively subject to a **Low** magnitude, so the potential impact from hydrodynamic changes leading to scour around subsea infrastructure is of **Minor** effect. As such the cumulative impact from hydrodynamics changes leading to scour on these receptors is considered **Not Significant**.

Colonisation of hard structures

The long term placement of subsea hard infrastructure (mattress, rock placement) may led to colonisation of hard structures. The potential impact may be both beneficial and adverse on adjacent benthic communities.

The introduction of hard structures to a soft-sediment environment, may be both beneficial (e.g., promoting colonisation, locally increasing biodiversity and organic inputs to sediments) and adverse (e.g. increasing availability of new substrate for INNS colonisation). Understanding the sensitivities to receiving benthic habitats can be complex, and as such sensitivity is assessed as **Medium.**

As determined for the cumulative assessment for '***Long term loss to benthic habitats and species via placement of hard substrates on the seabed***' (**Section 7.10.4.2**), the total footprint of installed hard infrastructure for the Project alone and cumulatively, represents only a small proportion of total available habitat. Therefore, any potential adverse (and/or beneficial impacts) from an increase in new artificial hard substrate, will be limited. The cumulative impact magnitude is **Low**.

The **Medium** sensitivity for benthic ecology, subject to a **Low** magnitude of impact, so risk is considered **Minor**. As such, the cumulative impact of colonisation of hard structures on these receptors is considered **Not Significant**.

7.10.4.3 FISH AND SHELLFISH ECOLOGY

The following potential impacts that may affect benthic ecology during the construction, operation and decommissioning phases of the Project were considered for cumulative impact significance:

- Temporary localised disturbance of seabed habitats;
- Temporary disturbance via suspended sediment concentration and smothering;
- Long term localised disturbance to seabed habitats; and
- Fish aggregation effects.

Temporary localised disturbance of seabed habitats

Temporary habitat disturbance during the construction phase of the Project has the potential for cumulative impacts to fish and shellfish receptors, with the construction of export cables related to OWFs. These cumulative impacts have the potential to arise during trenching, cable lay, burial and associated sediment deposition/smothering of fish and shellfish species.

Localised disturbance to habitat available to fish and shellfish species is likely to occur during the laying and burial of cable within the seabed substrate. Temporary direct disturbance will occur within the footprint of the cable-laying equipment in areas of seabed that are not bolstered by cable protection. Temporary indirect disturbance will occur in the area surrounding the installed cable, where suspended sediments may settle.

Most pelagic and diadromous fish species, as well as demersal fish species, are generally considered to have **Low** sensitivity to this pressure due to their high mobility. However, species such as Atlantic herring are considered to have **Medium** sensitivity and Priority Marine Features such as European spiny lobster fan mussel, and horse mussel have a **High** sensitivity.

As discussed for Benthic Ecology above in **Section 7.10.4.2**, the Project cable corridor does not overlap with the array areas of the proposed OWF developments (**Figure 7-62**) and so there is no expected spatial overlap of localised disturbance predicted to occur. The exact offshore export cable corridors (ECCs) for the OWFs are not confirmed, however, it is expected in the region of the landfall of the Project they will interact. Whilst there will be a temporal overlap in cable installation works for the Project and construction activities for a number of OWFs in the region (see **Figure 7-63**), localised disturbance of fish and shellfish habitats will occur only when works are occurring at any one particular area. Therefore, impacts will not be occurring continuously throughout these construction phases, resulting in cumulative impact. Cumulatively, the magnitude of impact is therefore, determined to be **Low**.

The **Low** sensitivity of pelagic fish, demersal fish (including sandeel), diadromous fish, and shellfish, and the **Low** impact magnitude are assessed overall to have **Negligible** effect from the impact, which is therefore **Not Significant**.

As a result of the higher sensitivities of Atlantic herring and PMFs (**Medium** sensitivities) and the **Low** magnitude impact from temporary localised disturbance of seabed habitats, **Minor** effect is assessed for those species, and therefore also **Not Significant**.

Temporary disturbance via suspended sediment concentration and smothering

Disturbance to seabed habitats associated with the proposed works has the potential to mobilise sediments into the water column and, therefore, increase SSCs. This can have a detrimental impact on receptors as it has the potential to cause smothering as well as to reduce visibility which can impair hunting behaviours.

Elasmobranchs, most pelagic, demersal and diadromous fish species are generally considered to have **Low** sensitivity to this pressure. However, eggs and larvae of some fish and shellfish species are considered to show **Medium** sensitivity. **Medium** sensitivity is also considered appropriate for Atlantic herring, and shellfish species.

Impacts originating from these pressures, from the Project alone, are expected to be localised, with sediment deposition likely to be limited to the area of direct impacts (within a few hundred metres of the cable), and persisting over a limited temporal period (within one tidal cycle) (refer to **Section 7.1.5.2**). Suspended sediment plumes and associated sediment deposition resulting from construction of the OWF developments may generate relatively larger plumes, due to the greater relative footprint of disturbance expected from these projects. As stated in **Section 7.10.4.2** for benthic ecology, the Project's cable corridor does not spatially overlap with the array areas of the proposed OWF developments and is expected to have limited proximity with the associated offshore ECCs, with the potential exception of the landfall area(s) (**Figure 7-62**). Any suspended sediment plumes extending from the array area boundaries and offshore ECCs, overlapping the Project, will be spatially limited and temporary. If occurring at the same time (see **Figure 7-63**), the net direction of plumes will be driven primarily by tidal patterns, limiting the risk of potential overlap between them. Furthermore, localised disturbance of seabed habitats and, thus, increases in SSC and deposition, will occur only when works for the Project are occurring at any one particular area, and, therefore, will not be continuous with the installation works for the OWF developments. The cumulative impact magnitude for fish and shellfish species is considered to be **Low**.

Pelagic fish, demersal fish, and diadromous fish of **Low** sensitivity are therefore, assessed as having **Negligible** effect and combined with the **Low** impact magnitude, the cumulative impact of temporary disturbance via suspended sediment concentration on pelagic fish, demersal fish, and diadromous fish is considered **Not Significant**.

Atlantic herring and shellfish are assessed as the impact having a **Minor** effect due to their **Medium** sensitivity, and combined with the **Low** impact magnitude, the cumulative impact remains **Not Significant**.

Long term localised disturbance to seabed habitats

Long term habitat loss/alteration during the operational phase of the Project from installation of cable protection, also has the potential for cumulative habitat loss/alteration with the installation of foundations and scour protection for the planned OWF developments in the region.

Most demersal, pelagic and diadromous fish species are considered to have a **Low** sensitivity to the pressure. The same sensitivity is applied to sandeel, European lobsters as well as shellfish. Atlantic herring, however, is considered to have **Medium** sensitivity. Fan mussel and horse mussel have a low tolerance, adaptability, and recoverability by virtue of their restricted ranges in eastern Scottish waters and, therefore, are considered to have a **High** sensitivity.

The predicted, long term localised disturbance of seabed habitats for fish and shellfish from the Project alone is very small, in relation to available habitat, and this is also determined when assessed with potential cumulative effects of habitat loss with the installation of OWF infrastructure. The magnitude of cumulative, long term localised disturbance of seabed habitats for fish and shellfish ecology is therefore, considered **Low.**

As a result of the **Medium** sensitivity of Atlantic herring, combined with the **Low** magnitude of impact, long term localised disturbance of seabed habitats has been assessed as having a **Minor** effect. As such, the cumulative impact of long term localised disturbance of seabed habitats on Atlantic herring is considered **Not Significant**.

As a result of the **High** sensitivity of PMFs, combined with the **Low** magnitude of impact, long term localised disturbance of seabed habitats has been assessed as having a **Minor** effect. As such, the cumulative impact of long term localised disturbance of seabed habitats on PMFs is considered **Not Significant**.

7.10.4.4 MARINE MEGAFAUNA

The following potential impacts that may affect marine megafauna during the construction, operation and decommissioning phases of the Project were considered for cumulative impact significance:

- Temporary disturbance via suspended sediment concentration (SSC);
- Temporary disturbance via underwater noise and vibration; and
- Vessel displacement and collision risk.

Temporary disturbance via suspended sediment concentration

Disturbance to seabed habitats associated with the Project during cable installation works has the potential to mobilise sediments into the water column, increasing SSCs. The reduction in water clarity will reduce visibility, which can impair foraging capabilities, and these effects may be increased where seabed disturbance is occurring in the same region for other projects.

Sensitivity to the impact pathway will primarily depend on feeding strategies employed by megafaunal species. Pinnipeds can hunt prey via changes in water movement that are detected by their *vibrissae*, however, are also demonstrated to rely on visual hunting strategies (see **Section 7.4.5.1**) and, therefore, may exhibit sensitivities to suspended sediment plumes. Species of cetaceans that feed via use of echolocation (e.g., harbour porpoise, common dolphin, and common bottlenose dolphin) will not be impaired by increases in SSCs, and can be scoped out for assessment in the CIA. Conversely the cetacean, minke whale, which are visual feeders, will be sensitive to changes in water clarity. In consideration of the range of sensitivities, but high mobility of this receptor group, sensitivity is overall, assessed as **Low**.

As discussed above for benthic ecology, and fish and shellfish ecology (**Section 7.10.4.2** and **Section 7.10.4.3**, respectively), the risk for cumulative impacts arising from sediment plumes between the Project and the screened in OWF developments is overall, unlikely to be greater than that assessed for the Project alone. The potential exception is considering increases in SSC that may occur around the potential convergence of cumulative operations in the landfall areas. The risk of exposure in these areas may vary depending on season and species behaviour, with some feeding in shallower waters in the summer (e.g. basking shark), while others prefer feeding in deeper waters (e.g., grey seal). Overall, the magnitude of impact is assessed as **Low.** It is unlikely that there will be continuous cable installation activities occurring in the nearshore areas of the Project, alongside construction activities for the offshore ECCs of the OWFs and, furthermore, any plumes generated would cumulatively only represent a small proportion of available foraging habitat.

The **Low** sensitivity of marine megafauna, combined with **Low** magnitude has been assessed as having a **Negligible** effect. As such, the cumulative impact of temporary disturbance via SSC is considered **Not Significant**.

Temporary disturbance via underwater noise and vibration

Temporary disturbance via underwater noise and vibration from the Project alone, will primarily occur during the construction phase of the Project, through 'continuous' sources of noise from vessels, and subsea operations of cable burial and rock/mattress. 'Impulsive' sources of noise from temporary short-term use of USBL equipment, may also occur during the construction phase, and the frequency range of this equipment can overlap with the auditory range of some megafaunal species. A risk of cumulative impacts may occur, due to an increase in vessel activities and subsea operation, alongside the various offshore ECCs activities associated with proposed OWFs in the region.

Underwater noise can lead to direct effects of mortality, and physiological and auditory injury, the latter of which can be classified as PTS or TTS (Todd *et al*., 2015). Indirect effects, such as masking of communication signals may also occur, and with disturbance effects potentially leading to displacement from an area. Sensitivity can be species specific and will vary depending on factors including behaviour and auditory sensitivities. Cetaceans and pinnipeds, while reported to be sensitive to underwater noise, are highly mobile and will be able to move away from a disturbed area, returning on cessation of operations. Overall sensitivity to potential cumulative activities of underwater noise disturbance is determined to be **Low.** It is noted that sensitivity of basking shark was assessed as negligible for this impact from the Project alone (see **Section 7.4.5.2**) and, as such, is not considered in the assessment for the CIA.

Underwater noise from vessels is not considered to result in a magnitude of underwater noise that exceeds thresholds for recoverable injury for sensitive cetacean species beyond several metres from the source (Southall *et al*., 2019). Any disturbance from vessels and underwater noise operations from the Project alone, and cumulatively with other projects will be short-term and temporary. While there is an overall, predicted temporal overlap in activities occurring between some projects (**Figure 7-63**), it is not expected that these vessels/subsea operations will be continuously operating in the same area, at any one time. The Moray Firth is a busy shipping area, and the cumulative magnitude of impact is not predicted to be significant above baseline conditions. Furthermore, both the Project and the OWFs will adhere to standard embedded mitigation measures, including development of MMPPs, adherence to the SMWWC, and the Basking Shark Code of Conduct. The magnitude of impacts is, therefore, considered to remain as **Low**, as assessed for the Project alone.

The **Low** sensitivity of marine megafauna, combined with **Low** magnitude has been assessed as having a **Negligible** effect. As such, the cumulative impact of temporary disturbance via underwater noise and vibration is considered **Not Significant**.

Vessel displacement and collision risk

An increase in vessel activities arising from the Project alone, alongside vessel activities for the proposed OWFs in the region, may result in a cumulative increased risk of displacement and collision for marine megafauna. This may be of importance when there is a temporal overlap in multiple installation activities occurring during the various construction phases of these projects (**Figure 7-63**).

Species can be most vulnerable when vessels are operating erratically or running at higher speeds. However, the Moray Firth is a busy shipping area, and it may be expected that these mobile species inhabiting these waters have become adapted to vessel movements, quickly responding and avoiding risk of injury. Sensitivity is assessed as **Low**.

The cumulative impact magnitude may be slightly elevated above that assessed for the Project alone. It is noted that there may be a concentration of activities around the southern landfall area of the Project, where a potential convergence of different construction activities may occur across projects, and the density of vessels likely to be operating in this area is not currently known. However, installation vessels will be moving at slow speeds, and/or be stationary during the construction phase, and when transiting to and from site(s) will use regular and pre-approved routes. Furthermore, both the Project and the OWFs, will adhere to standard embedded mitigation measures, including development of MMPPs, adherence to the SMWWC, and the Basking Shark Code of Conduct that will reduce the risk of collision, such as use of Marine Mammals Observers (MMOs). On a precautionary basis a **Medium** magnitude is concluded.

The **Low** sensitivity of marine megafauna, combined with **Medium** magnitude has been assessed as having a **Minor** effect. As such, the cumulative impact of vessel displacement and collision risk is considered **Not Significant**.

7.10.4.5 ORNITHOLOGY

The following potential impacts that may affect ornithological receptors during the construction, operation and decommissioning phases of the Project were considered for cumulative impact significance:

- Vessel-related disturbance and displacement;
- Reduced foraging success due to decreased visibility;
- Short term habitat loss (e.g. via cable burial), where the seabed type will remain similar; and
- Long term habitat loss or alteration (e.g. due to rock protection).

Vessel-related disturbance and displacement

Disturbance during the installation of the cable due to vessel presence and activity may temporarily displace birds from their foraging areas, resulting in a loss of habitat. For the Project alone, the disturbance will be restricted to the cable installation corridor and the immediate vicinity of the Project vessels during construction, operation, and decommissioning. The effects are considered to last only for the duration of the cable installation at any single location, and therefore will be direct, temporary, reversible and short term in nature. Once the cable installation is complete and vessel activity ceases at that location, birds are likely to return to these areas. Sensitivities for ornithological receptors will be species specific, and as assessed for the Project, alone: fulmar, gannet and terns have a **Negligible** sensitivity, whereas kittiwake and herring gull are of **Low** sensitivity to this impact pathway (see **Section 7.5.5.1**).

For bird species, it is considered that cumulative increases in vessel traffic will not be measurable against the range of background levels. However, it is noted that given the high vessel activity observed around the southern landfall where spatial and temporal overlap between the Project and other OWF export cables are potentially greatest, there may be risk of localised elevated activities above baseline. However, the increased vessel traffic during construction will be short term and temporary, and highly localised compared to the foraging ranges of the bird species assessed. Vessel traffic during the operational phase of the Project and during the operation of other OWFs is expected to be greatly reduced compared to the construction phase. Overall, the impact magnitude is **Low**.

A **Negligible** sensitivity for fulmar, gannet, and terns and a **Low** sensitivity for kittiwake and herring gull, along with cumulative **Low** magnitude means that significance of vessel-related disturbance and displacement is **Negligible** for these speices. As such, the cumulative impact of vessel-related disturbance and displacement is considered **Not Significant**.

A **Medium** sensitivity for shag and auks and cumulative **Low** magnitude means that the effect of vessel-related disturbance and displacement is **Minor** for these species. As such, the cumulative impact of vessel-related disturbance and displacement is considered **Not Significant**.

Reduced foraging success due to decreased visibility

The proposed works involve the laying and burial of cable within the seabed substrate during the construction phase. Due to associated increases in turbidity from sediment plumes, the activity has the potential to cause indirect effects on the foraging success of birds. Increases in SSCs (increased turbidity) in the water column can make it more difficult for birds to see and locate prey, and where these increases overlap within water depths that seabird species can dive/hunt within, the sensitivities for ornithological receptors will be species specific. As assessed for the Project alone, it is determined that kittiwake and herring gull has a **Negligible** sensitivity, fulmar, gannet, shag and tern has a **Low** sensitivity, and auks has a **Medium** sensitivity (see **Section 7.5.5.2**).

As assessed above in the CIA for marine megafauna (**Section 7.10.4.4 '*Temporary disturbance via suspended sediment concentrations*'**), it is not expected that there would be a significant increase above that assessed for the Project alone, for reducing foraging capabilities for mobile receptors due to increases in SSCs via seabed disturbance arising from multiple construction activities. However, as also noted, the potential impact magnitude is predicted to potentially vary along the Project corridor, with potential localised higher increases in the shallower areas at the landfall areas where there may be a localised increases in activity, and overlap in seabed disturbance (**Table 7-46**). The southern landfall of the Project overlaps the foraging range of the Ythan Estuary, Sands of Forvie and Meikle Loch SPA; designated for species of tern. Therefore, the magnitude of impact may be greater for this species group, and magnitude is assessed as **Medium** (for terns) and **Low** (for all other receptor groups).

A **Negligible** sensitivity for kittiwake and herring gull, and a **Low** sensitivity for fulmar, gannet, shag, along with cumulative **Low** magnitude, mean that significance of reduced foraging success due to decreased visibility is **Negligible** for these species. A **Low** sensitivity for terns along with a cumulative **Medium** magnitude mean that significance of reduced foraging success due to decreased visibility is **Minor**. A **Medium** sensitivity for auks and cumulative **Low** magnitude means that risk of reduced foraging success due to decreased visibility is **Minor**.

Overall, the assessment concludes **No Significant Effect** from the cumulative impact of reduced foraging success due to decreased.

Short term habitat loss (e.g. via cable burial), where the seabed type will remain similar

During the Project and OWF's construction phases, proposed activities involve the laying and burial of cables within the seabed substrate, which may cause short term cumulative habitat loss or alteration of benthic and fish communities in areas where the cable will be buried. This may potentially lead to loss or disruption of fish spawning grounds, indirectly affecting the foraging success of birds by limiting prey resources, leading to a reduction in foraging success and increased energy expenditure as birds may need to access alternative foraging areas.

The sensitivities of ornithological receptors to this impact can depend on a combination of considerations, including species specific foraging ranges, diving depths, and feeding preferences, alongside understanding potential impact on their prey itself (fish and shellfish). Aligning with the sensitivity assessments in **Section 7.5.5.3**, **Negligible** sensitivities are determined for kittiwake, herring gull, fulmar, and gannet; these are shallower divers, and/or have a wide foraging range, or demonstrate feeding adaptations. A **Low** sensitivity is concluded for terns which will be foraging close to shore and, thus, may be sensitive to increased activities occurring at multiple landfall sites in a given area, and shag, that do not exhibit plasticity in their foraging behaviour. A **Medium** sensitivity is assigned to auks, that feed on limited types of prey items.

The combined footprint of habitat disturbance occurring across multiple projects during construction, resulting in the short term loss of supporting habitats for bird species, is unlikely to be large in relation to available habitat for foraging species. Furthermore, seabed disturbance and habitat loss will be short term and temporary, with expected sediment recovery occurring over time. Following the short term construction periods, any disturbance at the seabed over the long term operational phases of these projects will be infrequent and highly localised. Overall, magnitude is assessed as **Low** for all species.

A **Negligible** sensitivity for kittiwake, herring gull, fulmar, and gannet, and a **Low** sensitivity for shag and terns, along with cumulative **Low** magnitude means that significance of short term habitat loss is **Negligible** for these species. A **Medium** sensitivity for auks and cumulative **Low** magnitude means that effect of short term habitat loss is **Minor**.

Overall, the assessment concluded **No Significant Effect** from the cumulative impact of short term habitat loss.

Long term habitat loss or alteration (e.g. due to rock protection)

During the Project and OWF's construction phases, proposed activities include the laying and burial of cables within the seabed. Such changes may indirectly affect bird foraging success by altering benthic and fish communities where cable stabilisation/protection and/or crossings are required for the Project, and from within the offshore ECCs and array areas of proposed OWFs.

In a realistic worst-case scenario, the shift in seabed composition could lead to a reduction in prey availability, forcing birds to expend more energy seeking alternative foraging areas.

The sensitivities of species to long term habitat loss or alteration, are as assessed for the impact pathway from the Project alone (see **Section 7.5.6.2**). A **Negligible** sensitivity is concluded for kittiwake and herring gull, a **Low** sensitivity is concluded for fulmar, gannet, shag, and tern, and a **Medium** sensitivity is concluded for auks.

While the loss of habitat will be long term for the Project (40years), and will be expected to overlap with the long term operation of OWFs projects, it is not predicted to be significant in consideration of extent. The maximum footprint of predicted habitat loss, from the installation of cable protection along the Project's corridor and associated cable crossings has a footprint of XXXm2 (xxxxkm2), representing a very small proportion of available habitat/seaspace for birds. It is deemed unlikely that the cumulative impact of habitat loss from the Project and from the proposed OWFs in the region, will be above that as assessed for the Project alone. Therefore, magnitude is assessed as **Low**.

Negligible sensitivity for fulmar and herring gull, and a **Low** sensitivity for kittiwake, gannet, shag, and terns, along with cumulative **Low** magnitude means that significance of reduced foraging success due to impacts to prey species is **Negligible** for these species. A **Medium** sensitivity for auks and cumulative **Low** magnitude means that risk of reduced foraging success due to impacts to prey species is **Minor**.

Overall, the assessment concludes **No Significant Effect** from the cumulative impact of reduced foraging success due to impacts to prey species.

7.10.4.6 COMMERCIAL FISHERIES

The following potential impacts that may affect commercial fisheries during the construction, operation and decommissioning phases of the Project were considered for cumulative impact significance:

- Temporary loss of access to fishing grounds and displacement of fisheries
- Impacts to commercially important fish and shellfish species
- Permanent loss of access to fishing grounds and displacement of fisheries

Temporary loss of access to fishing grounds and displacement of fisheries

Temporary loss of access to fishing grounds and displacement of fisheries during the construction phase of the Project has the potential for cumulative impacts with the construction of other OWF export cables in the region. Cumulative loss of access has the potential to occur due to the temporal overlap of multiple project exclusion zones and, in some cases, spatial overlap within the inshore region, particularly around the southern landfall location (**Figure 7-62**; **Figure 7-63**).

Fishing methods have different levels of sensitivities to the temporary loss of access to grounds and displacement of fisheries activities, varying depending on gear type. For example, dredgers have a **High** sensitivity; otter trawls, pots and traps, and demersal trawlers have a **Medium** sensitivity, whereas demersal seine netters have a **Low** sensitivity.

Overall, impact magnitude is considered cumulatively to be **Medium**, accounting for the highest densities of vessel activities expected during the overlapping construction phases of the Project and at proposed OWFs developments.

An overall **Medium** sensitivity, combined with a **Medium** magnitude would lead to an overall effect determined to be **Moderate** and, therefore, **Significant**. However, with successful implementation of additional mitigation measures noted in **Chapter 7.6**, the residual effects from cumulative impacts to temporary loss of access to fishing grounds and displacement of fisheries is assessed as **Minor** and **Not Significant**.

Impacts to commercially important fish and shellfish species

During the overlapping construction phases of the Project and OWF developments in the region, the cable installation activities on the seabed have the potential to cumulatively impact commercially important fish and shellfish species. This may lead to impacts through temporary localised disturbance on seabed habitats via suspended sediment concentration and smothering, and underwater noise and vibration.

Allowing for species-specific ranges in sensitivities to these impacts, an overall sensitivity of **Medium,** is concluded. As assessed in the CIA for fish and shellfish (see **Section 7.10.4.3**), a **Low** magnitude is concluded for impacts to commercial important fish and shellfish species.

With a **Medium** sensitivity of receptors and cumulative **Low** magnitude of impact, the overall effect is assessed to be **Minor** and **Not Significant**.

Permanent loss of access to fishing grounds and displacement of fisheries

For certain vessels/gear types, there may be risk associated with the potential long-term presence of areas of shallow buried cable during operation, cable exposures and/or external cable protection. This can lead to parts of the proposed cable corridor of the Project and offshore ECC of OWFs in the region becoming areas lost to fishing activity.

As described above, fishing methods have different levels of sensitivities (e.g., otter trawls, demersal seine netters, dredgers, demersal trawlers: **Medium**; pots and traps: **Negligible**).

In consideration of the small relative loss of grounds due to the Project cable corridor and the offshore ECCs of the OWFs, in relation to large operating area for some fisheries, alongside adaptability in in fishing activities in area, a **Low** magnitude is concluded.

With an overall **Medium** sensitivity of receptors and cumulative **Low** magnitude of impact, the overall effect is assessed to be **Minor** and **Not Significant**.

7.10.4.7 SHIPPING AND NAVIGATION

For the Project alone, all impacts were assessed as Negligible throughout the lifetime of the Project (see **Section 7.7.9**). As such there is no pathway for cumulative impacts with the construction of export cables related to OWFs and it is considered that there are No Cumulative Impacts to shipping and navigation receptors.

7.10.4.8 MARINE ARCHAEOLOGY

The following potential impacts that may affect marine archaeology during the construction, operation and decommissioning phases of the Project were considered for cumulative impact significance:

- Direct physical impacts from seabed disturbance; and
- Indirect physical impacts from changes in hydrodynamics, sediment transport and suspended sediment (plumes).

As archaeological receptors cannot adapt, tolerate, or recover from physical impacts caused by a proposed development, for the purpose of this assessment, the sensitivity of each asset is quantified only by its value. For heritage assets, direct physical impacts will be permanent and irreversible. However, indirect impacts such as changes to sedimentation may be reversible or subject to alteration following cessation of activity. The nature of the marine archaeological resource is such that there is a high level of uncertainty concerning remains on the seabed. Often data regarding the nature and extent of sites are limited or out of date and, as such, the precautionary principle has been applied to all aspects of archaeological impact assessment.

Direct physical impacts from seabed disturbance

Seabed disturbance due to installation of the cable, including from invasive surveys (cores), pre lay grapnel runs, trenching/ploughing, HDD, cable protection and anchoring, is the most likely source of direct physical impacts to known and unknown Marine Archaeology and Cultural Heritage assets, with the potential to damage, partially or wholly remove these assets. The majority of the potential cumulative impacts may occur within the construction phases of the Project and the OWFs in the region (**Figure 7-63**), when the greatest level of subsea activities will be occurring. The potential for a risk of impact during the overlapping operation phases will be limited,only during once off, or on-going, cable surveys.

The sensitivity of these known and unknown assets is variable.

There is no direct spatial overlap with the Project and the array areas of the proposed OWFs in the region, but a potential risk of spatial interaction around the Project cable corridor and ECCs of the OWFs at the landfall areas. Direct physical impacts have the potential to be one off, non-reversible and permanent and, as such, on a precautionary basis, a **High** cumulative magnitude of effect is concluded.

The cumulative risk is assessed as **Moderate**–**Major**. This is considered **Significant**. However, given the proposed additional mitigation of avoidance using AEZs and review of further geophysical/geotechnical data, this will significantly reduce the predicted residual effect of this predicted cumulative impact on the cultural heritage, and reduce significance to **Negligible**, **Not Significant**.

Indirect physical impact - Changes in hydrodynamics, sediment transport and plumes

Changes in hydrodynamics or sediment transport and the creation of sediment plumes are the main causes of indirect physical impact to known and unknown Marine Archaeology and Cultural Heritage assets. Cumulative changes in hydrodynamics and sediment transport have the potential to destabilise any assets, causing potentially continued, non-reversible and, in the realistic worst case, permanent damage. As a result of these processes the asset may move out of its original context and association, or be damaged in this process, or be removed/dispersed (for smaller items or palaeolandscape features).

Sensitivity and magnitude of these assets varies, with risk on a precautionary basis generally considered to be **Major**, **Significant**. However, with additional mitigations in place, of avoidance using AEZs and review of further geophysical/geotechnical data, the significance decreases to **Negligible**, **Not Significant**.

7.10.4.9 OFFSHORE INFRASTRUCTURE

Temporary loss of access and disturbance to other sea users during the construction phase of the Project has potential for cumulative impacts with the construction of other OWF export cables, due to the presence of installation vessels and operation of subsea machinery. The construction phase of the Project is proposed to overlap with the construction phase of multiple export cables related to OWFs and in some cases will spatially overlap within the inshore region, particularly around the southern landfall location, posing the greatest potential for cumulative impacts to other users (**Table 7-46**).

It is considered that cumulative increases in vessel traffic will not be measurable against the range of background levels, given the high vessel activity observed around the southern landfall (NASH, 2024), where spatial and temporal overlap between the Project and other OWF export cables will be greatest. Given the implementation of standard industry best practice measures across offshore developments, such as issuing Notices to Mariners (NtMs) and production of a CEMP, coupled with the temporary and short term nature of increased vessel activities during construction, it is considered that cumulative temporary loss of access and displacement to other sea users will be **Minor**, **Not Significant**.

7.10.5 ASSESSMENT SUMMARY

The Cumulative Impact Assessment concluded **No Significant Effects** throughout the construction, operation, and decommissioning phases of the Project apart from for three pressure/receptor combinations where **Major** significance is assessed:

- Temporary loss of access to fishing grounds and displacement of fisheries in relation of commercial fisheries;
- Direct physical impacts from seabed disturbance in relation to marine archaeology; and
- Indirect physical impact - Changes in hydrodynamics, sediment transport and plumes in relation to marine archaeology.

However, with the use of mitigation, the significance of these three pressure/receptor combinations becomes **Minor**/**Negligible**, **Not Significant**.

Table 7-47 shows the receptors that have been assessed as part of the MEA for the Cumulative Impact Assessment.

TABLE 7-47: SUMMARY OF CUMULATIVE IMPACT ASSESSMENT

Topic	Potential Impact	Overall Risk (with embedded mitigation)	Significance	Additional mitigation	Overall Residual Risk	Overall significance
Physical Environment	Included in other receptors in the CIA					
Benthic Ecology	Temporary localised disturbance to seabed habitats	Minor	Not Significant	None required	Minor	Not Significant
	Temporary disturbance via SSC	Minor	Not Significant	None required	Minor	Not Significant
	Long term loss to benthic habitats and species	Minor	Not Significant	None required	Minor	Not Significant
	Hydrodynamic changes leading to scour	Minor	Not Significant	None required	Minor	Not Significant
	Colonisation of hard structures	Minor	Not Significant	None required	Minor	Not Significant
Fish and Shellfish Ecology	Temporary localised disturbance of seabed habitats	Negligible/Minor	Not Significant	None required	Negligible/Minor	Not Significant
	Temporary disturbance via SSC	Negligible/Minor	Not Significant	None required	Negligible/Minor	Not Significant
	Long-term localised disturbance to seabed habitats	Negligible/Minor	Not Significant	None required	Negligible/Minor	Not Significant
Marine Megafauna	Temporary disturbance via SSC	Negligible	Not Significant	None required	Negligible	Not Significant
	Temporary disturbance via underwater noise and vibration	Negligible	Not Significant	None required	Negligible	Not Significant
	Vessel displacement and collision risk	Minor	Not Significant	None required	Negligible	Not Significant

Topic	Potential Impact	Overall Risk (with embedded mitigation)	Significance	Additional mitigation	Overall Residual Risk	Overall significance
Ornithology	Vessel-related disturbance and displacement	Negligible/Minor	Not Significant	None required	Negligible/Minor	Not Significant
	Reduced foraging success due to decreased visibility	Negligible/Minor	Not Significant	None required	Negligible/Minor	Not Significant
	Short term habitat loss where the seabed will remain similar	Negligible/Minor	Not Significant	None required	Negligible/Minor	Not Significant
	Long term habitat loss or alteration	Negligible/Minor	Not Significant	None required	Negligible/Minor	Not Significant
Commercial Fisheries	Temporary loss of access to fishing grounds and displacement	Moderate	Significant	Mitigation measures noted in Chapter 7.6	Minor	Not Significant
	Impacts to commercially important fish and shellfish	Minor	Not Significant	None required	Minor	Not Significant
	Permanent loss of access to fishing grounds and displacement	Minor	Not Significant	None required	Minor	Not Significant
Shipping and Navigation	Scoped Out of Cumulative Impact Assessment					
Marine Archaeology	Direct physical impacts from seabed disturbance	Moderate/Major	Significant	Avoidance using AEZ, review of further geophysical/geotechnical data	Negligible	Not Significant
	Indirect physical impact	Major	Significant	Avoidance using AEZ, review of further geophysical/geotechnical data	Negligible	Not Significant

Topic	Potential Impact	Overall Risk (with embedded mitigation)	Significance	Additional mitigation	Overall Residual Risk	Overall significance
Offshore Infrastructure	Temporary loss of access and displacement to other sea users	Minor	Not Significant	None required	Minor	Not Significant

8. CONCLUSION

The project description presented in **Section 5: Project Description** outlines the marine activities proposed for the Spittal to Peterhead HVDC Link project, describes the landfall and subsea cable installation corridor, which have been revised as the project has progressed in order to minimise environmental impacts through design wherever possible (outlined in **Section 1: Route Selection and Alternatives**). An indicative method statement from the preferred installation contractor has been used to inform the project description in **Section 5: Project Description**, in order to give a realistic indication of the likely activities and durations of works that will be associated with the installation, and operation of the cable. However, it is noted that the actual installation methods will be determined following further detailed route engineering, and there is still some uncertainty in regard to specific elements of the project. In order to account for this, the project description presents an envelope for activities, where the remaining possible options for installation are described. Such an approach allows a robust and realistic worst-case impact assessment to be undertaken, informed by specific footprints and durations, but which retains the flexibility required as the project enters detailed design and execution phases.

Over the development of the project, SSENT has engaged with numerous stakeholders, including regulators, statutory advisors, local agencies and the public. Such consultation has proved important in developing the project design to the stage it has reached, and to informing the extent of the impact assessment, as detailed in **Section 3: Stakeholder Engagement**. On the basis of known sensitivities, proposed activities and stakeholder feedback, specific impact assessments were undertaken for a number of topics:

- Physical Processes (**Section 7.1**);
- Benthic and Intertidal Ecology (**Section 7.2**);
- Fish and Shellfish Ecology (**Section 7.3**);
- Marine megafauna (**Section 7.4**);
- Ornithology (**Section 7.5**);
- Commercial Fisheries (**Section 7.6**);
- Shipping and Navigation (**Section 7.7**);
- Marine Archaeology (**Section 7.8**);
- Offshore Infrastructure (**Section 7.9**);
- Cumulative Impacts Assessment (**Section 7.10**)
- Habitats Regulations Appraisal (**APPENDIX A:**);
- Nature Conservation Marine Protected Areas (NCMPA) Assessment (**APPENDIX B:**);
- Water Framework Directive Compliance (**APPENDIX C:**); and
- Physical Processes Technical Appendix (**APPENDIX D:**).

Where relevant, these impact assessments have considered interactions with protected sites, indirect impacts on other receptors and the potential for cumulative impact. As outlined in **Sections 7.1-7.10**, it is predicted that there will be **No Significant Effects** on the receptors identified as a result of the proposed activities for the Project. Such a conclusion can be drawn because the inherent nature of the Project will not result in a significant impact and due to

SSENT developing control and mitigation measures to ensure that the scale of any impact is of an acceptable level. SSENT recognises that the effective implementation of these control and mitigation measures, summarised in **Table 6-5** will be critical to ensuring that the project activities do not result in a significant impact. As outlined in **Table 6-5**, a suite of documents will be developed, including:

Article I. A Fisheries Liaison and Mitigation Action Plan (FLMAP); and

Article II. A Construction Environmental Management Plan (CEMP).

These documents, as part of the Project's embedded mitigation, will ensure that all personnel involved in the Project are fully aware of the manner in which activities must be conducted. It is noted that these documents will be provided to MD-LOT for acceptance prior to the commencement of relevant installation activities and are likely to be required by conditions of the Marine Licence. On the basis of the impact assessments presented in **Sections 7.1-7.10** and the control and mitigation measures summarised in Table 6-5, it is anticipated that the project outlined in **Section 5** will be conducted with **No Significant Effect** on any environmental or societal receptors identified.

Summary of Impacts for the full MEA can be found in **Table 8-1** below.

TABLE 8-1: SUMMARY OF IMPACTS

Topic	Potential Impact	Receptor	Sensitivity	Magnitude	Overall Risk (with embedded mitigation)	Significance (with embedded mitigation)	Additional Mitigation	Overall Residual Risk	Overall Significance
CONSTRUCTION									
Benthic Ecology	Temporary (short term) localised disturbance of seabed habitats	PMF Burrowed Mud	Medium	Low	Minor	Not Significant	None required	Minor	Not Significant
		PMF Offshore Subtidal Sands and Gravels	Medium	Low	Minor	Not Significant	None required	Minor	Not Significant
		PMF Ocean Quahog	High	Low	Minor	Not Significant	None required	Minor	Not Significant
	Temporary (short term) disturbance via increase suspended sediment concentrations and associated deposition	PMF Burrowed Mud	Medium	Negligible	Negligible	Not Significant	None required	Negligible	Not Significant
		PMF Offshore Subtidal Sands and Gravels	Medium	Negligible	Negligible	Not Significant	None required	Negligible	Not Significant
		PMF Kelp Beds	Medium	Low	Minor	Not Significant	None required	Minor	Not Significant
		PMF Ocean Quahog	High	Negligible	Negligible	Not Significant	None required	Negligible	Not Significant
		Annex I Geogenic Reefs	Medium	Low	Minor	Not Significant	None required	Minor	Not Significant
		Annex I Biogenic (*S. spinulosa*) Reefs	Medium	Low	Minor	Not Significant	None required	Minor	Not Significant
		Annex I Biogenic (*M. modiolus)* Reefs	High	Low	Minor	Not Significant	None required	Minor	Not Significant
	Impact to habitats or species as a result of pollution or accidental discharge	PMF Burrowed Mud	Medium	Negligible	Negligible	Not Significant	None required	Negligible	Not Significant
		PMF Offshore Subtidal Sands and Gravels	Medium	Negligible	Negligible	Not Significant	None required	Negligible	Not Significant
		PMF Kelp Beds	Medium	Negligible	Negligible	Not Significant	None required	Negligible	Not Significant
		PMF Ocean Quahog	High	Negligible	Negligible	Not Significant	None required	Negligible	Not Significant
		Annex I Geogenic Reefs	Medium	Negligible	Negligible	Not Significant	None required	Negligible	Not Significant
		Annex I Biogenic (*Sabellaria spinulosa*) Reefs	Medium	Negligible	Negligible	Not Significant	None required	Negligible	Not Significant
		Annex I Biogenic (*M. modiolus)* Reefs	High	Negligible	Negligible	Not Significant	None required	Negligible	Not Significant
	Increase risk of introduction and spread of MNNS	PMF Burrowed Mud	Low	Negligible	Negligible	Not Significant	None required	Negligible	Not Significant
		PMF Offshore Subtidal Sands and Gravels	Negligible	Negligible	Negligible	Not Significant	None required	Negligible	Not Significant
		PMF Kelp Beds	Medium	Negligible	Negligible	Not Significant	None required	Negligible	Not Significant

Topic	Potential Impact	Receptor	Sensitivity	Magnitude	Overall Risk (with embedded mitigation)	Significance (with embedded mitigation)	Additional Mitigation	Overall Residual Risk	Overall Significance
		PMF Ocean Quahog	Low	Negligible	Negligible	Not Significant	None required	Negligible	Not Significant
		Annex I Geogenic Reefs	Low	Negligible	Negligible	Not Significant	None required	Negligible	Not Significant
		Annex I Biogenic (*Sabellaria spinulosa*) Reefs	Medium	Negligible	Negligible	Not Significant	None required	Negligible	Not Significant
Fish and Shellfish Ecology	Temporary (short term) localised disturbance of seabed habitats	Pelagic Fish	Low	Low	Negligible	Not Significant	None required	Negligible	Not Significant
		Demersal Fish (including sandeel)	Low	Low	Negligible	Not Significant	None required	Negligible	Not Significant
		Diadromous Fish	Low	Low	Negligible	Not Significant	None required	Negligible	Not Significant
		Shellfish	Low	Low	Negligible	Not Significant	None required	Negligible	Not Significant
		Atlantic Herring	Medium	Low	Minor	Not Significant	None required	Minor	Not Significant
	Temporary (short term) disturbance via suspended sediment concentration	PMFs	High	Low	Minor	Not Significant	None required	Minor	Not Significant
		Pelagic Fish	Low	Low	Negligible	Not Significant	None required	Negligible	Not Significant
		Demersal Fish	Low	Low	Negligible	Not Significant	None required	Negligible	Not Significant
		Diadromous Fish	Low	Low	Negligible	Not Significant	None required	Negligible	Not Significant
		Shellfish	Medium	Low	Minor	Not Significant	None required	Minor	Not Significant
		Atlantic Herring	Medium	Low	Minor	Not Significant	None required	Minor	Not Significant
		PMFs	Medium	Low	Minor	Not Significant	None required	Minor	Not Significant
		Pelagic Fish eggs and larvae	Medium	Low	Minor	Not Significant	None required	Minor	Not Significant
	Temporary disturbance via underwater noise and vibration	All receptors	Low	Negligible	Negligible	Not Significant	None required	Negligible	Not Significant
Marine Megafauna	Temporary (short term) disturbance via underwater noise and vibration	Pinnipedia	Low	Low	Negligible	Not Significant	None required	Negligible	Not Significant
		Cetacea	Low	Low	Negligible	Not Significant	None required	Negligible	Not Significant
		Basking Shark	Low	Low	Negligible	Not Significant	None required	Negligible	Not Significant
	Vessel displacement and collision risk	Pinnipedia	Low	Low	Negligible	Not Significant	None required	Negligible	Not Significant
		Cetacea	Low	Low	Negligible	Not Significant	None required	Negligible	Not Significant
		Basking Shark	Low	Low	Negligible	Not Significant	None required	Negligible	Not Significant
Ornithology	Vessel-related disturbance and displacement	Auks	Medium	Low	Minor	Not Significant	None required	Minor	Not Significant
		Fulmar	Negligible	Low	Negligible	Not Significant	None required	Negligible	Not Significant
		Gannet	Negligible	Low	Negligible	Not Significant	None required	Negligible	Not Significant
		Herring Gull	Low	Low	Negligible	Not Significant	None required	Negligible	Not Significant
		Kittiwake	Low	Low	Negligible	Not Significant	None required	Negligible	Not Significant

Topic	Potential Impact	Receptor	Sensitivity	Magnitude	Overall Risk (with embedded mitigation)	Significance (with embedded mitigation)	Additional Mitigation	Overall Residual Risk	Overall Significance
		Shag	Medium	Low	Minor	Not Significant	None required	Minor	Not Significant
		Terns	Negligible	Low	Negligible	Not Significant	None required	Negligible	Not Significant
	Reduced foraging success due to decreased visibility	Auks	Medium	Low	Minor	Not Significant	None required	Minor	Not Significant
		Fulmar	Low	Low	Negligible	Not Significant	None required	Negligible	Not Significant
		Gannet	Low	Low	Negligible	Not Significant	None required	Negligible	Not Significant
		Herring Gull	Negligible	Low	Negligible	Not Significant	None required	Negligible	Not Significant
		Kittiwake	Negligible	Low	Negligible	Not Significant	None required	Negligible	Not Significant
		Shag	Low	Low	Negligible	Not Significant	None required	Negligible	Not Significant
		Terns	Low	Medium	Minor	Not Significant	None required	Minor	Not Significant
	Short term habitat loss (e.g. via cable burial), where the seabed type will remain similar	Auks	Medium	Low	Minor	Not Significant	None required	Minor	Not Significant
		Fulmar	Negligible	Low	Negligible	Not Significant	None required	Negligible	Not Significant
		Gannet	Negligible	Low	Negligible	Not Significant	None required	Negligible	Not Significant
		Herring Gull	Negligible	Low	Negligible	Not Significant	None required	Negligible	Not Significant
		Kittiwake	Negligible	Low	Negligible	Not Significant	None required	Negligible	Not Significant
		Shag	Low	Low	Negligible	Not Significant	None required	Negligible	Not Significant
		Terns	Low	Low	Negligible	Not Significant	None required	Negligible	Not Significant
Commercial Fisheries	Temporary (short term) loss of access to fishing grounds and displacement of fisheries	Otter Trawlers	Medium	Low	Minor	Not Significant	None required	Minor	Not Significant
		Pots and Traps	Medium	Low	Minor	Not Significant	None required	Minor	Not Significant
		Demersal Seine Netters	Low	Low	Negligible	Not Significant	None required	Negligible	Not Signifcant
		Dredgers	High	Low	Minor	Not Significant	None required	Minor	Not Significant
		Demersal Trawlers	Medium	Low	Minor	Not Significant	None required	Minor	Not Significant
	Impacts to commercially important fish and shellfish species	Otter Trawlers	Medium	Low	Minor	Not Significant	None required	Minor	Not Significant
		Pots and Traps	Medium	Low	Minor	Not Significant	None required	Minor	Not Significant
		Demersal Seine Netters	Medium	Low	Minor	Not Significant	None required	Minor	Not Significant
		Dredgers	Medium	Low	Minor	Not Significant	None required	Minor	Not Significant
		Demersal Trawlers	Medium	Low	Minor	Not Significant	None required	Minor	Not Significant
Shipping and Navigation	Potential impact to commercial vessel and ferry vessel routing	Commercial vessel and ferry vessel routing	Low	Low	Negligible	Not Significant	None required	Negligible	Not Significant
	Potential impact to small craft routing/activities	Small craft routing/activities	Low	Low	Negligible	Not Significant	None required	Negligible	Not Significant

Topic	Potential Impact	Receptor	Sensitivity	Magnitude	Overall Risk (with embedded mitigation)	Significance (with embedded mitigation)	Additional Mitigation	Overall Residual Risk	Overall Significance
	Potential impact to military exercises	Military Exercises	Negligible	Negligible	Negligible	Not Significant	None required	Negligible	Not Significant
	Potential impact on vessel-to-vessel collision risk	Vessels	Low	Low	Negligible	Not Significant	None required	Negligible	Not Significant
	Potential impact on emergency response/search and rescue	Emergency response/search and rescue	Low	Low	Negligible	Not Significant	None required	Negligible	Not Significant
	Potential impact on oil and gas activities	Oil and gas activities	Low	Low	Negligible	Not Significant	None required	Negligible	Not Significant
	Potential impact on electromagnetic interference and vessel compasses	Electromagnetic instruments and vessel compasses	Negligible	Negligible	Negligible	Not Significant	None required	Negligible	Not Significant
	Potential impact to risk of snagging of anchors and fishing gear	Anchors and fishing gear	Low	Negligible	Negligible	Not Significant	None required	Negligible	Not Significant
	Potential impact on under keel clearance	Under keel clearance	Negligible	Negligible	Negligible	Not Significant	None required	Negligible	Not Significant
	Potential impact on access to ports and harbours	Ports and harbours	Negligible	Negligible	Negligible	Not Significant	None required	Negligible	Not Significant
Offshore Infrastructure	Temporary (short term) loss of access to other users during cable installation/ decommissioning due to the presence of project vessels.	Vessels servicing other plans and projects	Low	Low	Negligible	Not Significant	None required	Negligible	Not Significant
		Subsea 7 Area	Medium	Low	Minor	Not Significant	None required	Minor	Not Significant
	Collision risk between installation/ decommissioning vessels with other sea users	Vessels	High	Negligible	Negligible	Not Significant	None required	Negligible	Not Significant
	Direct damage to assets of other users	Assets of other users	High	Low	Minor	Not Significant	None required	Minor	Not Significant
OPERATION									
Benthic Ecology	Long term loss to benthic habitats and species via placement of hard substrates on the seabed	PMF Burrowed Mud	High	Negligible	Minor	Not Significant	None required	Minor	Not Significant
		PMF Offshore Subtidal Sands and Gravels	High	Negligible	Minor	Not Significant	None required	Minor	Not Significant
		PMF Kelp Beds	High	Negligible	Minor	Not Significant	None required	Minor	Not Significant

Topic	Potential Impact	Receptor	Sensitivity	Magnitude	Overall Risk (with embedded mitigation)	Significance (with embedded mitigation)	Additional Mitigation	Overall Residual Risk	Overall Significance
		PMF Ocean Quahog	High	Low	Minor	Not Significant	None required	Minor	Not Significant
		Annex I Geogenic Reefs	High	Low	Minor	Not Significant	None required	Minor	Not Significant
		Annex I Biogenic (*Sabellaria spinulosa*) Reefs	High	Low	Minor	Not Significant	None required	Minor	Not Significant
	Hydrodynamic changes leading to scour around subsea infrastructure	PMF Burrowed Mud	High	Low	Minor	Not Significant	None required	Minor	Not Significant
		PMF Offshore Subtidal Sands and Gravels	High	Low	Minor	Not Significant	None required	Minor	Not Significant
		PMF Kelp Beds	Medium	Low	Minor	Not Significant	None required	Minor	Not Significant
		PMF Ocean Quahog	Medium	Low	Minor	Not Significant	None required	Minor	Not Significant
		Annex I Geogenic Reefs	Medium	Low	Minor	Not Significant	None required	Minor	Not Significant
		Annex I Biogenic (*Sabellaria spinulosa*) Reefs	High	Low	Minor	Not Significant	None required	Minor	Not Significant
	Colonisation of hard structures	PMF Burrowed Mud	Medium	Low	Minor	Not Significant	None required	Minor	Not Significant
		PMF Offshore Subtidal Sands and Gravels	Medium	Low	Minor	Not Significant	None required	Minor	Not Significant
		PMF Kelp Beds	Low	Low	Negligible	Not Significant	None required	Negligible	Not Significant
		PMF Ocean Quahog	High	Low	Minor	Not Significant	None required	Minor	Not Significant
		Annex I Geogenic Reefs	Medium	Low	Minor	Not Significant	None required	Minor	Not Significant
		Annex I Biogenic (*Sabellaria spinulosa*) Reefs	Medium	Low	Minor	Not Significant	None required	Minor	Not Significant
Fish and Shellfish Ecology	Long term localised disturbance to seabed habitats	Pelagic Fish	Low	Low	Negligible	Not Significant	None required	Negligible	Not Significant
		Demersal Fish (including sandeel)	Low	Low	Negligible	Not Significant	None required	Negligible	Not Significant
		Diadromous Fish	Low	Low	Negligible	Not Significant	None required	Negligible	Not Significant
		Shellfish	Low	Low	Negligible	Not Significant	None required	Negligible	Not Significant
		Atlantic Herring	Medium	Low	Minor	Not Significant	None required	Minor	Not Significant
		PMFs	High	Low	Minor	Not Significant	None required	Minor	Not Significant
	Fish aggregation effects	All receptors	Low	Low	Negligible	Not Significant	None required	Negligible	Not Significant
	Temporary disturbance via	Pinnipedia	Low	Low	Negligible	Not Significant	None required	Negligible	Not Significant
		Cetacea	Low	Low	Negligible	Not Significant	None required	Negligible	Not Significant

Topic	Potential Impact	Receptor	Sensitivity	Magnitude	Overall Risk (with embedded mitigation)	Significance (with embedded mitigation)	Additional Mitigation	Overall Residual Risk	Overall Significance
	underwater noise and vibration	Basking Shark	Low	Low	Negligible	Not Significant	None required	Negligible	Not Significant
	Vessel displacement and collision risk	Pinnipedia	Low	Low	Negligible	Not Significant	None required	Negligible	Not Significant
		Cetacea	Low	Low	Negligible	Not Significant	None required	Negligible	Not Significant
		Basking Shark	Low	Low	Negligible	Not Significant	None required	Negligible	Not Significant
Ornithology	Vessel-related disturbance and displacement	All receptors	Low	Low	Negligible	Not Significant	None required	Negligible	Not Significant
	Long term habitat loss or alteration (e.g. due to installation of scour protection)	Auks	Medium	Low	Minor	Not Significant	None required	Minor	Not Significant
		Fulmar	Negligible	Low	Negligible	Not Significant	None required	Negligible	Not Significant
		Gannet	Negligible	Low	Negligible	Not Significant	None required	Negligible	Not Significant
		Herring Gull	Negligible	Low	Negligible	Not Significant	None required	Negligible	Not Significant
		Kittiwake	Low	Low	Negligible	Not Significant	None required	Negligible	Not Significant
		Shag	Low	Low	Negligible	Not Significant	None required	Negligible	Not Significant
		Terns	Low	Low	Negligible	Not Significant	None required	Negligible	Not Significant
Commercial Fisheries	Permanent loss of access to fishing grounds and displacement of fisheries	Otter Trawlers	Medium	Low	Minor	Not Significant	None required	Minor	Not Significant
		Pots and Traps	Negligible	Low	Minor	Not Significant	None required	Minor	Not Significant
		Demersal Seine Netters	Medium	Low	Minor	Not Significant	None required	Minor	Not Significant
		Dredgers	Medium	Low	Minor	Not Significant	None required	Minor	Not Significant
		Demersal Trawlers	Medium	Low	Minor	Not Significant	None required	Minor	Not Significant
	Impacts to commercially important fish species	Otter Trawlers	Medium	Negligible	Negligible	Not Significant	None required	Negligible	Not Significant
		Pots and Traps	Medium	Negligible	Negligible	Not Significant	None required	Negligible	Not Significant
		Demersal Seine Netters	Medium	Negligible	Negligible	Not Significant	None required	Negligible	Not Significant
		Dredgers	Medium	Negligible	Negligible	Not Significant	None required	Negligible	Not Significant
		Demersal Trawlers	Medium	Negligible	Negligible	Not Significant	None required	Negligible	Not Significant
	Snagging Risk	Otter Trawlers	Medium	Low	Minor	Not Significant	None required	Minor	Not Significant
		Pots and Traps	Negligible	Low	Negligible	Not Significant	None required	Negligible	Not Significant
		Demersal Seine Netters	Medium	Low	Minor	Not Significant	None required	Minor	Not Significant
		Dredgers	Medium	Low	Minor	Not Significant	None required	Minor	Not Significant
		Demersal Trawlers	Medium	Low	Minor	Not Significant	None required	Minor	Not Significant

Topic	Potential Impact	Receptor	Sensitivity	Magnitude	Overall Risk (with embedded mitigation)	Significance (with embedded mitigation)	Additional Mitigation	Overall Residual Risk	Overall Significance
Shipping and Navigation	Potential impact to commercial vessel and ferry vessel routing	Commercial vessel and ferry vessel routing	Low	Negligible	Negligible	Not Significant	None required	Negligible	Not Significant
	Potential impact to small craft routing/activities	Small craft routing/activities	Negligible	Negligible	Negligible	Not Significant	None required	Negligible	Not Significant
	Potential impact to military exercises	Military Exercises	Negligible	Negligible	Negligible	Not Significant	None required	Negligible	Not Significant
	Potential impact on vessel-to-vessel collision risk	Vessels	Negligible	Negligible	Negligible	Not Significant	None required	Negligible	Not Significant
	Potential impact on emergency response/search and rescue	Emergency response/search and rescue	Negligible	Negligible	Negligible	Not Significant	None required	Negligible	Not Significant
	Potential impact on oil and gas activities	Oil and gas activities	Negligible	Negligible	Negligible	Not Significant	None required	Negligible	Not Significant
	Potential impact on electromagnetic interference and vessel compasses	Electromagnetic instruments and vessel compasses	Negligible	Negligible	Negligible	Not Significant	None required	Negligible	Not Significant
	Potential impact to risk of snagging of anchors and fishing gear	Anchors and fishing gear	Low	Negligible	Negligible	Not Significant	None required	Negligible	Not Significant
	Potential impact on under keel clearance	Under keel clearance	Negligible	Negligible	Negligible	Not Significant	None required	Negligible	Not Significant
	Potential impact on access to ports and harbours	Ports and harbours	Negligible	Negligible	Negligible	Not Significant	None required	Negligible	Not Significant
Offshore Infrastructure	Temporary loss of access to other users during cable investigations due to the presence of project vessels.	Vessels servicing other plans and projects	Low	Negligible	Negligible	Not Significant	None required	Negligible	Not Significant
		Subsea 7 Area	Medium	Negligible	Negligible	Not Significant	None required	Negligible	Not Significant
	Collision risk between operational investigation survey vessels with other sea users	Vessels	High	Negligible	Negligible	Not Significant	None required	Negligible	Not Significant
MARINE ARCHAEOLOGY									
Marine Archaeology	Direct physical impact – seabed disturbance	Known assets of archaeological potential	High-Low	High - Medium	Major-Minor adverse	**Significant**	Avoidance with an AEZ/AAP, Operational awareness of location, review of any	Negligible	Not Significant

Topic	Potential Impact	Receptor	Sensitivity	Magnitude	Overall Risk (with embedded mitigation)	Significance (with embedded mitigation)	Additional Mitigation	Overall Residual Risk	Overall Significance
							further geophysical data, WSI and PAD		
		Boundary Bank, Reiss Links (MHG2016)	Medium	Medium	Moderate adverse	**Significant**	Area of Archaeological potential	Negligible	Not Significant
		3 x medium potential anomaly (SPTL_043, SPTL_084 and SPTL_092)	Medium	High	Major adverse	**Significant**	25 m AEZ	Negligible	Not Significant
		2 x high potential anomaly. Wreck (SPTL_115 and SPTL_107)	High	High	Major adverse	**Significant**	50 m AEZ	Negligible	Not Significant
		Low potential anomalies and magnetic contacts	Low	High	Minor adverse	Not Significant	Operational awareness of location, review of any further geophysical data, PAD	Negligible	Not Significant
		Unknown assets and features of archaeological potential	Unknown	High	Moderate adverse	**Significant**	Review of any further geophysical and geotechnical data, WSI and PAD to manage and monitor assets	Negligible	Not Significant
	Indirect disturbance	Known assets of archaeological potential	High-Low	Medium-Low	Major-Minor adverse	**Significant**	Avoidance with an AEZ	Negligible	Not Significant
		Boundary Bank, Reiss Links (MHG2016)	Medium	Low	Moderate adverse	**Significant**	Area of Archaeological potential	Negligible	Not Significant
		3 x Medium potential anomaly (SPTL_043, SPTL_084 and SPTL_092)	Medium	Low	Moderate adverse	**Significant**	25 m AEZ	Negligible	Not Significant
		2 x high potential anomaly. Wreck (SPTL_115 and SPTL_107)	High	Low	Moderate adverse	**Significant**	50 m AEZ	Negligible	Not Significant
		Low potential anomalies and magnetic contacts	Low	Low	Minor adverse	Not Significant	Operational awareness of location, review of any further geophysical data, PAD	Negligible	Not Significant
		Unknown assets and features of archaeological potential	Unknown	Medium	Moderate adverse	**Significant**	Review of any further geophysical and geotechnical data, WSI and PAD to manage and monitor assets	Negligible	Not Significant
		Known assets of archaeological potential	High-Low	Negligible	Beneficial impact	N/A	Review of any further geophysical and geotechnical data, WSI and	Negligible	Not Significant

Topic	Potential Impact	Receptor	Sensitivity	Magnitude	Overall Risk (with embedded mitigation)	Significance (with embedded mitigation)	Additional Mitigation	Overall Residual Risk	Overall Significance
		Unknown assets and features of archaeological potential	Unknown	Negligible			PAD to manage and monitor assets		
CUMULATIVE IMPACT ASSESSMENT									
Physical Environment	**Scoped Out of Cumulative Impact Assessment**								
Benthic Ecology	Temporary (short term) disturbance to seabed habitats	Seabed habitats	Medium/High	Low	Minor	Not Significant	None required	Minor	Not Significant
	Sediment plume dispersal	Seabed habitats	Medium	Low	Minor	Not Significant	None required	Minor	Not Significant
	Long term habitat loss	Seabed habitats	High	Low	Minor	Not Significant	None required	Minor	Not Significant
	Hydrodynamic changes leading to scour	Seabed habitats	High	Low	Minor	Not Significant	None required	Minor	Not Significant
	Colonisation of hard substrates	Seabed habitats	Medium	Low	Minor	Not Significant	None required	Minor	Not Significant
Fish and Shellfish Ecology	Temporary disturbance to seabed habitats	Pelagic, demersal, diadromous	Low	Low	Negligible	Not Significant	None required	Negligible	Not Significant
		Atlantic herring	Medium	Low	Minor	Not Significant	None required	Minor	Not Significant
		PMFs	High	Low	Minor	Not Significant	None required	Minor	Not Significant
	Temporary disturbance via SSC and smothering	Pelagic, demersal, diadromous, elasmobranchs	Low	Low	Negligible/Minor	Not Significant	None required	Negligible/Minor	Not Significant
		Atlantic herring	Medium	Low	Minor	Not Significant	None required	Minor	Not Significant
		PMFs	Medium	Low	Minor	Not Significant	None required	Minor	Not Significant
	Long term habitat loss	Pelagic, demersal, diadromous	Low	Low	Negligible/Minor	Not Significant	None required	Negligible/Minor	Not Significant
		Atlantic herring	Medium	Low	Minor	Not Significant	None required	Minor	Not Significant
		PMFs	Low-High	Low	Minor	Not Significant	None required	Minor	Not Significant
Marine Megafauna	Vessel displacement and collision risk	-	-	-	Negligible	Not Significant	None required	Negligible	Not Significant
	Vessel-related disturbance	-	-	-	Negligible	Not Significant	None required	Negligible	Not Significant
	Disturbance from underwater noise and vibration	-	-	-	Negligible	Not Significant	None required	Negligible	Not Significant
Ornithology		Fulmar, gannet, terns	Negligible	Low	Negligible	Not Significant	None required	Negligible	Not Significant

Topic	Potential Impact	Receptor	Sensitivity	Magnitude	Overall Risk (with embedded mitigation)	Significance (with embedded mitigation)	Additional Mitigation	Overall Residual Risk	Overall Significance
	Vessel-related disturbance and displacement	Kittiwake, herring gull	Low	Low	Negligible	Not Significant	None required	Negligible	Not Significant
		Shag, auks	Medium	Low	Minor	Not Significant	None required	Minor	Not Significant
	Reduced foraging success due to decreased visibility	Fulmar, gannet, shag	Low	Low	Negligible	Not Significant	None required	Negligible	Not Significant
		Kittiwake, herring gull	Negligible	Low	Negligible	Not Significant	None required	Negligible	Not Significant
		Terns	Low	Medium	Minor	Not Significant	None required	Minor	Not Significant
	Short term habitat loss	Fulmar, herring gull, gannet, kittiwake	Negligible	Low	Negligible	Not Significant	None required	Negligible	Not Significant
		Shag, terns	Low	Low	Negligible	Not Significant	None required	Negligible	Not Significant
		Auks	Medium	Medium	Minor	Not Significant	None required	Minor	Not Significant
	Long term habitat loss	Fulmar, herring gull, gannet	Negligible	Low	Negligible	Not Significant	None required	Negligible	Not Significant
		Kittiwake, shag, terns	Low	Low	Negligible	Not Significant	None required	Negligible	Not Significant
		Auks	Medium	Low	Minor	Not Significant	None required	Minor	Not Significant
Commercial Fisheries	Temporary loss of access to fishing grounds and displacement	Dredgers	High	Medium	Moderate	**Significant**	Consultation with commercial fisheries industry plus dedicated engagement planning through Fisheries Liaison Mitigation and Action Plan	Negligible	Not Significant
		Otter trawls, pots and traps, demersal trawlers	Medium	Medium	Moderate	**Significant**		Negligible	Not Significant
		Demersal seine netters	Low	Medium	Minor	Not Significant	None required	Minor	Not Significant
	Impacts to fish and shellfish	All	Medium	Low	Minor	Not Significant	None required	Minor	Not Significant
	Permanent loss of access to fishing grounds and displacement	Otter trawls, demersal seine netters, dredgers, demersal trawlers	Medium	Low	Minor	Not Significant	None required	Minor	Not Significant
		Pots and traps	Negligible	Low	Minor	Not Significant	None required	Minor	Not Significant
Shipping and Navigation	**Scoped Out of Cumulative Impact Assessment**								
Marine Archaeology	Direct physical impacts from seabed disturbance	All	Low-High	High	Moderate-major	**Significant**	Avoidance using AEZ, review of further geophysical/geotechnical data	Negligible	Not Significant
	Indirect physical impact	All	Low-High	High	Major	**Significant**	Avoidance using AEZ, review of further geophysical/geotechnical data	Negligible	Not Significant

Topic	Potential Impact	Receptor	Sensitivity	Magnitude	Overall Risk (with embedded mitigation)	Significance (with embedded mitigation)	Additional Mitigation	Overall Residual Risk	Overall Significance
Offshore Infrastructure	Temporary loss of access and displacement to other sea users	Vessel activities	Medium	Low	Minor	Not Significant	None required	Minor	Not Significant

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APPENDIX A: HABITATS REGULATIONS APPRAISAL

A.1 INTRODUCTION

The present assessment is in support of a Marine Licence Application (MLA) to the Marine Directorate Licensing Operations Team (MD-LOT), by Scottish and Southern Electricity Networks Transmission (SSENT), for the installation and operation of a 525 kV High Voltage Direct Current (HVDC) transmission cable system between Spittal and Peterhead (**Figure A-1**). The marine component of this project spans approximately 172 km in length and is hereby known as 'the Project'. The MLA covers installation of this cable between Mean High Water Springs (MHWS) at 2 Scottish landfalls, located in the proximity to Spittal and Peterhead. This assessment considers relevant designated protected sites within the Scottish inshore 12 nautical mile (nm) territorial sea and offshore waters.

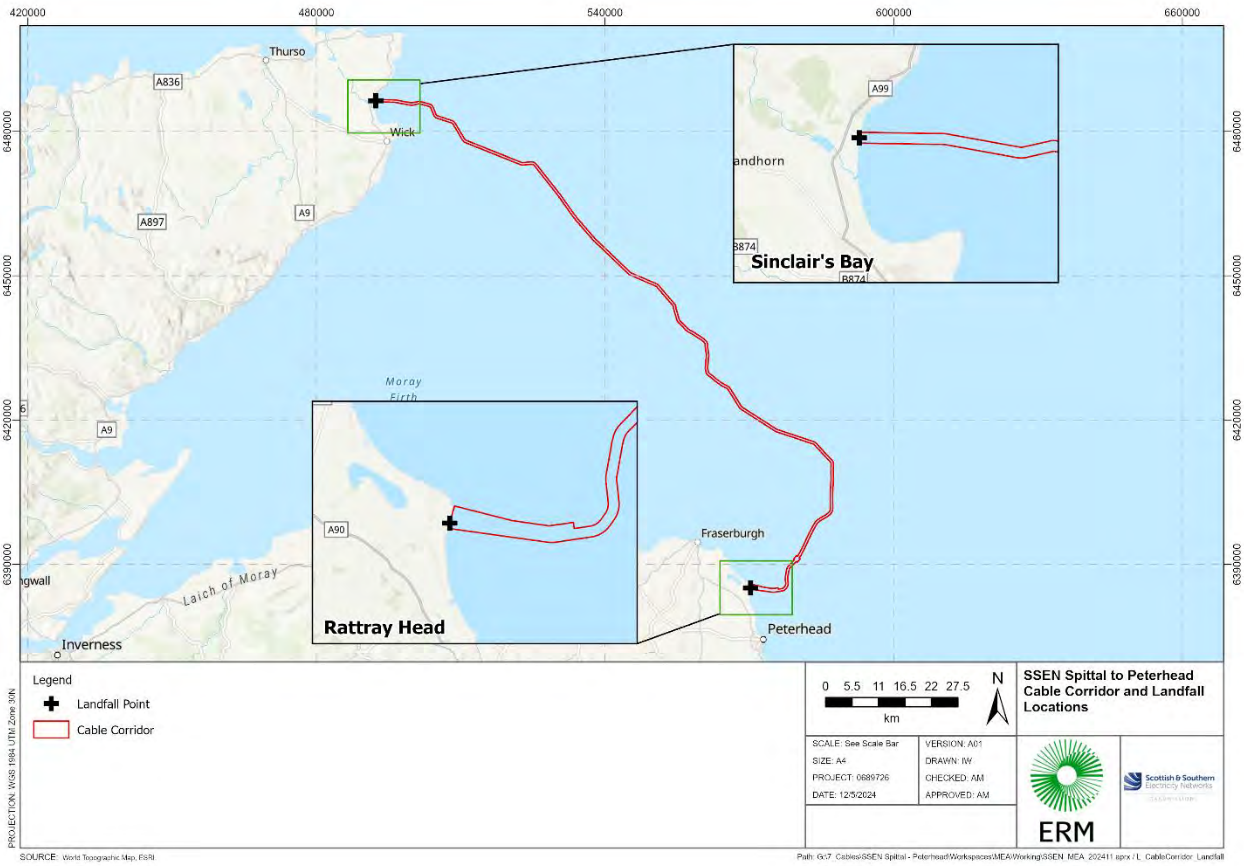
This report presents the screening exercise within the Project Habitats Regulations Appraisal (HRA). The structure of this report is as follows:

- Overview of the HRA process, and assessment methodology (**Section A.2**)
- Project Description and design envelope parameters relevant to HRA (**Section A.3**)
- The screening exercise, including the identification of sites and the assessment of exposure to effect pathways resulting from the Project (**Section A.4**).

Where there is credible evidence that there is no risk that the Project activities are 'likely to have a significant effect' (LSE) on specific features of a European or Ramsar site by undermining its conservation objective(s), these features have been screened out and will not require further assessment. Where such determination has been concluded, the justification is noted within the relevant receptor chapters.

If a credible impact pathway is identified, or there is reasonable doubt whether the Project will or will not result in LSE, in view of the conservation objectives, then the respective site and feature would be screened in and taken forward to the next stage, Appropriate Assessment.

FIGURE A-1 PROJECT LOCATION AND LANDFALL



A.2 METHODOLOGY

A.2.1 OVERVIEW OF THE HABITATS REGULATIONS APPRAISAL PROCESS

Habitats Regulations Assessment Process and the United Kingdom's Exit from the European Union

The Conservation (Natural Habitats, &c.) Regulations 1994 as amended[16], The Conservation of Habitats and Species Regulations 2017 (as amended)[17], and The Conservation of Offshore Marine Habitats and Species Regulations 2017[18] (as amended), transpose the EU Habitats Directive (Council Directive 92/43/EEC)[19] and certain elements of the Wild Birds Directive (Directive 2009/147/EC)[20] (known together as the Nature Directives), into UK and Scottish law.

Following the United Kingdom's exit from the European Union (EU), and the end of the transition period on 31 December 2020, legislation has been passed to transfer functions from

[16] https://www.legislation.gov.uk/uksi/1994/2716/contents/made
[17] https://www.legislation.gov.uk/uksi/2017/1012/contents/made
[18] https://www.legislation.gov.uk/uksi/2017/1013/contents/made
[19] Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A31992L0043
[20] Directive 2009/147/EC of the European Parliament and of the Council of 30 November 2009 on the conservation of wild birds: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32009L0147

the European Commission to the appropriate authorities in the UK[21] and Scotland[22]. While references in an EU context throughout the legislation have been re-defined to a UK only context, overall, the legislative changes do not result in material changes in how HRAs are undertaken in the UK. Habitat and species protection and standards will be implemented in the same or an equivalent way, maintaining existing protections for habitats and species. The environmental assessment regimes that inform planning decisions, including HRA, continue to apply post-EU exit.

HABITATS REGULATIONS SITE DESIGNATIONS

All European protected sites and species retain the same level of protection now that the UK has left the European Union. However, The Conservation (Natural Habitats, &c.) (EU Exit) (Scotland) (Amendment) Regulations 2019 now provide for the creation of a 'national site network' within the UK territory. This is comprised of the sites that had been already designated under the Nature Directives before exit day that formed part of Natura 2000, or, at any time on or after exit day, European sites, European marine sites and European offshore marine sites for the purposes of any of the retained transposing regulations.

As a matter of government policy, potential Special Protection Areas (pSPA) and Ramsar sites (sites designated under the 1971 Ramsar Convention for their internationally important wetlands) are afforded the same level of protection.

Appropriate management objectives will be established for the national site network (the 'network objectives').

STAGE 1 – SCREENING AND DETERMINATION OF LIKELY SIGNIFICANT EFFECT

The screening stage examines the likely effects of a project either alone, and/or in combination with other projects and plans on a European site and seeks to answer the question "*can it be concluded that no likely significant effect will occur*?". To determine if it cannot be excluded on the basis of objective evidence that the construction and/or operation of the Project[23] will have any significant effects on the designated sites, the issues listed below have been considered:

- Could the proposals affect the qualifying interest and are they sensitive/vulnerable to the effect?;
- The probability of the effect happening?;
- The likely consequences for the site's conservation objectives if the effect occurred?; and
- The magnitude, duration, and reversibility of the effect, considering any mitigation built into the Project design?

The screening stage will therefore conclude one of the outcomes listed below:

- No likely significant effect;
- A likely significant effect will occur; and

[21] https://www.legislation.gov.uk/uksi/2019/579/contents/made
[22] https://www.legislation.gov.uk/ssi/2019/113/contents/made
[23] It has been assumed that any effects from decommissioning would be addressed in full by the Competent Authority closer to the time when it may occur, based on more specific information about the activities and processes involved, and also the prevailing environmental conditions.

- It cannot be concluded that there will be no LSE.

Where the assessment concludes the second or third outcome, then the need for an Appropriate Assessment (AA) is triggered[24]. Natural England's internal guidance (Natural England Internal Guidance, 2018) states, in paragraphs 4.3 to 4.5, that:

4.3 "*In undertaking an assessment of 'likely significant effects' under the Habitats Regulations, authoritative case law has established that:*

- *an effect is likely if it* "cannot be excluded on the basis of objective information." *(Case C-127-02 Waddenzee – refer para 45)*;
- *an effect is significant if it* "is likely to undermine the conservation objectives." *(Case C-127-02 Waddenzee – refer para 48)*; and
- *in undertaking a screening assessment for likely significant effects* "…it is not that significant effects are probable, a risk is sufficient" *but there must be credible evidence that there is* "…a real, rather than a hypothetical, risk." *(Boggis v Natural England and Waveney DC (2009) EWCA Civ 1061 – refer paras 36-37)*.

4.4 The Advocate General's opinion in Sweetman also offers some simple guidance that the screening step 'operates merely as a trigger' which asks, "should we bother to check*?" (Case C-258/11 Sweetman Advocate General Opinion (refer paras 49-50).*

Recent case law has also confirmed that measures intended to avoid, or reduce, the harmful effects of a project on a European site should not be considered at the screening stage (C-323/17 People over Wind). Such matters are to be considered as part of an AA. However, from an air quality perspective, the assessment does consider the embedded measures that are required to meet emission limits and air quality standards designed for the protection of human health. Recent case law (Case C-721/21 Eco Advocacy CLG v An Bord Pleanála) highlighted that account could be taken of features where they are incorporated into a plan/project as standard features, irrespective of the effect they have on the European site (e.g. standard measures to remove contaminants, which may reduce harmful effects on a European site).

The screening assessment also must include a consideration of other projects and whether likely significant effects on European site may result in combination with these other projects. In drawing up the list of other projects and plans, account will be taken also of the need to avoid "*legislative overkill*" that could occur through the inclusion of *"… all plans and projects capable of having any effect whatsoever…"* (Case C-258/11 Sweetman v An Bord Pleanála (2013))[25] and that there is credible evidence that the risk from these other projects and plans is real (see reference to Boggis above). This will include consideration of the likely effects of the project/plans on the conservation objectives of the European site(s) affected.

STAGE 2 – APPROPRIATE ASSESSMENT

Where an Appropriate Assessment (AA) is required, its aim is to determine if the effects of a project alone and/or in-combination will have an adverse effect on European sites. AA should exclusively focus on the qualifying features of the European site and consider any effects on

[24] In the case of the third outcome, European guidance (Assessment of Plans and Projects Significantly affecting Natura 2000 sites (2001)) advises that sufficient uncertainty remains to indicate that an appropriate assessment should be carried out.
[25] In Case C 258/11

the conservation objectives of those qualifying interests. It must provide evidence for the regulator to be able to rule out all reasonable scientific doubt that the proposal would not have an adverse effect on the integrity of the site. EC guidance states that without proper reasoning the assessment does not fulfil its purpose and cannot be considered *"appropriate"*. In terms of what is reasonable, guidance states *"to identify the potential risks, so far as they may be reasonably foreseeable in the light of such information as can be reasonably obtained"* (European Communities, 2000).

The AA contains two stages as listed below:

- A scientific evaluation of all the likely significant effects of a project alone, or in combination with other projects, on the relevant qualifying interests of a European site; and
- A conclusion, based on outcomes of the scientific evaluation, as to whether the integrity of a European site will be compromised.

The emphasis for AA is to prove that no adverse effects due to a project will occur which would undermine a European site's conservation integrity. Site integrity can be defined as *"the coherence of its structure and function across its whole area that enables it to sustain the habitat, complex of habitats and/or the levels of populations of the species for which it was classified"* (EC, 2000).

The assessment also needs to consider any measures which will be implemented to avoid or reduce the level of impact from a project. The Competent Authority may also consider the use of conditions or restrictions to help avoid adverse effects on site integrity.

If the AA concludes that there will be an adverse effect on the integrity of the European site, or that there is uncertainty and a precautionary approach is taken, then consent can only be granted through means of derogation, if there are no alternative solutions, Imperative Reasons of Overriding Public Interest (IROPI) is applicable, and compensatory measures have been secured.

A.3 SUMMARY OF PROJECT DESCRIPTION

The Project comprises a 525 kV High Voltage Direct Current (HVDC) transmission cable system, approximately 172 km long, and with 2 landfall areas (Sinclair's Bay – Northern landfall; and Rattray Head – Southern landfall) comprising a 400 kV substation and a HVDC station each, located in the proximity of Spittal and Peterhead, respectively. It is important to highlight that, at the time of drafting this assessment, there was no intertidal work planned or discussed. The project itself will have several stages from preparation of the area, installation and operation and protection material.

Background information associated with the Project is presented in **Section 1** and the full description of the Project is presented in **Section 5**. A summary of the key Project design information supplied and deemed necessary to inform the HRA are shown in **Table A-1**.

TABLE A-1 PROJECT DESIGN ENVELOPE (PDE) PARAMETERS CONSIDERED TO INFORM THE HABITAT REGULATORY ASSESSMENT

Parameter	Unit	Value
Total Project Programme	Months	45 Total Land and offshore (running in parallel) 33 Land 43 Offshore
Total Duration of Offshore Construction Works	Months	The overall development will consider a length of 3 years 7 months. Time during operations will have to be considered to monitor the project
Total Duration of Landfall Works	Months	33 months
Operational Lifetime	Years	40
Number of Vessels Simultaneously Active (during construction)	Number	7 plus support vessels
Types of Installation Vessel	-	Cable lay vessel; Trench support vessel; Subsea Rock Installation Vessel; DP Construction Support Vessel (CSV) - Mattress installation, PLGR, MFE, Mechanical Cutting etc.; Guard vessels (8 – 9 guard vessels for every 90 km of cable route; maximum 17) Multi cat vessels (Spud can and anchor spread); Survey Vessels (nearshore and offshore).
Total Project Area	km^2	88.13
Total Area of Works within 3 nm: Northern landfall Southern landfall	km^2	 4.82 5.12
Installation Characteristics		
Burial Technique (offshore)	-	Pre-Lay Grapnel Run (PLGR). Boulder clearance. Pre-sweeping of sandwaves. Trenching tools (e.g. Jet trencher).
Burial Technique (nearshore – 1km)	-	HDD. CPS. Rock placement trench and, if not trenched, mattress to cover surface lay.

Parameter	Unit	Value
Burial Technique (intertidal)	-	HDD
Maximum Burial Depth	M	1.8
Minimum Burial Depth	M	0.6
Trench Width	M	0.5–1
Width of seabed disturbance from installation tool	M	5–10
Duration of installation	Hours	408 hours per campaign (2 campaigns). 408 x 2 x 1.1 = 898 hours (total)
Cable Protection		
Protection Material	Material Type and size	HDD exit and crossings. 1) Rock type and grain size - 70 mm based on a rock density of 2,650 kg/m^3 (grading 1-5"). 2) Mattresses – nature inclusive designs (NID) under consideration for mattresses. Mattresses will be used to cover and help minimise the presence of the cable with minimal footprint of these effects. Approximate size: 6 m x 3 m x 0.3 m

A.4 STAGE 1 SCREENING OF STATUTORY DESIGNATED SITES AND FEATURES

A.4.1 APPROACH TO SCREENING FOR LIKELY SIGNIFICANT EFFECT

To maintain an approach that encompasses the potential footprint of effects associated with the project, but also ensuring screening and assessment remain proportionate to the scale and magnitude of the project, screening buffers have been applied to the HRA process. Sites outside of these screening buffers are considered sufficiently distanced from the project that it is reasonable to conclude No Likely Significant Effect. A summary of the approach used for each receptor group is provided in **Table A-2**.

TABLE A-2 BUFFERS ADOPTED FOR LIKELY SIGNIFICANT EFFECT SCREENING

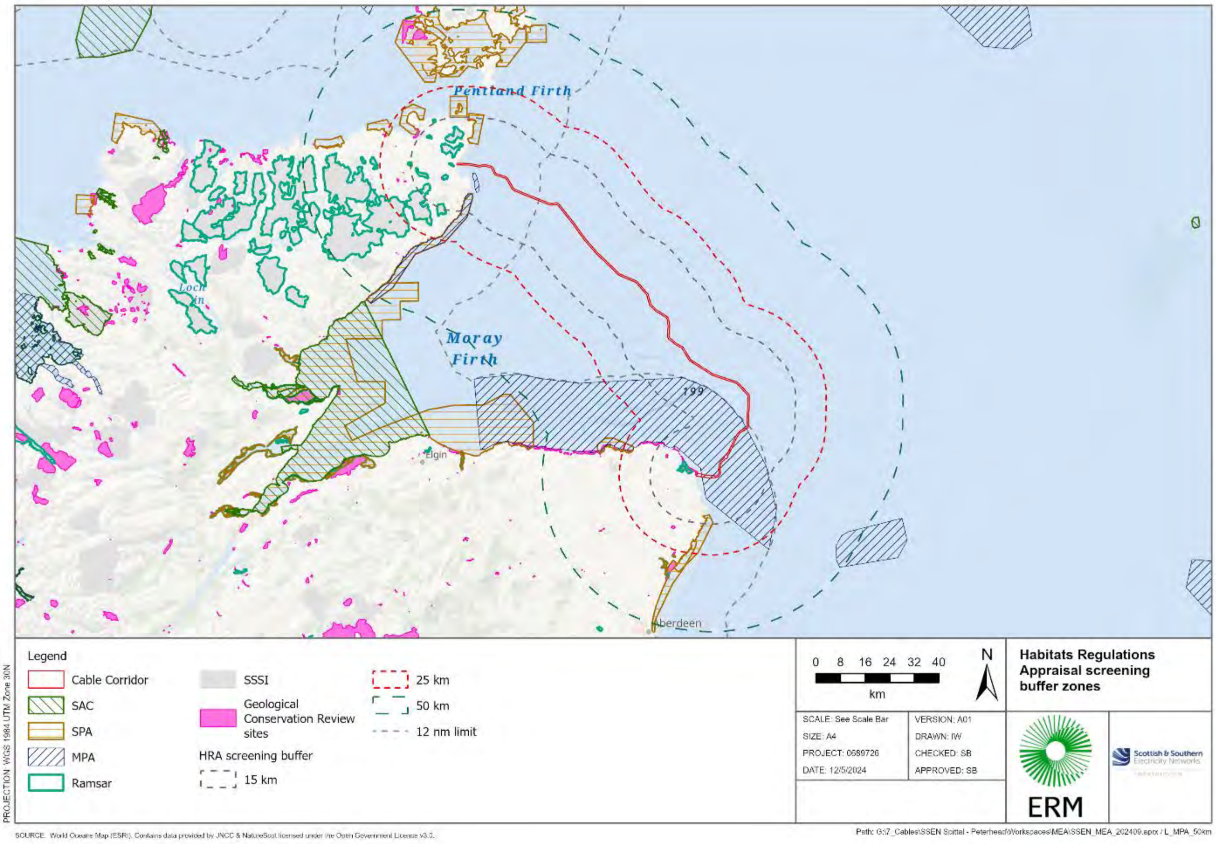
Receptor	Screening Methodology
Annex I Benthic Habitats (Special Areas of Conservation; SACs)	**25 km** screening buffer. This buffer is expected to exceed the maximum distance of sediment plume effects (suspended sediment, deposition and smothering) and hydrodynamic effects (wave and tidal current) on benthic habitats and species.

Receptor	Screening Methodology
Annex II Migratory Fish (SACs)	**25 km** screening buffer. This buffer is considered sufficient to ensure that there is no measurable habitat loss or barrier to species movement arising from the project activities.
Annex II Marine Mammals (SACs)	**50 km** screening buffer. This buffer is applied to encompass foraging and movement of mobile marine mammal features outside of the boundaries of the SACs of which they are a qualifying feature.
Special Protection Area (SPA) Classified Bird Populations and Ramsar Sites	**50 km** screening buffer for breeding features. Although this buffer is smaller than the species specific foraging ranges presented by Woodward et al. (2019), it is considered sufficient to encompass all important foraging and supporting habitats at nearby SPAs. **15 km** screening buffer for non-breeding features. If an SPA supports breeding (Annex I seabirds, with a buffer of 50 Km) and non-breeding (Annex I seabirds with a buffer of 15 km), the area is screened based on the 50 km buffer, covering both types of features and No Likely Significant Effect (No LSE). **0 km** screening buffer for terrestrial features. Features that do not make use of the marine environment are only screened in where there is direct overlap between the Project and the SPA (this can only occur at landfall locations). Where an SPA is classified for terrestrial and marine features, No LSE is concluded for all terrestrial features if there is no direct overlap.

For sites that are within the distance buffers presented in **Table A-2**, feature-specific sensitivity to pressures associated with the proposed activity is considered. NatureScot's 'FeAST' (Feature Activity Sensitivity Tool) has been used, where possible; however, it should be noted that sensitivity assessments have not been conducted for several qualifying features. **Table A-3** shows the different buffers adopted whilst conducting this assessment. The main rationale for using these distances was to ensure the assessment conducted was proportionate to the scale and magnitude of the project. The application of the standard approach of seabird ranges would encompass up to 100 SPAs, which is in this case would be an overestimation of the footprint of the project.

Figure A-2 presents the location of SACs, SPAs, and Ramsar Sites considered within the assessment, in relation to the cable corridor and the relevant buffer regions. One SAC and 11 SPAs/Ramsar Sites are situated within the screening distances.

FIGURE A-2 THE PROPOSED PROJECT AREA, HABITATS REGULATIONS APPRAISAL SCREENING BUFFER ZONES (15 KM, 25 KM, AND 50 KM), AND SPECIAL AREAS OF CONSERVATION, SPECIAL PROTECTION AREAS, AND RAMSAR SITES WITHIN SCREENING DISTANCE



A.4.2 IN COMBINATION ASSESSMENT

Some projects may be unlikely to have significant effects on their own, but in combination with other plans or projects may be significant. It must, therefore, be concluded, whether the plan or project, in combination with other plans or projects, is capable of causing Likely Significant Effects.

Various key public sources can be consulted to identify a 'long list' of plans and projects in the area, and these may include the following:

- 4C Offshore Global Offshore Maps (4C Offshore, 2024);
- The Crown Estate Scotland / Outreach a'Chrùin Alba) Spatial Data Hub;
- National Marine Plan Interactive (NMPi) (Marine Scotland, 2024);
- Global Renewables Infrastructure Projects (GRIP) Database (RCG, 2024); and
- The North Sea Transition Authority (NSTA) Offshore Oil and Gas Activity (NSTA, 2023).

Those reasonably foreseeable projects and plans that are to be located within the region of the project will be considered. However, assessments will also be cognisant of highly mobile receptors, such as birds and marine mammals, that may interact with a project across wider scales. Of the 'long list' of plans or projects that are of relevance, a 'short list' is then identified. For the purpose of this assessment, projects and plans that are fully implemented and in operation are not considered under the in combination assessment, as they will have been considered under the baseline environment. However, where it is identified that there are ongoing impacts from built and operational projects, these are to be considered within the baseline environment of each of the relevant topic chapters within the CIA chapter.

It is important to note that an in combination list of plans and projects for HRA may be different to the cumulative/in combination list for different types of assessments (e.g. Environmental Impact Assessment (EIA)/Marine Environmental Assessments (MEA), and MCZ assessments).

Screening for Likely Significant Effect

Screening has been undertaken on a two-stage iterative basis, where, initially, screening distances (**Table A-2**) have been used to identify sites within the vicinity of the project. Following this, sites within screening distance were assessed to a higher level of detail.

The screening distances laid out in **Table A-2** identified the following European sites, which are taken forward for further consideration within the screening process:

SACs Designated for Annex I Benthic Habitats:

- Moray Firth SAC (UK0019808);

SACs Designated for Annex II Migratory Fish Species:

- No sites were located within the screening threshold distance;

SACs Designated for Annex II Species:

- Moray Firth SAC (UK0019808);

SPAs with Classified Bird Populations:

- North Caithness Cliffs SPA (UK9001181);
- East Caithness Cliffs SPA (UK9001182);
- Scapa Flow SPA (UK9020321);
- North Orkney SPA (UK9020314);
- Ythan Estuary, Sands of Forvie and Meikle Loch SPA (UK9002221) and Ythan Estuary and Meikle Loch Ramsar Site (UK13061);
- Moray Firth SPA (UK9020313);
- Hoy SPA (UK9002141);
- Buchan Ness to Collieston Coast SPA (UK9002491);
- Copinsay SPA (UK9002151);
- Troup, Pennan and Lion’s Head SPA (UK9002471).

Table A-3 presents the results of the screening exercise for the sites listed above. The qualifying features of each site are presented alongside the assessment and justification for determination of LSE. Where applicable, assessment of feature sensitivity is based on FeAST (NatureScot, 2023); however, the tool does not yet include assessments for any marine bird species, other than black guillemot *Cepphus grylle*, and does not consider common bottlenose dolphin *Tursiops truncatus*. It is understood that 36 sensitivity assessments for marine birds have been conducted (Rogerson *et al.*, 2021). However, at the time of drafting this assessment, it is unclear if these sources have been published. Therefore, where appropriate, the methodology report (Rogerson *et al.*, 2021), and references therein, has been used alongside alternative published reports and studies, in order to determine whether features are likely to be sensitive to pressures associated with the project.

As detailed in **Table A-3**, **No Likely Significant Effect is concluded for all sites and qualifying features**, primarily due to the small and highly localised scale and magnitude of the project. No qualifying features were assessed as having greater than negligible sensitivity to the proposed works.

In combination Assessment

Given that each of the features of the sites assessed, is screened out as having no LSE to any pressure pathways considered, an in combination assessment has not been undertaken.

Appropriate Assessment

Appropriate Assessment (HRA Stage 2) is not required, and no further assessment has been undertaken.

TABLE A-3 SCREENING FOR LIKELY SIGNIFICANT EFFECT (LSE) CONCLUSIONS

Site Name and Code	Qualifying Features* * No Likely Significant Effect (LSE) is concluded for all terrestrial features.	Distance from Cable Corridor (km)	Screening for Likely Significant Effect (LSE)
Special Areas of Conservation (SACs)			
Moray Firth SAC (UK0019808)	Common bottlenose dolphin *Tursiops truncatus*; Sandbanks which are covered by sea water at all times (subtidal sandbanks).	21.03	The Moray Firth SAC is located in excess of 20 km from the project area. Although this is within the screening distance for Annex I habitats, it is considered that this is in excess of the spatial extent of secondary project effects (i.e. settlement of sediment mobilised during trenching operations). Therefore, there is no pressure pathway from project effects to impact designated Annex I habitats, and **No LSE** is concluded for the subtidal sandbanks feature of this SAC. The Moray Firth SAC is also screened into assessment for consideration of potential Project effects on Annex II marine mammal species. Cetacean species have been recorded in the region covered by the cable installation corridor (Evans *et al.,* 2011; Reid *et al.*, 2003). The area is regularly monitored and observed trends have shown a clear inter-annual variability with stable abundances over time (Cheney *et al*., 2024). It is also important to note that bottlenose dolphin are known to frequent, or seasonally visit, the waters of the north coast of Scotland. Specifically, it has been reported that bottlenose dolphin are regularly present within the vicinity of the cable installation corridor (Evans *et al.,* 2011). However, the proposed Project activities are located >20 km from the Moray Firth SAC. It is considered that project activities have potential to affect bottlenose dolphin through impacts to benthic habitat (i.e. feeding resource), increase in suspended sediments, or subsea acoustic emissions. Of these pressures, bottlenose dolphin are only considered to be sensitive to underwater noise, which may "*cause marine mammals to relocate, interfere with communication, navigation, foraging, and may disrupt social bonds*" (NatureScot, 2024). The proposed cable installation operations are expected to produce low levels of acoustic disturbance, and any noise would be expected to attenuate within a small distance from the source. Given

Site Name and Code	Qualifying Features* * No Likely Significant Effect (LSE) is concluded for all terrestrial features.	Distance from Cable Corridor (km)	Screening for Likely Significant Effect (LSE)
			that animals affected by pressures associated with the proposed works will have travelled >20 km from the Moray Firth resident population, the area of effect is considered to represent a negligible portion of their available foraging area. Therefore, for the purposes of this assessment, bottlenose dolphin are screened out. Considering the proposed project and the localised level of operations, these species will not be affected by the proposed project. Therefore, **No LSE** is predicted.
Special Protection Areas (SPAs) and Ramsar Sites			
North Caithness Cliffs SPA (UK9001181)	Breeding populations of: Black-legged kittiwake *Rissa tridactyla*; Common guillemot *Uria aalge*; Razorbill *Alca torda*; Atlantic puffin *Fratercula arctica*; Northern fulmar *Fulmarus glacialis*; Peregrine falcon *Falco peregrinus**.	6.7	The North Caithness Cliffs SPA is in close proximity to the project (6.7 km); thus, there is potential for interaction to occur for all features except peregrine falcon, where **No LSE** is determined. For seabird features (black-legged kittiwake, common guillemot, razorbill, Atlantic puffin, and northern fulmar), there is potential for the project activities to affect foraging areas, supporting habitat, and affect individual foraging birds. Cable installation works will involve direct disturbance of a small width of seabed for the length of the cable corridor, and use of several works and support vessels. Due to the nature of the project, effects will be limited to within the immediate vicinity of the ongoing works, and will be temporary and short term. The project may result in disturbance of a small number of individuals during periods when vessels are active. However, disturbance will be highly localised and affect a negligible proportion of the foraging range for these species, which ranges from 95.2 km for razorbill, to 1,200.2 km for northern fulmar (Woodward *et al.*, 2019). A small area of supporting habitat may be temporarily affected during installation; however, the recovery period is expected to be short term and impacts to benthic species and habitats and fish and shellfish were not significant (**Section 7.2 and 7.3**). Therefore, the project is not expected to

Site Name and Code	Qualifying Features* * No Likely Significant Effect (LSE) is concluded for all terrestrial features.	Distance from Cable Corridor (km)	Screening for Likely Significant Effect (LSE)
			result in any measurable effect on the qualifying features and **No LSE** is concluded. **No Likely Significant Effect** is determined for the North Caithness Cliffs SPA and its qualifying features.
East Caithness Cliffs SPA (UK9001182)	Breeding populations of: Black-legged kittiwake; Great black-backed gull *Larus marinus*; European herring gull *Larus argentatus*; Common guillemot; Razorbill; Northern fulmar; Great cormorant *Phalacrocorax carbo*; European shag *Gulosus aristotelis*; Peregrine falcon; Seabird assemblage.	8.97	The East Caithness Cliffs SPA supports similar species to the North Caithness Cliffs SPA, with the addition of great black-backed and herring gulls, great cormorant and European shag. For black-legged kittiwake, common guillemot, razorbill, Atlantic puffin, and peregrine falcon, the same rationale and conclusions as made for the North Caithness Cliffs SPA are also appliable. Therefore, **No LSE** is determined. Great black-backed gull and European herring gull are surface-feeding gulls, which feed in the upper water column only. Therefore, there is no potential for interactions with the seabed to affect these species. The species are also insensitive to vessel-related disturbance (Cook and Burton, 2010; Furness *et al.*, 2013). Should temporary disturbance or habitat loss occur, gulls are opportunistic species which can make use of a wide variety of marine and terrestrial habitat and prey species; thus, show high adaptability and tolerance. Therefore, **No LSE** is concluded for these species. Great cormorant and European shag are pursuit-foraging, diving birds that make use of the nearshore marine environment, having respective foraging ranges of 25.6 ± 8.3 km, and 13.2 ± 10.5 km (Woodward *et al.*, 2019). There is potential for interaction with the project; however, due to its small magnitude and spatial footprint, interaction will be very limited. Both species forage on small pelagic fish species, and the project is not predicted to affect any prey species (see **Section 7.3 Fish and Shellfish**). Cormorant and shag show some sensitivity to vessel-related disturbance (Furness *et al.*, 2013; MMO, 2018). However, a limited number of vessels are expected to be present at any given time during the proposed

Site Name and Code	Qualifying Features* * No Likely Significant Effect (LSE) is concluded for all terrestrial features.	Distance from Cable Corridor (km)	Screening for Likely Significant Effect (LSE)
			project. Therefore, it is expected that disturbance will be restricted to the immediate vicinity of the works and will be short term in nature. Additionally, the increased number of vessels, when compared with background vessel traffic in the region, is likely to be negligible and not expected to result in a measurable effect on foraging seabirds. Therefore, **No LSE** is concluded. **No Likely Significant Effect** is determined for the East Caithness Cliffs SPA and its qualifying features.
Scapa Flow SPA (UK9020321)	Breeding populations of: Red-throated diver *Gavia stellata*. Non-breeding populations of: Common eider *Somateria mollissima**; Long-tailed duck *Clangula hyemalis*; Red-breasted merganser *Mergus serrator*; Slavonian grebe *Podiceps cristatus**; Black-throated diver *Gavia arctica*; Great northern diver *Gavia immer*; European shag.	30	Scapa Flow SPA is located 30 km from the cable corridor, thus is outside the screening distance for non-breeding features (15 km). As such, **No LSE** is concluded for all non-breeding qualifying features of the SPA: common eider, long-tailed duck, red-breasted merganser, Slavonian grebe, black-throated diver, great northern diver, and European shag. Red-throated diver has a foraging range of up to 9 km during the breeding season (Woodward *et al.*, 2019). Therefore, with the SPA being 30 km from the project, there is no potential for interaction. As such, **No LSE** is determined for the breeding red-throated diver feature of the Scapa Flow SPA. **No Likely Significant Effect** is determined for the Scapa Flow SPA and its qualifying features.
North Orkney SPA (UK9020314)	Breeding populations of: Red-throated diver. Non-breeding populations of: Velvet scoter *Melanitta fusca*; Slavonian grebe*; Great northern diver.	46	North Orkney SPA is located 46 km from the cable corridor, thus is outside the screening distance for non-breeding features (15 km). As such, **No LSE** is concluded for all non-breeding qualifying features of the SPA: velvet scoter, Slavonian grebe, and great northern diver. Red-throated diver has a foraging range of up to 9 km during the breeding season (Woodward *et al.*, 2019). Therefore, with the SPA being 46 km from the project, there is no potential for interaction.

Site Name and Code	Qualifying Features* * No Likely Significant Effect (LSE) is concluded for all terrestrial features.	Distance from Cable Corridor (km)	Screening for Likely Significant Effect (LSE)
			As such, **No LSE** is determined for the breeding red-throated diver feature of the North Orkney SPA. **No Likely Significant Effect** is determined for the North Orkney SPA and its qualifying features.
Ythan Estuary, Sands of Forvie and Meikle Loch SPA (UK9002221) and Ythan Estuary and Meikle Loch Ramsar Site (UK13061)	Breeding populations of: Sandwich tern *Thalasseus sandvicensis*; Common tern *Sterna hirundo*; Little tern *Sternula albifrons*. Non-breeding populations of: Pink-footed goose *Anser brachyrhynchus**; Common eider*; Northern lapwing *Vanellus vanellus**; Common redshank *Tringa totanus**; Waterfowl assemblage*.	21.1	The project is located 21.1 km from the Ythan Estuary, Sands of Forvie and Meikle Loch SPA and associated Ramsar Site. Therefore, it is outside the screening distance for non-breeding and terrestrial features: pink-footed goose, common eider, northern lapwing, common redshank, and waterfowl assemblage. As such, there is no potential for interaction and **No LSE** is concluded for these qualifying features of the SPA. The project is outside the foraging range of little tern (5 ± 0 km; Woodward *et al.*, 2019), thus there is no potential for interaction and **No LSE** is determined. Although the project is within species specific foraging ranges (Woodward *et al.*, 2019) of common tern (18.0 ± 8.9 km) and Sandwich tern (34.3 ± 23.2 km), it is important to recognise the scale of the proposed works. Cable installation works will disturb a minor proportion of tern foraging habitat for a very short period and are not predicted to have a significant effect on benthic species and habitats or on tern prey items, such as sandeel (refer to **Section 7.2 Benthic Ecology and 7.3 Fish and Shellfish**). Terns show some sensitivity to vessel-related disturbance. However, as per the project specifications, a limited number of vessels will be operating over a short time. Temporary (short term) displacement may occur on a highly localised scale, which will not result in a measurable effect on tern foraging success. As such, due to the highly localised effects and small scale and magnitude of the proposed works, **No LSE** is determined. **No Likely Significant Effect** is determined for the Ythan Estuary, Sands of Forvie and Meikle Loch SPA and its qualifying features.

Site Name and Code	Qualifying Features* * No Likely Significant Effect (LSE) is concluded for all terrestrial features.	Distance from Cable Corridor (km)	Screening for Likely Significant Effect (LSE)
Moray Firth SPA (UK9020313)	Breeding populations of: European shag. Non-breeding populations of: Greater scaup *Aythya marila**; Common eider*; Common scoter *Melanitta nigra*; Velvet scoter; Long-tailed duck; Common goldeneye *Bucephala clangula**; Red-breasted merganser*; Slavonian grebe*; Red-throated diver; Great northern diver; European shag.	42.6	The Moray Firth SPA is located 42.6 km from the project, thus, is outside the screening range for non-breeding and terrestrial features (15 km and 0 km, respectively). Therefore, there is no potential for interaction and **No LSE** is concluded for: greater scaup, common eider, common and velvet scoters, long-tailed duck, common goldeneye, red-breasted merganser, Slavonian grebe, red-throated and great northern divers, and the non-breeding population of European shag. European shag has a mean maximum foraging range of 13.2 ± 10.5 km (Woodward *et al.*, 2019), putting the project outside the foraging range of the species. Therefore, there is no potential for interaction, and **No LSE** is concluded for the breeding population of European shag. **No Likely Significant Effect** is determined for the Moray Firth SPA and its qualifying features.
Hoy SPA (UK9002141)	Breeding populations of: Black-legged kittiwake; Great black-backed gull; Great skua *Stercorarius skua*; Arctic skua *Stercorarius parasiticus*; Common guillemot; Atlantic puffin; Red-throated diver; Northern fulmar; Peregrine falcon*; Seabed assemblage.	27.4	The Hoy SPA is located 27.4 km from the cable corridor, which corresponds to a 32 km at-sea distance. The following features are, therefore, outside the species-specific foraging ranges (Woodward *et al.*, 2019) of the project: Arctic skua (2.7 km) and red-throated diver (9 km). Therefore, there is no potential for interaction and **No LSE** is concluded for these features. Additionally, peregrine falcon is a terrestrial species which makes no use of the marine environment, except for hunting over the intertidal zone during low tide. Therefore, there is no potential for interaction and **No LSE** is concluded. The other seabird features with foraging ranges (Woodward *et al.*, 2019) that introduce potential for interaction are: black-legged kittiwake (156.1 ± 144.5 km); great black-backed gull (73 ± 0 km); great skua (443.3 ± 487.9 km); common guillemot (55.5 ± 39.7 km); Atlantic puffin (119.6 ± 131.2 km); and northern fulmar (542.3 ± 657.9 km).

Site Name and Code	Qualifying Features* * No Likely Significant Effect (LSE) is concluded for all terrestrial features.	Distance from Cable Corridor (km)	Screening for Likely Significant Effect (LSE)
			Whilst there is potential for interaction, the Hoy SPA is located to the southwest of Orkney, thus it is spatially separated from the project by the peninsula at John o' Groats, reducing the potential for interaction. Additionally, these species have extensive foraging ranges from their breeding colonies, meaning there is an extensive amount of alternative foraging habitat available to these birds outside the project area. The project may result in short term displacement of some foraging individuals over a small spatial extent; however, the effects are unlikely to result in a substantial increase in energy expenditure or reduction in foraging success. Habitat loss will be limited to the immediate vicinity of the project works and only result in measurable effect at the seabed. The impact assessments for benthic ecology and fish and shellfish ecology determined any effects would be not significant (refer to **Sections 7.2 and 7.3**). Therefore, it is concluded that the project will result in **No LSE**. **No Likely Significant Effect** is determined for the Hoy SPA and its qualifying features.

Buchan Ness to Collieston Coast SPA (UK9002491)	Breeding populations of: Black-legged kittiwake; European herring gull; Common guillemot; Northern fulmar; European shag; Seabird assemblage.	12	The Buchan Ness to Collieston Coast SPA is located 12 km from the project. All seabird species are within foraging range (Woodward *et al.*, 2019), however, the interaction between the project and available foraging areas is very limited. Kittiwake, guillemot and fulmar have extensive foraging ranges (95.2 to 1,200.2 km); thus, the potential Project effects will constitute a very small proportion of any potential foraging habitat. Additionally, impacts will be short term and restricted to the immediate vicinity of the project. These birds have a vast extent of alternative foraging habitat available, thus **No LSE** is concluded. European herring gull has a foraging range of 58.8 ± 26.8 km (Woodward *et al.*, 2019). The species is insensitive to vessel-related disturbance (Cook and Burton, 2010; Furness *et al.*, 2013). It feeds on the surface of the water, in the upper water column, and the intertidal zone or terrestrial habitats, preying on a wide range of species and food resources. Therefore, herring gull has very high adaptability should any displacement or habitat loss occur. As such, the project is not expected to result in any measurable effect on the herring gull feature of the SPA, and **No LSE** is concluded. European shag is a pursuit-foraging diving bird that makes use of the nearshore marine environment, having a foraging range of 13.2 ± 10.5 km (Woodward *et al.*, 2019). There is potential for interaction with the project, however, this is very limited due to the Project's predicted small magnitude of effect and spatial footprint. Shag forage on small pelagic fish species, and the project is not predicted to affect availability of these prey species (**Section 7.5**). Whilst shag show some sensitivity to vessel-related disturbance (Furness *et al.*, 2013; MMO, 2018), a limited number of vessels are expected to be present at any given time. Additionally, disturbance will be restricted to the immediate vicinity of the works and will be short term in nature. The increase in vessels, when compared with background vessel traffic in the region, is likely to be negligible and not expected to result in a measurable effect on foraging seabirds. Therefore, **No LSE** is concluded. **No Likely Significant Effect** is determined for the Buchan Ness to Collieston Coast SPA and its qualifying features.

Site Name and Code	**Qualifying Features*** * No Likely Significant Effect (LSE) is concluded for all terrestrial features.	**Distance from Cable Corridor (km)**	**Screening for Likely Significant Effect (LSE)**
Copinsay SPA (UK9002151)	Breeding populations of: Black-legged kittiwake; Great black-backed gull; Common guillemot; Northern fulmar; Seabird assemblage.	42.4	The qualifying features of the Copinsay SPA have large foraging ranges (Woodward *et al.*, 2019), from 73 km (great black-backed gull) to 1,200.2 km (northern fulmar). Therefore, there is potential for interaction between the project and foraging birds. However, only a negligible proportion of available foraging habitat may be affected, leaving a vast extent of alternative habitat available. Additionally, any displacement or habitat loss which may occur, will be very short term in nature and limited to the immediate vicinity of the project footprint or operating vessels. Therefore, there is no potential for the project to affect the seabird populations of the Copinsay SPA and **No LSE** is concluded. **No Likely Significant Effect** is determined for the Copinsay SPA and its qualifying features.
Troup, Pennan and Lion's Head SPA (UK9002471)	Breeding populations of: Black-legged kittiwake; European herring gull; Common guillemot; Northern fulmar; European shag; Seabird assemblage.	22.2	The Troup, Pennan and Lion's Head SPA is located 22.2 km from the project, however, this is a straight-line distance. The at-sea distance is almost 30 km. All seabird species are within foraging range (Woodward *et al.*, 2019), however, the interaction between the project and foraging areas available is very limited. Kittiwake, guillemot and fulmar have extensive foraging ranges (95.2 to 1,200.2 km); thus, the project can only affect a very minor proportion of any potential foraging habitat. Additionally, impacts will be short term and restricted to the immediate vicinity of the project. These birds have a vast extent of alternative foraging habitat available, thus **No LSE** is concluded. European herring gull has a foraging range of 58.8 ± 26.8 km (Woodward *et al.*, 2019). The species is insensitive to vessel-related disturbance (Cook and Burton, 2010; Furness *et al.*, 2013). It feeds on the surface of the water, in the upper water column, and the intertidal zone or terrestrial habitats, preying on a wide range of species and food resources. Therefore, herring gull has very high adaptability should any displacement or habitat loss occur. As such,

Site Name and Code	Qualifying Features* * No Likely Significant Effect (LSE) is concluded for all terrestrial features.	Distance from Cable Corridor (km)	Screening for Likely Significant Effect (LSE)
			the project is not expected to result in any measurable effect on the herring gull feature of the SPA, and **No LSE** is concluded. European shag is a pursuit-foraging diving bird that makes use of the nearshore marine environment, having a foraging range of 13.2 ± 10.5 km (Woodward *et al.*, 2019). There is potential for interaction with the project, however, this is very limited due to the Project's predicted small magnitude of effect and spatial footprint. Shag forage on small pelagic fish species, and the project is not predicted to affect availability of these prey species (**Section 7.3: Fish and Shellfish**). Whilst shag show some sensitivity to vessel-related disturbance (Furness *et al.*, 2013; MMO, 2018), a limited number of vessels are expected to be present at any given time. Additionally, disturbance will be restricted to the immediate vicinity of the works and will be short term in nature. The increase in vessels, when compared with background vessel traffic in the region, is likely to be negligible and not expected to result in a measurable effect on foraging seabirds. Therefore, **No LSE** is concluded. **No Likely Significant Effect** is determined for the Troup, Pennan and Lion's Head SPA and its qualifying features.

A.5 CONCLUSIONS

HRA screening has been undertaken to determine if the proposed works have potential to impact features of European sites. Screening distances have been applied to the project boundary to identify sites to be considered for LSE. The following screening distances were applied **Table A-2**:

- Annex I benthic habitats: 25 km;
- Annex II migratory fish: 25 km;
- Annex II marine mammals: 50 km;
- Annex I seabirds (breeding): 50 km;
- Annex I seabirds (non-breeding): 15 km;
- Annex I terrestrial birds (0 km).

No LSE was concluded for all sites outside of the screening distances due to the absence of pressure-receptor pathway. A total of 12 sites (1 SAC, 10 SPAs, and 1 Ramsar Site) were situated within the stated screening distances, and were screened for further consideration within **Table A-3**.

The Moray Firth SAC is located 21 km from the proposed works and was considered for potential effects on designated Annex I habitats (Sandbanks which are covered by sea water at all times) and Annex II species (bottlenose dolphin). Although this site was located within the screening distance, it was considered that the spatial separation from the proposed works precludes any impacts on the designated Annex I habitats. As such, **No Likely Significant Effect** was determined for subtidal sandbanks.

Bottlenose dolphin is recognised as sensitive to acoustic disturbance. However, the levels predicted to occur during project activities are low and would attenuate within a short distance from the source. Given the spatial separation between the Moray Firth resident population and the site of the proposed works, it is concluded that the area of effect would constitute a negligible proportion of the available foraging area for this population. As such, **No Likely Significant Effect** is also concluded for Moray Firth SAC designated population of Annex II bottlenose dolphin.

The SPAs screened into assessment ranged from 6.7 to 46 km from the project area, and are classified for a range of features, including breeding and non-breeding gulls, terns, auks, divers, fulmar, cormorants, shags, and a variety of waders, wildfowl, and terrestrial species. Seabird foraging ranges (Woodward *et al.*, 2019) were considered when screening for LSE, giving indication of the proportion of available habitat which may be affected. The project is of relatively small magnitude and effects will be highly localised and restricted to the immediate vicinity of any ongoing works. In addition, assessment of impacts to benthic habitats (**Section 7.2**) and fish and shellfish receptors (**Section 7.3**) within the Project MEA are not significant; thus, impacts to seabird prey and supporting habitat are also considered to be minimal. In view of these factors, **No Likely Significant Effect** was concluded for all SPAs and Ramsar Site features considered within assessment.

No LSE was concluded for all SACs, SPAs, and Ramsar Sites considered within Stage 1 HRA screening and, therefore, no site will be taken forward for Stage 2 Appropriate Assessment.

APPENDIX B: NATURE CONSERVATION MARINE PROTECTED AREA ASSESSMENT

B.1 INTRODUCTION

B.1.1 PROJECT OVERVIEW

Scottish and Southern Electricity Network Transmission (SSENT) is the licensed electricity Transmission Owner in the north of Scotland. As part of Scotland and the United Kingdom's (UK's) net zero energy targets, the Electricity System Operator's (ESO) Pathway to 2030 Holistic Network Design confirmed the need for an offshore transmission connection between Caithness (Spittal) and Aberdeenshire (Peterhead). This link will enable the efficient high volume power transmission from generators in the far north of Scotland to the network at Peterhead, for further transmission to demand centres, as appropriate.

SSENT (the '**Applicant'**) is, therefore, looking to develop a High Voltage Direct Current (HVDC) electricity transmission link between Spittal and Peterhead, collectively known as the Spittal to Peterhead HVDC Reinforcement project (hereafter referred to as the '**Project'**)

The project proposal for the 2 GW bipole, 525 kV HVDC link will consist of:

- A HVDC link, including approximately 172 km of subsea cable;
- New HVDC Converter Station at Spittal; and
- New HVDC Converter Station at Peterhead.
- To ensure efficiency when connecting into the existing transmission network, the sites of the new HVDC converter stations should be located in close proximity to:
- New Spittal 400 kV Substation; and
- New Peterhead 400 kV Substation.

B.1.2 PURPOSE OF THIS REPORT

Marine Protected Areas (MPAs) in Scottish territorial waters are designated under Section 67 of the Marine (Scotland) Act 2010[26]. The requirements in Section 83 of the Marine (Scotland) Act 2010, apply where the public authority has the function of determining an application (whenever made) for authorisation of the doing of any act, and whether the act is capable of affecting (other than insignificantly)—

> *"(i)a protected feature in a Nature Conservation MPA, …*
>
> *(iv)any ecological or geomorphological process on which the conservation of any protected feature in a Nature Conservation MPA [….] is (wholly or in part) dependent. ("*

Section 83 also requires MD-LOT, as the public authority, to not grant authorisation for the doing of the act unless either—

> *"(a) the person applying for the authorisation satisfies the authority that there is no significant risk of the act hindering the achievement of (as the case may be)—*
>
> > *(i) the stated conservation objectives for the Nature Conservation MPA,*
>
> *(b)that person is not able to satisfy the authority as mentioned in paragraph (a) but—*

[26] https://www.legislation.gov.uk/asp/2010/5/contents

(i) satisfies it that there is no other means of proceeding with the act which would create a substantially lower risk of hindering the achievement of those objectives or (as the case may be) that purpose,

(ii) satisfies it that the benefit to the public of proceeding with the act clearly outweighs the risk of damage to the environment that will be created by proceeding with it, and

(iii) satisfies it and the Scottish Ministers that the person will undertake, or make arrangements for, the undertaking of, measures of equivalent environmental benefit to the damage which the act will or is likely to have in or on the marine protected area concerned."

MPAs in Scottish offshore waters (i.e., beyond 12 nautical miles (nm)) are designated under section 116 of the Marine and Coastal Access Act 2009[27] (MCAA). Section 126 of the MCAA details duties of public authorities in relation to certain decisions where a public authority has the function of determining an application (whenever made) for authorisation of the doing of an act, where the act is capable of affecting (other than insignificantly)—

"(i) the protected features of an MCZ (Marine Conservation Zone);

(ii) any ecological or geomorphological process on which the conservation of any protected feature of an MCZ is (wholly or in part) dependent."

The authority is not permitted to grant authorisation for the act in question unless the applicant seeking the authorisation has satisfied them that there is no signifcant risk or that the three conditions in subsection 7 have been met. These conditions are that —

"(a) there is no other means of proceeding with the act which would create a substantially lower risk of hindering the achievement of those objectives,

(b) the benefit to the public of proceeding with the act clearly outweighs the risk of damage to the environment that will be created by proceeding with it, and

(c) the person seeking the authorisation will undertake, or make arrangements for the undertaking of, measures of equivalent environmental benefit to the damage which the act will or is likely to have in or on the MCZ."

It should be noted that under section 116 (7) of the MCAA, an MCZ designated by the Scottish Ministers is to be known as a marine protected area.

B.1.3 AIMS AND OBJECTIVES

This document has been produced as an appendix to the Marine Environmental Assessment (MEA) to provide evidence on whether the potential impacts of the Project will:

- Be capable of affecting (other than insignificantly) a protected feature in a Nature Conservation MPA (NCMPA) or any ecological or geomorphological process on which the conservation of any protected feature in any relevant NCMPA relies, or
- If considered capable of affecting (other than insignificantly) a protected feature, ecological or geomorphological process of an NCMPA, be capable of creating a significant risk of hindering the conservation objectives on any relevant NCMPA.

[27] https://www.legislation.gov.uk/asp/2010/5/contents

The following sections describe the approach to the initial screening and main assessment stages of the process. Given that Marine Scotland's Nature Conservation Marine Protected Areas: Draft Management Handbook (Marine Scotland, 2013) remains unavailable, the following sections are based on guidance provided on Marine Conservation Zones (MCZs) and marine licensing (MMO, 2013)[28].

This MPA Assessment should be read alongside the following chapters and supported appendices of the MEA:

- **7.1: Physical Environment;**
- **7.2: Benthic Ecology;**
- **7.3: Fish and Shellfish Ecology;**
- **7.4: Marine Megafauna;**
- **7.5: Ornithology;**
- **7.6: Commercial Fisheries**
- **7.7: Shipping and Navigation**
- **7.8: Marine Archaeology**
- **7.9: Offshore Infrastructure**
- **7.10: Cumulative Impact Assessment;**
- **APPENDIX A: Habitats Regulation Appraisal Technical Appendix;**
- **APPENDIX C: Water Framework Directive Compliance Assessment;**
- **APPENDIX D: Physical Processes Technical Appendix;**
- **APPENDIX E: Marine Archaeology Technical Appendix;**
- **APPENDIX F: Cumulative Impact Assessment Project List; and**
- **APPENDIX G: Navigational Risk Assessment.**

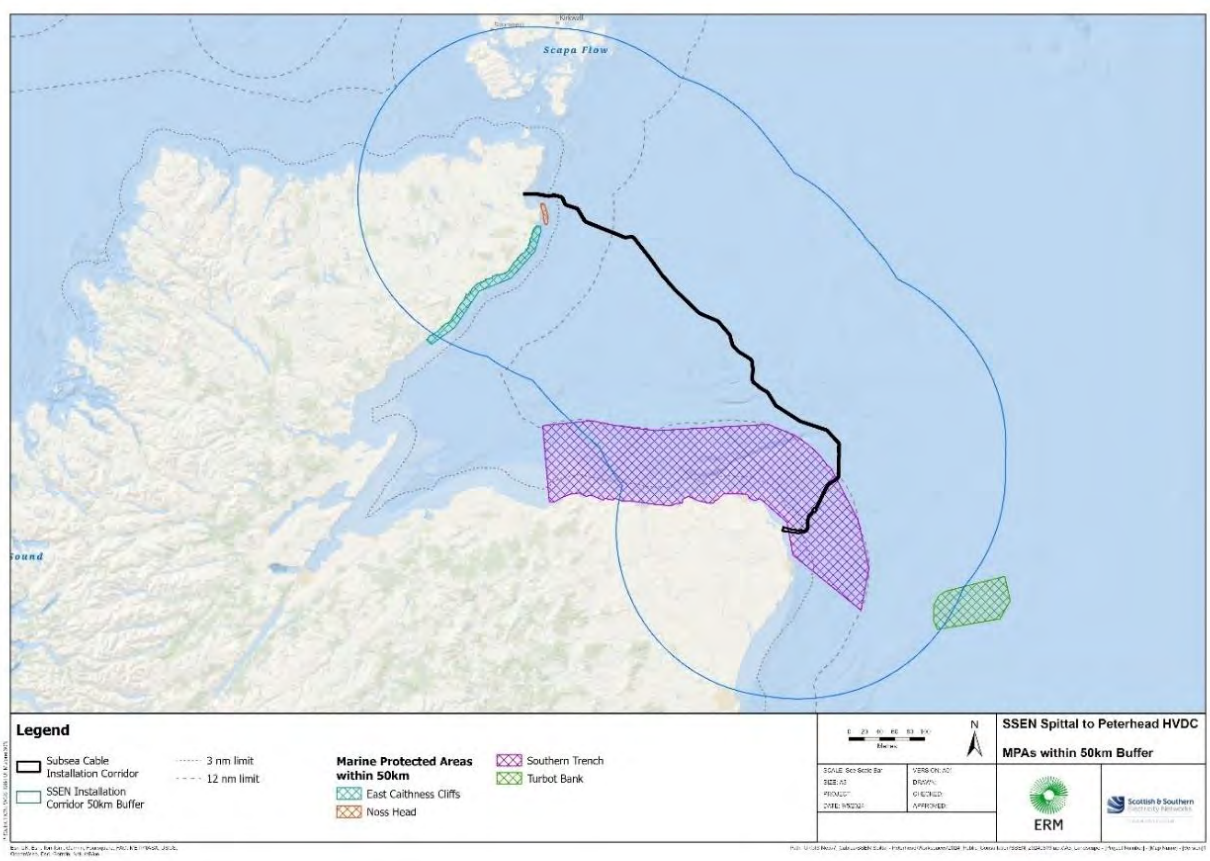
[28] https://www.gov.uk/government/publications/marine-conservation-zones-mczs-and-marine-licensing

B.2 LOCATION AND PROPOSED PROJECT DESCRIPTION

B.2.1 SITE LOCATION AND CABLE CORRIDOR

The proposed HVDC subsea cable will be approximately 172 km in length and will pass through Scottish waters, including the outer Moray Firth, as well as a portion of the North Sea. The proposed subsea cable will connect a new HVDC convertor station and substation in Spittal, Caithness, to a counterpart convertor station and substation in Peterhead, Aberdeenshire. The northern cable landfall will be situated at Sinclair's Bay, and the southern landfall will be at Rattray Head. The cable corridor will directly overlap with the Southern Trench NCMPA, and will be within 50 km of the Noss Head NCMPA, East Caithness Cliffs NCMPA and Turbot Bank NCMPA (**Figure B-1**).

FIGURE B-1 SPITTAL TO PETERHEAD CABLE CORRIDOR LOCATION SHOWING LOCATIONS OF NEARBY NATURE CONSERVATION MARINE PROTECTION AREAS



B.2.2 PROPOSED PROJECT DESCRIPTION

This section provides an outline description of the Project and describes the activities likely to be associated with the installation of the HVDC for the Project. It summarises anticipated key subsea construction works required to lay and protect the cable between the landfalls. A full detailed Project description is presented in **Section 5** of the MEA.

PROJECT PROGRAMME

A summary of the indicative installation schedule is presented in **Table B-1** below:

TABLE B-1 INSTALLATION SCHEDULE

Activity	Indicative Duration	Window
Horizontal Directional Drilling (HDD) Drilling Operations (Sinclair's Bay and Rattray Head)	24 months	Q1 2026 to Q4 2027
Pre-lay and unexploded ordnance (UXO) Survey	4 months	Q2 to Q3 2027
Route Clearance	6 months	Q1 to Q3 2028
HDD Nearshore Marine Works	2 months	Q3 2028 to Q1 2029
Cable Lay	6 months	Q3 2028 to Q2 2029
Post Lay Trenching	6 months	Q4 2028 to Q3 2029
Post Lay Rock Placement	6 months	Q2 to Q4 2029

The total Offshore Construction Works programme will be <4 years (3 years and 7 months).

The total duration of landfall works will be 26 months.

The operational lifetime of the Project is 40 years.

CABLE SPECIFICATIONS AND CROSSINGS

The Project proposal for the 2 GW bipole, 525 kV HVDC cable, will consist of a new 165 km (172 km maximum realistic worst case) subsea cable. The proposed design will consist of a four-cable bundle (2x HVDC, 1 fibre optic, 1 dedicated metallic return), where the transmission asset is anticipated to have an operational life span of 40 years.

At the time of writing, the proposed cable will have three cable crossings and one Subsea7 towed bundle crossing. There will be no pipeline crossings.

B.2.3 OFFSHORE CABLE INSTALLATION

It is understood that SSENT intends to bury the subsea cable along the majority of the corridor, apart from where this is not possible (e.g., at cable crossings or where seabed characteristics are inappropriate for burial (see **Section 5.5: Cable Protection**)). The exact installation methodologies that will be employed along the route will be confirmed once the installation contract is awarded.

It is envisaged that a variety of pre-installation works, installation and burial techniques will be required due to the variable nature of the seabed along the proposed cable corridor. The key expected elements are summarised below. As far as possible, these details will be refined using specific survey data from the 2023/24 marine surveys, and related outputs of any completed early-stage route engineering studies in the final detailed design.

B.2.3.1 Pre-lay survey

Prior to offshore cable installation, contractors will clear seabed obstacles from the planned cable route. This will be undertaken via a combination of the following:

- Pre-Lay Grapnel Run (PLGR), which will utilise a series of grapnels, of varying sizes, to clear small-scale, relatively lightweight obstructions such as old cable fragments, discarded fishing gear *etc.*; and
- Boulder clearance to remove obstructions to trenching or reduce freespans in sections where trenching is not feasible. This may be undertaken with a boulder plough in areas where larger boulders/high density of boulders exist which may damage cable installation tools/prevent burial, or a grab, to relocate boulders on an individual basis, as appropriate.

B.2.3.2 Offshore Cable Trenching and Laying/ Burial

The main options available for cable trenching and burial are:

- Separate cable lay and burial campaigns: in this approach, the subsea cable is pre-laid onto the seabed, where it is left *in situ* for a period of time. A second operation is then undertaken to bury the cable using a cable trencher (post-lay burial);
- Simultaneous lay and burial with cable plough or trencher; and
- Separate trenching and burial campaigns: A seabed trench is pre-cut using a large plough or trencher. Cable is then laid into the open trench followed by backfill via a cable plough, an ROV, via natural backfill or with rock placement.

There are a diverse range of cable burial machines available on the market capable of burying offshore cables. The Project is proposing to use the following:

- Horizontal Directional Drilling (HDD) (for nearshore <1 km); and
- The use of mattresses to cover surface lay (mattresses will be used at crossings and surface lay for *Sabellaria* reef) (nearshore <1 km if required).

Any of these may be used during the installation phase of this Project; therefore, the environmental assessments undertaken will assess the potential impacts of all these tool types, or the realistic worst case for the receptor. Given that the cable will mostly be laid as a bundle, it is generally impractical to simultaneously lay and bury the cable without significantly reducing the lay speeds and introducing a range of additional risks into the operation, i.e. increased potential of damage to the cable, and exposure to weather risk.

It is currently predicted that the realistic worst case maximum width of disturbance during offshore cable trenching and laying will be 10 m, with the cable trench width itself being between 0.1-0.5 m. The target burial depths will be between 0.6 m to 1.8 m.

B.2.3.3 Vessel Activity

Installation vessels, plus support vessels, are anticipated to be required during offshore (and inshore) cable installation for the Project. These will comprise:

- Cable lay vessel;

- Trench support vessel;
- Subsea rock installation vessel;
- Dynamic positioning (DP) system construction support vessel (CSV) (mattress installation, PLGR, mass flow excavation (MFE), mechanical cutting *etc.*);
- Guard vessels;
- Multi cat vessels (spud can and anchor spread); and
- Survey vessels (nearshore and offshore).

At any one time, the maximum number of vessels active during operations will be 7.

B.2.3.4 Landfall Cable Installation

For cable installation at the landfall, HDD will be employed. HDD will comprise drilling under potential obstructions such as dunes, sea defences, *etc.*, at a relatively shallow angle of less than 20 degrees, and curving upwards to reach the seabed at approximately 5–10 m below sea level. A duct is then pushed from the landfall, and this provides a conduit for the cables to be pulled through.

B.2.3.5 Cable Protection

Cable routing is the principal method of avoiding hazards and sensitive features. However, it is not always possible to avoid all constraints, with areas of insufficient sediment cover being a particular issue with many subsea cable routes, as burial of cable to an acceptable depth of Lowering (DoL) cannot be achieved. In such circumstances, additional external cable protection is required.

A similar scenario arises at cable crossings, where burial to an acceptable DoL is not possible, and the newly installed cable must be laid over an existing cable and then covered with additional external cable protection. Options for external cable protection for the Project include:

- Rock placement;
- Concrete mattresses;
- Gabion/Rock Filter bags: Flexible bags filled with small-grade rock that can be deployed over areas of unburied/shallow-buried cables; and
- Cable Protection Systems (CPS).

Details relating to the cable protection predicted for the Project are summarised in **Table B-2.**

TABLE B-2 ESTIMATED SPECIFICATION FOR CABLE PROTECTION

Cable protection and Associated Works Feature	Estimate value
Material Type	
Cable protection material (type)	HDD exit and cable crossings: Rock type and grain size – 70 mm based on a rock density of 2650 kg/m^3 (grading 1-5"); Mattresses: Standard concrete design mattresses will be planned for crossings. Nature-inclusive designs (NID) will be utilised in areas requiring specific protection (e.g. *Sabellaria* reefs).

Cable protection and Associated Works Feature	Estimate value
Length of Cables Requiring Cable Protection (m)	
Length of cables requiring cable protection (m) CPS PE Uraduct (length 1.7 m roughly)	2000 m
Length of cables requiring cable protection (m) CPS Cast Iron shells (CIS) (length 0.4 m roughly)	300 m (HDD duct to bundle)
Mattresses (6 m x 3 m x 0.3 m)	1800 m, extending to an extra 600m (based on 185 matts/km + 10% contingency)
Length of cables requiring cable protection (m) rock placement	25,090 m
Cable Protection Dimensions & Footprint	
Cable protection max height (m)	1.125 m
Cable protection max width (m)	11.4 m
Total cable protection footprint (m^2)	Rock berm & Crossings = 25,090 m x 11.4 m = 286,026 m^2 Mattress at reef: (1,800 m + 600 m) x 3 m = 7,200 m^2

B.2.4 OFFSHORE OPERATION WORKS

Once installed, fully commissioned and operational, submarine cables do not require routine maintenance. However, as part of routine asset management procedures, regular cable surveys will likely be undertaken using standard geophysical survey equipment and/or ROVs to monitor the DoC of the cable.

If such surveys, and/or other sources of monitoring data, indicate areas of shallow burial, exposures and/or freespans, then operational investigation surveys will likely be required to ensure that the integrity of the cable is maintained. Operational investigation activities are typically focused on ensuring that sufficient DoC is re-established. This can be achieved by: (a) undertaking routine cable survey operations, using jetting tools/ROVs; and/or (b) installation of additional cable protection such as rock or mattresses. The assessment of risk arising from operational investigation activities is not considered in this NCMPA assessment.

B.2.5 OFFSHORE DECOMMISSIONING WORKS

Subsea cables installed in Scottish territorial waters will enter into fixed-term leases of an agreed 40-year duration with the CES; who manages the seabed within a 12 nm limit. As part of this lease, which will cover the landfall and installation corridor from MHWS out to the 12 nm limit, conditions exist with regard to the decommissioning. An Initial Decommissioning Plan (IDP) will be developed and appended to the CES license agreement entered into by SSENT for this project.

This report contains a preliminary assessment of the impacts from decommissioning. MD-LOT will likely impose conditions for the submission of a decommissioning plan two years prior to cable end of life, or immediately, if works are halted before completion and in the case of a cable fault.

The actual process of decommissioning will be subject to environmental and economic assessments in the years leading up to decommissioning, and will follow industry best practice at that time.

B.3 METHODOLOGY

Under section 126 of the MCAA, and section 83 of the Marine (Scotland) Act 2010, the public authority is initially required, when determining consenting application, to consider whether the activity applied for is capable of affecting (other than insignificantly) a protected feature in an MPA or any ecological or geomorphological process on which the conservation of any protected feature in an MPA is dependent.

The overall process of this assessment has been considered in **Section 2**. It is understood that during the process, consultation is sought from the appropriate statutory nature conservation bodies (SNCBs)[29].

In the absence of formal guidance from MD-LOT in relation to the assessment of NCMPAs during the licence decision making process, the Marine Management Organisation (MMO) guidance (2013) for MCZ assessments has been applied here.

The MMO guidelines (2013) are a staged approach, comprising three sequential stages:

- **Screening**;
- **Stage 1 Assessment**; and
- **Stage 2 Assessment**.

The MCAA and the Marine (Scotland) Act 2010 does not provide any legislative requirement for explicit consideration of in combination or cumulative impact assessment to be undertaken when assessing the impacts of licensable activities upon an NCMPA (MMO, 2013). However, the MMO considers that in combination and cumulative effects must be considered for their full discharge of duties under Section 69 (1) of the MCAA.

B.3.1 SCREENING

Screening focusses on what can reasonably be predicted as a result of the proposal, and whether it is capable of affecting (other than insignificantly) the protected features of an NCMPA. This stage should result in removing from further consideration all pressures/operations which are not in any way connected to the protected feature(s).

Screening uses information that is currently available on the activities applied for, and considers aspects such as the scale, timing, and duration of proposed activities/developments, either within an NCMPA, or beyond it, to identify suitable Zones of Influence (ZoI). It will also consider, where appropriate, the location of the feature, its mobility, and forging ranges (e.g. for ornithological features).

‘Capable of affecting’ is a simple test that assesses whether operations interact spatially or temporally with an NCMPA, either directly or indirectly. Understanding whether there is an

[29] NatureScot for NCMPAs within 12 nautical miles (nm) or the Joint Nature Conservation Committee (JNCC) for MPAs out with 12 nm.

effect (other than insignificantly) can involve assessing whether any features are sensitive to pressures interacting spatially and temporally.

In order to determine if the proposed activity may take place within, or near to, an area being put forward for, or already designated as, an NCMPA, the following risk-based approaches are used. An appropriate buffer, that exceeds the ZoI, is used as a screening distance that allows for a consideration of both direct and indirect potential impacts arising from the Project on NCMPAs.

To determine whether the proposed activity may be capable of affecting (other than insignificantly) the protected features of an NCMPA, or any ecological or geomorphological process on which the conservation of any protected feature of an NCMPA is (wholly or in part) dependent, the following evidence and information are then used:

- MPA Site documentation;
- MPA Conservation and Management Advice documentation;
- NatureScot Feature Activity Sensitivity Tool (FeAST) (FeAST, 2024);
- The Marine Life Information Network - Marine Evidence based Sensitivity Assessment (MarESA) (Tyler-Walters *et al*., 2023);
- Joint Nature Conservation Committee (JNCC) Marine Habitat Classification for Britain and Ireland (JNCC, 2022);
- European Environment Agency (EEA) European Natural Information System (EUNIS) habitat classification (EEA, 2022); and
- Scientific reports and peer-reviewed literature.

Screening results should include advice provided by the SNCBs and regulators on which sites should be included in the MPA Assessment.

Where it is concluded that the activity is capable of affecting (other than insignificantly) the protected features of an MPA, then a Stage 1 Assessment must be carried out to consider impact against the conservation objectives of the site features.

Based on the application of the MMO (2013) guidance to Scottish MPAs discussed above, it is considered that Section 83 of the Marine (Scotland) Act 2010 would apply if it is determined through the course of screening that:

"the activity is capable of affecting (other than insignificantly) either: (i) a protected feature in a Nature Conservation MPA; (ii) a stated purpose for a Demonstration and Research MPA; (iii) a marine historic asset in a Historic MPA; or (iv) any ecological or geomorphological process on which the conservation of any protected feature in a Nature Conservation MPA, or on which the stated purpose for a Demonstration and Research MPA, is (wholly or in part) dependent".

B.3.2 STAGE 1 ASSESSMENT

Section 83(4)(a) and (b) requires MD-LOT, as the public authority, to not grant authorisation for the doing of the act unless the authority is satisfied that there is no significant risk of the act hindering the achievement of the stated conservation objectives for the Nature Conservation MPA. Equally, Section 126(1) and (7) require a public authority to not authorise an act unless the person seeking authorisation satisfies the authority that there is no significant risk of the act hindering the achievement of the conservation objectives stated for the MCZ.

These are considered a 'Stage 1' assessment.

In determining 'significant risk of hindering', the Marine Scotland (2014a) guidance states *"The assessment should build on the initial screening assessment that considers the pressures associated with the activity and the sensitivity of the protected features, and information on the likely spatial overlap. To determine whether there is a 'significant risk of hindering' the achievement of the conservation objectives of the protected features of a nature conservation MPA aspects such as the intensity, frequency, and duration of any activities associated with the function or act should be considered."*

Within this stage of assessment, hindrance of objectives is considered to be any operation that could, either alone or in combination, directly or indirectly:

- In the case of a conservation objective of 'maintain', increase the likelihood that the current status of a feature would go downwards (e.g. from favourable to degraded) either immediately or in the future; or
- In the case of a conservation objective of 'recover', decrease the likelihood that the current status of a feature could move upwards (e.g. from degraded to favourable) either immediately or in the future.

Conservation advice is available for NCMPAs on Nature Scot's Site Link webpages (NatureScot, 2024). The Conservation and Management Advice provides advice on activities that may affect the protected features of NCMPAs, as well as on matters which are capable of damaging, or otherwise affecting, the protected features of the NCMPA, and how the Conservation Objectives of the site may be furthered or their achievement hindered.

The Stage 1 NCMPA assessment considers the direct and indirect impact-receptor pathways of each of the attributes, for all protected features of the relevant NCMPAs, to assess whether there may be a significant risk to the conservation objectives of the NCMPA. This draws on information presented within the relevant chapters of the MEA, as well as the FeAST tool, which allows understanding of the pressures and receptor sensitivities to those pressures. The assessment then considers whether the Project is likely to hinder achievement of conservation objectives for the sites.

Consultation with relevant SNCBs and other advisors may be undertaken at this stage.

Where it is concluded that the activity is capable of hindering the conservation objectives of an NCMPA, either directly or indirectly, alone or cumulatively, then a Stage 2 Assessment derogation assessment must be carried out before authorisation can occur.

B.3.3 STAGE 2 ASSESSMENT

The Stage 2 assessment will consider whether the conditions in Section 83(4)(b) can be met, by consideration of whether the benefit to the public of proceeding with the act, clearly outweigh the risk of damage to the environment that will be created by proceeding with it; and, if so, then whether MD LOT can be satisfied that arrangements will be made for the undertaking of measures of equivalent environmental benefit, to the damage which the act will, or is likely to, have, in or on, the NCMPA.

Figure B-2 below presents a summary of the NCMPA decision process.

B.3.4 CUMULATIVE ASSESSMENT

Some projects may be unlikely to have significant effects on their own, but cumulative effects with other plans or projects may be significant. It must, therefore, be concluded, whether the plan or project, cumulative with other plans or projects, is capable of hindering the conservation objectives in an NCMPA.

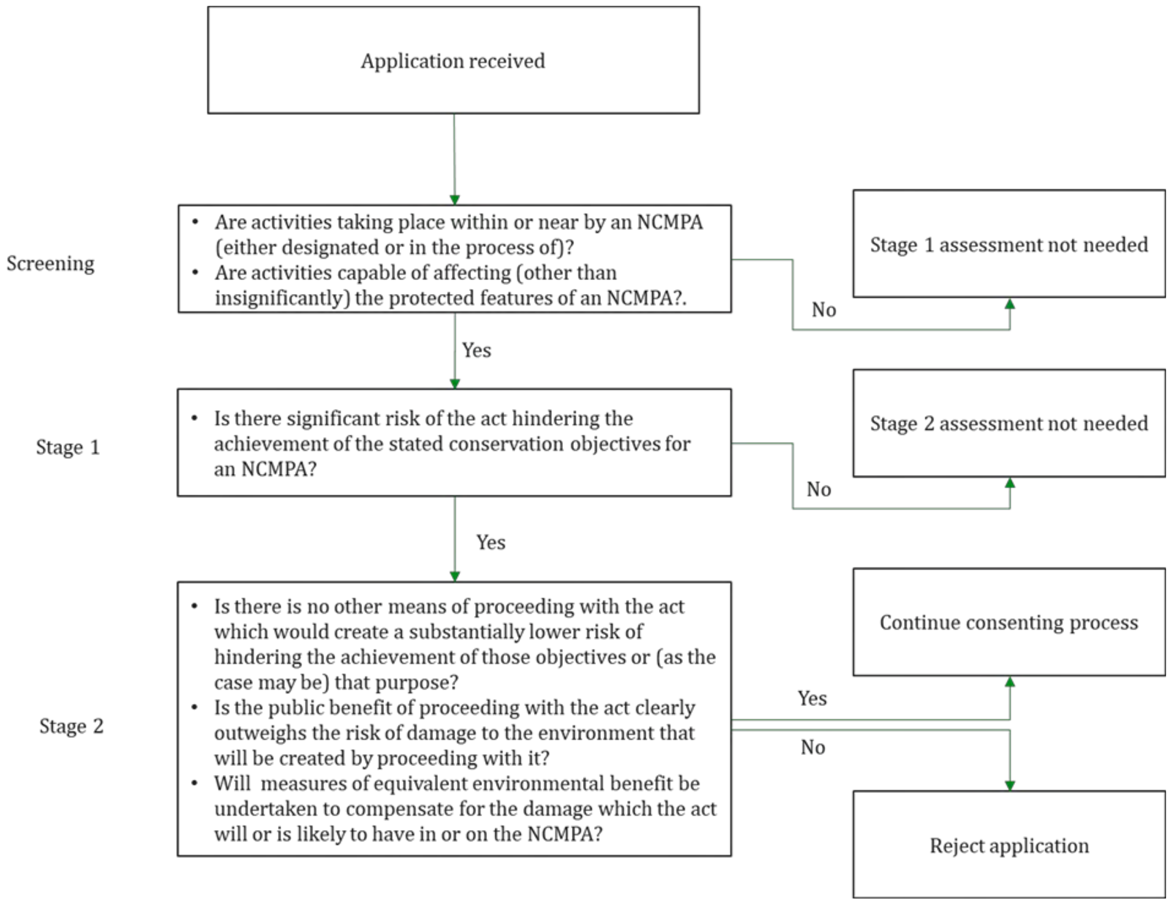
Various key public sources can be consulted to identify a 'long list' of plans and projects in the area, and these may include the following:

- 4C Offshore Global Offshore Maps (4C Offshore, 2024);
- The Crown Estate Scotland / Outreach a'Chrùin Alba) Spatial Data Hub;
- National Marine Plan Interactive (NMPi) (Marine Scotland, 2024);
- Global Renewables Infrastructure Projects (GRIP) Database (RCG, 2024); and
- The North Sea Transition Authority (NSTA) Offshore Oil and Gas Activity (NSTA, 2023).

Those reasonably foreseeable projects and plans that are to be located within the region of the project will be considered. However, assessments will also be cognisant of highly mobile receptors, such as birds and marine mammals, that may interact with a project across wider scales. Of the 'long list' of plans or projects that are of relevance, a 'short list' is then identified. For the purpose of this assessment, projects and plans that are fully implemented and in operation are not considered under the cumulative assessment, as they will have been considered under the baseline environment. However, where it is identified that there are ongoing impacts from built and operational projects, these are to be considered within the baseline environment of each of the relevant topic chapters within the CIA document.

It is important to note that a cumulative list of plans and projects for an NCMPA, may be different to the cumulative/in combination list for different types of assessments (e.g. Habitats Regulations Appraisal (HRA), Environmental Impact Assessment (EIA)/Marine Environmental Assessments (MEA), and MCZ assessments).

FIGURE B-2: SUMMARY OF THE NCMPA MARINE LICENCE DECISION PROCESS (ADAPTED FROM: MMO, 2013)



B.4 PROJECT SPECIFIC SURVEYS AND ASSESSMENTS

To further inform the NCMPA assessment, where available, project-specific data sources and assessments have been consulted.

Reviews of the following MEA chapter sections and supporting appendices have also been made:

- **7.1: Physical Environment;**
- **7.2: Benthic Ecology;**
- **7.3: Fish and Shellfish Ecology;**
- **7.4: Marine Megafauna;**
- **7.5: Ornithology;**
- **7.6: Commercial Fisheries**
- **7.7: Shipping and Navigation**
- **7.8: Marine Archaeology**
- **7.9: Offshore Infrastructure**
- **7.10: Cumulative Impact Assessment;**
- **APPENDIX A: Habitats Regulation Appraisal Technical Appendix;**
- **APPENDIX C: Water Framework Directive Compliance Assessment;**

- **APPENDIX D: Physical Processes Technical Appendix;**
- **APPENDIX E: Marine Archaeology Technical Appendix;**
- **APPENDIX F: Cumulative Impact Assessment Project List; and**
- **APPENDIX G: Navigational Risk Assessment.**

PROJECT SURVEYS

Project specific geotechnical, benthic intertidal surveys have been undertaken between 2023/2024, and where data are available and relevant, have been used to further inform the MEA and this assessment (refer to **Section 0** in the MEA for full details).

In addition, the outputs of CBRA and Preliminary BAS, undertaken for the refined subsea cable corridor, have also been reviewed, where appropriate.

B.5 SCREENING – ALONE

<u>Screening Question 1</u>: Is a licensable activity taking place within or near to an area being put forward for, or already designated as an NCMPA?

There are 4 NCMPAs within 50 km of the proposed cable corridor. These are:

- Southern Trench NCMPA: 0 km;
- Noss Head NCMPA: 2.36 km;
- East Caithness Cliffs NCMPA: 8.97 km; and
- Turbot Bank NCMPA: 22.08 km.

Turbot Bank NCMPA is designated for sandeel (*Ammodytes marinus*/*Ammodytes tobianus*), and whilst these are protected mobile fish species, it is their supporting habitat within the site boundary that is important for this feature. Sandeel are closely associated with sandy habitats, where they will reside in for months at a time (JNCC, 2024), and in consideration of the distance of the Project from the site boundary (22 km), it is considered that there is no direct or indirect pathway that will interact with the supporting habitat for this feature. Turbot Bank NCMPA is, therefore, excluded from further assessment.

The following assessments will be undertaken for Southern Trench NCMPA, Noss Head NCMPA, and East Caithness Cliffs NCMPA.

<u>Screening Question 2</u>: Is a licensable activity capable of affecting (other than insignificantly) the protected features of an NCMPA or any ecological or geomorphological process on which the conservation of any protected feature of an NCMPA is (wholly or in part) dependent?

In the following, each site is taken in turn for assessment.

- Southern Trench NCMPA
- Noss Head NCMPA and
- East Caithness Cliffs NCMPA.

B.5.1 SOUTHERN TRENCH NCMPA

Key information used for the screening assessment of Southern Trench NCMPA alone was sourced from:

- Conservation and Management Advice Note Southern Trench NCMPA (NatureScot, 2020);
- Scotland's National Marine Plan Interactive (NMPi) (Scottish Government, 2023);
- Feature Activity Sensitivity Tool (FeAST, 2023);
- Scottish Natural Heritage (SNH) Descriptions of Scottish Priority Marine Features (PMFs) (Tyler-Walters *et al.*, 2016); and
- Relevant published reports and peer-review scientific literature.

B.5.1.1 SITE FEATURES

The Southern Trench NCMPA (2,398 km^2) was designated to protect four biodiversity features and two geodiversity features:

- **Biodiversity Features:**
    - Burrowed mud – Inshore sublittoral sediment (Marine);
    - Fronts – Large-scale feature (Marine);
    - Shelf deeps – Large-scale feature (Marine);
    - Minke whale *Balaenoptera acutorostrata* - Mammals (Marine);
- **Geodiversity Features:**
    - Quaternary of Scotland - Quaternary geology and geomorphology; and
    - Submarine Mass Movement – Geomorphology.

B.5.1.2 FEATURES TO BE SCREENED

For the features listed above for Southern Trench NCMPA, the distances of the features (where known) from the cable corridor are listed in **Table B-3**. Where distances are >10 km, and/or it is acknowledged that there is no likely impact pathway between the Project and the feature, these have been screened out for further screening assessment under Screening Question 2.

TABLE B-3 SCREENING OF FEATURES FOR SOUTHERN TRENCH NCMPA

Feature	Distance from cable corridor	Screened In for Further Assessment under Screening Question 2
Burrowed mud	4.84 km	**Yes** – Whilst the cable corridor itself does not directly overlap with burrowed mud feature, the 10 km buffer does, and, therefore, may potentially overlap with secondary impacts arising from the Project (see **Figure B-3** and **Figure B-4** below).
Quaternary of Scotland – Sub-feature: Subglacial tunnel valleys	0 km	**Yes** – Two previously identified subglacial tunnel valleys are present in the area (**Figure B-4**) and these intersect the cable corridor (at KP 145.3 and KP 149.9; see **APPENDIX D: Physical Processes**). However, subglacial tunnels are formed in bedrock, via erosion under ice sheets, and are not considered sensitive to anthropogenic pressures. This is because most anthropogenic activities are not sufficient to affect geomorphological seabed and geological features (Brooks, 2013, NatureScot, 2020). However, on a precautionary basis, this feature is assessed further under screening question 2.
Quaternary of Scotland – Sub-feature: Moraines	0 km	**Yes** – Whilst the cable corridor avoids the deepest portion of the Southern Trench NCMPA, and most of the associated features, a small, localised, extent of it does intersect a previously mapped moraine at KP 152.1 (see **Figure B-3** and **Figure B-4** below; and **APPENDIX D: Physical Processes**).
Submarine Mass Movement	22.38 km	**No** – The feature is too distant from the Project for any impact pathways to affect it, with neither the cable corridor nor the 10 km buffer directly overlapping this feature (see **Figure B-3** below). Furthermore, most anthropogenic activities are not sufficient to affect geomorphological seabed and geological features (Brooks, 2013). Submarine Mass Movements are formed in bedrock and sediments after the melting of ice sheets and are considered to be resistant to changes (NatureScot, 2020).
Shelf deeps	4.67 km	**No** – The cable corridor does not directly overlap this feature (see **Figure B-3** below) and there are no impact pathways expected from any secondary effects arising within the 10 km buffer on its feature. Shelf deeps, including those within this NCMPA, are natural in origin and considered to be highly robust. As such they are not considered to be prone to significant damage from anthropogenic activities (NatureScot, 2020).
Minke whale (*Balaenoptera acutorostrata*)	**Yes** - As a mobile feature there is potential direct or indirect spatial interaction with the Project, and the 10 km buffer (see **Figure B-5** below).	
Fronts	**No** – Whilst the cable corridor will likely spatially overlap with predicted thermal fronts (see **Figure B-6** below), and it is understood that thermal fronts can be sensitive to pressures including tidal flow changes or physical seabed changes, most anthropogenic activities within the marine environment are unlikely to cause a significant risk of impact to the front features of this MPA (NatureScot, 2020). It is unlikely that there will be any impact pathway from the offshore cable installation, operation, or decommissioning work of the Project, as these are not expected to cause substantial changes to hydrodynamic flows or the seabed.	

FIGURE B-3 THE PROPOSED CABLE CORRIDOR, AND OF DISTRIBUTION OF BURROWED MUD, MORAINES, SUBMARINE MASS MOVEMENT, AND SHELF DEEPS OF THE SOUTHERN TRENCH NCMPA (SOURCE: SCOTTISH GOVERNMENT, 2024)

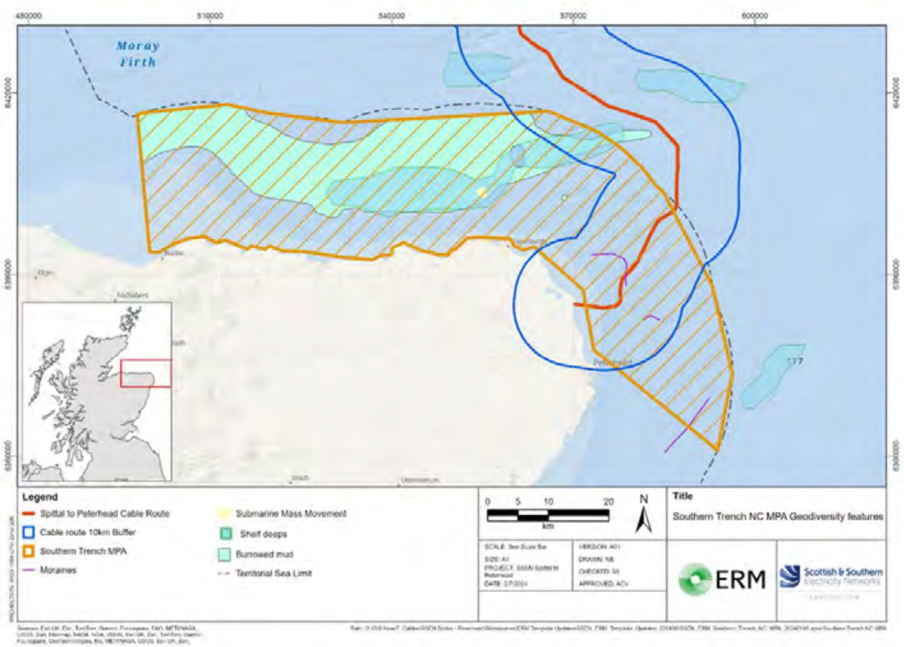


FIGURE B-4 SOUTHERN TRENCH NCMPA KNOWN/MODELLED DISTRIBUTION OF PROTECTED FEATURES (FROM: NATURESCOT, 2019)

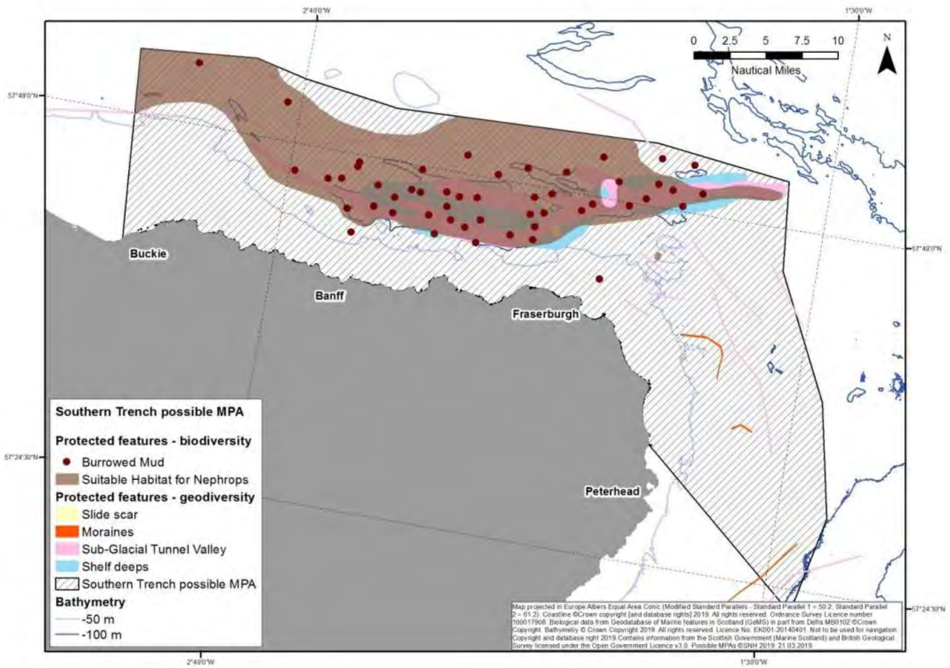


FIGURE B-5 SOUTHERN TRENCH NCMPA AND MINKE WHALE DENSITIES (ALL MONTHS 2000-2012) AND MODELLED PERSISTENCE OF ABOVE MEAN DENSITIES (SUMMER 2001-2012) (FROM: NATURESCOT, 2020)

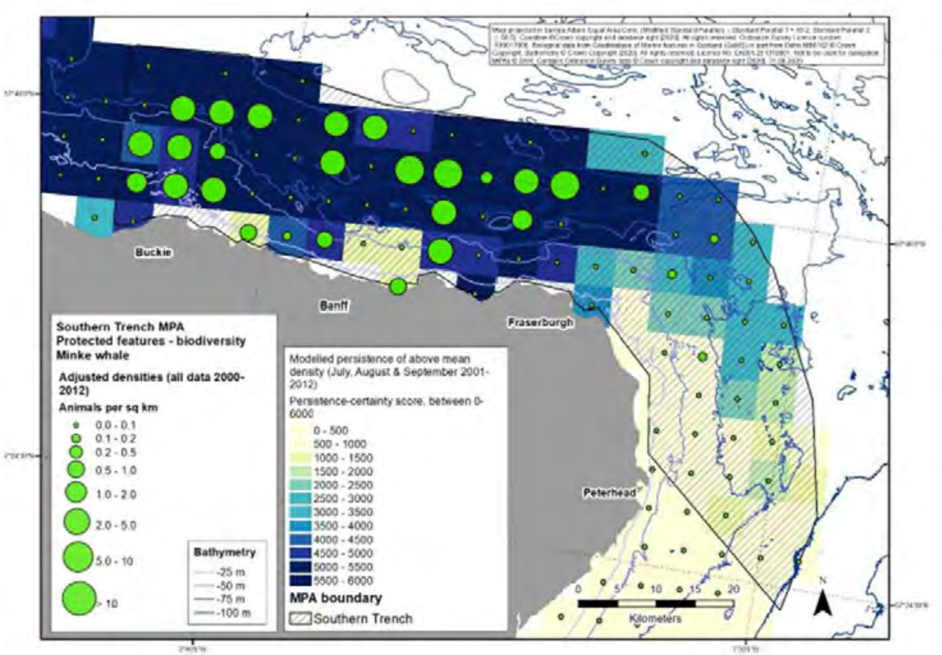
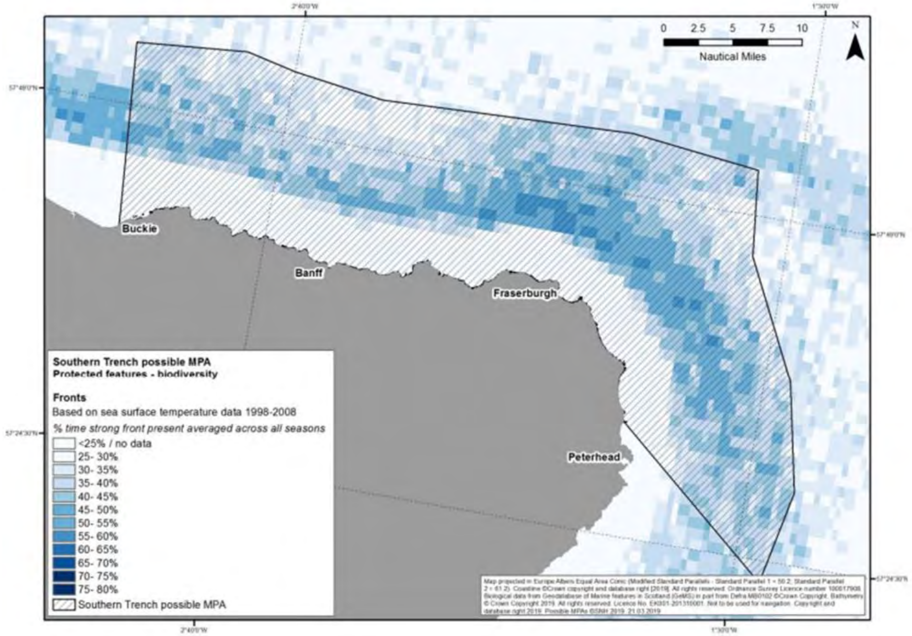


FIGURE B-6 SOUTHERN TRENCH NCMPA AND THERMAL FRONTS (BASED ON SEA SURFACE TEMPERATURE 1998-2008) (FROM: NATURESCOT, 2020)



B.5.1.3 SCREENING ASSESSMENT

BURROWED MUD

Burrowed mud is a Priority Marine Feature (PMF) in Scotland. The Scottish sea lochs, and the northern North Sea, support an estimated 95% of UK records of this habitat (Tyler-Walters *et al.,* 2016). Within the NCMPA, the burrowed mud feature is, predominantly, located along the outer Moray coast, both within and outside the Southern Trench, between depths of 70-188 m. From a survey carried out in 2011, the habitat is estimated to cover a total area of approximately 225 km^2 (Hirst *et al.,* 2012). Subsequent studies have determined that the habitat occurs both in and around the trench itself (Axelsson *et al.,* 2017; Moore *et al.,* 2017, 2019).

The representative biotope within the site is 'Seapens and burrowing megafauna in circalittoral fine mud' (SS.SMu.CFiMu.SpnMeg). This can also form part of the protected habitat 'sea pen and burrowing megafauna' as listed under OSPAR Threatened and/or Declining Species and Habitats (OSPAR, 2024). Burrowing species such as *Nephrops norvegicus*, *Calocaris macandreae*, *Callianassa subterranea*, and *Goneplax rhomboides* are common within the Southern Trench NCMPA. The feature is most sensitive to significant abrasion or disruption of seabed sediments, alteration of local water hydrographic and sedimentary processes, and increases in organic particulate matter in the immediate area. As per the latest assessment date (2019), its condition status is classified as **Favourable** (NatureScot, 2020). The conservation advice to support the management of the activity *cable and pipelines* is **no existing management required** for existing cable and pipelines; and **reduce or limit pressures** - minimise footprint of new cables and pipelines within areas of burrowed mud habitat (NatureScot, 2020).

The burrowed mud feature within the Southern Trench NCMPA is 4.84 km away from the Project (at its nearest point); therefore, whilst the 10 km buffer of the cable corridor overlaps it, the cable corridor itself does not (xxxx) Evidence of burrows indicated that the PMF (and OSPAR habitat 'sea pen and burrowing megafauna communities') may be present (see **Section7.2: Benthic Ecology** of the MEA); however, it was determined that at only a one location (S2P_30) did the mean densities of burrows exceed the 0.2/m^2 threshold required to qualify as an OSPAR habitat. This location was outside of the NCMPA.

FeAST (2023) was reviewed to identify those pressures that can arise from the activity of '**Infrastructure – cables & pipelines (Operation & Installation**)' and which pressures the feature has a 'High' or 'Medium' sensitivity to. FeAST identified burrowed mud to have a high sensitivity to the pressure *Physical change to (another seabed type);* and a medium sensitivity to the pressures: *Physical removal (extraction of substratum)*, *surface abrasion, sub-surface abrasion/penetration*, *removal of target species (including lethal),* and *removal of non-target species (including lethal)*. However, as the cable corridor does not directly overlap with burrowed mud feature of the NCMPA, there is no expected pathway between the physical cable installation, operation, and decommissioning activities of the Project directly impacting the seabed within the cable corridor, that may result in these pressures on the feature and, as such, these are not considered in this assessment.

The sediments along the cable corridor that may become disturbed during cable works are naturally low in organic carbon (refer to **APPENDIX C: Water Framework Directive Compliance Assessment** for further information). Therefore, considering the expected impacts arising from the Project, the medium sensitivity pressure for burrowed mud of *organic enrichment*, that has an associated pressure benchmark deposit of 100 gC/m^2/year, is not likely to occur.

Similarly, the medium sensitivity pressures for *water flow (tidal current) changes – local,* or *wave exposure changes – local*, are unlikely to meet and/or exceed the pressure benchmarks as listed under FeAST, and unlikely to be of relevance for this feature. This is due to the distance from the cable corridor, and any localised potential cable protection installed along it, which may result in highly localised hydrographic changes.

Under FeAST, the medium sensitivity pressure of *siltation rate changes (Heavy)* is to be considered further under screening, as it may arise through Project activities within the 10 km buffer zone that overlaps the feature in the NCMPA.

Pressure(s) to be Assessed:

- Siltation rate changes (Heavy) – Medium Sensitivity.

Table B-4 presents the screening assessment for burrowed mud, where **Burrowed mud is screened OUT** and is not carried forward for assessment under Stage 1.

TABLE B-4 FEATURE – BURROWED MUD

Pressure and Sensitivity (FeAST, 2023)	Magnitude of Impacts	Effects	Significance / screening result
Siltation rate changes (Heavy) Medium Sensitivity Sensitivity benchmarks: Heavy deposition: >5 cm and <30 cm of fine material added to the habitat in a single discrete event or continuous deposition of fine material for heavy siltation rate changes.	During the pre-lay and cable installation works of the Project, sediments will become disturbed, moved, and resuspended. These moved and suspended particles subsequently settle on the seabed, increasing siltation rates. There will also be potentially localised increases in suspended sediment concentrations (SSC) from HDD drilling fluids, which may also subsequently impact siltation, although this is unlikely in consideration of the distance of the southern landfall from this feature in the NCMPA. The magnitude of any siltation rate change on the burrowed mud feature will be dependent upon the degree of disturbance occurring at source, sediment properties, local hydrodynamic conditions and distance of the feature from the source of the impact. Direct sediment disturbance occurring for cable installation, will be occurring over a short time period, and localised to maximum widths of 10 m along the corridor, and 11.4 m widths where localised areas of.rock protection is insallted. It has been assessed for the Project (in MEA **Chapter 7.1 Physical Environment**) that seabed sediments along the cable corridor mainly range from sand to sandy gravel. Therefore, the majority of suspended sediments will fall out of suspension relatively quickly, leaving any fines, that can be transported further, to settle in low concentrations. The magnitude of impact is short term, and spatially restricted. Deposition on the feature in the NCMPA is unlikely to occur, where it lies at 4.84 km (at its nearest point) from the cable corridor.	Siltation at these depths can completely smother species and habitats, particularly sessile organisms such as seapens. Heavy siltation may result in hypoxia, an inability to feed or photosynthesise and potentially death, unless tolerance species or species that can re-emerge (FeAST, 2023). *Siltation rate changes (Heavy),* if occurring across the feature within the NCMPA, any effects would be short term, infrequent, and highly localised. Overall, it is unlikely to significantly affect the feature, due to the predicted limited spatial extents of suspended sediment plumes generated during the Project, and the distance of the feature from the nearest plume generation sites.	The Project is not capable of affecting (other than insignificantly), the protected feature burrowed mud of the Southern Trench NCMPA from *siltation rate changes (Heavy).*

MINKE WHALE (*BALAENOPTERA ACUTOROSTRATA*)

Minke whale is a listed PMF species, where it is distributed throughout Scottish waters. The species is also listed in Annex IV of the EU Habitats Directive and protected in the UK under schedule 5 in the Wildlife and Countryside Act 1981. Minke whale are known to have lifespans of approximately 50 years, and reach maturity between 7 and 10 years old (Evans, 1991). Individuals can reach lengths between 6.5-10 m and, generally, travel in alone or in pairs; however, they are known to form larger groups of up to 15 (Reid *et al*., 2003, Edwards, 2006).

Individuals present within the Southern Trench NCMPA have previously been identified as being mostly juveniles (Robinson *et al*., 2009). The NCMPA supports above average densities of minke whale compared to the whole of Scottish territorial waters (Paxton *et al*., 2014). Densities are high in the majority of the designated site, but decrease towards the southeast section, just east of Fraserburgh and Peterhead. Minke whale in the NCMPA are known to spend the first half of the year in the outer Moray Firth, before moving inwards in July to feed for the rest of the year, where they feed on a range of fish including sandeel Ammodytidae sp., sprat *Sprattus sprattus*, and Atlantic herring *Clupea harengus*, as well as pelagic crustaceans such as krill. This is important, as it allows individuals to establish their energy reserves prior to winter migration to breeding areas (NatureScot, 2020; SeaWatch Foundation, 2012).

As per the latest assessment date (2019), the condition status for minke whale is classified as **Favourable** (NatureScot, 2020). The conservation advice to support the management of the activity *cable and pipelines* is **reduce or limit pressures** where early discussion of siting, design and construction is recommended, to reduce risks of disturbance (NatureScot, 2020).

The feature minke whale, and the pressures relevant to this feature as a result of the proposed Project are not available on FeAST. Therefore, additional sources were consulted to determine pressures relevant to this Project and the sensitivity of the feature. These pressures are subsequently aligned (where possible) with pressure terminology as listed under FeAST.

Pressure(s) to be assessed are:

- Underwater noise;
- Visual disturbance (behaviour);
- Death or injuring by collision below water; and
- Habitat change and indirect impacts on prey[30].

Sources of visual disturbance and underwater noise from vessel operations, seabed equipment operations, and potential geophysical and ROV surveys, are assessed together under the two pressures of *underwater noise* and *visual disturbance (behaviour).* **Table B-5** presents the screening assessment for minke whale, where it is determined that **Minke whale is screened OUT** and is not carried forward for assessment under Stage 1.

[30] Not a pressure listed under FeAST.

TABLE B-5 FEATURE – MINKE WHALE *BALAENOPTERA ACUTOROSTRATA*

Pressure & Sensitivity Description	Magnitude of Impacts	Effects	Significance / screening result
Underwater noise Visual disturbance (behaviour) Minke whale can be sensitive to underwater noise and visual disturbance, which could arise from vessel and construction activities, and from geophysical surveys (Tyler-Waters *et al.,* 2016). Minke whale is classified in the 'Low-frequency' (LF) hearing group, with auditory bandwidth of 7 Hertz (Hz) to 35 Hz. (Southall *et al.,* 2019). Auditory injury thresholds for LF species to impulsive noise are: Temporary threshold shift (TTS)[31] • SPL_{peak} 213 decibels (dB) re 1 μPa; and • SEL_{cum} 168 dB re 1 μPa^2s[32]. • Permanent threshold shift (PTS)[31] • SPL_{peak} 219 dB re 1 μPa; and • SEL_{cum} 183 dB re 1 μPa^2s[31]. It is noted that there is no agreed current benchmark available for what critical level of activity may result in behavioural	Continuous (non-impulsive) underwater noise will be produced via the movement of vessel(s) to, from, and along the areas of the cable corridor and, potentially, from equipment operations at the seabed itself during the offshore cable installation period. The physical presence of vessels and associated construction activities will also be higher, notably during the offshore cable installation, and decommissioning phases. The maximum number of vessels that will be in operation across the cable corridor is not expected to exceed 7 at any one-time during cable installation. It may be expected that any visual or underwater noise disturbance caused from vessels will be highly localised to the area of works at any one time. Only a small extent of cable installation activities will be occurring at the seabed in the NCMPA, relative to the overall area of the NCMPA (2,398 km^2) and, therefore, there will be only highly localised increased sound emissions and visual disturbance such as suspension of sediments caused by activities at the seabed itself, and/or from vessels present above. The offshore installation periods will be split into separate periods, where for the entire cable corridor, pre-laying activities will be limited to 4 months, route clearance to 6 months, and cable lay to 6 months. As such, during these overall time periods, the time vessel(s) will be operating within the NCMPA will be shorter than this and, furthermore, concentrated within the southern region of the NCMPA, away from	There are currently limited studies available regarding the effects of vessel disturbance on this feature, where both increased energy expenditure and reduced foraging activity has been observed from boat interactions (Salamander, 2024a). Underwater noise arising from the Project may result in localised disturbance of the feature, changes in behaviour, and displacement from foraging areas. For example, studies by Christiansen *et al.* (2013) have shown when encountering vessels, minke whale have been found to shorten dives and increase sinuous movement. As such, this can reduce the feeding success of individuals, which could impact reproductive success. Whilst animals may choose to flee the Project area during activities, it may be anticipated that they will return following cessation of the disturbance. Any disturbance effects occurring on the feature (visual or sound) will be highly localised, short term and temporary during the lifetime of the Project. Auditory injury may be caused from geophysical surveys, if source levels from equipment (e.g., USBL) are	The Project is not capable of affecting (other than insignificantly) the protected feature minke whale of the Southern Trench NCMPA from *underwater noise* and *visual disturbance (behaviour)*.

31 Southall *et al* (2016)
32 SPL_{peak} = instantaneous peak sound pressure levels; SEL_{cum} = M-weighted cumulative Sound Exposure Level

Pressure & Sensitivity Description	Magnitude of Impacts	Effects	Significance / screening result
disturbance for minke whale (Salamander, 2024a). Criteria for behaviour disruption that are adopted for LF cetaceans are: • Impulsive noise: 160 dB re 1 µPa [RMS]; and • Continuous noise: 120 dB re 1 µPa [RMS][33].	the relatively higher recorded densities of minke whale that is reported further north in the site. Operation works will be long term (<40 years), however, any vessels required to undertake routine cable surveys within the cable corridor in the NCMPA itself, are expected to be highly infrequent and localised during this time. Should all cables be removed during decommissioning, the magnitude of impact for underwater noise and visual disturbance from vessels and associated seabed equipment, will be as described above for the construction period. In addition, geophysical surveys may be required during offshore cable installation works, and operation works (e.g. to check depth of burial (DoB) of the cable). Sub-bottom Profiler (SBP) and Ultra-short Baseline (USBL) systems operated during these surveys may emit medium frequencies, that may overlap with LF cetaceans. The sound emitted (a ping, generally every second) attenuates as it propagates through the water column, and rate of decay of sound over distance depends on local oceanographic conditions. The sound level of USBL is expected to be below the permanent threshold shift (PTS) onset for injury for minke whale. With reference to other studies, injury and disturbance thresholds for minke whale from USBL were estimated to be limited to <10 m and 63 m from the source, respectively. Comparatively the injury and disturbance thresholds for sound levels emitted by SBPs were estimated to be exceeded at <18-116 m and <4,642 m, respectively (SSEN, 2022). The magnitude of any impact from geophysical surveys will be spatially limited to a relatively small zone of	above the PTS-onset thresholds for minke whale. However, it is likely that any effect will be minimal, when considering the limited scale of geophysical activities associated with the Project, and the wide foraging habitat for the feature inside and outside the NCMPA.	

[33] NMFS (2018); Southall *et al.* (2016)

Pressure & Sensitivity Description	**Magnitude of Impacts**	**Effects**	**Significance / screening result**
	ensonification. The exposure for the feature will only be maintained if the animal remains within this zone associated with the vessel for long periods, which is unlikely as minke whale are highly mobile. They are also present only in low densities within the area of the NCMPA through which the cable corridor will be routed. Overall, magnitude of impacts from underwater noise and visual disturbance (behaviour) will be highly localised and occur over discrete periods of time within both the NCMPA, and along the wider cable corridor itself.		
Death or injuring by collision below water Large species, such as minke whale are most at risk from collision with vessels (review by SSEN, 2022).	The potential for minke whale to collide with project vessels will be limited to those areas where vessel activities are occurring. As described, above, for *Underwater Noise* and *visual disturbance (behaviour)* the risk of collision will be spatially localised, infrequent, and short term, as it will only be relevant to the area where the cable is being laid and across vessel transit routes. These are small in comparison to the NCMPA and wider region. Although risk of collision will be possible during the 40-year operation works period, the likelihood will remain low, as vessel activities will be less frequent than during offshore cable installation phase, and highly localised to where routine cable surveys will be required across the route.	Potential collision with vessels and their propellers can result in injury and potentially mortality (NatureScot, 2020). The risk of injury or death of whales after colliding with a vessel can be lower if vessels are moving at a speed below 14 knots (Laist *et al*., 2006). The likely effects of death or injury by collision is not significant.	The Project <u>is not capable of affecting</u> (other than insignificantly) the protected feature minke whale of the Southern Trench NCMPA from *death or injuring by collision below water.*
Habitat change and indirect impacts on prey	Temporary and/or permanent change in foraging habitat and indirect impacts on prey for minke whale arising from the Project will depend upon the extent of temporary disturbance of habitats important in supporting prey, and any long term loss of supporting habitat for these species from the placement of the cable and associated scour protection. Seabed disturbance during pre-lay works, cable and scour protection installation has a maximum predicted	The placement of the cable and associated scour protection has the potential to overlap with the spawning and nursery grounds of prey species as well as feeding grounds of minke whale. This could result in decreased reproductive success of prey species which would	It is concluded that the Project <u>is not capable</u> of affecting (other than insignificantly) the minke whale feature of the Southern Trench NCMPA from

Pressure & Sensitivity Description	Magnitude of Impacts	Effects	Significance / screening result
	width of 10 m. Sediments will be removed as the plough or trencher moves forward and the cable is laid in the narrow 0.5-1 m wide trench. Sediment will be pushed to either side of the trench and may undergo compaction. It is expected that most of the cable length will be buried, and the sediments back filled into the trench. The scale of disturbance to prey species during offshore cable installation will be highly localised, and short term, along the cable corridor including inside and outside of the NCMPA. Any generated suspended sediment plumes and associated sediment deposition will be primarily constrained to the footprint of the trench area, spreading to only limited extents either side, where sands and gravels fall out of suspension relatively quickly. Fine sediments will however potentially advect further. The impact on the seabed, and thus supporting habitats for prey species at any one location will be short term during offshore cable installation and, subsequently, for only highly limited areas of the route requiring routine cable surveys during operation.	result in a potential decrease in prey populations. A loss of habitat and foraging opportunities could hinder the feeding success of minke whale. This could reduce the energy available to any individual, which may reduce life expectancy but also reproductive success. Such effects arising from the Project are considered to be unlikely, when considering of the small temporary disturbance footprint of the cable installation works across the NCMPA, and any highly localised area of long term cable protection that may be required along it.	*temporary loss of habitat and foraging opportunities.*

QUATERNARY OF SCOTLAND

The Quaternary of Scotland feature comprises two sub-features: Subglacial Tunnel Valleys and Moraines.

Sub-feature: Subglacial Tunnel Valleys

The Project is taking place near to, and over, the Quaternary of Scotland – subglacial tunnel valleys feature of the Southern Trench NCMPA (hereafter referred to as subglacial tunnel valleys feature). This feature is located in the centre of the NCMPA, directly north of Fraserburgh, as well as in the northeast of the NCMPA. Whilst the cable corridor avoids the deepest portions of the Southern Trench NCMPA, where most of the associated geodiversity features are present, the cable corridor is predicted to directly overlap the feature at KP 145.3 and KP 149.9.

Subglacial tunnel valleys are formed within bedrock over millennia, due to erosion whilst underneath ice sheets. As such, these features are considered to be resistant to anthropogenic activities, and have a low sensitivity to pressures as a result of anthropogenic activities. This is because most anthropogenic activities within the marine environment are not of sufficient magnitude to impact geological and geomorphological seabed features (Brooks, 2013).

The subglacial tunnel valleys within the Southern Trench NCMPA consist of a series of basins and valleys within the bedrock which are greater than 58 km in length, whilst having a depth of at least 250 m. This feature covers an area of the seabed of approximately 550 km^2, and is situated at a depth greater than 100 m. The subglacial tunnels stretch from west to east with smaller tributary tunnels running perpendicular to them (Bradwell *et al*., 2008; Holmes *et al*., 2004). The subglacial tunnel valleys within the Southern Trench NCMPA are of scientific importance, as they are one of the largest and most well preserved enclosed glacial seabed basins within the waters of the UK (NatureScot, 2020; Brooks, 2013).

FeAST (2023) identifies those pressures that can arise from the activity of '**Infrastructure – cables & pipelines (Operation & Installation**)' to which subglacial tunnel valleys have a 'High' or 'Medium' sensitivity. No Medium or High sensitivity pressures were identified in the FeAST assessments, with only a series of Low sensitivity pressures (*physical removal (extraction of substratum); sub-surface abrasion/penetration; surface abrasion; water flow (tidal currently) changes-local; and wave exposure changes-local)*. As it is currently predicted that the cable corridor will intersect with an area of this feature within the NCMPA, following conservation advice, consideration is given to these low sensitivity pressures of abrasion and disturbance of seabed sediments.

Pressures to be assessed:

- Surface abrasion – Low Sensitivity; and
- Sub-surface abrasion/penetration - Low Sensitivity.

Table B-6 presents the screening assessment for subglacial tunnel valleys. It has been predicted that the Project is not capable of affecting (other than insignificantly) this sub-feature of the Quaternary of Scotland geodiversity feature (see **Table B-6** below). Subglacial tunnel valleys is determined screened OUT, and will be not be carried forward for assessment under Stage 1.

TABLE B-6 SUB-FEATURE - SUBGLACIAL TUNNEL VALLEYS

Pressure & Sensitivity (FeAST, 2023)	Magnitude of Impacts	Effects	Significance / screening result
Surface abrasion/penetration Low Sensitivity **Subsurface abrasion/penetration** Low Sensitivity	The disturbance of overlying seabed sediments during cable installation has a maximum predicted width of 10 m. Overlaying sediments will be removed from their undisturbed positions on the seabed as the plough or trencher moves forward, and the cable is laid in the narrow 0.5-1 m trench. Sediment will be pushed to either side of the trench and may undergo compaction; some sediments may also become suspended. This sediment will either be actively returned to the trench area or allowed to passively settle. As such, the magnitude of impact is short term as it will only occur during the ploughing/trenching and laying process, and is spatially restricted to the cable corridor. The feature is extensive across the NCMPA (550 km^2) and is only estimated to interact with the cable corridor across a localised area and, therefore, the potential risk from abrasion or disturbance is spatially very limited.	Trenching will cause localised areas of abrasion and changes may occur to the topography of the seabed. No effects as a result of the proposed Project have been determined. This is due to most anthropogenic impacts in the marine environment not being sufficient to damage subglacial tunnel valleys (Brooks, 2013).	The Project <u>is not capable</u> of affecting (other than insignificantly) the protected feature subglacial tunnel valleys of the Southern Trench NCMPA from *Surface abrasion/penetration or subsurface abrasion/penetration.*

Sub-feature: Moraines

Within the Southern Trench NCMPA, moraines form part of the Quaternary of Scotland feature alongside subglacial tunnel valleys. Moraines are a relict feature that are composed of glacial till (poorly sorted boulders, gravels, sand and clays of variable consolidation), and within the NCMPA they are interspersed within the subglacial tunnel valley systems (NatureScot, 2020).

The Project is taking place near to, and over, the Quaternary of Scotland - moraines feature of the Southern Trench NCMPA (hereafter referred to as moraines). Whilst the cable corridor avoids the deepest portions of the Southern Trench NCMPA, where most of the associated geodiversity features are present, the cable corridor is predicted to directly overlap the feature at KP 152.1 (see **Figure B-3** The proposed Cable corridor, and of distribution of burrowed mud, moraines, submarine mass movement, and shelf deeps of the Southern Trench NCMPA (Source: Scottish Government, 2024), and **APPENDIX D: Physical Processes Technical Appendix**). The moraines that intersect the cable corridor within the NCMPA are, largely, buried in more recent seabed sediments; however, as identified in the 2023 bathymetric survey data collected for the Project, moraines are not distinct features. The mapped moraines only reach a maximum height of 5 m above the seabed, comparable to other irregular topography in the area. In sub-bottom data, the moraines are seen only as asymmetric ridges. Where the feature is predicted to be within 2 m of the surface, its width is predicted to be approximately 300 m (see **Chapter 7.1 Physical Environment** of the MEA). As per the latest assessment date (2019), the feature's condition status is classified as **Favourable** (NatureScot, 2020). There is currently no conservation advice to support the management of the activity *cable and pipelines* on moraines (NatureScot, 2020).

FeAST (2023) identified those pressures that can arise from the activity of 'Infrastructure – cables & pipelines (Operation & Installation)' to which moraines have a 'High' or 'Medium' sensitivity. As it is currently predicted that the cable corridor will intersect with an area of moraines, the high sensitivity pressures of *Physical removal (extraction of substratum)* and medium sensitivity pressure of *sub-surface abrasion/penetration* will be assessed here.

Moraines were also assessed in FeAST as having a medium sensitivity to the pressure *water flow (tidal current) changes – local,* with the pressure benchmark set as a change in peak mean spring tidal flow being greater than 0.1 m/s across an area >1 km^2, or 50% of width of water body for >1 year. It is not currently known exactly where cable protection will be required along the cable corridor, and which specifications (if any) will be placed on, and/or, near to the moraines feature of the NCMPA. At present, development of the detailed design by the Contractor is ongoing. In **Section 7.1 Physical Environment** of the MEA, it was determined that there would be, under the realistic worst-case scenario, only negligible changes arising to changes in sediment transport systems from long term placement of cable protection and, thus, no long term changes in hydrodynamic regimes. As such this pressure will not be assessed further here.

Pressures to be assessed:

- Physical removal (extraction of substratum) – High Sensitivity; and
- Sub-surface abrasion/penetration – Medium Sensitivity.

Table B-7 sub-Feature - Moraines presents the screening assessment for moraines, where **moraines is screened IN** and is carried forward for assessment under Stage 1.

TABLE B-7 SUB-FEATURE - MORAINES

Pressure & Sensitivity (FeAST, 2023)	Magnitude of Impacts	Effects	Significance / screening result
Physical removal (extraction of substratum) High Sensitivity	The seabed disturbance of overlying sediments during cable installation has a maximum predicted width of 10 m. Sediments overlaying the moraines will be removed from their undisturbed positions in the seabed as the plough or trencher moves forward and the cable is laid in the narrow 0.5-1 m wide trench. Sediment will be pushed to either side of the trench and may undergo compaction; some sediments may also become suspended. This sediment will either be actively returned to the trench area over the moraines or allowed to passively settle. It is predicted that the buried depth of the moraines that intersect the cable corridor is mainly at depths >2 m and, therefore, mainly greater than the estimated maximum burial depths of 1.8 m for the Project. Where it is within 1.8 m of the seabed surface, its width is estimated to be at 300 m. Conservatively, it has been predicted that current design parameters indicate that the affected volume (from physical removal) would be less the 0.02% of the volume of the moraines within this depth range (0-1.8 m). Furthermore, this proportion would be significantly less when the full vertical extent and, hence, volume of the feature is considered. It is also considered that if any disposal mounds deposited on the seabed from cable installation comprise material dredged from moraines, it may be reasonable to presume that they will likely comprise consolidated boulder clay. Such mounds will become semi-permanent or permanent seabed features, which will persist over the lifetime of the Project and, potentially, beyond.	Trenching will cause localised areas of abrasion and changes may occur to the topography of the seabed. The physical removal (extraction) of surface sediments overlying the moraines is unlikely to have a significant effect on the feature itself. Should there be the partial removal (extraction) of a moraine itself, then this relic feature will have no resilience, and the effect would be deemed to be a permanent loss. Should disposal mounds comprising material from moraines, not be backfilled into the trench during pre-lay and/or cable installation, this may cause localised changes to seabed topography. However, this is unlikely to cause any significant scour effects via changes in hydrodynamics and sediment transport.	The Project <u>is capable</u> of affecting (other than insignificantly) the protected feature moraines of the Southern Trench NCMPA from *Physical removal (extraction of substratum).*

Pressure & Sensitivity (FeAST, 2023)	Magnitude of Impacts	Effects	Significance / screening result
Sub-surface abrasion/penetration Medium Sensitivity	As detailed above, maximum disturbance during cable installation of the seabed sediments overlying moraines may reach 10 m in width and may interact with this feature where operations reach <1.8 m depth. Moraines have a varying resistance to *sub-surface abrasion or penetration,* that will depend on the degree of their consolidation. CPT survey data collected for the Project have interpreted that material present is consistent with consolidated till and, thus, likely to be resistant to abrasion and penetration.	Trenching will cause localised area of abrasion and changes may occur to the topography of the seabed. Sub-surface abrasion and penetration of a moraines feature during cable installation is determined to be highly localised and unlikely to significantly impact the feature due to the nature of its predicted consolidated sediments.	The Project <u>is not capable</u> of affecting (other than insignificantly) the protected feature moraines of the Southern Trench NCMPA from *Sub-surface abrasion/penetration*.

B.5.2 NOSS HEAD NCMPA

Key information used for the screening assessment of Noss Head NCMPA is sourced from:

- Conservation and Management Advice Note Noss Head MPA (NatureScot, 2024);
- Scotland's National Marine Plan Interactive (NMPi) (Scottish Government, 2023);
- Feature Activity Sensitivity Tool (FeAST, 2023);
- Scottish Natural Heritage (SNH) Descriptions of Scottish Priority Marine Features (PMFs) (Tyler-Walters *et al*., 2016);
- The Marine Life Information Network (MarLIN) (MarLIN, 2024); and
- Relevant published reports and peer-review scientific literature.

B.5.2.1 SITE FEATURES

The Noss Head NCMPA (8 km^2) has been designated to protect one biodiversity feature:

Biodiversity Feature:

- Horse mussel beds – Inshore sublittoral sediment (Marine).

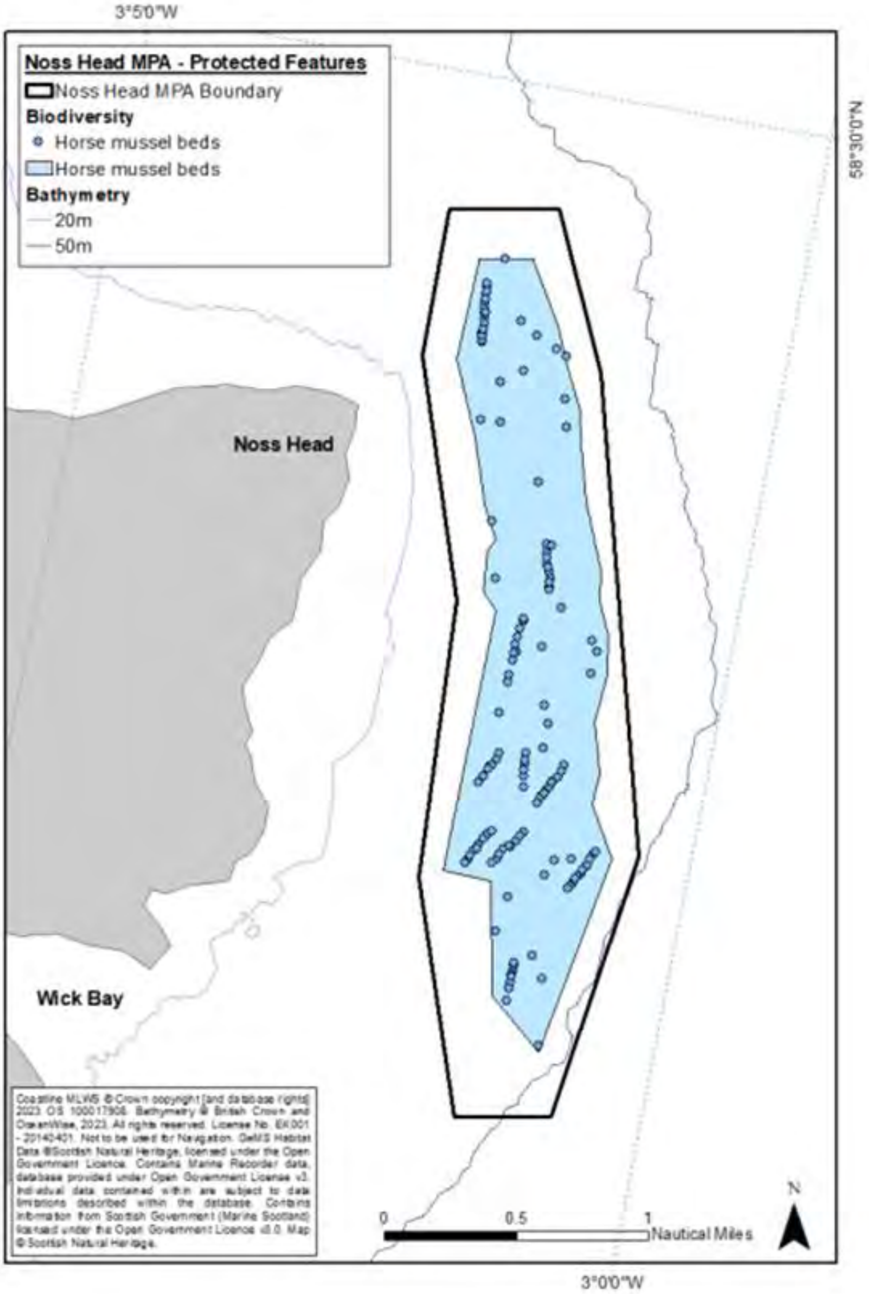
B.5.2.2 FEATURES TO BE SCREENED

For the feature listed above for Noss Head NCMPA, the distance from the cable corridor is listed below in **Table B-8**. Where distance is >10 km, and/or it is acknowledged that there is no likely impact pathway between the Project and the feature, this have been screened out for further assessment under Screening Question 2.

TABLE B-8 SCREENING OF FEATURES FOR NOSS HEAD NCMPA

Feature	Distance from cable corridor	Screened in for Further Assessment under Screen Question 2
Horse mussel beds	2.36 km^2 (from boundary of NMCPA)	**Yes** – Whilst the cable corridor itself does not directly overlap with the boundary of the NCMPA and, therefore, horse mussel *Modiolus modiolus* beds, the 10 km buffer does (see **Figure B-1** above). Therefore, indirect impacts arising from the Project may, potentially, interact with this feature where it is reported to have an extensive distribution across the entire site (see **Figure B-7** below).

FIGURE B-7 NOSS HEAD AND DISTRIBUTION OF HORSE MUSSEL BEDS (FROM: NATURESCOT, 2024)



B.5.2.3 SCREENING ASSESSMENT

HORSE MUSSEL BEDS

Horse mussel beds (*Modiolus modiolus* beds) are a listed PMF broad habitat in Scotland, and under OSPAR Threatened and/or Declining Species and Habitats (Tyler-Walters *et al.,* 2016; OSPAR, 2024). In the UK, 85% of all horse mussel beds are in Scotland, and Noss Head NCMPA supports the largest confirmed horse mussel beds in Scottish waters. In the site, the horse mussel beds have an estimated extent of 3.85 km^2, varying in SACFOR[34] abundances

[34] SACFOR = Super Abundant, Abundant, Common, Frequent, Observed, Rare.

from 'Frequent' to 'Super Abundant', in water depths of 38-50 m. The feature is characterised by the biotope '*Modiolus modiolus* beds with hydroids and red seaweeds on tide-swept circalittoral mixed substrata' (SS.SBR.SMus.MoT). This feature is an example of beds present along an open coast, where, as per the latest assessment (2014), its condition status is **Favourable** (NatureScot, 2024). The conservation advice to support the management of the activity *cable and pipelines* is **remove or avoid pressures** associated with further cable and pipeline infrastructure in areas where there would be likely to lead to cumulative impacts on horse mussel beds (NatureScot, 2024).

No horse mussels were observed within the macrofaunal grab samples, or from the video and photographic stills acquired from the 2023/2024 Project specific surveys undertaken outside of the NCMPA, along the cable corridor (see **Section 7.2: Benthic Ecology**). The Project is 2.36 km from the site boundary; however, the 10 km buffer overlaps the site and, therefore, this buffer will overlap the feature (**Figure B-2**)

FeAST (2023) identified those pressures that can arise from the activity of '**Infrastructure – cables & pipelines (Operation & Installation**)', and to which the feature has a 'High' or 'Medium' sensitivity to. FeAST identified horse mussel beds to have a high sensitivity to the pressures *Physical change to (another seabed type); Physical removal (extraction of substratum),* and *Sub-surface abrasion/penetration,* and a medium sensitivity to the pressure *Surface abrasion*. However, as the cable corridor does not directly overlap with the feature, or the boundary of the NCMPA itself, there is no pathway between the cable installation, operation, and decommissioning activities of the Project directly impacting the seabed that may result in these pressures on the feature, and as such these are not considered in this assessment.

Furthermore, the high sensitivity pressures of *Removal of non-target species (including lethal),* and *Removal of target species (including lethal)* are not of relevance to activities associated with the Project and will not be considered further. In addition, it is predicted that there is no impact pressure pathway for the medium sensitivity pressures of *Temperature change* and *Water flow (tidal current) changes – local*.

Pressure(s) to be Assessed:

- Siltation rate changes (heavy): High Sensitivity; and
- Siltation rate changes (light): Medium Sensitivity.

The pressures *Siltation rate changes (heavy)* and *siltation rates changes (light)* will be assessed together in this assessment for a consideration of potential secondary impacts on the feature through deposition of suspended sediments generated during the Project. **Table B-9** presents the screening assessment for horse mussel beds, where **Horsel mussel beds is screened OUT**, and is not carried forward for assessment under Stage 1.

TABLE B-9 FEATURE – HORSE MUSSEL BEDS

Pressure & Sensitivity (FeAST, 2023)	Magnitude of Impacts	Effects	Significance / screening result
Siltation rate changes (heavy) High Sensitivity **Siltation rate changes (light)** Medium Sensitivity Horse mussel beds are sensitive to siltation and smothering (NatureScot, 2024), and have the following sensitivity benchmarks: Heavy deposition: >5cm and <30 cm of fine material added to the habitat in a single discrete event or continuous deposition of fine material for heavy siltation rate changes. Light deposition: <5cm of fine material added to the seabed in a single event or continuous deposition of fine material.	During the pre-lay and cable installation works of the Project, sediments will become disturbed, moved, and resuspended, whereby particles will then subsequently settle on the seabed, increasing siltation rates. There will also be potentially localised increases in SSC from HDD drilling fluids which may also change siltation rates. The magnitude of any siltation rate change on horse mussel beds will be dependent upon the degree of disturbance occurring at source, sediment properties, local hydrodynamic conditions and distance of the feature from the source of the impact. Direct sediment disturbance occurring along the cable corridor and, notably, within the region of the feature will be occurring over a short time period and localised to maximum widths of 10 m along the corridor. It has been assessed that, for the Project (in MEA **Chapter 7.1 Physical Environment),** seabed sediments along the cable corridor mainly range from sand to sandy gravel. Therefore, the majority of suspended sediments will rapidly fall out of suspension relatively quickly, leaving any fines, that can be transported further, to settle in low concentrations, potentially over the feature. Noss Head NCMPA is situated along the coast, within the region of the northern Landfall for the Project which is where HDD works will be undertaken. HDD drilling fluids may include finer material such as drilling muds which may be transported further than the coarser sediments disturbed during trenching along the offshore cable corridor. Any suspended plumes and subsequent deposition occurring from	Low siltation rates and accumulation on horse mussel beds can be beneficial whereby it can provide a rich organic habitat to support diverse infaunal communities. However, if accumulation builds up, this can smother horse mussels and associated epifaunal species such as the barnacle *Balanus crenatus* and *Ophiothrix fragilis.* Erect sessile organisms such as hydroids and red seaweed will also be impacted, unable to feed and photosynthesise, respectively. Under dense and/or continuous deposition rates, the horse mussel population may die, and this can also result in a reduced biodiversity from direct mortality of associated species, and or indirectly through the loss of complexity of the beds in supporting other species. Any deposition of sediments via disturbance of the seabed along the cable corridor and/or HDD activities at the Landfall is likely to be highly localised to these areas. Deposition on the beds, should they occur, will not be heavy, and expected to be temporary, where tide-swept currents will resuspend and transport them away.	The Project <u>is not capable of affecting</u> (other than insignificantly) the protected feature horse mussel beds of the Noss Head NCMPA from *siltation rate changes (heavy/light).*

Pressure & Sensitivity (FeAST, 2023)	Magnitude of Impacts	Effects	Significance / screening result
	HDD activities, will be highly localised to the exit points, temporary (e.g., less than a neap tidal cycle), infrequent and, thus, of a low magnitude overall. It is unlikely that any dispersion, and subsequent deposition of drilling fluid particles onto the feature, will be significant in depth (light or heavy) and/or continuous in the area across the feature. The magnitude of impact for deposition (light/heavy) is short term, and spatially restricted. Heavy deposition is unlikely to occur on the feature in the NCMPA, where it is 2.36 km (at its nearest point from) the cable corridor.		

B.5.3 EAST CAITHNESS CLIFFS NCMPA

Key Information used for the screening assessment of East Caithness Cliffs NCMPA is sourced from:

- Protected Nature Sites Application;
- Feature Activity Sensitivity Tool (FeAST, 2023); and
- Relevant published reports and peer-review scientific literature.

B.5.3.1 SITE FEATURES

The East Caithness Cliffs NCMPA (114 km^2) has been designated to protect one biodiversity feature:

- Black guillemot *Cepphus grylle.*

B.5.3.2 FEATURES TO BE SCREENED

The distance from the cable corridor and the black guillemot feature of the East Caithness Cliffs NCMPA as well as the rationale for screening for this feature is presented in **Table B-10**. Screening for the feature was assessed on a precautionary basis.

TABLE B-10 SCREENING OF FEATURES FOR EAST CAITHNESS CLIFFS NCMPA

Feature	Distance from cable corridor	Screened in for Further Assessment under Screen Question 2
Black guillemot *Cepphus grylle*	9.7 km (distance from the NCMPA boundary)	**Yes** – Whilst the cable corridor itself does not directly overlap with the boundary of the NCMPA or known black guillemot colonies, portions of the cable corridor and 10 km buffer potentially overlaps with their foraging range, which is estimated to be up to 9.1 km from breeding colonies (Woodward et al 2019). Considering the distance from the nearest boundary of the NCMPA, this foraging range overlaps the 10 km buffer of the Project.

B.5.3.3 SCREENING ASSESSMENT

BLACK GUILLEMOT CEPPHUS GRYLLE

Black guillemot is a species of seabird which is classified as 'Least Concern' according to the International Union for Conservation of Nature and Natural Resources (IUCN) Red List (IUCN, 2018). Black guillemot reproduce in temperate and arctic regions of the Atlantic and Pacific oceans. Within sub-arctic and temperate seas such as the North Sea, black guillemot typically stay within the coastal zone (Dehnhard, 2023). This species hunts for food by diving in shallow coastal waters at depths typically between 15 and 20 m, although they are known to forage at depths as deep as 43 m. Diving to these depths, for a typical duration of 95 seconds, enables black guillemot to prey upon benthic fish species such as gadoids and sandeel (Ammodytidae), as well as crustaceans such as squat lobsters (Masden *et al*., 2013; Denhard *et al*., 2023). Black guillemot are known to forage within close proximity to their colonies and, as such, have a maximum foraging range of approximately only 13 km (Cairns, 2013).

Within the East Caithness Cliffs NCMPA, black guillemot breed on the rocky cliffs situated between Wick and Helmsdale (NatureScot, 2014a). In 2014, 1,589 black guillemot individuals were counted within the site (NatureScot, 2014b). There is currently no condition status assessment available for East Caithness Cliffs NCMPA. It is noted that the NCMPA overlaps the seaward part of the East Caithness Cliffs Special Protection Area (SPA) (117 km^2), designated for internationally important numbers of other seabirds, including razorbill *Alca torda*, black-legged kittiwake *Rissa tridactyla*, northern fulmar *Fulmarus glacialis,* and common guillemot *Uria aalge*. As per the latest condition assessment of the SPA (2014-2015), of the 10 designated features, 6 are in Favourable and 4 in Unfavourable condition; noting that, for common guillemot, its status is Favourable (NatureScot, 2024).

The Project is located, at its nearest point, 9.7 km from the East Caithness Cliffs NCMPA. Therefore, the 10 km buffer of the cable corridor just overlaps the site and, thus, potentially colonies. As the feature has an estimated foraging range of 13 km, there is the potential that it will overlap with both the buffer and activities occurring along the cable corridor. FeAST (2023) was reviewed to identify those pressures that can arise from the activity of '**Infrastructure – cables & pipelines (Operation & Installation)**', and which pressures the feature has a 'High' or 'Medium' sensitivity to.

FeAST identified black guillemot to have a high sensitivity to the pressure *Introduction or spread of non-indigenous species (competition*); and a medium sensitivity to the pressures: *barrier to species movement*, *death or injury by collision below water*, *physical loss (to land or freshwater habitat), removal of non-target species (including lethal)*, *underwater noise*, *visual disturbance (behaviour),* and *death or injury by collision above water*.

Some of these pressures are not considered further in this assessment. The *introduction or spread of non-indigenous species (competition)* relates mainly to mink, which will prey upon the feature, and is considered one of the biggest threats to black guillemot populations (Nordström *et al*., 2003). Mink will not be introduced as a result of the activities related to this project and, as such, this pressure will not be considered in this screening assessment. There is no expected *barrier to species movement* from the Project, with no infrastructure located above the water, and only limited to discrete areas on the seabed where cable protection will be placed. Additionally, the pressure of *physical loss (to land or freshwater habitat)* will not be considered as it does not relate to predicted impacts arising from the Project. The pressure of *removal of non-target species (including lethal)* will also not be considered because it is a pressure generally related to fishing activities and, as such, is out with the scope of the Project.

Pressure(s) to be Assessed:

- Death or injury by collision below water – Medium Sensitivity;
- Death or injury by collision above water – Medium Sensitivity;
- Underwater noise – Medium Sensitivity; and
- Visual disturbance (behaviour) – Medium Sensitivity.

The medium sensitivity pressures of *underwater noise* and *visual disturbance (behaviour)* are assessed together as they are a result of the same pressure pathway, vessel activity, and this will also consider potential temporary displacement effects on the feature that can arise from noise and visual disturbance. The medium sensitive pressures of *death or injury by collision below water* and *death or injury by collision above water* have also, on a precautionary basis been assessed here.

Table B-11 presents the screening assessment for black guillemot, where **Black guillemot is screened OUT**, and is not carried forward for assessment under Stage 1.

TABLE B-11 FEATURE - BLACK GUILLEMOT *CEPPHUS GRYLLE*

Pressure & Sensitivity (FeAST, 2023)	**Magnitude of Impacts**	**Effects**	**Significance / screening result**
Death or injury by collision below water Medium Sensitivity **Death or injury by collision above water** Medium Sensitivity The pressure benchmark is 'death or injury below water' and 'death or injury above water', which can be from vessel movements (excludes activities that may involve vessels for routine surveys only). Inclusion of this pressure is highly precautionary.	The likelihood of black guillemot colliding with vessels during the Project below or above water is very low. There will be a maximum of 7 vessels active (plus support vessels) at any one time during the offshore and landfall cable installation, and this represents the realistic worst-case scenario, for the Project. Any vessel movements will be clustered around areas of the corridor and will be infrequent, depending on programme. The offshore installation periods will be split into separate periods where, for the entire cable corridor, operational windows are as followed: pre-laying activities limited to 4 months, HDD nearshore marine works to 2 months, route clearance to 6 months, and cable lay itself to 6 months. During these periods (some of which overlap with one another) the vessel(s) will be operating outside of the NCMPA. However, portions of the cable corridor and the 10 km buffer potentially overlaps with the foraging range of black guillemot. The risk of collision will be limited to the areas where vessel activities are occurring at any one time. The risk will be localised, and short term as it will only be relevant to the area	The potential direct impact of collision with project vessels above or below water is injury and death for the feature. It is assessed to not be significant due to the negligible likelihood of occurrence.	The Project is <u>not capable of affecting</u> (other than insignificantly) the protected feature black guillemot of East Caithness Cliffs NCMPA from *death or collision below water* and *death or injury by collision above water.*

Pressure & Sensitivity (FeAST, 2023)	Magnitude of Impacts	Effects	Significance / screening result
	where the cable is being laid within the foraging range of black guillemot which will be relatively localised in comparison to it.		
Underwater noise Medium Sensitivity **Visual disturbance (behaviour)** Medium Sensitivity The pressure benchmark for underwater noise is 'Anthropogenic sound sources that exceed levels that elicit a response from an individual, in terms of movement away, or cessation of feeding (for disturbance), for example, or exposure which leads to auditory injury.' The pressure benchmark for visual disturbance is 'the visual disturbance of biota by anthropogenic activities'.	Continuous (non-impulsive) underwater noise and vibrations will be produced via the movement of the vessel(s) to, and from, and along the areas where the cable will be laid; as well as during the laying of the cable, and potentially from equipment operations at the seabed itself during the offshore cable installation period. There will be a maximum of 7 vessels active (plus support vessels) at any one time during the offshore and landfall cable installation and this represents the realistic worst-case scenario, for the Project. Any vessel movements will be clustered around areas of the corridor and be infrequent depending on programme. The presence of the vessels will cause visual disturbance to black guillemot. The offshore installation operational windows for works, will be split into short (some overlapping) periods only. During these periods, the vessels will be operating out with the boundary of the NCMPA, away from the cliff faces where black guillemot colonies are located. However, portions of the cable corridor and the 10 km buffer	Underwater noise and visual disturbance as a result of vessel movement and cable laying activities may result in black guillemots fleeing from the immediate area. This could result in increasing/changes in foraging behaviour, increased energy costs, directly impacting local population dynamics. Any noise and visual disturbance and displacement effects are low in consideration of the scale of the project and are likely be a limited interaction with the feature.	The Project is <u>not capable of affecting</u> (other than insignificantly) the protected feature black guillemot of East Caithness Cliffs NCMPA from *underwater noise* and *visual disturbance.*

Pressure & Sensitivity (FeAST, 2023)	Magnitude of Impacts	Effects	Significance / screening result
	potentially overlaps with the foraging range of black guillemot Operation works will be long term (40 years), however, any vessels required to undertake routine cable surveys within the cable corridor are expected to be highly infrequent and localised during this time and are not expected to operate within the NCMPA. Should all cables be removed during decommissioning, the magnitude of impact for underwater noise and visual disturbance from vessels and associated seabed equipment, will be as described above for the cable installation period.		

B.5.4 SCREENING SUMMARY

Following screening of the Project alone for Southern Trench, Noss Head NCMPA, and East Caithness Cliffs NCMPA, only the moraine sub-feature of the Quaternary of Scotland feature of the Southern Trench NCMPA is carried forward into Stage 1 Assessment for assessment. All other site features and sub-features have been screened out for further assessment.

In consideration that all features of each of the three sites assessed are screened out as either having no direct or indirect pathway of impact, or not having an impact (other than insignificant) on the protected features of the sites (with exception of moraines), a cumulative impacts assessment has not been undertaken during screening.

A Stage 1 risk assessment for Quaternary of Scotland - moraines from the Project alone, and cumulatively with other relevant project/plans, has been undertaken and is presented below.

B.6 STAGE 1 ASSESSMENT – ALONE AND IN COMBINATION

Is there a significant risk of the Offshore Development hindering the achievement of the Conservation Objectives of the Southern Trench MPA?

Following the screening assessment completed for the Project alone, a Stage 1 assessment is undertaken for the Quaternary of Scotland - moraines sub feature of the Southern Trench NCMPA, alone and in combination.

B.6.1 SOUTHERN TRENCH NCMPA

This Stage 1 assessment has primarily been informed through a review of the Conservation and Management Advice for Southern Trench NCMPA (NatureScot, 2020).

B.6.1.1 Conservation Benefits

The Quaternary of Scotland geodiversity feature of the Southern Trench NCMPA has the benefit of providing protection where the site's geodiversity features contribute towards an understanding of past ice sheet behaviour and global climate change. Wider benefits may also include the reconstruction of past ice sheets, and storytelling of past global climate change to aid in climate change projections.

B.6.1.2 Conservation Objectives

The Conservation Objectives of the Southern Trench MPA, are that the protected features:

- So far as already in favourable condition, remain in such condition; and
- So far as not already in favourable condition, be brought into such condition, and remain in such condition (Scottish Government, 2020).

The specific feature condition status of Quaternary of Scotland is currently assessed as **Favourable**[35].

"*Favourable condition*" with regards to a geodiversity feature, means that:

a) its extent, component elements and integrity are maintained;

b) its structure and functioning are unimpaired; and

c) its surface remains sufficiently unobscured[36] for the purposes of determining whether the criteria in paragraphs (a) and (b) are satisfied (Scottish Government, 2020).

B.6.1.3 Conservation Advice for Management of Activities

NatureScot provides advice to support the management of activities, where it is considered necessary to achieve the Conservation Objectives for protected features. Advice may include management to remove or avoid pressures, management to reduce or limit pressures, or that no additional management is required. It is noted, that for the Southern Trench NCMPA, NatureScot does not provide conservation advice to support the management of activities in relation to the Quaternary of Scotland. At present, conservation advice is only available for the

[35] Condition status as per the latest assessment date of 2019 (NatureScot, 2020).
[36] For the purpose of determining whether a feature of geomorphological interest in sufficiently unobscured, any obscuring of that feature entirely by natural processes is disregarded.

biodiversity protected features of burrowed mud and minke whale for the activity '*cables and pipelines'* (NatureScot, 2020).

B.6.1.4 Risk of hindering the achievement of the Conservation Objectives of the Southern Trench MPA – Alone

Table B-12 below provides the assessment of risk, from the Project alone, for the Quaternary of Scotland. Given that only the moraines sub-feature of the Quaternary of Scotland feature was screened in, only this sub-feature is discussed here.

TABLE B-12 ASSESSMENT OF RISK (PROJECT ALONE) OF HINDERING THE ACHIEVEMENT OF CONSERVATION OBJECTIVES OF THE SOUTHERN TRENCH MARINE PROTECTED QUATERNARY OF SCOTLAND

Risk of Project – Alone	Additional Mitigation	Risk of Conservation Objectives
(A) Conserve the feature's extent, component elements and integrity		
Moraines have a high sensitivity to any partial removal (extraction), that may be required during cable installation for the Project. Any partial removal of this feature, whilst being a permanent impact, is expected to be highly localised and impact a small extent of that particular feature (e.g. would be < than 0.02% of the moraine volume within the 1.8 m of the surface)[37]. Moraines are widely distributed geodiversity features of the Southern Trench NCMPA, where they are extensive within the site. Any direct impacts occurring to moraines will make a negligible difference to conservation of this feature's overall extent within the NCMPA. The deposition of partially removed moraine material on the seabed, adjacent to cable installation works, may potentially remain *in situ* for the lifetime of Project, and beyond, if it is not backfilled into the cable trench. Localised deposition of this material may change local hydrodynamics (water flow), for which the feature is assessed overall as having a Medium Sensitivity; however, a subsequent Low sensitivity is assigned for surface abrasion, should this flow change cause associated scour. Moraines of the Southern Trench NCMPA are described as comprising of boulder clay and consolidated material and, thus, may show some resistance to scour. It is, therefore, unlikely that should extracted moraines be deposited on the seabed, it will significantly change their component elements and integrity over time. Only finer surficial sediments that settle on these features would be expected to be transported away, or subject to scour effects. It is predicted, overall, that it is unlikely that the conservation of the components and integrity of the feature will be at risk from the Project.	No significant effects were determined for Physical Environment (**Chapter 7.1** MEA). Therefore, **no additional mitigation is proposed.** <u>Embedded mitigation include(s):</u> Cable Burial Risk Assessment (CBRA); Initial route design to avoid sensitive areas; Minimise the impact footprint on the feature as much as possible; Production of a Construction Environmental Management Plan (CEMP); Regular cable surveys to monitor DoB of the cable; and Rock berms with slopes less than 1:3 wherever possible (this may minimise potential hydrodynamics effects and disruption in sediment transport patterns).	No Significant Risk to hindering the achievement of the Conservation Objectives

[37] This is a highly conservative estimate based on the upper 1.8 m (maximum burial depth) of the moraine. The moraine extends below this depth, but it was not considered because the base of the moraine cannot be identified in the sub-bottom data. This calculation also assumes the subsurface beneath the entire footprint of impact (10 m) is affected. In reality, although the seabed may be impact over a 10 m width, the subsurface impact will be much narrower, based on the trench width (assumed to be 1 m). Based on the realistic worst-case scenario this will only equate to 0.02% of the upper 1.8% of the moraine. This methodology does not consider spatial variations in the moraine beyond the limits of the data coverage and assumes the mapped length of the moraine by NatureScot (2020) is correct.

Risk of Project – Alone	Additional Mitigation	Risk of Conservation Objectives
(B) Conserve the structure and functioning of the features so that they remain unimpaired		
Information on this is only available for the feature as a whole – Quaternary of Scotland. This feature represents one of the largest and best-preserved examples in the UK of an enclosed glacial seabed basin and is also important for furthering the scientific understanding of ice sheet drainage (NatureScot, 2020). Its function for scientific importance would be at risk should the Project impact the site-specific Conservation Objective described above for (A) (*extent, component elements and integrity of the feature*). As assessed under (A) (above), any activity of the Project alone, will not significantly risk the conservation of the feature's extent, component elements, and integrity. Whilst there will be the potential for permanent removal and displacement of the feature through cable installation, and potentially pre-lay works (e.g. sand wave levelling), this magnitude of spatial impact would be highly localised, and therefore, would not significantly impact the overall feature's structure and function.	No significant effects were determined for Physical Environment (**Chapter 7.1** MEA), and therefore, **no additional mitigation is proposed.** <u>Embedded mitigation include(s):</u> As listed above.	No Significant Risk to hindering the achievement of the Conservation Objectives
(C) Conserve the surface of the feature so that it remains sufficiently unobscured for the purpose of determining whether the criteria in the conservation objectives (A) and (B) are satisfied		
It is assessed to be unlikely that the proposed cable installation works for the Project would result in an obscuring of the surface of the feature, as such that an assessment of Conservation Objectives listed under (A) and (B) could not be fully met. If the footprint of installation works overlaps the feature, this would be highly limited across a spatial scale and so would not significantly obscure the surface. Should there be partial removal (extraction) through cable installation and/or pre-lay (sand wave levelling etc.) across the cable corridor, this would, as a realistic worst case, deposit the removed section of moraines feature on adjacent seabed area(s) and, thus, not be removed from the NCMPA.	As no significant effects were determined for Physical Environment (**Chapter 7.1** MEA), **no additional mitigation is proposed**. <u>Embedded mitigation include(s):</u> As listed above.	No Significant Risk to hindering the achievement of the Conservation Objectives

B.6.1.5 Risk Assessment – In Combination

As detailed in **Chapter 7.10** Cumulative Impact Assessment of the MEA, an assessment of cumulative impacts will consider the combined impacts of the Project, with the impacts from other plans and projects that share a relevant pathway of effect, on the same single receptor/resource. Listed in **APPENDIX F:** is the long list of projects and plans identified, and of the long list, the following six projects/plans were screened in for assessment for the Project in the MEA itself:

- Ayre Floating Offshore Wind Farm (FLOW) (NE2): Offshore Scoping submitted June 2024;
- Muir Mhôr Floating Offshore Wind Farm: Offshore Scoping submitted July 2023;
- Buchan OWF (NE8): Offshore Scoping submitted September 2023;
- Marram Wind FLOW (NE7): Offshore scoping submitted January 2023;
- Salamander FLOW: Offshore EIA submitted April 2024; and
- Green Volt FLOW: Consented (not built) April 2024.

All projects/plans are offshore renewable developments, representing both OWF and FLOW and are predicted to have a potential temporal overlap with the Project. Of those listed above, Ayre FLOW will not be considered further, as it is located towards the northern region of the Project cable corridor, and has no spatial overlap with the Southern Trench NCMPA. Where only scoping reports are currently available, these projects will also not be considered, if there is insufficient information available presently with which to support a specific assessment of risk to Quaternary of Scotland.

The following Projects are, therefore, assessed, specifically in relation to their offshore Export Cable Corridors (ECCs), that both directly overlap the Southern Trench NCMPA:

- **Salamander FLOW** (hereafter referred to as Salamander) offshore ECC; and
- **Green Volt FLOW** (hereafter referred to as Green Volt) offshore ECC.

TABLE B-13 ASSESSMENT OF RISK (PROJECT IN COMBINATION) TO THE SITE-SPECIFIC CONSERVATION OBJECTIVES OF THE SOUTHERN TRENCH MARINE PROTECTED QUATERNARY OF SCOTLAND

Risk of Project – In Combination	Additional Mitigation	Risk of Conservation Objectives
(A) Conserve the feature's extent, component elements and integrity		
The Quaternary of Scotland geodiversity sub-feature of moraines has a high sensitivity to any partial removal (extraction), that may occur during cable installation for the Project, and in combination with installation of offshore export cables for the Salamander and Green Volt developments, that both have offshore export cable corridors (ECCs) overlapping with the Southern Trench NCMPA. However, the cable corridor of the Project, and the proposed offshore ECCs for Salamander and Green Volt, are all routed to avoid the deepest portions of the NCMPA, where most of the associated geodiversity features of Quaternary of Scotland (moraines and subglacial tunnel valleys) are present (Green Volt, 2022a; Salamander, 2024b). For example, for Green Volt, it is stated that the cable route avoids the main interests of the NCMPA (Green Volt, 2022a). As assessed for Salamander, at present no classified moraines are defined along the section of its proposed offshore ECC within the NCMPA boundary. Even if present, the localised nature of construction activities has been predicted to be small relative to the extent of feature, and the supporting NCMPA assessment for Salamander concluded No Significant Risk to the feature extent, component elements and integrity alone, and in combination (Salamander, 2024b; 2024c). The physical environment Cumulative Effects Assessment (CEA), considered potential morphological changes to designated features on the seabed, but had not considered hydrological (e.g. water flow/tidal current) changes or associated patterns in sediment transport due to the highly localised nature of potential blockage related changes predicted (Salamander, 2024b); an impact to which moraines are reported as having a medium sensitivity (FeAST, 2023). However, as no classified moraines were defined along the offshore ECC, potential cumulative effects on the feature have not been considered further. Moraines are a widely distributed, geodiversity feature of the Southern Trench NCMPA, where they are extensive within the site. Any direct cumulative impacts occurring to this feature will make a negligible difference to conservation of the feature's overall extent within the NCMPA. It is predicted unlikely that the conservation of the components and integrity of the feature will be at risk from the Project in combination with other projects/plans.	No significant effects were determined for Physical Environment (**Chapter 7.1** MEA) and for the cumulative assessment of the Project (**APPENDIX F:**), and therefore, **no additional mitigation is proposed.** Embedded mitigation include(s): • Cable Burial Risk Assessment (CBRA); • Initial route design to avoid sensitive areas; • Minimise the impact footprint on the feature as much as possible; • Production of a Construction Environmental Management Plan (CEMP); • Regular cable surveys to monitor DoB of the cable; and • Rock berms with slopes less than 1:3 wherever possible.	**No Significant Risk**

Risk of Project – In Combination	Additional Mitigation	Risk of Conservation Objectives
(B) Conserve the structure and functioning of the features so that they remain unimpaired		
Information on this is only available for the feature as a whole. This feature represents one of the largest and best-preserved examples in the UK of an enclosed glacial seabed basin and is also important for furthering the scientific understanding of ice sheet drainage (NatureScot, 2020). Its function for scientific importance will be at risk, should the Project impact the site-specific Conservation Objective described above for (A) (*extent, component elements and integrity of the feature*). As assessed under (A) (above), any activity of the Project in combination with relevant projects and plans, will not significantly risk the conservation of the feature's extent, component elements, and integrity. Whilst there will be the permanent removal and displacement of the feature through cable installation, and potentially pre-lay works (e.g. sand wave levelling), this magnitude of spatial impact would be highly localised, and therefore, would not significantly impact the overall feature's structure and function.	No significant effects were determined for Physical Environment (**Chapter 7.1** MEA) and for the cumulative assessment of the Project (**APPENDIX F:**), and therefore, **no additional mitigation is proposed.** <u>Embedded mitigation include(s):</u> As listed above.	**No Significant Risk**
(**C) Conserve the surface of the feature so that it remains sufficiently unobscured for the purpose of determining whether the criteria in the conservation objectives (A) and (B) are satisfied**		
It is assessed to be unlikely that the proposed cable installation works for the Project in combination with relevant projects and plans would result in an obscuring of the surface of the feature, as such that an assessment of Conservation Objectives listed under (A) and (B) could not be fully met. If the footprint of installation works overlaps the feature for Salamander and Green Volt, this this would be highly limited across a spatial scale and so would not significantly obscure the surface. Should there be partial removal (extraction) through installation and/or pre-lay across the cable corridor of the Project and the offshore ECCs of Salamander and Green Volt, this would, as a realistic worst case, deposit the removed section of moraines feature on adjacent seabed area(s) and, thus, not be removed from the NCMPA.	No significant effects were determined for Physical Environment (**Chapter 7.1** MEA) and for the cumulative assessment of the Project (**APPENDIX F:**), and therefore, **no additional mitigation is proposed.** <u>Embedded mitigation include(s):</u> As listed above.	**No Significant Risk**

B.7 CONCLUSIONS

Overall, it is concluded that the Project is not capable of affecting, other than insignificantly, the protected features of Noss Head NCMPA, and East Caithness Cliffs NCMPA.

It is concluded that the Project is not capable of affecting, other than insignificantly, features of the Southern Trench NCMPA, with the exception of the sub-feature moraine of Quaternary of Scotland. However there is no significant risk of it hindering the achievement of the Conservation Objectives of the Southern Trench NCMPA for this feature.

This conclusion was reached in both Screening of these sites and their designated features within **Section B.5** and further supported in the Stage 1 Assessment provide in **Section B.6**.

Therefore, it is assessed that the Project does not pose a significant risk of hindering the achievement of the Conservation Objectives or purpose of the aforementioned NCMPAs.

APPENDIX C: WATER FRAMEWORK DIRECTIVE COMPLIANCE ASSESSMENT

C.1 INTRODUCTION

In accordance with the requirements of the Marine (Scotland) Act 2010, Scottish and Southern Electricity Networks Transmission (SSENT) is submitting a Marine Licence Application (MLA) to the Marine Directorate Licensing Operations Team (MD-LOT) for the installation and operation of a 525 kV High Voltage Direct Current (HVDC) transmission cable system between Spittal and Peterhead (**Figure C-1**). The marine component of this project spans approximately 172 km in length and is hereby known as 'the Project'. The cable extends between Mean High Water Springs (MHWS) at 2 Scottish landfalls, located in proximity to Spittal and Peterhead respectively.

Under Part 4 of the Marine (Scotland) Act 2010, subsea cables projects require a Marine Licence prior to installation in Scottish Waters, however as such projects are not listed on Schedule 1 or Schedule 2 of the Marine Works (Environmental Impact Assessment) (Scotland) Regulations 2017 (as amended), a formal Environmental Impact Assessment (EIA) is not required to be submitted as part of the MLA.

To support the MLA, an assessment has been carried out to consider the effects of the Project in respect of the European Community (EC) WFD 2000/60/EC, which was transposed into Scottish law by the Water Environment and Water Services (Scotland) Act 2003 (as amended), and was subsequently retained following the UK's exit from the European Union. The WFD legislation sets out the requirements for an assessment to be carried out to ensure that the Project activities do not adversely affect the water environment and comply with the objectives of the WFD.

The WFD legislation introduced a framework of river basin management plans (RBMPs) (SEPA, 2021), requiring objectives to be set for every water body in terms of ecological status. To help achieve these objectives, the Act also gave Scottish Ministers powers to introduce regulations to control activities that can have an adverse effect on the water environment. Such controls have been put in place through the Water Environment (Controlled Activities) (Scotland) Regulations 2011 (as amended), which control a range of activities including abstraction, discharges and engineering activities (Scottish Government, 2012).

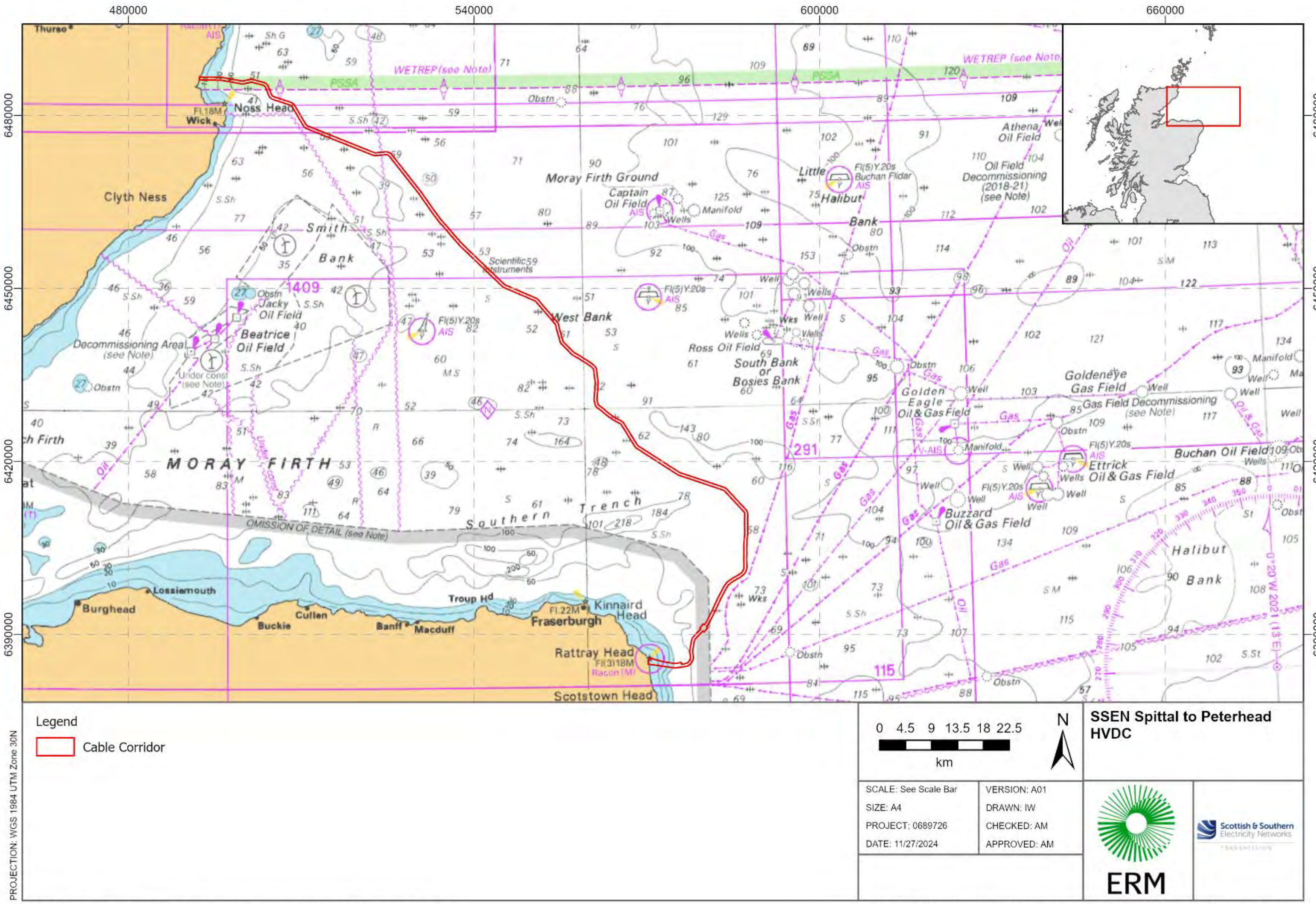
RBMP (cycle 3) objectives for the period from 2021 to the end of 2027 include:

- To prevent deterioration of the status or potential (in the case of heavily modified water bodies and artificial water bodies) of surface waters and ground water; and
- To aim to achieve good environmental status (GES) or good potential for all water bodies and good surface water chemical status. Specifically, 81% of the water environment being in a good or better condition by 2027 and 90% in the long term once natural conditions have recovered (SEPA, 2021).

Coastal and transitional water bodies and other waters are protected and designated under the WFD (Water Environment and Water Services (Scotland) Act 2003 (as amended)). However, there are a number of other EU Directives that have been transposed into Scottish Law and support the WFD. The requirements of the named Directives will only apply in the UK to the extent that they are assimilated law and have been transposed by domestic legislation. Areas designated under the Bathing Waters Directive (2006/7/EC), the Nitrates Directive (91/676/EEC), or the Habitats Directive (92/43/EEC) are designated protected areas under the WFD and must be managed in accordance with the requirements of both Directives. The Shellfish Waters (Shellfish Waters Directive (2006/113/EC) was repealed by the WFD; however, Article 4.9 of the WFD sets out that it offers a level of protection at least equal to any directive which it repeals. As such, it is necessary to ensure the quality of those designated sites, set out their specific environmental quality standards and to carry out periodical monitoring, and to include assessment and consideration within a WFD Compliance Assessment.

Consideration of the WFD is required for projects which have the potential to detrimentally impact the chemical and/or ecological status of a waterbody or to prevent improvements that may otherwise result in a waterbody meeting its WFD objectives. The aim of the WFD is for all water bodies to be at overall GES.

FIGURE C-1 PROJECT LOCATION AND LANDFALL AREAS



SOURCE: © Crown Copyright and/or database rights. Reproduced by permission of The Keeper of Public Records and the UK Hydrographic Office (www.GOV.uk/UKHO).

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C.2 LEGISLATION

The WFD Assessment has been conducted in line with the following relevant legislation/plans:

- EU Marine Strategy Framework Directive (MSFD) (2008/56/EC), transposed by the Marine Strategy Regulation 2010 (as amended). Its primary aim is to effectively protect the marine environment;
- EU Water Framework Directive (WFD) (2000/60/EC), transposed by the Water Environment and Water Services (Scotland) Act 2003 (as amended). The regulations aim at raising the quality of all water bodies, prevent deterioration and enhance ecosystems;
- EU Environmental Quality Standards Directive (EQSD) (2008/105/EC), covered by the Water Environment and Water Services (Scotland) Act 2003 (as amended). These standards ensure that surface waters meet minimum quality requirements for selected pollutants and progressively reduce or phase out emissions of hazardous substances;
- Nitrates Directive (91/676/EEC), transposed by the Action Programme for Nitrate Vulnerable Zones (Scotland) Regulations 2008 (as amended), addresses the pollution by nitrates from agricultural sources, aiming at reducing water pollution by nitrates to prevent eutrophication;
- Groundwater Directive (2006/118/EC), transposed by Water Environment (Controlled Activities) (Scotland) Regulations 2011, which establishes a framework for the protection of groundwater quality;
- Bathing Waters Directive (2006/7/EC), transposed by the Bathing Waters (Scotland) Regulations 2008 (as amended), which sets specific microbiological criteria to ensure the quality and safety of waters used for human recreation;
- Shellfish Waters Directive (2006/113/EC) was repealed in December 2013 and has been replaced by the Water Environment (Shellfish Water Protected Areas: Designation) (Scotland) Order 2013 which sets specific microbiological criteria to ensure the quality and safety of shellfish intended for human consumption; and
- River Basin Management Plan (RBMP) (SEPA, 2021). RBMPs are a crucial management tools in integrated water resources management. These plans provide a comprehensive framework for understanding and addressing water-related challenges within a specific drainage basin. RBMPs set legally binding, locally specific environmental objectives that serve as the foundation for water regulation and planning activities. These objectives underpin activities such as permitting and provision of stability for economic development. The plans aim to enhance nature and the natural water assets that are the foundation of everyone’s wealth, health, and well-being, as well as the things people value, including culture and wildlife. These plans cover rivers, lakes, canals, estuaries, coasts, and groundwater, recognizing their essential services and worth.

C.2.1 WATER FRAMEWORK DIRECTIVE (2000/60/EC)

The WFD sets out legal requirements intended to encourage the sustainable use of water and to protect and improve the quality of surface waters (including rivers, lakes, transitional and coastal waters and man-made water bodies), and groundwater bodies. Coastal waters are limited to 3 nautical miles (nm) from the coast in Scotland.

The WFD is a Directive intended to establish a framework for the protection of all inland surface waters (rivers and lakes), transitional waters, coastal waters and groundwaters, specifically to:

- Prevent further deterioration of aquatic ecosystems, protecting and enhancing their status and, with regard to their water needs, terrestrial ecosystems and wetlands directly depending on the aquatic ecosystems;
- Promote sustainable water use based on continuous efficient management of water resources;
- Aim at enhanced protection and improvement of the aquatic environment, through specific measures for the progressive reduction of discharges, emissions and losses of priority substances and the cessation or phasing-out of discharges, emissions and losses of the priority hazardous substances;
- Ensure the progressive reduction of pollution of groundwater and prevents its further pollution; and
- Contribute to mitigating the effects of floods and droughts (WFD 2000/60/EC).

The Directive aims to protect and improve the overall health of the water environment. For surface waters there are two separate water body classifications: ecological and chemical. The WFD is based on attributing a classification status to all water bodies, with the aim for all water bodies to be at a good status. For a water body to be in overall 'good' status, both ecological and chemical status must be at least 'good'.

The ecological status of surface waters is classified using information on the biological, physico chemical and hydromorphological elements of the body of water. Ecological status is classified using the following scale:

- High (denoting largely undisturbed conditions. All other classes represent increasing deviation from this natural condition, otherwise described as a 'reference condition');
- Good (benchmark for GES and RBMP objective for all waters);
- Moderate;
- Poor; and
- Bad.

Classification under the WFD is determined in accordance with the 'one out, all out' principle, meaning that the worst assessment result for quality element determines the overall assessment result. This means that the condition of a single quality element can cause a water body to fail to reach its WFD classification objectives.

The chemical status of a water body provides details on the water quality and is defined through compliance with EQS (2008/105/EC) for priority substances and / or priority hazardous substances. The WFD chemical status of a water body with respect to these priority substances and priority hazardous substances is classed as ‘good’ or ‘fail’.

Where the hydromorphology of a surface water body has been significantly altered for anthropogenic purposes, it can be designated as an Artificial or Heavily Modified Water Body

(A/HMWB). An alternative environmental objective, or "Good Environmental Potential" (GEP) is applicable in these cases.

The UK Technical Advisory Group (UKTAG) utilises the 'mitigation measures approach' for HMWB classification (UKTAG, 2008a). The protocol involves checking though a list of standard mitigation measures potentially applicable to all HMWBs. The first and second steps of the classification method evaluates the presence/absence of these measures to mitigate the impacts of physical modification and, if adequate mitigation is in place and functioning appropriately (second step), the water body can potentially achieve GEP status. If this is not the case, then the water body will be classified as 'moderate' or worse. The third step of the classification method involves the assessing field data and cross-check the results with biological and physico-chemical data before the final ecological potential classification (UKTAG, 2008b).

The competent authority for implementing the WFD and developing RBMPs in Scotland is the Scottish Environment Protection Agency (SEPA).

C.2.2 ENVIRONMENTAL QUALITY STANDARDS DIRECTIVE (2008/105/EC)

The Environmental Quality Standards Directive (EQSD) (2008/105/EC) outlines concentration limits for water quality parameters for 20 priority substances and 13 priority hazardous substances. Exceedance above the limits could result in a deterioration of the water quality and potentially the WFD status.

The aim of the WFD, as stated in WFD Article 1(e), is to "cease or phase out discharges, emissions and losses of priority hazardous substances, with the ultimate aim of achieving concentrations in the marine environment near background values for naturally occurring substances and close to zero for man-made synthetic substances".

Priority hazardous substances are substances which are toxic and are persistent (due to their nature, they do not readily break down in the water environment) and have the potential to bioaccumulate.

C.2.3 BATHING WATERS DIRECTIVE (2006/7/EC)

The Bathing Waters Directive aims to reduce the risk to public health at locations where a large number of people bathe. Under the Bathing Water (Scotland) Regulations 2008, Scottish Ministers must determine for each designated bathing water the period during which large numbers of bathers are expected as the bathing season. The period has traditionally been from the 1 June to 15 September with the pre-season beginning from 15 May.

Water quality samples are analysed for the faecal indicator organisms Escherichia coli and intestinal enterococci and other quality indicators including cyanobacterial (bluegreen algae) blooms, macroalgae (seaweed), marine phytoplankton and other waste. An increase in the concentrations of these bacteria indicates a decrease in water quality. The classification describes the general water quality condition for each location (**Table C-1**):

- Excellent;
- Good;
- Sufficient; and
- Poor.

Based on four years of monitoring data. These classifications are calculated at the end of one season for display during the following season.

TABLE C-1 BATHING WATERS CLASSIFICATION FOR COASTAL AND TRANSITIONAL WATERS

Parameter	Excellent	Good	Sufficient	Poor
Escherichia coli (cfu/100 ml)	100*	200*	185**	>185**
Intestinal enterococchi (cfu/100 ml)	250*	500*	500**	>500**

* Based upon a 95-percentile evaluation.
** Based upon a 90-percentile evaluation.
Note: A percentile is a measure used in statistics indicating the value below which a given percentage of observations in a group of observations fall.

SEPA is responsible for ensuring compliance with the Bathing Waters Directive and monitors water quality and the designated protected sites.

C.2.4 SHELLFISH WATERS DIRECTIVE (2006/113/EC)

EU Shellfish Waters Directive (2006) was repealed in 2013 and all responsibility for legislative protection of shellfish waters was subsumed into the WFD. The Shellfish Waters Directive sought to enhance water quality, promote the growth of healthy shellfish, and ensure the production of high-quality edible shellfish. These requirements are covered in the Water Environment (Shellfish Water Protected Areas: Designation) (Scotland) Order 2013 and the Water Environment (Shellfish Water Protected Areas: Environmental Objectives etc.) (Scotland) Regulations 2013. The legislation sets standards for various parameters that should be monitored in designated shellfish areas. These parameters are set for pH, temperature, salinity and the presence or concentration of certain substances (dissolved oxygen, hydrocarbons, metals, organohalogenated substances etc.). Importantly, a discharge should not cause an increase in suspended solids exceeding 30% above background levels, as shellfish can be adversely affected by the effects of sediment smothering.

The Directive states that a proportion of samples must conform to the established values:

- 100% of samples for the parameters 'organohalogenated substances' and 'metals';
- 95% of the samples for the parameters 'salinity' and 'dissolved oxygen';
- 75% of the samples for the other parameters; and
- No evidence of harm to the shellfish from organohalogenated substances.

The Directive is transposed into Scottish law thought the Water Environment (Shellfish Water Protected Areas: Designation) (Scotland) Order 2013 and the Water Environment (Shellfish Water Protected Areas: Environmental Objectives etc.) (Scotland) Regulations 2013. SEPA implements these Orders and monitors the standards of these designated sites.

C.3 GUIDANCE

There is no guidance produced by SEPA for undertaking a WFD assessment in Scotland, therefore the following guidance documents were consulted, and have been used in support of this document:

- United Kingdom Environment Agency Water Framework Directive Assessment: estuarine and coastal waters;
- United Kingdom Environment Agency Water Framework Directive Risk Assessment: How to assess the risk of your activity (EA, 2016a and EA, 2016b); and
- National Infrastructure Planning, Advice Note 18: The Water Framework Directive.

Some key points are as follows:

- A WFD assessment is required as part of the application to the licensing authority;
- The assessment helps in understanding the impact the Project activity may have on the immediate water body and any linked water bodies;
- It determines whether the Project activity complies with the River Basin Management Plans; and
- The WFD aims for all water bodies to be at good status. In a WFD assessment, it must be shown if the Project activity will cause or contribute to deterioration of status or jeopardise the water body achieving good status.

C.4 METHODOLOGY

The assessment of the Project's impact of construction, operation, and decommissioning activities on compliance with the WFD has utilised the generic environmental objectives outlined in Article 4.1 of the WFD. These objectives include:

- **Objective 1**: Avoid any alterations that could affect or lead to a failure in achieving GES or Potential for surface water, or lead to a decline in surface water Ecological Status or Potential; and
- **Objective 2**: Prevent any changes that may permanently obstruct or undermine the achievement of Environmental Objectives in other water bodies.

An evaluation has been conducted for the water body to pinpoint potential alterations in hydromorphological aspects, and physical and biological quality elements attributable to the preferred option. The WFD Compliance Assessment methodology is completed according to the following stages:

- **Stage 1 Screening**: identify activities associated with the Project (during each stage) that have the potential to have an impact and identify the water bodies hydrologically connected to the Project activities;
- **Stage 2 Scoping**: identify the potential risks to each water body and each receptor (quality elements of the water body); and
- **Stage 3 Impact Assessment**: assess the hydrological connectivity (pathway) of the site investigation activities (source) on the WFD water bodies and other statutory receptors and determines if any activity may cause deterioration of the status of the water body or jeopardise the achievement of GES for said water body.

Further considerations are then made in relation to mitigation: identification and evaluation of mitigation measures required to prevent impact on the WFD water body status. Temporary impacts are not considered to result in deterioration in WFD status of the water body, if the water body:

- Is only impacted for a short time period;

- Recovers within a short time period (1 to 2 tidal cycles, or 14–28 days); and
- Recovers without the need for any restoration measure.

C.4.1 WFD STAGE 1: SCREENING

The screening process occurs in a number of steps:

- Consideration for the Project design and "*to determine if there are any activities associated with the Proposed Development that don't require further consideration, for example activities which have been ongoing since before the current RBMP plan cycle and which have thus formed part of the baseline*" (Planning Inspectorate Advice Note 18 (PINS, 2017));
- Collation of environmental baseline data and identification of WFD designated water bodies (directly or indirectly hydrologically connected to the Project) which could be impacted; and
- Consideration and identification of any Project activity that could lead to potential impacts. At this stage activities not considered to cause effect are screened out.

C.4.2 WFD STAGE 2: SCOPING

The scoping process identifies any risks related to the any activities screened-in as specified by Advice Note 18 (PINS, 2017) to "*identify risks of the Proposed Development's activities to receptors based on the relevant waterbodies and their water quality elements*". The Stage 2 Scoping is relevant to surface water compliance assessments only. This stage is undertaken separately for each surface water body and each activity (or group of activities).

The WFD Assessment considers potential risks on the following components of the WFD water body receptors (quality elements), as noted by EA Guidance:

- Physical habitat – the distribution and diversity of habitat including the physical processes that sustain and create the habitats;
- Water quality – particularly physico-chemical aspects of water quality;
- Migratory fish and eels;
- Benthic invertebrates - worms, molluscs, crustacea etc.;
- Macrophytes - water plants visible to the naked eye; and
- Phytoplankton.

C.4.3 WFD STAGE 3: IMPACT ASSESSMENT

A detailed impact assessment is conducted in Stage 3 for each receptor identified as being at risk of deterioration from the Project activities. The assessment determines:

- If the Project activities will support RBMPs objectives;
- If the Project activities will cause significant, non-temporary deterioration of the water body;
- If prevention of achievement of WFD objectives is likely to occur (GES or GEP); and
- If the activities will prevent the implementation of mitigation measures for A/HMWBs.

The Project is considered non-compliant if any activities are deemed to cause deterioration in any of the receptors and quality elements assessed.

C.5 IMPACT ASSESSMENT METHODOLOGY

The Impact Assessment methodology takes into account the pathway or pollutant linkage between the source and receptor. The source-pathway-receptor model utilised is defined as:

- Source (contaminant): a substance that is in, on or under the land and has the potential to cause harm or to cause pollution of controlled waters;
- Pathway: a route or means by which a receptor can be exposed to, or affected by, a contaminant; and
- Receptor: something that could be adversely affected by a contaminant, such as people, an ecological system, property, or a water body.

If a pathway is identified, there is potential for a risk of deterioration to the WFD water body status as a result of the Project activity. To avoid or reduce the risk of impact on the receptor, mitigation measures which remove or minimise the risks must be employed. As outlined in the EA guidance (EA, 2017) mitigation methods may include, but are not limited to:

- Change in materials or substances used;
- Reduced scale and size of activity;
- Changes to working practices e.g. how equipment is used;
- Changes to the period over which the activity happens; or
- Changes to where the activity occurs.

Following identification of potential risks to the receptors and implementation of mitigation measures, the assessment of the deterioration of the WFD status and the statutory receptors, is carried out. Each identified risk is classified based on the resulting level of deterioration:

- Beneficial: positive effects which result in improvement of water body and contribute towards achieving WFD objectives;
- No deterioration: temporary adverse effects where the water body will recover in a short time without any restoration measures;
- Direct deterioration: deterioration as a result of Project activities and occurring immediately;
- Indirect deterioration: deterioration as a result of the Project activities; and
- Cumulative deterioration: deterioration as a result of existing effects in the water body which are not related to the Project activities.

C.6 STAGE 1 SCREENING

C.6.1 SUMMARY OF PROJECT DESCRIPTION

The Project comprises a 525 kV High Voltage Direct Current (HVDC) transmission cable system approximately 172 km long and 2 landfall areas (Sinclair's Bay – Northern landfall and Rattray Head – Southern landfall) comprising a 400 kV substation and a HVDC station each, located in the proximity of Spittal and Peterhead respectively. Key Project design information, necessary to the WFD Compliance Assessment, below MHWS, are shown in **Table C-2**.

Note: no intertidal works are planned.

TABLE C-2 PROJECT DESIGN ENVELOPE (PDE) PARAMETERS RELEVANT TO THE WFD COMPLIANCE ASSESSMENT

Parameter	Unit	Value
Total Project Programme	Months	45 Total Land and offshore (running in parallel) 33 Land 43 Offshore
Total Duration of Offshore Construction Works	Months	30 months
Total Duration of Landfall Works	Months	4 months
Operational Lifetime	Years	40
Maximum Simultaneous Number of Active Vessels (during construction)	Number	7
Types of Installation Vessel	-	Cable lay vessel Trench support vessel Subsea Rock Installation Vessel DP Construction Support Vessel (CSV) - Mattress installation, Pre-Lay Grapnel Run (PLGR), mass flow excavator, Mechanical Cutting etc. Guard vessels (8 – 9 spaced at 10 – 15 km intervals for every 90 km of cable route; maximum 17) Multi cat vessels (Spud can and anchor spread) Survey Vessels (nearshore and offshore)
Total Project Area	km^2	88.13
Total Area of Works within 3 nm	km^2	4.82 (Northern landfall) 5.12 (Southern landfall)
Installation Characteristics		
Burial Technique (offshore)	-	PLGR; Boulder clearance;

Parameter	Unit	Value
		Trenching tools (e.g. Jet trencher)
Burial Technique (nearshore – 1km)	-	Horizontal directional drilling (HDD); CPS; Rock placement trench and if not trenched mattress to cover surface lay
Burial Technique (intertidal)	-	HDD
Maximum Burial Depth	m	2.1
Minimum Burial Depth	m	0.6
Trench Width	m	0.5 – 1
Width of seabed disturbance from installation tool	m	5 – 10
Duration of installation	hours	408 hours per campaign (2 campaigns) 408 x 2 x 1.1 = 898 hours (total)
Cable Protection		
Protection Material	Material Type and size	HDD exit and crossings 1) Rock type and grain size - 70 mm based on a rock density of 2650 kg/m3 (grading 1-5"") 2) Mattress's – At the time of writing this report, various nature inclusive designs for mattresses/similar protection are being assessed Approximate size: 6 m x 3 m x 0.3 m

C.6.2 WATER BODY IDENTIFICATION

This assessment will consider WFD Coastal or Transitional water bodies up to 3 nm from the shoreline, which may be affected by the Project activity, including:

- Water bodies directly impacted by the Project footprint and those located within 2 km from any project activity;
- Water bodies indirectly impacted by the Project activity and located within the Area of Influence of Project Activities, determined by the extent of the Total Suspended Solid Plume, the realistic worst-case scenario (affected in turn by the tidal excursion zone); and
- Water bodies hydrologically connected to adjacent, directly affected water bodies and water bodies downstream from the water bodies directly affected by the Project activity.

The Coastal and Transitional water bodies identified for the whole area (SEPA, 2024) are shown in **Figure C-2**. **Figure C-3** and **Figure C-4** show the WFD designated water bodies, protected and designated sites (e.g. Marine Protected Areas (MPAs), Bathing waters and Shellfish waters) and disposal sites near the landfall area. **Table C-3** lists the relevant WFD designated water bodies screened in this assessment.

FIGURE C-2 PROJECT LOCATION, WATER FRAMEWORK DIRECTIVE DESIGNATED WATER BODIES, THEIR STATUS, AND PROTECTED AREAS

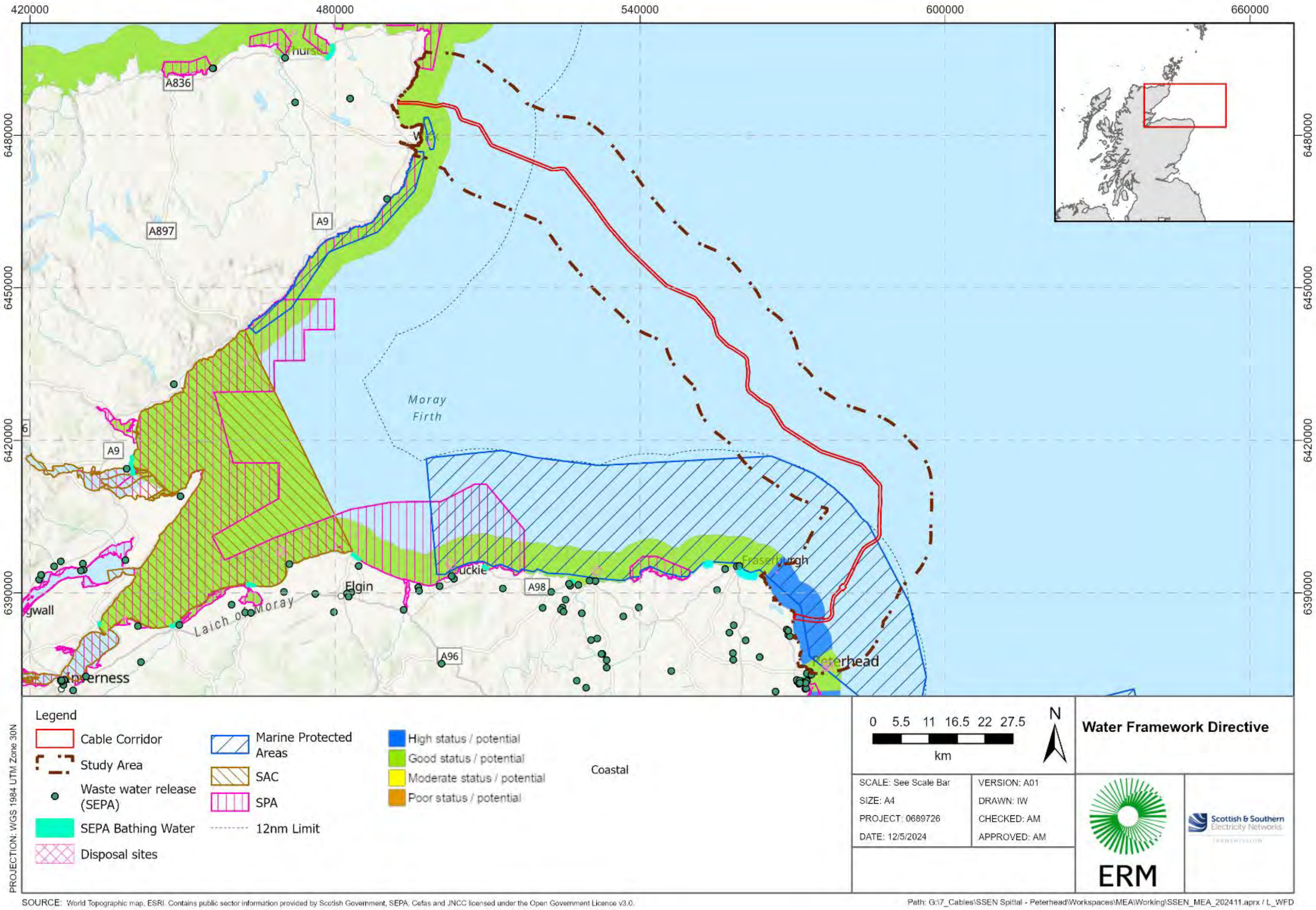


FIGURE C-3 PROJECT SOUTHERN LANDFALL AREA AND WATER FRAMEWORK DIRECTIVE DESIGNATED WATER BODIES

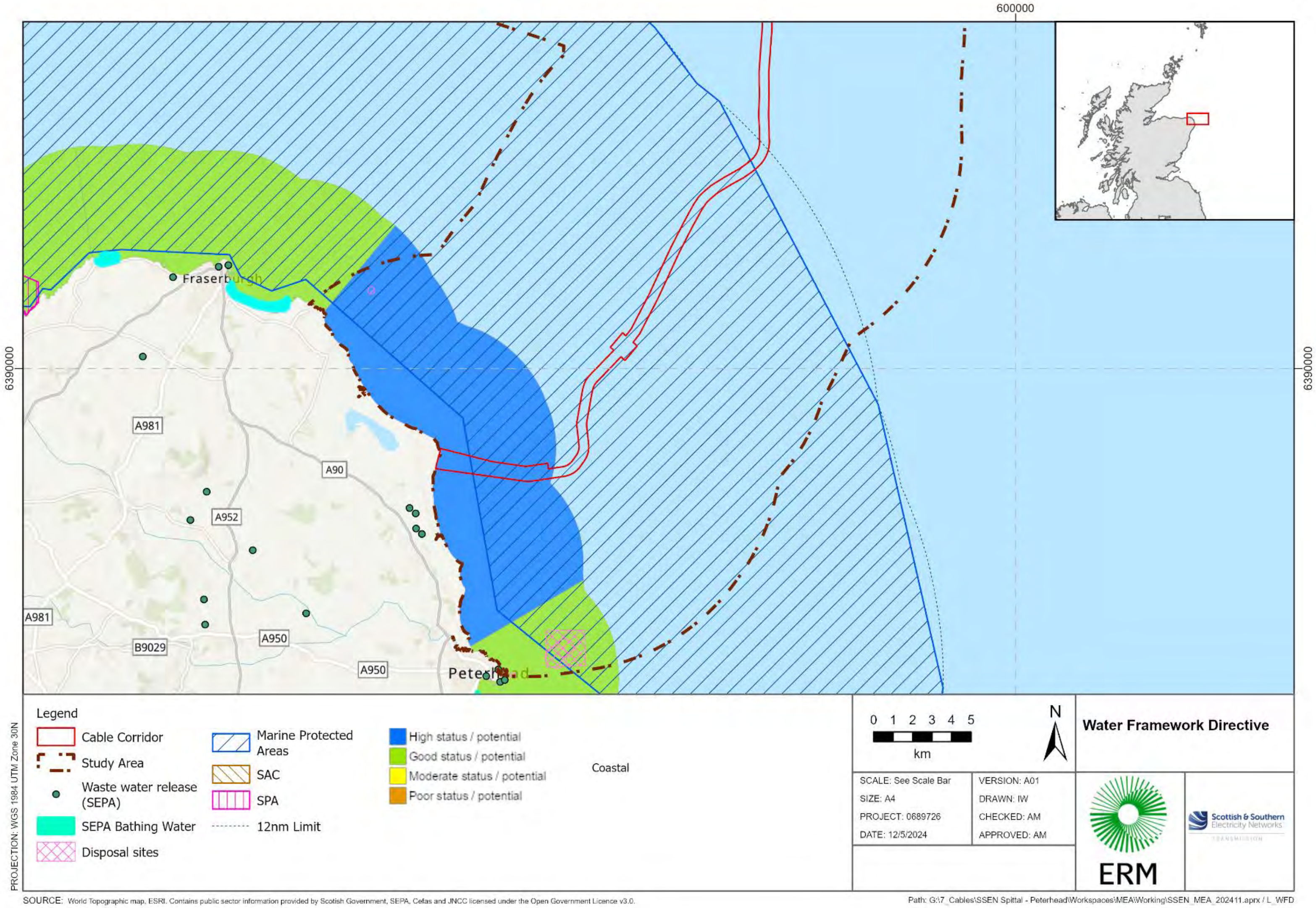

600000
6390000
6390000
Fraserburgh
Peterhead
A981
A90
A952
A981
B9029
A950
A950
Legend
Cable Corridor
Study Area
Waste water release (SEPA)
SEPA Bathing Water
Disposal sites
Marine Protected Areas
SAC
SPA
12nm Limit
High status / potential
Good status / potential
Moderate status / potential
Poor status / potential
Coastal
0 1 2 3 4 5
km
N
Water Framework Directive
SCALE: See Scale Bar
SIZE: A4
PROJECT: 0689726
DATE: 12/5/2024
VERSION: A01
DRAWN: IW
CHECKED: AM
APPROVED: AM
ERM
Scottish & Southern Electricity Networks
PROJECTION: WGS 1984 UTM Zone 30N
SOURCE: World Topographic map, ESRI. Contains public sector information provided by Scottish Government, SEPA, Cefas and JNCC licensed under the Open Government Licence v3.0.
Path: G:\7_Cables\SSEN Spittal - Peterhead\Workspaces\MEA\Working\SSEN_MEA_202411.aprx / L_WFD

FIGURE C-4 PROJECT NORTHERN LANDFALL AREA AND WATER FRAMEWORK DIRECTIVE DESIGNATED WATER BODIES

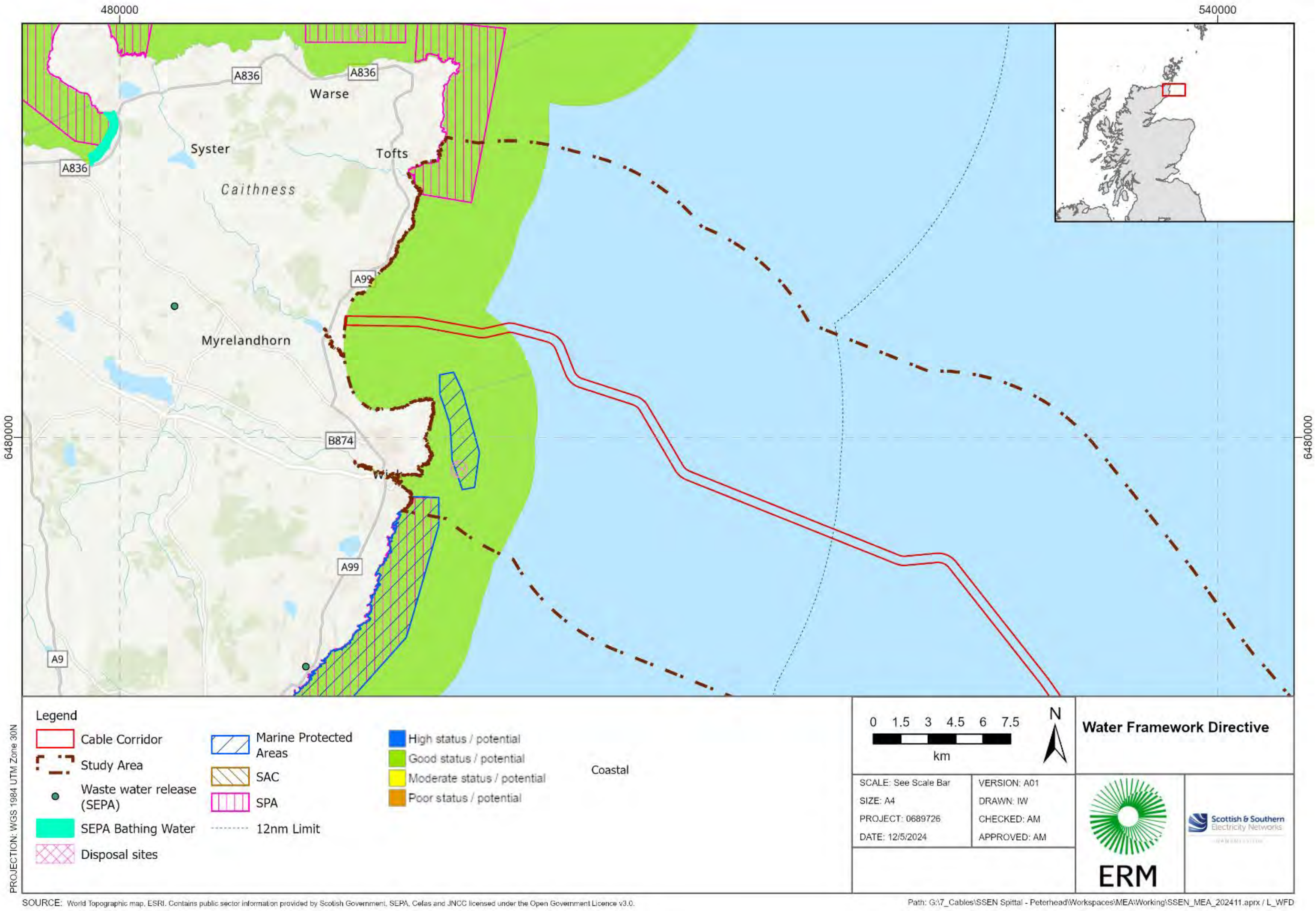


TABLE C-3 WFD WATER BODIES SCREENING

Water Body	ID	Type	Status 2022	Relation to activities
Cairnbulg Point to the Ugie Estuary	200142	Coastal	High	Southern landfall: directly impacted
Strathbeg Estuary	200137	Transitional	High	Southern landfall: indirect - downstream
Burn of Strathbeg	23060	River	Good	Southern landfall: indirect - downstream
Loch of Strathbeg	100136	Lake	Moderate	Southern landfall: indirect - downstream
Burn of Savoch/ Logie Burn	23061	HMWB River	PEP	Southern landfall: indirect - downstream
Black Water - d/s St. Fergus	23062	River	Good	Southern landfall: indirect - downstream
Black Water - u/s St. Fergus	23064	River	Moderate	Southern landfall: indirect - downstream
Rosehearty to Cairnbulg Point	200500	Coastal	Good	Southern landfall: indirect-hydrologically connected
Ugie Estuary to Buchan Ness (Peterhead)	200131	HMWB Coastal	GEP	Southern landfall: indirect-hydrologically connected
Duncansby Head to Noss Head	200219	Coastal	Good	Northern landfall: directly impacted
Bower Burn / Burn of Lyth	20026	HMWB River	GEP	Northern landfall: indirect - downstream
Kirk Burn	20027	River	Moderate	Northern landfall: indirect - downstream
Gill Burn	20000	River	Good	Northern landfall: indirect – downstream
Dunnet Head to Duncansby Head	200225	Coastal	Good	Northern landfall: hydrologically connected

Noss Head to Halberry Head	200472	Coastal	Good	Northern landfall: hydrologically connected

Of the water bodies considered in **Table C-3**, only the coastal and transitional water bodies highlighted in yellow have been screened in and taken to Stage 2 Scoping, as shown in **Table C-4.** Although the other water bodies are downstream or hydrologically connected to Cairnbulg Point to the Ugie Estuary and Duncansby Head to Noss Head, the water bodies size prevents any indirect connections to the Project, the water bodies screened out are located >2 km away from the source of potential Impacts (predicted extent of significant sediment plume for coarser sediment types. A 2 km boundary has been selected because the majority of the substrate in the area comprises coarser sediment such as sand, gravelly sand and sandy gravel and therefore, although TSS will be elevated immediately after installation, concentrations are predicted to fall to background levels within close proximity of the installation activity (66 m of ploughing activity in hard ground areas and 70 m in sandy areas), with fine deposition occurring out to a maximum of 2 km (Gooding *et al.,* 2012).

TABLE C-4 WFD WATER BODIES SCREENED IN AND TAKEN TO STAGE 2 SCOPING (SEPA, 2022)

Parameter	**Cairnbulg Point to the Ugie Estuary**	**Duncansby Head to Noss Head**
Water body ID	200142	200219
Water body Type	Coastal	Coastal
Heavily Modified?	No	No
River Basin District Name	North East Scotland	North Highland
Surface Area	127.8 km^2	173.5 km^2
Ecological Classification 2022 – Cycle 3	**High**	**Good**
Chemical Classification 2022 – Cycle 3	High	Good
Distance from Project activity	0 (Sothern Landfall)	0 (Northern Landfall)
WFD protected areas within 2 km	Yes	Yes

ENVIRONMENTAL CHARACTERISTICS

The preferred subsea cable corridor is located within the Moray Firth, which is a large inlet opening to the northern North Sea. The Study Area includes the coastline at the northern landfall (Sinclair's Bay) and southern landfall (Rattray Head) sites as well as the cable corridor with a minimum buffer of 10 km.

PHYSICAL CONDITIONS

A more detailed account of baseline physical conditions is included in **Section 7.1 Physical Environment** and **Appendix D: Physical Environment Technical Appendix.**

Hydrological regime

The tidal environment within the Moray Firth is semi-diurnal. Mean Spring Peak Flows are greatest near both the landfall sites; up to approximately 1.5 m/s near the southern landfall site, and 0.9 m/s near the northern landfall site (ABPmer *et al.,* 2008). With respect to tidal range in the Moray Firth, this generally increases from east to west, with a spring range along most of the cable corridor of 2.7 - 2.9 m (ABPMer *et al.,* 2008). At the southern landfall, the spring tidal range is approximately 3.3 m, with a Mean High Water Spring (MHWS) of 4 m, and Mean Low Water Spring (MLWS) of 0.7 m (UHKO, 2023).

The tidal axis (the long-axis orientation of the tidal ellipse) along most of the proposed cable corridor is, generally, aligned approximately north to south (ABPMer *et al.,* 2008). This results in a generally southerly flood tide and northerly ebb tides. The tidal currents, are, generally aligned approximately parallel to the adjacent coastlines.

Morphological conditions

Water depths across the Spittal to Peterhead cable corridor range from 1.2 m to 105.65 m below LAT. Seabed gradients of >5° were observed in the areas of bedrock outcrop and bedforms. Potentially mobile ripples and megaripples were identified throughout the corridor, with crest orientations ranging from east-west to north-south. Other notable features include rippled scour depressions, sand ribbons, boulders, and mounds associated with hard substrate (BGS, 2023).

Regional seabed sediments along the proposed cable corridor ranges from sand to sandy gravel (see Physical Environment Technical Appendix for further details). Sandy gravel was identified at, or near, both the northern and southern landfall sites at Sinclair's Bay and Rattray Head respectively. The highest fines content was observed in the deeper regions (>70 m) of the offshore subtidal corridor (Benthic Solutions, 2024).

WATER AND SEDIMENT QUALITY

Sediment Quality

A number of wastewater treatment plants, dredge spoils deposits sites (closed and open) and industrial marine discharge sites are located near the southern landfall area (**Figure C-4**). These disposal and discharge sites could act as sources of contaminants (e.g. metals and hydrocarbons). However, sediments in the area comprise primarily sand and gravel, reducing the potential for metals' adsorption (process by which heavy metals bind to sediment particles, particularly fines and accumulate as a function of surface area).

Contaminant concentrations in the northern North Sea biogeographic region have been found to be generally above background but below concentrations where adverse effects could occur (Marine Scotland, 2021). A hazardous substances assessment in sediment and biota in the Moray Firth region, revealed that metal inputs were some of the highest across all the regions surveyed and there was an increasing trend for mercury (Hg) (Marine Scotland, 2021). Surveys carried out along the Beatrice wind turbine and cable corridor areas also revealed slightly elevated concentrations of Lead (Pb), typical in areas associated with historical oil and gas activities (Repsol Sinopec Resources UK, 2018). Additionally, slightly elevated arsenic (As) concentrations, but below Cefas Action Level 2 (MMO, 2015), could potentially be present at the landfall areas, as it is common occurrence in the North Sea (e.g. Salamander, 2024). This is due to a legacy of historical industrial discharges, as well as natural chemical weathering processes (Whalley e*t al.,* 1999).

Site-specific grab sampling for sediment physico-chemical data collection was carried out along the proposed cable corridor (Benthic Solution, 2024). Survey data shows that metal contaminant concentrations within the subtidal nearshore and offshore regions, reported low metal concentrations, below Cefas Action Level 1 (Benthic Solutions, 2024). Overall, the results were typical of the northern North Sea biogeographic region and showed no evidence of pollution.

The total hydrocarbon content (THC) of sediments was low throughout the cable corridor with values ranging from 0.18 mgkg-1 to 9.86 mgkg-1, with an average, in the subtidal region of 2.39 mgkg-1±2.13 SD, where it increased with the concentrations of fines (Benthic Solutions, 2024).

Polycyclic aromatic hydrocarbons (PAH) can enter the environment through atmospheric deposition and river run-off and are derived from a variety of sources. Heavy weight PAH (4-6 rings aromatics) are generated primarily from pyrolytic sources, including forest fires and burning of fossil fuels (Neff, 1979). Petroleum derived PAH are primarily characterised by 2-3 rings aromatics. Site-specific subtidal survey data show mixed source variability between the sampling locations, where PAH ranged between 0.0 µgkg-1 and 134.0 µgkg-1 (mean 15.5 µgkg-1±31SD), with stations at KP 92.4 and KP 108.4 showing values above Cefas Action level 1 (100 µgkg-1).

The average TOC in the subtidal survey corridor was moderately low at 0.31% ±0.16SD, with maximum TOC concentrations recorded at the offshore locations (0.94% at KP 67.4) (Benthic Solutions, 2024).

Water Quality

Sea surface salinity in the Moray Firth and the northern North Sea varies between 34 and 35.5 PSU (practical salinity units) and sea surface temperatures range between 7.5 °C and 13.9 °C (Marine Scotland, 2021). Suspended solids concentration (SSC) is generally low throughout, although seasonally variable, with annual surface concentrations averaging 0.7 mg/l (Cefas, 2018).

Water samples with the highest levels of chemical contamination and nutrient concentrations are usually found at inshore estuaries and coastal sites subject to high industrial usage and urbanisation (Marine Scotland, 2021 and Cefas, 2001). However, nutrient concentrations were below assessment criteria and relatively stable. Overall, the Moray Firth showed no evidence of eutrophication as a consequence of nutrient enrichment (Marine Scotland, 2021). The water bodies have a water quality status of High and Good for the Cairnbulg Point to the Ugie Estuary and the Duncansby Head to Noss Head respectively).

ECOLOGICAL CONDITIONS

The following sensitive features were identified within the Intertidal and Benthic Ecology Study Area (KP 0 to KP 164) (**Section 7.2: Benthic Ecology**):

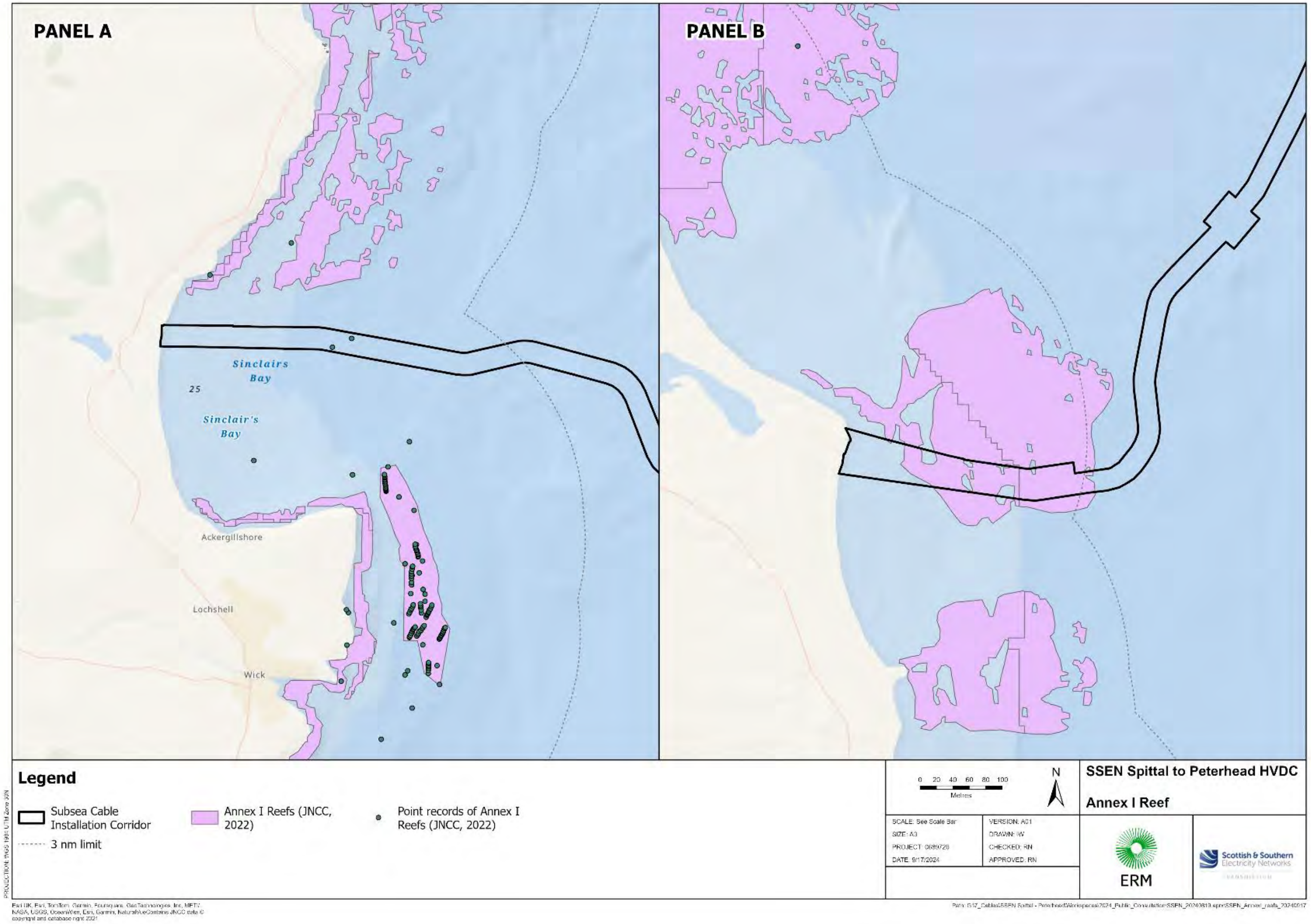
- Annex I Bedrock Reefs;
- Annex I Stony Reefs;
- Annex I Biogenic (*Sabellaria spinulosa*) Reefs;

- Annex I Biogenic (*Modiolus modiolus*) Reefs;
- Priority Marine Feature (PMF) Burrowed Mud;
- PMF Offshore Deep Sea Muds;
- PMF Offshore Subtidal Sands and Gravels;
- PMF Kelp Beds;
- PMF Ocean Quahog (*Arctica islandica*); and
- Dog whelk (*Nucella lapillus*).

Annex I stony and biogenic reefs were identified within the water bodies as shown in **Figure C-5**.

The cable corridor at the southern landfall and within the Cairnbulg Point to the Ugie Estuary water body, overlaps an area identified with an Annex I Reefs habitat (H1170) (JNCC, 2022). Site-specific survey data (Benthic Solutions, 2024) shows the presence of patchy low to medium biogenic reefs (S. spinulosa) and low reefiness stony reef at the southern landfall (**Section 7.2: Benthic Ecology**).

FIGURE C-5 PROJECT LANDFALLS AREAS WITHIN 3 NM LIMIT AND ANNEX I REEFS HABITATS



PROTECTED AREAS

Bathing Waters

There are no designated bathing waters within 2 km of the Project activity at the southern landfall site within the Cairnbulg Point to the Ugie Estuary waterbody, and the northern landfall within the Duncansby Head to Noss Head water body. The closest bathing waters are:

- Peterhead Lido, (classified as Excellent in 2023), >12 km from the southern landfall; and
- Fraserburgh (classified as Excellent in 2023) >11 km from the southern landfall.

Shellfish Waters

The closest designated shellfish waters are Dornoch Firth and Cromarty Bay, located >88 km from the northern landfall site within the Cairnbulg Point to the Ugie Estuary water body.

Marine Protected Areas (MPAs)

Table C-5 identifies the MPAs located in the proximity to the WFD designated water bodies screened in the assessment (the Cairnbulg Point to the Ugie Estuary water body and the Duncansby Head to Noss Head water body). Nature Conservation Marine Protected Areas (NCMPAs), Special Protected Areas (SPA) and Special Areas of Conservation (SAC) have been considered in the assessment. The sites highlighted in yellow represent the MPAs located within 2 km from the water bodies screened in.

TABLE C-5 MARINE PROTECTED AREAS IN THE VICINITY OF THE DESIGNATE WATER BODIES SCREENED IN

Marine Protected Area	Designation	Distance to Project Activity	Features
Southern Trench	NCMPA	0 km - within the Cairnbulg Point to the Ugie Estuary water body	Burrowed mud Fronts Quaternary of Scotland Minke whale Shelf deeps Submarine mass movement
Buchan Ness to Collieston Coast	SPA	4.3 km from the Cairnbulg Point to the Ugie Estuary water body	Fulmar (*Fulmarus glacialis*), breeding Guillemot (*Uria aalge*), breeding Herring gull (*Larus argentatus*), breeding Kittiwake (*Rissa tridactyla*), breeding Shag (*Phalacrocorax aristotelis*), breeding Seabird assemblage, breeding
Troup, Pennan and Lion's Heads	SPA	16.8 km from the Cairnbulg Point to the Ugie Estuary water body	Fulmar (*Fulmarus glacialis*), breeding Guillemot (*Uria aalge*), breeding Herring gull (*Larus argentatus*), breeding Kittiwake (*Rissa tridactyla*), breeding Razorbill (*Alca torda*), breeding Seabird assemblage, breeding
Turbot Bank	NCMPA	42 km from the Cairnbulg Point to the Ugie Estuary water body	Sandeels (*Ammodytes marinus / Ammodytes tobianus*)

Marine Protected Area	Designation	Distance to Project Activity	Features
Moray Firth	SPA	40 km from the Duncansby Head to Noss Head water body	Common scoter (*Melanitta nigra*), non-breeding Eider (*Somateria mollissima*), non-breeding Goldeneye (*Bucephala clangula*), non-breeding Great northern diver (*Gavia immer*), non-breeding Long-tailed duck (*Clangula hyemalis*), non-breeding Red-breasted merganser (*Mergus serrator*), non-breeding Red-throated diver (*Gavia stellata*), non-breeding Scaup (*Aythya marila*), non-breeding Shag (*Phalacrocorax aristotelis*), breeding Shag (*Phalacrocorax aristotelis*), non-breeding Slavonian grebe (*Podiceps auritus*), non-breeding Velvet scoter (*Melanitta fusca*), non-breeding
Moray Firth	SAC	59 km from the Duncansby Head to Noss Head water body	Bottlenose dolphin (*Tursiops truncatus*) Subtidal sandbanks
Noss Head	NCMPA	0 km – within the Duncansby Head to Noss Head water body	Horse mussel beds
East Caithness Cliffs	SPA, SAC and NCMPA	5.2 km from the Duncansby Head to Noss Head water body	Vegetated sea cliffs Cormorant (*Phalacrocorax carbo*), breeding Fulmar (*Fulmarus glacialis*), breeding Great black-backed gull (*Larus marinus*), breeding Guillemot (*Uria aalge*), breeding Herring gull (*Larus argentatus*), breeding Kittiwake (*Rissa tridactyla*), breeding Peregrine (*Falco peregrinus*), breeding Razorbill (*Alca torda*), breeding Shag (*Phalacrocorax aristotelis*), breeding Seabird assemblage, breeding Black guillemot (*Cepphus grylle*)
North Caithness Cliffs	SPA	0 km - within the Duncansby Head to Noss Head water body	Fulmar (*Fulmarus glacialis*), breeding Guillemot (*Uria aalge*), breeding Kittiwake (*Rissa tridactyla*), breeding Peregrine (*Falco peregrinus*), breeding Puffin (*Fratercula arctica*), breeding Razorbill (*Alca torda*), breeding Seabird assemblage, breeding

C.7 STAGE 2 SCOPING

This section outlines the potential risks to the Cairnbulg Point to the Ugie Estuary, and Duncansby Head to Noss Head water bodies, and their quality elements. The Project activities determined to pose a risk of potential impacts during construction, operations, and decommissioning are:

- Trenching;
- HDD; and
- Cable protection installation.

Water bodies and activities can be scoped out of the assessment if it can be adequately demonstrated there is no risk that they will impact the status of WFD water bodies, and the activities are compliant with the requirements of the WFD. A detailed impact assessment is required otherwise.

The operation phase of the Project has been scoped out of the assessment. No seabed disturbance, affecting the water bodies and their quality elements and receptors, has been predicted to occur during the cable operational phase of the Project. Operational investigation survey activities have also been scoped out of the assessment as only small, localised and no non-temporary effects and impacts have been identified as a result of the Project.

The Project decommissioning plan is currently unavailable. A separate WFD compliance assessment will be carried out, at a later stage, to consider the effects of decommissioning activities on the relevant designated water bodies and their quality elements.

The following section considered the potential for the activities listed above to impact WFD receptors, namely: hydromorphology, biology (habitats and fish), water quality and protected areas. Additional consideration is made of potential for introduction or spread of invasive non-native species (INNS). The potential impacts resulting in a "*yes*" and highlighted in yellow, will be taken to stage 3 assessment.

CAIRNBULG POINT TO THE UGIE ESTUARY WATER BODY

Hydromorphology

Table C-6 considers whether the hydromorphology of the water body is at risk from Project activities and details whether a Stage 3 impact assessment will be required.

TABLE C-6 HYDROMORPHOLOGY SCOPING QUESTIONS

Consider if the activity:	Yes/No – Hydromorphology Risk Issues
Could impact on the hydromorphology (for example morphology or tidal patterns) of a water body at high status	No. The water body is of High status; however, the Project footprint is small, and the impact is not predicted to cause significant, non-temporary deterioration.
Could significantly impact the hydromorphology of any water body	No. The impact area is small relative to the size of the receiving environment. The impact is not predicted to cause significant, non-temporary deterioration.
Is in a water body that is heavily modified for the same use as your activity	No. The water body is not classified as HMWB.

Biology

Consider if habitats are at risk of Project activities which have a footprint (including a temperature or sediment plume) of >0.5 km², >1% of the water bodies area, <500 m of any higher sensitivity habitat, or >1% of any lower sensitivity habitat. WFD habitat sensitivity classification is presented in **Table C-7**.

Table C-8 considers if the benthic habitats of the water body are at risk from the Project activity and details whether a Stage 3 impact assessment will be required.

TABLE C-7 EXAMPLE HABITAT SENSITIVITIES

High Sensitivity	Low Sensitivity
Chalk reef	Cobbles, gravel, and shingle
Clam, cockle and oyster beds	Intertidal soft sediments like sand and mud
Intertidal seagrass	Rocky shore
Maerl beds	Subtidal boulder fields
Mussel beds, including blue and horse mussel	Subtidal rocky reef
Polychaete reef	Subtidal soft sediments
Saltmarsh	
Subtidal kelp beds	
Subtidal seagrass	

Note: Higher sensitivity habitats have a low resistance to, and recovery rate from human pressures. Lower sensitivity habitats have a medium to high resistance to, and recovery rate from, human pressures. Source: GOV.UK, Environment Agency (2017).

TABLE C-8 WATER BODY BIOLOGY HABITATS SCOPING QUESTIONS

Consider if the footprint of the activity:	Yes/No – Biology – Habitats Risk Issues
0.5 km^2 or larger	No. The Project footprint (i.e. cable installation corridor) shown in the **Figure C-1** - **Figure C-5** comprises a 500 m buffer along the cable corridor, due to routing uncertainties and potential micro-routing options. In the realistic worst-case scenario a maximum disturbance width of 10 m (trench including installation tool), is expected (the cable length within 3 nm is 5.9 km), leading to a realistic maximum footprint of 0.06 km^2. The potential for a significant sediment plume generated by the trenching activities has been considered; however, the sediment within the water body comprises sand, sandy gravel, gravelly sand and exposed bedrock (not trenched, cable protection applicable), therefore, no spatially or temporally significant plume is predicted as a result of the Project activities. The impact is not predicted to cause significant deterioration.
1% or more of the water body’s area	No. Considering a realistic footprint of 0.06 km^2, the Project activity footprint will cove 0.04% of the water body surface area (173.5 km^2).

Consider if the footprint of the activity:	Yes/No – Biology – Habitats Risk Issues
Within 500m of any higher sensitivity habitat	No. No higher sensitivity habitats have been identified within 500 m of the Project activities (Marine Scotland Maps, 2024).
1% or more of any lower sensitivity habitat	No. The Project activity overlaps an Annex I reefs (H1170) estimated to cover an area of 21.5 km² (JNCC, 2022). Mattresses will be used for cable protection (6 m x 3 m x 0.3 m along the estimated 1.9 km stretch of the cable corridor overlapping the reef), in the realistic worst-case scenario covering 0.03% of the habitat. Therefore, the overall footprint of the disturbance will not affect >1% of the habitat. Mattresses sizes have not changed

Note: A footprint may also be a temperature or sediment plume.

Section 7.2: Benthic Ecology, provides baseline information on the benthic communities found within the Study Area.

Table C-9 details whether an impact assessment for the biology quality element of fish, is required.

TABLE C-9 WATER BODY BIOLOGY FISH SCOPING QUESTIONS

Consider if your activity:	Yes/No – Biology – Fish Risk Issues
Is in an estuary and could affect fish in the estuary, outside the estuary but could delay or prevent fish from entering it or could affect fish migrating through the estuary	No. The Project is not located near an Estuary and the impact of Project activities is not predicted to cause significant, non-temporary deterioration.
Could impact on normal fish behaviour like movement, migration or spawning (for example creating a physical barrier, noise, chemical change or a change in depth or flow)	No. The proposed HDD and trenching activities are of small spatial scale and temporary therefore, the impact is not predicted to cause significant and/or non-temporary deterioration. Rock and mattress protection will only be used where necessary (for reasons of asset integrity or navigational safety) (at the time of writing the report, exact locations of mattresses are unknown) and have a maximum height of 0.3 m and therefore is not predicted to cause significant impacts on fish movement and behaviour across the water body.
Could cause entrainment or impingement of fish.	No. No entrainment or impingement of fish will occur as a result of Project activities.

Section 7.3 Fish and Shellfish Ecology, provides baseline information on the fish communities found within the Study Area.

Water Quality

The water quality of a water body, encompassing its biological and chemical elements, is a WFD receptor. Consequently, any activities that might cause deterioration must be assessed for potential risks. In this context, statutory guidance on water quality contamination is obtained from the EQSD (2008/105/EC), whilst non-statutory guidance on sediment contamination is provided by Cefas Action Levels indicators.

Table C-10, Table C-11 and **Table C-12** detail whether an impact assessment is required for the water quality elements of the water body. This chapter provides baseline information on water and sediment quality within the Project Study Area and the water bodies scoped in for assessment.

TABLE C-10 WATER BODY WATER QUALITY BIOLOGICAL SCOPING QUESTIONS

Consider if your activity:	Yes/No – Water Quality – Biological (Phytoplankton and Algae) Risk Issues
Could the activity affect water clarity, temperature, salinity, oxygen levels, nutrients, or microbial patterns continuously for longer than a spring neap tidal cycle (about 14 days)	No. Water clarity is to be temporarily affected (less than a neap tidal cycle) during trenching, HDD and placement of cable protection. Modelling studies indicate that sand (0.062 mm – 2 mm) and coarse sediment (>2 mm) could disperse up to a maximum of 700 m and 100 m, respectively, from the source of seabed disturbance, whereas silt and clay (at a level above 1 mg/l) may travel over a distance of up to 2 km however, cable-laying activities do not create major or long term change in SSC, with deposits only measurable within a few hundred metres (**Section 7.1 Physical Environment).** Due to the coarse nature of the sediment within the water body, (sand to gravelly sand and gravel), the plume effects would only last a period of minutes to hours in any one location, following discrete seabed disturbance events. As a consequence of HDD, some bentonite clay will be released into the water column, but, due to tidal currents, it will be dispersed rapidly to near-background levels (tens of mg/l), within hundreds of metres of the point of release, limiting accumulation on the seafloor (**Section 7.1 Physical Environment**). Temperature, salinity and dissolved oxygen will not be affected by the Project activities. The impact is therefore not predicted to cause significant, non-temporary deterioration.
Is the activity in a water body with a phytoplankton status of moderate, poor, or bad	No. The water body has a status of High (2022).
Is the activity in a water body with a history of harmful algae?	No. There is no evidence of a history of harmful algae events.

TABLE C-11 WATER BODY WATER QUALITY CHEMISTRY SCOPING QUESTIONS

If your activity uses or releases chemicals (for example through sediment disturbance or building works) consider if:	Yes/No – Water Quality – Chemical Risk Issues

The chemicals are on the Environmental Quality Standards Directive (EQSD) list	No. No discharge of EQS chemicals is expected. Non-toxic, biodegradable bentonite clay has been considered for HDD which is not on the EQSD list. The impact is not predicted to cause significant, non-temporary deterioration.
It disturbs sediment with contaminants above Cefas Action Level 1	No. Site-specific data shows background levels of contaminants in the sediment within the water body (3 nm) and below Cefas Action Level 1.

TABLE C-12 WATER BODY WATER QUALITY CHEMISTRY (MIXING) SCOPING QUESTIONS

If your activity has a mixing zone (like a discharge pipeline or outfall) consider if:	Yes/No – Water Quality – Chemical Risk Issues
The chemicals released are on the Environmental Quality Standards Directive (EQSD) list	No. Water based muds will be used during the HDD activities, not present on the EQS list. No other chemical discharges will occur during trenching and placement of cable protection on the seabed.

Protected Areas

As part of Stage 2 Scoping, it is necessary to evaluate whether WFD protected areas within 2 km of each water body are at risk, as outlined in the Assessment Methodology. These protected areas include SACs, SPAs, bathing waters, nutrient-sensitive areas, and shellfish waters. The protected areas located within or in the vicinity of the water body of Cairnbulg Point to the Ugie Estuary have been discussed, in summary:

- Bathing Waters: No designated bathing waters are located within 2 km;
- Shellfish Waters: No designated shellfish waters are located within 2 km;
- Nutrient Sensitive Areas: The Project location is not within a Nitrate Vulnerable Zone (below MHWS);
- Protected Areas: The closest designated protected area is the Southern Trench NCMPA, located within the water body. The qualifying features of the NCMPA are:
  - Burrowed mud;
  - Fronts;
  - Quaternary of Scotland (moraines and sub-glacier tunnels);
  - Minke whale;
  - Shelf deeps; and
  - Submarine mass movement.

Table C-13 details whether an impact assessment is required for the protected areas element of the water body.

TABLE C-13 WATER BODY PROTECTED AREAS SCOPING QUESTIONS

Consider if your activity is:	Yes/No – Protected Areas Risk Issues
Within 2 km of any WFD protected area*	**Yes**, The Project overlaps the Southern Trench NCMPA. The impacts of the Project activities on the protected areas are discussed in **APPENDIX B:, NCMPA Assessment**. No Bathing Waters nor Shellfish Water are located within 2 km of the Project activity.

* a regulator can extend the 2km boundary if the desired activity has an especially high environmental risk.

Invasive Non-Native Species (INNS)

Table C-14 details whether an impact assessment is required for the INNS quality element of the water body.

TABLE C-14 WATER BODY INVASIVE SPECIES SCOPING QUESTIONS

Consider if your activity is:	Yes/No – INNS Risk Issues
Introduce or spread INNS	No. Vessel movements will be limited to the Moray Firth area. Vessels will comply with the International Maritime Organization (IMO) ballast water management guidelines will ensure that the risk of potential introduction and spread of INNS will be minimised. The impact is not predicted to cause significant, non-temporary deterioration.

SUMMARY OF THE CAIRNBULG POINT TO THE UGIE ESTUARY WATER BODY STAGE 2 SCOPING

A summary of the Scoping outcome assessing the effects of the Project on the Cairnbulg Point to the Ugie Estuary water body is shown in **Table C-15.**

TABLE C-15 WATER BODY SUMMARY OF SCOPING QUESTIONS

Receptor	Potential Risk to Receptor?	Note the risk issue(s) for impact assessment
Hydromorphology	No	-
Biology: habitats	No	-
Biology: fish	No	-
Water quality: biology	No	-
Water Quality: chemistry and mixing	No	-
Protected areas	**Yes**	The Project overlaps the Southern Trench NCMPA.
INNS	No	-

Potential impacts have been identified for the protected areas quality element of Cairnbulg Point to the Ugie Estuary water body and therefore, the receptor have been taken to Stage 3 assessment.

DUNCANSBY HEAD TO NOSS HEAD WATER BODY

Hydromorphology

Table C-16 considers if the hydromorphology of the water body is at risk from the Project activity and details whether a Stage 3 impact assessment will be required.

TABLE C-16 HYDROMORPHOLOGY SCOPING QUESTIONS

Consider if the activity:	Yes/No – Hydromorphology Risk Issues
Could impact on the hydromorphology (for example morphology or tidal patterns) of a water body at high status	No. The water body is of Good status.
Could significantly impact the hydromorphology of any water body	No. The impact area is small relative to the size of the receiving environment. The impact is not predicted to cause significant, non-temporary deterioration.
Is in a water body that is heavily modified for the same use as your activity	No. The water body is not classified as HMWB.

Biology

Consider if habitats are at risk of Project activities which have a footprint (including a temperature or sediment plume) of >0.5 km², >1% of the water bodies area, <500 m of any higher sensitivity habitat, or >1% of any lower sensitivity habitat (**Table C-17**). WFD habitat sensitivity classification is presented in **Table C-17**. **Table C-18** considers if the benthic habitats of the water body are at risk from the Project activity and details whether a Stage 3 impact assessment will be required.

TABLE C-17 EXAMPLE HABITAT SENSITIVITIES

High Sensitivity	Low Sensitivity
Chalk reef	Cobbles, gravel, and shingle
Clam, cockle and oyster beds	Intertidal soft sediments like sand and mud
Intertidal seagrass	Rocky shore
Maerl beds	Subtidal boulder fields
Mussel beds, including blue and horse mussel	Subtidal rocky reef
Polychaete reef	Subtidal soft sediments
Saltmarsh	
Subtidal kelp beds	
Subtidal seagrass	

Note: Higher sensitivity habitats have a low resistance to, and recovery rate from human pressures. Lower sensitivity habitats have a medium to high resistance to, and recovery rate from, human pressures. Source: GOV.UK, Environment Agency (2017).

TABLE C-18 WATER BODY BIOLOGY HABITATS SCOPING QUESTIONS

Consider if the footprint of the activity:	Yes/No – Biology – Habitats Risk Issues
0.5 km^2 or larger	No. The Project footprint (i.e. cable installation corridor) comprises a 500 m buffer along the cable corridor, due to routing uncertainties and potential micro-routing options. In the realistic worst-case scenario a maximum disturbance width of 10 m (including trench and installation tool), is expected (the cable length within 3 nm is 8.7 km), leading to a realistic maximum footprint of 0.09 km^2. The potential for a significant sediment plume generated by the trenching activities has been considered however, the sediment within the water body comprises sand, sandy gravel, gravelly sand and exposed bedrock (not trenched, cable protection applicable); therefore, no spatially or temporally significant plume is predicted as a result of the Project activities. The impact is not predicted to cause significant deterioration.
1% or more of the water body's area	No. Considering a realistic footprint of 0.09 km^2, the Project activity footprint will cove 0.07% of the water body surface area (127.8 km^2).
Within 500 m of any higher sensitivity habitat	No. No higher sensitivity habitats have been identified within 500 m of the Project activities. The closest higher sensitivity habitat, horse mussel beds, are located >1 km from the cable corridor (Marine Scotland, 2024).
1% or more of any lower sensitivity habitat	No. Site-specific surveys did not detect the presence of any lower sensitivity habitat.

Note: A footprint may also be a temperature or sediment plume.

Section 7.2 Benthic Ecology, provides baseline information on the benthic communities found within the Study Area.

Table C-19 details whether an impact assessment for the biology quality element of fish, is required.

TABLE C-19 WATER BODY BIOLOGY FISH SCOPING QUESTIONS

Consider if your activity:	Yes/No – Biology – Fish Risk Issues
Is in an estuary and could affect fish in the estuary, outside the estuary but could delay or prevent fish from entering it or could affect fish migrating through the estuary	No. The Project is not located near an Estuary and the impact of Project activities is not predicted to cause significant, non-temporary deterioration.
Could impact on normal fish behaviour like	No.

Consider if your activity:	Yes/No – Biology – Fish Risk Issues
movement, migration or spawning (for example creating a physical barrier, noise, chemical change or a change in depth or flow)	The proposed HDD and trenching activities are of small scale and temporary therefore, the impact is not predicted to cause significant and/or non-temporary deterioration. Rock and mattresses protection may be used sparingly (at the time of writing the report, exact locations of mattresses are unknown) and have a maximum height of 0.3 m and therefore is not predicted to cause significant impacts on fish movement and behaviour across the water body.
Could cause entrainment or impingement of fish.	No. No entrainment or impingement of fish will occur as a result of the Marine Infrastructure Project activities.

Section 7.3 Fish and Shellfish Ecology, provides baseline information on the fish communities found within the Study Area.

Water Quality

The water quality of a water body, encompassing its biological and chemical elements, is a WFD receptor. Consequently, any activities that might cause deterioration must be assessed for potential risks. In this context, statutory guidance on water quality contamination is obtained from the EQSD (2008/105/EC), whilst non-statutory guidance on sediment contamination is provided by Cefas Action Levels indicators.

Table C Table C-20, **Table C-21** and **Table C-22** detail whether an impact assessment is required for the water quality elements of the water body. This Appendix provides baseline information on water and sediment quality within the Project Study Area and the water bodies scoped in for assessment.

TABLE C-20 WATER BODY WATER QUALITY BIOLOGICAL SCOPING QUESTIONS

Consider if your activity:	Yes/No – Water Quality – Biological (Phytoplankton and Algae) Risk Issues
Could the activity affect water clarity, temperature, salinity, oxygen levels, nutrients, or microbial patterns continuously for longer than a spring neap tidal cycle (about 14 days)	No. Water clarity is to be temporarily affected (less than a neap tidal cycle) during trenching, HDD and placement of cable protection. In terms of trenching, modelling studies indicate that sand (0.062 mm – 2 mm) and coarse sediment (>2 mm) could disperse up to a maximum of 700 m and 100 m, respectively, from the source of seabed disturbance, whereas silt and clay (at a level above 1 mg/l) may travel over a distance of up to 2 km however, cable-laying activities do not create major or long term change in SSC, with deposits only measurable within a few hundred metres (**Section 7.1 Physical Environment).** Due to the coarse nature of the sediment (sand to gravelly sand and gravel), the plume effects would only last a period of minutes to hours in any one location following discrete seabed disturbance events. As a consequence of HDD, some bentonite clay will be released into the water column, but, due to tidal currents, it will be dispersed rapidly to near-background levels (tens of mg/l), within hundreds of metres of the point of release, limiting accumulation on the seafloor (**Section 7.1Physical Environment)**. Temperature, salinity and dissolved oxygen will not be affected by the Project

Consider if your activity:	Yes/No – Water Quality – Biological (Phytoplankton and Algae) Risk Issues
	activities. The impact is therefore not predicted to cause significant, non-temporary deterioration.
Is the activity in a water body with a phytoplankton status of moderate, poor, or bad	No. The water body has a status of Good (2022).
Is the activity in a water body with a history of harmful algae?	No. There is no evidence of a history of harmful algae events.

TABLE C-21 WATER BODY WATER QUALITY CHEMISTRY SCOPING QUESTIONS

If your activity uses or releases chemicals (for example through sediment disturbance or building works) consider if:	Yes/No – Water Quality – Chemical Risk Issues
The chemicals are on the Environmental Quality Standards Directive (EQSD) list	No. No discharge of EQS chemicals is expected. Non-toxic, biodegradable bentonite clay has been considered for HDD which is not on the EQSD list. The impact is not predicted to cause significant, non-temporary deterioration.
It disturbs sediment with contaminants above Cefas Action Level 1	No. Site-specific data shows background levels of contaminants in the sediment within the water body (3 nm) and below Cefas Action Level 1.

TABLE C-22 WATER BODY WATER QUALITY CHEMISTRY (MIXING) SCOPING QUESTIONS

If your activity has a mixing zone (like a discharge pipeline or outfall) consider if:	Yes/No – Water Quality – Chemical Risk Issues
The chemicals released are on the Environmental Quality Standards Directive (EQSD) list	No. Water based muds will be used during the HDD activities, not present on the EQS list. No other chemical discharges will occur during trenching and placement of cable protection on the seabed.

Protected Areas

As part of Stage 2 Scoping, it is necessary to evaluate whether WFD protected areas within 2km of each water body are at risk, as outlined in the Assessment Methodology. These protected areas include NCMPAs, SACs, SPAs, bathing waters, nutrient-sensitive areas, and shellfish waters. The protected areas located within or in the vicinity of the water body of Duncansby Head to Noss Head have been discussed in Environmental Characteristics, in summary:

- Bathing Waters: No designated bathing waters are located within 2 km;
- Shellfish Waters: No designated shellfish waters are located within 2 km;

- Nutrient Sensitive Areas: The Project location is not within a Nitrate Vulnerable Zone (below MHWS);
- Protected Areas: The closest designated protected areas are the Noss Head NCMPA and the North Caithness Cliffs SPA, both located within the water body however, they are approximately 2.1 km and 7 km from any Projected activities (outside of the plume area of influence).

Table C-23 details whether an impact assessment is required for the protected area element of the water body.

TABLE C-23 WATER BODY PROTECTED AREAS SCOPING QUESTIONS

Consider if your activity is:	Yes/No – Protected Areas Risk Issues
Within 2 km of any WFD protected area*	No. No MPAs, Bathing Waters nor Shellfish Water are located within 2 km of the Project activity. The closest MPA, the Noss Head NCMPA is located 2.1 km from any Project activity.

* A regulator can extend the 2km boundary if the desired activity has an especially high environmental risk.

Invasive non-Native Species (INNS)

Table C-24 details whether an impact assessment is required for the INNS element of the water body.

TABLE C-24 WATER BODY INVASIVE SPECIES SCOPING QUESTIONS

Consider if your activity is:	Yes/No – INNS Risk Issues
Introduce or spread INNS	No. Vessel movements will be limited to the Moray Firth area. Vessels will comply with the International Maritime Organization (IMO) ballast water management guidelines will ensure that the risk of potential introduction and spread of INNS will be minimised. The impact is not predicted to cause significant, non-temporary deterioration.

SUMMARY OF THE DUNCANSBY HEAD TO NOSS HEAD WATER BODY STAGE 2 SCOPING

A summary of the Scoping outcome assessing the effects of Project on the Duncansby Head to Noss Head water body is shown in Table **C-25**.

TABLE C-25 WATER BODY SUMMARY OF SCOPING QUESTIONS

Receptor	Potential Risk to Receptor?	Note the risk issue(s) for impact assessment
Hydromorphology	No	-
Biology: habitats	No	-
Biology: fish	No	-
Water quality: biology	No	-
Water Quality: chemistry and mixing	No	-

Protected areas	No	-
INNS	No	-

C.8 STAGE 3 ASSESSMENT

SUMMARY AND ASSESSMENT

Stage 3 Assessment considers the potential impacts identified in Stage 2 Scoping and considering the Project mitigations measures, assesses these risks for compliance with the WFD and RBMP objectives.

Potential impacts from the Project construction activities, including trenching, HDD and cable protection installation, were identified on the protected areas quality element of the Cairnbulg Point to the Ugie Estuary water body. The impacts of the Project activity on the Southern Trench NCMPA have been extensively assessed in **APPENDIX B: NCMPA assessment** and therefore, will not be described in this section.

In summary, the NC MPA risk assessment states that no potentially significant impact pathways have been identified for the majority of the designated features of the Southern Trench NCMPA and have been screened out of the assessment. Potential hazards affecting the Quaternary of Scotland feature have been screened in for assessment however, after the implementation of mitigation measures (e.g. micro-siting) no significant risks have been identified. Therefore, the impact of construction activities (trenching, HDD and cable protection installation) are not predicted to cause significant, non-temporary deterioration. Additionally, the Project activities will not impede support to RBMP objectives and the achievement of GES.

C.9 CONCLUSIONS

Stage 1 screening and Stage 2 scoping assessment have evaluated all activities that could potentially impact WFD designated water bodies, including their quality elements and statutory receptors. The impacts of the operation, operational investigation surveys, and decommissioning phases of the Project were screened out in Stage 1. The impacts of the Project construction phase, which included trenching, HDD and cable protection installation were scoped out in Stage 2 for the quality elements of the Duncansby Head to Noss Head water body and the majority of the quality elements for the Cairnbulg Point to the Ugie Estuary water body. The potential impacts of the Project construction activity on the Southern Trench NCMPA (for the Cairnbulg Point to the Ugie Estuary water body), WFD designated protected area, was taken to Stage 3 assessment.

The identified potential impacts of the Project activities associated with the construction, phase of the Project were examined in the Stage 3 assessment to determine whether:

- The Project activities will cause any significant, non-temporary deterioration of the water body;
- The Project activities will support RBMP objectives; and
- The achievement of WFD objectives (GES or GEP) is likely to be prevented.

It has been determined that it is improbable that the Project, upon implementation of mitigation measures, will yield any significant, non-temporary effects on any water body. Additionally, the Project will not hinder and will support the achievement of WFD and RBMP objectives. Consequently, the Project is determined to align with the requirements of the WFD and therefore, is considered to be WFD compliant.

APPENDIX D: PHYSICAL PROCESSES TECHNICAL APPENDIX

D.1 INTRODUCTION

As part of the Marine Environmental Assessment for SSEN Spittal to Peterhead HVDC Subsea Link (hereafter referred to as 'the Project'), this technical report has been prepared to describe the potential effects of the Project on the marine Physical Environment during the construction and operation stages.

To enable the potential effects of the Project to be assessed, a description of the current Physical Environment has been produced, to provide a robust baseline against which the assessment will be undertaken. The baseline has been informed by a desk-based literature review, including collation and review of open-source bathymetric and geology data, as well as analysis of site-specific data. The Physical Environment baseline includes:

- Seabed bathymetry (including geomorphology);
- Seabed geology;
- Superficial sediment;
- Tidal currents;
- Storm surges;
- Waves ;
- Stratification;
- Sediment transport;
- Coastal characteristics; and
- Designated sites.

The proposed Project works have the potential to result in environmental effects upon the Physical Environment. The effects on the Physical Environment are assessed for the realistic worst-case Project Design Envelope (PDE) defined in the MEA report.

It should be noted that, in most cases, the Physical Environment is not in itself, a sensitive receptor, but instead, changes in physical environment create pathways that have the potential to indirectly impact other environmental receptors. The pathways that will be assessed in the MEA are summarised in **Table D-1**.

TABLE D-1 SUMMARY OF POTENTIAL PATHWAYS (PHYSICAL ENVIRONMENT)

Potential Pathway of Impact for Other Topics	**Relevant Phase of Project**		
	Installation	Operation	Decommissioning
Change in wave and regime and tidal currents	Effects likely to be negligible, short term, and spatially restricted	Possible near-field effects depending on cable protection methods	Effects likely to be negligible, short term, and spatially restricted
Increase in suspended sediment concentration	Effects likely to be negligible, short term, and spatially restricted	Effects likely to be negligible, short term, and spatially restricted	Effects likely to be negligible, short term, and spatially restricted
Change to sediment transport system	Effects likely to be negligible and spatially restricted	Possible depending on cable protection methods, but effects likely to be low and spatially restricted	Effects likely to be negligible and spatially restricted

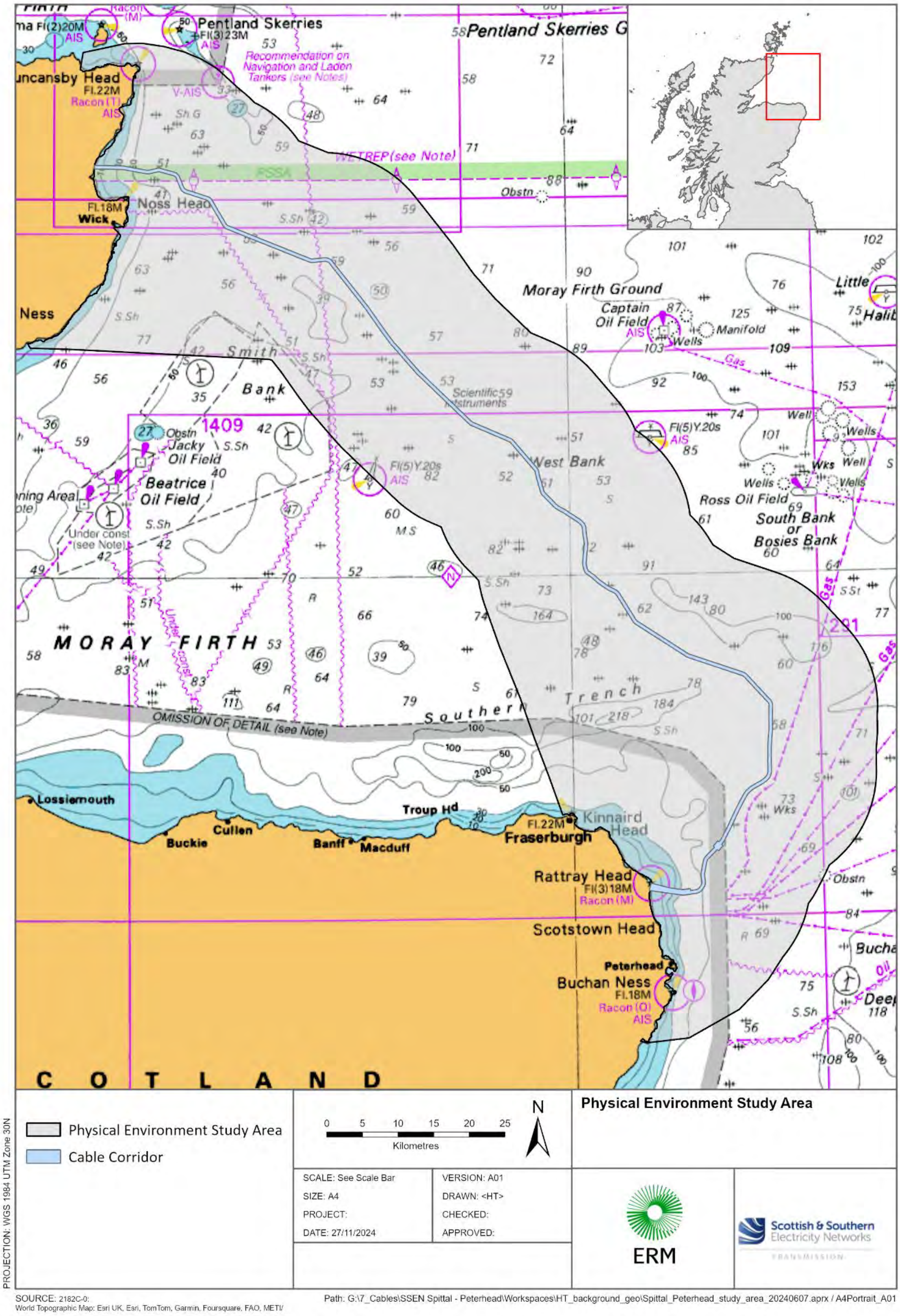
Change in the seabed morphology of protected features	Subglacial tunnel valleys	Effects likely to be negligible, short term, and spatially restricted	Effects likely to be negligible, short term, and spatially restricted	Effects likely to be negligible, short term, and spatially restricted
	Moraines	Effects depending upon cable installation methods and composition and consolidation of till	Effects depending upon cable installation methods and composition and consolidation of till	Effects depending upon cable installation methods and composition and consolidation of till
	Slide scars	Effects likely to be negligible or low due to distance from cable route	Effects likely to be negligible or low due to distance from cable route	Effects likely to be negligible or low due to distance from cable route
Change in coastal morphology		Effects likely to be low (depending on installation methods) and spatially restricted	Effects likely to be low (depending on installation methods) and spatially restricted	Effects likely to be low (depending on installation methods) and spatially restricted

D.2 STUDY AREA

The preferred subsea cable corridor is located within the Moray Firth, which is a large inlet opening to the northern North Sea. For the purpose of this report, the Physical Environment Study Area includes the coastline at the northern landfall (Sinclair's Bay) and southern landfall (Rattray Head) sites, as well as the cable route with a minimum buffer of 15 km (**Figure D-1**). The Physical Environment Study Area is determined by regional marine and coastal hydrodynamic processes and other, local, project-specific influences. At the northern landfall site, the Physical Environment Study Area extends from Fraserburgh (~15 km to the northwest) to Cruden Bay (~20 km to the south). At the Rattray Head landfall, the Physical Environment Study Area extends from Invershore (~15 km to the north) to Gills Bay (~25 km to the south).

Throughout this Physical Processes Technical Appendix, Kilometre Points (KPs) are used to refer to specific areas within the Physical Environment Study Area. These KPs correspond to the survey route, and may differ from the final installation KPs.

FIGURE D-1 PHYSICAL ENVIRONMENT STUDY AREA



D.3 DATA SOURCES

Table D-2 summarises key Physical Environment data sources used to define the baseline environment.

TABLE D-2 KEY BASELINE DATA SOURCES FOR THE PHYSICAL ENVIRONMENT

Source	Summary	Coverage
The European Marine Observation and Data Network (EMODnet) for thematic mapping of bathymetry, seabed substrate and geology	Baseline mapping of bathymetry, seabed substrate and sub-surface geology to provide an overview of seabed conditions, complementing site-specific surveys	Full study area
British Geological Survey (BGS)	Quaternary geology, bedrock geology, and seabed sediments	Full study area
Copernicus Marine	Baseline mapping of (amongst other things) wind, wave and temperature characteristics	Global coverage
Cefas	Wavenet - Hourly timeseries of metocean data including wave height, period, peak direction, and sea temperature	Nearest buoy is Moray Firth Wavenet, in the inner Firth
ABPmer - Seastates	Long term (back to 1979) wave hindcast hourly model of wave parameters, including significant wave height, maximum wave height, wave period and wave direction	Full study area
United Kingdom Hydrographic Office (UKHO) seabed mapping service	Recent and historic seabed bathymetry data	Coverage over most of the area at 4 m resolution. Coverage of KP1 to 10 at 2 m resolution
Various scientific literature	Papers include those relating to the bedrock and Quaternary geology, past sea-level and ice sheets, metocean conditions, sediment transport, and coastal systems	Various

D.4 SITE-SPECIFIC SURVEY DATA

Project-specific geophysical and environmental surveys were undertaken by REACH Subsea with Blocks 2-7 (offshore) acquired between 18 December 2023 and 31 January 2024, Block 1 (nearshore at Brough Head) acquired between 30 October 2023 and 22 November 2023, and Block 8 (nearshore at Rattray Head) acquired between 02 December 2023 and 01 March 2023. After indications were noted of *Sabellaria* reef formations within the survey corridor in Block 7, additional geophysical and visual survey was completed between 13-20 March 2024.

The geophysical data included multibeam echosounder, sidescan sonar, sub-bottom profiler, and magnetometer/gradiometer. The geophysical data covers the approximately 172 km long route with a 500 m survey corridor achieved by 17 survey lines at 30 m spacing and crosslines along the route at 5 km intervals. The nearshore landfalls are covered by survey grids completing full coverage of the route. A wider section was surveyed near to Sinclair's Bay to provide some route-engineering choices depending on the existing local infrastructure constraints. This section extended from approximately KP 2 to KP 10, with a width of ~10.5 km (east to west) and ~13 km (north to south).

Environmental seabed sampling and video assessment was carried out at intervals along the cable route. Intertidal data was acquired over approximately 3 km total, in addition to seabed sampling in the upper to lower eulittoral zone.

The results of the geophysical and environmental surveys are presented in the following reports:

- SSEN Transmission Spittal to Peterhead Marine Cable Route Survey Geophysical Interpretation Report (REACH-7506-SR-001) (REACH Subsea, 2024b); and
- SSEN Transmission Spittal to Peterhead Habitat Assessment and Environmental Baseline Report (REACH-7506-SR-EBS-02) (REACH Subsea, 2024a).

The geotechnical site investigation conducted by Altantis Geoservices Ltd was performed from 22 January 2024 to 19 February 2024. Multiple geotechnical testing and sampling techniques were used throughout the campaign. This included:

- 89 Seabed Cone Penetration Test (CPT) locations and 21 bumpover locations; and
- 83 Vibrocore (VC) locations and 16 bumpover locations.

The results from the geotechnical site investigation are presented in:

- SSEN Transmission Spittal to Peterhead Geotechnical Results Report REACH-7506-SR-003-R01;
- SSEN Transmission Spittal to Peterhead Geotechnical Laboratory Test Report REACH-7506-SR-004-02; and
- SSEN Transmission Spittal to Peterhead Integrated Report REACH-7506-SR-002 Integrated Report_Rev2.

D.5 BASELINE CONDITIONS

Bathymetry

Publicly available and site-specific data were used to investigate the bathymetry in the Moray Firth area. United Kingdom Hydrographic Office (UKHO) bathymetry provided full coverage of the area at a resolution of 4 m. Local, higher resolution, bathymetry data (2 m resolution) cover the area surrounding the cable corridor, between KP 1.5 and 10.1 (UKHO, 2022). Site-specific bathymetric data were acquired in 2023, for a 500 m wide cable corridor, at 0.2 m resolution, by REACH Subsea (REACH Subsea, 2024b).

The Moray Firth is a large inlet on the northeast coast of Scotland opening to the northern North Sea to the east and the north (**Figure D-1**). The deepest point of the Firth is within the Southern Trench, a west to east orientated channel, lying off the southern shoreline of the Firth, to the west of the cable route, where depths of more than 220 m are encountered. Depths shoal to approximately 40 m in the centre of the Firth, on Smith Bank, to the west of the northern section of the proposed cable route.

According to the 2023 REACH Subsea geophysical survey (REACH Subsea, 2024b), water depths across the Spittal to Peterhead cable corridor range from -1.2 m to 105.65 m below LAT

(REACH Subsea, 2024b). The minimum water depths were located at KP 0.14, and the maximum water depths were located at KP 91.7. Seabed gradients of >5° were observed in the areas of bedrock outcrop and bedforms, with the maximum seabed gradient (35-40°) associated with an outcrop at KP 157.4 (REACH Subsea, 2024b).

Seabed Geomorphology

There are a number of potentially active and relict bedforms and geomorphological features in the Physical Environment Study Area, reflecting contemporary seabed processes and past glacial and geological activity. Approximately 20 km offshore from the proposed southern landfall site at Rattray Head, there is a potentially mobile sand wave field in approximately 80 m below LAT, with crests oriented approximately southwest-northeast. The scale of these bedforms varies across the area, but the amplitudes are generally 1-10 m[38] and wavelengths generally 30-100 m. Bedforms identified in the cable corridor by REACH Subsea (2024b) include ripples (with wavelengths 0.5-2 m and crest heights of 0.1-0.3 m) and megaripples (with wavelength of 5-60 m and crest heights of 0.1-1.5 m), which are predominantly oriented north-south. Between KP 8.30 and KP 30.3, the bedforms are oriented east-west. Between KP 33.2 and KP 89.8, the ripples are predominantly located within relative seabed depressions, which are channelised in some areas, and may be rippled scour depressions (RSDs) (**Figure D-2**). Where the depressions have a channelised form, they vary from north-south to northeast-southwest orientation.

There are sand ribbons with parasitic bedforms around KP 8.7 (**Figure D-3**), which correspond to an area with a higher proportion of gravel, while hard substrate offshore the northern landfall site (identfied by BGS, 2023b) is visible in the bathymetry data as mounds which transition into northeast-southwest oriented linear features (**Figure D-4**). In water depths of 56-66 m below LAT these are likely to correspond to bedrock.

Frequent boulders[39] can be seen in the bathymetry data throughout the corridor. The boulders have diameters of <0.3-5.9 m and heights of <0.1-1.7 m. Between KP 97.4 and KP 141.4 some of the boulders are associated with scour, forming northwest-southeast oriented linear depressions (**Figure D-5**).

Given the dimensions of the bedforms, sandwave levelling will not be required prior to cable installation. However, boulder clearance and pre-lay grapnel run (PLGR) are likely to be undertaken.

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[38] Bedforms smaller than this may be present in this area, but are below the resolution of the UKHO bathymetric data.
[39] Only boulders equal to or larger than 0.3 m, in any dimension, were individually picked by Reach Subsea (2024); and only boulders equal to or greater than 1 m, in any dimension, were picked within the boulder fields.

FIGURE D-2 BATHYMETRY DATA IN THE MORAY FIRTH AREA (SOURCE: EMODNET, 2020; REACH SUBSEA, 2024a)

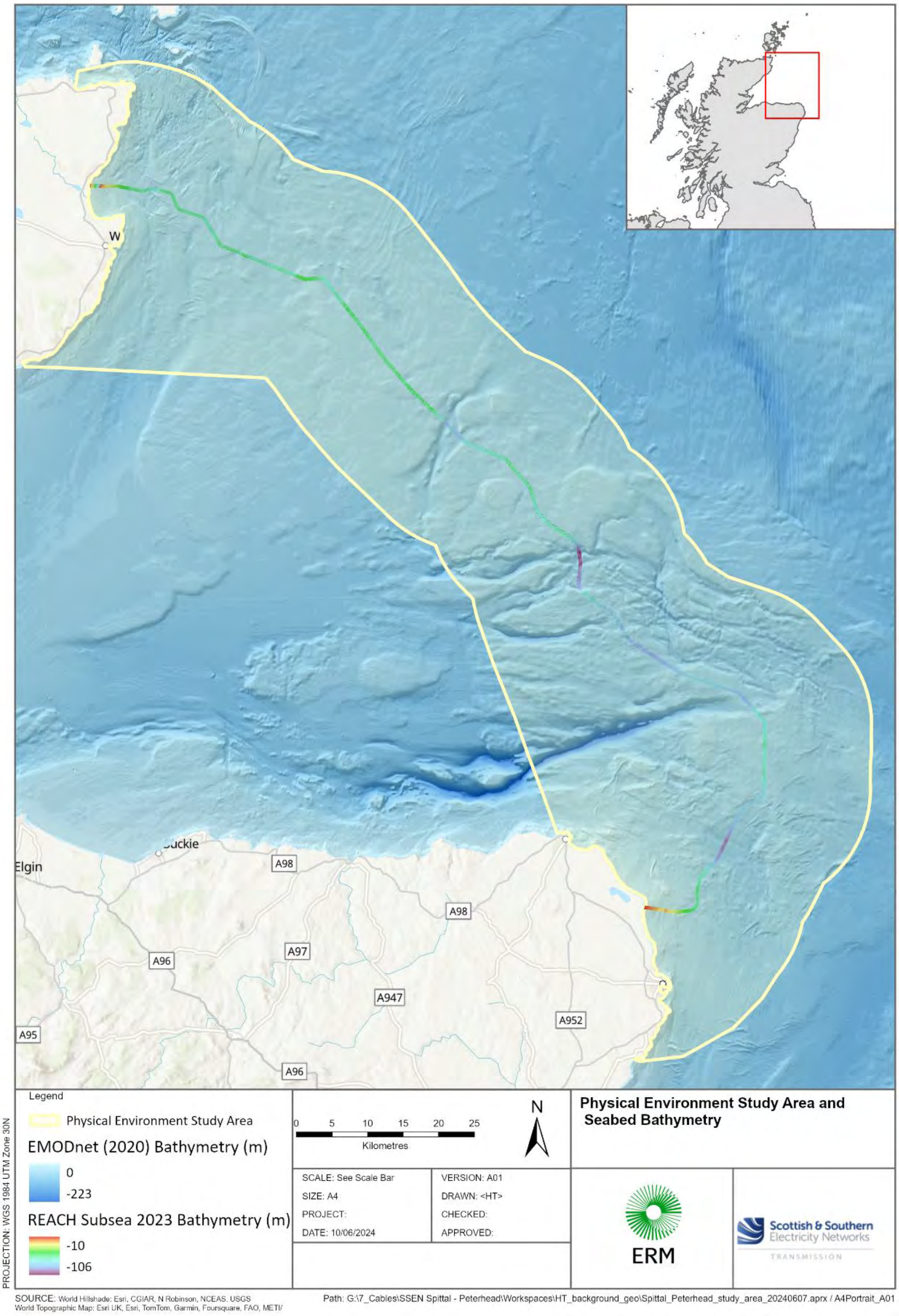


FIGURE D-3 WINNOWED CHANNEL BETWEEN KP 78.2 AND KP 78.5 (SOURCE: REACH SUBSEA, 2024b)

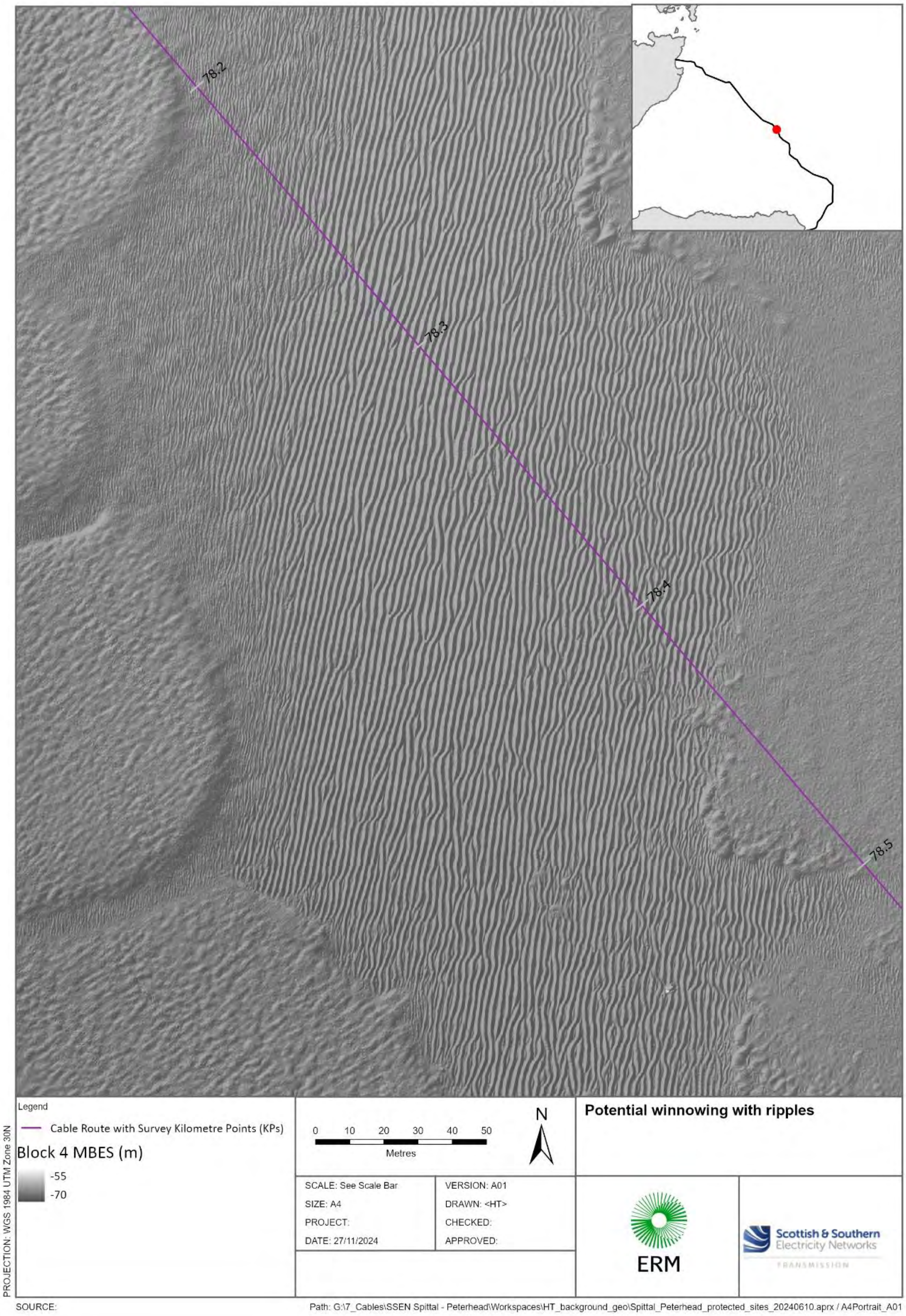


FIGURE D-4 HARD SUBSTRATE AND SAND RIBBONS BETWEEN KP 7.3 AND KP 10.9 (SOURCE: REACH SUBSEA, 2024a)

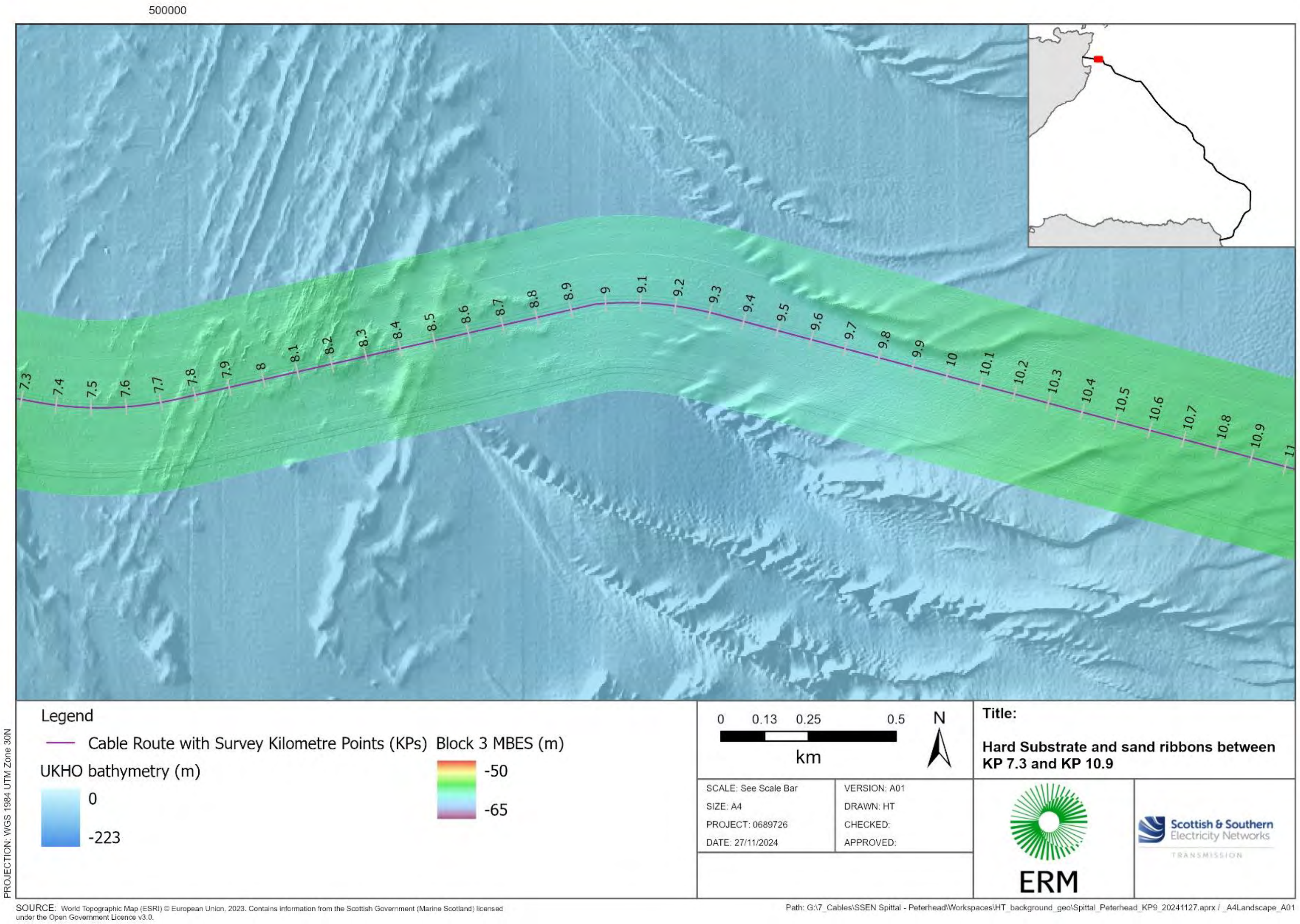
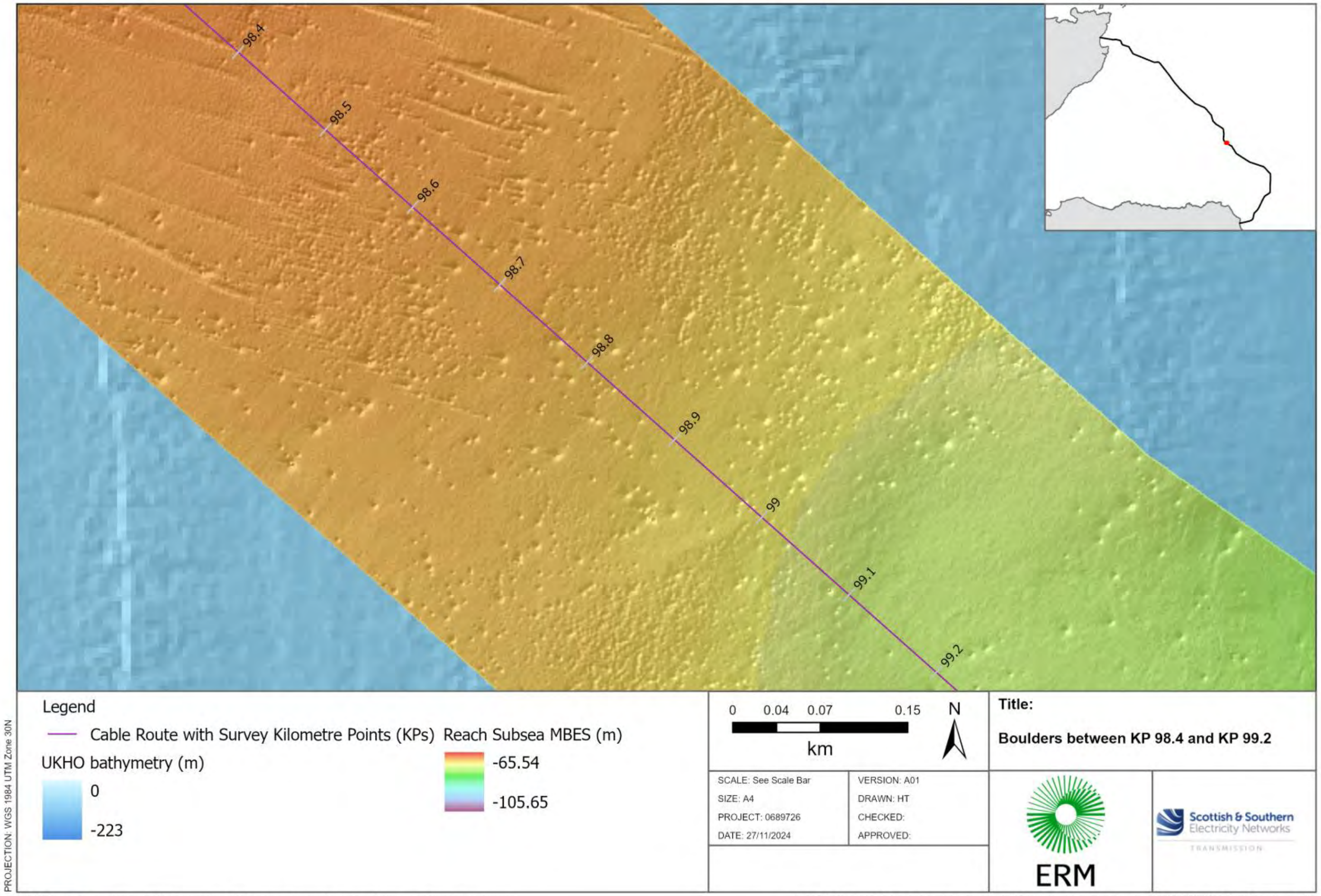


FIGURE D-5 BOULDERS BETWEEN KP 98.3 AND KP 99.2 (SOURCE: REACH SUBSEA, 2024b)



SOURCE: World Topographic Map (ESRI) © European Union, 2023. Contains information from the Scottish Government (Marine Scotland) licensed under the Open Government Licence v3.0.

Path: G:\7_Cables\SSEN Spittal - Peterhead\Workspaces\HT_background_geo\Spittal_Peterhead_KP99_20241127.aprx / _A4Landscape_A01

Regional Geology

PRE-QUATERNARY GEOLOGY

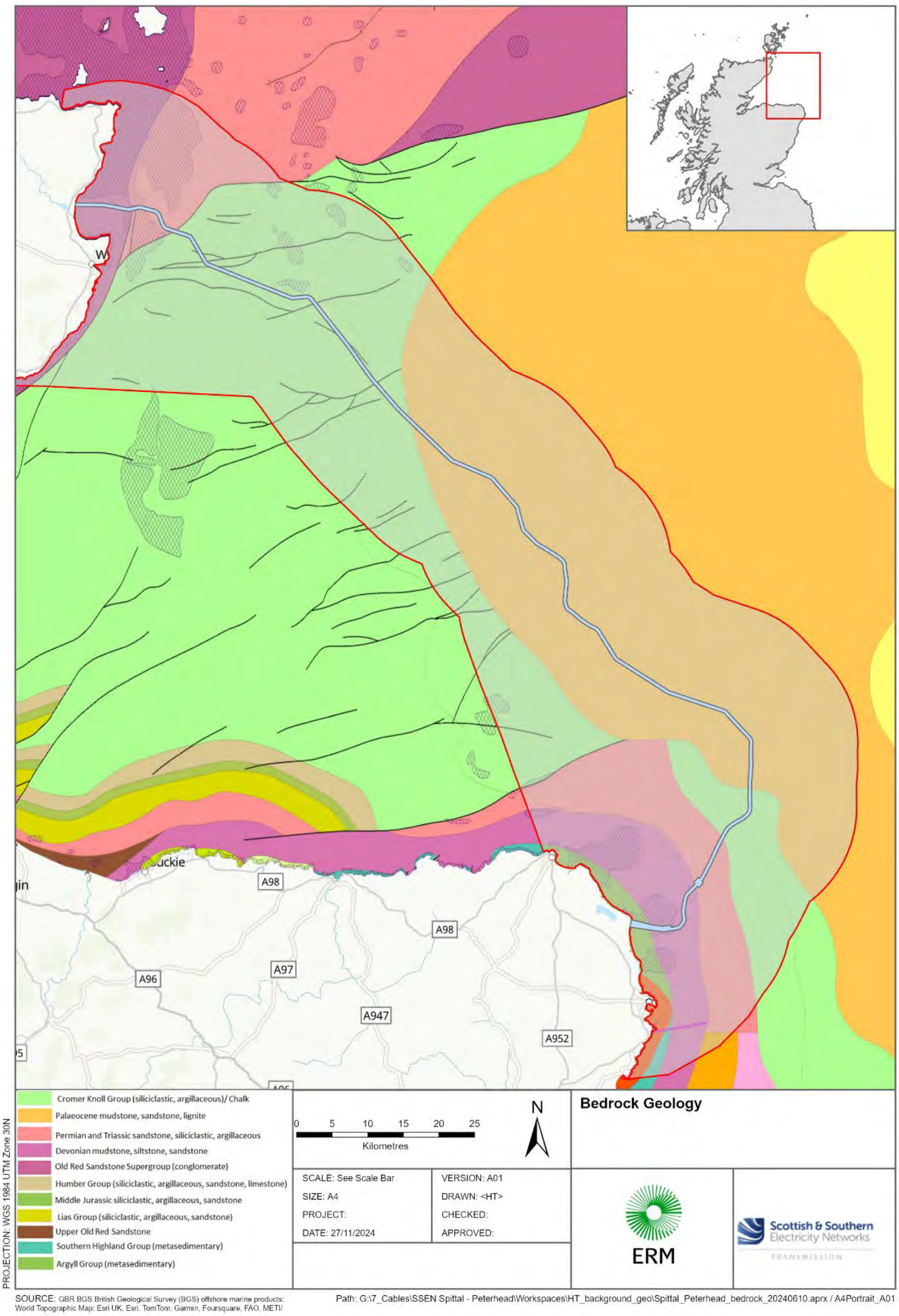
The structure of the bedrock beneath the Moray Firth is characterised by a complex pattern of faulted half-grabens (basins) and fault block highs (platforms) that developed during crustal extension (Andrews, 1990). As a result of this extension, east-northeast to west-southwest trending faults were formed, that intersect the cable corridor (**Figure D-6**). The Moray Firth has been a depositional centre from Devonian times to present, and the maximum sedimentary thickness within the inner Moray Firth Basin correspond to locations of the half-grabens.

The bedrock geology in the Moray Firth predominantly consists of Paleogene (66–23 Ma) interbedded sedimentary units (lignite and undifferentiated mudstone and sandstone) and Cretaceous (145–66 Ma) sedimentary units (chalk and siliciclastic argillaceous rocks of the Cromer Knoll Group) (**Figure D-6**). Closer to both coasts, the bedrock beneath the proposed cable route consists of older Triassic (252– 201 Ma) and Permian (299–252 Ma) interbedded units of undifferentiated sandstone, with conglomerate, siltstone, mudstone with evaporites to the north, and siliciclastic, argillaceous units to the south (**Figure D-6**).

Further landward, on both ends of the proposed cable route, the bedrock consists of Devonian (419–359 Ma) units, with these units consisting of undifferentiated mudstone, siltstone, and sandstone to the north, and conglomerate to the south (part of the Old Red Sandstone Supergoup). Near the southern landfall site (Rattray Head), the bedrock consists of Pre-Cambrian (>541 Ma) metasedimentary rock of the Argyll group (**Figure D-6**).

Areas of hard substrate that correspond to bedrock outcrop, are identified within the Old Red Sandstone conglomerate, and Argyll Metasedimentary deposits near the southern landfall site at Rattray Head; and in the Devonian rocks at the northern landfall site (Sinclair’s Bay). There are also localised areas of bedrock outcrop in the Cromer Knoll and Chalk units in the north.

FIGURE D-6 BEDROCK GEOLOGY IN THE MORAY FIRTH AREA (SOURCE: BGS, 2023a)



QUATERNARY GEOLOGY

The Quaternary evolution of the Inner Moray Firth Basin is linked to a complex interplay between climactic variation, ice sheet dynamics, and sea level change accompanying the advance and retreat of the British and Irish Ice Sheet (BIIS). A complex Quaternary history is recorded, with thick Quaternary deposits reflecting early deltaic sedimentation, followed by predominantly glacial and glaciomarine conditions during the middle and late Pleistocene, followed by a thin cover of Holocene sediments.

Within the broader Moray Firth area, Quaternary sediments thin westwards, from over 400 m thick in the Witch Ground Basin to <20 m thick, or absent, in the inner Firth, except for a number of localised basins with thicker deposits along the southern shore of the Moray Firth (Andrews *et al*., 1990). The thickest Quaternary deposits along the proposed cable route are at the easternmost points of the route, where there is >50 m thickness (BGS, 2022). Along most of the route the Quaternary thickness is 5–20 m. There is <5 m Quaternary thickness near both the northern and southern landfall sites, and at local areas where hard substrate has been identified.

GLACIAL AND SEA LEVEL HISTORY

Glaciations are responsible for both the erosion and deposition of sediment. The glacial history of eastern Scotland is complex and much debated, with evidence of at least 3 glaciations identified in the area. During the Quaternary glaciations, the Moray Firth was the location of a large ice-stream that flowed west to east, into the North Sea basin (Bradwell *et al.,* 2008). West-east, streamlined, ridges and grooves to the east of the proposed cable route are bedforms associated with the ice streaming (Finlayson *et al*., 2008). Additionally, deep, west to east trending, trenches (the largest of which is the Southern Trench), up to >200 m deep (generally 2-3 km wide and 10 to >75 km long), cut across the southern half of the proposed cable route. These are interpreted to be tunnel valleys associated with sub-glacial meltwater release.

Bosies Banks, an area of shallow and irregular seabed ~50 km north of Fraserburgh, is interpreted to represent a terminal moraine from the last BIIS retreat (Graham *et al.,* 2008). Although the timing of ice sheet retreat across the area is debated, most recent dating indicates that westward retreat from the Witch Ground areas, through the Bosies and Halibut Bank regions, occurred from 18 to 15 ka (Evans *et al.*, 2021; Clark *et al*., 2022).

There are a number of Sea-Level Index Points (SLIPs) along the coasts. The earliest SLIPs near the southern landfall site (~17.5-18 ka) demonstrate higher sea-levels (~+13 m), coinciding with the last glacial period (Shennan *et al*., 2018). This was followed by rapid sea-level lowering to (>-15 m) due to isostatic uplift, with a brief period of sea-level rise then fall, before a persistent sea-level rise since ~11.9 ka when sea-level rise associated with late-glacial melting eventually overtook isostatic uplift at the start of the Holocene (Shennan *et al*., 2018). Given the depths of the Moray Firth, it is unlikely that much of the proposed cable route has been sub-aerially exposed since the Last Glacial Maximum (LGM), with coastline advance and retreat likely limited to within ~5 km of the present coastline (Brooks *et al*. 2011). However, a model by Holmes *et al. (*2004) showed the potential for a much greater area of sub-aerial exposure between approximately 16–14 ka, covering a large proportion of the proposed cable route, and identified possible fluvioglacial channels in the West Bank and Bosies Bank areas.

Superficial Sediments

The Moray Firth seafloor predominantly consists of Holocene sediments, whose distribution reflects the glacial and sea-level history of the area, as well as the present hydrodynamic regime. The primary source of seabed sediments is the reworking of offshore Pleistocene deposits, with negligible sediment input from the land (Andrews *et al*., 1990).

Regional seabed sediments along the proposed cable route range from sand to sandy gravel (**Figure D-7**). Sandy gravel is identified at, or near, both the northern and southern landfall sites, at Sinclair’s Bay and Rattray Head respectively; and also in the centre of the proposed cable route where it cuts across the edge of Smith Bank. The seabed sediments and geology identified by REACH Subsea (2024a, 2024b) include silt, silty sand, sandy gravel, gravelly sand, sand, outcropping rock, and boulders.

A lack of major river input in the northern part of the Physical Environment Study Area has resulted in minor clastic input which, combined with strong currents, provided favourable conditions for calcareous seabed biota over the last 10,000 years (Holmes *et al.,* 2004). As a result, the nearshore areas and mid-continental shelf bank, have high proportions of calcium carbonate (Farrow *et al*., 1984).

PSA in Blocks 1 and 8 indicate that the seabed along the length of the route predominantly consists of sand (>80%) (REACH Subsea, 2024a). The nearshore regions (Bocks 1 and 8) contained >99% sand, whereas offshore stations showed more variability, with higher proportion of fines (>15%) generally found in the deepest regions (>70 m) (REACH Subsea, 2024a). Gravel content was variable, with high proportions between KP 127 to KP 139 and KP 144 to KP 159, correlating with seabed areas identified as 'gravelly sand' (REACH Subsea, 2024a).

The site-specific data from REACH Subsea show that the superficial sediments along the route are dominated by sands and gravels (**Figure D-8**). The site-specific data is generally consistent with the regional mapping; differences largely relate to different classification schemes. Near the northern landfall site the sediment is dominated by slightly gravelly slightly silty Sand, with some areas of coarser sediment (sandy Gravel with cobbles and boulders) (**Figure D-9**). Notable, the area identified as hard substrate by BGS between KP 7.9 and KP 10 does not correspond with bedrock or gravel in the REACH Subsea interpretation. Near the southern landfall, the seafloor sediment is dominated by slightly gravelly slightly silty sand to sandy gravel with cobbles and boulders (**Figure D-9**). Bedrock outcrop/sub-crop dominated between KP 161.1 and 165.3; which is broadly consistent with the BGS interpretation. According to the REACH Subsea (2024) interpretation, the HDD exit is in an area of bedrock outcrop/subcrop at the southerly landfall site; and slightly gravelly slightly silty sand at the northerly landfall site.

FIGURE D-7 SEABED SEDIMENTS IN THE MORAY FIRTH AREA (SOURCE: BGS, 2023B; REACH SUBSEA, 2024a, 2024b)

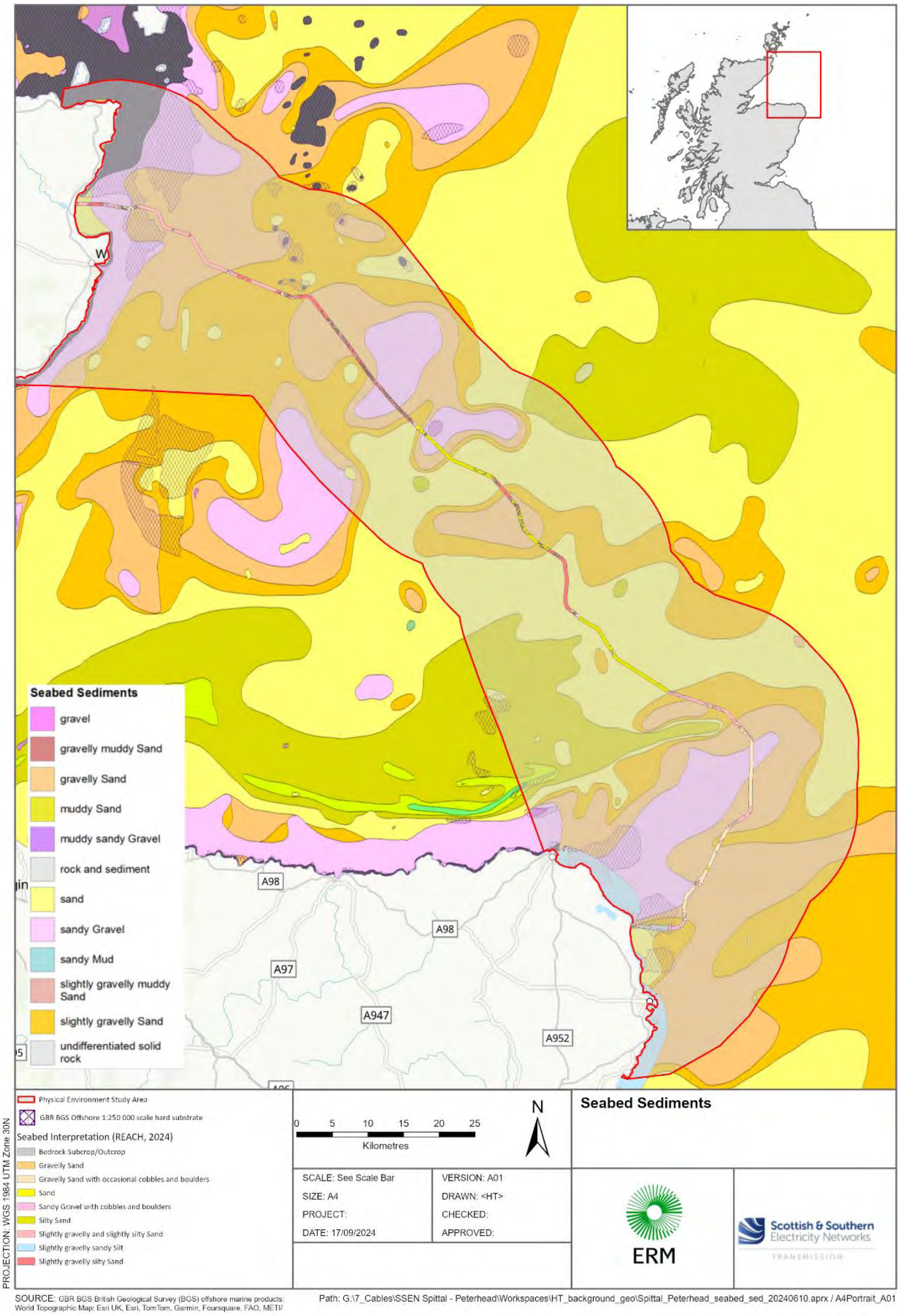


FIGURE D-8 SEABED SEDIMENTS NEAR THE NORTHERN LANDFALL (SOURCE: BGS, 2023b; REACH SUBSEA, 2024a)

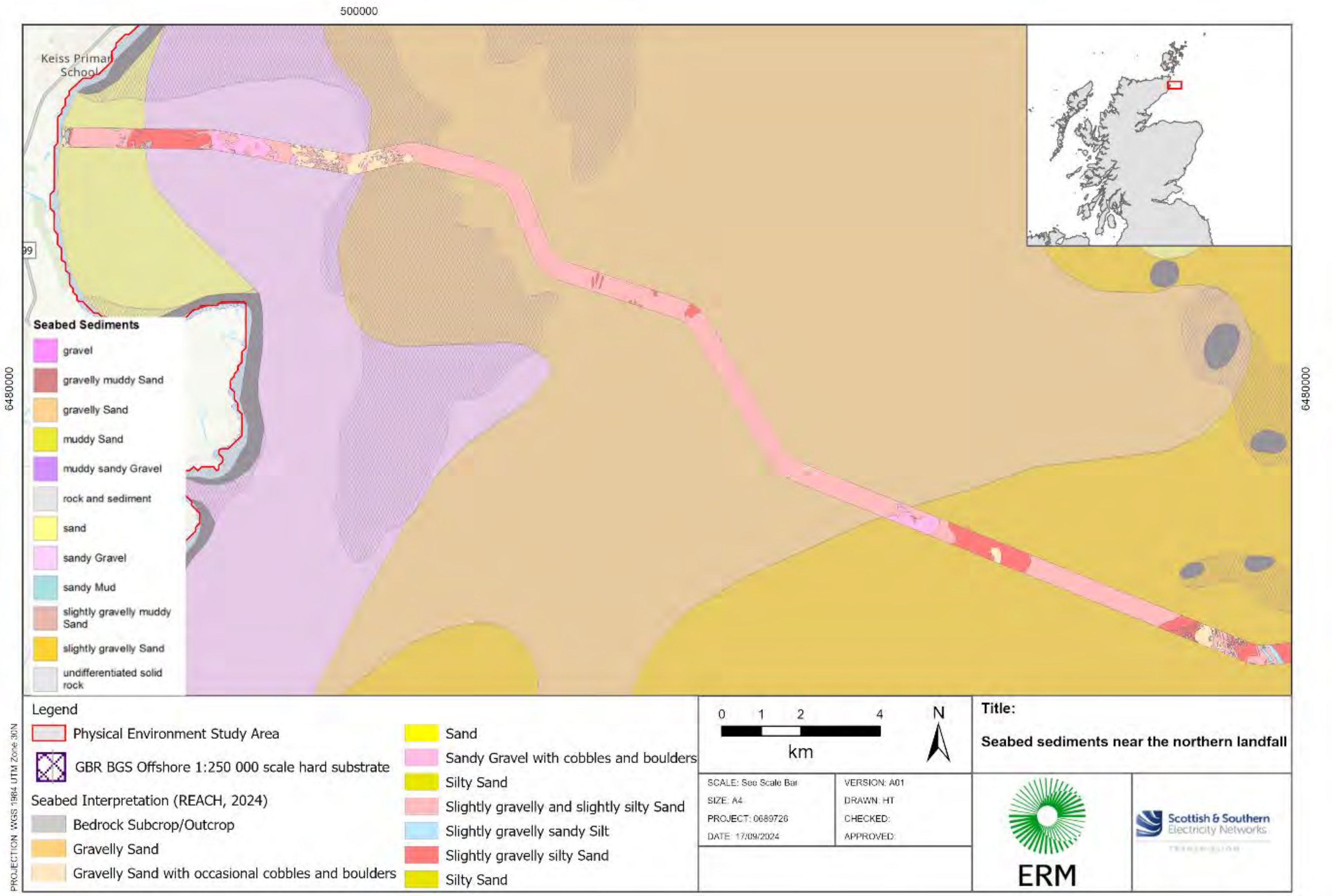
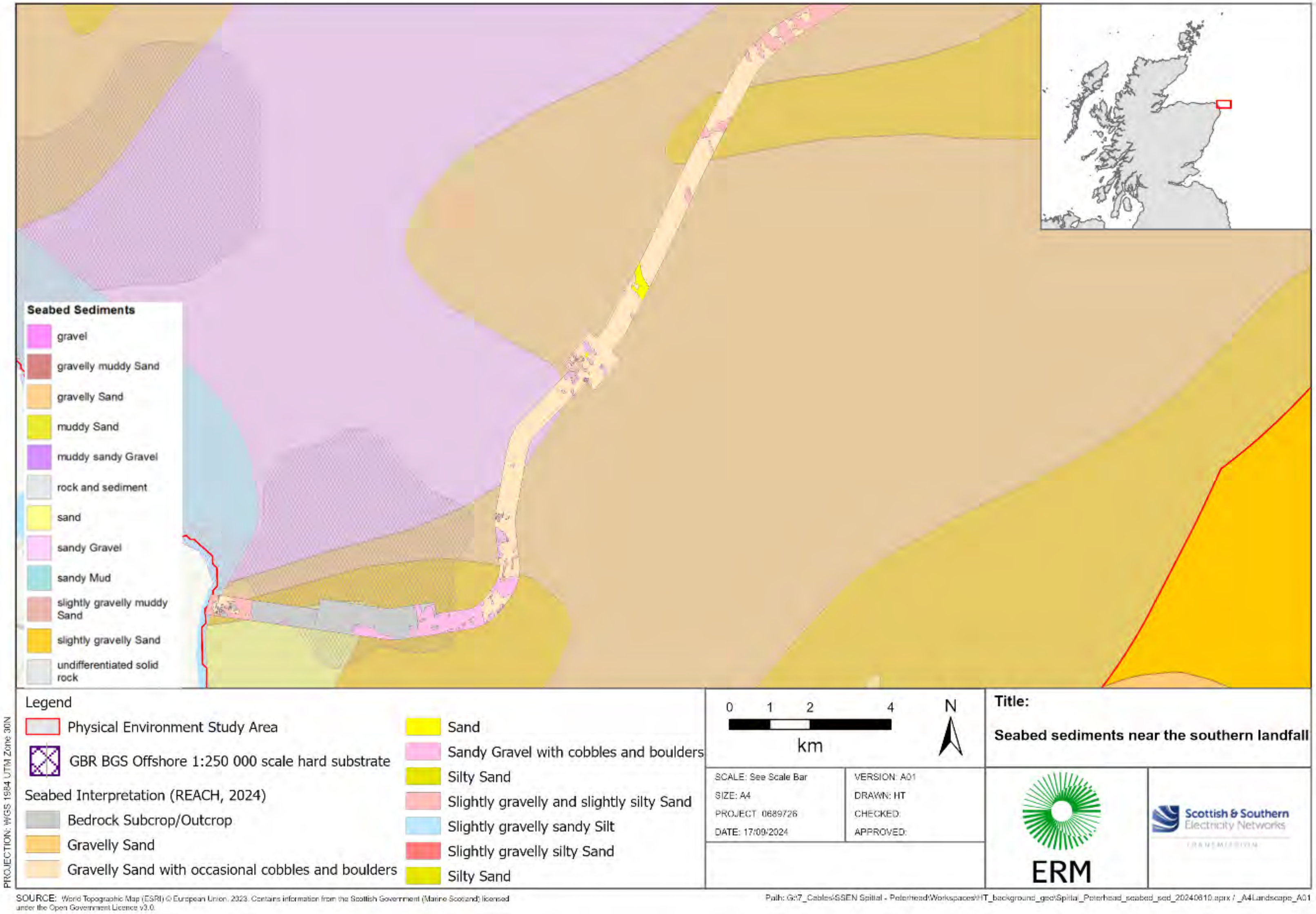


FIGURE D-9 SEABED SEDIMENTS NEAR THE SOUTHERN LANDFALL AT RATTRAY HEAD (SOURCE: BGS, 2023b; REACH SUBSEA, 2024b)



Hydrodynamics

TIDAL CURRENTS

The tidal environment within the Moray Firth is semi-diurnal. Mean Spring peak flows are greatest near both the landfall sites; up to approximately 1.5 m/s near the southern landfall site, and 0.9 m/s near the northern landfall site (**Figure D-10**; ABPmer *et al*., 2008). Mean Spring peak flows are lower in the centre of the proposed cable route, at around 0.3 m/s. The strongest tides within the Study Area are north of the northern landfall site, where the Mean Spring tidal flow is 3.72 m/s, although this area does not have data coverage in **Figure D-10** (ABPmer *et al*., 2008).

With respect to tidal range in the Moray Firth, this generally increases from east to west, with a spring range along most of the cable route of 2.7-2.9 m (ABPmer *et al*., 2008). At the southern landfall, the spring tidal range is approximately 3.3 m, with a Mean High Water Spring (MHWS) of 4 m, and Mean Low Water Spring (MLWS) of 0.7 m (UHKO, 2023).

The tidal axis (the long-axis orientation of the tidal ellipse) along most of the proposed cable route is, generally, aligned approximately north to south (ABPmer *et al*., 2008). This results in a generally southerly flood tide and northerly ebb tides. The tidal currents are, generally, aligned approximately parallel to the adjacent coastlines.

STORM SURGES

Storm surges are produced when high winds build up a wall of water, which is exacerbated by the effects of atmospheric pressure (Prichard, 2013). Storm surge propagation has been extensively studied in the North Sea and is generally well understood. The estimated extreme sea level (generated by storm surge and astronomical tides), with a 10-year return period, is 3.08 m ODN in the Moray Firth, 2.71 m near the northern landfall site (Sinclair's Bay), and 3.00 m near the southern landfall site (Rattray Head) (EA, 2018).

WAVES

Waves within the Physical Environment Study Area are a combination of waves locally generated by wind, and waves generated elsewhere in the North Sea. Long term hindcast records of wave data have been derived from ABPmer's SEASTATES model (ABPmer, 2018).

At the northern landfall site, the mean wave height is 0.9 m and the predominant wave directions are from the northeast and southeast (each >30% of the time; **Figure D-11**). At the southern landfall site, the mean wave height is 1.4 m and the predominant wave directions are southeast (approximately 30% of the time) and northeast (approximately 20% of the time) (**Figure D-11**). Mean wave height generally increases with the distance from the coast, and is recorded as being up to 1.9 m along the proposed cable route. The wave directions are more variable within the middle of the Moray Firth, but the predominant wave directions are south, southwest, and west (approximately 15-20% of the time each; **Figure D-11**).

STRATIFICATION

Stratification relates to the vertical and horizontal distribution of sea water temperature and salinity. This influences the availability of nutrients and, thus, the distribution and growth rates of pelagic flora and fauna. Stratification is greater during the summer due to increased heat input preferentially warming the upper part of the water column, resulting in a steep vertical gradient between warmer surface waters and colder bottom waters. The gradient corresponds to a gradient in water density, which acts as a barrier to vertical mixing, resulting in vertical stratification.

Temperature and salinity data are available from a high-resolution 3D ocean model covering the European North-West Shelf, accessed through the Copernicus data portal (Copernicus, 2023). These data show that close to the coast, waters are well mixed throughout the year, but there is evidence of vertical stratification further offshore in summer months, which is weaker (or absent) in summer months. The front separating well-mixed from stratified waters varies in location and position throughout the year.

FIGURE D-10 SPRING PEAK TIDAL FLOW IN THE MORAY FIRTH AREA (FROM: ABPmer, 2008)

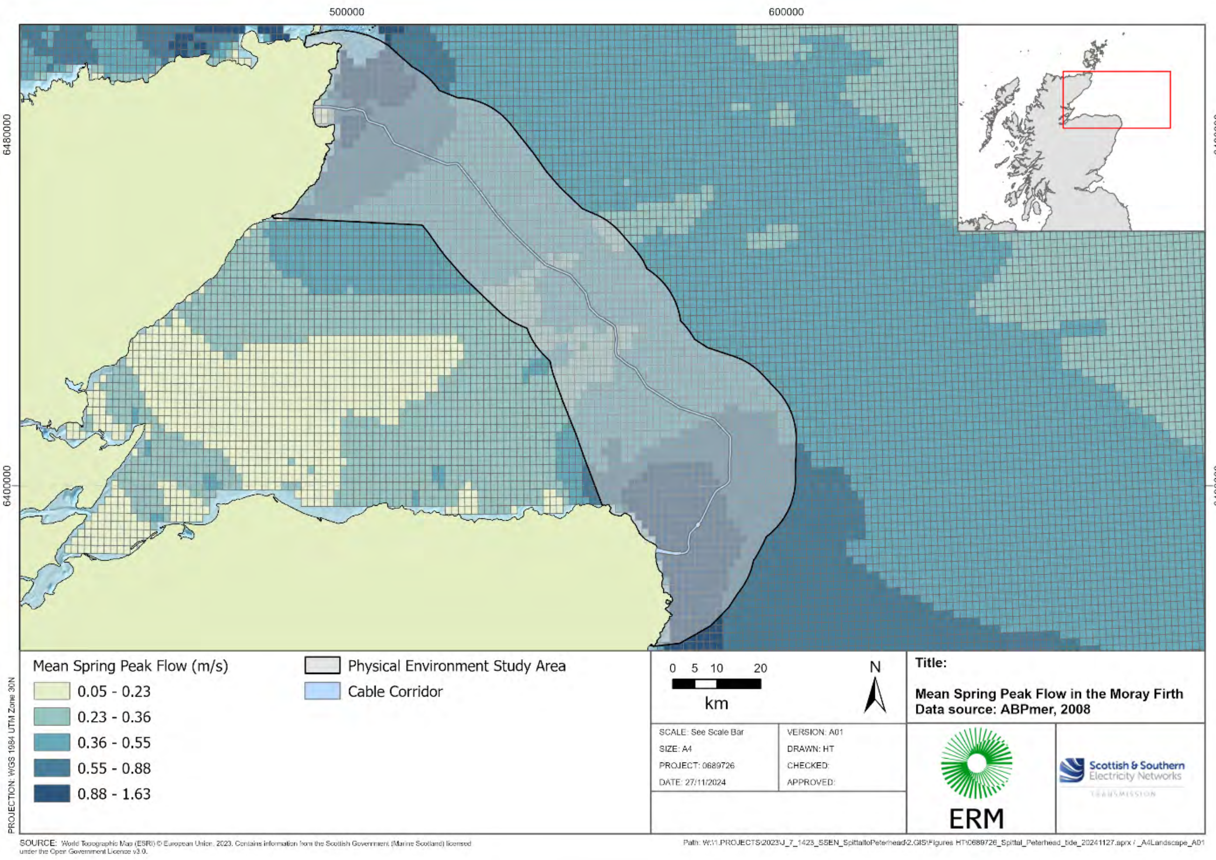
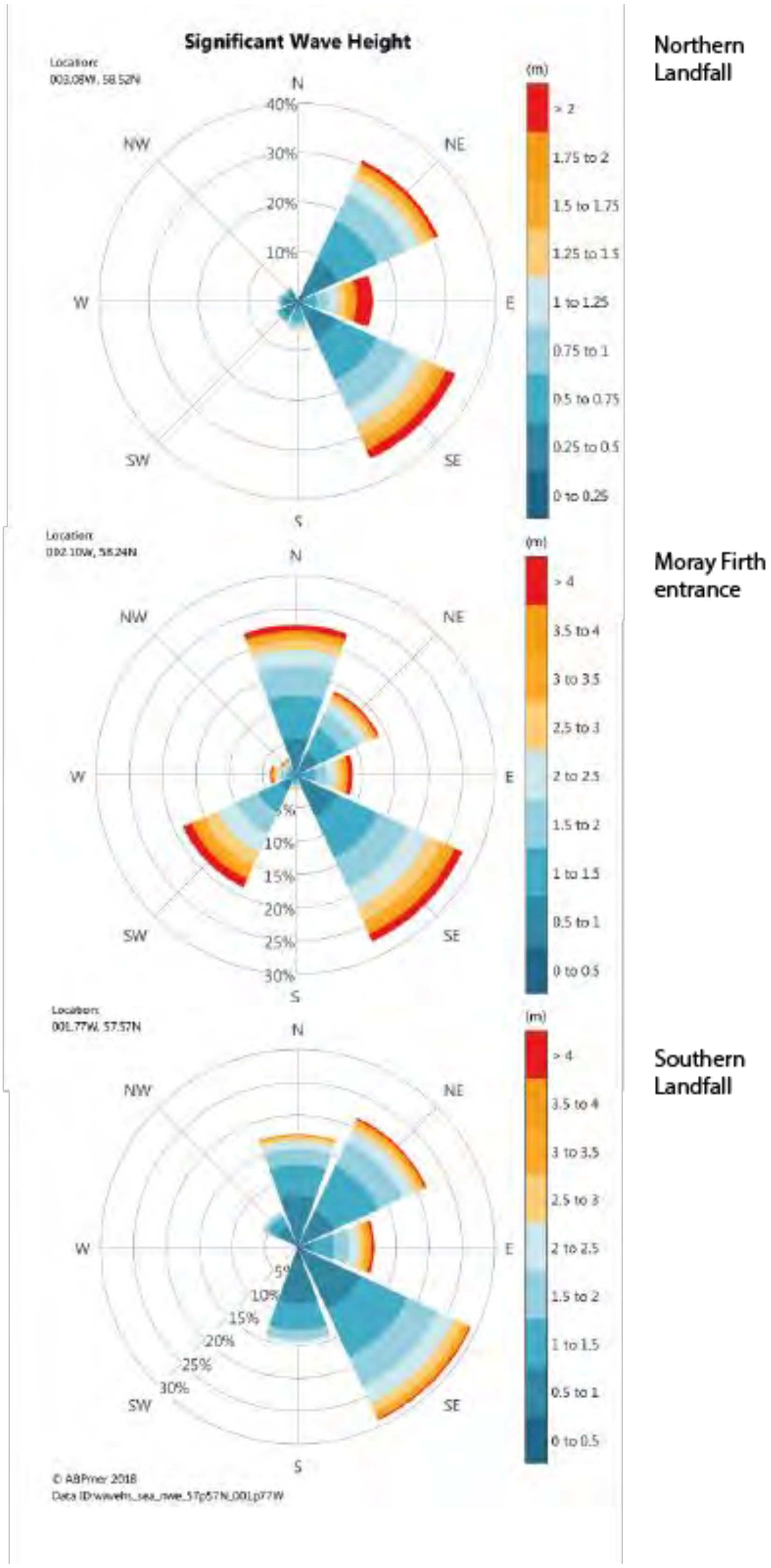


FIGURE D-11 SIGNIFICANT WAVE HEIGHT ROSES IN THE MORAY FIRTH AREA (FROM: ABPmer, 2018)

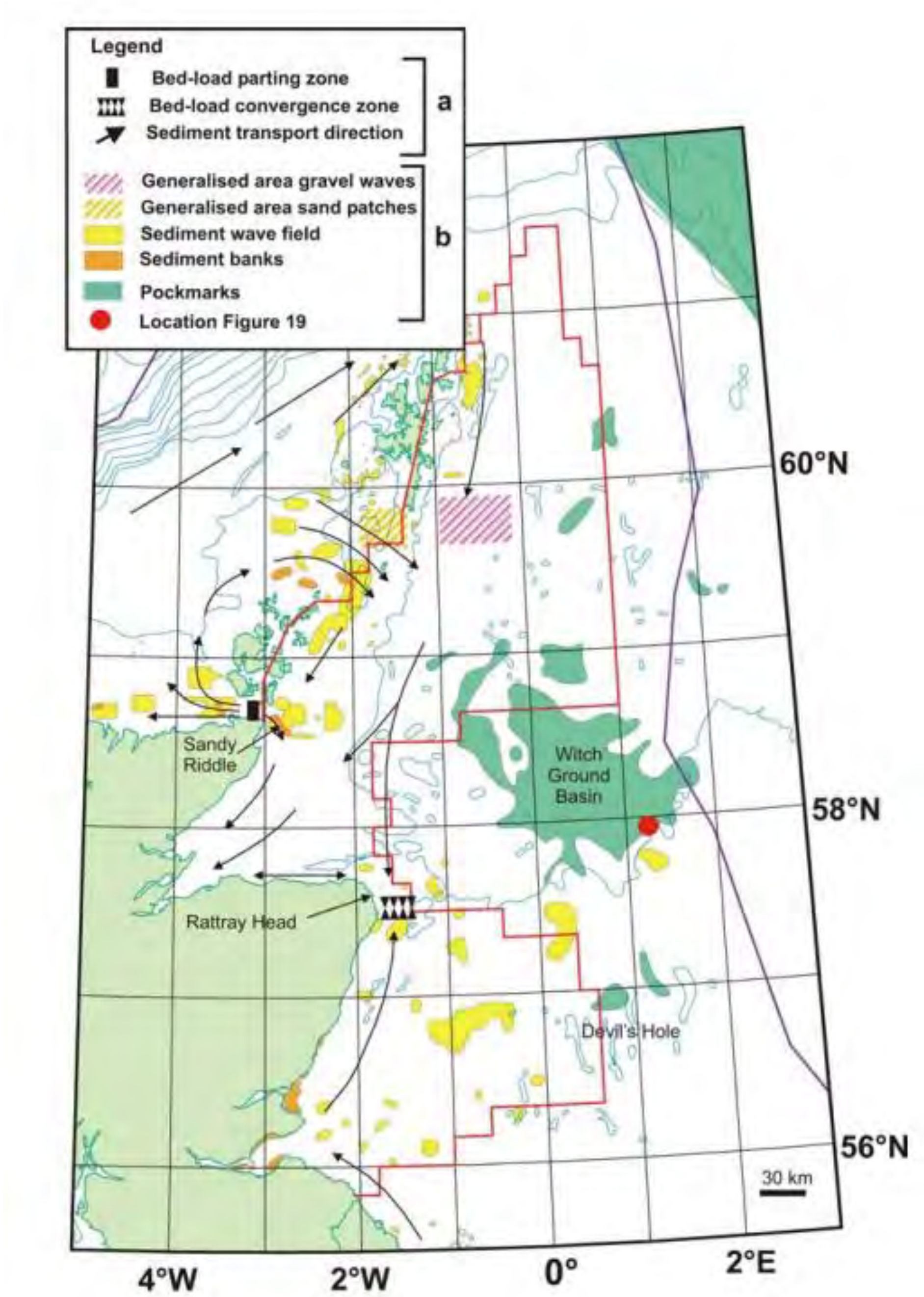


Sediment Transport

Tidal and wind-driven currents in the Moray Firth region induce a sufficiently high shear stress to exceed the critical stress and initiate sediment movement. There is a general net sediment transport to the southwest, towards the inner Moray Firth (**Figure D-12**; Holmes *et al.,* 2004). Longitudinal sand ribbons ~35 km east of Sinclair's Bay are evidence of this southwesterly transport direction. However, greater complexity exists at the entrance to the Moray Firth and nearer both landfall sites, due to the effects of local currents.

The data show there are east-west oriented bedforms in gravelly sand ~10 km offshore from the northern landfall site, which are consistent with a net southerly sediment transport direction (**Figure D-12**). Sandy Riddle, ~13 km to the northeast of the cable route, is identified as one of the most active places in the area for bedload transport, and is indicative of a complex bedload transport environment. Sediment transport is also complex to the south, with a bedload convergence zone identified off the southern landfall site, to the south of which there is northerly net sediment transport (**Figure D-12**).

FIGURE D-12 SEDIMENT TRANSPORT DIRECTION (FROM: HOLMES *et al*., 2004)



Coastal Characteristics

The coastline included in the Physical Environment Study Area around the southern landfall site at Rattray Head, extends ~15 km to the northwest of the landfall site and ~20 km to the south, from Fraserburgh to Cruden Bay.

The coastline at the southern landfall (Rattray Head) includes extensive sandy beaches backed by dune systems that are part of a more extensive geomorphological assemblage that includes Loch Strathbeg, the UK's largest paramaritime freshwater lake (Soulsby *et al.,* 1997). The hydrogeology of the dune system is important as it is part of the same system as the loch. The dunes are mature and retreating with frequent undercutting. The Rattray Head dune system is cut by multiple pipelines which are buried in trenches. These trenches were re-vegetated to facilitate stability (Ritchie and Gimingham 1989). Soulsby *et al.* (1997) concluded that the construction of the pipeline landfalls had 'no major effect' on the hydrogeology of the dune system. Most of the coastline is undefended, which is due to a combination of sparse population and low rates of erosion. Localised artificial defences are in place, particularly around Peterhead. South of Peterhead the coastline is rocky/cliffed with no clear evidence of significant marine erosion. A comparison of the MHWS contours from 1900 to present indicates seaward migration of the contour (i.e. accretion) of about 50 m (Rennie *et al.*, 2021). Despite this, Rennie *et al.* (2021) predict a landward retreat of the MHWS contours of ~15 m by 2060.

The coastline included in the Physical Environment Study Area around the northern landfall site (Sinclair's Bay) extends ~15 km to the north of the landfall site and ~25 km to the south, from Invershore to Gills Bay. The coastline is predominantly rocky, with the longest stretch of beach being at Sinclair's Bay, where the proposed northern landfall site is located. This area appears to include dune environments, which become less extensive to the south. Development has occurred in the vicinity of the dunes as part of the Subsea7 pipeline launch facility, located in Westerloch, Wick. The facility fabricates and launches sections of pipeline up to 7.7 km long. There are some sea defences indicating this coastline is subject to erosion. Additionally, World War II coastal defences are collapsing onto the beach as a result of the sand dunes around the structures being eroded.

Designated Sites

The Physical Environment Study Area includes a number of nationally and internationally designated nature conservation sites. Many of the sites are primarily designated for the habitats rather than the presence of geological or geomorphological features, however changes to the physical environment at these sites may impact the habitats they support. The most significant protected site to note is the Southern Trench Marine Protected Area (MPA). The Southern Trench is a deep, glacial, feature, which is protected for its geological and biological diversity. Due to it being a dynamic mixing zone of warm and cold waters, it attracts key commercial fish species including herring, mackerel and cod. Where present, the soft sand seabed provides a habitat for sandeels, which draws predators including minke whale. The thick, soft mud also present, provides an important biological habitat. These habitats may be affected by changes in the physical environment, and impacts on these are discussed further in their respective chapters of the MEA (Chapters 7.2, 7.3 and 7.4).

Protected geological features within the Southern Trench MPA include sub-glacial tunnel valleys, moraines, slide scar, shelf deep, and burrowed mud. Two previously identified sub-glacial tunnel valleys intersect the cable corridor at KP 145.3 and 149.9 (NatureScot, 2020). The mapped features correspond to an area of deeper bathymetry (up to 96 m depths). NatureScot (2020) states that "*Subglacial tunnel valleys are highly resistant to human activities…and are either considered not sensitive or to have a low sensitivity to pressures arising from human activities".* The slide scar is found on, or below, the flanks of the sub-glacial tunnel valleys which are >20 km from the cable route, and outside of the Physical Environment Study Area.

Within the Southern Trench MPA, NatureScot (2020) mapped a moraine that intersects the cable corridor at around KP 152.1. The moraine is largely buried in more recent seabed sediment and, thus, not a distinct feature in the bathymetric data. In the bathymetry data, irregular topography, that may be associated with the moraine, is visible for a width of around

600 m, intersecting the cable corridor, obliquely, between approximately KP 153.7 and KP 154.6. However, in sub-bottom data, the width of the interpreted buried moraine feature, where it lies within 2 m of the seabed surface (the maximum burial depth), is approximately 300 m. A cross-profile shows that it is an asymmetric ridge with two peaks, reaching a maximum of 5 m above the surrounding seafloor. This relief is of a comparable magnitude to other irregular topography in the area. According to the NatureScot (2020) map, this moraine has a length of approximately 10 km. As may be expected, there is no corresponding distinct, linear, bathymetric feature in the UKHO bathymetry (4 m) resolution data, due to the moraine being predominantly buried.

Regarding moraines, NatureScot (2020) states that: "*Their resistance to erosion is highly variable and depends upon the composition and level of consolidation of the till. Overall, moraines are considered to have a medium sensitivity to sub-surface abrasion and changes in tidal flow, and a high sensitivity to physical removal*". At the nearest vibrocore locations (KP 152 and KP 154) there was short penetration and limited recovery (1.5 and 1 m, respectively), which is likely to be the result of the vibrocore hitting the buried portion of the moraine and the associated till (*e.g.*, dense sand, cobbles, stiff clay *etc*.). At the nearest Cone Penetration Test (CPT) location (KP 153), the material is interpreted to be very dense gravelly sand to sand, which is consistent with consolidated till. This material is likely to be resistant to erosion from changes in the hydrodynamic regime, but will be locally trenched for cable burial.

There is potential Annex I Reefs present near both landfall sites. This is discussed further in the Benthic Ecology Chapter (**7.2**) of the MEA report.

The designated sites in the Physical Environment Study Area are summarised in **Table D-3** and **Figure D-13,** with details of the designated features of the Southern Trench MPA showing in **Figure D-14.**

TABLE D-3 NATURE CONSERVATION SITES DESIGNATED FOR PHYSICAL ENVIRONMENT FEATURES

Site	Qualifying Feature	Distance from cable corridor
Special Areas of Conservation (SACs)		
East Caithness Cliff	Vegetated sea cliffs	10.1
Buchan Ness to Collieston Coast	Vegetated sea cliffs	14.5
Sites of Special Scientific Interest		
Duncansby Head	Coastal geomorphology	8.6
John o' Groats	Silurian – Devonian Chordata	13.8
Longberry Coast	Non-marine Devonian	9.2

Site	Qualifying Feature	Distance from cable corridor
Castle of Old Wick to Craig Hammel	Maritime cliff	10.2
Craig Hammel to Sgaps	Maritime cliff, Non-marine Devonian, birds	12.8
Dunbeath to Sgaps Geo	Maritime cliff	20.2
Loch of Strathbeg	Coastal geomorphology, Fen meadow, Eutrophic loch, birds	0
Bullers of Buchan Coast	Coastal geomorphology, Maritime cliff	14.5
Cairnbulg to St Combs Coast	Dalradian	6.7
Rosehearty to Fraserburgh Coast	Dalradian	14.6
Marine Protected Areas (MPAs)		
Noss Head	Horse mussel beds, inshore sublittoral sediment	2.1
East Caithness Cliffs	Vegetated sea cliff	9.0
Southern Trench	Inshore sublittoral sediment, large-scale feature, Quaternary geology and geomorphology (sub-glacial tunnel valleys and moraines), shelf deep, submarine mass movement	Intersects the cable route between survey KP 140.5 and KP 164.6
Geological Conservation Review Sites		
Wick Quarries	Non-marine Devonian	9.2
Sarclet	Non-marine Devonian	15.3
Duncansby to Skirza Head	Coastal geomorphology	8.5
John o'Groats	Non-marine Devonian	13.8
Strathbeg	Coastal geomorphology	0

Site	Qualifying Feature	Distance from cable corridor
Cairnbulg to St Combs	Dalradian	6.8
Fraserburgh to Rosehearty	Dalradian	13.7
Bullers of Buchan	Coastal geomorphology	14.3

FIGURE D-13 DESIGNATED SITES IN THE MORAY FIRTH AREA

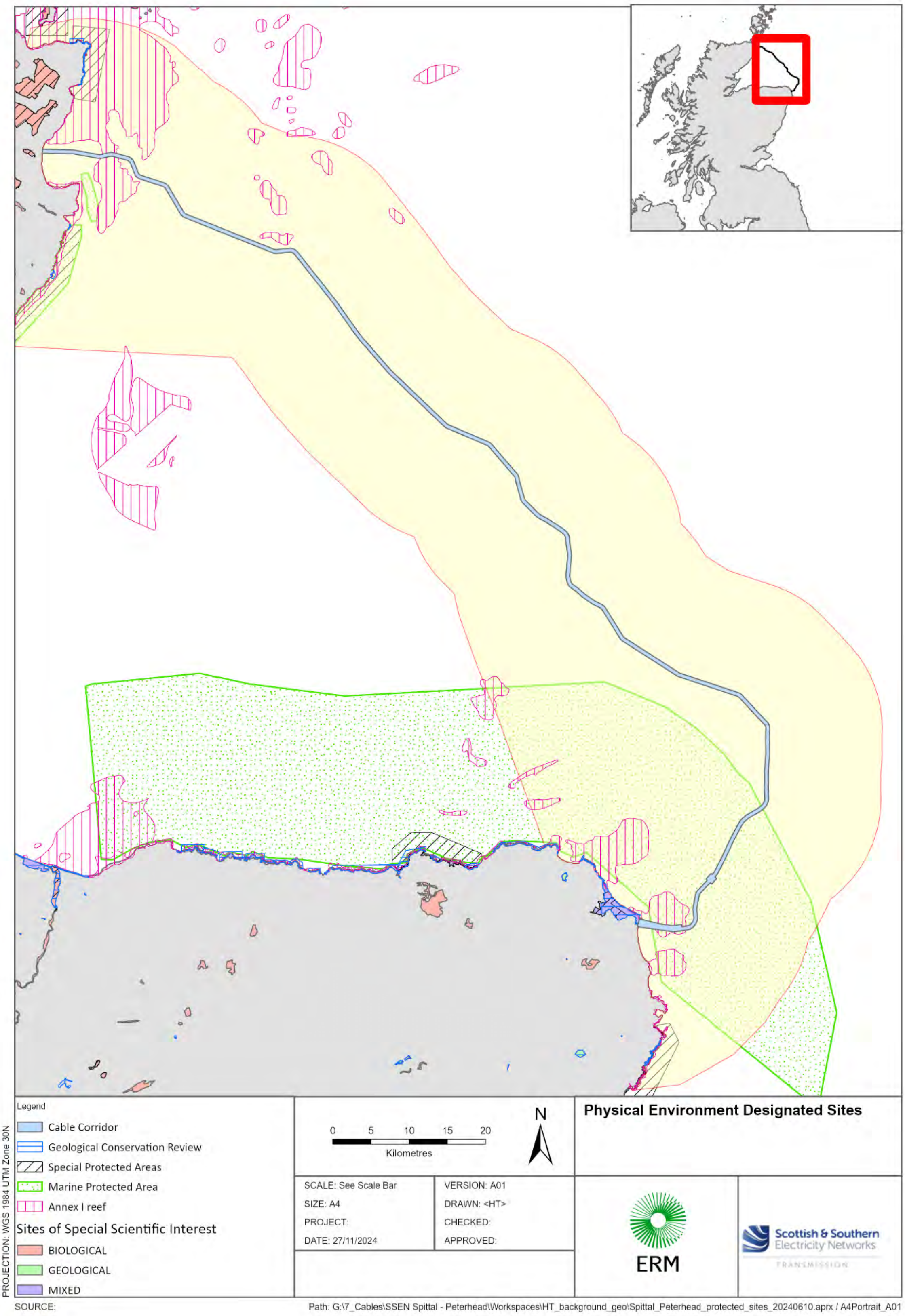
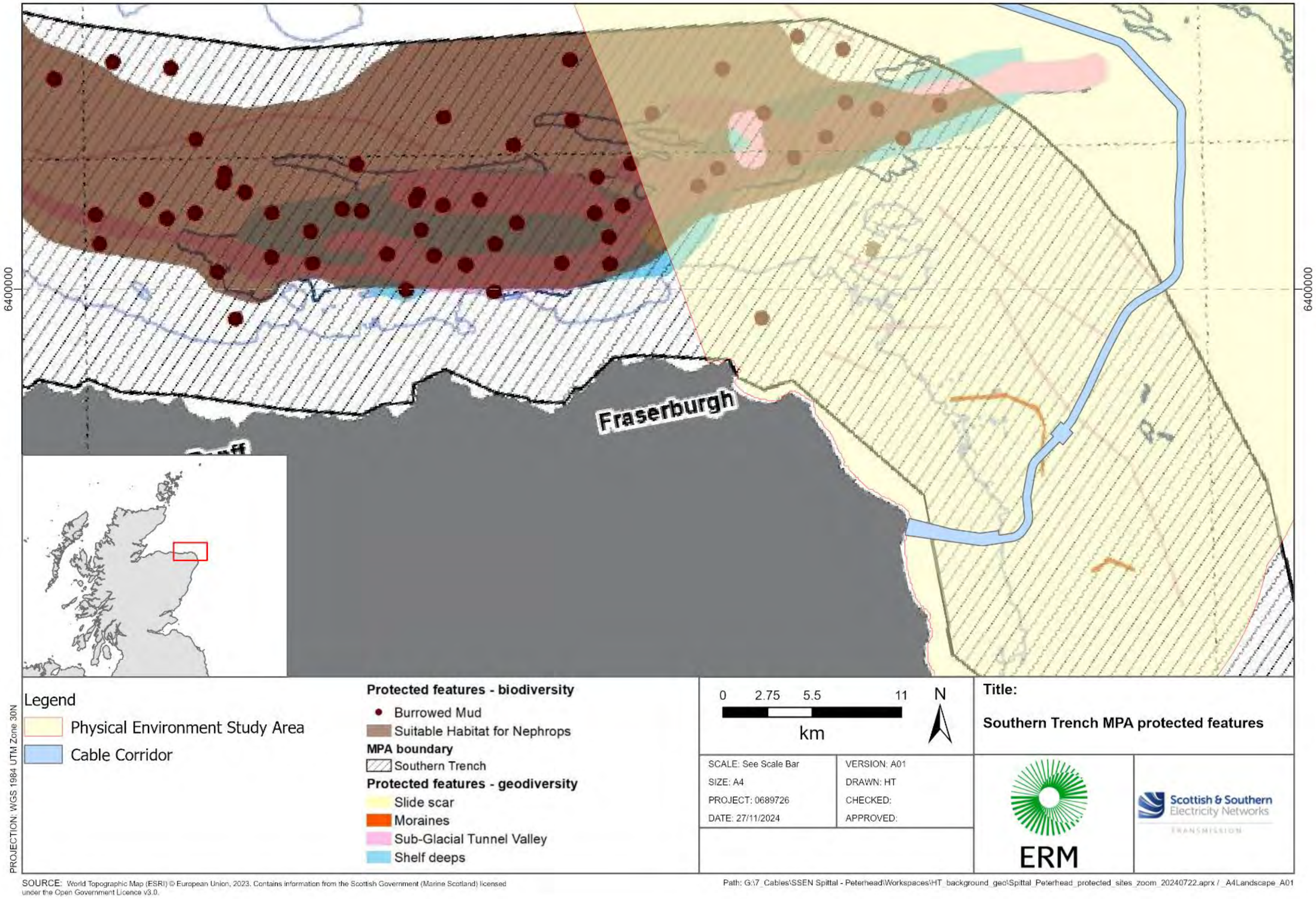


FIGURE D-14 PROTECTED FEATURES IN THE SOUTHERN TRENCH MARINE PROTECTED AREA



Future Changes

According to the UKCP Marine Projections report (Palmer *et al.,* 2018), a number of aspects described in this Physical Environment Technical Appendix are expected to evolve during the lifetime of the Project.

By 2060, it is predicted that mean sea-level will rise by approximately 0.43 m above present levels (based on the Representative Concentration Pathway (RCP) 8.5[40]; 95th percentile) at the southern landfall site, and 0.45 m at the northern landfall with rates of change increasing over time.

Sea-level rise may result in larger waves which, in turn, may cause an increase in erosion at the coastline. Sea-level rise may also result in the loss of intertidal habitats. The southern landfall site is largely unprotected by sea defences, but some defences exist at the northern landfall site, where marine erosion is evident.

D.6 METHODOLOGY

Changes to the Physical Environment may occur during the construction, operation, or decommissioning stages of the Project. This includes:

- Pre-lay grapnel run and boulder clearance
- Seabed levelling prior to cable laying;
- Cable burial by ploughing, jetting and trenching;
- Open-cut trenching at the landfall (including cofferdams);
- Horizontal Directional Drill (HDD) installation;
- Installation of cable protection.

The potential effects, as a result of each of these activities, is described in this Technical Appendix, in order to inform the MEA.

Numerical modelling was not deemed necessary, considering the nature of the Project works. Therefore, the assessment is based on open-source literature and data, and site-specific data.

D.7 DESCRIPTION OF ACTIVITIES CAUSING SEABED DISTURBANCE AND SUSPENDED SEDIMENT

D.7.1 CABLE BURIAL BY PLOUGHING, JETTING AND TRENCHING

SSEN plans to bury the cable along the entire length of the route (where possible). During cable burial operations, the seabed is disturbed and there is localised and temporary sediment suspension and resettling (BERR, 2008).

Monitoring that has been undertaken during cable installation shows that cable-laying activities do not create a major or long term change in suspended sediment concentration (SSC) levels (BERR, 2008; EMU, 2005; SeaScape Energy, 2008). The monitoring also showed that sediment is largely deposited immediately adjacent to the cable route; even changes associated with relatively fine sediment were only measurable within a few hundred metres (BERR, 2008; EMU, 2005; SeaScape Energy, 2008).

[40] RCP 8.5 is considered to represent a realistic worse case.

BERR (2008) assessed the post-burial effects of cable burial on sandy seabeds, using desk-based and monitoring studies. The report concludes that the potential for effects on the surficial sediment thickness or type is limited, concluding:

"The low levels of sediment that are mobilised during cable laying mean that there will be only low levels of deposition around the cable route. The finer material will generally remain in suspension for longer but will settle and remobilise on each tide with no measurable material left in place. Coarser sediments are expected to settle within a few metres of the cable route and following disturbance is likely to recover rapidly, given similar communities in the vicinity" (BERR, 2008).

Additionally, cable installation methods may cause localised areas of abrasion and, therefore, changes may occur to the topography of the seabed and compaction of the seabed strata. The exact nature of the seabed disturbance and potential for an increase in SSC depends on the seafloor geology, the burial depth, and the burial method. In general, the following burial methods are available:

- Jetting;
- Trenching (cutting and jetting);
- Jet Ploughing;
- Rock Installation.

JETTING

Jetting is a methodology suitable for post-lay burial in sands and low- to medium-strength clays. Coarse gravels and high strength clays are likely to limit the performance of jetting tools in general, however many high-powered tools with variable pump/jetting configurations are available.

Generally, these tools are remotely operated vehicle (ROV)-based, free-flying, tools, which may also be tracked, or be fitted with freely rotating wheels or skids for soils of variable bearing capacity.

As the trencher is started, water is taken in through the top of the tool and distributed under pressure by a number of pumps, through jetting swords or arms, and exits through nozzles. These can be blanked off or increased/decreased in size, depending on the soil type and strength, to provide a suitable flow and pressure to fluidise or break up the soil ahead of the swords. A larger backwash nozzle and/or inward-facing transport nozzles provide a force to both move the trencher forward and to 'wash-out' the trench behind the tool, to enable the product to deflect into the trench before the sediment resettles, providing cover if the sediments are granular. However, return of the materials to the trench is not guaranteed, as there are several factors outside the control of the operator, which may cause the material to be dispersed before cover is achieved. It is possible to run the tool over the buried cable to provide multiple passes to target increased depth of lowering requirements.

Jet trenchers are generally limited to burial depths of 3 m, which is dictated by the sword length of the tool, and the available pump power. Multiple passes also bring with them the risk of not engaging the product in the jet-swords, and of creating a wider trench without significantly lowering the cable further. To increase the cover potential in some cohesive soils, backfill ploughs or trench-infill swords can be added to some jet trenchers, although this generally requires a separate run.

MECHANICAL TRENCHER/CHAIN CUTTER

Mechanical trenchers/chain cutters are suitable for use in granular materials, with increased gravel content, or higher-strength clays. They generally operate with tracked propulsion, using a mixture of jetting swords and forward- and upward-rotating chains, with steel picks or paddles embedded within the chains, ripping the soil upwards as they move. The jetting sword package may be fitted to the rear of the trencher, to help maintain a clearer trench for the product to deflect into. They are also considered suitable for post-lay burial. They have a disadvantage in softer, lower-strength soils, or those where the granular material is lightly consolidated as they are heavy and rely on the tracks for forward progress.

JETTING CABLE PLOUGH

There are several types of subsea plough on the market, but the jetting plough is increasingly seen as an innovative tool for most soil conditions. As the plough share, either raked back or upright, passes through a granular soil, the pore-water is displaced, causing a slight vacuum-like effect of the soil onto the share. This increases the friction and causes an increase in the tow-force required to pull the plough along. However, the jetting plough mitigates this, by pumping water ahead of the share to 'loosen' the soil ahead of the share. It is seen as a simultaneous lay-and-bury tool, which requires a combined vessel able to pull the plough while laying the cable.

PRE-LAY PLOUGH

These ploughs are often used to clear boulder fields or areas of stiffer materials, creating a trench in which to lay the cable during a following pass by a separate vessel. The cable may not be laid in the base of the trench and, as a consequence, burial may not always be achieved to the required protection levels.

ROCK INSTALLATION

Where burial is not possible, through sub- or out-cropping rock or hard cohesive materials, it may be prudent to consider surface-lay of the cable, followed by a covering layer of protective gravel-sized rock. The vessels for this are generally larger, and require deeper water depths to operate. The fall-pipe, through which the rock is pumped, may be controlled by an ROV at the base, ensuring an accurate laying of the rock.

D.7.2 HDD INSTALLATION

Horizontal directional drilling (HDD) cable installation reduces the impact on the coastline at the landfall by avoiding open-cut trenching and cofferdams. The HDD exit is proposed to be 1.3 or 1.8 km from the end of the marine route at Sinclair's Bay and either 1.6 or 2.3 km from the end of the marine route at Rattray Head. The drill punch-out at both landfalls will be below LAT.

During drilling, drilling fluid, which consists of bentonite clay suspended in water, is released at the punch-out location into coastal waters and may cause a sediment plume. The concentration of bentonite is typically low (typically between 13 litres (30 kg) and 35 litres (80 kg) of dry bentonite clay per m^3 of water (30,000 to 80,000 mg/l)).

D.7.3 INSTALLATION OF CABLE PROTECTION

The preferred method for cable protection in the Project is burial. However, cable protection may be used where cable burial cannot be achieved due to cable crossings or substrate type. These areas are summarised in the BAS.

Types of cable protection may include: rock placement, concrete mattresses, grout or sandbags, frond mattresses, and uraduct (or similar). These will all have differing potential to impact the physical environment.

The installation of protection measures results in a temporary increase in suspended sediment in the water column. As with the other cable installation techniques (**Section D.7.1**) this is likely to be localized and temporary, and not result in a significant change in the sediment composition or thickness. The scale of effects on SSC, due to the installation of cable protection, is likely to be less than that of cable burial by ploughing, trenching or jetting, in the short term, because the length of the cable likely to be protected, is less than the length where installation occurs. In addition, cable protection is often used over hard substrates, so there is less mobile sediment to resuspend.

The use of cable protection has the potential for a longer-term impact on the physical environment than the installation activities previously discussed. This is because the protection remains in place on the seabed during the operational stage of the cable life-cycle. Cable protection measures may change the morphology of the seafloor and, therefore, have the potential to cause changes in the local hydrodynamic processes, potentially affecting sediment transport processes (including potential scour of the seabed). Additionally, they change the composition of the seafloor; in some cases this may be a change from a soft seabed (sand/mud) to hard seabed. It is unlikely that cable protection methods will be used in areas of soft sediment, so this potential effect is scoped out and not considered further.

If protection measures are used near to the shore, there is the potential that changes to the sediment transport processes may affect the shoreline. The potential for long term impacts on the physical environment depends on the hydrodynamic regime and seabed composition in the vicinity of the protection methods.

The BAS noted some areas with limited burial potential in the nearshore region. The cable protection method needs to be carefully considered, in this case, to ensure there is no resulting impact on the coastline.

D.8 SEDIMENT DISPERSION ZONE OF INFLUENCE

Sediment of different particle size behave differently after being brought into suspension by mechanical disturbance, such as during the cable installation process. Coarse material settles to the seabed relatively quickly, whereas fine particles may produce a more persistent plume. Monitoring that has been undertaken during cable installation shows that cable-laying activities do not create a major or long term change in the SSC levels (BERR, 2008; EMU, 2005; SeaScape Energy, 2008). The monitoring also showed that sediment is largely deposited immediately adjacent to the cable route; even changes associated with relatively fine sediment were only measurable within a few hundred metres (BERR, 2008; EMU, 2005; SeaScape Energy, 2008). The sediment dispersion zone of influence is determined by the seabed sediment composition and the hydrodynamic conditions.

The cable route is characterised by a range of different seabed sediment types. The PSA data indicates that the route predominately consists of sand (>80%; see **Section D.5**), with variable amounts of gravel, and a greater proportion of fines in the deeper waters (>70 m). In the nearshore region the proportion of sand exceeds 99% (REACH Subsea, 2024).

Modelling studies undertaken for other offshore development projects in the North Sea, with similar seabed substrate and hydrodynamic conditions can be used to estimate the distance that sediment may travel in suspension as a result of cable installation. These studies indicate that sand (0.062 mm – 2 mm) and coarse sediment (>2 mm) could disperse up to a maximum of 700 m and 100 m, respectively, from the source of seabed disturbance, whereas silt and clay (at a level above 1 mg/l) may travel over a distance of up to 2 km (Royal Haskoning, 2011; Scira Offshore Energy Ltd, 2006; Intertek, 2017).

APPENDIX E: MARINE ARCHAEOLOGY TECHNICAL APPENDIX

Spittal to Peterhead Cable Route

Archaeological Assessment of Geophysical and Hydrographic Data

Produced for ERM

MSDS Marine

2024/MSDS24304/1

Spittal to Peterhead Cable Route

Archaeological Assessment of Geophysical and Hydrographic Data

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1.0 Introduction and location

1.0.1 MSDS Marine Limited (MSDS Marine) have been contracted by Environmental Resource Management Ltd (ERM) to undertake an archaeological assessment of geophysical and hydrographic survey data collected in relation to a proposed cable route. The cable route is 165 km in length between Spittal and Peterhead within the North Sea off the northeast coast of Scotland. The geophysical data were collected within a predefined 500 m corridor centred on the route centre line and discussed through this report as the Survey Corridor. For reference there is a Marine Cable Corridor, which follows the 500 m width for the majority of the route, but widens up to 1 km within the southern landfall. Although displayed on figures, the discussion is focused on referencing anomalies within the 500 m Survey Corridor.

1.0.2 The survey was conducted by Reach Subsea AS (Reach) between October and December 2023, and consisted of Sidescan Sonar (SSS), Multibeam Bathymetry (MBES), Magnetometer, and Sub-bottom Profiler (SBP). The assessment is being undertaken to inform the consenting process.

1.0.3 This document forms the archaeological assessment of the geophysical and hydrographic survey data, and outlines the specification of the data, the method of archaeological assessment, the presentation of the results, and recommendations for mitigation strategies.

1.0.4 The location of the cable route is shown in Figure 1.

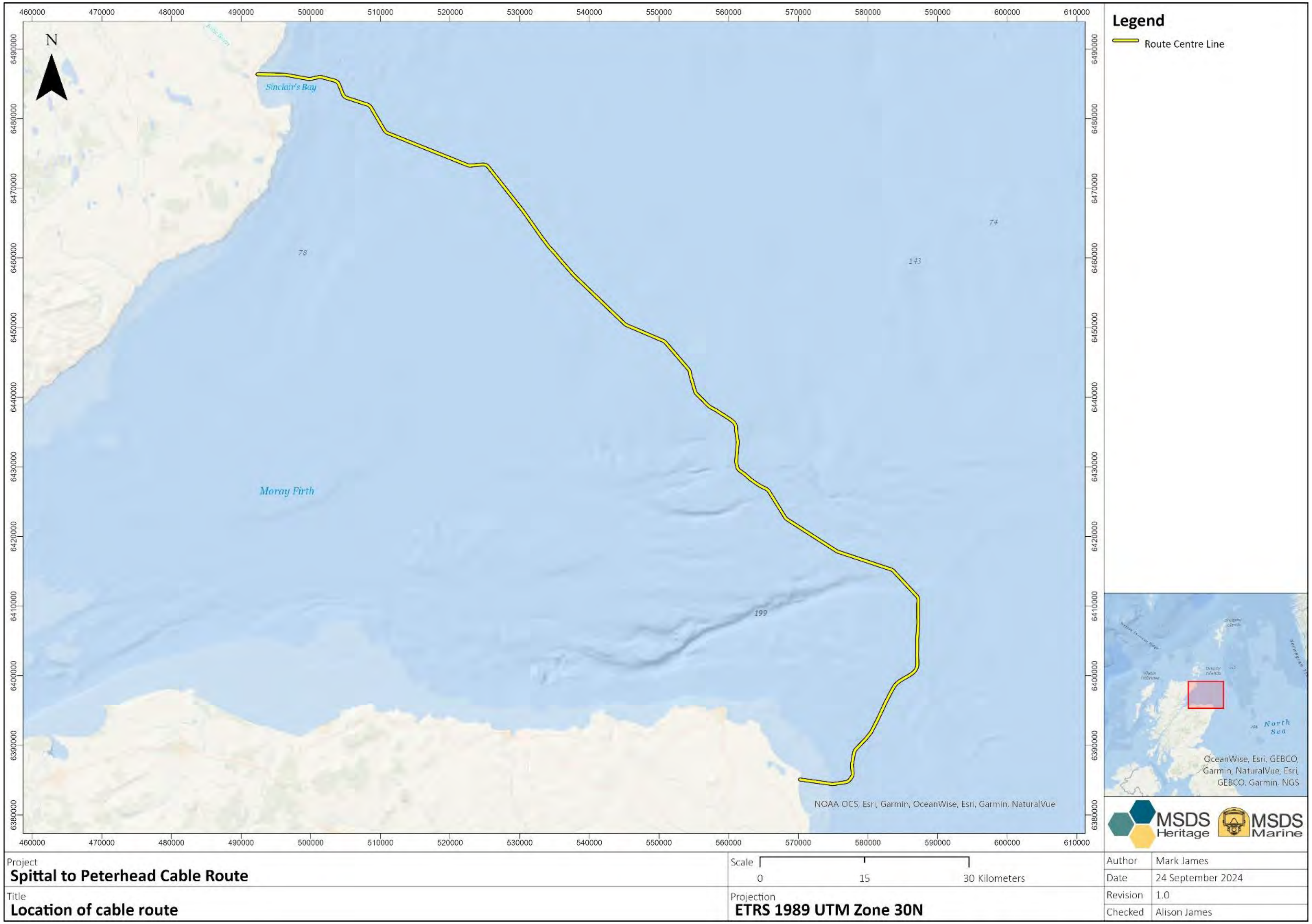


Figure 1: Location of the cable corridor

2.0 Aims and objectives

2.1 Archaeological review of geophysical and hydrographic data

2.1.1 The principle aim of the archaeological review of geophysical and hydrographic data is to establish the presence of material of potential archaeological significance on the seabed. The identification of material allows for strategies to be recommended to mitigate against any negative effects that may be caused by the development process.

2.1.2 The objectives of the archaeological interpretation can be summarised as follows;

- To establish the presence of anthropogenic material of archaeological potential;
- To interpret the identified anomalies as to their potential to be of archaeological significance;
- To recommend mitigation strategies for the anomalies appropriate to their archaeological potential; and
- To recommend further works that may be required and their specifications.

3.0 Methodology

3.1 Data collection

3.1.1 The survey was conducted by Reach between 27th October and 18th December 2023 onboard *Viking Reach*. The survey was mobilised with a Multibeam Echo Sounder (MBES), a Sidescan Sonar (SSS), and a magnetometer/gradiometer.

3.1.2 The SSS, MBES, and the gradiometer were mounted on a Surveyor Remotely Operated Vehicle (SROV). The SROV is a towed remotely operated survey platform (much like an ROV) that is mounted with the sensors.

3.1.3 Survey operations were undertaken within the 500 m Survey Corridor centred on the proposed cable centreline, and within the Marine Cable Corridor.

3.1.4 The survey was planned with a line spacing of 30 m for the main lines, and 5 km for the cross lines. The line planning ensured 100% coverage of SSS data was achieved, including the nadir, typically referred to as 200% coverage. The MBES swathe sector angle was set to produce a full coverage dataset, with sufficient overlap, in the depth of water over the survey areas.

3.1.5 In addition, gradiometer data were collected along each of the survey lines, the average altitude was 7 m. The extents of the survey in relation the route centreline, the Survey Corridor, and the Marine Cable Corridor are presented in Figure 2.

3.1.6 The survey achieved 100% SSS and MBES coverage of the cable corridor, with gradiometer data collected to the line plan specification as outlined above. The equipment specification is shown in Table 1.

Sensor	Manufacturer	Model	Frequency
Sidescan Sonar	Edgetech	2205	300 / 600 kHz 40 m range
Multibeam	Kongsberg	EM2040 dual head	300 kHz
Gradiometer	Subvision	GMA1000	10 Hz sample rate

Table 1: Geophysical and hydrographic sensor specifications

3.1.7 The data were collected to a specification appropriate to achieve the following interpretation requirements:

- Sidescan Sonar: ensonification of anomalies > 0.5 m
- Multibeam Bathymetry: ensonification of anomalies > 1.0 m
- Magnetometer: 5 nT

3.2 Positioning

3.2.1 All data were collected with reference to the European Terrestrial Reference System 1989 (ETRS89) datum and Universal Transverse Mercator (UTM) Zone 30 North projection (ETRS89 Z30N). All vertical depths are relative to LAT and were reduced to LAT using Vertical Offshore Reference Frames (VORF).

3.2.2 The SROV was positioned using an Ultra Short Baseline (USBL) positioning system to ensure positional accuracy throughout the survey. USBL ensures the actual position of the sensor is recorded, as opposed to when the position is estimated based upon the direction of the vessel and the amount of cable out (layback).

3.2.3 Although the accuracy of the USBL system is dependent on the angle, and the distance of the beacon from the transceiver, tolerances of between 0.5 m and 2.0 m can be achieved. Positional accuracy is further increased through the correlation of the SSS dataset with the MBES dataset.

3.2.4 Surface and sub-sea position sensors specifications are detailed below in Table 2.

Sensor	Manufacturer	Model	Accuracy
Surface positioning	Unknown	Unknown	RTK
Sub-sea positioning	Sonardyne	Sprint	0.15 m

Table 2: Offshore position sensor specifications

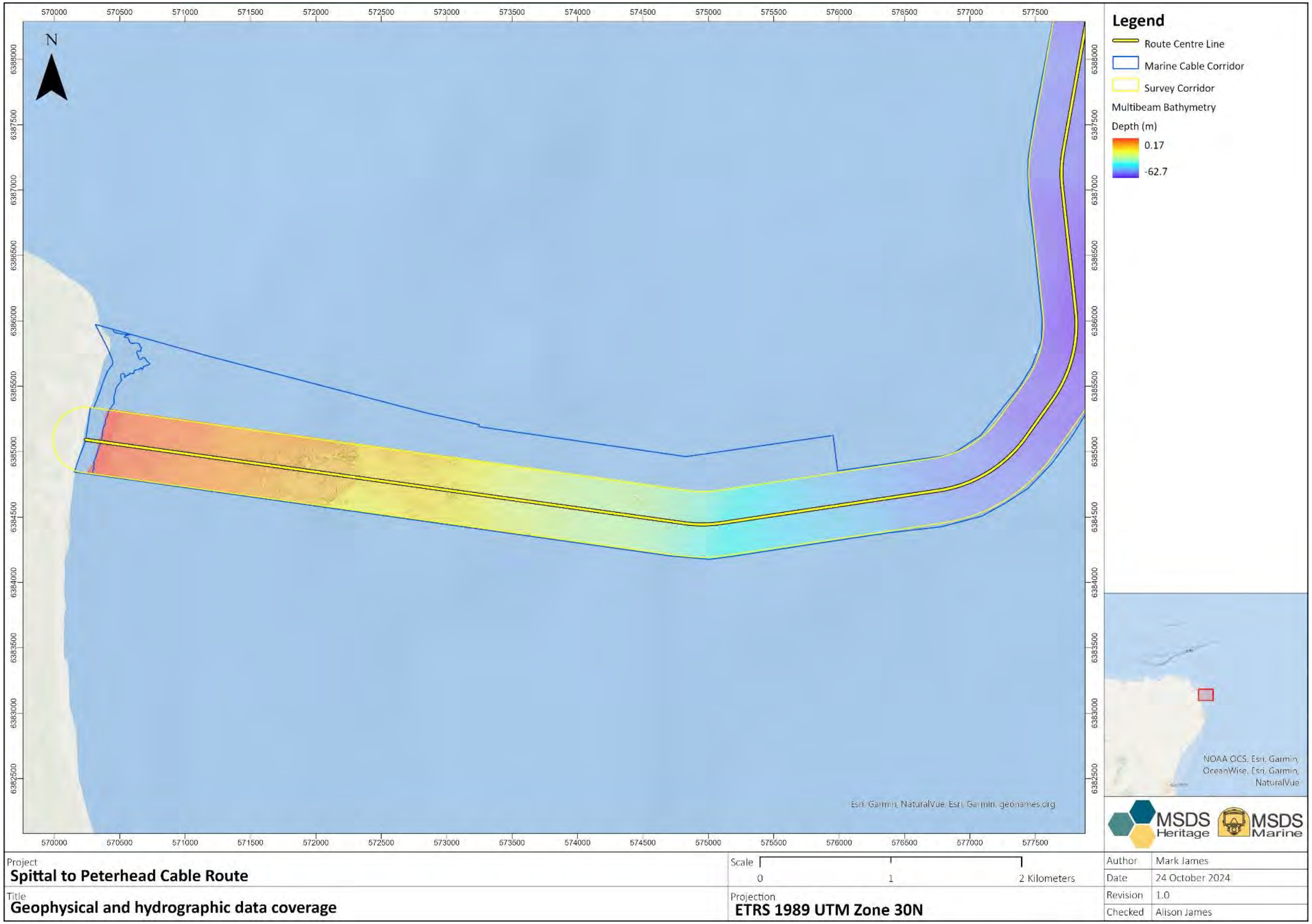


Figure 2: Geophysical and hydrographic data coverage

3.3 Data deliverables to MSDS Marine

3.3.1 MSDS Marine were provided with the survey deliverables by Reach, on behalf of ERM, including both raw and processed data, alongside interpretations and reports. The primary deliverables are detailed in Table 3 below.

Sensor	Data type	Format
Sidescan Sonar	Raw lines (LF and HF)	.xtf
	Processed lines (HF)	.xtf
	Mosaic (HF) 0.2 ppm	.tif
	Contacts	.shp
Gradiometer	Raw lines	.csv
	Grids (residual and altitude)	.tif
	Mosaic (residual and altitude)	.tif
	Contacts	.csv
Multibeam bathymetry	Raw lines	.xyz
	Grids (at 0.2 and 1.0 m)	.xyz
	Mosaic (at 1.0 m)	.tiff
GIS	Geodatabase	.gdb
Reports	Operations report	.pdf
	Interpretation report	.pdf

Table 3: Data deliverables to MSDS Marine

3.4 Data quality and limitations

Sidescan Sonar (SSS)

3.4.1 The SSS data covered the extents of the Survey Corridor, providing 100% seafloor coverage including the nadir. The data were generally of very good quality, with minimal interference or data degradation caused by environmental factors, or the simultaneous use of different sensors. The positions of features correlated well with the MBES data due to the use of the SROV.

3.4.2 Features such as ripples and sand waves were noted with the dataset. These features obscure the line of sight of the SSS creating acoustic shadow which can mask the presence of anomalies. This is to some degree mitigated by the collection of 100% coverage data including the nadir, as this equates to 200% coverage excluding the nadir. Further mitigation is provided through the assessment of MBES data which is collected above features reducing the acoustic shadow.

Multibeam Bathymetry (MBES)

3.4.3 The MBES data covered the extents of the Survey Corridor, providing 100% coverage. A review of the un-gridded point cloud data shows that the quality is good with no significant height or positioning errors that effect the overall dataset. The data density is good, and the data is able to be gridded to 0.2 m, increasing the ability to identify smaller features. Features identified within the MBES data correlate with those identified in the SSS data. MBES data is considered to provide the most accurate positioning due to the direct, and fixed, correlation between the sensor, and the Motion Reference Unit (MRU).

Gradiometer

3.4.4 The gradiometer data covered the extents of the Survey Corridor and was collected along the pre-defined survey line plan. The data were sampled at 10 Hz, at a maximum altitude of 7 m. The data were suitable to identify anomalies with a peak-to-peak amplitude of 5 nT.

Summary

3.4.5 The data collected across the Survey Corridor are of good quality overall, and in the case of SSS and MBES provided 100% coverage. The gradiometer data were collected to the pre-determined line.

3.4.6 The data is considered of an appropriate specification, coverage, and quality, to undertake a robust archaeological assessment to inform the consenting process.

3.5 Archaeological assessment of data

3.5.1 The archaeological assessment of data was undertaken by a qualified and experienced maritime archaeologist with a background in geophysical and hydrographic data acquisition, processing, and interpretation.

3.5.2 Following delivery of the required datasets, an initial review was undertaken to gain an understanding of the geological and topographic make-up of the survey area. Within the extent of the survey area the potential for variations in the seabed are high and can affect the interpretation of anomalies.

3.5.3 The assessment considers the full extents of the survey data which includes full coverage of the Survey Corridor.

3.5.4 Whilst some of the data extends beyond the cable corridor, the purpose of the assessment is to characterise the historic environment and therefore data from the wider area were considered. The focus of the mitigation measures is, however, on anomalies within the cable corridor, or where mitigation measures would impact within the cable corridor.

Sidescan Sonar

3.5.5 SSS is considered the best tool for the identification of anthropogenic anomalies on the seabed due to the ability to ensonify small features and as such forms the basis of any archaeological assessment of data. SSS data in .xtf format were imported into Moga Seaview 6.2 software, navigation and positioning were checked and corrected where required, and optimal gains were applied to ensure the consistent presentation of data.

3.5.6 Data were reviewed on a line-by-line basis, and all anomalies of potential anthropogenic origin identified and recorded. Records include at a minimum an image of the anomaly, dimensions, and a description. Whilst typically only images of medium and high potential anomalies are presented with the assessment report, images of all anomalies are recorded as interpretations can change as the data assessment progresses. A rating of archaeological potential was assigned to the anomaly following the criteria outlined in Table 4 below.

3.5.7 Following assessment of the individual lines, a mosaic was created and a Geotiff exported to allow for the checking of positional accuracy against the MBES data and to identify the extents of any anomalies that may have extended past the limits of individual lines.

Magnetometer

3.5.8 Magnetometer data indicates the presence of ferrous, and thus usually anthropogenic, material both on, and under the seabed. Where line spacing allows, typically to a specification for the detection of potential UXO, magnetometer data can provide accurate positions of buried ferrous anomalies. The survey line spacing for the Spittal to Peterhead cable route is c.30 m which is too great for the accurate positioning of small magnetic anomalies at distances away from the tracklines, but is generally sufficient for anomalies that would be considered of high archaeological potential. Where possible, magnetic anomalies were correlated with anomalies visible on the seabed.

3.5.9 Magnetometry data were provided as .csv files and as a gazetteer detailing all anomalies greater than 5 nT. An assessment was made by MSDS Marine as to the suitability of the gazetteer for archaeological interpretation. Where required the .csv magnetometer data was imported into Moga Seaview 6.2 software where the data was smoothed, and a 'baseline' identified and removed from the data to highlight ferrous anomalies whilst taking into account geological variations in the data.

3.5.10 Magnetic anomalies identified within the data had the position, intensity and dimensions recorded. A rating of archaeological potential was assigned to the anomaly following the criteria outlined in Table 4 below. The data were gridded to visually identify areas where the distribution of anomalies may represent a wider feature such a buried but dispersed wreck, or modern features such as buried cable or chain.

Multibeam Bathymetry

3.5.11 Due to the minimum anomaly detection size of MBES data being larger than that of SSS data, the primary use during archaeological assessment, outside of seabed characterisation, is the corroboration of anomalies identified within other datasets and the visualisation of anomalies that may otherwise be obscured by shadow.

3.5.12 Navigation corrected, but unprocessed, MBES data were provide to MSDS Marine as .xyz files, the data were imported into QPS Fledermaus where it was gridded and exported as a floating point raster, the raster was imported into ArcGIS Pro 3.3.1 and a hill-shaded surface applied, shading was adjusted to ensure the optimal presentation of data. The resulting 3-Dimensional image was viewed on a block-by-block basis, and all anomalies of potential anthropogenic origin identified and recorded.

3.5.13 Records include, at a minimum, an image of the anomaly, dimensions, and a description. A rating of archaeological potential was assigned to the anomaly following the criteria outlined in Table 4 below. Where the interpretation of an anomaly was unclear, the data were imported into point cloud visualisation software such as Cloud Compare, in order to view the un-gridded data. The gridded surface image was exported as a Geotiff to allow further assessment alongside other datasets.

Potential	Criteria
Low	An anomaly potentially of anthropogenic origin but that is unlikely to be of archaeological significance – Examples may include discarded modern debris such as rope, cable, chain, or fishing gear; small, isolated anomalies with no wider context; or small boulder-like features with associated magnetometer readings.
Medium	An anomaly believed to be of anthropogenic origin but that would require further investigation to establish its archaeological significance – Examples may include larger unidentifiable debris or clusters of debris, unidentifiable structures, or significant magnetic anomalies.
High	An anomaly almost certainly of anthropogenic origin and with a high potential of being of archaeological significance – high potential anomalies tend to be the remains of wrecks, the suspected remains of wrecks, or known structures of archaeological significance.

Table 4: Criteria for the assessment of archaeological potential

Combined assessment

3.5.14 Following the assessment of all datasets the results were loaded into ESRI ArcGIS Pro 3.3.1, a Geographical Information System (GIS), and reviewed alongside each other, along with Geotiffs of the SSS, MBES, and Magnetometer data. The concurrent review allows the amalgamation of duplicate anomalies, the assessment of the wider context, and an understanding of the extents of a feature that may be partially buried, or span across two or more lines of data.

3.5.15 Data from the United Kingdom Hydrographic Office (UKHO), including the positions of wrecks and obstructions, and the relevant Historic Environment Records (HER) and Canmore records, as well as all other relevant data such as third-party assets were assessed to ensure that any additional information is drawn upon, but also that anomalies are not unnecessarily identified as having archaeological potential when the origination can be identified. The resultant remaining anomalies assessed as having archaeological potential were compiled into a gazetteer and a shapefile.

3.5.16 The interpretation of geophysical and hydrographic data is, by its very nature, subjective. However, with experience and by analysing the form, size, and characteristics of an anomaly, a reasonable degree of certainty as to the origin of an anomaly can be achieved.

3.5.17 Measurements can be taken in most data processing software, and whilst largely accurate, discrepancies can be noted due to a number of factors. Where there is uncertainty as to the potential of an anomaly, or its origin, a precautionary approach is always taken to ensure the most appropriate mitigation for the historic environment.

3.5.18 It should be noted that there may be instances where an anomaly may exist on the seabed but not be visible in the geophysical data. This may be due to being covered by sediment or being obscured from the line of sight of the sonar. The use of both SSS and MBES data mitigates this by visualising anomalies from multiples angles, including from above. Anomalies were named following the standard MSDS Marine convention, [PROJECTYEAR_ID], e.g., SP24_XXX.

3.6 Mitigation

3.6.1 The following section discusses the archaeological mitigation strategies which are considered for the Spittal to Peterhead cable route, the proposed mitigation is presented in Section 8.0.

Surface anomalies

3.6.2 To ensure the most appropriate and robust mitigation for the historic environment, whilst being proportional to the requirements of the development, mitigation recommendations are determined on an anomaly-by-anomaly basis, and consider all available data including;

- Potential significance;
- Size;
- Seabed type;
- Seabed dynamics;
- Development type; and
- Potential negative impacts.

3.6.3 Mitigation strategies have been based on the criteria in Table 5 below.

Potential	Criteria
Low	No archaeological significance interpreted. Maintain an operational awareness of the anomaly's location and reporting through the agreed protocol should material of potential archaeological significance be encountered.
Medium	Avoidance of the anomaly's position and where appropriate an archaeological exclusion zone may be recommended. Ground truthing of the anomaly through the use of divers or an ROV would establish the archaeological potential.
High	Archaeological exclusion zones will be recommended based on the size of the anomaly, any outlying debris and the seabed dynamics as interpreted from the SSS and MBES data.

Table 5: Mitigation criteria for archaeological anomalies

3.6.4 Where an anomaly is visible in the MBES data, that position will generally be used for the implementation of mitigation recommendations.

3.6.5 The mitigation strategies detailed in Table 6 have been used.

Potential	Criteria
Archaeological Exclusion Zones (AEZs)	For archaeologically significant anomalies that are clearly identifiable in the survey data and where the extents are largely known, Archaeological Exclusion Zones (AEZs) will be recommended. AEZs will remain for the life of The Project or until ground truthing or higher resolution data determines a reduction in potential, significance, or extents.
Temporary Archaeological Exclusion Zones (TAEZs)	Where an anomaly is not visible in the survey data but likely to exist on the seabed at a known position or where the extents of an anomaly are not fully identifiable, Temporary Archaeological Exclusion Zones (TAEZs) will be recommended. TAEZs have been identified as highly likely to be altered following higher resolution or full coverage data assessment, however, they will remain in place until alterations have been formally agreed.
Areas of Archaeological Potential (AAP)	Areas of Archaeological Potential (AAP) are primarily reserved for magnetic anomalies where, due to line spacing, positions are not accurately known. AAPs demonstrate that there is potentially an anomaly of archaeological significance around the given position. The anomaly is likely to be identified following higher resolution or full coverage data assessment but as the nature and position is not precisely known, no formal exclusion zone is recommended but instead a general awareness of the position is considered appropriate at this phase.

Table 6: Archaeological mitigation strategies

4.0 Results of surface geophysical anomalies

4.0.1 For the avoidance of confusion, the results of magnetic anomalies with no surface expression are presented in Section 5.0, UKHO records in Section 6.0, and HER and Canmore records in Section 7.0.

4.0.2 A total of 123 surface anomalies of potential archaeological interest were identified within the dataset. Of these, 111 lie within the Survey Corridor. The remaining twelve lie within the extents of the survey data which extended into the Marine Cable Corridor. The anomalies are categorised by potential in Table 7.

Potential	Survey Corridor	Marine Cable Corridor	Total
Low	106	12	118
Medium	3	0	3
High	2	0	2
Total	111	12	123

Table 7: Distribution of archaeological anomalies by potential

4.0.3 The distribution of anomalies is shown in Figure 3, as can be noted the distribution is fairly uniform across the surveyed area. The ratios of high, medium, and low potential anomalies are relatively consistent with a typical archaeological assessment of data.

4.0.4 The distribution of anomalies within the geophysical data shows a consistent approach to the assessment. The high, medium, and low potential anomalies are discussed below according to their assessed potential.

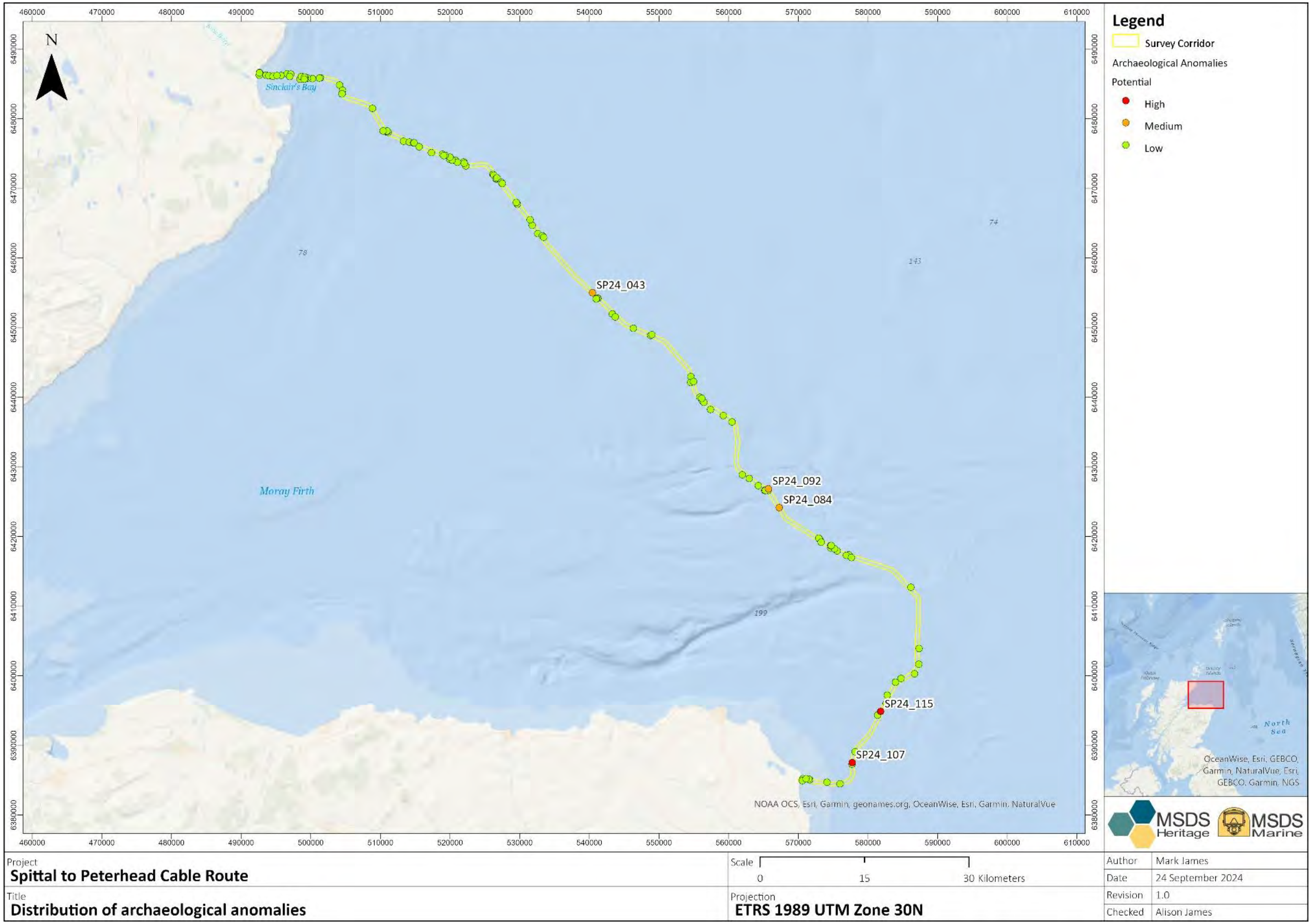


Figure 3: Distribution of Archaeological Anomalies

4.1 Low potential anomalies

4.1.1 118 anomalies interpreted as of low archaeological potential were identified within the dataset. Of these, 106 lie within the Survey Corridor. The remaining twelve lie within the extents of the survey data which extended into the Marine Cable Corridor. The anomalies can be categorised as follows in Table 8.

Anomaly category	Survey Corridor	Marine Cable Corridor	Total
Chain, cable, or rope	16	6	22
Likely geological	20	1	21
Potential debris	51	3	54
Seabed disturbance	1	0	1
Linear Feature	6	1	7
Fishing gear	12	1	13
Total	106	12	118

Table 8: Low potential anomaly categories

4.1.2 The anomalies interpreted as of low archaeological potential (see Table 4) are a mixture of small features, often boulder-like, or likely to represent modern debris such as chain, cable, or rope, or small items of debris with no features indicating archaeological potential. Each anomaly was reviewed and interpreted to be of low archaeological potential. A further review was undertaken following the assessment of the survey area extents.

4.1.3 Table 9 below provides a brief justification for the interpretation of each category of low potential anomalies. To note, the descriptions below are generalised, and each anomaly is interpreted based on individual characteristics, other anomalies within the wider area, seabed characterisation, etc.

Anomaly category	Description
Chain, cable, or rope	Features identified as chain, cable, or rope are generally identified as long, linear, or curvilinear features with little or no measurable height. The length and form will generally preclude their assessment as of a higher archaeological potential.
Likely geological	Features identified as likely geological, are generally precautionary identifications where the form is indictive of a geological feature but may be of a size, or form, which is unusual in the surrounding area.
Potential debris	Features identified as potential debris will generally display characteristics indicating anthropogenic origin, such as straight or angular edges. Boulder like features, with associated magnetic anomalies can also be categorised as potential debris.
Seabed disturbance	Features identified as seabed disturbances are where the main characteristic is a change in the seabed surface that may indicate either low lying material, or partially buried material. The potential will be determined based on the size, associated magnetic anomalies, and the surrounding environment.
Linear Feature	Linear features are anomalies which primarily consist of a single linear element, but that don't appear to be chain cable of rope. A single isolated linear feature, whilst potentially indicative of anthropogenic debris, may not warrant an interpretation of higher archaeological interest.
Fishing gear	Features identified as fishing gear may include pot strings where small features are linked by rope like features, features with a mid-water component indicating snagged nets, or features associated with trawl scars.

Table 9: Low potential anomaly descriptions

4.1.4 Low potential anomalies have been assessed against all available evidence and are deemed unlikely to be of archaeological significance and as such are not discussed further within the results section of this report. The identification of an anomaly as of low archaeological potential is commensurate with the mitigation for this category - *Maintain an operational awareness of the anomaly's location and reporting through the agreed protocol should material of potential archaeological significance be encountered*.

4.1.5 The distribution of low potential anomalies is shown in Figure 4. Further information regarding mitigation can be found in Section 8.0, and a gazetteer of low potential anomalies, including positions and dimensions, can be found in Annex A – *Anomalies of archaeological potential*.

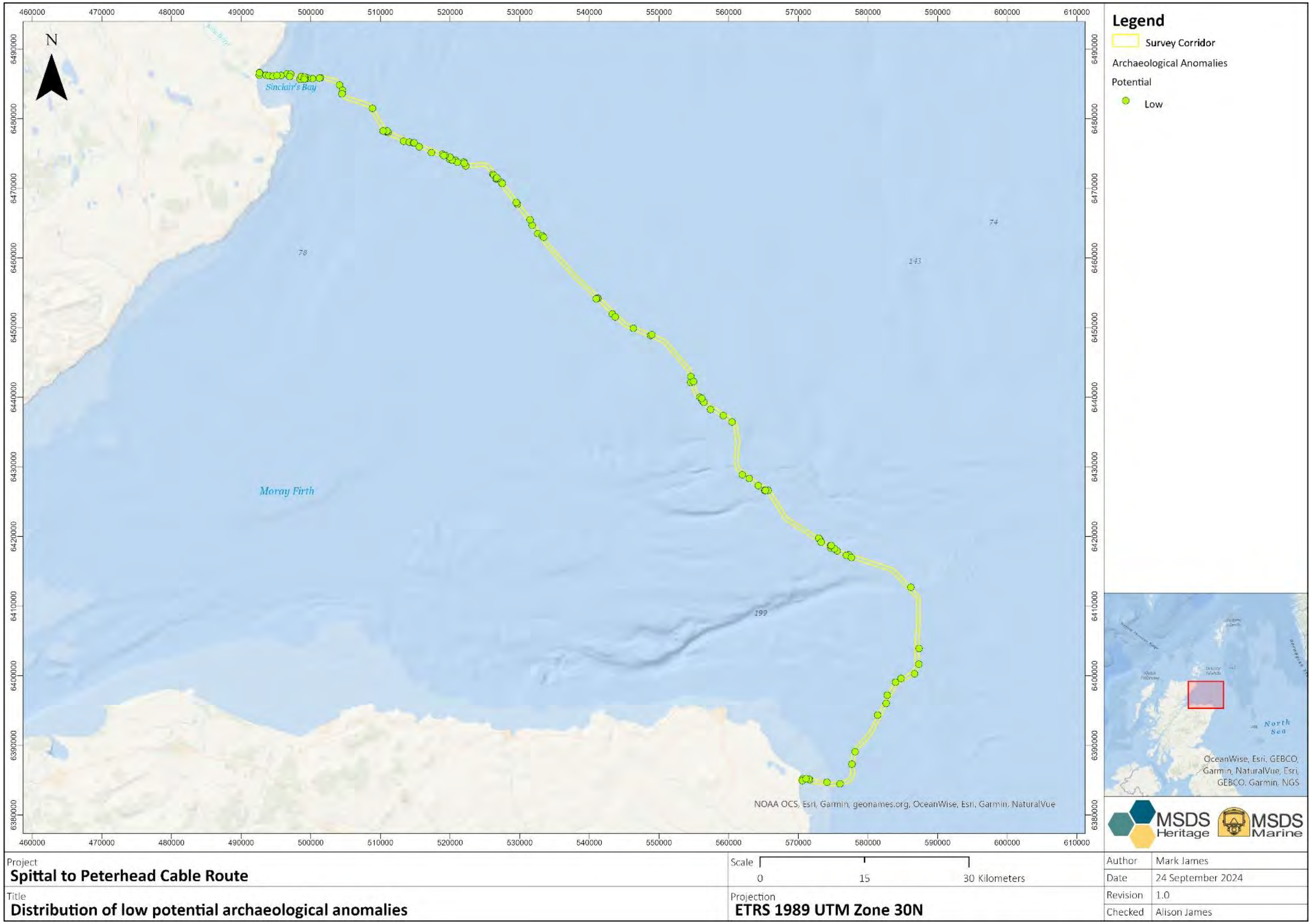


Figure 4: Distribution of Low Potential Archaeological Anomalies

4.2 Medium potential anomalies

4.2.1 Three anomalies interpreted as of medium archaeological potential were identified within the dataset, all three of which fall within the Survey Corridor. The anomalies can be categorised as follows in Table 10, the distribution is presented in Figure 5.

Anomaly category	Survey Corridor
Potential debris	2
Potentially geological	1
Total	3

Table 10: Medium potential anomaly categories

4.2.2 The anomalies interpreted as of medium archaeological potential have characteristics that indicate a likelihood of representing anthropogenic material that has the potential to be of archaeological interest, or where a precautionary approach has been taken for anomalies where the identification isn't clear.

4.2.3 The identification of an anomaly as of medium archaeological potential is commensurate with the mitigation for this category - *Avoidance of the anomaly's position and where appropriate an archaeological exclusion zone may be recommended. Ground truthing of the anomaly through the use of divers or an ROV would establish the archaeological potential*.

4.2.4 Each medium potential anomaly is discussed, along with an image, within this section of this report. Further information regarding mitigation can be found in Section 8.0, and a gazetteer of medium potential anomalies, including positions and dimensions can be found in Annex A – *Anomalies of archaeological potential*.

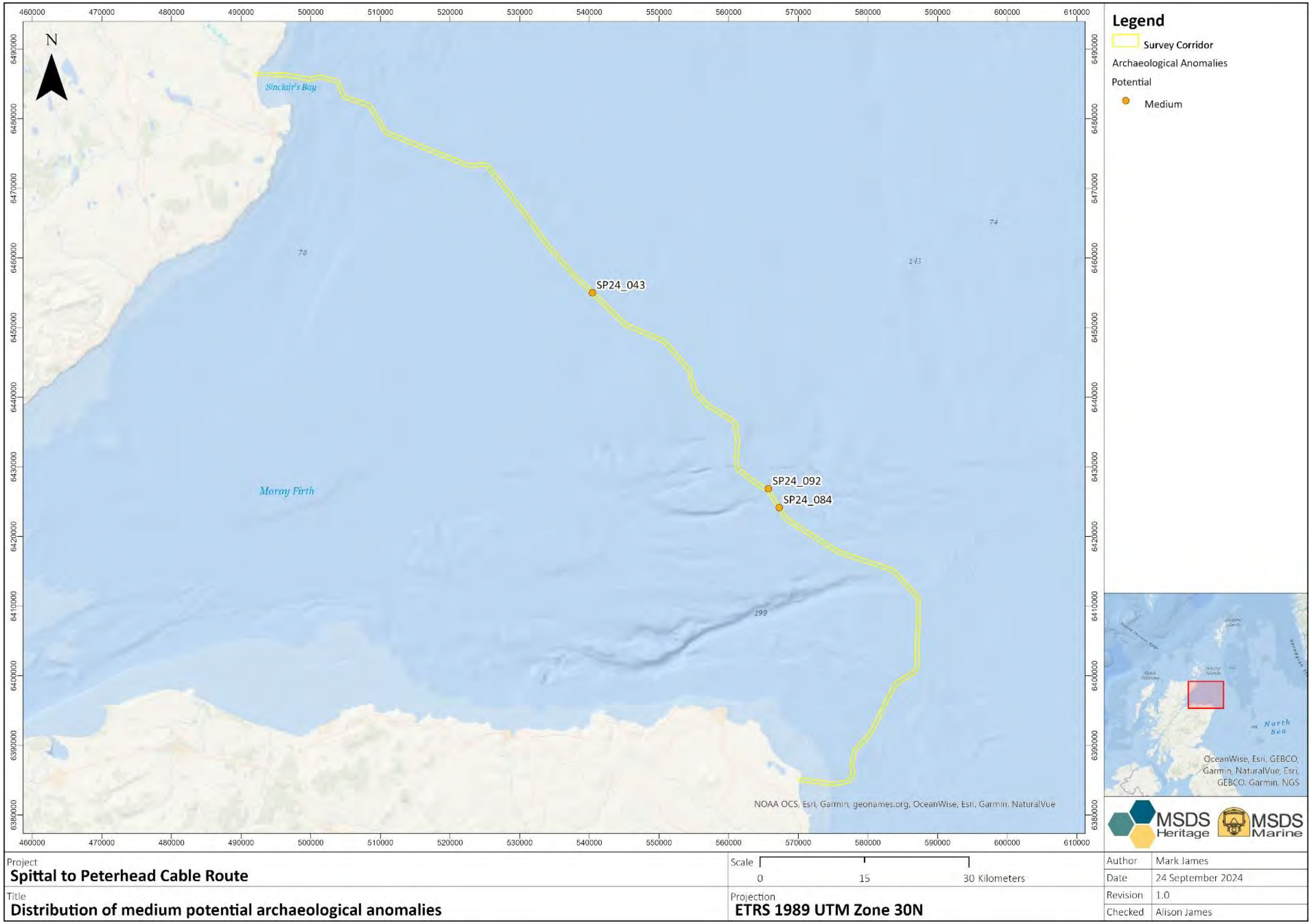


Figure 5: Distribution of Medium Potential Archaeological Anomalies

Medium potential SP24_043

4.2.5 SP24_043 (Figure 6) lies with the Survey Corridor, c. 57 km southeast of the Spittal landfall, and c. 28 m northeast of the proposed cable route. The anomaly is visible in the SSS and MBES data, has no associated magnetic anomaly, and does not correspond with any UKHO, HER, or Canmore records, the nearest being Canmore 285404 and Canmore 222085 27 km to the northwest.

4.2.6 The anomaly is visible in the SSS and MBES data as a cluster of anomalies measuring 3.3 m x 7.5 m with a measurable height of 0.4 m. Within the SSS data the form of the anomalies indicates potential anthropogenic origin, although within the MBES data the form is more geological, lying within an area of boulders. The lack of a magnetic anomaly may support a geological origin.

4.2.7 Therefore, the assessment as of medium potential is precautionary, based primarily on the SSS data. Further assessment of Remotely Operated Vehicle (ROV) data would be required to better understand the origin, and therefore the archaeological potential.

Medium potential SP24_084

4.2.8 SP24_084 (Figure 7) lies with the Survey Corridor, c. 39 km north of the Peterhead landfall, and c. 31 m northeast of the proposed cable route. The anomaly is visible in the SSS and MBES data, has no associated magnetic anomaly, and does not correspond with any UKHO, HER, or Canmore records, the nearest being Canmore 328308 7.7 km to the southeast.

4.2.9 The anomaly is visible in the SSS data as a low-lying mound measuring 4.5 m x 1.7 m with a measurable height of 0.3 m and orientated northwest, southeast. A further feature extends from the southeastern end towards the southwest for c. 3.5 m. Within the MBES data the mound is visible but appears to have an irregular surface. The overall form of the anomaly is indicative of anthropogenic material, and the size may indicate the potential to be of archaeological significance. There remains the potential for the anomaly to be geological in origin, or potentially fishing gear.

4.2.10 Therefore, the assessment as of medium potential is precautionary. Further assessment of Remotely Operated Vehicle (ROV) data would be required to better understand the origin, and therefore the archaeological potential.

Medium potential SP24_092

4.2.11 SP24_092 (Figure 8) lies with the Survey Corridor, c. 41 km north of the Peterhead landfall, and c. 219 m northeast of the proposed cable route. The anomaly is visible in the SSS and MBES data, has no associated magnetic anomaly, and does not correspond with any UKHO, HER, or Canmore records, the nearest being Canmore 328308 10.8 km to the southeast.

4.2.12 Within the SSS data the anomaly appears as a large, almost boulder like, feature measuring 4.8 m x 3.8 m with a measurable height of 1.5 m. Within the MBES data the anomaly appears lozenge shape and it made up of three linear components running along the length. There is notable scour along all sides, but most prominent to the northwest and southwest. Within the MBES data the form of the anomaly is indicative of anthropogenic material, the size indicating the potential to be of archaeological interest.

4.2.13 Further assessment of Remotely Operated Vehicle (ROV) data would be required to better understand the origin, and therefore the archaeological potential.

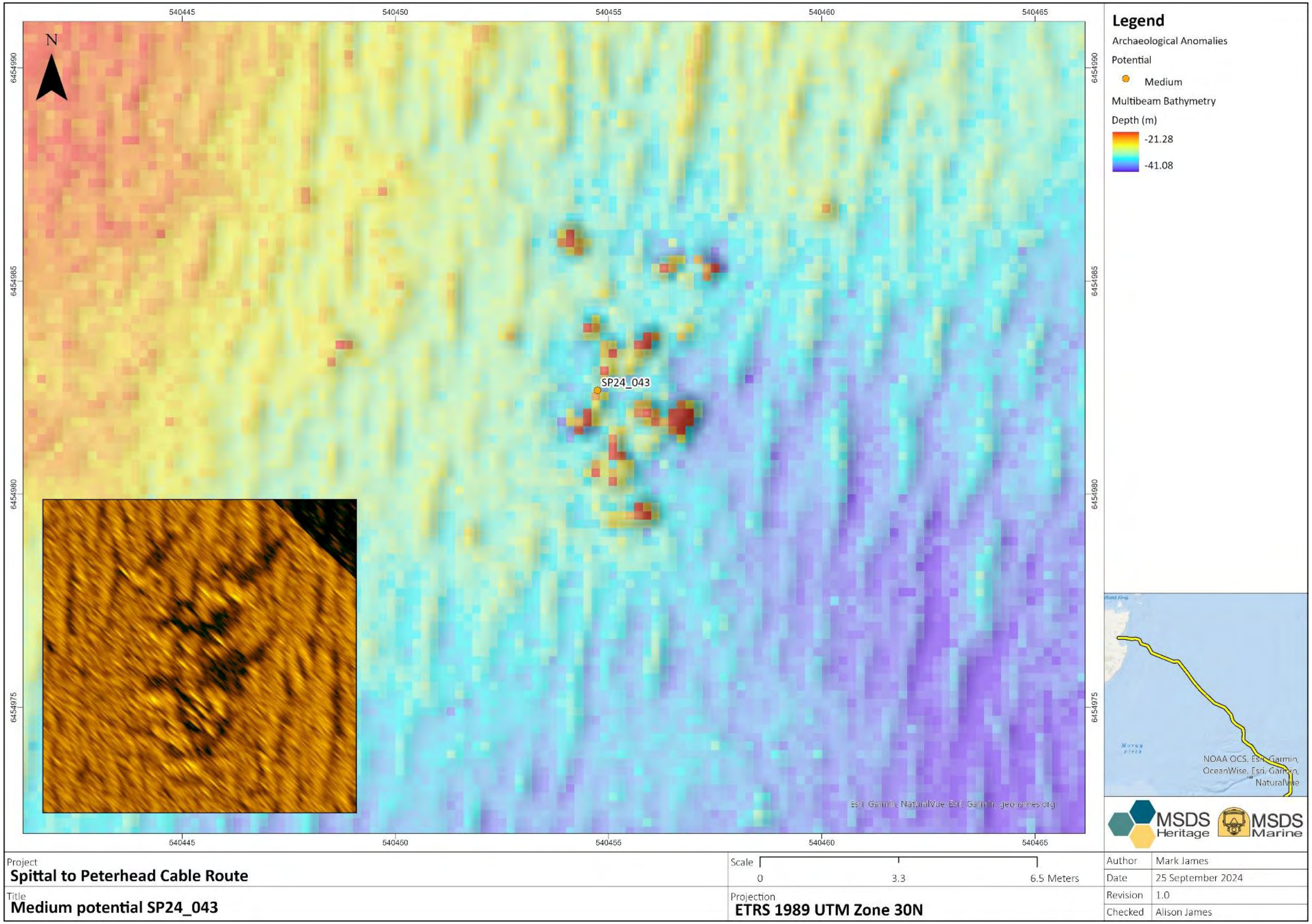
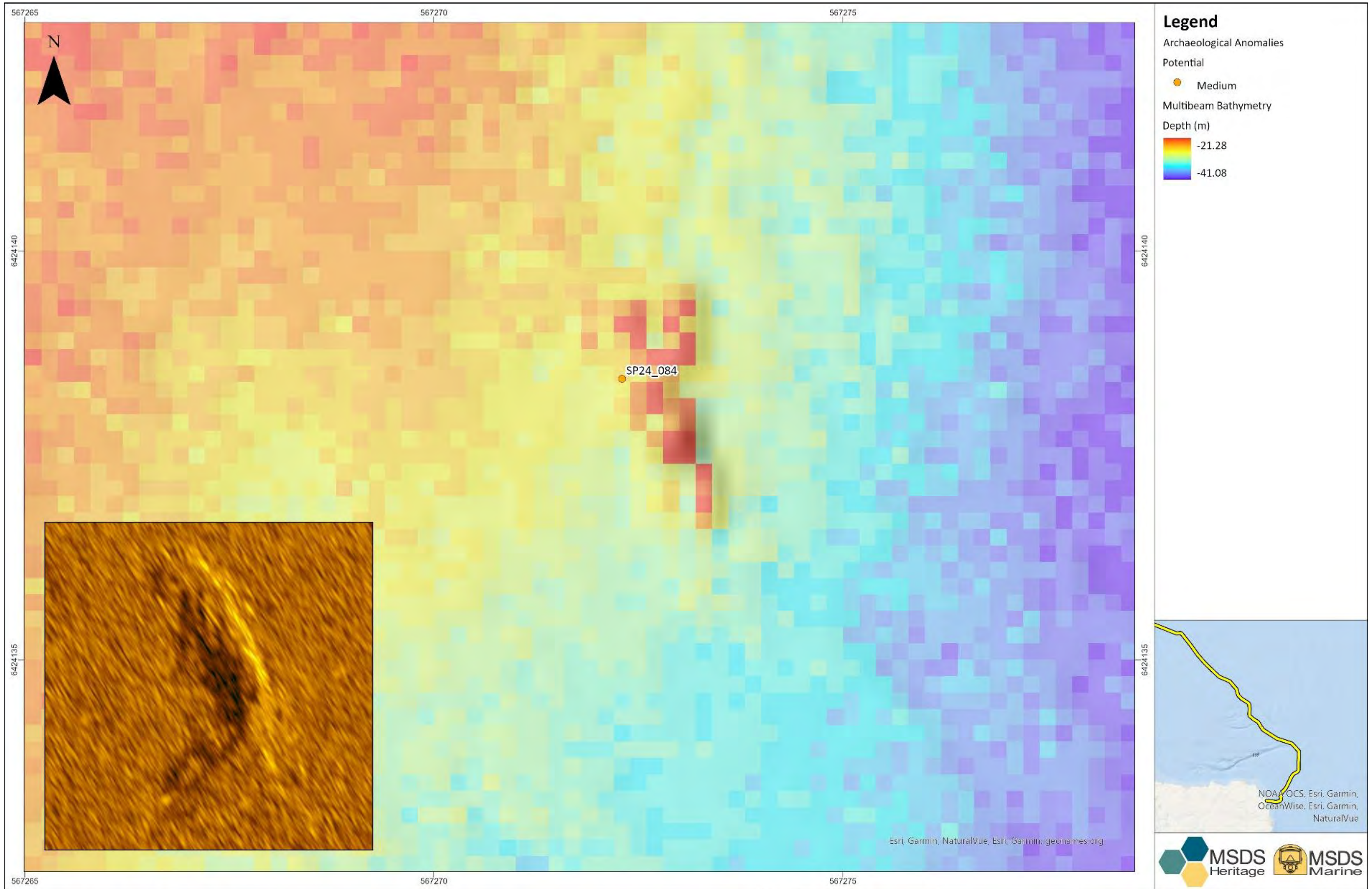


Figure 6: Medium Potential SP24_043



Project	Scale	Author	Mark James
Spittal to Peterhead Cable Route	0 1.8 3.5 Meters	Date	25 September 2024
Title	Projection	Revision	1.0
Medium potential SP24_084	ETRS 1989 UTM Zone 30N	Checked	Alison James

Figure 7: Medium Potential SP24_084

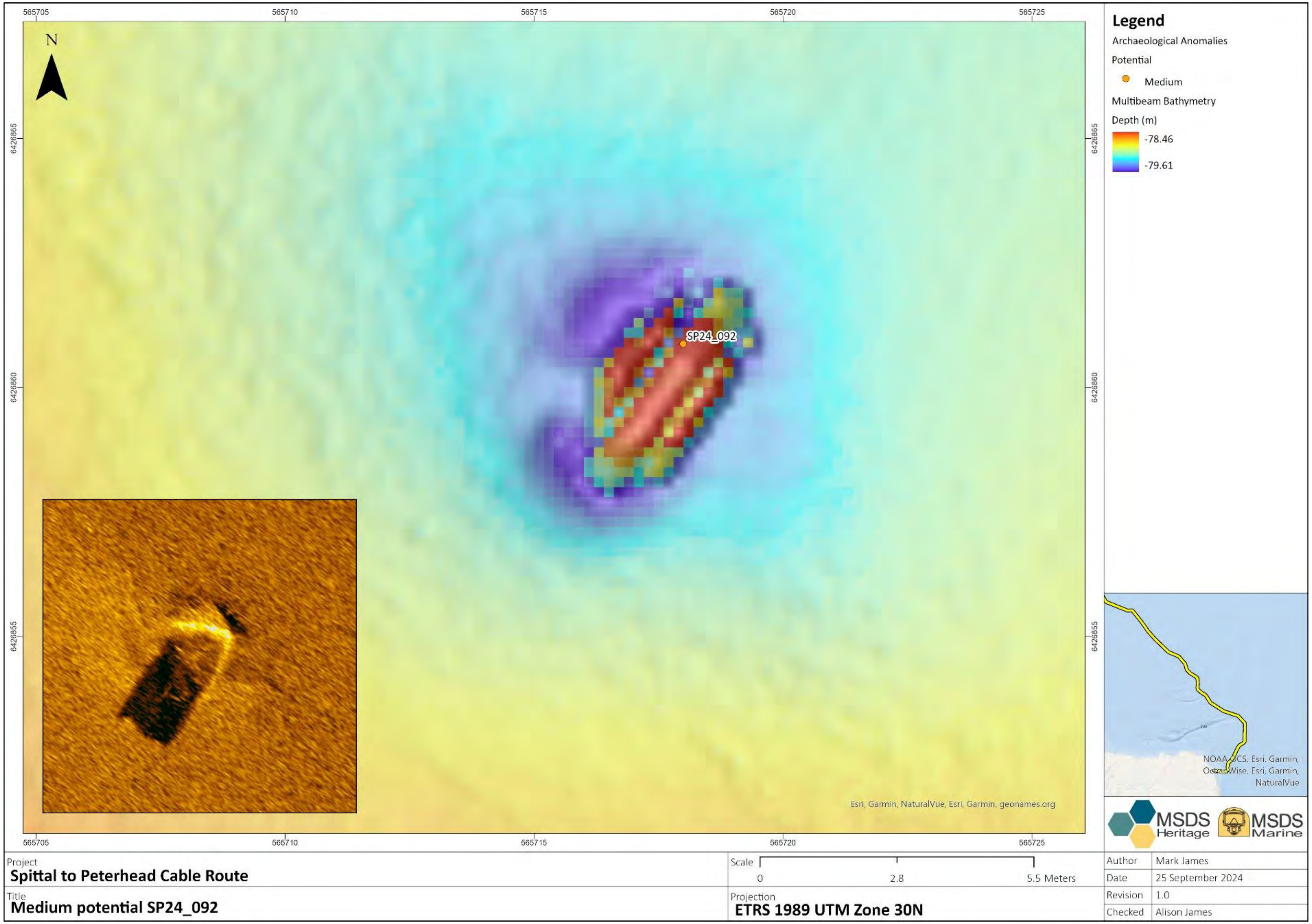


Figure 8: Medium Potential SP24_092

4.3 High potential anomalies

4.3.1 Two anomalies interpreted as of high archaeological potential were identified within the dataset, both of which fall within the Survey Corridor. The anomalies can be categorised as follows in Table 11, the distribution is presented in Figure 9.

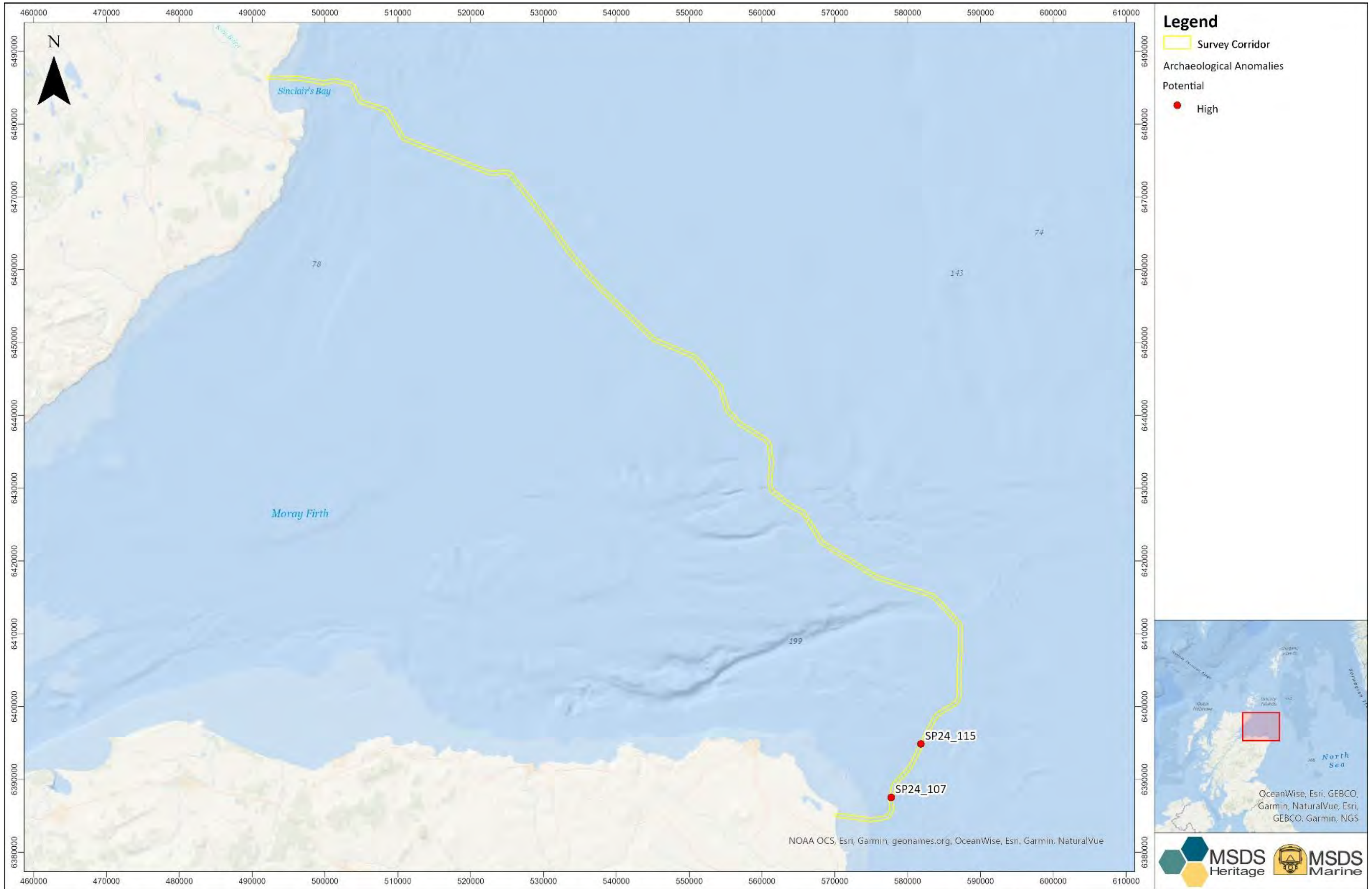
Anomaly category	Survey Corridor
Wreck	1
Potential wreck	1
Total	2

Table 11: High potential anomaly categories

4.3.2 The anomalies interpreted as of high archaeological potential have characteristics that indicate a high likelihood of representing anthropogenic material that has a high potential to be of archaeological interest, or where a precautionary approach has been taken for anomalies where the identification isn't clear.

4.3.3 The identification of an anomaly as of high archaeological potential is commensurate with the mitigation for this category - *Archaeological exclusion zones will be recommended based on the size of the anomaly, any outlying debris and the seabed dynamics as interpreted from the SSS and MBES data*.

4.3.4 Each high potential anomaly is discussed, along with an image, within this section of this report. Further information regarding mitigation can be found in Section 8.0, and a gazetteer of high potential anomalies, including positions and dimensions can be found in Annex A – *Anomalies of archaeological potential*.



Project: **Spittal to Peterhead Cable Route**	Scale: 0 – 15 – 30 Kilometers	Author	Mark James
		Date	24 September 2024
Title: **Distribution of high potential archaeological anomalies**	Projection: **ETRS 1989 UTM Zone 30N**	Revision	1.0
		Checked	Alison James

Figure 9: Distribution of High Potential Archaeological Anomalies

High potential SP24_107

4.3.5 SP24_0107 (Figure 10) lies with the Survey Corridor, c. 7.9 km north-northeast of the Peterhead landfall, and c. 25 m west of the proposed cable route. The anomaly is visible in the SSS and MBES data and has an associated magnetic anomaly of 23.9 nT. The position does not correspond with any UKHO, HER, or Canmore records, the nearest being Canmore 291694, 7.5 km to the south-southwest.

4.3.6 The anomaly is visible in both the SSS and MBES data as a concentration of linear, and curvilinear, features over an area of 21.8 m x 13.8 m with a measurable height of 0.4 m. Two further linear features lie 13.5 m to the northeast which are potentially related. Although in an area of seabed characterised by scattered boulders, the form of the features within the anomaly and the associated magnetic anomaly indicate anthropogenic material.

4.3.7 The overall form, size, and distribution of material could potentially represent the remains of a wrecked vessel, or other concentration of material. As such a high potential rating is considered appropriate.

High potential SP24_115

4.3.8 SP24_115 (Figure 11) lies with the Survey Corridor, c. 15 km northeast of the Peterhead landfall, and c. 97 m west of the proposed cable route. The anomaly is visible in the SSS and MBES data, has no associated magnetic anomaly, and does not correspond with any UKHO, HER, or Canmore records, the nearest being Canmore 291694, 14.8 km to the northwest.

4.3.9 The anomaly is visible in both the SSS and MBES data as a prominent anthropogenic feature measuring 10.8 m x 5.3 m with a measurable height of 1.8 m. Scour is visible along all sides but is most pronounced along the southwest and northeast sides. Within the SSS data the anomaly appears almost wreck like with what looks like a bow to the west and a stern to the east, with the MBES data this interpretation is slightly less clear although still potentially indicating a wreck.

4.3.10 It is likely that the anomaly represents a wreck, however the origin and identity are unclear. Should it be a wreck, the form does not indicate wooden construction (unless relatively modern) and could be of fiberglass, steel, or aluminium construction. The lack of a magnetic anomaly may indicate non-ferrous material. Due to the uncertainty in the origin a high potential rating is considered appropriate.

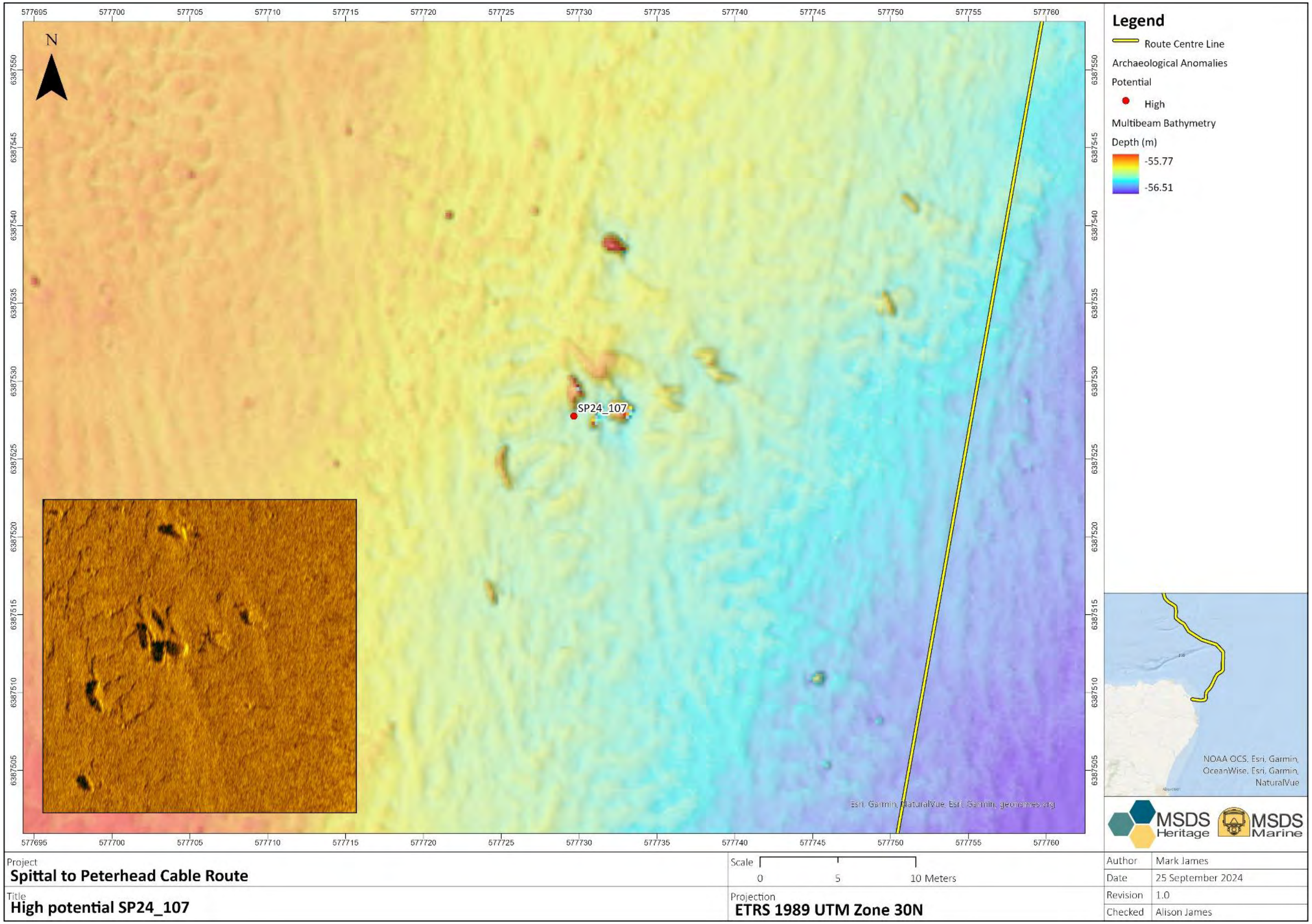


Figure 10: High Potential SP24_107

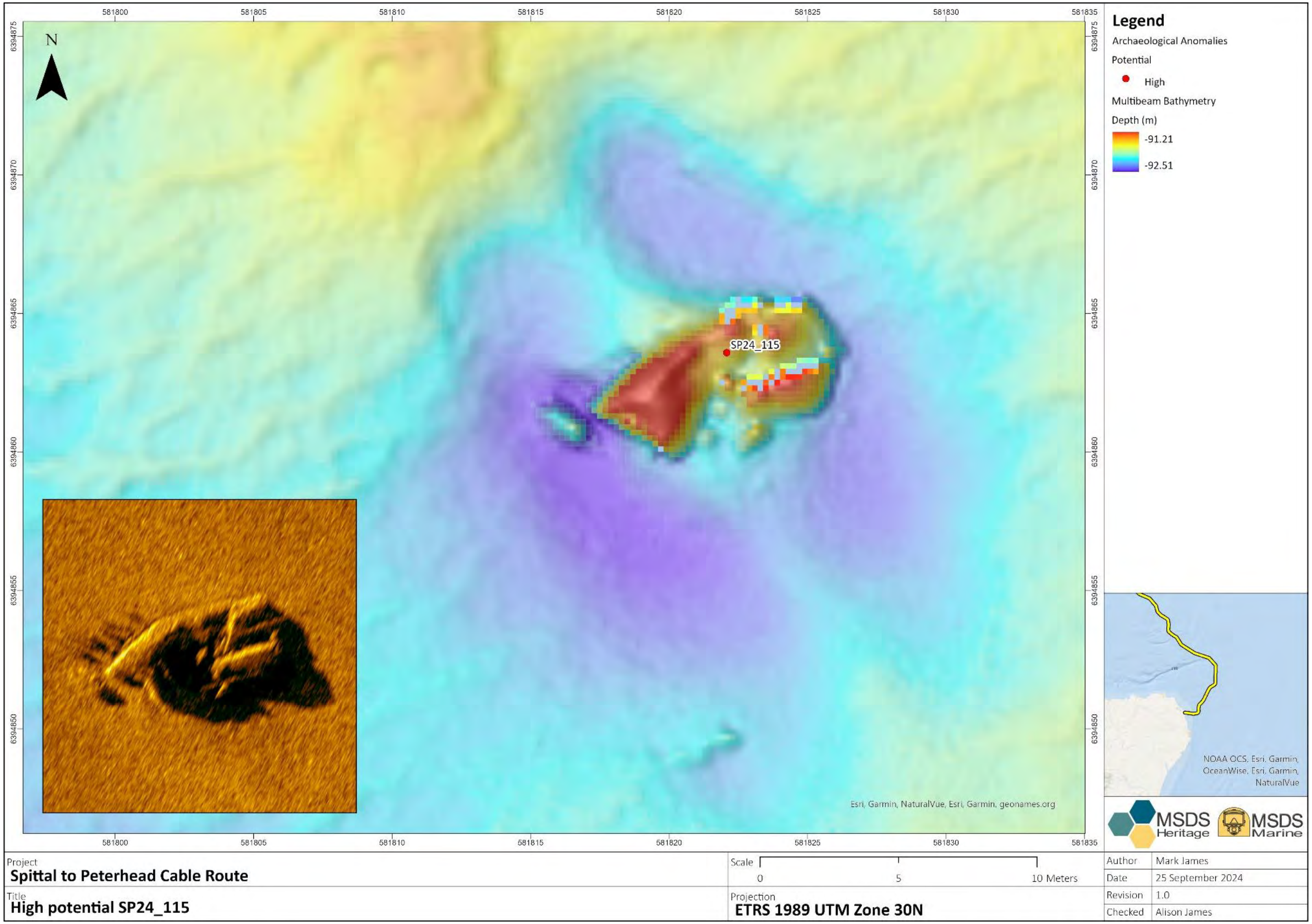


Figure 11: High Potential SP24_115

5.0 Magnetic anomalies

5.0.1 384 magnetic anomalies, ranging between 5.0 nT and 1,371.7 nT, were identified within the dataset, of these 365 do not correlate with known, or visible, features or infrastructure. 286 anomalies fall within the Survey Corridor, and 79 within the Marine Cable Corridor. The distribution of anomalies by amplitude is shown below in Table 12 with their spatial distribution presented in Figure 12.

Intensity (nT)	Survey Corridor	Marine Cable Corridor	Total
5 to 50	269	77	346
50 to 100	11	0	11
100 to 200	4	1	5
200 +	2	1	3
Total	286	79	365

Table 12: Magnetic anomalies

5.0.2 Anomalies identified from the magnetometer data are ferrous and thus generally anthropogenic in origin although they can be associated with geological features, however, there is no visual interpretation as with other geophysical data.

5.0.3 The magnetometer data collection methodology across the Spittal to Peterhead cable route was to run lines concurrently with the SSS and MBES, thus the line spacing is not sufficient for the detailed assessment of small, ferrous features on or below the seabed. The position for a magnetic anomaly can only be determined from directly below a single sensor, or where lines are run close enough together to be able to confidently position an anomaly seen on two, or more, lines. However, in combination with SSS and MBES data the magnetometer specification is considered sufficient to develop a broad understanding of the potential of the survey area, and to identify larger features of potential archaeological significance.

5.0.4 The positions of magnetic anomalies were viewed in the available datasets and where there was a strong correlation with a seabed anomaly, they were assessed for archaeological potential in the previous section. All remaining anomalies have been included within this section. A gazetteer of magnetic anomalies can be found in Annex B – *Magnetic anomalies*.

5.0.5 All isolated magnetic anomalies of 50 nT or less are considered to be of limited potential to be of archaeological significance.

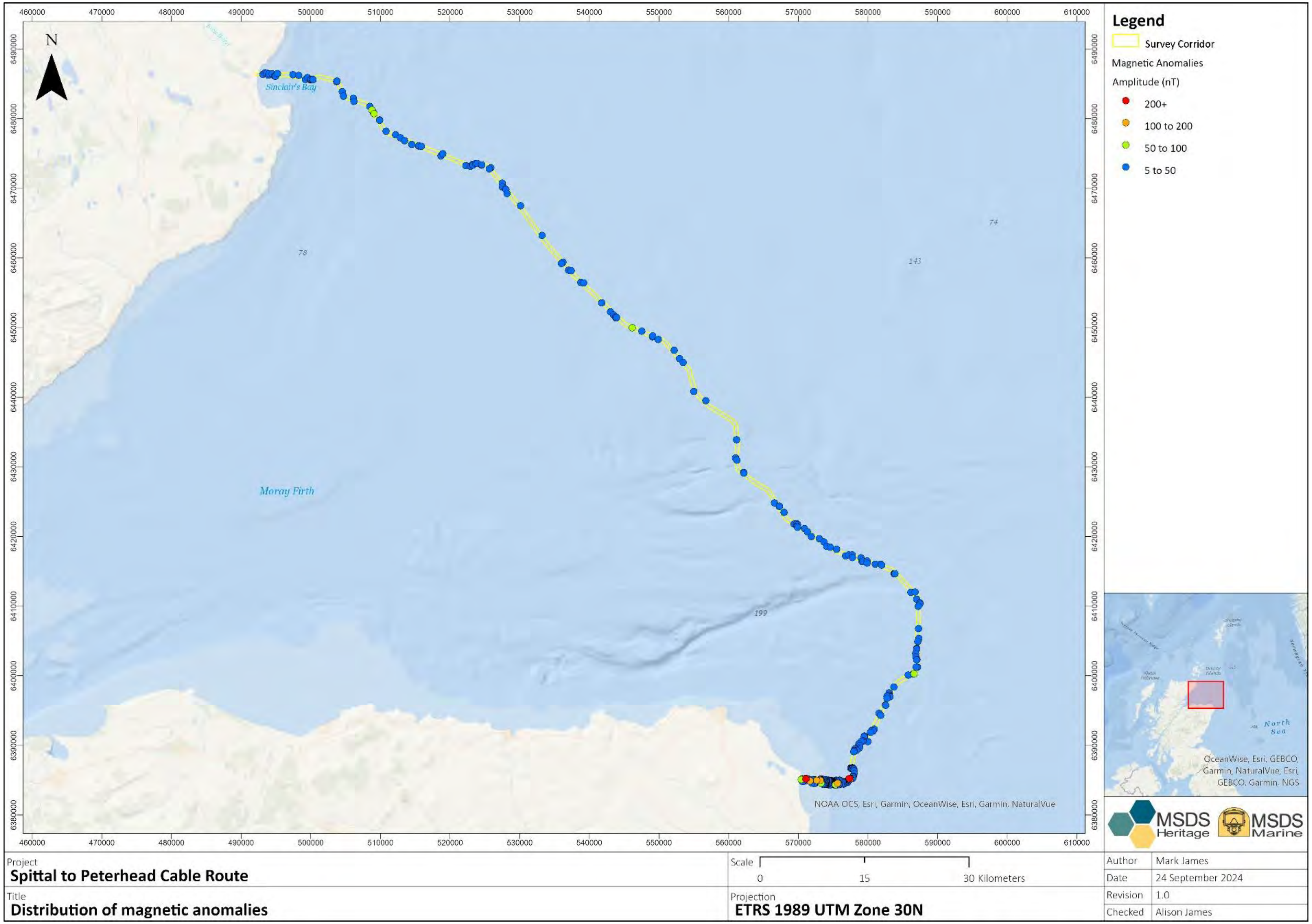


Figure 12: Distribution of Magnetic Anomalies

5.1 Overview of magnetic anomaly distribution

5.1.1 The distribution of magnetic anomalies along the cable route is broadly typical with a largely even distribution of predominantly small anomalies offshore increasing in density and amplitude towards the shore. The notable exception is towards the Spittal landfall where the distribution and size are similar that within the offshore cable corridor. The size and distribution of magnetic anomalies increases from the Peterhead landfall to c. 7.5 km offshore, with 176 of the 365 anomalies (48.2%) identified being within this area.

5.1.2 The anomalies outside of the Peterhead nearshore area (>7.5 km) are mostly under 50 nT (185) with the remainder (4) between 50 nT and 100 nT. These anomalies likely represent small pieces of debris, steel cable, fishing gear, etc. that are either buried or of a size not visible within the SSS or MBES datasets.

5.1.3 Within the nearshore area, 153 anomalies are under 50 nT and 15 are under 100 nT. Typically, there is a higher concentration of magnetic anomalies within the nearshore area due to fishing gear, small craft anchors, and debris through an increase in small boat traffic and material washing inshore.

5.1.4 The positions of the remaining anomalies (five between 100 nT and 200 nT and three greater than 200 nT) were viewed within the SSS and MBES data, with no material of archaeological interest identified, to note two anomalies lie outside the Survey Corridor. This area encompasses a large area of exposed, and protruding, bedrock and coarse sediments which may to some degree be masking features visible on the surface (Figure 13). However, due to the unlikeliness of significant burial of anomalies within this area it is unlikely that these magnetic anomalies represent material of medium or high archaeological potential as they are not visible within the SSS or MBES dataset. Within areas of rocky seabed, the potential for general marine debris will increase due to items such as anchors and chain, pots, fishing gear, etc. becoming snagged, broken, and discarded. The protruding nature of seabed also has the potential to 'catch' debris that may be mobile on the seabed.

5.1.5 No large magnetic anomalies correlate with the positions of UKHO, Canmore, or HER records.

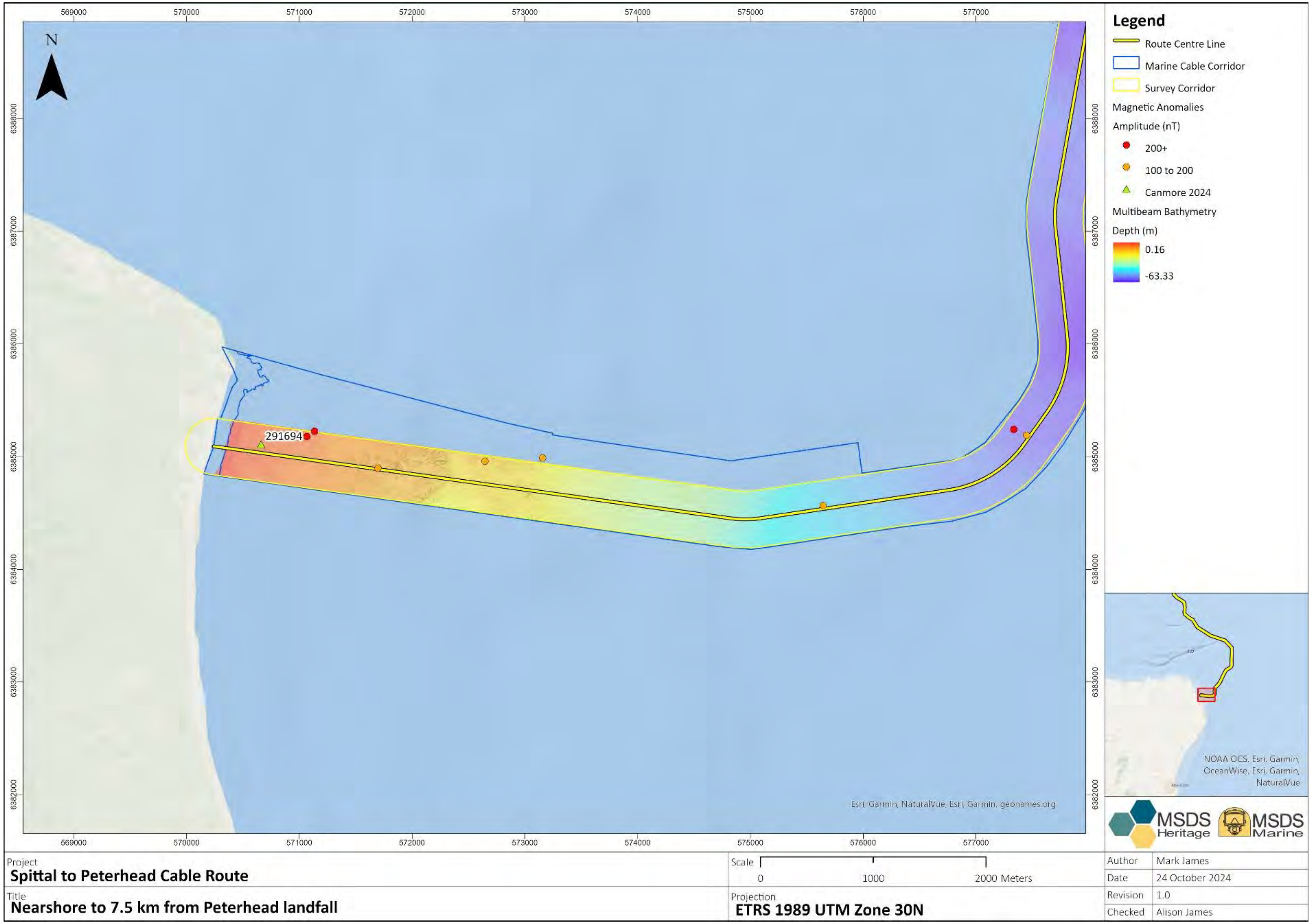


Figure 13: Nearshore to 7.5 km from Peterhead landfall

5.2 Discussion of potential

5.2.1 Magnetic anomalies >100 nT are typically described as large and have the potential to be of archaeological significance. It should be noted that these anomalies, and any interpretations, are based on a magnetic signature rather than a visible image of the anomaly on the seabed. It is often the case that during intrusive investigations these anomalies are identified as modern marine debris, including cable, chain, modern anchors, fishing gear, and parts of modern vessels such as outboard engines, and other detritus either deliberately or accidentally, put overboard. Where anomalies are largely isolated, or relating to a single feature, the most commonly identified material of archaeological interest are isolated anchors, often of indeterminate age. The difficulties in determining the age of concreted anchors, and the lack of a wider context means these are often classed as of low or medium potential to be of archaeological significance. However, whilst the chances of isolated magnetic anomalies being of archaeological interest is potentially low, this does not reduce the potential of anomalies to be of archaeological significance, and both must be considered during the recommendation of mitigation (Section 8.0).

5.2.2 However, the seabed within the area of the anomalies >100 nT is not conducive to the burial of material that would be considered of a size, or form, to be of medium or high potential to be of archaeological interest. As such, the overall potential is reduced.

6.0 United Kingdom Hydrographic Office (UKHO) Data

6.0.1 United Kingdom Hydrographic Office (UKHO) data from 2024 was obtained for the Survey Corridor for correlation with anomalies identified within the geophysical data, and the establishment of TAEZs if required. One UKHO record was identified within the Survey Corridor.

6.0.2 The categories of records, along with record counts, are detailed in Table 13, and the distribution presented in Figure 14.

Record type	Survey Corridor
Wreck	1
Total	1

Table 13: UKHO records by type within the Survey Corridor

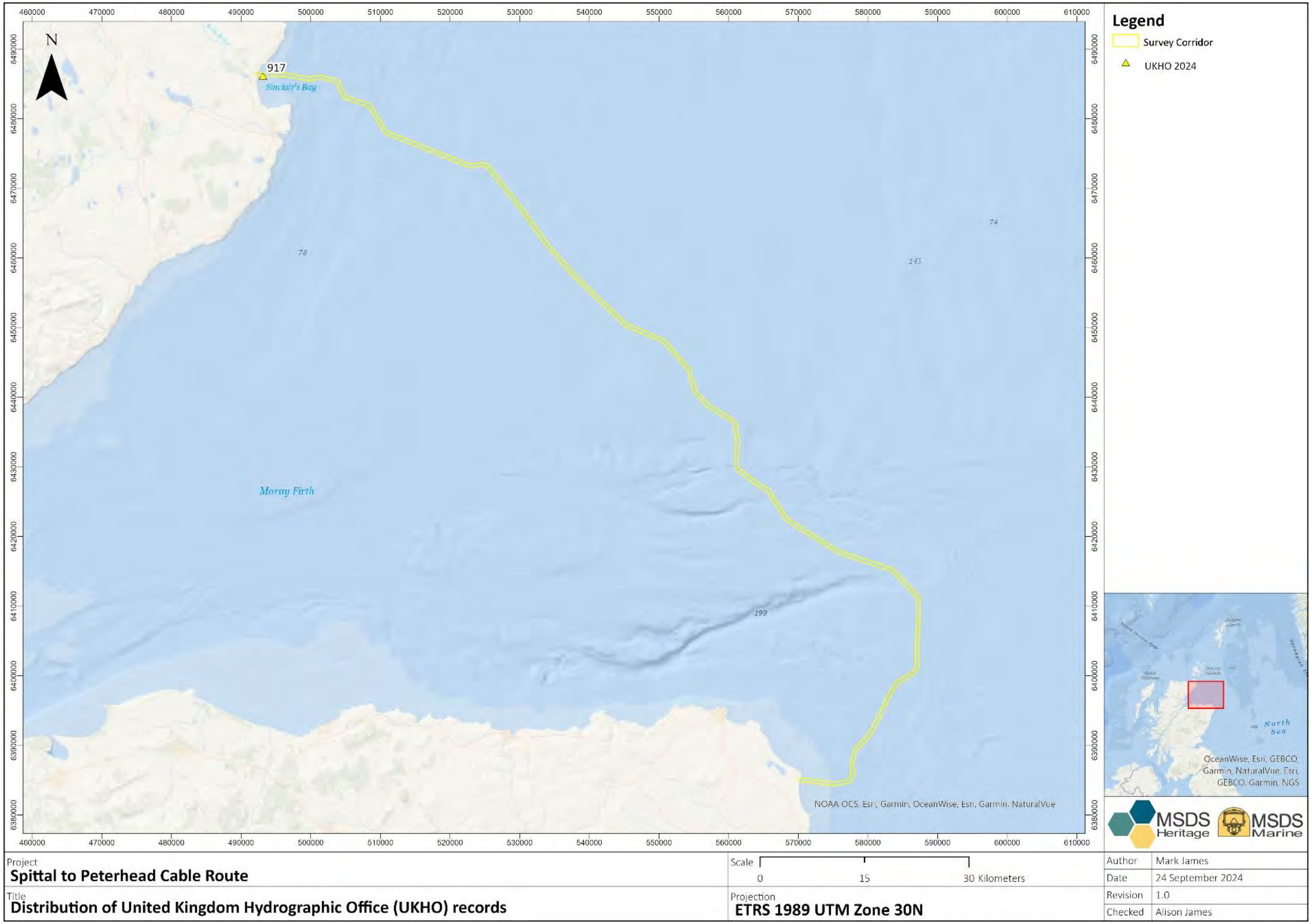


Figure 14: Distribution of United Kingdom Hydrographic Office (UKHO) Records

6.1 UKHO Records of Wreck

6.1.1 The one UKHO record is that of a wreck. UKHO data typically, where known, lists information about the wreck, the circumstances of its loss, surveying details, and whether the record is considered live or dead. A dead record is one which has *not been detected by repeated surveys, therefore considered not to exist*[1]. Whilst the decision to amend a wreck to dead is based on data available from repeat surveys, records can be amended for a number of reasons including:

- Deterioration of the wreck to such a degree that it no longer exists on the seabed;
- Continual burial of the wreck so that the presence is not detected over repeat surveys;
- The identification of the wreck as a natural feature; or perhaps most commonly,
- The wreck not existing at the listed location due to inaccurate reporting or positioning at the period of identification.

6.1.2 The position of the UKHO record was reviewed in the data, and an assessment made as to whether it was visible, or likely to exist on the seabed. The UKHO record is summarised in Table 14, and a description provided below.

Record	Status	Name	Date sank	Date recorded	Last detected	Visible in data
917	Dead	*Star of Victory*	1939	1939	1986	No

Table 14: UKHO records of wreck within the cable corridor

UKHO record 917

6.1.3 UKHO record 917 lies towards the Spittal landfall, c. 800 m from shore and c. 165 m south of the route centreline. The record relates to the *Star of Victory*, a British non-standard admiralty 'Strath' class trawler built in 1917.

6.1.4 The vessel was renamed the *City of Perth* whilst loaned to the US and was returned and sold out of service in 1922. At the time of sinking the vessel was en-route to Aberdeen for fishing when it ran aground at Sinclair Bay and became a total loss.

6.1.5 The position originates from the Lloyds underwriters report, and as such is not based on a visual record on the seabed. A singlebeam survey in 1986 failed to find the wreck and the record was amended to dead, a further multibeam survey in 2022 also failed to locate the wreck. No evidence of the wreck was identified within the geophysical or hydrographic data.

[1] https://www.wrecksite.eu/ukhoAbbrev.aspx

7.0 Historic Environment Records

7.1 Highland Historic Environment Record

7.1.1 Data were obtained from the Highland Historic Environment Record (HER) for the Survey Corridor. These records are used for correlation with anomalies identified within the geophysical data, in particular where the identity of an anomaly may be subject to uncertainty.

7.1.2 Three monument point records were identified within the Survey Corridor. The HER monument records are presented in Table 15 and in Figure 15.

HER ID	UKHO ID	Type	Summary
MHG14772	917	Wreck	Record of the trawler *Star of Victory* which ran aground in Sinclair Bay. The record correlates with the position of the UKHO record 917.
MHG14784	None	Wreck	Wreck of unknown date – no further information is provided.
MHG14785	None	Wreck	Wreck of unknown date – no further information is provided.

Table 15: HER monument point records within the cable corridor

HER record MHG14772

7.1.3 Record MHG14772 correlates with UKHO record 917, the wreck of the *Star of Victory* and is discussed as such in Section 6.0. No evidence of the wreck was identified within the geophysical or hydrographic data.

HER record MHG14784

7.1.4 Record MHG14784 is the record of an unknown wreck of unknown date, no further information is given. No evidence of the wreck was identified within the geophysical or hydrographic data.

HER record MHG14785

7.1.5 Record MHG14785 is the record of an unknown wreck of unknown date, no further information is given. No evidence of the wreck was identified within the geophysical or hydrographic data.

Figure 15: Distribution of Highland Historic Environment Records (points)

7.2 Canmore Records

7.2.1 Data were obtained from Canmore for the Survey Corridor. These records are used for correlation with anomalies identified within the geophysical data, in particular where the identity of an anomaly may be subject to uncertainty.

7.2.2 Five Canmore records were identified within the Survey Corridor. The Canmore records are summarised in Table 16 and presented in Figure 16.

Canmore ID	UKHO ID	Type	Summary
101902	917	Wreck	Record of the trawler *Star of Victory* which ran aground in Sinclair Bay. The record correlates with the position of the UKHO record 917.
222085	None	Wreck	Record of the wreck of the *Faithful*.
285404	None	Wreck	Record of the wreck of the *Leila.*
291694	None	Wreck	Record of an unknown wreck.
328308	None	Aircraft	Record of an unknown aircraft.

Table 16: Canmore records within the Survey Corridor

Canmore record 101902

7.2.3 Canmore record 101902 correlates with UKHO record 917, the wreck of the *Star of Victory* and is discussed as such in Section 6.0. No evidence of the wreck was identified within the geophysical or hydrographic data.

Canmore record 222085

7.2.4 Canmore record 222085 is the record of the wreck of the *Faithfull*, a wooden ketch built in 1897 and sunk in 1906. The *Faithfull* foundered 18 miles southeast of the Pentland Skerries with carrying a cargo of bricks, quicklime, and coal. The position is described as arbitrary, and no evidence of the wreck was identified within the geophysical or hydrographic data.

Canmore record 285404

7.2.5 Canmore record 285404 is the record of the wreck of the *Leila,* a 'fully rigged ship' built in 1864 and sunk in 1865. The wreck was identified as wreckage washing up on the shore following a storm, with one item bearing the letters LELA. The position is described as arbitrary, and no evidence of the wreck was identified within the geophysical or hydrographic data.

Canmore record 291694

7.2.6 Canmore record 291694 is the record of an unknown wreck sunk in 1774, the wreck was believed to be carrying a cargo of flax, hemp, and iron. The position is described as tentative, and no evidence of the wreck was identified within the geophysical or hydrographic data.

Canmore record 328308

7.2.7 Canmore record 328308 is the record of an unknown aircraft (cited as British and lost in 1933). The aircraft was identified when wreckage was trawled up 14 miles northeast of Fraserburgh. It is unclear as to the accuracy of the position, however no evidence of the wreck was identified within the geophysical or hydrographic data.

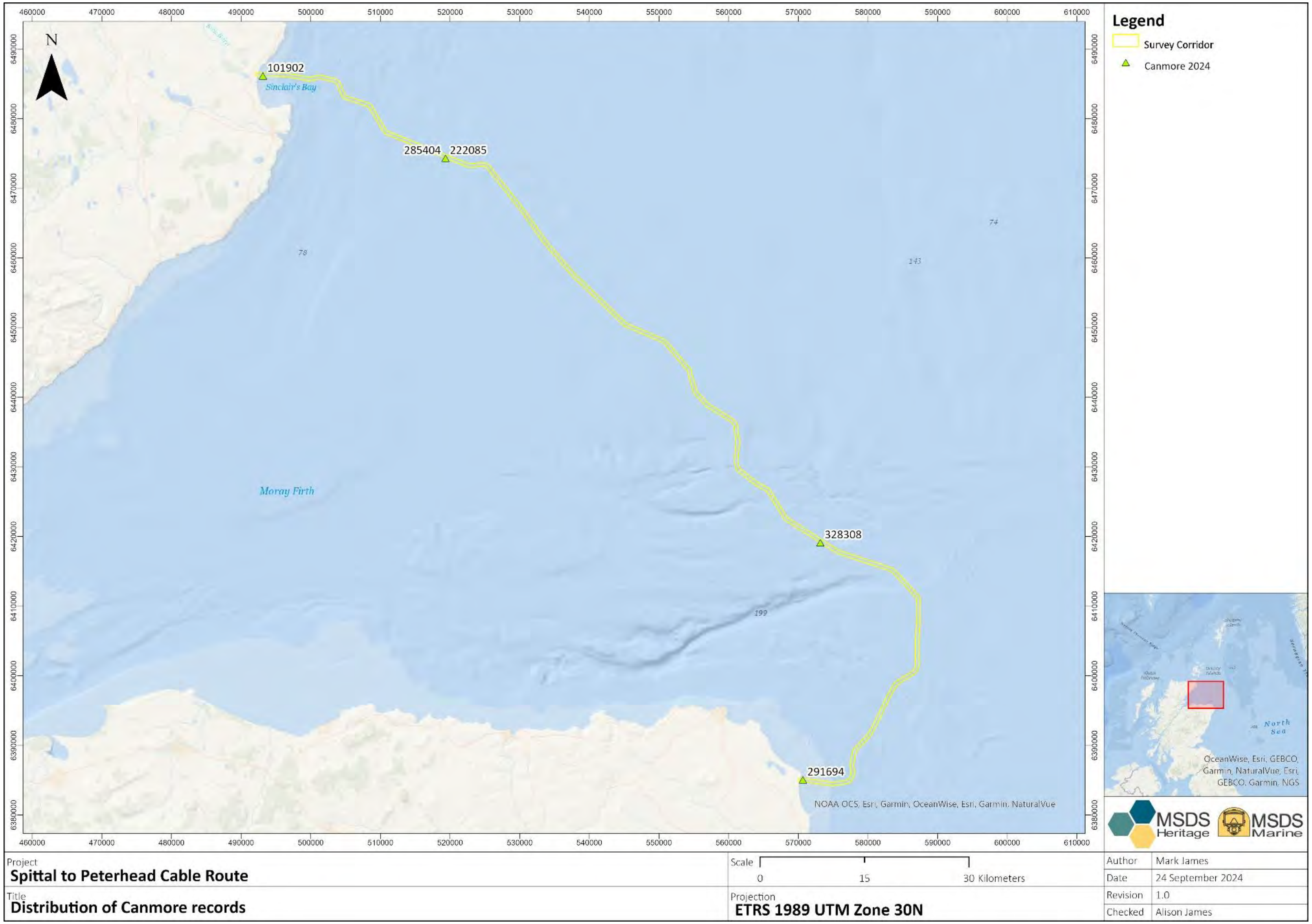


Figure 16: Distribution of Canmore records

8.0 Mitigation

8.0.1 This section provides recommendations for the robust, but proportional, mitigation of impacts to the historic environment for low, medium, and high potential anomalies, and magnetic anomalies, identified within the geophysical dataset, and within the Survey Corridor. As outlined in Section 3.5.18 recommended mitigation for these anomalies will be through the implementation of AEZs, TAEZs and AAPs.

8.0.2 The mitigation strategies recommended within this report are based on the available data, which includes full coverage MBES and full coverage high frequency SSS. Magnetometer data was collected at the same line spacing as the SSS and MBES which means there is potential for smaller items of buried material of archaeological interest to be present within the assessment area that is not visible within the current dataset, or for magnetic anomalies to not be represented in their true position.

8.0.3 However, the data serve to characterise the potential of the area with respect to the requirement for exclusion zones. Mitigation will be developed through each phase of survey works as detailed within Section 9.0.

8.1 Low Potential Anomalies

8.1.1 Low potential anomalies, and small magnetic anomalies, have been identified as potentially anthropogenic in origin but unlikely to be of archaeological significance and no exclusion zones are recommended for these anomalies. Should material of potential archaeological significance be identified during the course of pre-construction and construction works they should be reported under an appropriate protocol for archaeological discoveries such as the *Crown Estates Protocol for Archaeological Discoveries: Offshore Renewables Projects*[2] or a project specific protocol that considers the individual requirements of The Project.

8.2 Archaeological Exclusion Zones (AEZ)

8.2.1 Two high potential anomalies, and three medium potential anomalies, have been identified within the Survey Corridor dataset. The anomalies have been identified as likely to be of anthropogenic origin and potentially of archaeological significance. The anomalies have been recommended AEZs based on the size of the anomaly, the extents of any debris, the potential significance of the anomaly, the potential impact of the development and the seabed dynamics within the area.

[2] The Crown Estate, 2014. *Protocol for Archaeological Discoveries: Offshore Renewables Projects*. Wessex Archaeology on behalf of the Crown Estate.

8.2.3 Dependant on the form of anomalies, AEZs will either be recommended as a radius from the centre point of the anomaly or as a distance from the extents. Particularly in the case of shipwrecks, which tend to be longer in length than width, the use of a circle provides unequal protection around the extents. This not only impacts the protection afforded but does not represent proportional mitigation.

8.2.4 In total five AEZs relating to high and medium potential anomalies have been recommended within the Survey Corridor. Anomalies and their recommended exclusion zones are detailed in Table 17 and the distribution presented in Figure 17. Note, where discrepancies exist between the position within different datasets, the position deemed to be most accurate has been used, typically that derived from the MBES data.

Anomaly ID	Description	Potential	ETRS89 Z30N		AEZ (m)
			X	Y	
SP24_115	Wreck	High	581822.0	6394863.5	50 radius
SP24_107	Potential wreck	High	577729.6	6387527.7	50 radius
SP24_092	Potentially geological	Medium	565717.9	6426860.8	25 radius
SP24_084	Potential debris	Medium	567272.2	6424138.4	25 radius
SP24_043	Potential debris	Medium	540454.7	6454982.4	25 radius

Table 17: Archaeological Exclusion Zones within the cable corridor

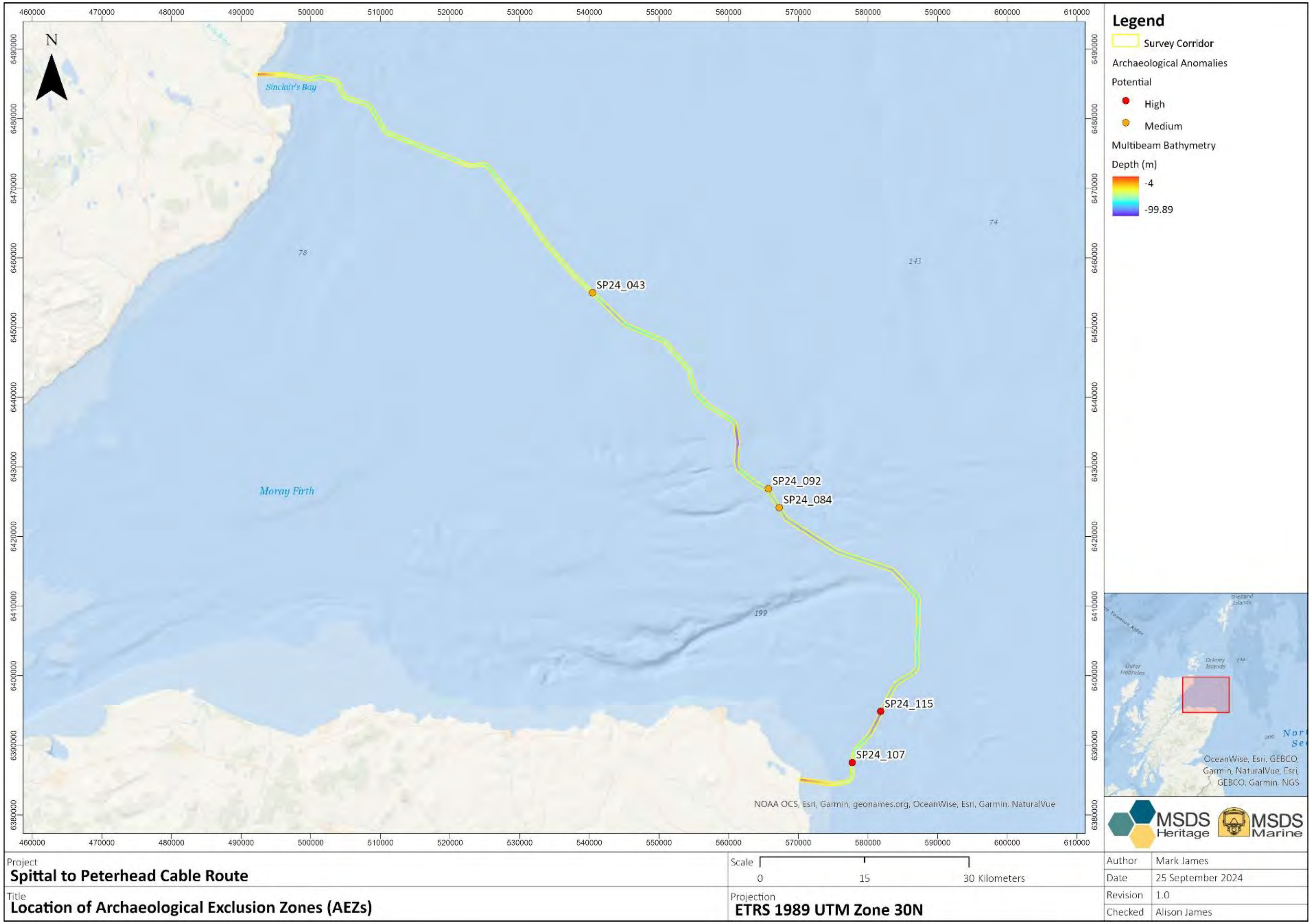


Figure 17: Location of Archaeological Exclusion Zones

8.3 Temporary Archaeological Exclusion Zones (TAEZ)

8.3.1 No TAEZs have been recommended within the Survey Corridor due to vagaries in the positions of the UKHO, Canmore, and HER records, the locations of the records lying within the data extents have been reviewed with no evidence of anthropogenic material identified. However, should material of potential archaeological significance be identified during the course of pre-construction and construction works they should be reported under an appropriate protocol for archaeological discoveries such as the *Crown Estates Protocol for Archaeological Discoveries: Offshore Renewables Project* or a project specific protocol that considers the individual requirements of The Project.

8.4 Areas of Archaeological Potential (AAP)

8.4.1 No AAPs have been recommended within the Survey Corridor as a result of the assessment of geophysical and hydrographic data, partly due to the nature of the seabed not being conducive to the burial of material that could be considered to be of medium or high potential. However, it should be noted that unidentified magnetic anomalies are present within the cable corridor and should material of potential archaeological significance be identified during the course of pre-construction and construction works they should be reported under an appropriate protocol for archaeological discoveries such as the *Crown Estates Protocol for Archaeological Discoveries: Offshore Renewables Projects* or a project specific protocol that considers the individual requirements of The Project.

8.4.2 Whilst not included within this assessment as it falls outside the extents of the geophysical data, an AAP has been recommended within the intertidal assessment being undertaken by ERM[3] and it is detailed here for completeness. The AAP has been established around Highland Historic Environment Record (HER) MHG2016[4] which is the record of a peat bank located within the intertidal area of the Spittal landfall. The feature is described as a peat-bank 7.8 m in length and 0.4 m deep orientated north-south, with a 2.25 m sand overburden. The bank is located at the beach head under shingle cover and is exposed during abnormally high [*sic*] high tides. ERM have recommended an AAP of 50 m radius from the position of the record (Figure 18).

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[3] ERM, in prep., *Spittal-Peterhead HVDC Subsea Link Marine Environmental Assessment (MEA), for Scottish and Southern Electricity Networks Transmission (SSENT)*. Project No. 0689726

[4] https://her.highland.gov.uk/monument/MHG2016 - accessed 24th October 2024

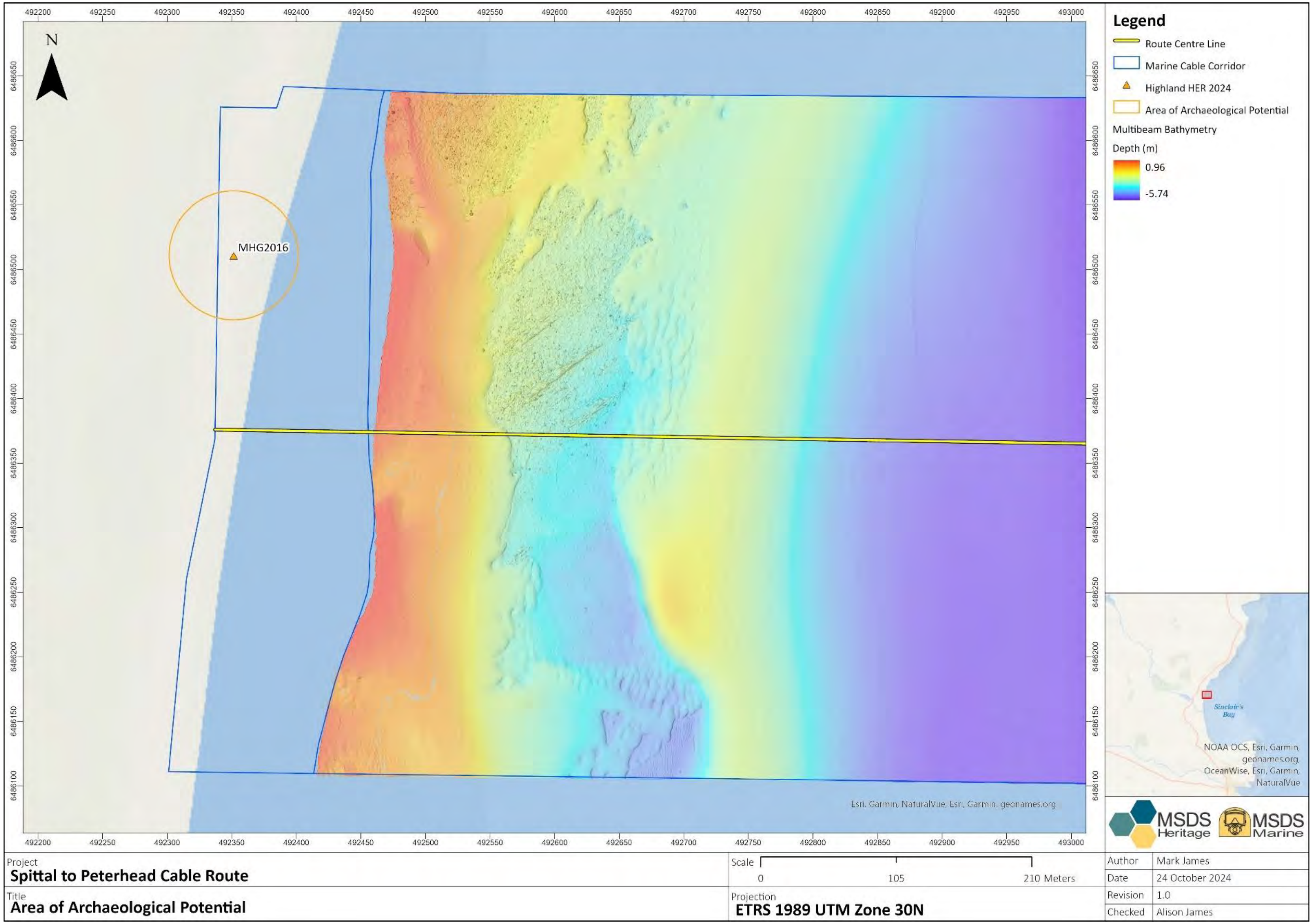

Figure 18: Area of Archaeological Potential

8.5 Notes on Exclusion Zones

8.5.1 Exclusion zones have been recommended based on the available evidence as interpreted by an experienced and qualified maritime archaeologist, they are to be agreed between The Project, the archaeological curator, and the regulator. Exclusion zones are implemented to protect, in-situ, potentially archaeologically significant material.

8.5.2 Where an exclusion zone has been implemented, no development work impacting the seabed is to take place within the prescribed area. Should an exclusion zone impact the development program it is recommended that a program of ground truthing be undertaken to establish the identity of an anomaly in order that the potential archaeological significance can be assessed by a qualified and experienced archaeologist. Following identification and assessment, the exclusion zone can be re-assessed to ensure mitigation is appropriate to the archaeological significance of the anomaly.

8.6 Protocol for Archaeological Discoveries

8.6.1 An appropriate protocol for archaeological discoveries such as the *Crown Estates Protocol for Archaeological Discoveries: Offshore Renewables Projects*[5] or a project specific protocol that considers the individual requirements of The Project should also be applied across the scheme. Such protocols provide a means of identifying previously unidentified archaeological remains and are an important part of the mitigation process.

[5] The Crown Estate, 2014. *Protocol for Archaeological Discoveries: Offshore Renewables Projects*. Wessex Archaeology on behalf of the Crown Estate.

9.0 Recommendations for Future Work

9.1 Archaeological Assessment of Geophysical Data

9.1.1 The archaeological interpretation of the geophysical data collected at the pre-application stage, to which this assessment pertains, provided a robust dataset from which the archaeological assessment was undertaken. Should future surveys be undertaken they will potentially combine an increase in resolution, and the addition of magnetometer data with tighter line spacing (as determined by the pUXO risk), within the area of impact. With the data resolution and coverage set to increase, the confidence in interpretation and appropriateness of mitigation strategies will also increase.

9.1.2 All geophysical data collected as part of The Project should be assessed for archaeological potential by a qualified and experienced maritime archaeologist where relevant to the development. It is recommended that the archaeologist have a demonstrable background in both the collection and processing of geophysical data as well as the archaeological assessment of data.

9.1.3 The methodology for the archaeological interpretation of data will follow that on which this review is based but will be subject to the preparation and agreement of a separate method statement. Whilst it is anticipated that methodologies will not vary a great deal between phases of work it is important to draw upon previous results to ensure the method proposed is both robust but practical.

Survey Specification

9.1.4 Survey specifications will vary dependent on a number of factors including, water depth, vessel, and equipment, however, certain recommendations can be made such as coverage, size of anomaly to be ensonified, and positional accuracy.

9.1.5 Of particular relevance is the specification for pUXO surveys which are undertaken to a specification suitable to reduce the UXO risk to As Low As Reasonably Practical (ALARP). In almost all instances' data collected for UXO assessment is highly suitable for archaeological assessment. General specifications are detailed below;

- Sidescan Sonar: data should be high frequency (at least 400-600 kHz), collected with a minimum of 200% coverage and the fish should be flown at an optimal altitude (typically c. 10% of range). The fish should be positioned with a correctly calibrated USBL system and layback recorded as a backup. The data should be of a quality and resolution to identify seabed anomalies >0.3 m.
- Sub-bottom Profiler: data should be collected at a frequency and power appropriate to the seabed type and the required penetration, vertical resolution should be <0.3 m where possible and the data should be heave corrected. Sub-bottom data are only collected below the sensor; therefore, data should be collected on all magnetometer lines as these are generally the tightest spacing.
- Multibeam Echo Sounder: for archaeological interpretation multibeam data are used for general seabed characterisation and quality control for the positioning of anomalies identified in the sidescan data. Data should be high resolution (typically 300-450 kHz) and acquired within IHO Special Order specifications, this includes full coverage data and a requirement to detect features >1.0 m on the seabed.

- Magnetometer: the method for magnetometer surveys will vary between multiple close survey lines or multiple magnetometers in an array and wider survey lines. Magnetometer surveys for UXO identification should aim for full coverage with a blanking distance of 2.5 m, a target positioning accuracy of +/-2.5m and an absolute accuracy of <2 nT. The fish should be flown between 2.0 m and 4.0 m above seabed and positioned with a correctly calibrated USBL system and layback recorded as a backup.

9.2 Protocol for Archaeological Discoveries (PAD)

9.2.1 A suitable protocol for archaeological discoveries is a key element of the mitigation procedures, particularly for anomalies identified as low archaeological potential, including small magnetic anomalies. A suitable protocol should also be implemented during any works that may visually inspect the seabed or recover material to deck.

9.2.2 The protocol will take the form of the Crown Estates *Protocol for Archaeological Discoveries: Offshore Renewables Projects*[6] or a project specific protocol that considers the individual requirements of The Project. The protocol will be agreed with the curator and the regulator prior to any impact on the seabed.

9.3 Ground Truthing

9.3.1 Should archaeological exclusion zones impact on the proposed development works it is recommended that a program of ground truthing is undertaken to establish the identity of the anomalies so that further archaeological assessment can be undertaken, and interpretations revised as appropriate.

[6] The Crown Estate, 2014. *Protocol for Archaeological Discoveries: Offshore Renewables Projects*. Wessex Archaeology on behalf of the Crown Estate.

10.0 Annex A – Anomalies of Archaeological Potential

Name	Potential	Description	Length (m)	Width (m)	Height (m)	Amplitude (nT)	AEZ (m)	X	Y	Area
SP24_001	Low	Potential debris	1.4	0.2	0.4	<Null>	<Null>	492691.1	6486496.0	Survey Corridor
SP24_002	Low	Potentially geological	1.7	0.9	0.4	<Null>	<Null>	492649.8	6486485.3	Survey Corridor
SP24_003	Low	Potential debris	1.6	1	0.5	<Null>	<Null>	492622.5	6486628.2	Marine Cable Corridor
SP24_004	Low	Potential debris	3.3	0.3	0.2	<Null>	<Null>	492591.3	6486225.2	Survey Corridor
SP24_005	Low	Potential debris	1.9	2.6	0.4	<Null>	<Null>	492620.5	6486635.5	Marine Cable Corridor
SP24_006	Low	Potential debris	1.3	0.3	0.1	<Null>	<Null>	492623.9	6486597.3	Survey Corridor
SP24_007	Low	Potentially geological	0.7	0.8	0.7	<Null>	<Null>	493566.2	6486224.6	Survey Corridor
SP24_008	Low	Potential debris	1.8	0.4	0.2	<Null>	<Null>	493975.1	6486171.8	Survey Corridor
SP24_009	Low	Chain cable or rope	6.9	1.8	0	<Null>	<Null>	517311.7	6475129.5	Marine Cable Corridor
SP24_010	Low	Potentially geological	5.5	3.2	1	<Null>	<Null>	498469.5	6485687.4	Survey Corridor
SP24_011	Low	Potential debris	6.4	3.6	0.1	<Null>	<Null>	494582.9	6486100.4	Survey Corridor
SP24_012	Low	Potential debris	1.1	1.1	0	<Null>	<Null>	513313.8	6476744.4	Survey Corridor
SP24_013	Low	Potentially geological	2.2	0.9	0.3	<Null>	<Null>	514141.8	6476641.7	Survey Corridor
SP24_014	Low	Potential debris	1.2	1	0.3	7	<Null>	504570.0	6483685.2	Survey Corridor
SP24_015	Low	Potential debris	1.8	1.1	0.6	8.6	<Null>	500258.9	6485735.5	Survey Corridor

Name	Potential	Description	Length (m)	Width (m)	Height (m)	Amplitude (nT)	AEZ (m)	X	Y	Area
SP24_016	Low	Potential debris	1.3	0.3	0.1	<Null>	<Null>	514768.6	6476521.2	Survey Corridor
SP24_017	Low	Fishing gear	1.6	0.9	0.3	<Null>	<Null>	510932.3	6478074.5	Survey Corridor
SP24_018	Low	Potential debris	3.4	1.2	0.6	<Null>	<Null>	499525.2	6485816.4	Survey Corridor
SP24_019	Low	Potentially geological	4.8	1.3	0.9	<Null>	<Null>	499227.7	6485775.7	Survey Corridor
SP24_020	Low	Potential debris	0.9	0.7	0.2	<Null>	<Null>	504144.0	6484836.1	Survey Corridor
SP24_021	Low	Potentially geological	3.2	3.4	0.4	<Null>	<Null>	504538.3	6484059.0	Survey Corridor
SP24_022	Low	Potential debris	5.2	1.5	0.3	<Null>	<Null>	508874.0	6481477.4	Survey Corridor
SP24_023	Low	Potential debris	1.2	0.4	0.1	<Null>	<Null>	511092.9	6478044.3	Survey Corridor
SP24_024	Low	Potentially geological	1.8	0.6	0.5	<Null>	<Null>	514825.1	6476534.3	Survey Corridor
SP24_025	Low	Fishing gear	79.9	0.2	0	<Null>	<Null>	510936.2	6478149.5	Survey Corridor
SP24_026	Low	Potential debris	4.2	2.2	0.7	<Null>	<Null>	497049.3	6486347.1	Survey Corridor
SP24_027	Low	Potential debris	3.6	2	0.9	9	<Null>	498651.6	6486032.1	Survey Corridor
SP24_028	Low	Potential debris	1.8	2	0.2	<Null>	<Null>	496578.0	6486419.0	Survey Corridor
SP24_029	Low	Potentially geological	3.9	0.9	0.8	<Null>	<Null>	499120.4	6485986.4	Survey Corridor
SP24_030	Low	Potential debris	3.5	1.6	1	<Null>	<Null>	497125.2	6486395.4	Survey Corridor
SP24_031	Low	Fishing gear	85.4	0	0	<Null>	<Null>	510939.2	6478258.4	Survey Corridor

Name	Potential	Description	Length (m)	Width (m)	Height (m)	Amplitude (nT)	AEZ (m)	X	Y	Area
SP24_032	Low	Potential debris	1.7	0.7	0.3	10.7	<Null>	504489.6	6483562.6	Survey Corridor
SP24_033	Low	Potential debris	2.9	1.1	0	<Null>	<Null>	495729.2	6486203.0	Survey Corridor
SP24_034	Low	Potentially geological	1.4	0.2	0.2	<Null>	<Null>	501404.1	6485856.9	Survey Corridor
SP24_035	Low	Potentially geological	3.7	0.8	1	<Null>	<Null>	499070.5	6485664.8	Survey Corridor
SP24_036	Low	Fishing gear	8	2.2	0	<Null>	<Null>	495151.2	6486194.9	Survey Corridor
SP24_037	Low	Potentially geological	2.7	2	1.8	<Null>	<Null>	501231.4	6485836.3	Survey Corridor
SP24_038	Low	Potential debris	2.6	1.5	0.4	5.1	<Null>	515577.9	6475940.1	Survey Corridor
SP24_039	Low	Potential debris	3.1	0.6	0.2	10.5	<Null>	510377.9	6478233.6	Survey Corridor
SP24_040	Low	Potentially geological	6.6	1.8	1.1	<Null>	<Null>	496972.5	6486036.3	Survey Corridor
SP24_041	Low	Potential debris	1.5	0.6	0.3	<Null>	<Null>	555882.5	6439997.1	Survey Corridor
SP24_042	Low	Seabed disturbance	7	6	0	46.3	<Null>	546294.0	6449908.5	Survey Corridor
SP24_043	Medium	Potential debris	7.5	3.3	0.4	<Null>	25 radius	540454.7	6454982.4	Survey Corridor
SP24_044	Low	Potential debris	1.6	0.9	0.5	<Null>	<Null>	529660.4	6467730.7	Survey Corridor
SP24_045	Low	Potential debris	4.2	1.3	0.4	<Null>	<Null>	529490.9	6467970.4	Survey Corridor
SP24_046	Low	Potential debris	4.8	0.7	0.1	<Null>	<Null>	520747.9	6474005.5	Survey Corridor
SP24_047	Low	Fishing gear	8.9	3.6	0.6	<Null>	<Null>	541236.9	6454183.3	Survey Corridor

Name	Potential	Description	Length (m)	Width (m)	Height (m)	Amplitude (nT)	AEZ (m)	X	Y	Area
SP24_048	Low	Potentially geological	3	0.8	0.5	<Null>	<Null>	548780.0	6448874.5	Survey Corridor
SP24_049	Low	Potential debris	1.3	0.5	0.3	11.4	<Null>	554561.2	6442963.7	Survey Corridor
SP24_050	Low	Potential debris	2.5	0.6	0.5	<Null>	<Null>	541090.2	6454215.6	Survey Corridor
SP24_051	Low	Potential debris	2.9	0.4	0.1	<Null>	<Null>	526164.1	6472005.1	Survey Corridor
SP24_052	Low	Potential debris	1.8	1	0.1	<Null>	<Null>	556228.8	6439481.0	Survey Corridor
SP24_053	Low	Potential debris	12.6	8.6	0.1	<Null>	<Null>	556447.8	6439247.7	Survey Corridor
SP24_054	Low	Potential debris	0.9	0.4	0	9.2	<Null>	559228.7	6437348.1	Survey Corridor
SP24_055	Low	Potential debris	1.4	0.6	0.2	<Null>	<Null>	532579.4	6463500.4	Survey Corridor
SP24_056	Low	Potential debris	2.9	1	0.2	<Null>	<Null>	531776.7	6464662.2	Survey Corridor
SP24_057	Low	Linear debris	4.1	0.4	0.1	<Null>	<Null>	526266.1	6471863.3	Survey Corridor
SP24_058	Low	Potential debris	1.4	0.7	0	14.3	<Null>	521032.6	6473749.5	Survey Corridor
SP24_059	Low	Chain cable or rope	4.9	5	0	<Null>	<Null>	519913.4	6474216.3	Survey Corridor
SP24_060	Low	Linear debris	5	0.2	0.1	<Null>	<Null>	520295.5	6474031.1	Survey Corridor
SP24_061	Low	Linear debris	5.5	0.1	0	<Null>	<Null>	522255.1	6473225.7	Survey Corridor
SP24_062	Low	Linear debris	10.2	0.2	0	<Null>	<Null>	526620.4	6471348.6	Survey Corridor
SP24_063	Low	Potential debris	3.7	2.2	0.3	<Null>	<Null>	543310.2	6451932.8	Survey Corridor

Name	Potential	Description	Length (m)	Width (m)	Height (m)	Amplitude (nT)	AEZ (m)	X	Y	Area
SP24_064	Low	Potentially geological	1.7	1.1	0.4	<Null>	<Null>	540993.8	6454133.6	Survey Corridor
SP24_065	Low	Chain cable or rope	3.9	0.1	0	<Null>	<Null>	526606.1	6471397.0	Survey Corridor
SP24_066	Low	Potential debris	6.1	0.8	0.1	<Null>	<Null>	554557.9	6442106.7	Survey Corridor
SP24_067	Low	Chain cable or rope	40.1	0.1	0	<Null>	<Null>	557389.7	6438242.5	Marine Cable Corridor
SP24_068	Low	Potential debris	2.7	0.8	0.1	<Null>	<Null>	543716.5	6451526.8	Survey Corridor
SP24_069	Low	Potentially geological	4.7	1.2	0.1	<Null>	<Null>	526727.2	6471502.2	Survey Corridor
SP24_070	Low	Potential debris	2.7	0.9	0.2	<Null>	<Null>	556149.5	6439829.3	Survey Corridor
SP24_071	Low	Potential debris	3.7	1.3	0	<Null>	<Null>	518931.7	6474905.7	Survey Corridor
SP24_072	Low	Potential debris	3	1	0.3	<Null>	<Null>	527391.6	6470852.6	Survey Corridor
SP24_073	Low	Fishing gear	16.4	8.9	0	<Null>	<Null>	527485.1	6470715.2	Survey Corridor
SP24_074	Low	Chain cable or rope	7.4	0.3	0.2	<Null>	<Null>	548960.2	6448973.7	Survey Corridor
SP24_075	Low	Chain cable or rope	7.1	2.4	0	<Null>	<Null>	519988.8	6474462.7	Survey Corridor
SP24_076	Low	Chain cable or rope	5.9	2.5	0	<Null>	<Null>	519281.3	6474724.6	Survey Corridor
SP24_077	Low	Potential debris	3.8	1.1	0.1	<Null>	<Null>	531469.5	6465463.1	Survey Corridor
SP24_078	Low	Chain cable or rope	65	0.1	0	<Null>	<Null>	533232.3	6463207.5	Survey Corridor
SP24_079	Low	Potential debris	2.4	2.2	0	5.4	<Null>	554952.9	6442252.3	Survey Corridor

Name	Potential	Description	Length (m)	Width (m)	Height (m)	Amplitude (nT)	AEZ (m)	X	Y	Area
SP24_080	Low	Potential debris	5.2	1.2	0.2	<Null>	<Null>	533433.6	6462979.9	Survey Corridor
SP24_081	Low	Potentially geological	3.6	1.3	0.5	<Null>	<Null>	521963.4	6473795.2	Survey Corridor
SP24_082	Low	Potential debris	1.9	1.4	0.1	<Null>	<Null>	519107.0	6474699.8	Survey Corridor
SP24_083	Low	Potential debris	3.1	0.3	0.1	<Null>	<Null>	522034.4	6473580.8	Survey Corridor
SP24_084	Medium	Potential debris	4.5	1.7	0.3	<Null>	25 radius	567272.2	6424138.4	Survey Corridor
SP24_085	Low	Potential debris	2.6	1.1	0	<Null>	<Null>	565649.4	6426602.5	Survey Corridor
SP24_086	Low	Fishing gear	65.1	0.1	0	<Null>	<Null>	562976.3	6428314.1	Survey Corridor
SP24_087	Low	Chain cable or rope	3.6	1.8	0.5	<Null>	<Null>	564258.7	6427313.6	Survey Corridor
SP24_088	Low	Potentially geological	2.1	1.2	1.3	<Null>	<Null>	560473.3	6436462.3	Survey Corridor
SP24_089	Low	Chain cable or rope	5.9	3.1	0	<Null>	<Null>	565182.2	6426627.2	Marine Cable Corridor
SP24_090	Low	Potential debris	2.3	1	0.1	<Null>	<Null>	565275.2	6426623.5	Survey Corridor
SP24_091	Low	Chain cable or rope	3.7	2.8	0	<Null>	<Null>	561986.2	6428853.1	Marine Cable Corridor
SP24_092	Medium	Potentially geological	3.8	4.8	1.5	<Null>	25 radius	565717.9	6426860.8	Survey Corridor
SP24_093	Low	Chain cable or rope	67	0.1	0	<Null>	<Null>	574672.9	6418356.7	Survey Corridor
SP24_094	Low	Potential debris	1.2	0.7	0.2	5	<Null>	573113.1	6419494.8	Survey Corridor
SP24_095	Low	Chain cable or rope	6.1	3.3	0	<Null>	<Null>	575577.7	6417922.8	Survey Corridor

Name	Potential	Description	Length (m)	Width (m)	Height (m)	Amplitude (nT)	AEZ (m)	X	Y	Area
SP24_096	Low	Linear debris	2.9	0.1	0	<Null>	<Null>	577264.1	6417337.8	Survey Corridor
SP24_097	Low	Chain cable or rope	24	0.7	0.1	<Null>	<Null>	575176.2	6418225.9	Survey Corridor
SP24_098	Low	Fishing gear	56.7	0.1	0	<Null>	<Null>	574668.7	6418681.2	Survey Corridor
SP24_099	Low	Potential debris	3	1	0.3	<Null>	<Null>	572923.7	6419748.2	Survey Corridor
SP24_100	Low	Potential debris	1.4	0.3	0.2	<Null>	<Null>	587314.1	6401641.8	Survey Corridor
SP24_101	Low	Potentially geological	4.5	2.2	1.3	<Null>	<Null>	587342.3	6403891.8	Marine Cable Corridor
SP24_102	Low	Potential debris	2.4	0.4	0.2	<Null>	<Null>	586165.4	6412719.2	Marine Cable Corridor
SP24_103	Low	Fishing gear	26.4	15.6	0.1	<Null>	<Null>	574747.5	6418698.4	Marine Cable Corridor
SP24_104	Low	Fishing gear	7.2	6.5	0.7	<Null>	<Null>	573291.1	6419180.9	Survey Corridor
SP24_105	Low	Chain cable or rope	12.6	6.9	0.1	<Null>	<Null>	576904.5	6417261.7	Survey Corridor
SP24_106	Low	Fishing gear	17	0.1	0	<Null>	<Null>	577624.0	6416962.9	Survey Corridor
SP24_107	High	Potential wreck	38.2	13.8	0.4	23.9	50 radius	577729.6	6387527.7	Survey Corridor
SP24_108	Low	Chain cable or rope	39.4	0.1	0	<Null>	<Null>	577686.5	6387293.7	Survey Corridor
SP24_109	Low	Chain cable or rope	12.9	0.1	0	<Null>	<Null>	582619.2	6396001.8	Survey Corridor
SP24_110	Low	Chain cable or rope	12.5	0.1	0	<Null>	<Null>	578159.0	6389075.1	Survey Corridor
SP24_111	Low	Fishing gear	7.8	2.1	0.1	<Null>	<Null>	584763.5	6399609.9	Survey Corridor

Name	Potential	Description	Length (m)	Width (m)	Height (m)	Amplitude (nT)	AEZ (m)	X	Y	Area
SP24_112	Low	Chain cable or rope	58.6	0.3	0	<Null>	<Null>	583935.2	6399054.3	Marine Cable Corridor
SP24_113	Low	Chain cable or rope	83.1	5.9	0.1	<Null>	<Null>	582773.1	6397218.4	Marine Cable Corridor
SP24_114	Low	Linear debris	6	0.1	0	<Null>	<Null>	581395.0	6394348.3	Marine Cable Corridor
SP24_115	High	Wreck	10.8	5.3	1.8	<Null>	50 radius	581822.0	6394863.5	Survey Corridor
SP24_116	Low	Chain cable or rope	25.6	0.4	0.1	<Null>	<Null>	574136.6	6384722.0	Survey Corridor
SP24_117	Low	Chain cable or rope	47.1	0.4	0	<Null>	<Null>	575996.4	6384463.2	Survey Corridor
SP24_118	Low	Potential debris	2.3	0.4	0	<Null>	<Null>	571649.7	6385033.5	Survey Corridor
SP24_119	Low	Potentially geological	7.6	2.6	0	<Null>	<Null>	571497.4	6385155.9	Survey Corridor
SP24_120	Low	Fishing gear	6.1	3.6	0.4	<Null>	<Null>	570662.5	6385184.7	Survey Corridor
SP24_121	Low	Potentially geological	2	1.1	0.5	12.5	<Null>	570582.3	6384940.2	Survey Corridor
SP24_122	Low	Potentially geological	10.1	1.1	0.5	<Null>	<Null>	571105.8	6385215.9	Survey Corridor
SP24_123	Low	Linear debris	8.1	0.5	0.3	<Null>	<Null>	586695.1	6400293.2	Survey Corridor

11.0 Annex B – Magnetic anomalies

Name	Potential	Description	Amplitude (nT)	Range (nT)	X	Y	Area
SP24_M_077	Magnetic	Asymmetric Dipole	13.1	5 to 50	493110.5	6486356.1	Survey Corridor
SP24_M_074	Magnetic	Dipole	10.3	5 to 50	493414.1	6486570.1	Survey Corridor
SP24_M_075	Magnetic	Positive Monopole	18.2	5 to 50	493658.7	6486552.9	Survey Corridor
SP24_M_078	Magnetic	Positive Monopole	6	5 to 50	493907.4	6486232.8	Survey Corridor
SP24_M_076	Magnetic	Positive Monopole	20.8	5 to 50	494011.2	6486442.2	Survey Corridor
SP24_M_081	Magnetic	Asymmetric Dipole	5.3	5 to 50	494472.6	6486431	Survey Corridor
SP24_M_084	Magnetic	Asymmetric Dipole	19.4	5 to 50	494782	6486126.2	Survey Corridor
SP24_M_085	Magnetic	Asymmetric Dipole	17.6	5 to 50	494877.7	6486094.1	Survey Corridor
SP24_M_086	Magnetic	Asymmetric Dipole	7.6	5 to 50	494914.8	6486093.9	Survey Corridor
SP24_M_079	Magnetic	Positive Monopole	9.2	5 to 50	495201.3	6486479.4	Survey Corridor
SP24_M_080	Magnetic	Positive Monopole	17	5 to 50	495222.4	6486477.9	Survey Corridor
SP24_M_082	Magnetic	Asymmetric Dipole	12	5 to 50	497414.8	6486320.9	Survey Corridor
SP24_M_083	Magnetic	Asymmetric Dipole	5.6	5 to 50	498258.4	6486197.9	Survey Corridor
SP24_M_092	Magnetic	Negative Monopole	14.7	5 to 50	499235	6485624.7	Survey Corridor
SP24_M_087	Magnetic	Positive Monopole	7.3	5 to 50	499509.1	6485879.9	Survey Corridor

Name	Potential	Description	Amplitude (nT)	Range (nT)	X	Y	Area
SP24_M_093	Magnetic	Positive Monopole	13.6	5 to 50	499954.7	6485608.3	Survey Corridor
SP24_M_090	Magnetic	Positive Monopole	7.4	5 to 50	499976	6485641.7	Survey Corridor
SP24_M_088	Magnetic	Positive Monopole	5.5	5 to 50	499985.4	6485674	Survey Corridor
SP24_M_091	Magnetic	Asymmetric Dipole	5.6	5 to 50	500211.7	6485633.3	Survey Corridor
SP24_M_089	Magnetic	Positive Monopole	5.8	5 to 50	500220.8	6485664.8	Survey Corridor
SP24_M_094	Magnetic	Positive Monopole	7.3	5 to 50	500332.7	6485598.2	Survey Corridor
SP24_M_096	Magnetic	Asymmetric Dipole	21.3	5 to 50	503714.1	6485316.8	Survey Corridor
SP24_M_095	Magnetic	Positive Monopole	5.8	5 to 50	503767.9	6485388.9	Survey Corridor
SP24_M_097	Magnetic	Positive Monopole	9.8	5 to 50	504523.3	6483881.1	Survey Corridor
SP24_M_098	Magnetic	Asymmetric Dipole	16.6	5 to 50	504723	6483218.5	Survey Corridor
SP24_M_099	Magnetic	Dipole	31.1	5 to 50	506119.7	6482922	Survey Corridor
SP24_M_100	Magnetic	Positive Monopole	7.5	5 to 50	506201.4	6482453.7	Survey Corridor
SP24_M_101	Magnetic	Positive Monopole	6.9	5 to 50	508471.9	6481761.9	Survey Corridor
SP24_M_102	Magnetic	Negative Monopole	96.8	50 to 100	508767.6	6481261	Survey Corridor
SP24_M_103	Magnetic	Positive Monopole	43	5 to 50	508935.5	6480978.9	Survey Corridor
SP24_M_104	Magnetic	Positive Monopole	5.9	5 to 50	508970	6480921.7	Survey Corridor
SP24_M_105	Magnetic	Negative Monopole	60.8	50 to 100	509101.4	6480699.8	Survey Corridor

Name	Potential	Description	Amplitude (nT)	Range (nT)	X	Y	Area
SP24_M_106	Magnetic	Negative Monopole	11.4	5 to 50	509872.8	6479800.5	Survey Corridor
SP24_M_107	Magnetic	Asymmetric Dipole	10.2	5 to 50	509887.1	6479776.7	Survey Corridor
SP24_M_108	Magnetic	Positive Monopole	5.7	5 to 50	510783.9	6478199	Survey Corridor
SP24_M_109	Magnetic	Positive Monopole	5.4	5 to 50	512175.4	6477657.6	Survey Corridor
SP24_M_110	Magnetic	Asymmetric Dipole	5.9	5 to 50	512840.8	6477264.9	Survey Corridor
SP24_M_111	Magnetic	Negative Monopole	5.5	5 to 50	513460	6476821.6	Survey Corridor
SP24_M_112	Magnetic	Negative Monopole	9	5 to 50	514510.5	6476301.7	Survey Corridor
SP24_M_114	Magnetic	Positive Monopole	7.3	5 to 50	515471.8	6476077.9	Survey Corridor
SP24_M_113	Magnetic	Negative Monopole	5.2	5 to 50	515492.4	6476104.4	Survey Corridor
SP24_M_115	Magnetic	Asymmetric Dipole	6.3	5 to 50	515853.5	6476022.3	Survey Corridor
SP24_M_117	Magnetic	Asymmetric Dipole	10.2	5 to 50	518694.9	6474659	Survey Corridor
SP24_M_116	Magnetic	Negative Monopole	13.7	5 to 50	518951.6	6474973.8	Survey Corridor
SP24_M_126	Magnetic	Negative Monopole	11.8	5 to 50	522251.1	6473231.3	Survey Corridor
SP24_M_127	Magnetic	Positive Monopole	6	5 to 50	522926.4	6473167.6	Survey Corridor
SP24_M_121	Magnetic	Negative Monopole	31	5 to 50	523208	6473374.3	Survey Corridor
SP24_M_120	Magnetic	Asymmetric Dipole	11.6	5 to 50	523246.7	6473436.6	Survey Corridor
SP24_M_125	Magnetic	Asymmetric Dipole	20.6	5 to 50	523306.4	6473322.3	Survey Corridor

Name	Potential	Description	Amplitude (nT)	Range (nT)	X	Y	Area
SP24_M_119	Magnetic	Asymmetric Dipole	5.6	5 to 50	523672.6	6473539.1	Survey Corridor
SP24_M_118	Magnetic	Dipole	30.7	5 to 50	523905.7	6473559.2	Survey Corridor
SP24_M_124	Magnetic	Negative Monopole	5.3	5 to 50	524510.7	6473342.3	Survey Corridor
SP24_M_123	Magnetic	Dipole	5.2	5 to 50	524528.1	6473343.7	Survey Corridor
SP24_M_122	Magnetic	Positive Monopole	48.7	5 to 50	524560.7	6473347.6	Survey Corridor
SP24_M_128	Magnetic	Negative Monopole	11.1	5 to 50	525839.8	6472954	Survey Corridor
SP24_M_129	Magnetic	Asymmetric Dipole	7	5 to 50	525634	6472778.5	Survey Corridor
SP24_M_130	Magnetic	Negative Monopole	12.6	5 to 50	527489.5	6470721.3	Survey Corridor
SP24_M_131	Magnetic	Positive Monopole	7.3	5 to 50	527540.7	6470172.2	Survey Corridor
SP24_M_132	Magnetic	Negative Monopole	10.1	5 to 50	527956.6	6469888.4	Survey Corridor
SP24_M_133	Magnetic	Negative Monopole	5.7	5 to 50	528005.5	6469826.2	Survey Corridor
SP24_M_134	Magnetic	Positive Monopole	10.6	5 to 50	528188.8	6469253.3	Survey Corridor
SP24_M_135	Magnetic	Asymmetric Dipole	5.4	5 to 50	530108.6	6467501.5	Survey Corridor
SP24_M_136	Magnetic	Asymmetric Dipole	8.4	5 to 50	533204.3	6463243.6	Survey Corridor
SP24_M_137	Magnetic	Asymmetric Dipole	22.2	5 to 50	536196.7	6459391.6	Survey Corridor
SP24_M_138	Magnetic	Positive Monopole	21.9	5 to 50	535985.1	6459178	Survey Corridor
SP24_M_139	Magnetic	Negative Monopole	5.6	5 to 50	537002.3	6458250.9	Survey Corridor

Name	Potential	Description	Amplitude (nT)	Range (nT)	X	Y	Area
SP24_M_140	Magnetic	Asymmetric Dipole	5.3	5 to 50	537391.3	6458169.8	Survey Corridor
SP24_M_141	Magnetic	Dipole	6.3	5 to 50	538755.9	6456487.3	Survey Corridor
SP24_M_142	Magnetic	Asymmetric Dipole	6.2	5 to 50	539184.5	6456407.8	Survey Corridor
SP24_M_143	Magnetic	Asymmetric Dipole	21.3	5 to 50	541792.7	6453535.5	Survey Corridor
SP24_M_144	Magnetic	Asymmetric Dipole	10.6	5 to 50	543039.4	6452258.3	Survey Corridor
SP24_M_145	Magnetic	Positive Monopole	5.5	5 to 50	543451.7	6451819.3	Survey Corridor
SP24_M_146	Magnetic	Positive Monopole	12.3	5 to 50	543760.6	6451484.5	Survey Corridor
SP24_M_148	Magnetic	Asymmetric Dipole	8.4	5 to 50	543824	6451379.8	Survey Corridor
SP24_M_147	Magnetic	Positive Monopole	11	5 to 50	543892.8	6451441.4	Survey Corridor
SP24_M_149	Magnetic	Asymmetric Dipole	54.8	50 to 100	546166	6449957.8	Survey Corridor
SP24_M_150	Magnetic	Positive Monopole	6.6	5 to 50	547520.3	6449475.5	Survey Corridor
SP24_M_152	Magnetic	Negative Monopole	8.2	5 to 50	549040.8	6448662.7	Survey Corridor
SP24_M_151	Magnetic	Dipole	24.2	5 to 50	549091.4	6448772.4	Survey Corridor
SP24_M_153	Magnetic	Negative Monopole	29.9	5 to 50	549907.2	6448291.6	Survey Corridor
SP24_M_154	Magnetic	Dipole	29.2	5 to 50	552172.7	6446728.6	Survey Corridor
SP24_M_155	Magnetic	Dipole	14.5	5 to 50	552940.7	6445558.5	Survey Corridor
SP24_M_156	Magnetic	Positive Monopole	17.9	5 to 50	553472.8	6444986.4	Survey Corridor

Name	Potential	Description	Amplitude (nT)	Range (nT)	X	Y	Area
SP24_M_157	Magnetic	Positive Monopole	20.4	5 to 50	554990.7	6440819.4	Survey Corridor
SP24_M_158	Magnetic	Positive Monopole	9.4	5 to 50	556708	6439498	Survey Corridor
SP24_M_159	Magnetic	Asymmetric Dipole	5.8	5 to 50	561144	6433904.4	Survey Corridor
SP24_M_160	Magnetic	Positive Monopole	5.9	5 to 50	560995.4	6431255.6	Survey Corridor
SP24_M_161	Magnetic	Dipole	6.8	5 to 50	561179.3	6430957.8	Survey Corridor
SP24_M_162	Magnetic	Negative Monopole	12.2	5 to 50	562153	6429197.9	Survey Corridor
SP24_M_163	Magnetic	Asymmetric Dipole	11.3	5 to 50	562182.3	6429103.4	Survey Corridor
SP24_M_164	Magnetic	Negative Monopole	9.3	5 to 50	566568.3	6424816	Survey Corridor
SP24_M_165	Magnetic	Negative Monopole	5.3	5 to 50	567250	6424340.3	Survey Corridor
SP24_M_166	Magnetic	Asymmetric Dipole	8.2	5 to 50	567298.2	6424318.7	Survey Corridor
SP24_M_167	Magnetic	Asymmetric Dipole	5.5	5 to 50	567939.2	6423457.9	Survey Corridor
SP24_M_169	Magnetic	Asymmetric Dipole	25.6	5 to 50	569401.7	6421764.5	Survey Corridor
SP24_M_168	Magnetic	Positive Monopole	15.5	5 to 50	569792	6421802.6	Survey Corridor
SP24_M_170	Magnetic	Negative Monopole	6.8	5 to 50	569884	6421706.3	Survey Corridor
SP24_M_171	Magnetic	Asymmetric Dipole	12.3	5 to 50	569805.4	6421435.2	Survey Corridor
SP24_M_172	Magnetic	Positive Monopole	5.3	5 to 50	569881.3	6421317.6	Survey Corridor
SP24_M_173	Magnetic	Positive Monopole	5.3	5 to 50	570888	6421133	Survey Corridor

Name	Potential	Description	Amplitude (nT)	Range (nT)	X	Y	Area
SP24_M_174	Magnetic	Positive Monopole	11.6	5 to 50	571319.8	6420681.1	Survey Corridor
SP24_M_175	Magnetic	Positive Monopole	14.9	5 to 50	571865.2	6419973.2	Survey Corridor
SP24_M_176	Magnetic	Dipole	11.2	5 to 50	573034.4	6419686.1	Survey Corridor
SP24_M_177	Magnetic	Negative Monopole	9.7	5 to 50	573679.1	6419238	Survey Corridor
SP24_M_178	Magnetic	Positive Monopole	14	5 to 50	574098.4	6418578.9	Survey Corridor
SP24_M_179	Magnetic	Asymmetric Dipole	10.4	5 to 50	574586.2	6418444.8	Survey Corridor
SP24_M_180	Magnetic	Negative Monopole	5.9	5 to 50	575493.4	6418149.4	Survey Corridor
SP24_M_183	Magnetic	Negative Monopole	5.6	5 to 50	576789.6	6417213.8	Survey Corridor
SP24_M_181	Magnetic	Asymmetric Dipole	34.8	5 to 50	577265.5	6417340.4	Survey Corridor
SP24_M_182	Magnetic	Negative Monopole	12	5 to 50	577746.3	6417337.9	Survey Corridor
SP24_M_184	Magnetic	Positive Monopole	8.6	5 to 50	577798.2	6416974.6	Survey Corridor
SP24_M_185	Magnetic	Dipole	6.2	5 to 50	578981.5	6416928	Survey Corridor
SP24_M_188	Magnetic	Asymmetric Dipole	12.2	5 to 50	579142	6416400	Survey Corridor
SP24_M_187	Magnetic	Dipole	7.6	5 to 50	579273.9	6416450	Survey Corridor
SP24_M_186	Magnetic	Dipole	12.4	5 to 50	579876	6416470.4	Survey Corridor
SP24_M_189	Magnetic	Negative Monopole	8.8	5 to 50	579863	6416191.8	Survey Corridor
SP24_M_190	Magnetic	Negative Monopole	8.3	5 to 50	581040.3	6416018.6	Survey Corridor

Name	Potential	Description	Amplitude (nT)	Range (nT)	X	Y	Area
SP24_M_191	Magnetic	Asymmetric Dipole	10.1	5 to 50	581809.3	6416015.3	Survey Corridor
SP24_M_192	Magnetic	Negative Monopole	16	5 to 50	581974.8	6415865	Survey Corridor
SP24_M_195	Magnetic	Asymmetric Dipole	16.8	5 to 50	583754.9	6414636.6	Survey Corridor
SP24_M_193	Magnetic	Negative Monopole	5.7	5 to 50	583814.6	6414663.8	Survey Corridor
SP24_M_194	Magnetic	Asymmetric Dipole	6.3	5 to 50	583861.5	6414654.1	Survey Corridor
SP24_M_197	Magnetic	Negative Monopole	27.4	5 to 50	586166.7	6411995.2	Survey Corridor
SP24_M_196	Magnetic	Asymmetric Dipole	5	5 to 50	586758.4	6412017.4	Survey Corridor
SP24_M_198	Magnetic	Asymmetric Dipole	11.6	5 to 50	587018.5	6410981.2	Survey Corridor
SP24_M_199	Magnetic	Negative Monopole	11.3	5 to 50	587464.8	6410444	Survey Corridor
SP24_M_200	Magnetic	Asymmetric Dipole	12.2	5 to 50	587459.4	6410324.6	Survey Corridor
SP24_M_201	Magnetic	Dipole	46.3	5 to 50	587243.3	6409967.7	Survey Corridor
SP24_M_202	Magnetic	Positive Monopole	16.1	5 to 50	587268.7	6406765.8	Survey Corridor
SP24_M_203	Magnetic	Negative Monopole	28.1	5 to 50	587314.2	6405356.5	Survey Corridor
SP24_M_204	Magnetic	Dipole	8.2	5 to 50	587159.5	6404915.9	Survey Corridor
SP24_M_205	Magnetic	Asymmetric Dipole	8.8	5 to 50	586986.5	6403893.2	Survey Corridor
SP24_M_206	Magnetic	Positive Monopole	13	5 to 50	587013.4	6403848	Survey Corridor
SP24_M_207	Magnetic	Asymmetric Dipole	7.5	5 to 50	586985.3	6403843	Survey Corridor

Name	Potential	Description	Amplitude (nT)	Range (nT)	X	Y	Area
SP24_M_208	Magnetic	Negative Monopole	5	5 to 50	586846.3	6403132.3	Survey Corridor
SP24_M_209	Magnetic	Dipole	8	5 to 50	586885.1	6402686.8	Survey Corridor
SP24_M_210	Magnetic	Asymmetric Dipole	6.4	5 to 50	587019.4	6402296.3	Survey Corridor
SP24_M_211	Magnetic	Negative Monopole	6.7	5 to 50	586988.1	6402272.6	Survey Corridor
SP24_M_213	Magnetic	Positive Monopole	10.5	5 to 50	587096	6401241.1	Survey Corridor
SP24_M_212	Magnetic	Positive Monopole	16.4	5 to 50	586909.1	6401241.8	Survey Corridor
SP24_M_214	Magnetic	Positive Monopole	61.8	50 to 100	586637.2	6400291.1	Survey Corridor
SP24_M_215	Magnetic	Dipole	10.2	5 to 50	586519.7	6400236.7	Survey Corridor
SP24_M_216	Magnetic	Asymmetric Dipole	7	5 to 50	585773.3	6400084.5	Survey Corridor
SP24_M_217	Magnetic	Asymmetric Dipole	7.3	5 to 50	583725.2	6398364.8	Survey Corridor
SP24_M_218	Magnetic	Asymmetric Dipole	13.6	5 to 50	583046	6397540.1	Survey Corridor
SP24_M_219	Magnetic	Asymmetric Dipole	22.5	5 to 50	583077.2	6397211.8	Survey Corridor
SP24_M_220	Magnetic	Asymmetric Dipole	5.8	5 to 50	583057.5	6397109.1	Survey Corridor
SP24_M_222	Magnetic	Positive Monopole	18.4	5 to 50	583146.1	6396955.7	Survey Corridor
SP24_M_221	Magnetic	Negative Monopole	9.5	5 to 50	582729.2	6397063.4	Survey Corridor
SP24_M_223	Magnetic	Asymmetric Dipole	6.6	5 to 50	582739	6396751.8	Survey Corridor
SP24_M_224	Magnetic	Negative Monopole	19.1	5 to 50	582522.7	6395780.1	Survey Corridor

Name	Potential	Description	Amplitude (nT)	Range (nT)	X	Y	Area
SP24_M_225	Magnetic	Positive Monopole	6.9	5 to 50	582546.6	6395761.2	Survey Corridor
SP24_M_226	Magnetic	Positive Monopole	8.2	5 to 50	581576.8	6394600.4	Survey Corridor
SP24_M_227	Magnetic	Positive Monopole	6.2	5 to 50	581801.4	6394295.3	Survey Corridor
SP24_M_228	Magnetic	Positive Monopole	6.3	5 to 50	580922.6	6392332.5	Survey Corridor
SP24_M_229	Magnetic	Negative Monopole	7.4	5 to 50	580564.5	6392161.4	Survey Corridor
SP24_M_230	Magnetic	Negative Monopole	6.7	5 to 50	580747.4	6392063.2	Survey Corridor
SP24_M_231	Magnetic	Asymmetric Dipole	19.5	5 to 50	580363.5	6391872.3	Survey Corridor
SP24_M_046	Magnetic	Asymmetric Dipole	5.5	5 to 50	579486.2	6391338.4	Marine Cable Corridor
SP24_M_013	Magnetic	Asymmetric Dipole	5.3	5 to 50	579497.8	6391212.8	Marine Cable Corridor
SP24_M_001	Magnetic	Asymmetric Dipole	6.7	5 to 50	579457.1	6391212.3	Marine Cable Corridor
SP24_M_024	Magnetic	Positive Monopole	8.4	5 to 50	579984.7	6390537.3	Marine Cable Corridor
SP24_M_232	Magnetic	Negative Monopole	7.4	5 to 50	579292.8	6390639.1	Survey Corridor
SP24_M_233	Magnetic	Negative Monopole	8.8	5 to 50	579269.3	6390615.2	Survey Corridor
SP24_M_234	Magnetic	Positive Monopole	6.7	5 to 50	579024.6	6390578.2	Survey Corridor
SP24_M_235	Magnetic	Negative Monopole	5.9	5 to 50	578694.2	6390194.6	Survey Corridor
SP24_M_236	Magnetic	Positive Monopole	6.9	5 to 50	578823.9	6389981	Survey Corridor
SP24_M_238	Magnetic	Negative Monopole	6.7	5 to 50	578763	6389618.4	Survey Corridor

Name	Potential	Description	Amplitude (nT)	Range (nT)	X	Y	Area
SP24_M_237	Magnetic	Positive Monopole	17.8	5 to 50	578433.5	6389621	Survey Corridor
SP24_M_239	Magnetic	Negative Monopole	6.1	5 to 50	578185.2	6389535.5	Survey Corridor
SP24_M_240	Magnetic	Positive Monopole	8	5 to 50	578166.7	6389514.9	Survey Corridor
SP24_M_241	Magnetic	Dipole	23.2	5 to 50	578361	6389279.5	Survey Corridor
SP24_M_242	Magnetic	Dipole	16.1	5 to 50	578022	6389241.4	Survey Corridor
SP24_M_243	Magnetic	Positive Monopole	6.4	5 to 50	578012.1	6389217.1	Survey Corridor
SP24_M_244	Magnetic	Asymmetric Dipole	28.8	5 to 50	577959.8	6389072.5	Survey Corridor
SP24_M_245	Magnetic	Positive Monopole	8.5	5 to 50	577787.6	6386806.2	Survey Corridor
SP24_M_246	Magnetic	Positive Monopole	8.9	5 to 50	577553.4	6386768.2	Survey Corridor
SP24_M_247	Magnetic	Asymmetric Dipole	12.3	5 to 50	577560	6386694.4	Survey Corridor
SP24_M_248	Magnetic	Positive Monopole	5.4	5 to 50	577651.1	6386692.4	Survey Corridor
SP24_M_249	Magnetic	Positive Monopole	6.2	5 to 50	577741.2	6386674.1	Survey Corridor
SP24_M_251	Magnetic	Asymmetric Dipole	12.5	5 to 50	577688	6386624.8	Survey Corridor
SP24_M_250	Magnetic	Asymmetric Dipole	23.7	5 to 50	577777.4	6386632.1	Survey Corridor
SP24_M_252	Magnetic	Asymmetric Dipole	7.7	5 to 50	577959.9	6386619.6	Survey Corridor
SP24_M_253	Magnetic	Positive Monopole	14.2	5 to 50	577917.7	6386460.5	Survey Corridor
SP24_M_254	Magnetic	Asymmetric Dipole	7.3	5 to 50	578025.3	6386290.9	Survey Corridor

Name	Potential	Description	Amplitude (nT)	Range (nT)	X	Y	Area
SP24_M_255	Magnetic	Negative Monopole	6	5 to 50	578024.2	6385939.5	Survey Corridor
SP24_M_256	Magnetic	Asymmetric Dipole	9.4	5 to 50	577906.7	6385530.4	Survey Corridor
SP24_M_257	Magnetic	Asymmetric Dipole	7.1	5 to 50	577902.3	6385515.7	Survey Corridor
SP24_M_258	Magnetic	Positive Monopole	9.4	5 to 50	577809.7	6385459.4	Survey Corridor
SP24_M_259	Magnetic	Asymmetric Dipole	13.6	5 to 50	577828.8	6385260.7	Survey Corridor
SP24_M_261	Magnetic	Positive Monopole	7.7	5 to 50	577505.2	6385221.7	Survey Corridor
SP24_M_263	Magnetic	Dipole	13.3	5 to 50	577550.9	6385180.9	Survey Corridor
SP24_M_262	Magnetic	Positive Monopole	126.3	100 to 200	577448.3	6385189.1	Survey Corridor
SP24_M_260	Magnetic	Positive Monopole	325.9	200+	577334.7	6385240.8	Survey Corridor
SP24_M_264	Magnetic	Positive Monopole	90.4	50 to 100	577394.4	6385169.2	Survey Corridor
SP24_M_265	Magnetic	Positive Monopole	55.3	50 to 100	577356.2	6385167.7	Survey Corridor
SP24_M_266	Magnetic	Asymmetric Dipole	99	50 to 100	577304.5	6385145.6	Survey Corridor
SP24_M_270	Magnetic	Positive Monopole	6.2	5 to 50	577293.7	6385001.8	Survey Corridor
SP24_M_267	Magnetic	Positive Monopole	8.8	5 to 50	577188.9	6385065.7	Survey Corridor
SP24_M_269	Magnetic	Asymmetric Dipole	12.1	5 to 50	577212.3	6385004.2	Survey Corridor
SP24_M_268	Magnetic	Positive Monopole	48.3	5 to 50	577171.7	6385049.4	Survey Corridor
SP24_M_287	Magnetic	Asymmetric Dipole	6.5	5 to 50	577069.2	6384668.2	Survey Corridor

Name	Potential	Description	Amplitude (nT)	Range (nT)	X	Y	Area
SP24_M_272	Magnetic	Positive Monopole	11.7	5 to 50	576870.1	6384817.6	Survey Corridor
SP24_M_283	Magnetic	Positive Monopole	7.5	5 to 50	576814.9	6384711	Survey Corridor
SP24_M_289	Magnetic	Asymmetric Dipole	8.2	5 to 50	576767	6384643.8	Survey Corridor
SP24_M_273	Magnetic	Positive Monopole	6.9	5 to 50	576712.5	6384788.2	Survey Corridor
SP24_M_274	Magnetic	Asymmetric Dipole	16.8	5 to 50	576703	6384783.4	Survey Corridor
SP24_M_276	Magnetic	Asymmetric Dipole	8.7	5 to 50	576558.5	6384762.8	Survey Corridor
SP24_M_288	Magnetic	Positive Monopole	6.1	5 to 50	576513.3	6384664.3	Survey Corridor
SP24_M_284	Magnetic	Positive Monopole	6	5 to 50	576500	6384692.6	Survey Corridor
SP24_M_277	Magnetic	Positive Monopole	10.7	5 to 50	576484.8	6384752.9	Survey Corridor
SP24_M_319	Magnetic	Positive Monopole	15.1	5 to 50	576516.6	6384422.7	Survey Corridor
SP24_M_285	Magnetic	Negative Monopole	6	5 to 50	576436.5	6384683.7	Survey Corridor
SP24_M_309	Magnetic	Asymmetric Dipole	16.2	5 to 50	576461.2	6384475.9	Survey Corridor
SP24_M_278	Magnetic	Asymmetric Dipole	9.3	5 to 50	576398.8	6384739.2	Survey Corridor
SP24_M_280	Magnetic	Asymmetric Dipole	9.7	5 to 50	576290.9	6384722.4	Survey Corridor
SP24_M_318	Magnetic	Negative Monopole	11.5	5 to 50	576149.8	6384428.1	Survey Corridor
SP24_M_038	Magnetic	Positive Monopole	7.1	5 to 50	575964.7	6385007.5	Marine Cable Corridor
SP24_M_039	Magnetic	Positive Monopole	6.2	5 to 50	575938.5	6384975	Marine Cable Corridor

Name	Potential	Description	Amplitude (nT)	Range (nT)	X	Y	Area
SP24_M_040	Magnetic	Positive Monopole	8.4	5 to 50	575916.6	6384880.5	Marine Cable Corridor
SP24_M_295	Magnetic	Positive Monopole	11.3	5 to 50	575803.9	6384589.6	Survey Corridor
SP24_M_328	Magnetic	Negative Monopole	11.5	5 to 50	575825.9	6384349	Survey Corridor
SP24_M_329	Magnetic	Negative Monopole	5	5 to 50	575789.8	6384344.1	Survey Corridor
SP24_M_297	Magnetic	Positive Monopole	160.6	100 to 200	575646	6384566.9	Survey Corridor
SP24_M_305	Magnetic	Positive Monopole	12.3	5 to 50	575637.3	6384504.2	Survey Corridor
SP24_M_298	Magnetic	Asymmetric Dipole	9.6	5 to 50	575611.8	6384562.2	Survey Corridor
SP24_M_293	Magnetic	Positive Monopole	13.4	5 to 50	575601.1	6384619.5	Survey Corridor
SP24_M_294	Magnetic	Asymmetric Dipole	6.1	5 to 50	575588.3	6384618.1	Survey Corridor
SP24_M_299	Magnetic	Positive Monopole	8.5	5 to 50	575577.8	6384557.3	Survey Corridor
SP24_M_015	Magnetic	Asymmetric Dipole	10	5 to 50	575443.9	6384990.8	Marine Cable Corridor
SP24_M_073	Magnetic	Asymmetric Dipole	27.8	5 to 50	575436.9	6384929.5	Marine Cable Corridor
SP24_M_302	Magnetic	Asymmetric Dipole	13	5 to 50	575487.9	6384511.9	Survey Corridor
SP24_M_330	Magnetic	Asymmetric Dipole	7.2	5 to 50	575441.3	6384322.1	Survey Corridor
SP24_M_327	Magnetic	Negative Monopole	50.1	50 to 100	575334.3	6384367.9	Survey Corridor
SP24_M_072	Magnetic	Asymmetric Dipole	14.5	5 to 50	575204.2	6384893.7	Marine Cable Corridor
SP24_M_313	Magnetic	Positive Monopole	18.3	5 to 50	575267	6384448.1	Survey Corridor

Name	Potential	Description	Amplitude (nT)	Range (nT)	X	Y	Area
SP24_M_331	Magnetic	Asymmetric Dipole	7.4	5 to 50	575228.7	6384320.2	Survey Corridor
SP24_M_041	Magnetic	Asymmetric Dipole	6.2	5 to 50	575133.4	6384883.3	Marine Cable Corridor
SP24_M_042	Magnetic	Asymmetric Dipole	6.3	5 to 50	575067.4	6384843.7	Marine Cable Corridor
SP24_M_314	Magnetic	Asymmetric Dipole	11.5	5 to 50	575053.6	6384447.1	Survey Corridor
SP24_M_031	Magnetic	Dipole	10	5 to 50	574999.1	6384743.4	Marine Cable Corridor
SP24_M_064	Magnetic	Asymmetric Dipole	13	5 to 50	574983.3	6384773.9	Marine Cable Corridor
SP24_M_029	Magnetic	Asymmetric Dipole	14.9	5 to 50	574959.5	6384803.2	Marine Cable Corridor
SP24_M_020	Magnetic	Positive Monopole	11.1	5 to 50	574958.8	6384832.7	Marine Cable Corridor
SP24_M_292	Magnetic	Positive Monopole	46.1	5 to 50	574954.9	6384623.1	Survey Corridor
SP24_M_310	Magnetic	Asymmetric Dipole	10.2	5 to 50	574925.1	6384474.8	Survey Corridor
SP24_M_054	Magnetic	Dipole	24.2	5 to 50	574896	6384715.8	Marine Cable Corridor
SP24_M_055	Magnetic	Asymmetric Dipole	12.6	5 to 50	574877.8	6384747.8	Marine Cable Corridor
SP24_M_056	Magnetic	Positive Monopole	24.5	5 to 50	574865.1	6384778.4	Marine Cable Corridor
SP24_M_058	Magnetic	Asymmetric Dipole	14.2	5 to 50	574854.7	6384811.3	Marine Cable Corridor
SP24_M_019	Magnetic	Asymmetric Dipole	8.9	5 to 50	574855.2	6384932.7	Marine Cable Corridor
SP24_M_018	Magnetic	Asymmetric Dipole	13	5 to 50	574817.7	6384876.5	Marine Cable Corridor
SP24_M_286	Magnetic	Positive Monopole	16.1	5 to 50	574788.3	6384670	Survey Corridor

Name	Potential	Description	Amplitude (nT)	Range (nT)	X	Y	Area
SP24_M_290	Magnetic	Positive Monopole	9.8	5 to 50	574765.5	6384642.1	Survey Corridor
SP24_M_067	Magnetic	Asymmetric Dipole	12.6	5 to 50	574739.9	6384827.5	Marine Cable Corridor
SP24_M_017	Magnetic	Asymmetric Dipole	15.1	5 to 50	574754.8	6384945.8	Marine Cable Corridor
SP24_M_016	Magnetic	Asymmetric Dipole	10.4	5 to 50	574740.8	6384918.5	Marine Cable Corridor
SP24_M_066	Magnetic	Asymmetric Dipole	6.1	5 to 50	574711.6	6384738.7	Marine Cable Corridor
SP24_M_303	Magnetic	Positive Monopole	20.6	5 to 50	574662.1	6384505.2	Survey Corridor
SP24_M_062	Magnetic	Asymmetric Dipole	15.8	5 to 50	574683.6	6384805.1	Marine Cable Corridor
SP24_M_043	Magnetic	Asymmetric Dipole	7	5 to 50	574666	6384959	Marine Cable Corridor
SP24_M_065	Magnetic	Asymmetric Dipole	20.9	5 to 50	574636.6	6384751.3	Marine Cable Corridor
SP24_M_061	Magnetic	Positive Monopole	24.4	5 to 50	574635.5	6384780.4	Marine Cable Corridor
SP24_M_060	Magnetic	Positive Monopole	18.5	5 to 50	574628.3	6384811.9	Marine Cable Corridor
SP24_M_021	Magnetic	Dipole	11.5	5 to 50	574636.4	6384903	Marine Cable Corridor
SP24_M_059	Magnetic	Asymmetric Dipole	16.8	5 to 50	574626.4	6384842.4	Marine Cable Corridor
SP24_M_068	Magnetic	Asymmetric Dipole	24.7	5 to 50	574622.7	6384872.9	Marine Cable Corridor
SP24_M_279	Magnetic	Asymmetric Dipole	6	5 to 50	574590.8	6384727.6	Survey Corridor
SP24_M_003	Magnetic	Asymmetric Dipole	14.4	5 to 50	574609.6	6384936.4	Marine Cable Corridor
SP24_M_332	Magnetic	Negative Monopole	7.5	5 to 50	574492.8	6384284.4	Survey Corridor

Name	Potential	Description	Amplitude (nT)	Range (nT)	X	Y	Area
SP24_M_057	Magnetic	Dipole	43.2	5 to 50	574579.1	6384939.8	Marine Cable Corridor
SP24_M_037	Magnetic	Dipole	8.1	5 to 50	574550.1	6384823.6	Marine Cable Corridor
SP24_M_012	Magnetic	Negative Monopole	16.1	5 to 50	574557	6384972.8	Marine Cable Corridor
SP24_M_069	Magnetic	Asymmetric Dipole	11.6	5 to 50	574512.5	6384950.1	Marine Cable Corridor
SP24_M_282	Magnetic	Positive Monopole	17.6	5 to 50	574467.6	6384711.9	Survey Corridor
SP24_M_030	Magnetic	Asymmetric Dipole	14.6	5 to 50	574477.1	6384924	Marine Cable Corridor
SP24_M_044	Magnetic	Asymmetric Dipole	8.9	5 to 50	574460.8	6384957	Marine Cable Corridor
SP24_M_281	Magnetic	Positive Monopole	6.3	5 to 50	574422.2	6384718.6	Survey Corridor
SP24_M_063	Magnetic	Asymmetric Dipole	6.1	5 to 50	574401.4	6384873.8	Marine Cable Corridor
SP24_M_047	Magnetic	Asymmetric Dipole	12.6	5 to 50	574391.8	6384906.3	Marine Cable Corridor
SP24_M_291	Magnetic	Asymmetric Dipole	14.7	5 to 50	574340.2	6384639.7	Survey Corridor
SP24_M_035	Magnetic	Asymmetric Dipole	14.8	5 to 50	574379	6384937.5	Marine Cable Corridor
SP24_M_004	Magnetic	Negative Monopole	31.7	5 to 50	574375.2	6384967	Marine Cable Corridor
SP24_M_316	Magnetic	Positive Monopole	9.9	5 to 50	574290.1	6384435.3	Survey Corridor
SP24_M_011	Magnetic	Asymmetric Dipole	14.4	5 to 50	574368.2	6384999.7	Marine Cable Corridor
SP24_M_300	Magnetic	Asymmetric Dipole	5.9	5 to 50	574294.4	6384525.9	Survey Corridor
SP24_M_275	Magnetic	Negative Monopole	7.1	5 to 50	574323.5	6384763.2	Survey Corridor

Name	Potential	Description	Amplitude (nT)	Range (nT)	X	Y	Area
SP24_M_022	Magnetic	Dipole	10.5	5 to 50	574315.1	6385007.9	Marine Cable Corridor
SP24_M_071	Magnetic	Asymmetric Dipole	7.2	5 to 50	574306.8	6384977.5	Marine Cable Corridor
SP24_M_315	Magnetic	Negative Monopole	25.5	5 to 50	574215	6384446.5	Survey Corridor
SP24_M_325	Magnetic	Positive Monopole	9.9	5 to 50	574007	6384384.7	Survey Corridor
SP24_M_045	Magnetic	Positive Monopole	7.7	5 to 50	574090.8	6385007.7	Marine Cable Corridor
SP24_M_053	Magnetic	Asymmetric Dipole	8.5	5 to 50	574056	6384832.2	Marine Cable Corridor
SP24_M_308	Magnetic	Positive Monopole	27.3	5 to 50	573991.2	6384477	Survey Corridor
SP24_M_324	Magnetic	Asymmetric Dipole	12.5	5 to 50	573960.7	6384389	Survey Corridor
SP24_M_028	Magnetic	Positive Monopole	10.6	5 to 50	574009.5	6384899.8	Marine Cable Corridor
SP24_M_323	Magnetic	Asymmetric Dipole	17.4	5 to 50	573916.5	6384396.2	Survey Corridor
SP24_M_007	Magnetic	Asymmetric Dipole	30.3	5 to 50	573979.5	6384992.8	Marine Cable Corridor
SP24_M_006	Magnetic	Asymmetric Dipole	11.8	5 to 50	573983.4	6385022.8	Marine Cable Corridor
SP24_M_307	Magnetic	Negative Monopole	8.6	5 to 50	573907.6	6384488.6	Survey Corridor
SP24_M_027	Magnetic	Asymmetric Dipole	19.4	5 to 50	573955.8	6384877.2	Marine Cable Corridor
SP24_M_005	Magnetic	Asymmetric Dipole	17	5 to 50	573975.5	6385054.3	Marine Cable Corridor
SP24_M_311	Magnetic	Asymmetric Dipole	30.6	5 to 50	573885.3	6384461	Survey Corridor
SP24_M_322	Magnetic	Asymmetric Dipole	15.7	5 to 50	573875.8	6384399.8	Survey Corridor

Name	Potential	Description	Amplitude (nT)	Range (nT)	X	Y	Area
SP24_M_306	Magnetic	Asymmetric Dipole	9.4	5 to 50	573875.1	6384494.6	Survey Corridor
SP24_M_317	Magnetic	Asymmetric Dipole	26.8	5 to 50	573866.1	6384433.9	Survey Corridor
SP24_M_048	Magnetic	Asymmetric Dipole	12.3	5 to 50	573933.2	6384968.2	Marine Cable Corridor
SP24_M_321	Magnetic	Asymmetric Dipole	24.4	5 to 50	573842.4	6384406.4	Survey Corridor
SP24_M_052	Magnetic	Asymmetric Dipole	22.8	5 to 50	573877.8	6384855.8	Marine Cable Corridor
SP24_M_326	Magnetic	Asymmetric Dipole	15	5 to 50	573795.1	6384382.4	Survey Corridor
SP24_M_304	Magnetic	Positive Monopole	13.3	5 to 50	573787.9	6384505	Survey Corridor
SP24_M_301	Magnetic	Positive Monopole	10.7	5 to 50	573741.3	6384512.3	Survey Corridor
SP24_M_008	Magnetic	Asymmetric Dipole	11.8	5 to 50	573751	6385085.8	Marine Cable Corridor
SP24_M_025	Magnetic	Asymmetric Dipole	14.7	5 to 50	573688.9	6385004.2	Marine Cable Corridor
SP24_M_051	Magnetic	Asymmetric Dipole	26.1	5 to 50	573658.9	6384887.2	Marine Cable Corridor
SP24_M_320	Magnetic	Complex	9.3	5 to 50	573586.7	6384411.9	Survey Corridor
SP24_M_014	Magnetic	Asymmetric Dipole	14.9	5 to 50	573561.3	6385022.1	Marine Cable Corridor
SP24_M_312	Magnetic	Dipole	11.1	5 to 50	573464.5	6384459.7	Survey Corridor
SP24_M_036	Magnetic	Dipole	7.2	5 to 50	573530.9	6384995.2	Marine Cable Corridor
SP24_M_034	Magnetic	Asymmetric Dipole	7.4	5 to 50	573501.1	6385120.5	Marine Cable Corridor
SP24_M_070	Magnetic	Dipole	41.7	5 to 50	573413.7	6384981.3	Marine Cable Corridor

Name	Potential	Description	Amplitude (nT)	Range (nT)	X	Y	Area
SP24_M_296	Magnetic	Asymmetric Dipole	68.9	50 to 100	573297.9	6384574.1	Survey Corridor
SP24_M_033	Magnetic	Asymmetric Dipole	15.8	5 to 50	573252.3	6384973.8	Marine Cable Corridor
SP24_M_032	Magnetic	Positive Monopole	14.8	5 to 50	573253.2	6385004.6	Marine Cable Corridor
SP24_M_023	Magnetic	Asymmetric Dipole	18.6	5 to 50	573230	6385068.4	Marine Cable Corridor
SP24_M_010	Magnetic	Positive Monopole	13.1	5 to 50	573195.8	6385163.5	Marine Cable Corridor
SP24_M_026	Magnetic	Positive Monopole	127.7	100 to 200	573157.3	6384987.8	Marine Cable Corridor
SP24_M_050	Magnetic	Asymmetric Dipole	28.9	5 to 50	573153	6384957.7	Marine Cable Corridor
SP24_M_009	Magnetic	Asymmetric Dipole	20.9	5 to 50	573165.2	6385106.5	Marine Cable Corridor
SP24_M_002	Magnetic	Dipole	6.6	5 to 50	573140.6	6385080.5	Marine Cable Corridor
SP24_M_271	Magnetic	Asymmetric Dipole	11.3	5 to 50	573092.2	6384935.8	Survey Corridor
SP24_M_049	Magnetic	Asymmetric Dipole	38.4	5 to 50	573090.3	6384967.6	Marine Cable Corridor
SP24_M_333	Magnetic	Asymmetric Dipole	20.3	5 to 50	573095.1	6384794.4	Survey Corridor
SP24_M_334	Magnetic	Positive Monopole	6.1	5 to 50	572749.5	6384845.7	Survey Corridor
SP24_M_335	Magnetic	Asymmetric Dipole	164.5	100 to 200	572646	6384959.4	Survey Corridor
SP24_M_336	Magnetic	Asymmetric Dipole	22.2	5 to 50	572586.6	6384865.5	Survey Corridor
SP24_M_337	Magnetic	Asymmetric Dipole	11	5 to 50	572434.7	6384583	Survey Corridor
SP24_M_338	Magnetic	Asymmetric Dipole	9.7	5 to 50	572402.4	6384536.4	Marine Cable Corridor

Name	Potential	Description	Amplitude (nT)	Range (nT)	X	Y	Area
SP24_M_339	Magnetic	Asymmetric Dipole	10.7	5 to 50	572384.1	6384762.6	Survey Corridor
SP24_M_340	Magnetic	Positive Monopole	5.7	5 to 50	572365.8	6384628.2	Survey Corridor
SP24_M_341	Magnetic	Positive Monopole	8.2	5 to 50	572298	6384503.7	Marine Cable Corridor
SP24_M_342	Magnetic	Positive Monopole	11.4	5 to 50	572278.5	6385081.8	Marine Cable Corridor
SP24_M_343	Magnetic	Positive Monopole	11.1	5 to 50	572225.2	6385062.6	Survey Corridor
SP24_M_344	Magnetic	Asymmetric Dipole	10.9	5 to 50	571954.2	6384577.8	Marine Cable Corridor
SP24_M_345	Magnetic	Asymmetric Dipole	49.2	5 to 50	571920.9	6385073.1	Survey Corridor
SP24_M_346	Magnetic	Asymmetric Dipole	12.5	5 to 50	571749	6384919.5	Survey Corridor
SP24_M_347	Magnetic	Asymmetric Dipole	108.6	100 to 200	571697.1	6384897.9	Survey Corridor
SP24_M_348	Magnetic	Asymmetric Dipole	17.5	5 to 50	571429.5	6385153.5	Survey Corridor
SP24_M_349	Magnetic	Complex	1371.7	200+	571135.2	6385224.7	Marine Cable Corridor
SP24_M_350	Magnetic	Asymmetric Dipole	20.7	5 to 50	571123.8	6385140.3	Survey Corridor
SP24_M_351	Magnetic	Positive Monopole	10.9	5 to 50	571095.3	6384929.1	Survey Corridor
SP24_M_352	Magnetic	Asymmetric Dipole	48.3	5 to 50	571085.9	6385231.9	Marine Cable Corridor
SP24_M_353	Magnetic	Complex	645.6	200+	571067.6	6385178.6	Survey Corridor
SP24_M_354	Magnetic	Asymmetric Dipole	10.1	5 to 50	571020	6385143.6	Survey Corridor
SP24_M_355	Magnetic	Asymmetric Dipole	7.9	5 to 50	571013.1	6385068	Survey Corridor

Name	Potential	Description	Amplitude (nT)	Range (nT)	X	Y	Area
SP24_M_356	Magnetic	Asymmetric Dipole	38.3	5 to 50	570983.7	6385220.4	Survey Corridor
SP24_M_357	Magnetic	Positive Monopole	27.2	5 to 50	570873.9	6385159.5	Survey Corridor
SP24_M_358	Magnetic	Positive Monopole	7.1	5 to 50	570810.9	6385065	Survey Corridor
SP24_M_359	Magnetic	Asymmetric Dipole	83.5	50 to 100	570774	6385163.7	Survey Corridor
SP24_M_360	Magnetic	Positive Monopole	15.8	5 to 50	570759.9	6384918.9	Survey Corridor
SP24_M_361	Magnetic	Asymmetric Dipole	18.9	5 to 50	570726.5	6384827.6	Survey Corridor
SP24_M_362	Magnetic	Asymmetric Dipole	6.7	5 to 50	570576.6	6385201.2	Survey Corridor
SP24_M_363	Magnetic	Positive Monopole	7.2	5 to 50	570571.8	6384801.6	Survey Corridor
SP24_M_364	Magnetic	Positive Monopole	41.9	5 to 50	570542.7	6385151.1	Survey Corridor
SP24_M_365	Magnetic	Asymmetric Dipole	99.4	50 to 100	570424.2	6385066.9	Survey Corridor

APPENDIX F: CUMULATIVE IMPACT ASSESSMENT PROJECT LIST

Table F-1 below details all the projects identified and considered as part of the cumultaive impact assessment.

TABLE F-1: PROJECTS TO BE CONSIDERED IN CUMULATIVE IMPACT ASSESSMENT

Type	Name	Developer / Operator	Status	Distance from Cable Corridor (km)	Screened IN or OUT
Offshore Renewables	Beatrice Offshore Wind Farm	Beatrice Offshore Wind Farm	Operational	12.72	OUT
Offshore Renewables	Hywind Scotland pilot park	Equinor	Operational	22.05	OUT
Offshore Renewables	Moray East	Moray Offshore Wind Farm	Operational	10.69	OUT
Offshore Renewables	Moray West	Moray Offshore Wind Farm (West)	Construction	26.51	IN
Offshore Renewables	Caledonia Offshore Wind Farm (NE4)	Caledonia Offshore Wind Farm	Pre-application	2.15	OUT
Offshore Renewables	Stromar Floating Offshore Wind Farm (NE3)	Stroma Wind	Pre-application	18.85	OUT
Offshore Renewables	Broadshore Offshore Wind Farm (NE6)	Broadshore Offshore Wind Farm	Pre-application	7.84	OUT
Offshore Renewables	Ayre Floating Offshore Wind Farm (NE2)	Thistle Wind Partners	Offshore Scoping submitted June 2024	45.52	IN
Offshore Renewables	Muir Mhòr Floating Offshore Wind Farm	Muir Mhòr Offshore Wind Farm	Offshore Scoping submitted July 2023	56.91	IN
Offshore Renewables	Buchan Offshore Wind Farm (NE8)	Buchan Offshore Wind	Offshore Scoping submitted September 2023	43.24	IN
Offshore Renewables	MarramWind Floating Offshore Wind Farm (NE7)	MarramWind	Offshore Scoping submitted January 2023	48.11	IN
Offshore Renewables	Salamander Floating Offshore Wind Farm	Salamander Wind Project Company	Offshore EIA submitted April 2024	20.34	IN
Offshore Renewables	Green Volt Floating	Green Volt Windfarm	Consented April 2024	45.1	IN

	Offshore Wind Farm				
Offshore Renewables	Pilot Pentland Firth Tidal Draft Plan Option Area	Scottish Government	Option Area	10.63	OUT
Subsea cable	Caithness-Moray HVDC	SSEN Transmission	Operational	1.04	OUT
Subsea cable	SHEFA 2	Faroese Telecom	Operational	0 (intersects)	OUT
Subsea cable	Shetland HVDC Link	SSEN Transmission	Operational	0 (intersects)	OUT
Subsea pipeline	36" Gas Brent A St. Fergus (FLAGS)	Shell PLC	Active	0.43	OUT
Subsea pipeline	HFC to St. Fergus South	GASSCO AS	Active	1.37	OUT
Subsea pipeline	32" MCP01 Bypass Bundle to St. Fergus Gas Plant	PX group	Active	1.55	OUT
Subsea pipeline	Britannia to St. Fergus	Harbour Energy PLC	Active	1.17	OUT
Subsea pipeline	Sage pipeline	Wood Group	Active	0.70	OUT
Oil and Gas Infrastructure	Beatrice B Platform	Repsol Resources UK	Plugged and Abandoned	35.46	OUT
Oil and Gas Infrastructure	Beatrice AP Platform	Repsol Resources UK	Plugged and Abandoned	43.74	OUT
Oil and Gas Infrastructure	Beatrice C Platform	Repsol Resources UK	Plugged and Abandoned	48.24	OUT
Oil and Gas Infrastructure	Captain Well Protection Platform A (WPPA)	Ithaca Energy	Active	25.15	OUT
Oil and Gas Infrastructure	Captain Bridge Linked Platform (BLP)	Ithaca Energy	Active	26.65	OUT
Oil and Gas Infrastructure	Captain Floating Production Storage and Offloading (FPSO)	Ithaca Energy	Active	26.28	OUT
Oil and Gas Infrastructure	Ross FPSO	Repsol Resources UK	Active	28.47	OUT
Oil and Gas Infrastructure	St. Fergus Gas Terminal	PX Group	Active	3.49	OUT

Aggregate and Dredge Disposal	Wick CR010	Licence provided by Marine Scotland	Closed	7.16	OUT
Aggregate and Dredge Disposal	Wick CR009	Licence provided by Marine Scotland	Open	7.16	OUT
Aggregate and Dredge Disposal	Inverallochy CR060	Licence provided by Marine Scotland	Open	12.18	OUT
Aggregate and Dredge Disposal	Peterhead CR090	Licence provided by Marine Scotland	Closed	7.97	OUT
Aggregate and Dredge Disposal	Peterhead CR070	Licence provided by Marine Scotland	Open	8.56	OUT
Aggregate and Dredge Disposal	Peterhead CR080	Licence provided by Marine Scotland	Open	8.85	OUT
Aggregate and Dredge Disposal	Peterhead CR095	Licence provided by Marine Scotland	Closed	10.15	OUT
Aggregate and Dredge Disposal	Peterhead CR100	Licence provided by Marine Scotland	Closed	11.40	OUT
Aggregate and Dredge Disposal	Peterhead CR105	Licence provided by Marine Scotland	Closed	12.37	OUT
Other	Subsea7 Wick Pipeline Fabrication and Launch Site	Subsea7	Active	0.85	OUT

APPENDIX G: NAVIGATIONAL RISK ASSESSMENT

SPITTAL TO PETERHEAD HVDC CABLE SCHEME

Navigation Risk Assessment

ERM

Document No: NASH-0343 | R04-00

09-Dec-24

PROJECT INFORMATION

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REPORT TITLE	Navigation Risk Assessment
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CLIENT ADDRESS	2nd Floor Exchequer Court 33 St Mary Axe London EC3A 8AA

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EXECUTIVE SUMMARY

A Navigation Risk Assessment (NRA) has been undertaken in line with International Maritime Organisation's (IMO) Formal Safety Assessment (FSA) methodology for the proposed 525-kilovolt (kV) High-Voltage Direct-Current (HVDC) link via subsea cable from Spittal to Peterhead developed by Scottish and Southern Electricity Networks (SSEN). The objectives of the NRA were to:

- Provide an overview of the existing marine activities in proximity to the cable corridor.
- Consider the future vessel traffic levels in proximity to the cable corridor.
- Identify key impacts/hazards associated with the subsea cable.
- Assess the levels of risk associated with each hazard.
- Where necessary, identify potential additional risk controls to reduce the severity or frequency of any hazards deemed unacceptable occurring.

The vessel traffic analysis showed that overall, the busiest areas of vessel activity were in proximity to the Port of Peterhead, as well as along main routes heading to/from the Orkney Islands, Shetland islands and Aberdeen. An average of nine cargo vessels per day and three tankers per day was recorded transiting through the shipping and navigation study area (hereafter referred to as the Study Area) during 2022. Two main ferry routes operated by NorthLink Ferries were observed; one between Aberdeen and Kirkwall, the other between Aberdeen and Lerwick. An average of three NorthLink Ferry transit per day was recorded within the Study Area. Oil and gas vessel activity was concentrated around Peterhead, with vessels transiting between the port and nearby oil/gas fields within the North Sea.

Fishing activity within the Study Area mainly comprised of vessels using demersal gears, with most of the activity taking place close to Peterhead. A low number of vessels using pots and traps was also recorded. Recreational activity was focussed near the coast, within approximately 5 nm of the landfalls.

Based on the existing activities in proximity to the cable corridor, 10 impacts on shipping and navigation were including in the assessment. The majority of these impacts were associated with the installation phase of the Project, including interactions and risks associated with the cable layer. The primary impact during the operational phase of the project was snagging of fishing gear and ship anchors.

The IMO's FSA is a structured methodology aimed at enhancing maritime safety, including protection of life, health, the marine environment and property, by using risk analysis and cost benefit assessment. Based on a review of hazard types, vessel categories and areas, a total of 16 hazards were identified. These included various snagging, grounding and collision incidents. None of the scenarios were assessed as High Risk – Unacceptable. One hazard (the risk of a fishing vessels snagging its gear or anchor) was assessed as Medium Risk. On the basis of implementing industry standard risk controls, it was concluded that this risk was As Low As Reasonably Practicable (ALARP). All other hazards were assessed as Low Risk.

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APPENDICES

Appendix A Hazard Log

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ABBREVIATIONS

Abbreviation	Detail
AIS	Automatic Identification System
ALARP	As Low as Reasonably Practicable
CBRA	Cable Burial Risk Assessment
COLREGs	Convention on the International Regulations for Preventing Collisions at Sea
CPA	Closest Point of Approach
CRP	Clear Range Procedure
DECC	Department of Energy and Climate Change
DfT	Department for Transport
DMR	Dedicated Metallic return
EIA	Environmental Impact Assessment
EN-1	National Policy Statement for Energy
EN-5	National Policy Statement for Electricity Networks Infrastructure
ERM	The ERM International Group Limited
ETA	Estimated Time of Arrival
FLO	Fisheries Liaison Officer
FSA	Formal Safety Assessment
GT	Gross Tonnes
HDD	Horizontal Directional Drilling
HVDC	High Voltage Direct Current
IALA	International Association of Lighthouse Authorities
ICW	In Collision With
IMO	International Maritime Organisation
LOA	Length Overall
m	Metre
MAIB	Marine Accident Investigation Branch
MCA	Maritime and Coast Guard Agency
MGN	Marine Guidance Note
NASH	NASH Maritime Ltd
NLB	Northern Lighthouse Board
nm	Nautical Mile
NPS	National Policy Statement
NRA	Navigation Risk Assessment
NtM	Notice to Mariners
OREI	Offshore Renewable Energy Installation

Abbreviation	Detail
OWF	Offshore Wind Farm
PEXA	Practice and Exercise Area
PIANC	The World Association for Waterborne Transport Infrastructure
Project	Spittal to Peterhead HVDC Cable Scheme
RNLI	Royal National Lifeboat Institute
RoPax	Roll-on Roll-off Passenger
RoRo	Roll-on Roll-off
RYA	Royal Yachting Association
SAR	Search and Rescue
SFF	Scottish Fishermen's Federation
SIRA	Simplified IALA Risk Assessment
SOLAS	The International Convention for the Safety of Life at Sea
SSEN	Scottish & Southern Electricity Networks
STCW	Standards of Training Certification and Watchkeeping
Study Area	Shipping and Navigation Study Area
UKHO	UK Hydrographic Office
UNCLOS	United Nations Convention on the Law of the Sea
VHF	Very High Frequency (radio communication)
VMS	Vessel Monitoring System
VTS	Vessel Traffic Service

1. INTRODUCTION

1.1 PROJECT OVERVIEW

NASH Maritime Ltd (NASH) have been contracted by The ERM International Group Limited (ERM), as lead marine consultant, to undertake a Navigation Risk Assessment (NRA) for the proposed construction and operational phases of the Spittal to Peterhead High Voltage Direct Current (HDVC) Cable Scheme. This NRA will form the technical basis for the Marine Navigation Chapter of the Marine Environmental Assessment (MEA).

The Spittal to Peterhead HVDC Cable Scheme (hereafter referred to as the 'Project') is a project by Scottish & Southern Electricity Networks (SSEN) Transmission, responsible for the electricity transmission network in the north of Scotland. The Project is part of the broader 'Pathway to 2030 Holistic Network Design', which aims to accommodate the growth in renewable electricity across Great Britain and meet the UK and Scottish Government's 2030 energy target.

To transfer the increasing amounts of renewable power generated in the north of Scotland to demand centres in the south, a 525-kilovolt (kV) HVDC link via subsea cable from Spittal in Caithness and Peterhead in Aberdeenshire is required. The design of the system requires the inclusion of an additional cable to reinforce the network referred to as the Dedicated Metallic Return (DMR). The DMR will be installed alongside the standard bi-pole arrangement of two HVDC cables and a fibre optic cable for communications The proposed HVDC system will be approximately 200-220 km in length, with approximately 164 km of subsea cable linking potential landfall sites.

1.2 OBJECTIVES

An NRA has been undertaken for the Project and has the following objectives:

- Provide a description of the baseline environment including key navigational features.
- Describe the baseline vessel traffic and risk profile.
- Determine the likely future traffic profile.
- Identify and assess potential impacts of the Project on shipping and navigation.
- Identify and assess potential cumulative and in-combination effects.
- Undertake an NRA that identifies and assesses hazards during construction, operation and decommissioning phases of the development.
- Identification of risk controls in relation to the Project hazards to reduce the risk to As Low As Reasonably Practicable (ALARP).
- Provide recommendations in relation to the safety of the development and co-existence of users with regards to shipping and navigation.

2. POLICY, GUIDANCE AND LEGISLATION

2.1 LEGISLATION AND NATIONAL POLICY

The United Nations Convention on the Law of the Sea (UNCLOS) (UN, 1982) is an international agreement that establishes a legal framework for all marine and maritime activities. Article 60 concerns artificial islands, installations and structures in the exclusive economic zone. Article 60(7) states that “Artificial islands, installations and structures and the safety zones around them may not be established where interference may be caused to the use of recognised sea lanes essential to international navigation.” As per Article 22(4), “The coastal state shall clearly indicate such sea lanes and traffic separation schemes on charts to which due publicity shall be given”.

Vessels navigating must also adhere to requirements under the International Convention for the Safety of Life at Sea (SOLAS), the International Convention for the Prevention of Pollution from Ships and the International Convention on Standards of Training, Certification and Watchkeeping for Seafarers (STCW). Furthermore, vessels will navigate in accordance with the Convention on the International Regulations for Preventing Collisions at Sea, 1972 as amended (COLREGs).

Scotland’s National Marine Plan has been considered, which covers both Scottish inshore waters (out to 12 nautical miles (nm)) and offshore waters (12 nm to 200 nm). Chapter 13 of the plan related to shipping, ports, harbours and ferries, whilst chapter 14 of the plan details marine planning policies for subsea cables. The key relevant policies stated within chapter 13 are presented in **Table 1**. These include the levels of marine traffic in Scottish waters relating to shipping, freight and trade, safeguarding the viability of main shipping routes, protecting dredging activity, oil and gas and renewable energy needs.

Table 1: Policies from Chapter 13 of Scotland’s National Marine Plan.

Policy ID	Description
TRANSPORT 1	Navigational safety in relevant areas used by shipping now and in the future will be protected, adhering to the rights of innocent passage and freedom of navigation contained in UNCLOS. The following factors will be taken into account when reaching decisions regarding development and use: • The extent to which the locational decision interferes with existing or planned routes used by shipping, access to ports and harbours and navigational safety. This includes commercial anchorages and defined approaches to ports. • Where interference is likely, whether reasonable alternatives can be identified. • Where there are no reasonable alternatives, whether mitigation through measures adopted in accordance with the principles and procedures established by the International Maritime Organization (IMO) can be achieved at no significant cost to the shipping or ports sector.
TRANSPORT 2	Marine development and use should not be permitted where it will restrict access to, or future expansion of, major commercial ports or existing or proposed ports and harbours which are identified as National Developments in the current National Planning Framework or as priorities in the National Renewables Infrastructure Plan.

Policy ID	Description
	Regional marine plans should identify regionally important ports and harbours, giving consideration to social and economic aspects of the port or harbour and the users of the facility subject to policies and objectives of this Plan. Regional plans should consider setting out criteria against which proposed activities and developments should be evaluated.
TRANSPORT 3	Ferry routes and maritime transport to island and remote mainland areas provide essential connections and should be safeguarded from inappropriate marine development and use that would significantly interfere with their operation. Developments will not be consented where they will unacceptably interfere with lifeline ferry services.
TRANSPORT 6	Marine planners and decision makers and developers should ensure displacement of shipping is avoided where possible to mitigate against potential increased journey lengths (and associated fuel costs, emissions and impact on journey frequency) and potential impacts on other users and ecologically sensitive areas.

Additional guidance used to inform the NRA include the Maritime and Coastguard Agency's (MCA) Marine Guidance Note (MGN) 372 (MCA, 2022), International Association of Lighthouse Authorities (IALA) G1162 The Marking of Offshore Man-Made Structures (IALA, 2021), The World Association for Waterborne Transport Infrastructure (PIANC) WG161 Interaction Between Offshore Wind Farms (OWFs) and Maritime Navigation (PIANC, 2018) and The Shipping Industry and Marine Spatial Planning (Nautical Institute, 2013).

2.2 PRIMARY GUIDANCE

The principal guidance document for NRAs is the MCA's MGN 654 (2021). MGN 654 describes the potential shipping and navigation issues which should be considered by Applicants when proposing Offshore Renewable Energy Installations (OREIs). Whilst the Spittal to Peterhead HVDC cable scheme is not an OREI, MGN 654 contains guidance specific to export cables, which is applicable for navigational safety around interconnectors. MGN 654 provides a detailed methodology for assessing the marine navigational safety risks. In particular, by following the methodology, the NRAs:

- Are proportionate to the scale of the development and magnitude of risks.
- Are based on the risk assessment approach of the Formal Safety Assessment (FSA).
- Are capable of utilising techniques and methods which produce results which are acceptable to the Government.
- Compare the base case and future case risks in the study area before predicting the impacts of the Project on that risk through a hazard log.
- Determine which risk controls should be put in place to minimise the risks to ALARP.

MGN 654 Annex 1 provides a standardised format of submission which is described in **Table 2**. Annex 3 provides guidance on Under Keel Clearance. Annex 4 provides hydrography guidelines, whilst Annex 5 contains guidance on requirements, guidance and operational considerations for search and rescue and emergency response.

Table 2: MGN 654 Annex 1 Methodology for Assessing the Marine Navigational Safety and Emergency Response Risks of Offshore Renewable Energy Installations.

The following content is included:	Compliant Yes/No	Comments
A risk claim is included supported by a reasoned argument and evidence	Yes	The risk assessment conducted in **Section 9** is supported by data analysis (**Section 6.2**), consultation (**Section 3.4.1**) and a review and discussion of impacts (**Section 8**). Therefore, a risk claim is made in **Section 11**.
Description of the marine environment	Yes	A description of the baseline marine environment is provided in **Section 5**.
Description of the Project and how it changes the marine environment	Yes	A description of the Project is provided in **Section 4**. Potential impacts are described in **Section 8**.
Analysis of the marine traffic	Yes	A detailed analysis of the baseline vessel traffic is provided in **Section 6.2**. **Section 6.4** presents the future baseline traffic profile. The impacts of the Project on that traffic are contained within **Section 8**.
Status of the hazard log	Yes	The navigational risk assessment is provided in **Section 9**. The hazard log is provided in **Appendix A**.
Navigation Risk Assessment	Yes	The NRA is provided in **Section 9.5**.
Search and Rescue overview and assessment	Yes	Existing search and rescue provision is described in **Section 5.3**. An assessment of impacts of the Project to search and rescue is provided in **Section 8.6**.
Emergency Response Overview and Assessment	Yes	
Status of Risk control log	Yes	Embedded mitigations are described in **Section 4.3**. The results of the NRA deemed that no additional mitigation measures were necessary.
Major Hazards Summary	Yes	A summary of the principal impacts of the Project are contained within **Section 8** and an NRA reported in **Section 9**.
Statement of Limitation	Yes	Any limitations or assumptions of this assessment are reported in their relevant sections.
Through Life Safety Management	Yes	Embedded mitigations are described in **Section 4.3**. The results of the NRA deemed that no additional mitigation measures were necessary.

The IMO FSA process has been applied within this NRA. The guidelines for FSAs were approved in 2002 and were most recently amended in 2018 by MSC-MEPC.2/Circ.12/Rev.2. This NRA has been conducted utilising this methodology, as per recommendations from MGN 654. Further details of the FSA process are presented in **Section 9.1**.

3. NAVIGATION RISK ASSESSMENT METHODOLOGY

3.1 OVERVIEW

The NRA has been produced in accordance with the IMO's FSA methodology (see **Section 2.2**). This assessment considers all identified impacts of the Spittal to Peterhead HVDC cable scheme on shipping and navigation receptors. The FSA defines a risk as "the combination of the frequency and the severity of the consequence" (IMO, 2018). Therefore, the likelihood and consequence of these impacts are assessed through the collection of high-quality datasets and consultation. Details on the risk criteria and matrix methodology are contained within **Section 9**.

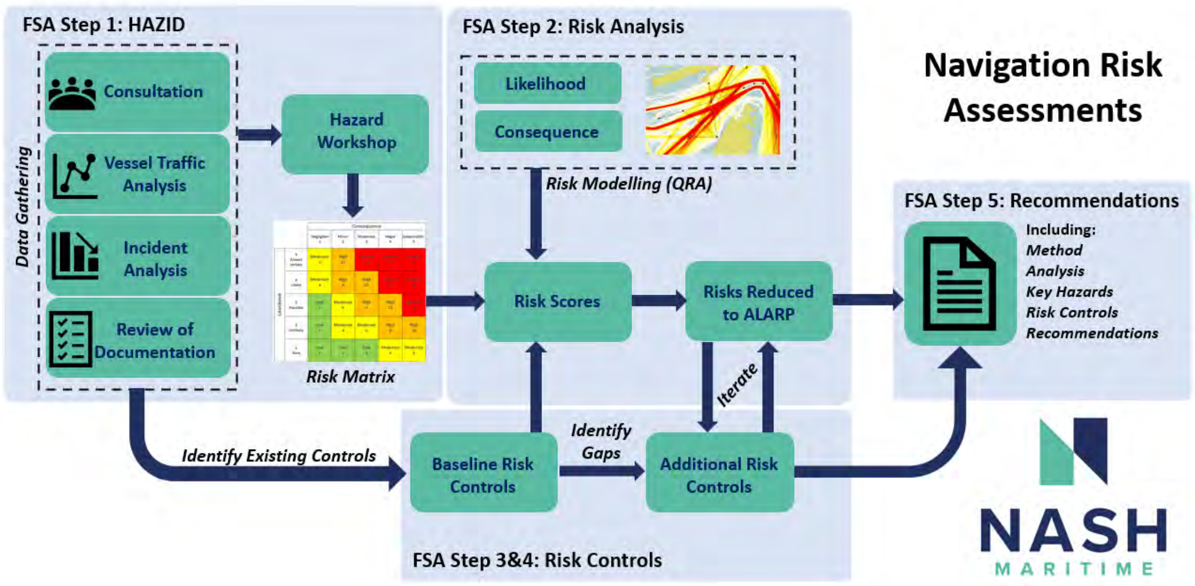

Figure 1: NRA Methodology.

3.2 SHIPPING AND NAVIGATION STUDY AREA

The shipping and navigation study area (hereafter referred to as the Study Area) is shown in **Figure 2** and comprises an area of 5 nm surrounding the cable corridor. This Study Area has been used within the NRA to assess shipping patterns in proximity to the Project. The proposed shipping and navigation Study Area has been agreed with consultees (see **Section 3.4.1**) and is consistent with industry best practice for NRAs.

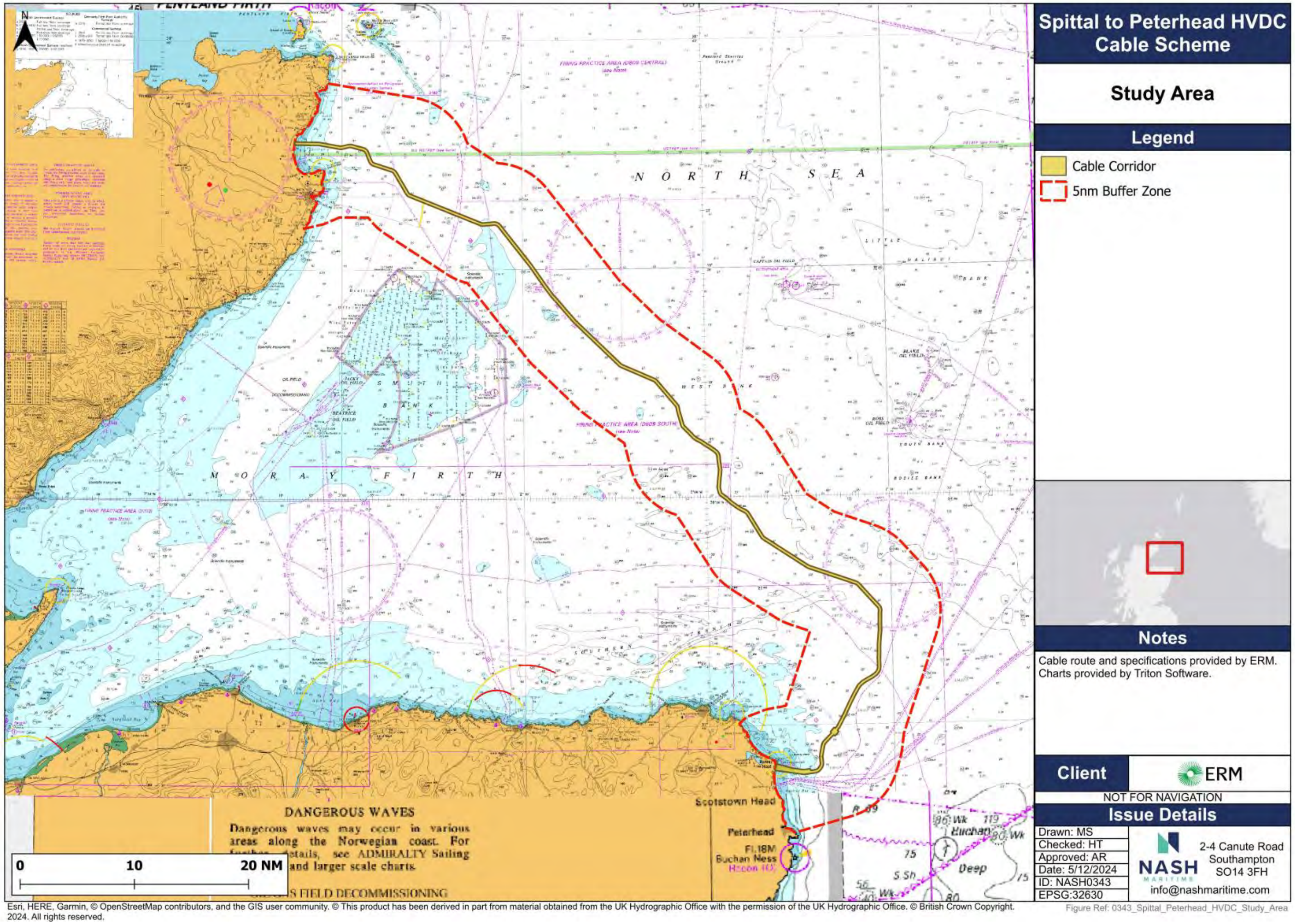

Figure 2: Spittal to Peterhead HVDC Cable Corridor and Study Area.

3.3 IALA RISK MANAGEMENT TOOLS

IALAs Simplified IALA Risk Assessment method (SIRA) follows the FSA process and allows organisations to assess maritime and navigation risk in their waters so that they can meet their obligations for the management of navigation safety (e.g., obligations under international conventions such as SOLAS, national domestic legislation, etc.). The principles of the SIRA approach have been used to conduct the risk assessment.

Details of the overarching methodology are provided in the following IALA Guidance:

- IALA (2022) G1018–- Risk Management.
- IALA (2017) G1138–- The Use of The SIRA.

3.4 DATA SOURCES

3.4.1 Consultation and Engagement

Consultation has been undertaken with relevant shipping and navigation stakeholders as part of the NRA to help in the identification and assessment of risk. A consultation letter was sent to stakeholders on 22 September 2023 and written responses were collated. Following this, consultation meetings were held with key stakeholders to discuss the Project and the associated impacts and potential mitigation measures further. Stakeholders contacted include:

- The MCA.
- Northern Lighthouse Board (NLB).
- Local ports and harbours (including Wick Harbour Authority, Fraserburgh Harbour Commissioners and Peterhead Port Authority).
- NorthLink Ferries.
- Scottish Fishermen's Federation (SFF).
- Royal Yachting Association (RYA) Scotland.
- Moray East OWF.
- UK Chamber of Shipping.
- Cruising Association.

A summary of responses to the consultation letter and consultation undertaken to date is presented in **Table 3**. The letter to stakeholders, full stakeholder responses and consultation meeting minutes can be found in **Appendix B** and **Appendix C**.

Table 3: Summary of Key Consultation Issues Raised during Consultation Activities Undertaken for the Project relevant to Shipping and Navigation.

Date/Form of Consultation	Consultee	Issue(s) Raised	Response to Issue Raised and/or Where Considered in this NRA
Consultation letter response	UK Chamber of Shipping	The following should be considered within the NRA: • Impact on normal anchoring activity. • Impact on emergency anchoring. • Burial depth and reduction in under keel clearance. • Magnetic interference. • Deviation and potential for collision between commercial vessels or commercial and third party vessels during installation/decommissioning.	The impacts relating to vessel anchoring, reduction in under keel clearance, electromagnetic interference and collision risk have been assessed within **Section 8**.
Consultation letter response	MCA	Consideration needs to be given to possible impacts on navigational issues for commercial and recreational craft, specifically: • Collision risk. • Navigational safety. • Risk management and emergency response. • Marking and lighting of site and information to mariners. • Effect on small craft navigational and communication equipment. • Risk to drifting recreational craft in adverse weather or tidal conditions. • The likely squeeze of small craft into the routes of larger commercial vessels.	The impacts relating to impacts on commercial and recreational craft have been assessed within **Section 8**.
Consultation letter response	MCA	The NRA should be accompanied by a detailed MGN 654 Checklist with completed required fields for cable installation.	An MGN 654 checklist has been completed and is contained within **Appendix D**.
Consultation letter response	MCA	Attention needs to be paid to routeing, particularly in heavy weather routeing so that vessels can continue to make safe passage without large-scale deviations. The likely cumulative and in combination effects on shipping routes should be considered which will be an important issue to assess for this Project. It should	Normal and adverse weather routeing has been considered within **Section 8**. Projects have been considered cumulatively within **Section 10**.

Date/Form of Consultation	Consultee	Issue(s) Raised	Response to Issue Raised and/or Where Considered in this NRA
		consider the proximity to wind farm developments, other infrastructure, and the impact on safe navigable sea room.	
Consultation letter response	MCA	Attention should be paid to cabling routes and where appropriate burial depth for which a Burial Protection Index study should be completed and subject to the traffic volumes, an anchor penetration study may be necessary. If cable protection measures are required e.g. rock bags or concrete mattresses, the MCA would be willing to accept a 5% reduction in surrounding depths referenced to Chart Datum. This will be particularly relevant where depths are decreasing towards shore and potential impacts on navigable water increase, such as at the horizontal directional drilling (HDD) location.	Embedded mitigations (see **Section 4.3**) include the production of a Cable Burial Risk Assessment (CBRA) to assess the level of protection required to mitigate against anchor penetration. The CBRA will also assess the water depth reduction where burial is not feasible and protection is required.
Consultation letter response	MCA	HVDC transmission infrastructure will be used. It should be noted that there is a potential impact on ships compasses from the electro-magnetic field generated. A pre-construction compass deviation study may be required on the expected electro-magnetic field, and we would be willing to accept a three-degree deviation for 95% of the cable route. For the remaining 5% of the cable route no more than five-degree deviation in water depths of 5 m and deeper will be attained. If this requirement cannot be met, further mitigation measures may be required including a post installation deviation survey of the cable route. This data must then be provided to the MCA and UK Hydrographic Office (UKHO), as a precautionary notation may be required on the appropriate Admiralty Charts regarding possible magnetic anomalies along the cable route.	Electromagnetic interference and effects on vessel compasses are considered within **Section 8**. Recommendations (see **Section 11.2**) include a compass deviation study pre-construction.
Consultation letter response	NLB	The requirement for landfall cable marker boards would require assessment when the exact landfall position, and cable burial method, are confirmed. All other normal mitigations for a subsea cable Project, such Notices to Mariners and charting of the cable route on completion, would be anticipated.	Recommendations (see **Section 11.2**) include liaison with NLB to ensure that marker boards are used at the landfalls if required following appropriate assessment.
Consultation letter response	NorthLink Ferries	NorthLink vessels predominantly follow standard routes with minimal deviation other than for weather, traffic avoidance, or emergency situations such as medical evacuations. The construction phase would have the most impact on ferry operations, with the multiple surface vessels involved. The operational phase will have minimal impact, only with additional consideration for ferries would be in a potential emergency response to any	Ferry displacement has been considered within **Section 8**.

Date/Form of Consultation	Consultee	Issue(s) Raised	Response to Issue Raised and/or Where Considered in this NRA
		failure in propulsion where emergency anchoring may be considered. This is not of great concern as the cable will be charted.	
Consultation letter response	RYA	Many recreational boats pass round Rattray Head in the period from April to October and the waters between there and Aberdeen are becoming increasingly busy with commercial activity. Many organisations now produce Notice to Mariners (NtM) in these waters and it is unrealistic to expect boaters on passage to look at all the relevant sites. The RYA encourage the use of Kingfisher but it is also important to post NtMs at ports, harbours and marinas within a day's travel.	Impacts to recreational activity have been considered within **Section 8**, noting that recreational activity is generally higher during the summer months. Embedded mitigation measures in **Section 4.3** include circulation of information via NtMs and the use of Kingfisher Bulletin.
Consultation letter response	SFF	The cable system will impact fishing activities as it crosses prime static gear, pelagic and demersal fishing grounds. All fishing activities within the cable route will be adversely impacted during survey works, construction, operation/maintenance and decommissioning phases that would result in displacement of static gears and deprivation of mobile gears (pelagic and demersal) from fishing along the cable route.	Impacts to fishing activities have been considered within **Section 8** and embedded mitigations include the circulation of information and use of Kingfisher Bulletin to minimise any impacts.
Consultation letter response	SFF	If the cable is not totally buried or concrete mattresses and grout bags are used for cable protections, it will pose safety risk for the fishing vessels. Specific hazard will likely be contingent if COLREGs and static gear markers are not observed.	Where the cable is unburied and additional protection is not in place, the embedded mitigations include the use of a guard vessel (**Section 4.3)**. Recommendations include the method of rock placement for external cable protection where required, instead of concrete mattresses or grout bags (see **Section 11.2**).
Consultation letter response	SFF	Some potential risk control measures to mitigate the impacts on fishing activity include: • Early engagement with fishing industry with sufficient notice given to the affected fishermen prior to commencement of survey works, and construction, operation/maintenance, and decommissioning stages. • Maximum efforts to be made to avoid boulders relocation and where required record and share the new location/coordinates of the	Included risk control measures within the embedded mitigations (see **Section 4.3**) or the recommendations where applicable (see **Section 11.2**).

Date/Form of Consultation	Consultee	Issue(s) Raised	Response to Issue Raised and/or Where Considered in this NRA
		displaced boulders and share them with the fishing industry (preferably via USB sticks). • During survey works, and construction, operation/maintenance, and decommissioning phases, ensure COLREGs and static gear markers are being observed and a guard vessel is used where cable is laid down on seabed prior burial.	
Consultation meeting	MCA	Notice to mariners and good liaison should be included in the risk controls, and vessels should also report operations via Channel 16 very high frequency (VHF).	Included risk control measures within the embedded mitigations (see **Section 4.3**).
Consultation meeting	MCA	With respect to collision hazards, the MCA would want to see third party scenarios assessed.	Third party scenarios have been considered within **Section 9** (HAZID 8–11).
Consultation meeting	MCA	Simultaneous operations with OWF activities are to be considered within the cumulative risk assessment.	Operations at the proposed OWF developments considered in combination with cable laying activities in **Section 10**.
Consultation meeting	MCA	For cable laying activities, a separation of at least 0.5 nm would be prudent, this would be at the master's discretion. There is generally a "keep a wide berth" rule, rather than specific legislation. It is not clear what catenary the cable might be at astern of the cable layer and the impact on navigation safety.	Recommendations (see **Section 11.2**) include 0.5 nm separation between cable installation vessels and third-party traffic.
Consultation meeting	MCA	The higher potential for impacts in bays was noted, and the MCA would expect to see some nearshore draught analysis for each landfall.	Nearshore vessel traffic is presented within **Section 6.3.3**, and vessel draughts/lengths for each 2.5 km section of cable is presented within **Section 6.3.4**.

3.4.2 Vessel Traffic Datasets

The vessel traffic data used within this NRA is listed below:

- Automatic Identification System (AIS) data from MarineTraffic covering two full years (2019 and 2022).
- RYA Coastal Atlas.
- UK Vessel Monitoring System (VMS) 2020 data from the Marine Marine Management Organisation (MMO).
- Department for Transport (DfT) shipping statistics (2022).

3.4.3 Incident Data

The following accident datasets were utilised to support this assessment.

- Marine Accident Investigation Branch (MAIB) accidents database (1991-2020).
- Royal National Lifeboat Institute (RNLI) incident data (2008-2022).
- DfT search and rescue (SAR) helicopter taskings (2022).

3.4.4 Other Data Sources

Other datasets utilised to support this assessment include:

- Offshore renewables (Crown Estate 2022).
- Admiralty charts (2022); British Crown and OceanWise.
- Admiralty Sailing Directions: NP52 (2022) and NP54 (2018).
- North Sea Transition Authority Energy Map (2023)).

4. DETAILED PROJECT OVERVIEW

4.1 CABLE LANDFALLS

Both ends of the Spittal to Peterhead HVDC Cable Scheme will come ashore at specific locations known as landfall sites, crucial locations that mark the transition from subsea to onshore cables.

The north cable landfall site is within Sinclair's Bay, a long wide soft sediment bay with an established sand dune system north of Wick. There are no environmental designations along the bay and there are relatively few engineering constraints in terms of constructability (provided that the Subsea7 pipeline launch facility and operations can be avoided). Sinclair's Bay has good access to the shore, although construction works would need to avoid nearby heritage features. Any potential interactions with the Loch of Wester Special Area of Conservation located west of the site would require careful planning and approvals. There are no major offshore constraints.

To the south, the cable landing site is at a wide soft sediment bay with an established dune system north of St Fergus (hereafter referred to as 'north of St Fergus'). Due to this dune system, there are additional challenges around access and a more complex landfall solution. This option presents the shortest onshore cable route, but conversely the longest marine cable route. The marine cable route has comparatively less interaction with marine habitats and species when compared with the other landfall options, and lower vessel traffic immediately offshore.

Detailed overviews of the north and south landfall sites are presented in **Figure 3**.

4.2 INSTALLATION METHOD

The Project will consist of two conductor cables, one DMR cable, and one fibre optic communications cable, all planned to be bundled and installed in a single trench. These cables will be installed within one of the proposed marine cable corridors. These corridors are 1 km wide to allow for route refinement informed by detailed landfall assessment, marine surveys, and engineering activities. The offshore cables will be buried in the seabed within a single trench to protect them. Where burial is not possible, they will be protected using external cable protection.

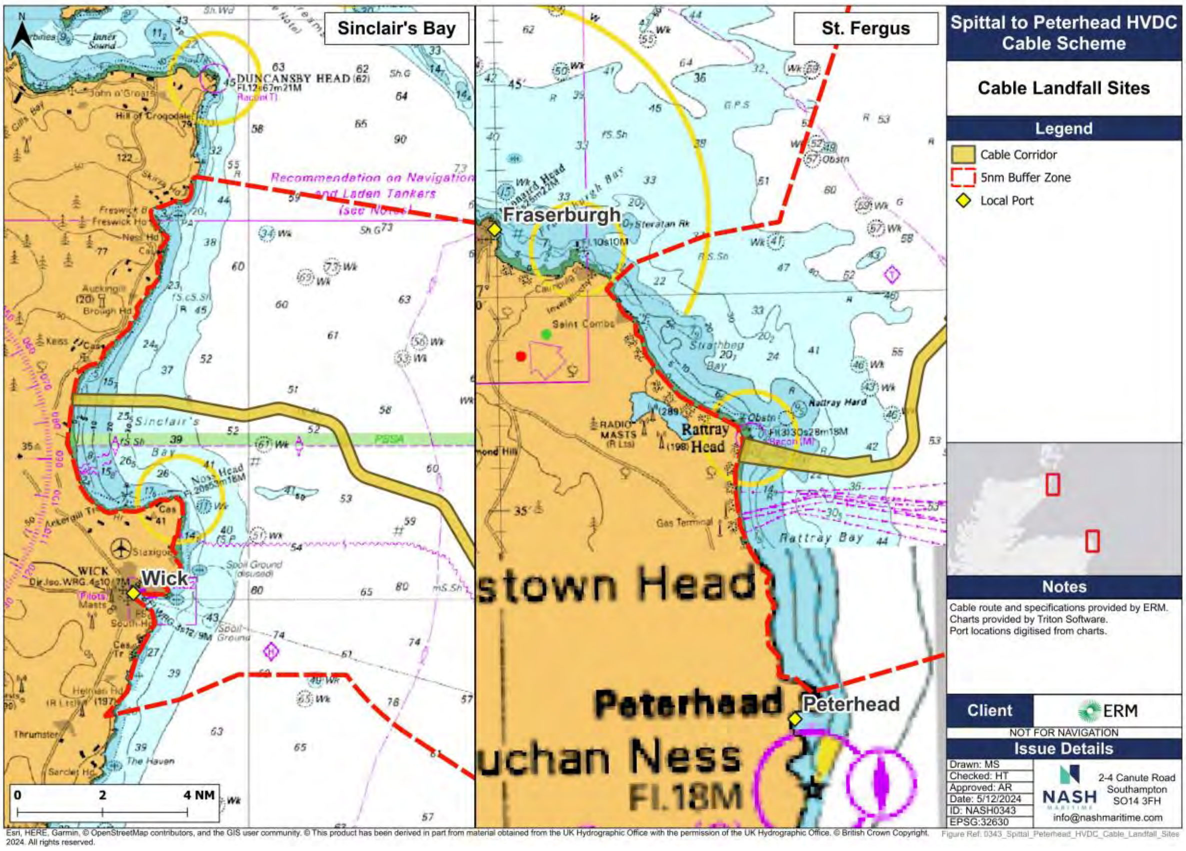

Figure 3: Cable Landfall Sites at Sinclair's Bay and St. Fergus.

4.3 EMBEDDED MITIGATIONS

This section details the mitigation measures that are assumed to be in place prior to the construction stage, as part of the FSA process.

4.3.1 Installation / Decommissioning

The mitigation measures assumed to be in place during the construction / decommissioning stage are detailed in **Table 4**.

Table 4: Embedded Mitigations during Installation and Decommissioning.

Mitigation	Description
Marking and lighting of Project vessels	Cable lay vessels will display appropriate marks and lights, and broadcast their status on AIS at all times, to indicate the nature of the work in progress, and highlight their restricted manoeuvrability.
Lighting and marking of site	Temporary aids to navigation will be deployed (if required) to guide vessels around any areas of installation activity.
Guard vessels	Guard vessel(s) will be employed where necessary to work alongside the installation vessel(s) during the construction period. The guard

Mitigation	Description
	vessel(s) will alert third party vessels to the presence of the installation activity and provide assistance in the event of an emergency. Guard vessels will also be used where necessary when cable exposures exist that would result in significant risk to receptors, until the risk has been mitigated by burial and/or other protection methods.
Compliance with maritime regulations	Project vessels will be fully compliant with COLREGs (IMO, 1972) and SOLAS (IMO, 1974).
VHF reporting	Vessels carrying out cable installation activities should report operations on VHF via Channel 16.
Closest point of Approach (CPA)	During cable laying activities, masters of vessels involved in installation activities should request a CPA of 0.5 nm to ensure passing vessels do so at a safe distance
Information to mariners	Notice to Mariners will be circulated to inform ports and maritime users of installation/decommissioning works.
Fisheries Liaison Officer (FLO)	A Fisheries Liaison Officer will be assigned for the Project to ensure early and effective communications and coexistence.
Liaison with ports/harbours	Ongoing liaison with local ports and harbours to ensure port operations and vessels visiting Fraserburgh, Peterhead and Wick are not disrupted.

4.3.2 Operation and Maintenance

The mitigation measures assumed to be in place during the operation stage are detailed in **Table 5**.

Table 5: Embedded Mitigations during Operation and Maintenance.

Mitigation	Description
Marking on charts	The fully installed cable will be clearly marked on nautical charts in line with UKHO standards, with associated note/warning.
Signage	The requirement for landfall cable marker boards will be assessed once the exact positions and burial methods are confirmed, per consultation with the NLB.
Kingfisher Bulletin	Locations of cables and associated infrastructure e.g., cable protection will be included in fishermen's awareness charts issued by Kingfisher.
Cable burial/protection	Marine cables will be suitably protected, e.g., buried where feasible, to help protect against snagging from fishing gear and risk from vessel anchors. Protection will be informed by a CBRA (the current target burial depth is 1.5 m).
Compliance with MGN 654	Cable protection will not reduce the navigable depth of water more than 5% without agreement with the MCA.
Cable design	Compass deviation effects will be minimised through cable design and separation distance.

5. DESCRIPTION OF THE MARINE ENVIRONMENT

5.1 NAVIGATIONAL FEATURES AND EXISTING INFRASTRUCTURE

The key navigational features identified in the vicinity of the Study Area are presented in **Figure 4**. These existing features form part of the baseline environment. Planned developments that may affect shipping and navigation in the area are considered within the cumulative assessment (see **Section 10**).

5.1.1 Local Ports and Harbours

The nearest major port to the northern cable landfall site at Sinclair's Bay is Wick Harbour, located approximately 5 nm south of the landfall site.

Wick harbour is situated at the head of Wick Bay and handles fishing, wind farm, leisure, and commercial traffic, the latter being accommodated mainly in River Harbour. The port also requires pilotage for those vessels that meet the requirements laid out in its pilotage directions. Wick Harbour Authority operates as the harbour authority. Pilot boarding typically takes place about 0.5 nm north east of South Head. Pilotage is compulsory for vessels over 90 gross tonnes (GT), except fishing vessels and yachts. All commercial vessels arriving at Wick Harbour are advised to notify the harbour four days prior to arrival. All leisure craft are asked to contact the harbour office and provide their passage plan, ETA and vessel specifications.

There are two major ports/harbours in the vicinity of the southern cable landfall site at St. Fergus: Peterhead, located 6 nm south, and Fraserburgh, 8 nm northwest of the landfall site.

The port of Peterhead is a commercial port providing services for dry cargo, cruise, energy and the fishing sectors. Peterhead is a major supply base for the offshore oil and gas industry and the most important fishing port in the UK for white and pelagic species. The largest vessels that can be accommodated at the port are of 280 metres (m) length and 10.5 m draught. There is also a large recreational boating community at Peterhead with the Peterhead Leisure Marina providing pontoon berthing for 150 vessels. Peterhead Port Authority operates as the port authority. The port also requires pilotage for those vessels that meet the requirements laid out in its pilotage directions. The pilot boards within two miles southeast of the breakwater entrance, except in adverse weather when they board inside the breakwater. The Port of Peterhead operates a Vessel Traffic Service (VTS) as defined by MGN 401 Amendment 3 (MCA, 2022) which manages vessel movements and operations within its Statutory Harbour Authority area. Vessels arriving at the Port of Peterhead should avoid delays at the pilot boarding area by sending an estimated time of arrival (ETA) via their agents twelve hours before arrival. If this is not practicable the advice should be given as near to twelve hours as possible.

Fraserburgh Harbour is primarily a busy fishing harbour providing for an extensive local fleet. There is also commercial vessel traffic. The harbour is also able to handle vessels of up to 92 m length, 16 m beam or 6.2 m draught. The harbour provides services to the offshore renewables sector being the operations and maintenance base for the Moray East OWF. Fraserburgh Harbour Commissioner acts as the port authority. The harbour operates a Local Port Service and pilotage service for vessels meeting the requirements of its pilotage directions. Pilotage is compulsory for commercial vessels of 300 tonnes and over except for those exempt by law. 24-hour service is operated. Pilots typically board within Fraserburgh

Bay but, by arrangement and in suitable weather, will do so within a two mile radius of the harbour entrance. Vessels entering, leaving or moving within Fraserburgh Harbour must report on VHF Channel 12.

5.1.2 Anchorages

In the vicinity of the northern cable landfall, Sinclair's Bay affords a fair charted anchorage in fine settled weather, but it is not safe in unsettled conditions. Wick Harbour also has a sandy bottom outer uncharted anchorage, which is sheltered during south southwest through north winds. An area of foul ground on the northern side of the bay must be avoided as there is unexploded ordnance on the seabed.

In the vicinity of the southern cable landfall, there is uncharted anchorage at Buchanhaven, a small fishing village with a boat harbour among the rocks which includes a jetty that extends 127 m from the shore, and affords a landing for boats at all states of the tides. Vessels can also anchor in Fraserburgh Bay, east of the harbour entrance, at a depth of 11 m.

With the exception of the aforementioned cable landfall sites, there are no anchorages along the cable corridor.

5.1.3 Offshore Wind Farms

Fully commissioned and operational OWFs in the vicinity of the Study Area include Moray East and Beatrice, approximately 17nm SE of the cable landfall at Sinclair's Bay. The Moray West OWF is currently under construction and lies to the west of Moray East.

5.1.4 Subsea Infrastructure

The Spittal to Peterhead cable corridor crosses the SHEFA-2 fibre-optic submarine cable which runs between Banff and Manse Bay in Orkney. The cable became operational in March 2008.

The cable corridor also crosses the 320 kV Shetland HVDC Link, which makes landfall at Noss Head. Installation of the HVDC cable began in early 2023 and was fully commissioned in August 2024; however, it has not yet been depicted on nautical charts.

5.1.5 Practice and Exercise Areas

The practice and exercise areas (PEXAs) that intersect the shipping and navigation Study Area are the D809 Central area located 15 nm east of the cable landfall at Sinclair's Bay and the D809 South located 16 nm south east of the cable landfall at Sinclair's Bay. The D809 North PEXA is located in the vicinity of the Study Area, 27 nm north east of the cable landfall at Sinclair's Bay. All three areas are operated in accordance with a Clear Range Procedure (CRP) where exercises and firing only take place when the area is considered to be clear of all shipping.

5.1.6 Routeing Measures and Reporting Schemes

There are no ship routeing measures in proximity to the Study Area. The ship reporting system in the Pentland Firth (known as PENTREP) is a reporting system that applies to all ships of 300 GT and over. The reporting system area is located 7.6 nm from the Spittal to Peterhead cable corridor.

5.1.7 Aids to Navigation

Sinclair's Bay's southern limit is marked by the Noss Head Lighthouse consisting of a white flashing light with a period of 20 seconds and a range of 15.5 nm. The Wick River Harbour is closed to traffic when a light beacon (three vertical red lights and orange triangle, point down, on metal post, 19 m in height) is lit. The South Pier Light (white eight-sided tower, 11 m in height) consists of a front and rear light. The front light sits on a mast whilst the rear light is situated on a red pole.

St. Fergus is marked by the Rattray Head Light, located at the northern limit of Scotstown Beach. Approaches to Peterhead Bay are indicated by the Kirktown Leading Lights, which include a front and rear light, both of which are fluorescent orange triangle point down on framework mast.

Fraserburgh Harbour's traffic lights are exhibited from Wast Pier in poor weather conditions. One fixed red light is exhibited when entry or departure is considered to be dangerous, two fixed red lights are shown when the port is closed. The port's major light is the Kinnaird Head Light (white flashing light with a period of five seconds and a range of 19 nm). Other aids to navigation include the Balaclava Breakwater Head Light and the Directional/Sectored light on the south east corner of North Pier.

Beatrice OWF lies to the north east of the Jacky Oil Field. Two wind turbines have been established to the south of the central platform. Both turbines, on which lights (special) are exhibited, have a 500 m exclusion zone around them.

Moray East Wind Farm is situated south east of the Beatrice Wind Farm. Turbine structures on the periphery of the wind farm display synchronised lights (special) and air obstruction lights.

5.1.8 Subsea7 Wick Fabrication Site

The Subsea7 site at Wick is a pipeline fabrication facility, located 1 nm from the north cable landfall. Pipeline bundles up to 7.7 km length are built on a length of railway track before being launched to sea and towed. Launches occur a few times a year and take between 12 and 36 hours to complete. Two powerful leading tugs tow the bundle, with a tug at the rear supporting the tail-end. A guard boat is used to lead the convoy, accompanied by a survey vessel for checking the bundle en-route to its subsea destination.

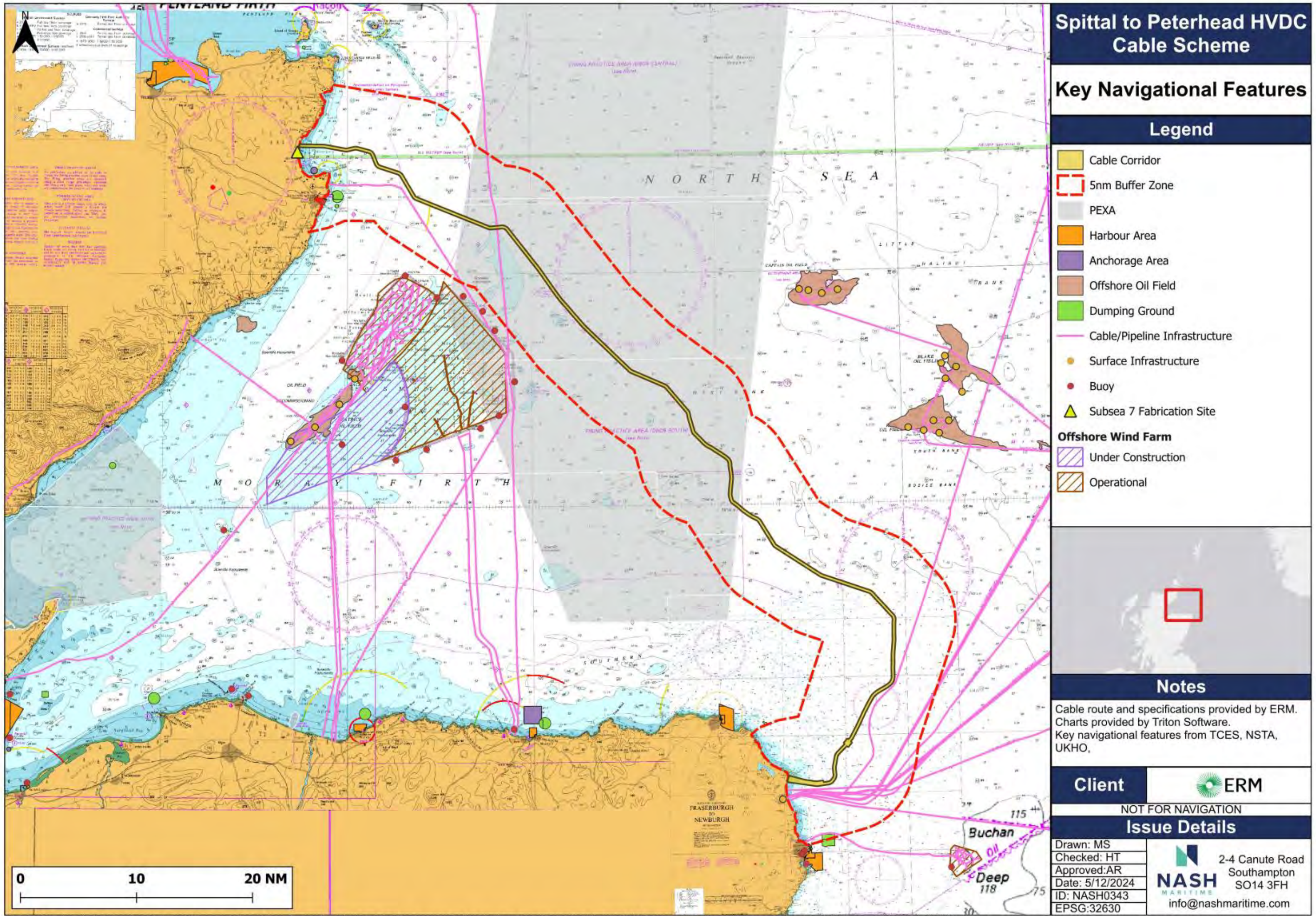

Figure Ref: 0343_Spittal_Peterhead_HVDC_Key_Navigational_Features

Figure 4: Key Navigational Features in proximity to the Spittal to Peterhead HVDC.

5.2 METOCEAN DATA

Metocean data was obtained from the relevant pilot books for the cable corridor, as listed in **Section 3.4.4**. In addition, tidal data was extracted from the nautical charts.

5.2.1 Wind

Winds are variable in both direction and speed in all seasons due to the frequent mobile depressions that affect the area. However, in the late winter and early spring, east to south east winds may persist for several days when a high cell becomes established over north west Europe. Over the North Sea, the winds are variable with either south west or north east winds being marginally predominant. To the east of the Study Area, the winds are also variable. Winds from south southeast to south west are slightly more predominant in winter.

Along the Scottish coast, winds are affected by topography. Winds may strengthen in narrow inlets and channels open to the prevailing wind, due to funnelling, or weaken over waters sheltered by high ground. Gale to hurricane force winds may occur from any direction especially during the period October to April. At Wick airport station, an average 28 days with gales are recorded per year. At Peterhead port station, 32 days with gales are recorded per year. Overall, gales that might require some form of adverse weather routeing occur less than ten percent of the year.

5.2.2 Tide and Current

The tides on the North and East coasts of Scotland are predominantly semi-diurnal. It is noted that given the length of the cable, tides and rates will vary along the route with the local bathymetry. Localised currents may be present in some areas which are not represented within the tidal diamond data, in particular close to the coast in proximity to the landfalls. Tidal levels at Wick Harbour show a mean spring range of about 2.8 m and a mean neap range of about 1.4 m. At Peterhead Port, the mean spring range is about 3.3 m and the mean neap range is about 1.5 m. At Fraserburgh Harbour, the mean spring range and the mean neap range are 3.0 m and 1.5 m respectively.

Tidal information is displayed on nautical charts for each point marked with a tidal diamond. The tidal diamonds in proximity to the cable corridor are presented within **Figure 5**, and the associated tidal data is shown in **Table 6**. The tidal rate is predominantly less than 0.6 knots, which is not considered to be significant. On occasion higher tide rates may be experienced, with the highest being 2.1 knots near Wick.

5.2.3 Visibility

Fog is not especially common over open sea, but good visibility in excess of 10 nm is also infrequent. In the North Sea, fog is most often associated with warm air blowing over a relatively cold sea with winds between southeast and southwest (printed passage).

Sea fog is mainly encountered between April and September with warm moist air from the south. Visibility is frequently good over the North Sea. At Wick airport station, 31 days with fog are recorded per year. At Peterhead port, 28 days with fog are recorded per year.

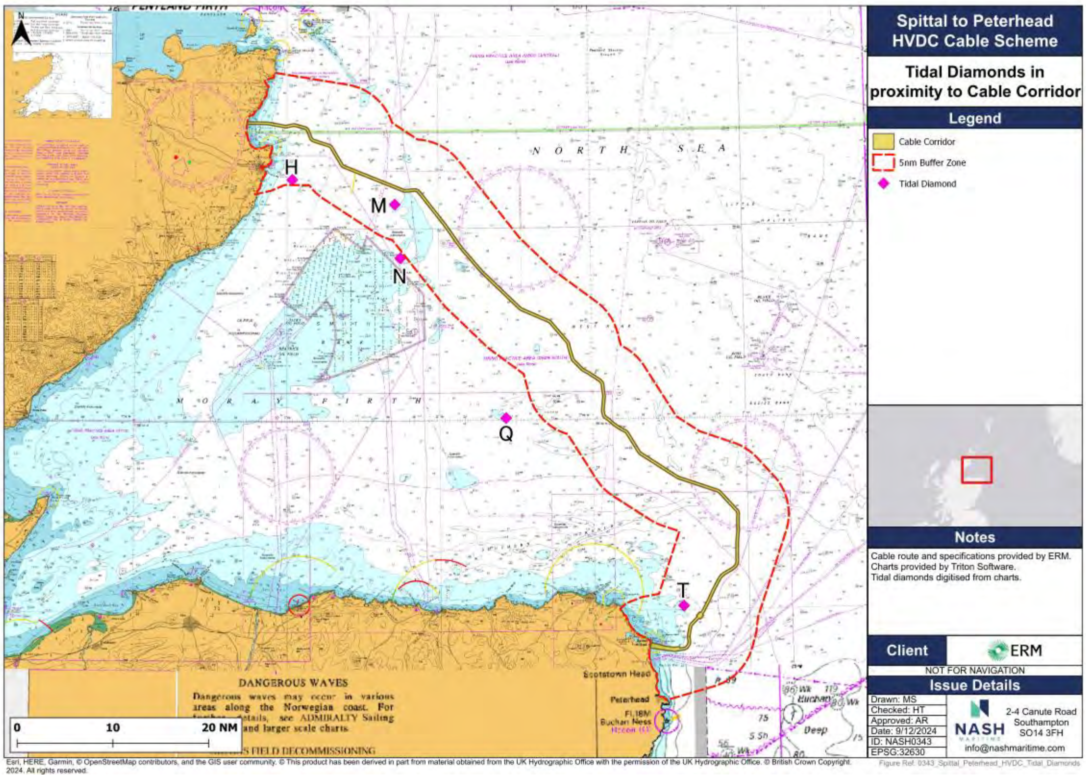

Figure 5: Tidal Diamonds in proximity to the Cable Corridor.

Table 6: Tidal Data in proximity to the Cable Corridor (all rates in knots).

Hours		H			M			N			Q			T		
		Direction	Rate at Spring tide	Rate at Neap tide	Direction	Rate at Spring tide	Rate at Neap tide	Direction	Rate at Spring tide	Rate at Neap tide	Direction	Rate at Spring tide	Rate at Neap tide	Direction	Rate at Spring tide	Rate at Neap tide
Before High Water	6	175	1.1	0.5	115	0.4	0.2	094	0.2	0.1	065	0.1	0.0	341	0.9	0.4
	5	181	1.5	0.8	148	0.6	0.3	143	0.5	0.2	105	0.1	0.0	018	0.2	0.1
	4	188	2.1	1.0	181	0.7	0.4	156	0.9	0.4	120	0.2	0.1	133	0.4	0.2
	3	196	1.5	0.8	174	0.8	0.4	165	1.1	0.5	128	0.3	0.1	147	0.9	0.4
	2	202	1.0	0.5	185	0.7	0.4	178	1.2	0.6	150	0.4	0.2	150	1.3	0.5
	1	257	0.3	0.1	210	0.4	0.2	179	0.5	0.2	168	0.3	0.1	149	1.7	0.8
High Water		344	0.7	0.3	298	0.3	0.2	227	0.1	0.0	183	0.1	0.1	147	1.1	0.5
After High Water	1	348	1.3	0.6	342	0.5	0.2	334	0.5	0.2		0.0	0.0	157	0.4	0.2
	2	358	1.9	0.9	347	0.6	0.3	338	0.9	0.4	329	0.2	0.1	305	0.4	0.2
	3	014	1.8	0.8	345	0.6	0.3	341	1.2	0.6	330	0.3	0.2	315	1.0	0.5
	4	031	1.4	0.7	343	0.7	0.4	347	1.0	0.5	323	0.4	0.2	318	1.5	0.7
	5	064	0.7	0.3	353	0.5	0.3	359	0.6	0.3	315	0.7	0.1	331	1.4	0.7
	6	168	0.8	0.4	090	0.5	0.1	055	0.2	0.1	344	0.5	0.0	338	1.1	0.5

5.3 EMERGENCY RESPONSE RESOURCES

SAR near to the Project is co-ordinated from Aberdeen Coastguard Operations Centre, located 28.4 nm from the cable landfall at St. Fergus. The Inverness SAR helicopter base, located 65 nm from the cable corridor, provides aerial capability for the area. RNLI all-weather lifeboats are located in Peterhead, Fraserburgh and Wick. The closest RNLI stations are at Wick, located 3.7 nm from the landfall at Sinclair's Bay, and at Peterhead, located 5.9 nm from the landfall at St. Fergus (note that distances are measured by straight line and do not taken into account vessel routeing).

6. EXISTING MARITIME ACTIVITIES

6.1 INTRODUCTION AND DATA SOURCES

A description of existing marine activities in the shipping and navigation Study Area is presented based on the data collected as listed in **Section 3.4**. Primarily, this includes analysis of full year 2019 and 2022 AIS datasets.

6.1.1 Effects of Covid-19

Since early 2020, the Covid-19 pandemic has substantially impacted commercial and recreational vessel movements both globally and locally. It is therefore possible that any data collected between 2020 and 2021 may be influenced by the pandemic although current vessel traffic levels are expected to have largely returned to pre-pandemic levels. As such, where appropriate, datasets have been used that precede the pandemic to benchmark those collected more recently and in order to provide a representative description of the baseline vessel traffic activity.

6.2 VESSEL TRAFFIC ANALYSIS

6.2.1 Overview

Annualised vessel traffic density in **Figure 6**, which presents the number of vessel transits through each 1 x 1 km grid cell for 2019 and 2022, shows the following:

- Vessel traffic density distribution remains highly consistent for both years, with a notable exception being the larger area of high vessel activity observed in the vicinity of Peterhead in 2019.
- High-density vessel activity surrounding the cable landfall site at St. Fergus, predominantly attributed to Peterhead and Fraserburgh ports.
- Relatively low-density vessel activity around the cable landfall at Sinclair's Bay, with the exception of a high-density patch adjacent to Wick harbour.
- Low to moderate vessel traffic density along the offshore section of the Study Area, with the exception of the high-density route between Aberdeen and the Pentland Firth.

Figure 7 shows all vessel tracks by vessel draught recorded during 2022. Vessels with a draught over 8 m infrequently navigate within 5 nm of the cable landfall sites. Deeper draught vessels (over 11 m) were mostly recorded navigating parallel to the cable corridor.

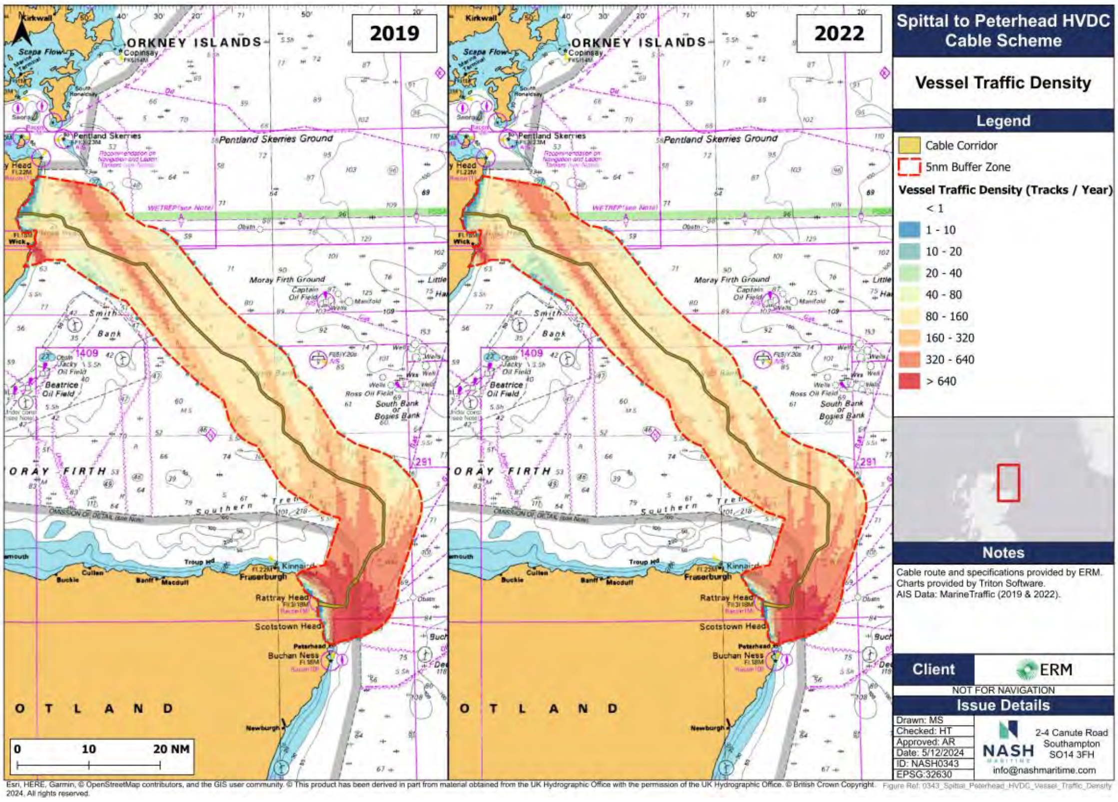

Figure 6: Annualised Vessel Traffic Density.

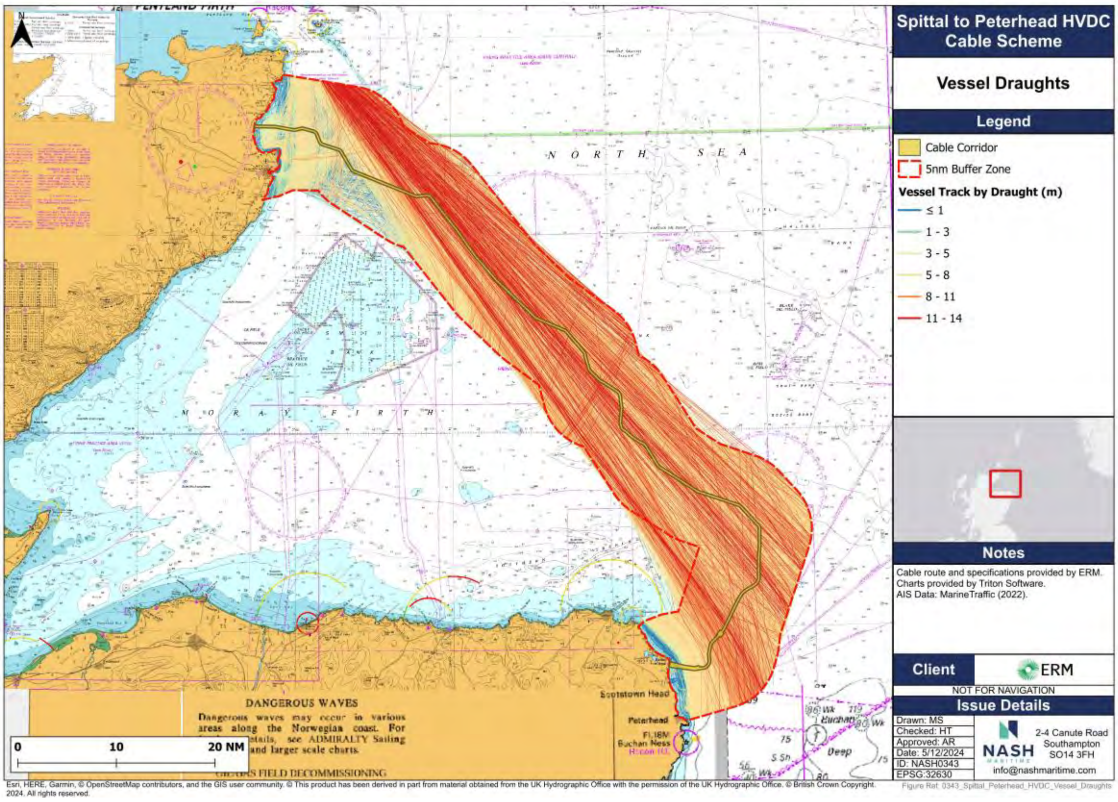

Figure 7: Vessel Draughts 2022.

Figure 8 shows all vessel tracks by vessel length during 2022. The majority of large vessels within the Study Area was bound for Orkney and Shetland Islands, typically navigating along the cable corridor. Almost all vessels between 100 m and 150 m in length that have been identified within the shipping and navigation Study Area are ferries and cargo vessels on three well-defined routes, of which two lead to the Orkney Islands and one leads to the Shetland Islands. Vessels over 200 m in length are also mostly cargo and tanker vessels bound to the Pentland Firth. Small craft, including fishing vessels, are located throughout the shipping and navigation Study Area, but largely concentrated close to shore. Of all the cargo vessels identified within the Study Area, the 138 m Mykines, 139 m Akranes, 101 m Samskip Hoffell, 100 m Francisca and 130 m EF Ava were the most frequent regular runners.

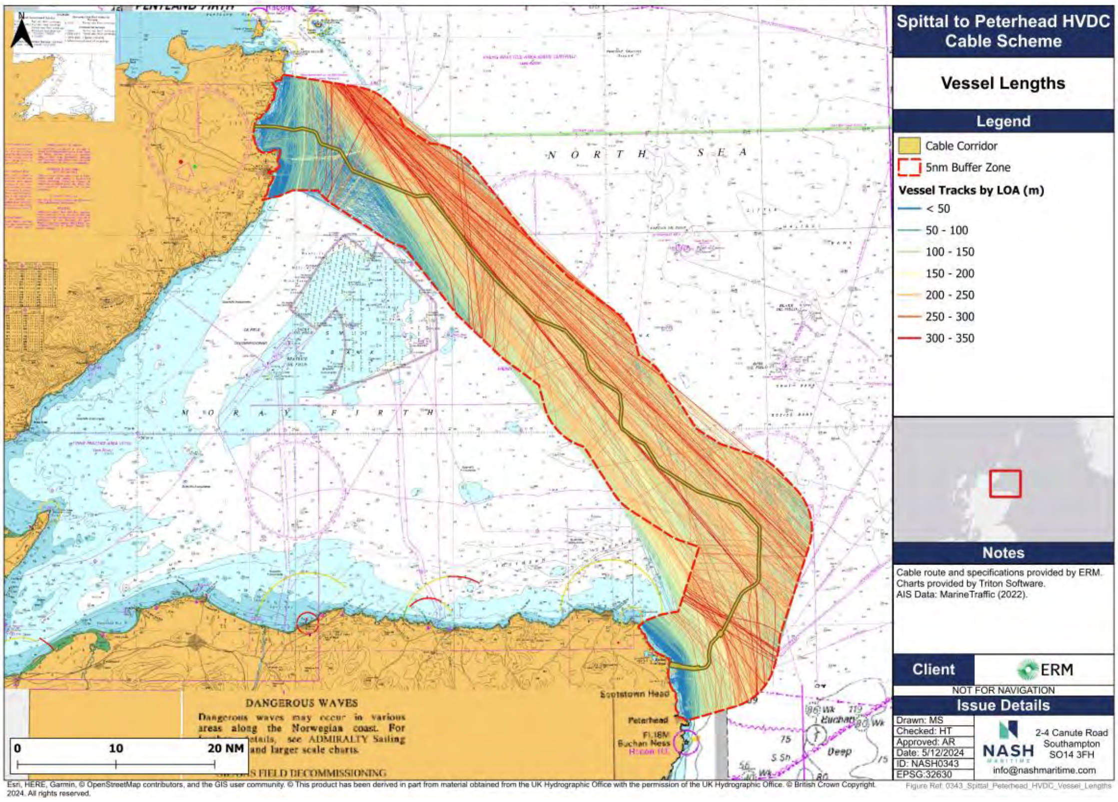

Figure 8: Vessel Lengths 2022.

6.3 VESSEL TRACKS BY TYPE.

6.3.1.1 Commercial

The tracks of commercial vessels, namely dry cargo vessels and liquid tankers, during 2022 are shown in **Figure 9** and **Figure 10**, respectively.

There were 3,349 cargo ship transits through the Study Area during 2022, of which 2,631 crossed over the cable corridor. These are mostly general cargo vessels of less than 150 m in length. The majority of cargo ship transits are shown to be bound towards the Pentland Firth, navigating along the Study Area and parallel to the cable corridor. These tend to include larger vessels such as container ships and bulk carriers.

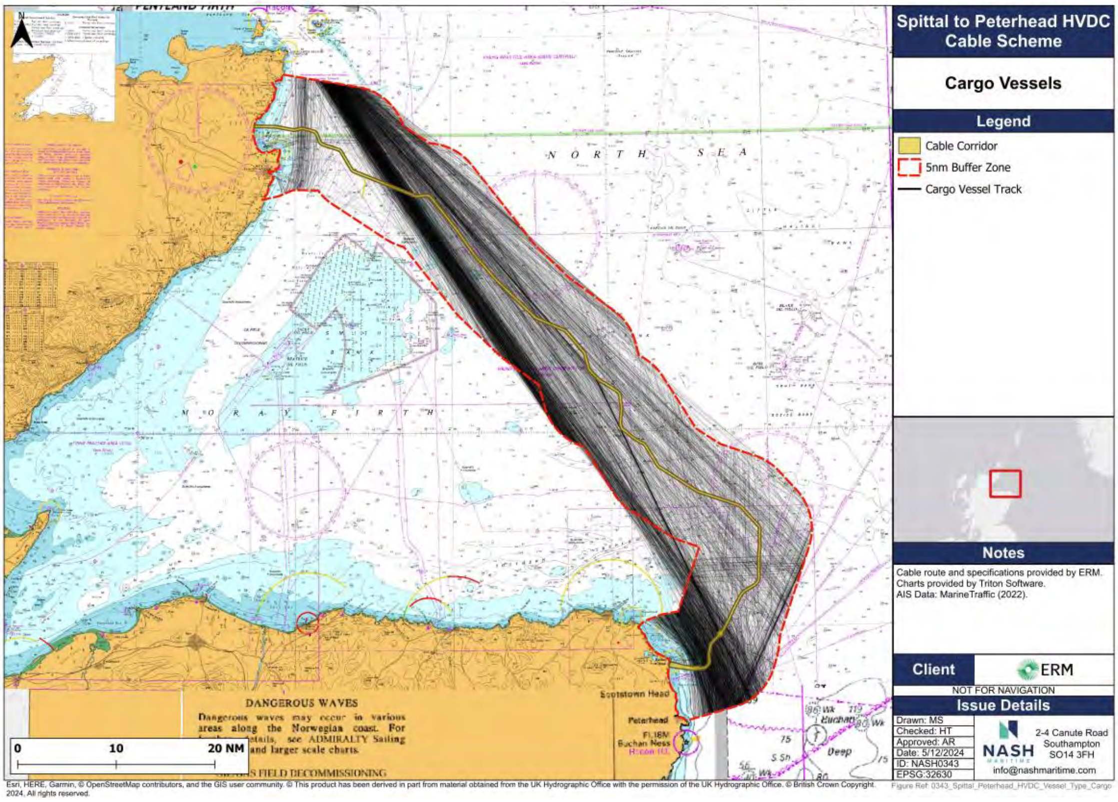

Figure 9: Cargo Vessels 2022.

Tanker tracks are largely consistent with the shipping route identified for cargo ships, albeit with less frequency with 1,006 transits through the shipping and navigation Study Area in 2022 and 823 crossing over the cable corridor. Some tanker vessels are also transiting towards the northern Orkney Islands and the Shetland Islands. Of all the tanker vessels identified within the Study Area, the 79 m Antares, 91 m Mersey Fisher, 80 m Thun Britain, and 234 m Petroatlantic were the most frequent regular runners. These vessels are typically navigated to and from the Orkney and Shetland Islands.

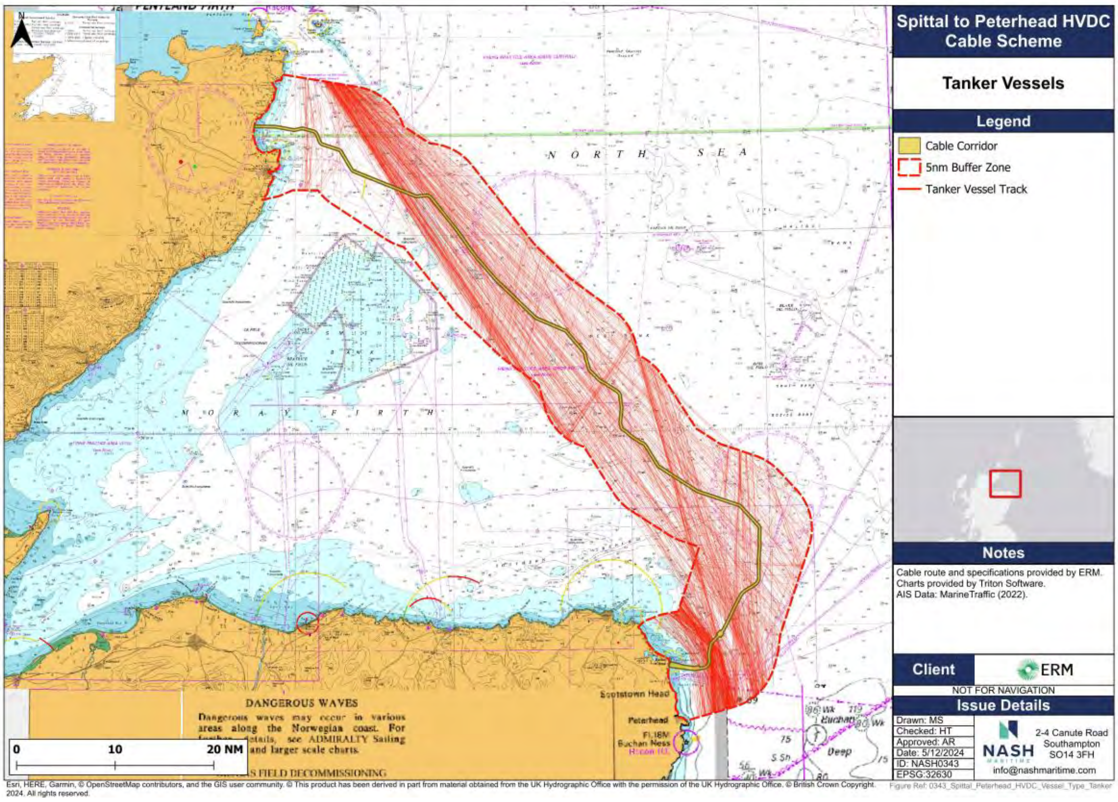

Figure 10: Tankers 2022.

6.3.1.2 Passenger

The tracks of passenger vessels during 2022 are shown in **Figure 11**, which includes both ferries and cruise ships.

On average, 3.9 ferry transits per day crossed through the Study Area, and a total of 1,432 ferry tracks in 2022. NorthLink has been identified as the principal operator in the Study Area, with four ferries sailing between Aberdeen and Lerwick/Kirkwall. The NorthLink ferries MV Hjaltland, MV Hrossey, MV Helliar, and MV Hildasay account for 72% of all passenger vessels and 94% of ferries navigating within the Study Area in 2022, forming the two major ferry routes observed. Details of the NorthLink ferry routes are provided in **Table 7**.

The NorthLink Ferries operate regular routes connecting Aberdeen with the Northern Isles. Every evening, two ferries, the MV Hrossey and MV Hjaltland, sail between Aberdeen and Lerwick in Shetland, with one ferry making the journey in each direction. One of these ferries sails directly, while the other makes a stop at Kirkwall in Orkney. In addition to the MV Hamnavoe, the MV Hrossey and MV Hjaltland also provide sailings from Aberdeen to Orkney, stopping at Kirkwall before continuing to Shetland. These indirect sailings to Orkney occur on certain days of the week. The ferry service from Aberdeen to Kirkwall operates on Tuesday (not in winter), Thursday, Saturday, and Sunday nights while the service from Kirkwall to Aberdeen operates on Monday (not in winter), Wednesday, and Friday nights.

The tracks of cruise ships are shown in **Figure 11,** with 339 cruise ship tracks crossing the Study Area in 2022. Of these, the 228 m Viking Venus, 289 m Emerald Princess, 318 m Mein

Shiff 3, and 203 m Aidaaura were among the most frequently identified cruise ships in the Study Area in 2022.

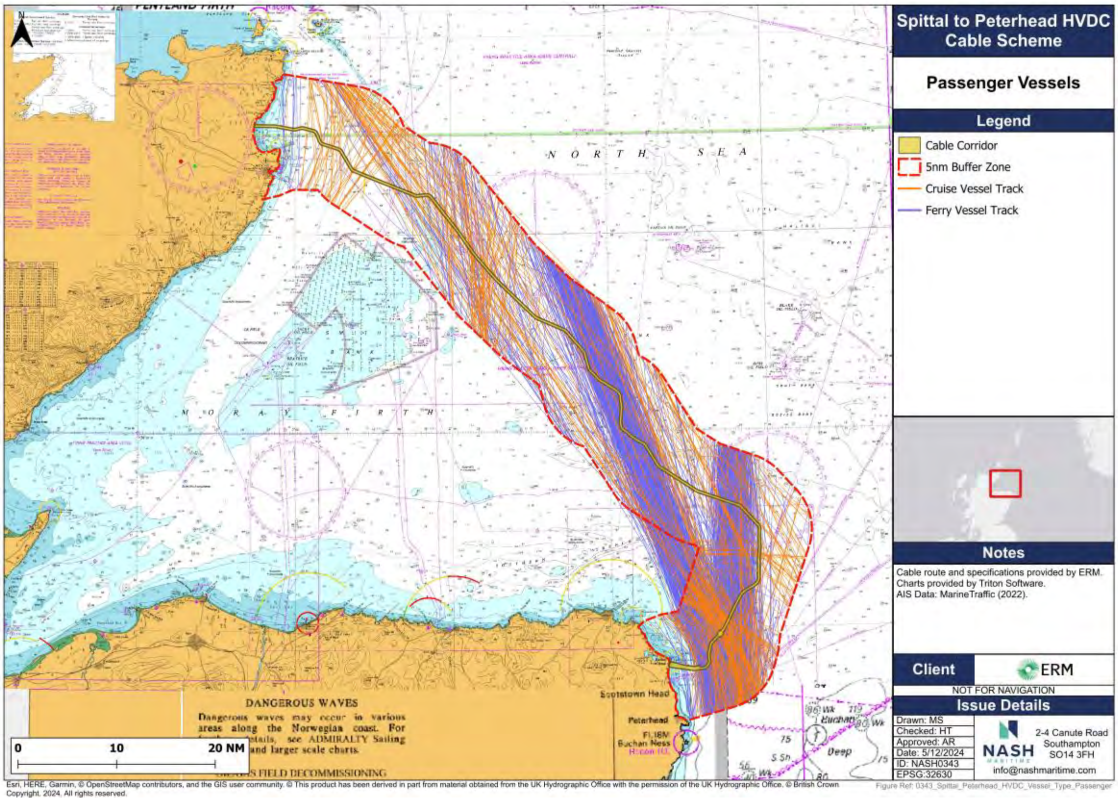

Figure 11: Passenger Vessels 2022.

Table 7: Ferry Route Details

Route	Ferry Names	Approximate Transits per Year
Aberdeen ⇔ Kirkwall	MV Hrossey MV Hjaltland	338
Aberdeen ⇔ Lerwick	MV Hrossey MV Hjaltland	728

6.3.1.3 Recreational Activity

The intensity of recreational vessel activity is shown in **Figure 12**. Historical AIS data and the RYA Coastal Atlas have been combined to determine which areas are likely to have greater recreational intensity. Approximately 7% of the cable corridor passes through moderate to high recreational vessel activity near the coast. The recreational activity within the Study Area is mainly focused in proximity to the coast, particularly within 5 nm of the cable landfall sites. There is little recreational activity throughout most of the offshore section of the Study Area, with no identified offshore cruising routes. On average, 3.9 recreational vessel transits crossed through the Study Area per day, with a total of 1,426 recreational vessel tracks in 2022.

A challenge in analysing recreational vessel patterns using AIS data is that not all vessels, particularly the smaller crafts, are required to transmit AIS signals. Previous RYA studies have concluded that between 10 to 30% of recreational crafts are transmitting AIS signals in the UK, though this varies greatly depending on the specific location. Although recreational activity may be under-represented by AIS data, it is not expected that the spatial pattern of recreational cruising routes would differ significantly from what is presented in **Figure 12**.

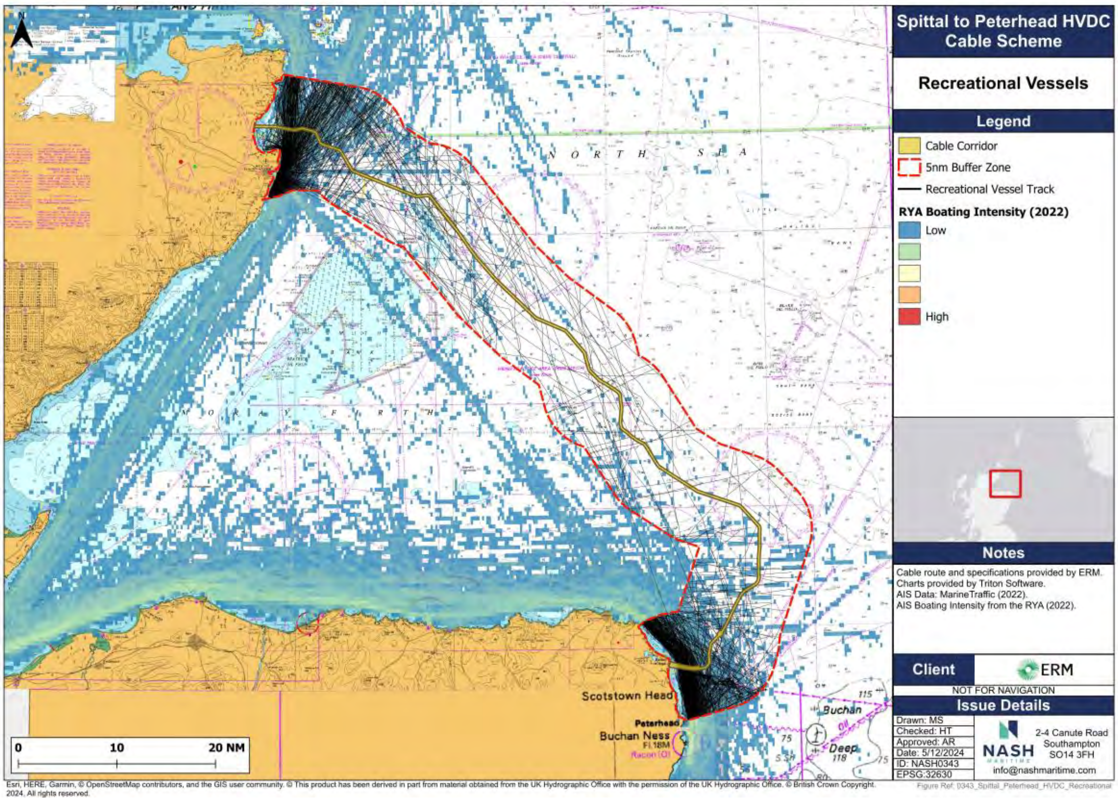

Figure 12: RYA Recreational Intensity and Recreational Tracks 2022.

6.3.1.4 Fishing Activity

The commercial fishing industry in the Moray Firth and the broader North Sea region is characterised by its extensive reach and diverse catch portfolio, targeting a number of valuable fisheries for demersal, pelagic, and shellfish species. Key shellfish species like king scallop and queen scallop are often harvested using dredgers, while whelk, lobster, and crab are targeted with pots. The demersal target species include haddock, cod, sole, thornback ray, and plaice, primarily employing beam and otter trawlers for their catches. Pelagic fish landings in this area are predominantly comprised of herring and mackerel, often captured through pelagic trawls. Fishing ports in the region with the highest fishing efforts are Peterhead and Fraserburgh, both of which are adjacent to the St. Fergus cable landfall site. Towards the cable landfall site at Sinclair's Bay, Wick Harbour is a notable fishing port that plays a significant role in the local fishing industry.

The tracks of fishing vessels are shown in **Figure 13** throughout each season, and the VMS data 2020 is presented in **Figure 14**. There is considerable fishing activity within and near the Study Area, with vessels up to 51.9 m in length engaged in mobile and static gear fishing.

However, some fishing vessels are engaged in guard vessel duties or other survey works and account for some of the concentrations around oil and gas installations. A main route between the Orkney Islands and Peterhead/Fraserburgh was observed during all four seasons in the upper part of the Study Area, in a NW/SE direction. The VMS data showed that for the cells intersecting the Study Area, 93% of vessels recorded used demersal gears, particularly bottom otter trawls, dredges, bottom twin trawls and bottom pair trawls. Low levels of vessels using pots were recorded.

It is noted that smaller fishing craft are often underrepresented in AIS data and active fishing is not specifically identified. However, all fishing vessels larger than 15 m in LOA must have operational AIS system and therefore AIS data may be used to visualise the general movements of fishing vessels around the Study Area.

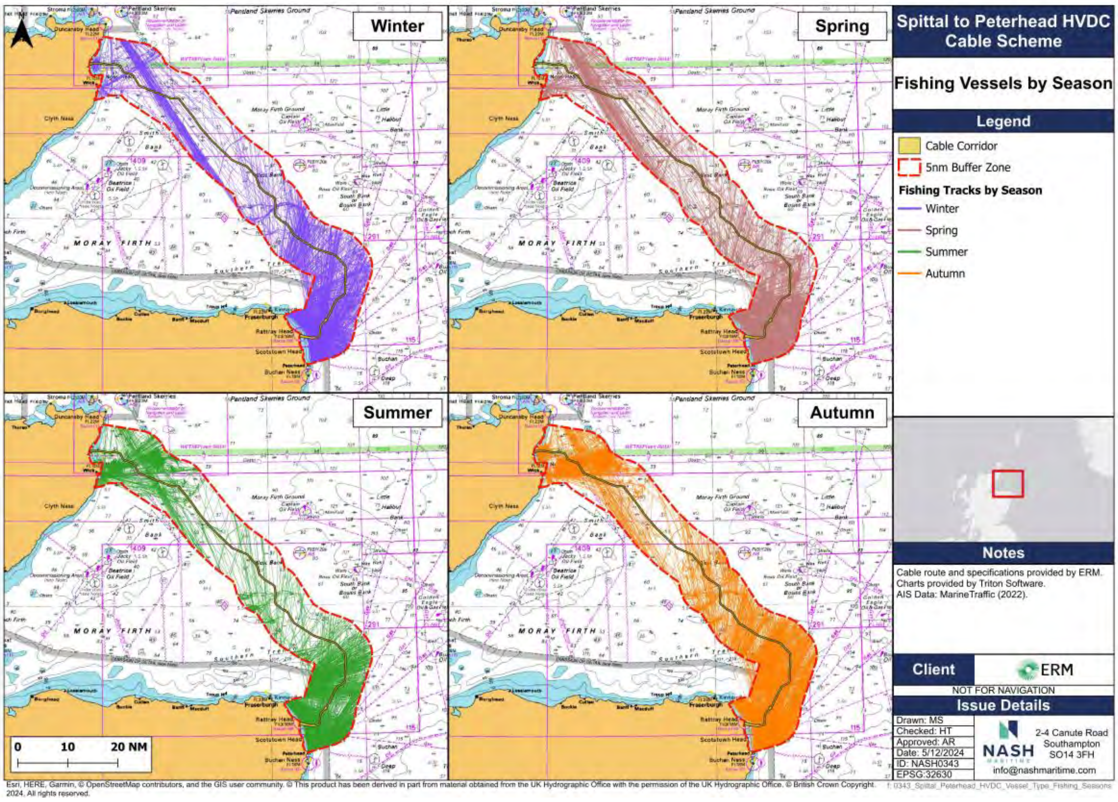

Figure 13: Fishing Vessels per Season 2022.

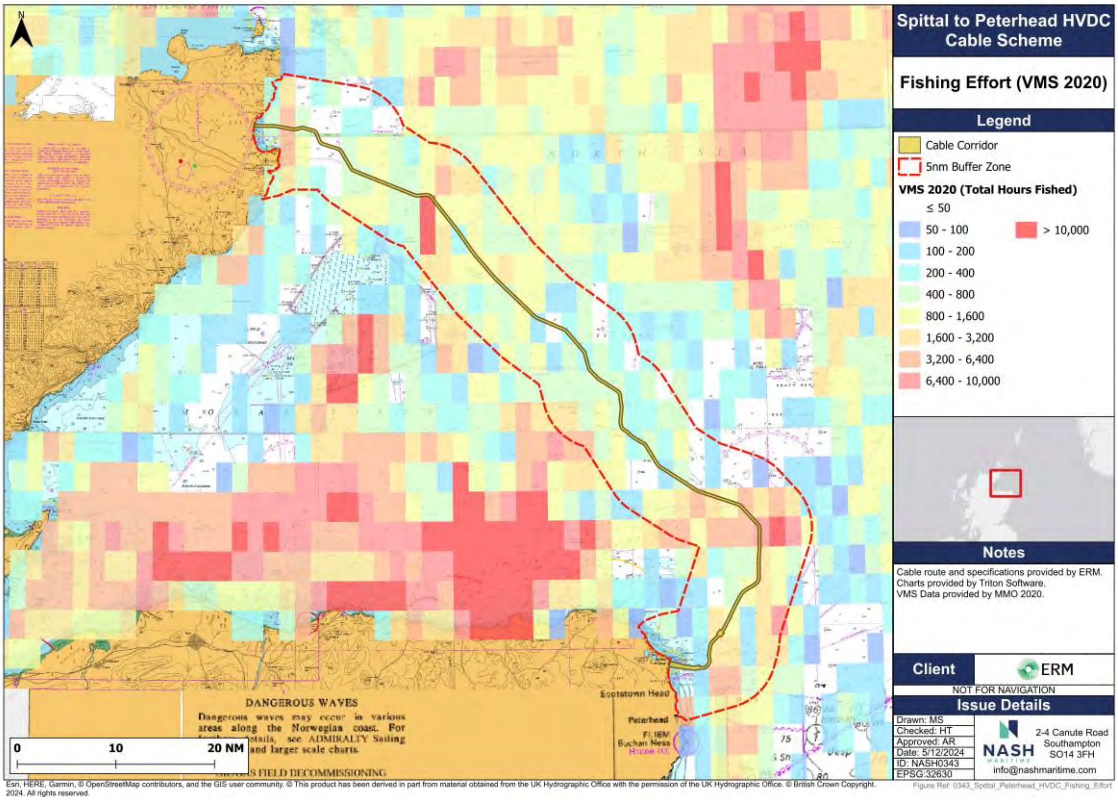

Figure 14: Fishing VMS 2020 (Total Time per Cell).

6.3.1.5 Other Vessel Types

The tracks of other vessel types are shown in **Figure 15**, which have been subdivided into key categories. Offshore supply vessels were recorded operating between Aberdeen/Peterhead and oil and gas fields platforms across the southern section of the Study Area.

Dense oil and gas activity was recorded transiting between Peterhead port and nearby oil fields (such as Beatrice, Captain, Blake, and Ross) as well as nearby gas fields (such as Cromarty).

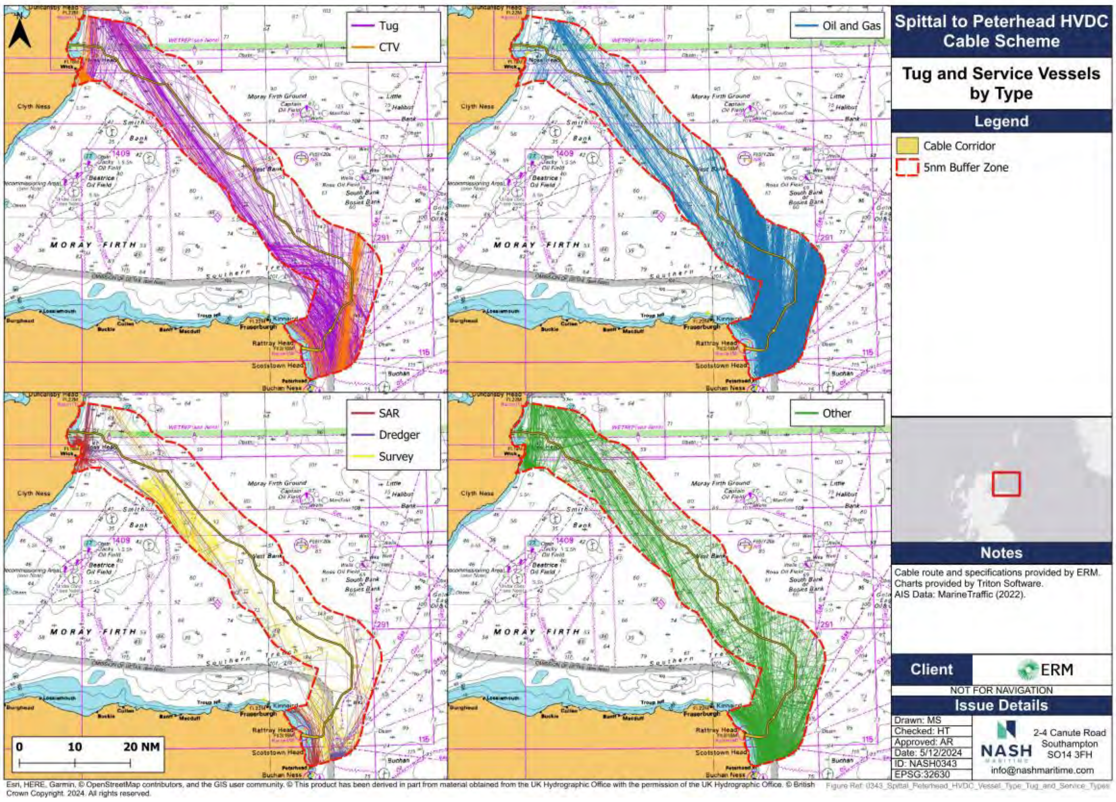

Figure 15: Other Vessel Tracks.

6.3.2 Non-Transit Activity

Figure 16 presents a grid showing the time spent by vessels at speeds less than 0.3 knots, highlighting key areas where vessels typically anchor. The main hotspots were observed within Sinclair's Bay and to the east of Wick, as well as to the north of Peterhead Port. The activity within Sinclair's Bay was related to a cable launch taking place at the Subsea7 facility. The main hotspots to the east of Wick can be attributed to the vessels associated with the Shetland HVDC Link. It is more likely that these vessels were using dynamic positioning rather than anchored.

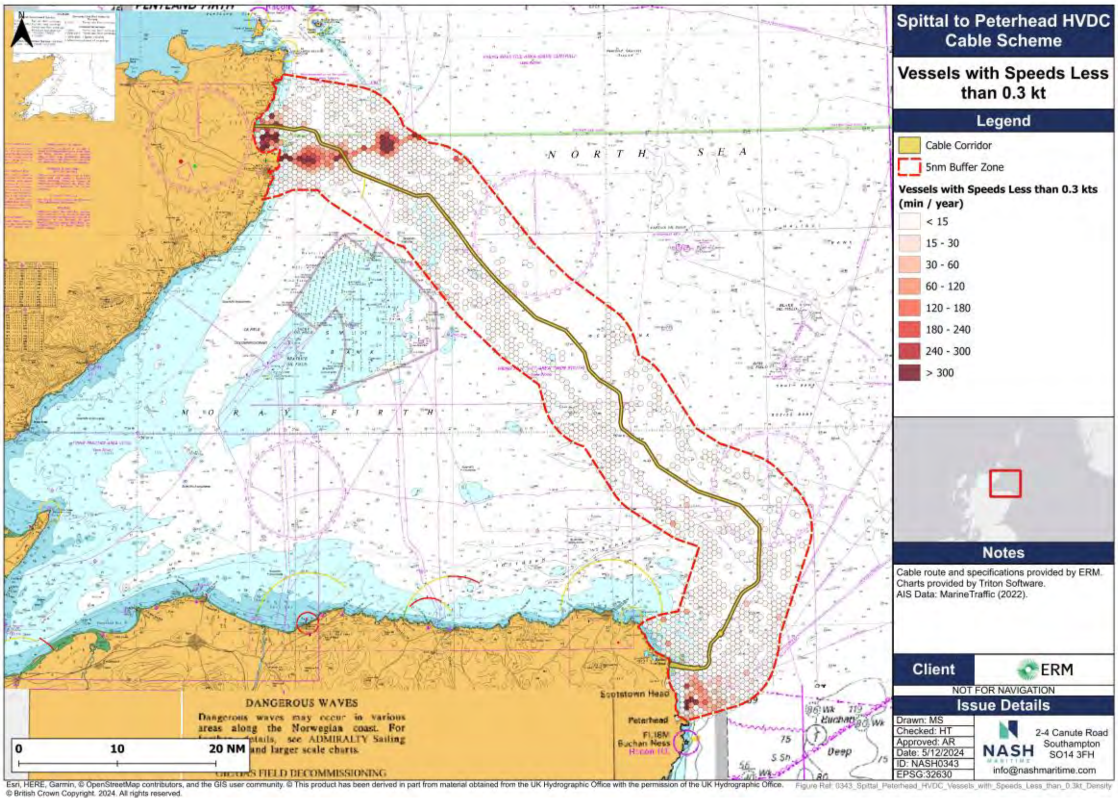

Figure 16: Non-Transiting Activity (Speeds under 0.3 Knots).

6.3.3 Vessel Traffic in Proximity to Cable Landfalls

Figure 17 presents a detailed overview of all vessel traffic in proximity to the landfalls colour-coded by vessel draught. Vessels with shallow draughts of less than 3 m were observed to transit closer to the coast. Vessels with a draught over 8 m deep were typically not recorded within water depths of 20 m or less.

Figure 18 shows a detailed overview of the recreational activity in proximity to the cable landfalls. The majority of recreational traffic recorded in proximity to the cable landfalls was under 20 m in length. Vessels in proximity to the south landfall were recorded passing through the Study Area to local harbours including Peterhead and Fraserburgh. Recreational traffic in proximity to the north landfall was mainly focused around Wick Harbour.

A detailed overview of fishing activity in proximity to the landfalls is shown in **Figure 19**. A number of fishing vessels were observed coastally under 15 m in length, meaning they were broadcasting voluntarily on AIS. Dense activity was observed in the vicinity of the south landfall with vessels both actively engaged in fishing and transiting.

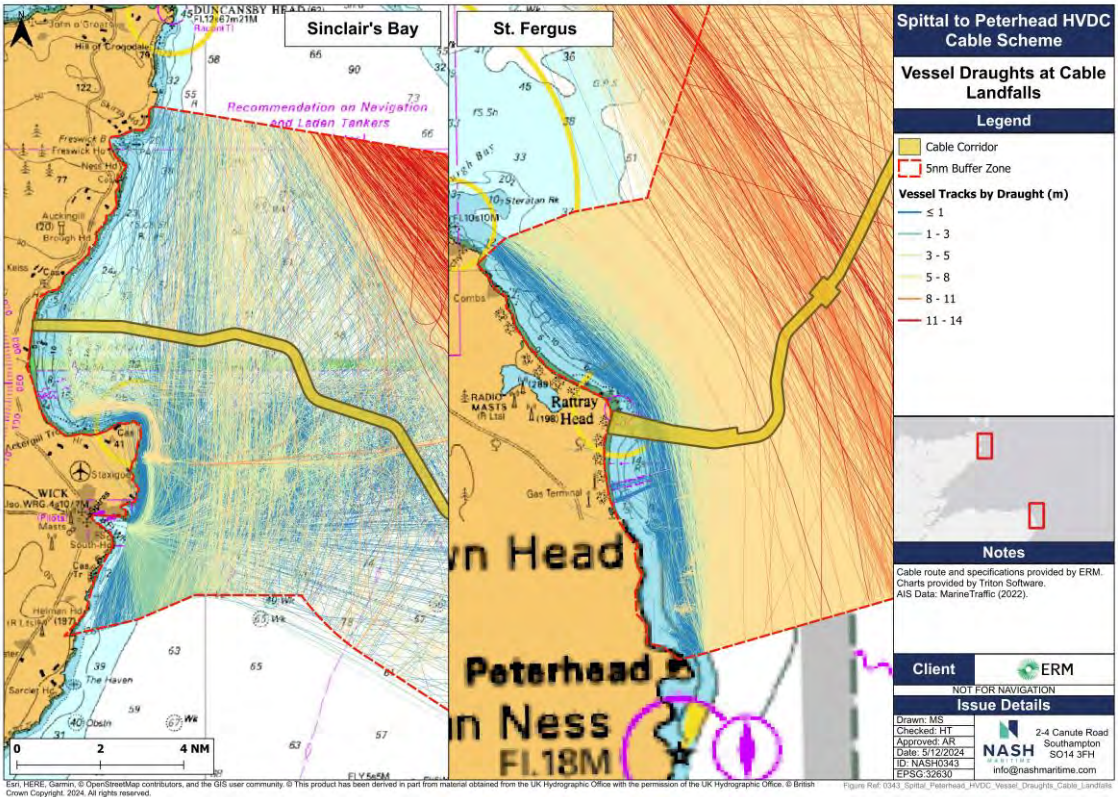

Figure 17: Vessel Tracks Colour-coded by Draught in proximity to Landfalls.

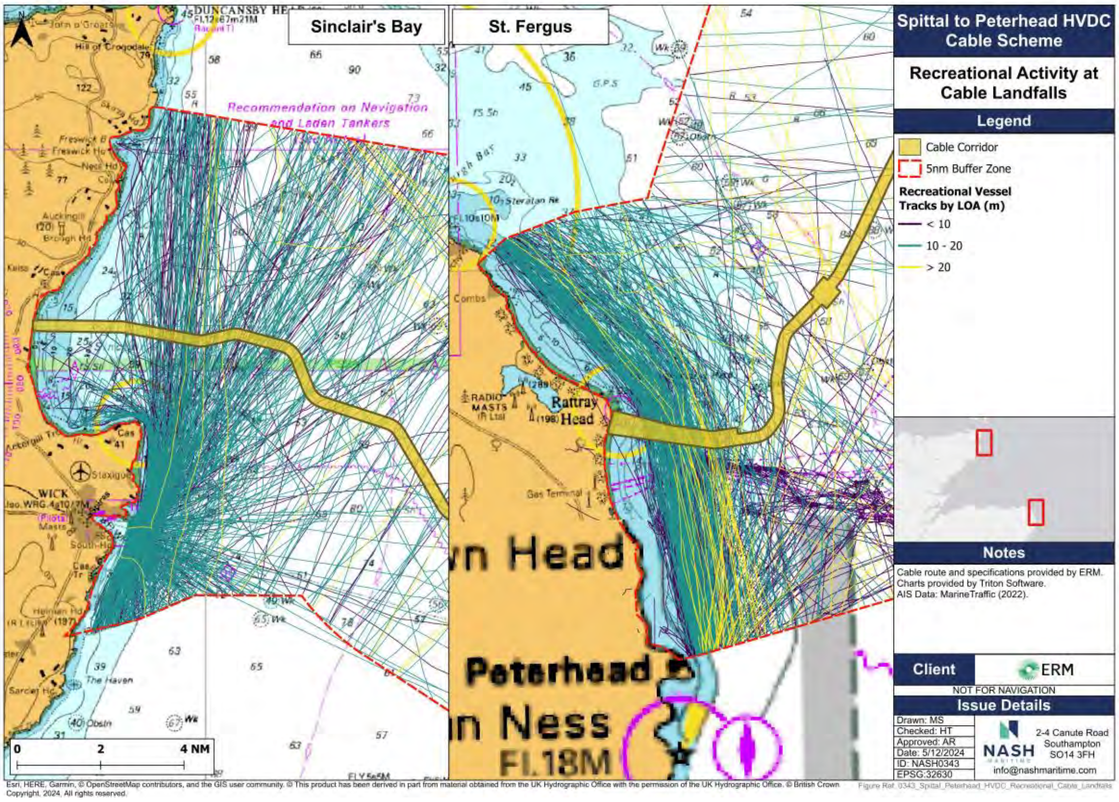

Figure 18: Recreational Vessel Tracks in proximity to Landfalls.

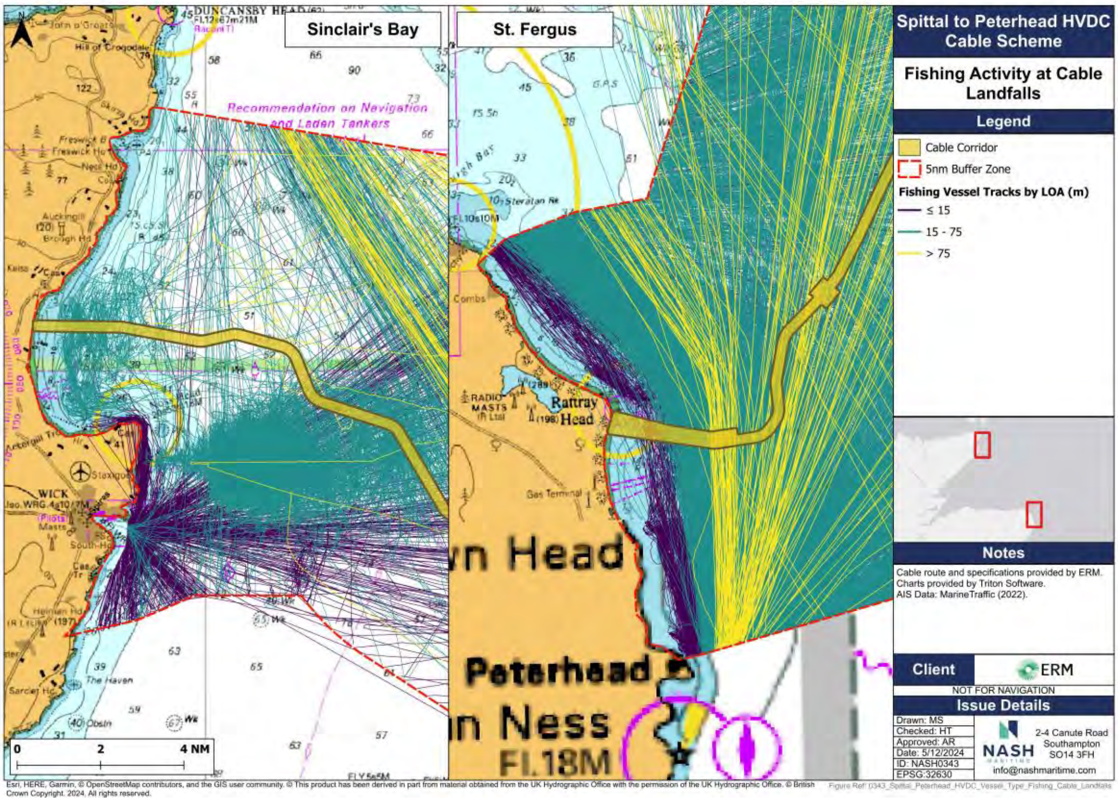

Figure 19: Fishing Vessel Tracks in proximity to Landfalls.

6.3.4 Cable Corridor Analysis

A cable corridor analysis was conducted to provide a detailed overview of the vessel activity along the route and help identify potential interactions between the subsea cable and various vessels navigating the region. A centreline through the cable corridor was segmented into 65 parts each measuring 2.5 km in length starting at the cable landfall at Sinclair's Bay running to the cable landfall at St. Fergus. For each segment, 2022 AIS data was collated on:

- The number of different vessel types crossing the cable corridor
- The average and maximum length overall (LOA) of these vessels
- The average and maximum draughts of these vessels.

Figure 20 and **Figure 21** show the number of vessel types crossing over the cable corridor sections. The graphs show a significant spike in vessel activity towards the southern cable landfall at St. Fergus, especially regarding cargo, tug and service, and fishing vessels. This can be attributed to the busy ports of Fraserburgh and Peterhead that are adjacent to the landfall at St. Fergus. Vessel counts remain relatively low along the rest of the cable corridor, with three notable exceptions: (1) a spike in cargo vessels at section 12, (2) a spike in tug and service vessels at section 46, and (3) a spike in passenger vessels at section 48. These align with the main vessel routes identified in **Section 6.2.1**.

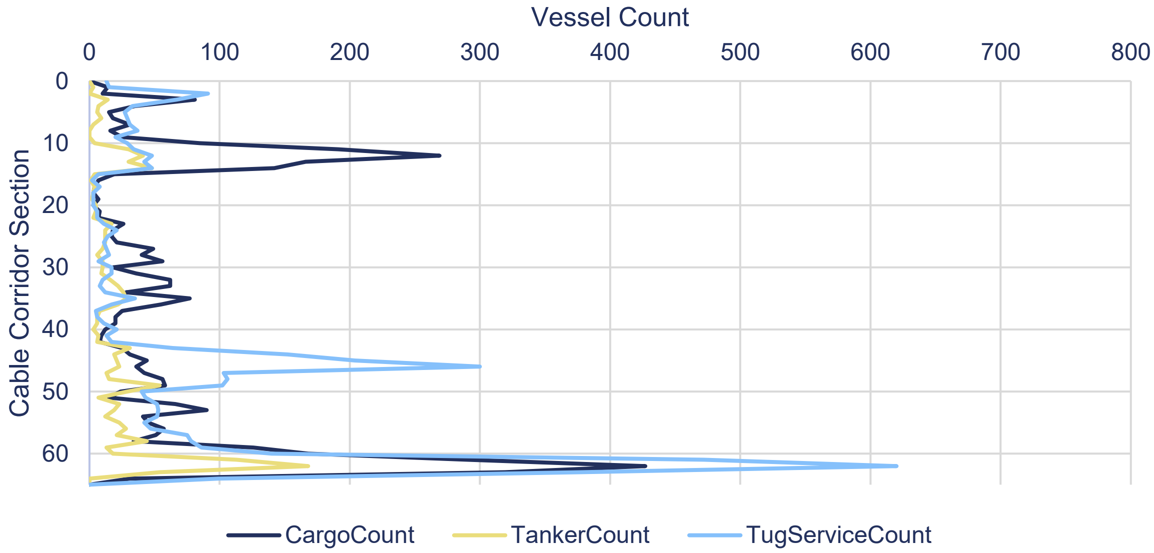

Figure 20: Cargo, Tanker, and Tug and Service Vessel Counts across each Section of the Cable Corridor.

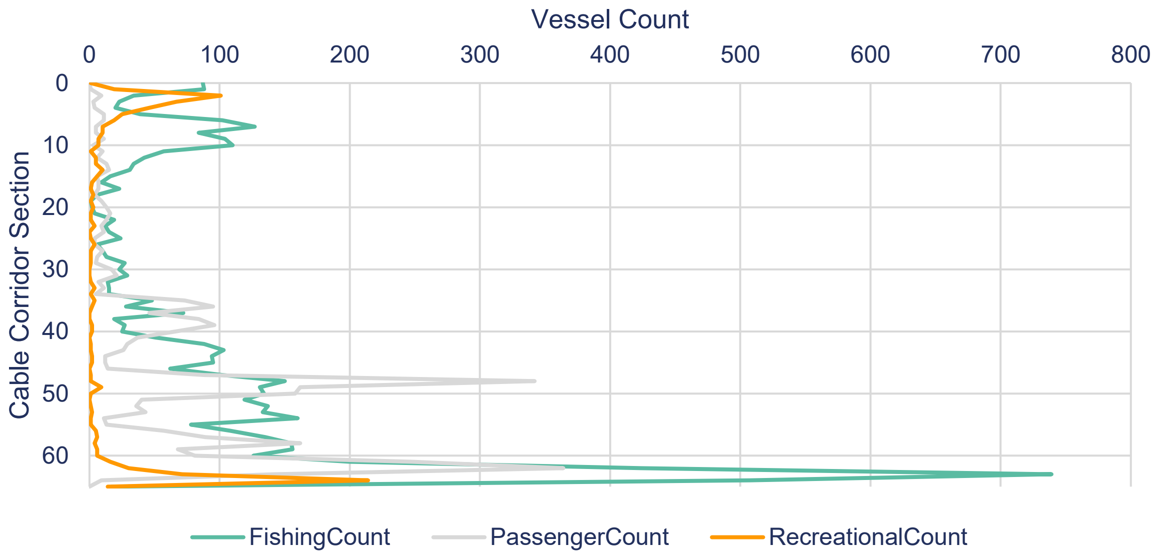

Figure 21: Fishing, Passenger and Recreational Vessel Counts across each Section of the Cable Corridor.

In addition, **Figure 22** and **Figure 23** show the average and maximum LOA and draught of the vessels crossing over each section of the cable corridor. The graphs show that vessels transiting close to the northern and southern landfalls have reduced lengths and draughts compared to the remainder of the cable corridor. The maximum LOA remains at approximately 250 – 300 m throughout most of the cable corridor, reducing to 25 m approaching the cable landfalls. The average draught of vessels near the cable landfalls is around 3m. The maximum draught at both cable landfalls is 5 m, which slowly rises to around 15m moving away from the landfalls.

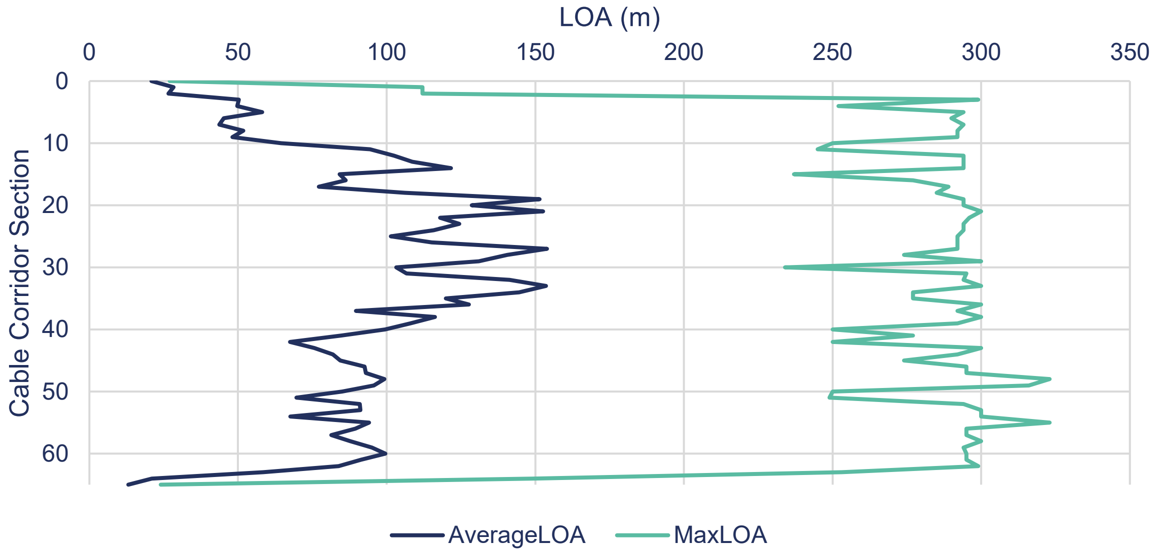

Figure 22: Average and Maximum LOA of the Vessels Crossing over each Section of the Cable Corridor.

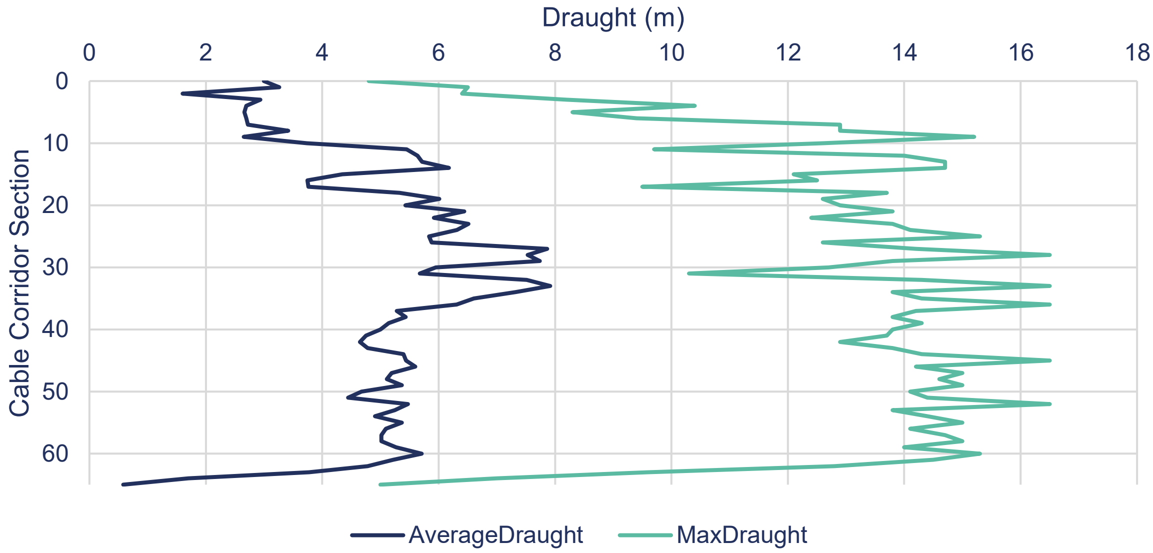

Figure 23: Average and Maximum Draught of the Vessels Crossing over each Section of the Cable Corridor.

6.4 HISTORICAL MARITIME INCIDENTS

Maritime incidents recorded in the Study Area between the MAIB (1991-2021) and RNLI (2008-2022) databases have been collated and presented. In processing the incidents, non-navigational incidents have been removed, such as shore-based activities (e.g., people cut off by the tide or swimmers in distress).

The recorded maritime incidents are presented spatially in **Figure 24** with the MAIB and RNLI incidents which occurred in the Study Area and are summarised in **Figure 25** and **Figure 26**, respectively.

The majority of incidents are recorded close to shore and around ports with reducing frequency further offshore. Notably there were no instances of passenger vessels, oil and gas service vessels or cargo vessels being involved in a collision, grounding or contact event outside of the harbour areas of Peterhead, Fraserburgh or Wick.

The most frequent incident category from the MAIB and RNLI data was mechanical / damage which predominantly involves failure of equipment on a vessel which could be engines, steering or any other navigational equipment. The second most frequent incident category for both the MAIB and the RNLI was personal injury which relates to injuries or sickness of crewmembers on vessels. All reported collisions, contacts and groundings reported occurred close to shore where there are more constrained conditions for navigation and a higher density of vessel traffic.

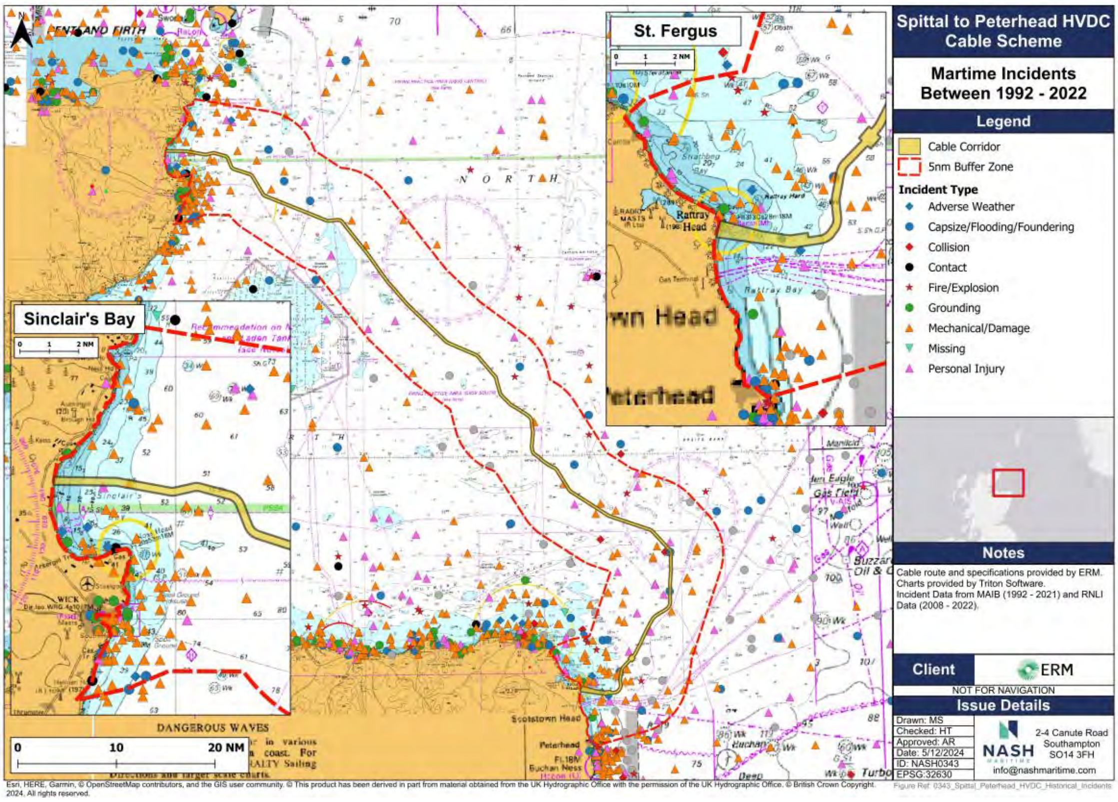

Figure 24: MAIB and RNLI Historical Incidents.

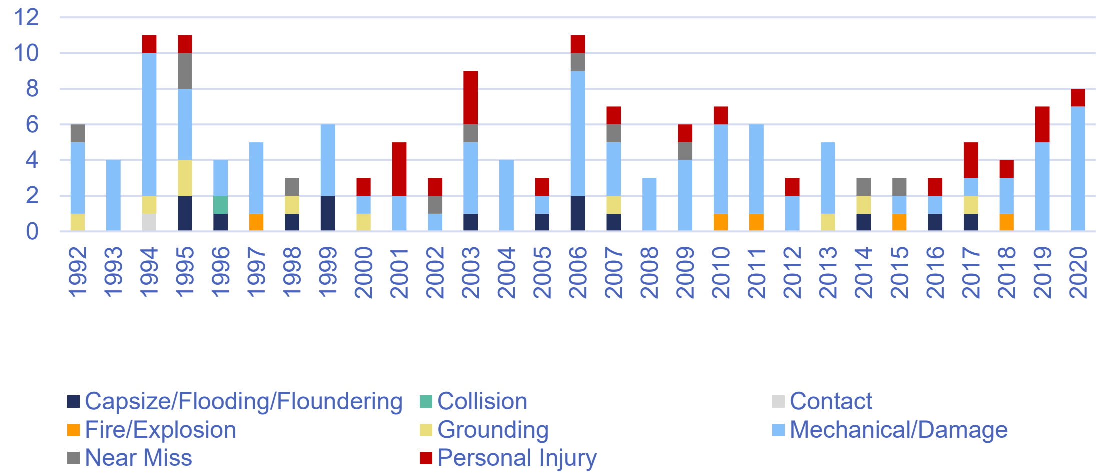

Figure 25: Annual Incidents Reported within the Study Area (MAIB, 1992 – 2020).

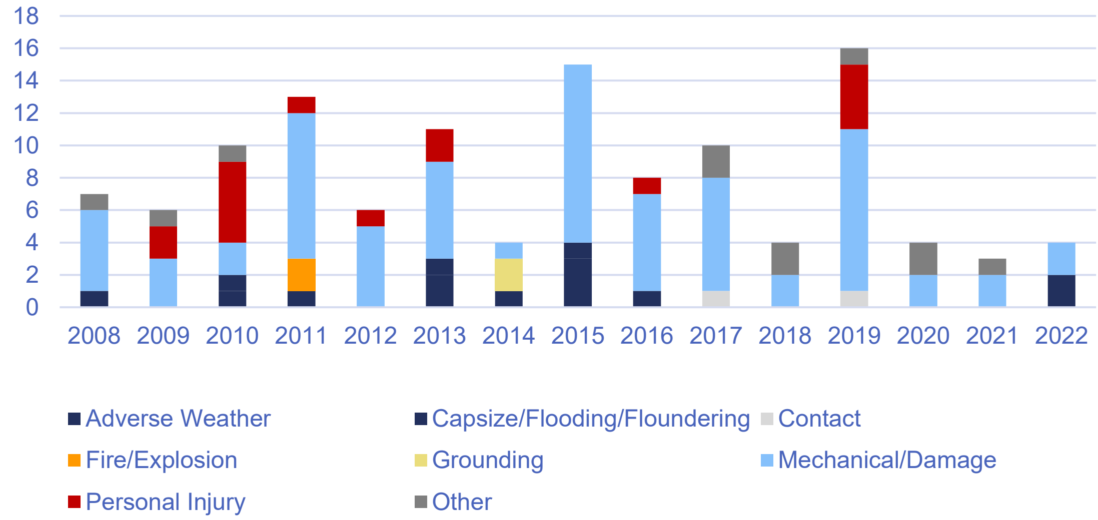

Figure 26: Annual Incidents Reported within the Study Area (RNLI, 2008 – 2022).

7. FUTURE TRAFFIC BASELINE

7.1 INTRODUCTION

This section presents the predicted future case traffic profile within the shipping and navigation Study Area for commercial, ferries, oil and gas, fishing and recreational vessel traffic.

7.2 COMMERCIAL TRAFFIC

DfT data on UK port trade is presented in **Figure 27** and **Figure 28** and shows a decline in port freight up until 2020 at both the national and port level, respectively. The DfT data demonstrates that UK ports were affected by measures to prevent and reduce the global spread of Covid-19 throughout 2020, as well as the UK exiting the European Union at the end of 2020. The DfT show a 9 % decrease in tonnage handled by UK ports in 2020 compared to 2019. Peterhead Port is the busiest port in proximity to the cable corridor. Overall, the number of vessels visiting Peterhead has remained steady with a spike in vessels using the port observed during 2014 and 2017.

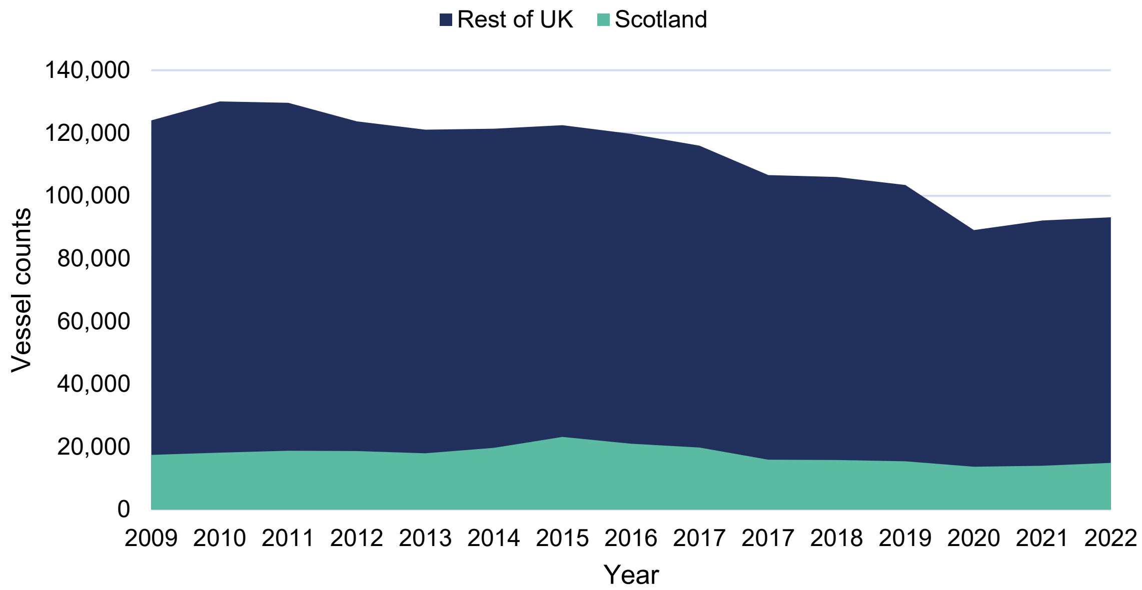

Figure 27: Port Arrival Statistics UK and Scotland 2009 – 2022 (DfT, 2023).

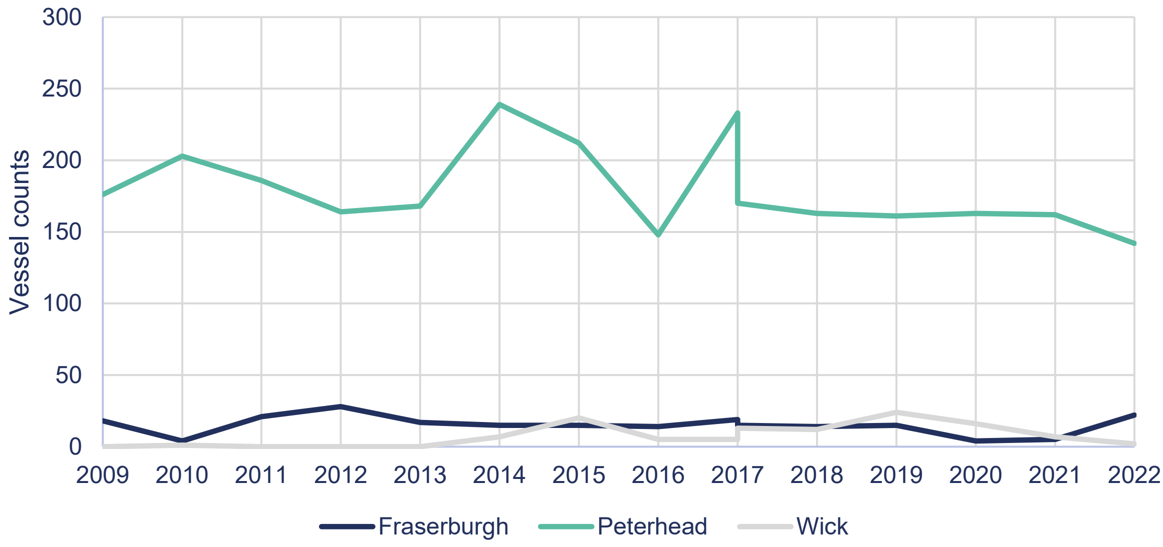

Figure 28: Port Arrival Statistics for ports in proximity to the cable landfall sites at Sinclair's Bay and St. Fergus (DfT, 2023).

Figure 29 shows Projected freight traffic into UK major ports, produced by the DfT in 2019. Overall, port traffic is forecast to remain relatively flat in the short term but grow in the long term, with tonnage 39% higher in 2050 compared to 2016. This equates to approximately a 15 % increase in national freight tonnage by 2035. The long-term growth in port traffic is driven by increases in unitised freight traffic, which compensates for decreases in other freight in the short term. Liquid bulk traffic (principally crude oil) has the largest forecasted decreases, continuing a historical trend. Similarly, general cargo is forecast to decrease, in line with the historic decreasing trend, which is likely driven by increased containerisation of goods. Dry bulk traffic is forecast to have a relatively large decrease in the short term, driven primarily by demand for coal being Projected to fall. In the long term, dry bulk traffic is forecast to increase, with other dry bulk, the largest category, continuing to increase as it has done historically (principally biomass). Motor vehicles, Twenty-foot Equivalent Unit container forecast for Lift-on Lift-off and the unit forecast for Roll-on Roll-off (RoRo) are all forecast to grow strongly, driven by economic growth.

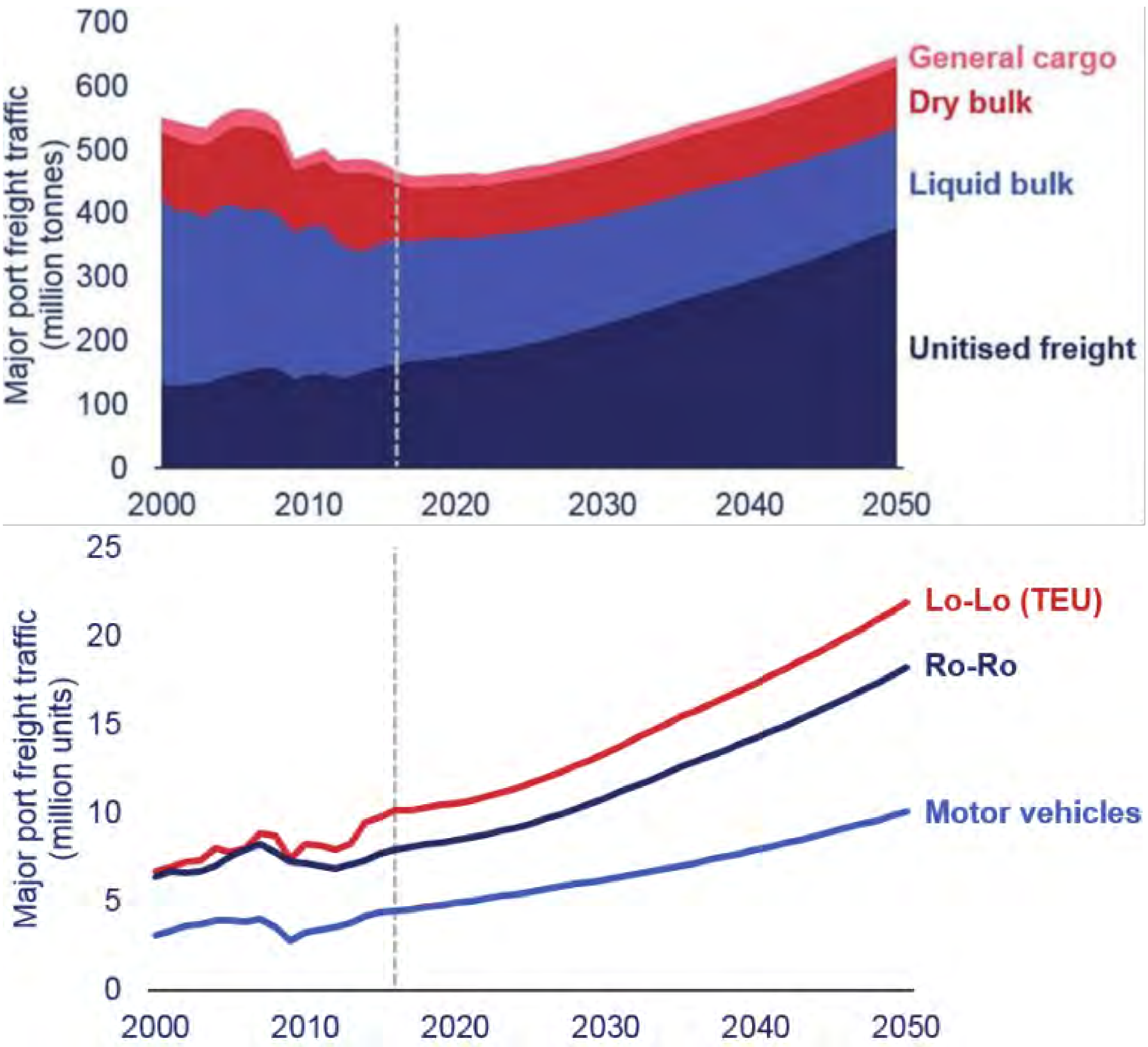

Figure 29: UK port freight Projections (DfT, 2019).

7.3 FERRIES

As presented within **Section 6.3.1.2**, NorthLink Ferries were the principal ferry operator recorded within the Study Area. Statistics for numbers of passengers and cars transported are published annually by NorthLink ferries. The number of passengers and cars transported per year over the last decade are shown in **Figure 30**. Overall, an increase in numbers was observed each year, with the exception of 2020 which saw a decrease in numbers due to the COVID-19 pandemic. Since the pandemic, the number of passengers and cars transported have recovered.

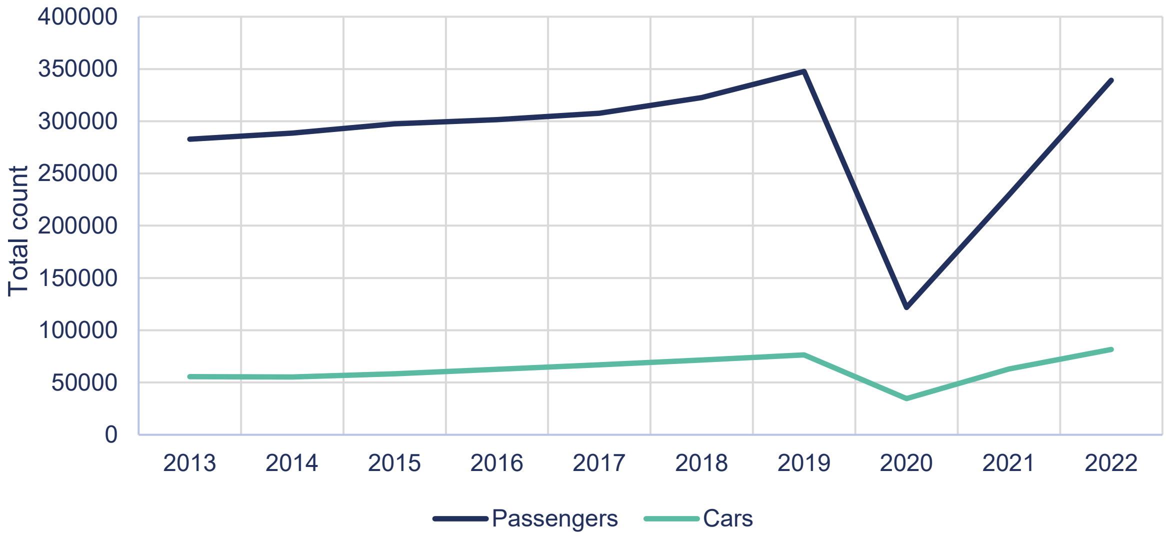

Figure 30:Passenger and Car Totals transported per Year (2013-2022) (source: northlinkferries.co.uk).

During Q2 2023, NorthLink Ferries increased the frequency of transits on their route between Scrabster and Stromness due to increased demand[1]. Although this ferry route does not impact the Spittal to Peterhead HVDC Study Area, an increase in demand for ferry services between Aberdeen and Lerwick/Kirkwall may necessitate and increase in the frequency of vessel transits on these routes which cross the Study Area.

7.4 OIL AND GAS

None of the oil and gas fields in proximity to the cable corridor are planned to be decommissioned in the near future. The UK Government continues to back the North Sea oil and gas industry, with new oil and gas licences to be granted in the UK[2]. The round expected to award over 100 licences in total (UK Government, 2023), with 27 licences already granted as of October 2023. The new licences mean that an increase in oil and gas activity is likely to be observed, particularly to and from Peterhead Port, a key oil and gas base.

7.5 FISHING ACTIVITY

Fishing within the North Sea is important for both the UK and neighbouring countries. There is limited information available for future fishing vessel activity on which reliable assumptions can be made. Commercial fisheries patterns change and fluctuate based on a range of natural and management-controlled factors, including market demand, market prices, stock abundance, management, environmental management, efficiency, technology and

[1] https://www.northlinkferries.co.uk/northlink-blog/may-2023-northlink-news-round-up/#:~:text=In%20order%20to%20accommodate%20any,Mainland%20and%20the%20Orkney%20Islands.

[2] https://www.gov.uk/government/news/hundreds-of-new-north-sea-oil-and-gas-licences-to-boost-british-energy-independence-and-grow-the-economy-31-july-2023

sustainability. Therefore, fishing fleets are unlikely to be impacted by quota transfers following the UK's withdrawal from the EU.

Uncertainty remains with respect to impacts of the UK's withdrawal from the Common Fisheries Policy and how activity may be affected within the Study Area. Under the new EU-UK Trade and Co-operation Agreement there is a five-year transition period, whereby 25% of the EU quote for British waters will be transferred to the UK fishing fleet by 2025.

Given the above information, fishing activity in the area is not anticipated to change significantly, with both local and foreign vessels continuing fishing activity in the area.

7.6 RECREATIONAL ACTIVITY

The RYA Water Sports Participation Survey conducted in 2019 found that the proportion of adults participating in boating activities has fluctuated between 6% and 8% between 2002 and 2018. Between 2008 and 2018, the proportion participating in yacht cruising, motor boating and power boating have remained consistent at 0.8%, 1.1% and 0.7% respectively. More recent data published in the 2021 Water Sports Participation Survey is significantly influenced by COVID with a significant variation between 2021 and 2022 due to national/local lockdowns.

Therefore, it is unlikely that there will be a significant change in the number of recreational users due to macro trends.

8. IMPACT ASSESSMENT

8.1 IMPACT IDENTIFICATION

Following consultation with stakeholders, analysis of data and a review of guidance, a total of 12 potential impacts of the Project on shipping and navigation were identified. These are presented in **Table 8**. Two impacts were scoped out of the assessment as based on the Project design and activities, there was not deemed to be a credible pathway for a significant impact on shipping and navigation.

Table 8: Impact Identification

ID	Potential Impact	Description	Scoped In / Out	Reason if Scoped Out
1	Potential impact to recognised sea lanes essential to international navigation	Access into major international sea lanes could be affected.	Out	There are no recognised sea lanes or routeing measures in proximity to the Project.
2	Potential impact to commercial vessel and ferry vessel routeing	Deviations to commercial vessel and ferry routeing increasing distances may be required, resulting in additional cost and time for the passage.	In	N/A
3	Potential impact to small craft routeing/activities	Activities and safety of small craft navigation such as cruising could be impacted/displaced.	In	N/A
4	Potential impact to military exercises	Military exercises in the vicinity of the cable route could be disrupted.	In	N/A
5	Potential impact on vessel to vessel collision risk	The risk of collision between navigating vessels, such as through the creation of choke points or increased vessel movements, could be increased.	In	N/A
6	Potential impact on allision risk	A risk to vessels of allision with a stationary structure forming part of the Project.	Out	The Project has no surface piercing structures that vessels could allide with.
7	Potential impact on emergency response/search and rescue	A vessels ability to respond to an emergency or search and rescue access for vessels or aircraft during an emergency could be inhibited.	In	N/A
8	Potential impact on oil and gas activities	The Project could disrupt or impede oil and gas activities or safety of installations or vessels.	In	N/A
9	Potential impact on	The Project infrastructure could cause electromagnetic interference	In	N/A

ID	Potential Impact	Description	Scoped In / Out	Reason if Scoped Out
	electromagnetic interference and vessel compasses	and interfere with vessel compasses.		
10	Potential impact to risk of snagging of anchors and fishing gear	The presence of subsea cables could pose a hazard to vessels using anchors or fishing gear	In	N/A
11	Potential impact on under keel clearance	The Project could reduce the navigable depth of water, increasing the risk of grounding.	In	N/A
12	Potential impact on access to ports and harbours	The Project could impede the access for vessels into ports and harbours.	In	N/A

8.2 POTENTIAL IMPACT TO COMMERCIAL VESSEL AND FERRY VESSEL ROUTEING

During the construction phase it is expected that commercial vessels and ferries may be required to reroute due to the presence of cable laying vessels and the requested 0.5 nm CPA to maintain a safe passing distance. Cable laying vessels are typically slow and limited in manoeuvrability during installation and are capable of laying cables at a rate of approximately 100 m to 200 m per hour, dependent on installation method and other factors such as ground conditions.

Two main ferry routes operated by NorthLink Ferries were observed within the vessel traffic analysis running between Aberdeen and Kirkwall/Lerwick (see **Section 6.3.1.2**). An average of approximately 3.9 ferry transits per day were recorded within the Study Area. Cargo vessels transited the Study Area more often with an average of nine transits per day, whilst tankers were less frequent with an average of three transits per day. The majority of passenger vessels, cargo vessels and tankers were recorded transiting to/from Orkney and Shetland utilising similar routes.

Whilst deviations may be required to route around cable laying activities, it is likely that these deviations will only be in the order of minutes given the low spatial footprint of these activities and the slow speed of the installation vessels, as passage planning can be carried out in advance to select the most efficient route around the works. Given the available searoom around the cable corridor, there is anticipated to be only a slight impact on commercial shipping routeing. Any impacts will be of a temporary nature during the cable laying / installation process.

It is not anticipated that adverse weather routes will be negatively affected by the cable installation due to the localised nature of the activities and infrequency of adverse weather routeing occurring. Gale-force winds, which might necessitate some form of adverse weather routeing, occur on fewer than 10% of days annually (see **Section 5.2.1**) but no meaningful adverse weather routeing patterns were identified from the AIS data. Furthermore, it is unlikely that cable laying will be undertaken during adverse weather conditions. There is adequate available searoom such that safe vessel routeing, even in adverse weather conditions, is achievable.

The impacts during decommissioning activities are likely to be similar to those during construction. Given the nature of the cable on the seabed and depth of water in proximity to commercial shipping routes, there are no anticipated changes to commercial vessel and ferry vessel routeing post installation of the cable. Commercial vessels and ferries will only be impacted where the cable requires maintenance or repair. Such activities will be carried out at isolated points along the cable that are affected, meaning that disruptions will be short term and localised only.

8.3 POTENTIAL IMPACT TO SMALL CRAFT ROUTEING/ACTIVITIES

During the installation of the cable it is expected that small craft may be required to alter their route due to the presence of cable laying vessels and associated CPA distances requested to maintain a safe passing distance. On average, 3.9 recreational vessel transits were recorded per day within the Study Area. The main areas of recreational activity were observed close to the shore around the cable landfalls, cruising along the Scottish coastline (see **Section 6.3.1.3**). Nearby recreational clubs include the West Wick Yacht Club and Peterhead Sailing Club. The installation of marine cabling will disrupt recreational activity within coastal waters, particularly if the installation works are carried out during the summer months when weather is more favourable for sailing. Vessels associated with HDD drilling at the landfalls also have potential to disrupt coastal recreational activities. Embedded mitigations such as circulation of information (e.g. NtMs) as well as the presence of guard vessels will notify sea users of construction works. However, it is noted that recreational vessels may be less aware of the construction works than larger, commercial vessels. Therefore, it is recommended that relevant local marinas are also notified of all installation works.

The impacts during decommissioning activities are likely to be similar to those during construction. There are no anticipated changes in small craft routeing post-installation of the Spittal to Peterhead HVDC cable, with the exception of during maintenance activities which will be temporary and localised to the site needing repaired.

8.4 POTENTIAL IMPACT TO MILITARY EXERCISES

Two PEXAs are intersected by the Spittal to Peterhead cable corridor, both of which are operated in accordance with a CRP where exercises and firing only take place when the area is considered to be clear of all shipping. Therefore, no firing is expected to be undertaken while there is cable installation work ongoing within the area. Assuming embedded mitigation measures (e.g. circulation of information) are in place preceding any installation works, it is likely the installation work timetable will be taken into consideration if any exercises were scheduled to take place within the area.

The impacts during decommissioning activities are likely to be similar to those during construction. There are no anticipated impacts on military exercises post-installation of the Spittal to Peterhead HVDC cable, with the exception of during maintenance activities.

8.5 POTENTIAL IMPACT ON VESSEL TO VESSEL COLLISION RISK

There is an increased collision risk created during the construction phase for all passing traffic due to the presence of installation vessels. This may be either due to the direct risk of a passing vessel colliding with the cable installation vessels or could arise due to vessels altering their route due to the works and transiting in closer proximity to other passing vessels.

Cable layers are slow moving and restricted in manoeuvrability during installation activities meaning these vessels may have limited capability in taking avoidance action from a passing vessel on a collision course, should such a situation arise. Due to their smaller size and manoeuvrability in comparison, guard vessels are considered to pose a lesser risk of collision than that of the cable laying vessels. Given the volume of traffic, distance between the cable corrior and the existing navigational features in proximity, it is considered that there is adequate searoom should a passing vessel be required to undertake collision avoidance actions.

There is the potential that the cable layer would cause deviation of vessel routes which increases collision risk between passing vessels. Collision risk for passing vessels with other passing vessels is greater in areas with a higher density of vessel activity. The density heat maps in **Section 6.2.1** showed that the area with highest vessel density was in proximity to Peterhead Port. As with the risk of a passing vessel colliding with an installation vessel, it is considered that there is adequate searoom should a vessel be required to undertake collision avoidance actions.

It is expected that the majority of vessels will be aware of the cable installation works prior to encountering the Project vessels through embedded mitigation measures, which include circulation of information via NtMs and the appropriate lighting and marking of installation vessels, making them highly visible. Installation vessels will be compliant with maritime regulations and will broadcast their status accurately through AIS to reflect the nature of activities being undertaken. In addition to the embedded mitigations, it is noted that adequate searoom is available along the cable corridor should collision avoidance action be required.

The impacts during decommissioning activities are likely to be similar to those during construction. There are no anticipated changes to vessel routeing post-installation of the Spittal to Peterhead HVDC cable, hence there is no expected impact on vessel to vessel collision risk.

8.6 POTENTIAL IMPACT ON EMERGENCY RESPONSE/SEARCH AND RESCUE

During the installation phase, the presence of the cable layer and guard vessels has the potential to inhibit search and rescue operations should an incident occur in close proximity to installation activities and the requested minimum CPA for passing vessels. There is also potential for an increased need for emergency response should an accident occur aboard the cable layer or ancillary vessels. The closest RNLI bases are located at Wick, Fraserburgh and Peterhead. The nearest search and rescue helicopter base is located at Inverness. The maritime incidents from the RNLI and MAIB databases are presented in **Section 6.4**. Based on the review of incidents, it can be seen that the proposed cable corridor its immediate vicinity has experienced a relatively low rate of accidents in recent years, especially over 5 nm from the coast and landfall options. The most common incident type within 5 nm of the cable corridor was mechanical/damage.

The embedded risk controls include NtMs and broadcast warnings will be promulgated in advance of any proposed works. The notices will include the time and location of any work being carried out, and emergency event procedures. Such procedures will forewarn recreational users who may not be as aware as commercial operators to avoid certain areas during parts of the installation process. An ERCOP will be produced to safely manage the operations of the cable installation. It is possible that in the event of a nearby maritime incident, an installation vessel or guard vessel may be the first vessel to respond.

The impacts during decommissioning activities are likely to be similar to those during construction. It is not anticipated that there will be any effects on emergency response post-installation of the cable.

8.7 POTENTIAL IMPACT ON OIL AND GAS ACTIVITIES

During installation, the presence of cable laying vessels and associated minimum requested CPAs for passing vessels could impact nearby oil and gas activities. The nearest oil or gas field to the cable corridor is Captain Oil Field located 12 nm north east of the cable corridor, meaning that the oil and gas facilities themselves are unlikely to be impacted such as on helicopter access or radar early warning systems. Oil and gas vessels would regularly cross the cable corridor, particularly in proximity to Peterhead Port (see **Section 6.3.1.5**). These vessels may be required to adjust their route due to the cable installation activities, however these deviations are expected to be in the order of minutes. The works are of a temporary nature and will only occupy a small area at a time. Embedded mitigation measures include the circulation of information via NtMs, meaning that vessel operators can carry out effective passage planning taking the works into consideration.

There are no anticipated impacts to oil and gas activities post-installation of the Spittal to Peterhead HVDC cable. It is not anticipated that there will be any effects on oil and gas activities post-installation of the cable.

8.8 POTENTIAL IMPACT ON ELECTROMAGNETIC INTERFERENCE AND VESSEL COMPASSES

The static magnetic fields created by HVDC cables can interact with the earth's natural magnetic field, which can result in interference with magnetic navigational equipment, particularly in shallow waters. Per consultation, the MCA would be willing to accept a three-degree deviation for 95% of the cable route. For the remaining 5% of the cable route no more than five-degree deviation in water depths of 5m and deeper will be attained.

The vast majority of commercial traffic uses Global Positioning System and non-magnetic gyrocompasses as the primary means of navigation, which are unaffected by Electromagnetic Interference. Therefore, it is considered unlikely that any created interference will have a significant impact on vessel navigation. Although this is the case, magnetic compasses are still as an essential means of navigation in the event of power loss or as a secondary source, and some smaller craft (fishing or recreational) may rely on it as their only means of navigation, especially in bad visibility or at night. Factors affecting the magnitude of deviation include water depth and burial depth.

The Spittal to Peterhead HVDC cable scheme is to be buried where possible, which will reduce the effects of electromagnetic interference. Where burial is not feasible external protection will be used to protect the cable, which will also contribute to counteracting such effects. Electromagnetic effects can also be minimised by cable design and alignment, which are included within the embedded mitigations (see **Section 4.3**). Furthermore, any residual effect will be highly localised and temporary for vessels crossing the cable route. Therefore, it is not considered to be a significant impact on navigation safety. The cable scheme is not anticipated to have electromagnetic effects during construction during which the cable will not be transmitting power.

8.9 POTENTIAL IMPACT TO RISK OF SNAGGING OF ANCHORS AND FISHING GEAR

Subsea cables introduce a risk of snagging, either by vessel anchors or fishing gear.

There is a risk that an anchored vessel will lose its holding ground and subsequently drag anchor over the cable. There are no designated or customary anchorages in the shipping and navigation Study Area. Analysis of vessels moving at speeds less than 0.3 knots is contained within **Section 6.3.2**, which showed that the few vessels moving at such speeds were mainly present within Sinclair’s Bay and east of Wick. Vessels were also recorded at such speeds outside Peterhead Port but there is substantial separation between these activities and the cable corridor. As previously noted, it is likely that the activity within Sinclair’s Bay is associated with a pipeline launch at the Subsea7 facility but such operations will be carefully controlled and operators will be familiar with the position of the cable. Therefore, it is assessed that the risk of anchor dragging across the cable is low.

Commercial ships may choose to deploy an anchor in an emergency (e.g. loss of power), and whilst unlikely, this could result in cable snagging if the anchor penetrates deep enough. This is more likely to occur in the shallower, coastal waters where there is a higher risk of grounding and a greater need for immediate action. In addition, on rare occasions, accidental deployment of an anchor has occurred due to poor stowage or equipment failure which has damaged subsea cables. A CBRA will be carried out, including anchor penetration studies, and will inform necessary target depths to protect from vessel anchors that may be deployed within the Study Area. In all cases, it is unlikely that the cable would pose a risk to the vessel and the most likely outcome would be cable damage.

Fishing by static and mobile gears was observed throughout the shipping and navigation Study Area (see **Section 6.3.1.4**). Within the VMS data, 93% of vessels recorded used demersal gears, which have the highest potential to interact with subsea cables. It is noted that bottom trawlers and dredgers have the potential to penetrate into the seabed and that these penetration depths of fishing gear tend to be small compared to vessel anchors. The subsea cables will be marked on nautical charts to ensure fishermen are informed of their presence. The CBRA will also consider fishing activity, and cable burial will mitigate the risk of fishing gear snagging the cable. Procedures will be adopted for recovery of gear following any snagging events were they to occur.

During operation and maintenance, the subsea cables will be buried, or protected where burial is not feasible. A CBRA will be undertaken to determine the appropriate level of protection and the cables periodically inspected once installed. Cable snagging is more likely where cables are exposed during the installation process, however the embedded mitigation measures include the use of guard vessels and circulation of information via NtMs to make vessels aware of installation works (see **Section 4.3**).

8.10 POTENTIAL IMPACT ON UNDER KEEL CLEARANCE

The Project could increase the risk of grounding by reducing the depth of water through the introduction of subsea cable protection post-installation. A reduction in under keel clearance primarily affects nearshore areas as the reduction in clearance is not as critical within deeper waters. Approximately 2.1 km of the cable corridor lies within waters less than 10 m in depth. The analysis of vessel draught within **Section 6.3.3** and **Section 6.3.4** showed that vessels with deeper draughts tend to transit further offshore, and that vessels with draughts deeper than 8 m rarely transited within the 20 m water depth contour. The risk of vessels grounding will be mitigated by burying the cable where feasible. Where burial is not feasible, the level of protection required will be informed by the CBRA. Other mitigations include charting of the cable and NtMs.

The embedded mitigations (see **Section 4.3**) include compliance with MGN 654, which states that:

> "*Any consented cable protection works must ensure existing and future safe navigation is not compromised. Consequently, the MCA would be willing to accept up to 5% reduction in surrounding charted depths referenced to Chart Datum, unless developers are able to demonstrate that any identified risks to any vessel type are satisfactorily mitigated.*"

8.11 POTENTIAL IMPACT ON ACCESS TO PORTS AND HARBOURS

There may be a disruption to port arrivals/departures due to the presence of installation vessels operating in close proximity. Ports and harbours in proximity to the Project are Peterhead Port, Wick Harbour and Fraserburgh Harbour, located 5.5 nm, 5.0 nm and 8.3 nm from the cable corridor respectively. The approaches to these ports and harbours are unobstructed by the cable activities. Installation of the cable is a temporary activity and the impact is expected to be minimal when taking into account the embedded mitigation measures, which include liaison with ports/harbours and Notice to Mariners (see **Section 4.3**).

The impacts during decommissioning activities are likely to be similar to those during construction. There are no anticipated impacts to ports and harbours post-installation of the Spittal to Peterhead HVDC cable, hence there is no expected impact on vessel to vessel collision risk.

9. NAVIGATION RISK ASSESSMENT

9.1 INTRODUCTION

The NRA follows the IMO's FSA, with consideration given to MGN 654. MGN 654 requires that the NRA contains a hazard log of shipping and navigation hazards caused or changed by the Project which includes an assessment of risk with embedded mitigation measures in place (see **Section 4.3**).

The development of the NRA, hazard log and associated risk scoring process is based on the following data, analysis, modelling and expertise of the Project team:

- Project description (see **Section 4**).
- Overview of the marine environment (see **Section 5**).
- Description of existing maritime activities (see **Section 6**).
- Future traffic baseline (see **Section 6.4**).

In addition to the above, a key component of the NRA is engagement with regulators and local stakeholders to confirm baseline shipping and navigation characteristics and elicit judgement on the levels of navigation risk associated with the proposed Project.

The risk assessment methodology employed for the Project is the IALA SIRA process, which follows both the MCA MGN 654 guidance and is also endorsed by the IMO via SN.1/Circ.296 in December 2010. The following sections outline:

- The overarching methodology of the risk assessment.
- The process of hazard identification.
- Risk control measures (applied or designed in).
- Results of the assessment of risk with the applied mitigations in place.
- Possible additional mitigation measures if required to reduce risk to acceptable levels.

The risk assessment Project methodology follows the FSA and is based on the principles set out in IALA Guidelines 1018 and 1138 which are endorsed by the IMO in SN.1/Circ.296 and the IMO's FSA. Navigation hazards are identified through, consultation and data analysis, before being assessed in terms of their likelihood and consequence. A risk matrix is then utilised to identify the significance of each hazard with possible additional risk controls identified based on the resultant risk score to reduce the risks to acceptable levels.

A description of the FSA process is as follows.

- **FSA Step 1: HAZID:** The Project team identifies navigation hazards related to defined and agreed assessment parameters, such as geographic areas, marine operation, or vessel type. This is achieved using a suite of quantitative (e.g. statistical vessel traffic analysis) and qualitative (e.g. consultation with stakeholders) techniques which enables an evidentially robust identification of navigation hazards.

- **FSA Step 2: Risk Analysis:** A detailed investigation of the causes, including the initiating events, and consequences of the hazards identified in Step 1 is undertaken. This is completed using a risk matrix, and enables ranking of hazards based on navigation risk, and a determination of hazard acceptability tolerability. This process allows attention to be focused upon higher-risk hazards enabling identification and evaluation of factors which influence the level of risk.
- **FSA Step 3 and 4: Risk Controls:** The identification of existing risk controls measures (which are assumed to be included in the assessment of navigation risk), and the identification of possible additional risk controls, not currently in place for the assessment parameters is undertaken. Possible additional risk control measures are identified based on prioritising mitigation of higher-risk hazards. During this stage risk control measures may be grouped into a defined and thought-out risk mitigation strategy.
- **FSA Step 5: Findings:** The assessment findings are developed and documented into a technical report and then presented to the relevant decision makers in an auditable and traceable manner. The findings are based upon a comparison and a ranking of all hazards and their underlying causes; the comparison and ranking of possible additional risk control options as a function of associated costs and benefits; and the identification of those options which mitigate hazards to acceptable or ALARP.

9.2 SCORING CRITERIA

Having identified all relevant impacts and hazards as a result of the Spittal to Peterhead HVDC cable system, a hazard log is constructed as described in MGN 654 Annex 1. Whilst there is no generally accepted standard for risk matrices, the matrix outlined in this section is proposed as suitable for the Project as it meets IMO and IALA guidance and is consistent with industry best practice.

Each hazard is scored based on its predicted frequency of occurrence (**Table 9**) and consequence (**Table 10**) for two scenarios, the ‘most likely’ and ‘worst credible’. Severity of consequence with each hazard under both scenarios is considered in terms of damage to:

- People – hazards may result in injuries or fatalities.
- Property – hazards may result in damage or loss of vessels or structures.
- Environment – hazards may result in environmental pollution such as oil spills.

- Commercial and reputation – hazards may result in loss of economic output, impact on vessel routes, interruption of supply/generation capacity and adverse media coverage.

This NRA assumes that vessels will be compliant with international conventions (e.g. COLREGS and STCW), and National regulations and Guidance (e.g. UK Merchant Shipping Act 1995, and MCA MGNs).

Table 9: Frequency of Occurrence Criteria

Rank	Title	Description	Definition
1	Remote	Remote probability of occurrence at Project site and few examples in wider industry.	<1 occurrence per 10,000 years
2	Extremely unlikely	Extremely unlikely to occur at Project site and has rarely occurred in wider industry.	1 per 100 – 10,000 years
3	Unlikely	Unlikely to occur at Project site during Project lifecycle and has occurred at other subsea cables.	1 per 10 – 100 years
4	Reasonably probable	May occur once or more during Project lifetime.	1 per 1 – 10 years
5	Frequent	Likely to occur multiple times during Project lifetime.	Yearly

Table 10: Severity of Consequence Categories and Criteria

Rank	Description	People	Property	Environment	Definition
1	Negligible	Minor injury	Less than £10,000	Minor spill no assistance required.	Minimal impact on activities. No cable damage.
2	Minor	Multiple minor injuries	£10,000-£100,000	Tier 1 local assistance required	Local negative publicity. Short term loss of revenue or interruption of services to ports/OWFs/oil and gas/ferries and other marine users. Cable inspection required.
3	Moderate	Multiple major injuries	£100,000-£1million	Tier 2 limited external assistance required	Widespread negative publicity. Temporary suspension of activities to ports/OWFs/oil and gas/ferries and other marine users. Cable damage requiring repairs.
4	Serious	Fatality	£1million-£10million	Tier 2 regional assistance required	National negative publicity. Prolonged closure or restrictions to ports/OWFs/

Rank	Description	People	Property	Environment	Definition
					oil and gas/ferries and other marine users. Significant cable damage requiring repair.
5	Major	Multiple fatalities	>£10million	Tier 3 national/international assistance required	International negative publicity. Serious and long-term disruption to ports/OWFs/oil and gas/ferries and other marine users. Cable out of service.

9.3 RISK MATRIX

The combination of the frequency and consequence scores for each scenario are then combined to produce an overall risk score, which is used to assign hazard risk rating in the Project risk matrix (**Table 11**). The methodology utilised was discussed with stakeholders during consultation and is consistent with other NRAs submitted for other offshore developments in the UK.

The assessment of risk is calculated eight times for each identified hazard; four times for the "realistic most likely" occurrence for each consequence category and four times for the "realistic worst credible" outcome for each consequence category. An overall risk score is then calculated using an averaging function weighted to the highest risk score for the "realistic most likely" and the highest risk score for the "realistic worst credible". The weighted averaging calculation is an average of:

- average of all the "realistic most likely" risk scores.
- average of all the "realistic worst credible" risk scores.
- highest individual score from the "realistic most likely" scores.
- highest individual score from the "realistic worst credible" scores.

The tolerability of these hazard risk scores with regards to significance and acceptability with or without further action are shown in **Table 12**.

MGN 654 Annex 1 notes that "There is no generally accepted standard for a risk matrix therefore developers the Applicants will be expected to define the following as appropriate":

- likelihood/frequency of incident scenarios.
- severity/consequence of incident scenarios.
- risk matrix.
- tolerability matrix scores.

The assessment criteria, including frequency and consequence bandings, are consistent with previous NRAs submitted and approved by the MCA. Furthermore, reference has been made to Intolerable/ALARP/Negligible bandings defined in IMO FSA studies, such as the FSA for Roll-on Roll-off Passenger (RoPax) Vessels (MSC 85 INF3). For example, a fatality every 10 years, or multiple fatalities every 100 years within the RoPax FSA was defined as the threshold between Unacceptable and ALARP, this translates to a score between 12-16 and 10-15 respectively on the risk matrix. Similarly, the same study determined that a fatality every 1,000 years, or multiple fatalities every 10,000 years was defined as the threshold between ALARP and Negligible, this translates to a score between 4-8 and 5-10 respectively on the risk matrix. The risk matrix presented in **Table 11** is therefore consistent with the FSA for RoPax Vessels (MSC 85 INF3).

Hazards are then defined as either Broadly Acceptable, with existing mitigation, or Unacceptable. MGN 654 Annex 1 states that where risks are scored as Medium Risk, “Further risk control options must be considered to the point where further risk control is grossly disproportionate (i.e. the ALARP principle) and an ALARP justification and declaration made.” Therefore, hazards scored as Medium Risk can only be Tolerable if ALARP is met.

Table 11: Risk Matrix

Severity of Consequences	**Major**	**5**	5	10	15	20	25
	Serious	**4**	4	8	12	16	20
	Moderate	**3**	3	6	9	12	15
	Minor	**2**	2	4	6	8	10
	Negligible	**1**	1	2	3	4	5
			1	**2**	**3**	**4**	**5**
			Remote	**Extremely unlikely**	**Unlikely**	**Reasonably probable**	**Frequent**
			Likelihood of occurrence				

Table 12: Tolerability and Risk Ratings

Hazard Score	Tolerability	Description
Negligible risk (< 4)	Broadly Acceptable	Generally regarded as not significant and adequately mitigated. Additional risk reduction should be implemented if reasonably practicable and proportionate.
Low risk (≥ 4 and < 6)		
Medium risk (≥ 6 and < 12)	Tolerable if ALARP	Generally regarded as within a zone where the risk may be tolerable in consideration of the Project. Requirement to properly assess risks, regularly review and implement risk controls to maintain risks to within ALARP where possible.
High risk (≥ 12 and < 20)	Unacceptable	Generally regarded as significant and unacceptable for Project to proceed without further risk controls.
Extreme risk (≥ 20)		

9.4 HAZARD IDENTIFICATION

An NRA should consider all identified hazards of the Project on shipping and navigation receptors. In developing the hazard log, consideration was given to Project phases, areas, hazard types and vessel types.

Nine hazard types were assessed, of which six were scoped out. **Table 13** presents all hazards identified, whether they were scoped in/out, and if scoped out, an explanation.

Table 13: Identified Hazards

Hazard Type	Definition	Scoped In	Explanation
Snagging	Vessel fishing gear or anchor snags a subsurface hazard (e.g., export cable).	Yes	N/A
Grounding	Vessel makes contact with the seabed/shoreline or underwater assets.	Yes	N/A
Collision	Collision between two vessels underway (also includes striking of an anchored or moored vessel).	Yes	N/A
Allision	Vessel makes contact with Fixed or Floating Object (e.g., WTGs/substation/O&G platform, etc.)	No	The Project PDE does not contain any surface piercing structures which vessels may allide with.
Foundering or capsize	Vessel sinks or grounds caused by loss of stability, buoyancy or water tight integrity (e.g., may be caused by severe adverse weather or mechanical failure).	No	The presence of subsea cables is not deemed to have any impact on the likeliness that a vessel will founder or capsize, as this is typically caused by a previous incident (for example machinery failure or a snagging).
Personnel	Incident to personnel associated with navigation related activities (e.g., pilot / crew / passenger boarding, mooring a vessel, tender operations, etc_.	No	The presence of subsea cables is not deemed to have any impact on the probability of a personal injury to personnel. Health and safety requirements onboard the installation vessels are not considered part of the NRA and are considered by the vessel operators. Pilot boarding and port operations do not occur in close proximity to the Project.
Wake wash	Vessel wave wake wash effect on other vessels.	No	The presence of subsea cables is not deemed to increase the likeliness of wake wash effect as this is directly caused by vessels themselves.

Hazard Type	Definition	Scoped In	Explanation
Fire/Explosion	Fire or explosion aboard a vessel.	No	The presence of subsea cables is not deemed to affect the risk of fire occurring on board a vessel.
Vessel Motions	Project puts vessels on routes which exposes them to increased risks associated with vessel motions such as cargo shift and injuries.	No	The presence of subsea cables is not deemed to impact vessel motions.

The vessel types identified are shown in **Table 14**.

Three areas were identified to assist with the assessment of the identified hazards. These are:

- Vicinity of the north landfall,
- Vicinity of the south landfall,
- Remainder of the cable corridor.

The NRA considers the construction (C), operation and maintenance (O), and decommissioning (D) phases of the Project. To reflect the similarity of the impacts during construction and decommissioning, these two categories were combined in all cases. Similarly, where hazards were deemed to have similar risk scores between construction and operation and maintenance, they were combined into a single hazard.

Table 14: NRA Vessel Types

ID	Description	Definition
1	Ferry / Passenger Vessel	Passenger Ferry Freight / RoRo Ferry Cruise Ship
2	Cargo Vessel / Tanker	Cargo (Container, Bulk, Reefer, General etc.) Tanker (Oil, Chemical, Gas etc.)
3	Tug / Service Vessels	Tugs Offshore Supply Vessels Standby Rescue Vessels Pilot Boats Wind Farm CTVs Other Service Vessels
4	Fishing	Trawlers Fishing Boats
5	Recreational	Sailing Yachts Pleasure Boats
6	Large Project Vessels	Cable Lay Vessel
7	Small Project Vessels	Guard Vessels

Based on the Project phases, vessel types, hazard types and hazard areas, a total of 16 hazards were identified.

9.5 NAVIGATION RISK ASSESSMENT RESULTS

9.5.1 Risk Assessment Summary

The results of the NRA, based on the approach described above shows that in total:

- No hazards were assessed as High Risk – Unacceptable.
- One hazard was assessed as Medium Risk – Tolerable (if ALARP).
- 15 hazards were assessed as Low Risk – Broadly Acceptable.

The full hazard log is available in **Appendix A**. **Table 15** describes the top 10 hazards identified in the NRA.

Table 15: Top 10 Hazards across All Identified Risks

ID	Rank	Phase	Area	Hazard title	Score	Rating
1	1	C/O/D	1/2/3	Snagging - Fishing	6.4	Medium Risk - Tolerable (if ALARP)
3	2	C/O/D	1/2/3	Snagging - Cargo/Tanker or Ferry/Passenger	6.0	Low Risk - Broadly Acceptable
13	2	C/D	1/2/3	Collision - Large Project Vessel in collision with (ICW). Ferry/Passenger	6.0	Low Risk - Broadly Acceptable
12	4	C/D	1/2/3	Collision - Large Project Vessel ICW. Cargo/Tanker	5.8	Low Risk - Broadly Acceptable
8	5	C/D	1/2/3	Collision - Ferry/Passenger ICW. Cargo/Tanker or Ferry/Passenger	5.3	Low Risk - Broadly Acceptable
9	6	C/D	1/2/3	Collision - Cargo/Tanker ICW. Cargo/Tanker	5.1	Low Risk - Broadly Acceptable
10	6	C/D	1/2/3	Collision - Small Craft ICW. Ferry/Passenger or Cargo/Tanker	5.1	Low Risk - Broadly Acceptable
14	6	C/D	1/2/3	Collision - Small Craft ICW. Large Project Vessel	5.1	Low Risk - Broadly Acceptable
16	6	C/D	1/2/3	Collision - Small Project Vessel ICW. Ferry/Passenger or Cargo/Tanker	5.1	Low Risk - Broadly Acceptable

ID	Rank	Phase	Area	Hazard title	Score	Rating
11	10	C/D	1/2/3	Collision - Small Craft ICW. Small Craft	4.8	Low Risk - Broadly Acceptable

9.5.2 Risk of collision

Table 16 presents the nine collision hazards identified and their associated hazards scores and ratings.

Table 16: Collision Hazards, Scores and Ratings

ID	Rank	Phase	Area	Hazard title	Score	Rating
13	2	C/D	1/2/3	Collision - Large Project Vessel ICW. Ferry/Passenger	6.0	Low Risk - Broadly Acceptable
12	4	C/D	1/2/3	Collision - Large Project Vessel ICW. Cargo/Tanker	5.8	Low Risk - Broadly Acceptable
8	5	C/D	1/2/3	Collision - Ferry/Passenger ICW. Cargo/Tanker or Ferry/Passenger	5.3	Low Risk - Broadly Acceptable
9	6	C/D	1/2/3	Collision - Cargo/Tanker ICW. Cargo/Tanker	5.1	Low Risk - Broadly Acceptable
10	6	C/D	1/2/3	Collision - Small Craft ICW. Ferry/Passenger or Cargo/Tanker	5.1	Low Risk - Broadly Acceptable
14	6	C/D	1/2/3	Collision - Small Craft ICW. Large Project Vessel	5.1	Low Risk - Broadly Acceptable
16	6	C/D	1/2/3	Collision - Small Project Vessel ICW. Ferry/Passenger or Cargo/Tanker	5.1	Low Risk - Broadly Acceptable
11	10	C/D	1/2/3	Collision - Small Craft ICW. Small Craft	4.8	Low Risk - Broadly Acceptable
15	12	C/D	1/2/3	Collision - Small Craft ICW. Small Project Vessel	4.4	Low Risk - Broadly Acceptable

The outputs for all nine collision hazards were Low Risk – Broadly Acceptable ratings.

The highest scoring collision hazard assessed relates to a large Project vessel in a collision with a ferry or passenger vessel. The realistic most likely scenario of such an occurrence would result in multiple minor injuries, moderate damage to vessels, minor pollution (Tier 1), national negative publicity and may result in a vessel requiring dry dock. In the worst case scenario, multiple fatalities, constructive loss, major pollution (Tier 3) and international negative publicity were identified as the realistic scenario. The frequency of a collision between a large Project vessel and a ferry or passenger vessel was deemed extremely unlikely in the most likely scenario and remote (<1 in 1000 years) in the worst case scenario. The frequencies assigned take into account the embedded mitigation measures, which include the use of guard vessels, compliance with maritime regulation and circulation of information via NtMs. Therefore, it is anticipated that vessels will be well informed of installation works. Although the frequency was ranked low, the consequences were determined to be more severe than the other permutations, mainly driven by the potential for fatality and national adverse publicity.

The second highest scoring collision hazard was for a collision between a large Project vessel and a cargo vessel or tanker. The scores assigned for the consequences to property, environment and business were the same as for a collision between a large Project vessel and a ferry or passenger vessel, with the same frequency of the hazard occurring. The lower overall hazard score for the collision between a large Project vessel and a cargo vessel or tanker is driven by the lesser consequence to people as opposed to the scenario with the ferry or passenger vessel.

The highest ranking collision hazard between third-party vessels was the scenario involving a collision between a ferry or passenger vessel with either a cargo vessel or tanker or another ferry or passenger vessel. The realistic most likely scenario for the hazard is multiple major injuries, moderate vessel damage, minor pollution (Tier 1), widespread negative publicity and short-term interruption to ferry services. The realistic worst credible outcome is multiple fatalities, constructive loss, serious pollution (Tier 2), international negative publicity and the ferry being out of service. The frequency for the realistic most likely scenario was ranked as extremely unlikely as it is extremely unlikely to occur at the Project site and has rarely occurred in wider industry, whilst the frequency assigned for the realistic worst credible outcome was remote.

9.5.3 Risk of snagging

Table 17 presents the four snagging hazards identified and their associated hazards scores and ratings.

Table 17: Snagging Hazards, Scores and Ratings

ID	Rank	Phase	Area	Hazard title	Score	Rating
1	1	C/O/D	1/2/3	Snagging - Fishing	6.4	Medium Risk - Tolerable (if ALARP)
3	2	C/O/D	1/2/3	Snagging - Cargo/Tanker or Ferry/Passenger	6.0	Low Risk - Broadly Acceptable
2	15	C/O/D	1/2/3	Snagging - Recreational or Tug/Service or Small Project Vessels	3.6	Negligible Risk - Broadly Acceptable

ID	Rank	Phase	Area	Hazard title	Score	Rating
4	16	C/D	1/2/3	Snagging - Large Project Vessel	3.5	Negligible Risk - Broadly Acceptable

The outputs for one of the snagging hazards gave a rating of Medium Risk – Tolerable (if ALARP), whilst the other three produced a rating of Low Risk – Broadly Acceptable.

The highest ranking of the snagging hazards was the snagging risk to fishing vessels either through the use of anchors or fishing gear. The outcome of the realistic most likely scenario would be minor injuries, minor damage to gear, no pollution, cable inspection and local negative publicity, whilst the realistic worst credible outcome would be a single fatality, loss of gear/craft, minor pollution (Tier 1), significant cable damage and national negative publicity. The frequency of a most likely outcome was deemed to be unlikely to occur at the Project site, although has reportedly occurred at other subsea cables. The worst case scenario was assigned a frequency of extremely unlikely to reflect that this has rarely occurred in wider industry.

The second highest ranked snagging hazard was for cargo vessels, tankers, passenger vessels or ferries snagging an anchor on the cable. Whilst the most realistic outcome results in less damage to the vessel than for fishing vessels, the cable damage itself will be more severe due to the increased size of the large commercial vessel anchors. The worst case scenario has potential to result in the loss of the vessel’s anchor and the cable being out of service, requiring repairs.

The two lower scoring snagging hazards relate to either a large Project vessel or a small craft other than a fishing vessel snagging their anchor on the cable. Although both worst case scenarios had the potential for a single fatality, the frequencies assigned for these outcomes were ranked lower than for the other two snagging hazards, attributing to the lower score outcome.

9.5.4 Risk of grounding

Table 18 presents the three grounding hazards identified and their associated hazards scores and ratings.

Table 18: Grounding Hazards, Scores and Ratings

ID	Rank	Phase	Area	Hazard title	Score	Rating
6	11	C/D	1/2	Grounding - Large Project Vessel	4.7	Low Risk - Broadly Acceptable
7	13	C/O/D	1/2	Grounding - Ferry/Passenger or Cargo/Tanker	3.8	Negligible Risk - Broadly Acceptable
5	14	C/O/D	1/2	Grounding - Recreational or Fishing or Tug/Service or Small Project Vessel	3.8	Negligible Risk - Broadly Acceptable

All three grounding hazards were ranked as Low Risk – Broadly Acceptable. The highest ranked relates to the grounding of a large Project vessel. The realistic most likely scenario for such an event would be multiple minor injuries, minor damage, no pollution, local negative publicity and a need for the cable to be inspected. In the worst case, the realistic most credible outcome is a single fatality, significant damage to the vessel, minor pollution (Tier 1) and significant cable damage. The grounding of a large Project vessel would have a higher potential for negative publicity than the other two scenarios. The frequency assigned for all grounding hazards was Extremely Unlikely, based on the fact that it is not likely to happen at the cable site and has rarely occurred in wider industry.

10. CUMULATIVE ASSESSMENT

10.1 LIST OF CUMULATIVE DEVELOPMENTS

Table 19 refers to proposed developments in proximity to the Project. Following this, **Figure 31** provides an illustrative overview of the cumulative Projects.

Table 19: List of Key Cumulative Projects in proximity to Cable Corridor.

Development Name	Distance from Cable Corridor
Caledonia OWF	1.2 nm
Broadshore OWF	5.0 nm
Stromar OWF	10.0 nm
Sinclair OWF	10.5 nm
Scaraben OWF	12.3 nm
Buchan OWF	23.7 nm

10.2 CUMULATIVE ASSESSMENT

A number of proposed OWFs are located in proximity to the Spittal to Peterhead cable corridor, the closest being the Caledonia OWF which is planned to be operational in 2030. The proposed Buchan Offshore Wind Project export cable corridor crosses the cable corridor close to the south landfall (Buchan Offshore Wind, 2023). Given the number of proposed wind farms in proximity, there is potential for other export cables to interact with the Spittal to Peterhead cable.

The construction phases of one or more of the proposed wind farm developments could have a temporal overlap with that of the Spittal to Peterhead HVDC cable. Levels of traffic are expected to increase during this time; and there will be a potential need for commercial route deviations. It is not anticipated that these deviations will make services unviable, however displacement of vessel traffic has potential to increase the risk of vessel to vessel collision where commercial vessels are concentrated. Similarly, during concurrent construction of wind farms and installation of the Spittal to Peterhead cable, recreational and fishing activities may be displaced. Hence there is potential for higher collision risk between commercial vessels and small craft. Following cable installation, commercial routes will not be affected by the Spittal to Peterhead cable. Once the OWFs are constructed, smaller vessels such as fishing vessels, recreational vessels and workboats may choose to transit through the wind farms.

The presence of OWFs has the potential to inhibit SAR activities within arrays, however this is mitigated through the production or an Emergency Response Cooperation Plan, which is a requirement per MGN 654 for offshore wind developments. Therefore, the impact on SAR is no worse for the Spittal HVDC cable with the cumulative projects.

The export cables associated with the proposed offshore wind developments will mean there are a higher number of cables in the area which pose a snagging risk to vessels. All of the subsea cables will be displayed on nautical charts and be suitably protected, whether through burial or external protection.

As with the Spittal to Peterhead cable, the wind farm export cables will be compliant with MGN 654, meaning that for 95% of the cable corridor a three degree compass deviation would be accepted. For the remaining 5% of the cable corridor no more than five-degree deviation in water depths of 5 m and deeper will be attained. Further measures such as cable burial and external protection will contribute towards minimising the effects of electromagnetic interference on vessel compasses. Compliance with MGN 654 also means that any external protection associated with the export cables will not reduce navigable water depths by more than 5%, minimising the impact on under keel clearance for vessels.

In summary, it is concluded that the cumulative effects of the Spittal to Peterhead HVDC link with other proposed projects/activities are not substantially different to those already assessed.

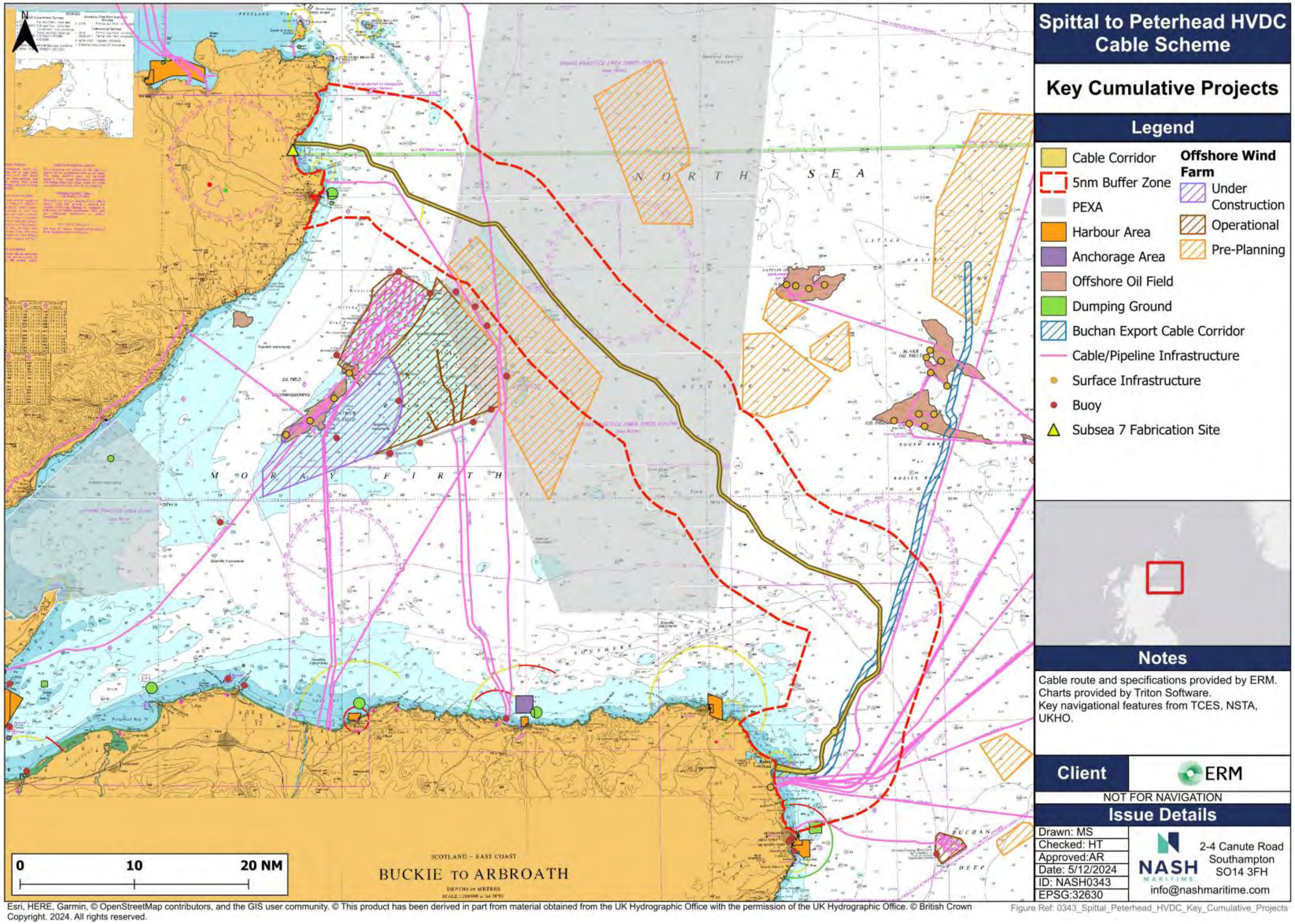

Figure 31: Overview of Cumulative Projects in proximity to Cable Corridor.

11. CONCLUSIONS AND RECOMMENDATIONS

11.1 CONCLUSIONS

A Navigation Risk Assessment (NRA) has been undertaken in line with International Maritime Organisation's (IMO) Formal Safety Assessment (FSA) methodology for the 525kV HVDC link via subsea cable from Spittal to Peterhead that SSEN are developing as part of the requirement for increasing renewable energy generation.

Vessel traffic analysis showed that overall, the busiest areas of vessel activity were in proximity to the Port of Peterhead, as well as along main routes heading to/from the Orkney and Shetland islands. An average of nine cargo vessels per day and three tankers per day was recorded transiting through the Study Area during 2022. Two main ferry routes operated by NorthLink Ferries were observed; one between Aberdeen and Kirkwall, the other between Aberdeen and Lerwick. An average of three NorthLink Ferry transit per day was recorded within the Study Area. Oil and gas vessel activity was focused around Peterhead, with vessels transiting between the port and nearby oil/gas fields within the North Sea

Fishing activity within the Study Area mainly comprised of vessels using demersal gears, with most of the activity taking place close to Peterhead. A low number of vessels were also recorded using pots and traps. Recreational activity was focussed near the coast, within approximately 5 nm of the landfalls. It is noted that fishing and recreational activity may be underrepresented due to AIS broadcasting requirements mandated for vessels over 15 m in length only.

A decrease was observed in commercial shipping activity during the COVID-19 pandemic; however it was observed that vessel numbers have largely returned to pre-pandemic levels. Recently NorthLink Ferries increased ferry crossing between Scrabster and Stromness. Over 100 new licences are to be awarded within the North Sea, meaning an increase in oil and gas traffic to and from Peterhead is likely. A total of 27 licences were awarded by the end of October 2023.

Based on the existing activities in proximity to the cable corridor 12 impacts were identified, two of which were scoped out as it was determined there was no impact pathway for the Project. The majority of the impacts identified were associated with the installation phase of the Project.

The IMO's FSA is a structured methodology aimed at enhancing maritime safety, including protection of life, health, the marine environment and property, by using risk analysis and cost benefit assessment. A total of nine hazards were identified, six of which were scoped out. Vessel categories and areas were defined, and a total of 16 hazards were identified. These included various snagging, grounding and collision incidents. None of the scenarios were assessed as High Risk – Unacceptable. One hazard (the risk of a fishing vessels snagging its gear or anchor) was assessed as Medium Risk whilst. On the basis of implementing industry standard risk controls, it was concluded that this risk was As Low As Reasonably Practicable (ALARP). All other hazards were assessed as Low Risk.

11.2 RECOMMENDATIONS

Based on responses to the consultation letter, as well as consultation with the MCA, the following recommendations are provided to ensure navigational safety is maintained during the construction, operational and decommissioning phases of the Spittal to Peterhead cable.

- Pre-construction compass deviation study.
- Liaison with NLB to ensure marker boards are used at landfalls, if required following appropriate assessment.
- Achieve burial across as much of the cable route as possible to minimise impact on fisheries.
- Consideration for use of rock placement rather than mattresses/grout bags where external protection is required to ensure risk of fishing gear snagging is reduced.
- If boulder relocation is required during installation, location co-ordinates for boulders should be recorded and shared within the fishing industry.
- During cable laying activities, masters of vessels involved in installation activities should request a CPA of 0.5 nm to ensure passing vessels do so at a safe distance.
- Cable protection will not reduce the navigable depth of water more than 5% without agreement with the MCA.

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Appendix A
Hazard Log

ID	Individual Haz. Rank	Project Phase	Area	Hazard Type	Vessel Type	Hazard Title	Transmission Individual													
							Realisitic Most Likely Scenario	Realistic Most Likely Scores					Realisitic Worst Credible Scenario	Realistic Worst Credible Scores					Baseline Risk Score	Baseline Risk Rating
								People	Property	Environment	Business	Frequency		People	Property	Environment	Business	Frequency		
1	1	C/O/D	1/2/3	Snagging	Fishing	Snagging - Fishing	Minor injuries; Minor damage to gear; No pollution; Cable inspection; Local negative publicity.	1	2	1	2	3	Single fatality; Loss of gear/small craft; Tier 1 pollution; Significant cable damage; National negative publicity.	4	4	2	4	2	6.4	Medium Risk - Tolerable (if ALARP)
2	15	C/O/D	1/2/3	Snagging	Recreational or Tug/Service or Small Project Vessels	Snagging - Recreational or Tug/Service or Small Project Vessels	Minor injuries; Minor damage to gear; No pollution; Cable inspection; Local negative publicity.	1	2	1	2	2	Single fatality; Loss of small craft; Tier 1 pollution; Significant cable damage; National negative publicity.	4	4	2	4	1	3.6	Negligible Risk - Broadly Acceptable
3	2	C/O/D	1/2/3	Snagging	Cargo/Tanker or Ferry/Passenger	Snagging - Cargo/Tanker or Ferry/Passenger	Minor injuries; No property damage; No pollution; Widespread negative publicity; Cable damage requiring repairs.	1	1	1	3	2	Minor injuries; Loss of the vessel's anchor Minor pollution; Cable out of service; International negative publicity.	1	2	2	5	2	6.0	Low Risk - Broadly Acceptable
4	16	C/D	1/2/3	Snagging	Large Project Vessel	Snagging - Large Project Vessel	Minor injuries; Minor damage; No pollution; Cable inspection; Local negative publicity.	1	1	1	2	2	Minor injuries; Loss of the vessel's anchor Tier 1 pollution; Cable out of service; International negative publicity.	1	2	2	5	1	3.5	Negligible Risk - Broadly Acceptable
5	14	C/O/D	1/2	Grounding	Recreational or Fishing or Tug/Service or Small Project Vessel	Grounding - Recreational or Fishing or Tug/Service or Small Project Vessel	Multiple minor injuries; No pollution; Cable inspection; Local negative publicity.	2	2	1	2	2	Single fatality; Loss of small craft; Tier 1 pollution; Significant cable damage; National negative publicity.	4	4	2	4	1	3.8	Negligible Risk - Broadly Acceptable
6	11	C/D	1/2	Grounding	Large Project Vessel	Grounding - Large Project Vessel	Multiple minor injuries; Minor damage; No pollution; Cable damage requiring repairs; Widespread negative publicity.	2	2	1	3	2	Single fatality; Significant damage to vessel; Tier 1 pollution; Significant cable damage; International negative publicity.	4	4	2	5	1	4.7	Low Risk - Broadly Acceptable
7	13	C/O/D	1/2	Grounding	Ferry/Passenger or Cargo/Tanker	Grounding - Ferry/Passenger or Cargo/Tanker	Multiple minor injuries; Minor damage; No pollution; Cable inspection; Local negative publicity.	2	2	1	2	2	Single fatality; Significant damage to vessel; Moderate pollution (Tier 2); Significant cable damage; National negative publicity.	4	4	3	4	1	3.8	Negligible Risk - Broadly Acceptable

ID	Individual Haz. Rank	Project Phase	Area	Hazard Type	Vessel Type	Hazard Title	Transmission Individual													
							Realisitic Most Likely Scenario	Realistic Most Likely Scores					Realisitic Worst Credible Scenario	Realistic Worst Credible Scores					Baseline Risk Score	Baseline Risk Rating
								People	Property	Environment	Business	Frequency		People	Property	Environment	Business	Frequency		
8	5	C/D	1/2/3	Collision	Ferry/Passenger ICW. Cargo/Tanker or Ferry/Passenger	Collision - Ferry/Passenger ICW. Cargo/Tanker or Ferry/Passenger	Multiple major injuries; Moderate damage to vessel; Tier 1 pollution; Widespread negative publicity; Short term interruption to ferry services.	3	3	2	3	2	Multiple fatalities; Constructive Loss; Serious pollution (Tier 2); International negative publicity. Ferry out of service.	5	5	4	5	1	5.3	Low Risk - Broadly Acceptable
9	6	C/D	1/2/3	Collision	Cargo/Tanker ICW. Cargo/Tanker	Collision - Cargo/Tanker ICW. Cargo/Tanker	Multiple minor injuries; Moderate damage to vessel; Tier 1 pollution; Widespread negative publicity; Vessel requires drydock.	2	3	2	3	2	Single fatality; Constructive Loss; Major pollution incident (Tier 3); National negative publicity.	4	5	5	4	1	5.1	Low Risk - Broadly Acceptable
10	6	C/D	1/2/3	Collision	Small Craft ICW. Ferry/Passenger or Cargo/Tanker	Collision - Small Craft ICW. Ferry/Passenger or Cargo/Tanker	Multiple major injuries; Moderate damage to vessel; Tier 1 pollution; Widespread negative publicity; Short term interruption to ferry services.	3	3	2	3	2	Multiple fatalities; Loss of small craft; Moderate damage to large vessel; Moderate pollution incident (Tier 2); National negative publicity; Ferry out of service.	5	4	3	4	1	5.1	Low Risk - Broadly Acceptable
11	10	C/D	1/2/3	Collision	Small Craft ICW. Small Craft	Collision - Small Craft ICW. Small Craft	Multiple minor injuries; Moderate damage to small craft; No pollution; Local negative publicity.	2	2	1	2	3	Single fatality; Loss of small craft; Moderate pollution incident (Tier 2); National negative publicity.	4	4	3	4	1	4.8	Low Risk - Broadly Acceptable
12	4	C/D	1/2/3	Collision	Large Project Vessel ICW. Cargo/Tanker	Collision - Large Project Vessel ICW. Cargo/Tanker	Multiple minor injuries; Moderate damage to vessel; Tier 1 pollution; National negative publicity; Vessel requires drydock.	2	3	2	4	2	Single fatality; Constructive Loss; Major pollution incident (Tier 3); International negative publicity.	4	5	5	5	1	5.8	Low Risk - Broadly Acceptable
13	2	C/D	1/2/3	Collision	Large Project Vessel ICW. Ferry/Passenger	Collision - Large Project Vessel ICW. Ferry/Passenger	Multiple minor injuries; Moderate damage to vessel; Tier 1 pollution; National negative publicity; Vessel requires drydock.	3	3	2	4	2	Multiple fatalities; Constructive Loss; Major pollution incident (Tier 3); Ferry out of service; International negative publicity.	5	5	5	5	1	6.0	Low Risk - Broadly Acceptable
14	6	C/D	1/2/3	Collision	Small Craft ICW. Large Project Vessel	Collision - Small Craft ICW. Large Project Vessel	Multiple major injuries; Moderate damage to vessel; Tier 1 pollution; Widespread negative publicity; Short term interruption to ferry services.	3	3	2	3	2	Multiple fatalities; Loss of small craft; Moderate damage to large vessel; Moderate pollution incident (Tier 2); National negative publicity.	5	4	3	4	1	5.1	Low Risk - Broadly Acceptable

ID	Individual Haz. Rank	Project Phase	Area	Hazard Type	Vessel Type	Hazard Title	Transmission Individual													
							Realisitic Most Likely Scenario	Realistic Most Likely Scores					Realisitic Worst Credible Scenario	Realistic Worst Credible Scores					Baseline Risk Score	Baseline Risk Rating
								People	Property	Environment	Business	Frequency		People	Property	Environment	Business	Frequency		
15	12	C/D	1/2/3	Collision	Small Craft ICW. Small Project Vessel	Collision - Small Craft ICW. Small Project Vessel	Multiple minor injuries; Moderate damage to small craft; No pollution; Widespread negative publicity.	2	2	1	3	2	Single fatality; Loss of small craft; Moderate pollution incident (Tier 2); National negative publicity.	4	4	3	4	1	4.4	Low Risk - Broadly Acceptable
16	6	C/D	1/2/3	Collision	Small Project Vessel ICW. Ferry/Passenger or Cargo/Tanker	Collision - Small Project Vessel ICW. Ferry/Passenger or Cargo/Tanker	Multiple major injuries; Moderate damage to vessel; Tier 1 pollution; Widespread negative publicity; Short term interruption to ferry services.	3	3	2	3	2	Multiple fatalities; Loss of small craft; Moderate damage to large vessel; Moderate pollution incident (Tier 2); National negative publicity; Ferry out of service.	5	4	3	4	1	5.1	Low Risk - Broadly Acceptable

Appendix B
Consultation Letter

NASH Maritime Ltd

2 Canute Road
Southampton
Hampshire
SO14 3FH

www.nashmaritime.com
+44 (0) 2380 381 681
22-09-2023

NASH Ref: 23-NASH-0343

Project Ref: Spittal to Peterhead HVDC Cable Scheme

SUBJECT: Spittal to Peterhead HVDC Cable Scheme shipping and navigation stakeholder consultation

Dear Stakeholder,

To meet the requirements of increasing renewable energy generation, multiple projects are being developed by SSEN Transmission. Extensive system studies have been completed to inform the ESO's 'Pathway to 2030 Holistic Network Design', confirming the requirement to develop new substations near Spittal in Caithness and Peterhead in Aberdeenshire.

One of the projects being developed as part of the requirement is a 525kV HVDC link via subsea cable from Spittal to Peterhead. The proposed cable system will comprise of two conductor cables, one dedicated metallic return cable, and one fibre optic communications cable, all bundled and buried within a single trench.

The offshore section of the Spittal to Peterhead HVDC Cable Scheme is approximately 164 km in length. The north landfall point is within Sinclair's Bay, to the North of Wick Harbour. The south landfall point is within Rattray Bay, located north of Peterhead Port. The preferred installation method at the landfalls is open-cut trenching, however, where this is not feasible, horizontal directional drilling will be utilised. An overview of the project location and 5 nm study area is shown in **Figure 1**. **Figure 2** shows detailed views of the north and south landfall sites, respectively. It is noted that the precise landfall within Sinclair's Bay is yet to be finalised, hence **Figure 2** depicts the 'Preferred Landfall Zone'.

NASH Maritime is undertaking a Navigation Risk Assessment (NRA) for the offshore section of the Spittal to Peterhead HVDC Cable Scheme. The purpose of this letter is to engage early with stakeholders and begin the consultation process to ensure that potential shipping and navigation impacts associated with the project, which have the potential to give rise to likely significant effects, are identified and assessed. Where appropriate, subsequent mitigation can then be identified for agreement with the relevant stakeholders. **Figure 3** presents an overview of the vessel traffic density for 2019 and 2022 within the study area.

Further information on the project can be found within the Spittal to Peterhead HVDC Cable Scheme Consultation Booklet May/June 2023 which can be found at: https://www.ssen-transmission.co.uk/globalassets/projects/projects/spittal-to-peterhead/spittalpeterhead-consultation-booklet-final.pdf.

We would be grateful for any comments or feedback in writing on any potential shipping and navigation impacts of the proposed Spittal to Peterhead HVDC Cable Scheme prior to Friday **20th Oct 2023** to consultation@nashmaritime.com. In particular, we are keen to understand the following potential impacts:

- Whether the proposed cable system is likely to impact your activities during either the construction, operation or decommissioning phases.
- Whether the cable system is likely to pose any concerns to safety of navigation or specific hazards during construction, operation or decommissioning phases. Where hazards are identified, it would be useful if you could provide further detail on the potential likelihood and consequence of these hazards in relation to the categories of people, property, business and the environment.
- Potential suitable risk controls or means to mitigate impacts on shipping and navigation in proximity to the cable route and its landfalls.

We will be holding stakeholder meetings on Microsoft Teams to provide further information on shipping and navigation in proximity to the cable route, as well as to give a preliminary overview of any impacts and hazards identified. Meetings will be arranged with stakeholders over the coming weeks.

Should you require any further information or wish to discuss the proposed project further then please do not hesitate to contact us using the details above.

Yours sincerely,

NASH Maritime

Enclosed:

Figure 1: Location of Spittal to Peterhead HVDC Cable Scheme and 5 nm Study Area

Figure 2: Detailed View of North and South Landfall Sites

Figure 3: Vessel Traffic Density 2019 and 2022

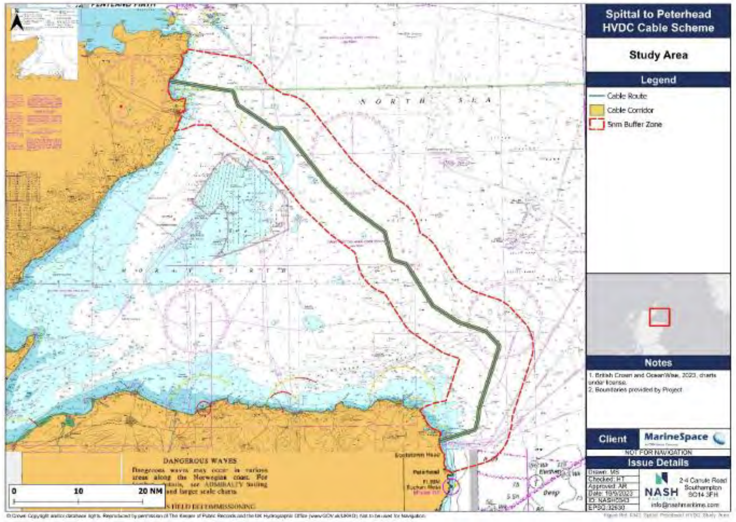

Figure 1: Location of Spittal to Peterhead HVDC Cable System and 5 nm Study Area

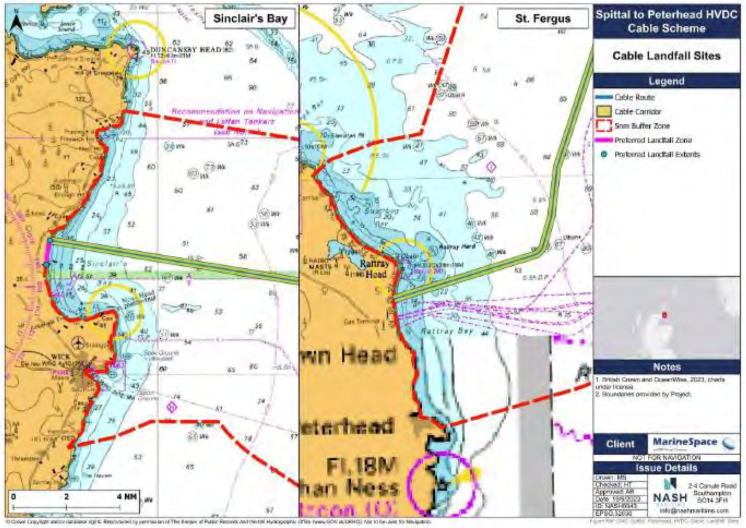

Figure 2: Detailed View of North and South Landfall Sites

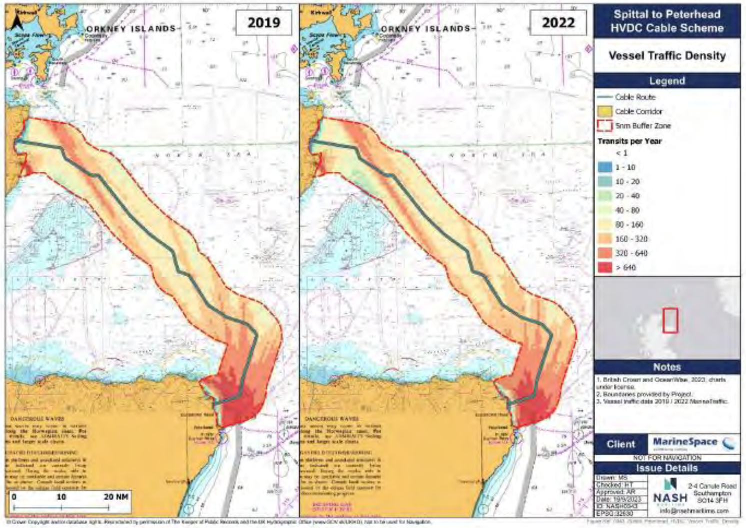

Figure 3: Vessel Traffic Density 2019 and 2022

Appendix C
Consultation Responses

Responses to the consultation letter from each key stakeholder contacted are presented within this Appendix.

Chamber of Shipping

Consultation

From: [redacted]
Sent: 18 October 2023 10:25
To: Consultation
Subject: RE: Spittal to Peterhead HVDC Cable Scheme

Dear Nash,

Potential concerns from Chamber of Shipping:

- Impact on anchoring activity – normal
- Impact on anchoring activity – emergency
- Burial depth/reduction in UKC
- Magnetic interference
- Deviation and potential for collision between commercial vessels or commercial and 3rd party during installation/decomm

Kind regards,

[redacted]
Policy Manager (Safety & Nautical) & Analyst

UK Chamber of Shipping
30 Park Street, London, SE1 9EQ

[redacted]
www.ukchamberofshipping.com

Maritime & Coastguard Agency

Maritime & Coastguard Agency

[redacted]
Maritime and Coastguard Agency
UK Technical Services Navigation
105 Commercial Road
Southampton
SO15 1EG

www.gov.uk/mca
10th October 2023

NASH Maritime Ltd
2 Canute Road
Southampton
Hampshire
SO14 3FH

By email to: consultation@nashmaritime.com

Dear NASH Maritime,

Thank you for your correspondence regarding the Spittal to Peterhead HVDC Cable Scheme. Technical Services Navigation Branch of MCA have reviewed the details and would like to comment as follows:

Overall consideration needs to be given to the possible impact on navigational issues for both commercial and recreational craft, specifically:

- Collision Risk
- Navigational Safety
- Risk Management and Emergency response
- Marking and lighting of site and information to mariners
- Effect on small craft navigational and communication equipment
- The risk to drifting recreational craft in adverse weather or tidal conditions
- The likely squeeze of small craft into the routes of larger commercial vessels.

We would expect the project to carry out a Navigational Risk Assessment as per the current MCA guidance, MGN654. The NRA should be accompanied by a detailed MGN 654 Checklist with completed required fields for cable installation which can be found at: https://www.gov.uk/guidance/offshore-renewable-energy-installations-impact-on-shipping

Attention needs to be paid to routing, particularly in heavy weather routeing so that vessels can continue to make safe passage without large-scale deviations. The likely cumulative and in combination effects on shipping routes should be considered which will be an important issue to assess for this project. It should consider the proximity to other windfarm developments, other infrastructure, and the impact on safe navigable sea room.

Attention should also be paid to cabling routes and where appropriate burial depth for which a Burial Protection Index study should be completed and subject to the traffic volumes, an anchor penetration study may be necessary. If cable protection measures are required e.g. rock bags or concrete mattresses, the MCA would be willing to accept a 5% reduction in surrounding depths

INVESTORS IN PEOPLE | Silver

referenced to Chart Datum. This will be particularly relevant where depths are decreasing towards shore and potential impacts on navigable water increase, such as at the HDD location.

High Voltage Direct Current (HVDC) transmission infrastructure will be used. It should be noted that there is a potential impact on ships compasses from the electro-magnetic field generated. A pre-construction compass deviation study may be required on the expected electro-magnetic field, and we would be willing to accept a three-degree deviation for 95% of the cable route. For the remaining 5% of the cable route no more than five-degree deviation in water depths of 5m and deeper will be attained. If this requirement cannot be met, further mitigation measures may be required including a post installation deviation survey of the cable route. This data must then be provided to the MCA and UKHO, as a precautionary notation may be required on the appropriate Admiralty Charts regarding possible magnetic anomalies along the cable route.

MGN 654 Annex 4 requires that hydrographic surveys should fulfil the requirements of the International Hydrographic Organisation (IHO) Order 1a standard, with the final data supplied as a digital full density data set, and survey report to the MCA Hydrography Manager. Failure to report the survey or conduct it to Order 1a might invalidate the Navigational Risk Assessment if it was deemed not fit for purpose.

To further comment specifically on the project we will need a more detailed overview. We welcome the invitation for further engagement with you and, as stated in your attachment, receiving further information on shipping and navigation in proximity to the cable route, and a preliminary overview of any impacts and hazards identified.

Yours Sincerely,

[redacted]

[redacted]
Offshore Renewables Project Lead
UK Technical Services Navigation

Northern Lighthouse Board

Northern Lighthouse Board

84 George Street
Edinburgh EH2 3DA

Tel: 0131 473 3100
Fax: 0131 220 2093

Website: www.nlb.org.uk
Email: enquiries@nlb.org.uk

Your Ref: Spittal to Peterhead HVDC Cable Scheme
Our Ref: AL/OPS/ML/S8_01_300

NASH Maritime Ltd
2 Canute Road
Southampton
Hampshire
SO14 3FH

25 September 2023

Spittal to Peterhead HVDC Cable Scheme – Shipping and Navigation Stakeholder Consultation

Thank you for your e-mail correspondence dated 22nd September 2023 proving Northern Lighthouse Board an early opportunity to comment on the Shipping and Navigational considerations for the proposed HVDC subsea cable link between Sinclair's Bay, to the North of Wick Harbour and Rattray Bay, located North of Peterhead Port.

In response to the questions posed within your consultation request, Northern Lighthouse Board have no objection to the proposed works and advise the following;

- NLB do not consider that the proposed cable system would impact on our Statutory duties as the General Lighthouse Authority for Scotland and the Isle of Man.
- NLB do not consider that the cable system will pose an undue hazard to navigation.
- The requirement for landfall cable marker boards would require assessment when the exact landfall position, and cable burial method, are confirmed. All other normal mitigations for a subsea cable project, such Notices to Mariners and charting of the cable route on completion, would be anticipated.

Yours sincerely

[redacted]

[redacted]
Navigation Manager

In Salutem Omnium
For the Safety of All

NorthLink Ferries

Consultation

From: [redacted]
Sent: 19 October 2023 13:50
To: Consultation
Cc: [redacted]
Subject: RE: Spittal to Peterhead HVDC Cable Scheme
Attachments: 23-NASH-0343_Spittal_to_Peterhead_HVDC_NRA_Consultation_Letter_R01-00.pdf

Spittal to Peterhead HVDC Cable Scheme – NorthLink Ferries Navigational RA Response

Dear Helen,

I'll try and summarise some of our responses under the different headings you have included in the consultation letter.

Construction
This I would expect be the phase which would have the most impact on our operations, with the multiple surface vessels involved.

Vessel Traffic Analysis – NorthLink Routes

As you will have identified during your analysis of the AIS track records, our vessels predominantly follow standard routes with minimal deviation other than for weather, traffic avoidance, or emergency situations such as medical evacuations. I have drawn on a couple of (rough) lines on the chart extract below to highlight our standard passage plans. I would be happy to share the lat/long of our passage plan waypoints should you require any greater detail.

Black – Kirkwall – Aberdeen
Blue – Lerwick - Aberdeen
(& Vice Versa)

Operation

Minimal impact on us, only additional consideration for our vessels would be in a potential emergency response to any failure in propulsion where emergency anchoring may be considered. Aware that the cable routes will be well highlighted on Admiralty Navigational Charts therefore not a great concern.

Decommissioning

Similar to the construction phase I would expect, with multiple surface vessels operating around the planned tracks of our vessels. As above detail included in the construction heading.

Questions

There were a couple of questions from the vessels however I expect we will get the answers to these in due course as the project progresses, therefore no immediate response required.

- What clearance will the vessels involved in constructions, predominately the cable layer require in NM?
- How many support vessels would you expect to be involved in the operation?

Summary

In summary, whilst the construction phase of this will undoubtedly have impacts on the routing of our vessels around the points of intersection, I feel these impacts can be mitigated through good planning and communication throughout which I have no doubt will be the case.

I am on leave for the next three weeks, however should you have any queries please feel free to get in touch with [redacted] our Marine Manager.

Thanks

Best Regards,

[redacted]
Marine Superintendent

[redacted]
W: www.northlinkferries.co.uk

Serco NorthLink Ferries
Jamieson Quay
Aberdeen, AB11 5NP

Royal Yachting Association

Consultation

From: [redacted]
Sent: 10 October 2023 12:47
To: Consultation
Cc: [redacted]
Subject: Re: Spittal to Peterhead HVDC Cable Scheme

I am sorry for not responding sooner. As you may imagine, we are getting a lot of requests for comments at the moment and this one slopped through the net. I will respond to your questions:

Whether the proposed cable system is likely to impact your activities during either the construction, operation or decommissioning phases. I do not imagine that there are likely to be significant impacts with the usual mitigations in place

.
Whether the cable system is likely to pose any concerns to safety of navigation or specific hazards during construction, operation or decommissioning phases. I have no such concerns; cable laying is covered by the ColRegs with which all boaters are expected to be familiar. However, note that many recreational boats pass round Rattray Head in the period from April to October and the waters between there and Aberdeen are becoming increasingly busy with commercial activity.

Potential suitable risk controls or means to mitigate impacts on shipping and navigation in proximity to the cable route and its landfalls. Many organisations now produce Notices to Mariners in these waters and it is unrealistic to expect boaters on passage to look at all the relevant sites. We encourage the use of Kingfisher but it will also be important to post NtMs at ports, harbours and marinas within a day's travel.

I will be happy to provide other information if that would be helpful.

Best wishes,
[redacted]
Planning and Environment Officer
RYA Scotland

Scottish Fishermen's Federation

SCOTTISH FISHERMEN'S FEDERATION

Scottish Fishermen's Federation
24 Rubislaw Terrace
Aberdeen, AB10 1XE
Scotland UK

[redacted]
E: sff@sff.co.uk

www.sff.co.uk

Our Ref: FH-NASH SPEC S&N/0001-23

Your Ref: 23-NASH-0343

The NASH Maritime Team
Highland House, Mayflower Close,
Chandlers Ford,
Eastleigh, Hampshire
SO53 4AR
E-mail: consultation@nashmaritime.com

20 Oct 2023

SFF Response on 'Spittal to Peterhead HVDC Cable Scheme, Shipping and Navigation Stakeholder Consultation'

This response to the scoping request is presented by the Scottish Fishermen's Federation on behalf of the 450 plus fishing vessels in membership of its constituent associations, the Anglo Scottish Fishermen's Association, Fife Fishermen's Association. Fishing Vessel Agents and Owners Association, Mallaig & North West Fishermen's Association, Orkney Fisheries Association, Scottish Pelagic Fishermen's Association, the Scottish White Fish Producer's Association and Shetland Fishermen's Association. The chair of NECrIFG has also been consulted and agrees.

Thank you for sharing the consultation opportunity on 'Spittal to Peterhead HVDC Cable Scheme Shipping and Navigation Stakeholder Consultation' with SFF.

Please find SFF's response to your questions as follows:

- **Question:** Whether the proposed cable system is likely to impact your activities during either the construction, operation or decommissioning phases.

SFF's Response: Yes, it does. Given the locality of the proposed cable system (c.164km in length from Spittal to Peterhead) the cable route cross prime static gear, pelagic and demersal fishing grounds. All fishing activities within the cable route will be adversely impacted during survey works, construction, operation/maintenance and decommissioning phases that would result in displacement of static gears and deprivation of mobile gears (pelagic and demersal) from fishing along the cable route.

- **Question:** Whether the cable system is likely to pose any concerns to safety of navigation or specific hazards during construction, operation, or decommissioning phases.

SFF's Response: To reiterate, the proposed cable system sits in prime static and mobile gears fishing ground so if the cable is not totally buried or concrete mattresses and grout bags are used for cable protections, it will pose safety risk for the fishing vessels. Specific hazard will likely be contingent if ColRegs and static gear markers are not observed.

• **Question:** Potential suitable risk controls or means to mitigate impacts on shipping and navigation in proximity to the cable route and its landfalls.

SFF's Response: Following are some thoughts on potential risk controls and measures to mitigate the impacts of the cable system on fishing vessels activities along the cable route.

- Early engagement with fishing industry should be made with sufficient notice given to the affected fishermen prior to commencement of survey works, and construction, operation/maintenance, and decommissioning stages.
- Ensure 100% cable burial is achieved and avoid use of cable protections especially concrete mattresses and grout bags. Where required (e.g. in areas of cable/pipeline crossing), rock dump (based on industry standard rock size) should be used to protect the cable.
- Maximum efforts to be made to avoid boulders relocation and where required record and share the new location/coordinates of the displaced boulders and share them with the fishing industry (preferably via USB sticks).
- During survey works, and construction, operation/maintenance, and decommissioning phases, ensure ColRegs and static gear markers are be observed and ERRV/Guard Vessel is used where cable is laid down on seabed prior burial.
- Appropriate compensation/disruption payment should be paid to the affected fishing vessels either they have been displaced from the cable route or have been deprived of fishing during survey works, and construction, operation/maintenance, and decommissioning stages.

Should you have any questions, feel free to contact us.

Best regards

[redacted]
Offshore Energy Policy Officer
Scottish Fishermen's Federation

Maritime & Coastguard Agency – Consultation Meeting Minutes

Per the MCA response to the consultation letter welcoming the invite to a further meeting, a consultation meeting was held on the 20th October 2023. The meeting minutes are provided below.

ATTENDEES

Organisation	Attendee	Role	Initial
NASH Maritime		Principal Consultant Consultant	AR HT
MCA		Offshore Renewables Project Lead	VJ

AGENDA

1. Introductions
2. Project overview
3. Data sources
4. Navigational features
5. Maritime incidents
6. Vessel traffic analysis
7. NRA methodology
8. Hazards identified
9. Discussion

NOTES OF MEETING

1	Introductions	Action
1.1	Introductions between attendees. HT gave an overview of the agenda.	
2	**Baseline Assessment**	
2.1	HT gave an overview of the Project, data sources and navigation features, noting the Subsea7 facility 1 nm south of the north landfall within Sinclair's Bay.	
2.2	HT gave overview of incident data.	
2.3	HT gave an overview of vessel traffic data collected as part of this study and the vessel traffic analysis undertaken.	
3	**Risk Controls and HAZID**	
3.1	HT gave an overview of the embedded risk control measures. AR asked if there were any other suggested risk controls. NorthLink liaison was suggested, as well as other key operators in the area.	1

	Notice to mariners and good liaison should be included in the risk controls, and vessels should also report operations via Channel 16 VHF.	2
3.2	VJ asked about typical cabling laying speed. HT responded that the working assumption is approximately 100-200 m/hr	
3.3	HT outlined the key hazards identified. AR explained rationale of collision hazards. VJ highlighted that with respect to collision hazards, the MCA would want to see third party scenarios assessed. AR explained that third party scenarios have been considered within HAZID 8 – 11.	
3.4	VJ noted that the greatest risk to vessels is likely to be nearshore. VJ asked whether a cumulative impact assessment has been undertaken as part of the NRA, noting potential for geophysical operations in the vicinity associated with offshore wind farms. Simultaneous operations with offshore wind farm activities are to be considered within the cumulative risk assessment.	 3
4	**Cable Laying Exclusion Zones / Safety Zones**	
4.1	AR asked if there was a typical rule followed when considering safe passing distances or exclusion zones around cable laying vessels. For cable laying activities, a separation of at least 0.5nm would be prudent, this would be at the master's discretion. There is generally a "keep a wide berth" rule, rather than specific legislation. Not clear what catenary the cable might be at astern of the cable layer and the impact on navigation safety.	
4.2	Distances for vessels passing behind the installation activities were discussed, and a distance of approximately 2 nm was agreed to be more than sufficient.	
4.3	VJ is going to check on safety zones and safe passing distances.	4
5	**Other**	
5.1	It was noted that engagement is ongoing with Subsea 7 regarding pipeline launches at the facility in Sinclair's Bay. This will ensure there is no conflict between cable laying activities and launches.	
5.2	VJ asked what application process the Project is following, noting that his written response was based on Marine Directorate scoping.	5
5.3	VJ noted higher potential for impacts in bays and added that he would expect to see some nearshore draught analysis for each landfall.	6
5.4	VJ requested that the presentation slides be shared with the MCA so they can review internally and provide more detailed feedback.	7

MEETING ACTIONS

Number	Owner	Action
1	NASH	Add liaison with NorthLink and other key operators as an embedded mitigation measure.
2	NASH	Include usage of VHF Channel 16 in the embedded mitigation measures.
3	NASH	Ensure simultaneous operations with offshore wind farms are considered within the cumulative risk assessment.
4	MCA	Check for guidance/advice on safety zones and safe passing distances for cable installation vessels.

Number	Owner	Action
5	NASH	Check what application process the Project is following.
6	NASH	Ensure a nearshore draught analysis is included in the NRA.
7	NASH	Share the presentation slides with VJ and the MCA.

Appendix D
MGN 654 Checklist

MGN Section	Yes/No	Comments
4. Planning Stage – Prior to Consent		
4.5 Site and Installation Co-ordinates: Developers are responsible for ensuring that formally agreed co-ordinates and subsequent variations of site perimeters and individual OREI structures are made available, on request, to interested parties at relevant Project stages, including application for consent, development, array variation, operation and decommissioning. This should be supplied as authoritative Geographical Information System (GIS) data, preferably in Environmental Systems Research Institute (ESRI) format. Metadata should facilitate the identification of the data creator, its date and purpose, and the geodetic datum used. For mariners' use, appropriate data should also be provided with latitude and longitude coordinates in WGS84 (ETRS89) datum.		
4.6 Traffic Survey – includes:		
All vessel types	✓	All vessel types were considered within the vessel traffic analysis in Section 6.2.
At least 28 days duration, within either 12 or 24 months prior to submission of the Environmental Impact Assessment Report	✓	Vessel traffic analysed within Section 6.2 covers a 12 month period of AIS data
Multiple data sources	✓	AIS was analysed, as well as VMS data within Section 6.3.1.4.
Seasonal variations	✓	12 months of data were analysed, hence seasonal variations are captured.
MCA consultation	✓	MCA were consulted with via letter to stakeholders and within dedicated meeting (see section 3.4.1).
General Lighthouse Authority consultation	✓	NLB were consulted with via letter to stakeholders (see Appendix B).
Chamber of Shipping and shipping company consultation	✓	UK Chamber of Shipping were consulted with via letter to stakeholders (see Appendix B).
Recreational and fishing vessel organisations consultation	✓	RYA Scotland and SFF were consulted with via letter to stakeholders (see Appendix B).
Port and navigation authorities consultation, as appropriate	✓	Peterhead Port, Fraserburgh Harbour and Wick Harbour were consulted with via letter to stakeholders (see Appendix B).
4.6.d Assessment of the cumulative and individual effects of (as appropriate):		
i. Proposed OREI site relative to areas used by any type of marine craft.	✓	
ii. Numbers, types and sizes of vessels presently using such areas	✓	Vessel counts provided for Study Area as well as crossing the cable corridor (see 6.2).
iii. Non-transit uses of the areas, e.g. fishing, day cruising of leisure craft, racing, aggregate dredging, personal watercraft etc.	✓	Non-transiting vessel types such as fishing/rec analysed within vessel traffic analysis (see section 6.2).
iv. Whether these areas contain transit routes used by coastal, deep-draught or international scheduled vessels on passage.	✓	
v. Alignment and proximity of the site relative to adjacent shipping routes	✓	Routes have been identified throughout the vessel traffic analysis (see section 6.2).
vi. Whether the nearby area contains prescribed routeing schemes or precautionary areas	✓	There are no routeing measures or precautionary areas in proximity to the cable corridor.
vii. Proximity of the site to areas used for anchorage (charted or uncharted), safe haven, port approaches and pilot boarding or landing areas.	✓	Navigational features including pilot boarding areas and anchorages are presented in section 5.1.

MGN Section	Yes/No	Comments
viii. Whether the site lies within the jurisdiction of a port and/or navigation authority.	✓	Navigational features including port and harbour limits are presented in section 5.1.
ix. Proximity of the site to existing fishing grounds, or to routes used by fishing vessels to such grounds.	✓	Fishing vessel traffic analysis carried out in section 6.3.1.4 and consultation with SSF (see section 3.4.1).
x. Proximity of the site to offshore firing/bombing ranges and areas used for any marine military purposes.	✓	Navigational features including PEXAs are presented in section 5.1.
xi. Proximity of the site to existing or proposed submarine cables or pipelines, offshore oil / gas platform, marine aggregate dredging, marine archaeological sites or wrecks, Marine Protected Area or other exploration/exploitation sites	✓	Navigational features including proposed submarine cables or pipelines, offshore oil / gas platform, marine aggregate dredging, marine archaeological sites or wrecks, Marine Protected Area or other exploration/exploitation sites are presented in section 5.1.
xii. Proximity of the site to existing or proposed OREI developments, in co-operation with other relevant developers, within each round of lease awards.	✓	Planned wind farm developments are presented and considered in section 10.
xiii. Proximity of the site relative to any designated areas for the disposal of dredging spoil or other dumping ground	✓	Navigational features including disposal and dumping grounds are presented in section 5.1.
xiv. Proximity of the site to aids to navigation and/or Vessel Traffic Services (VTS) in or adjacent to the area and any impact thereon.	✓	There are no VTSs in proximity to the cable corridor.
xv. Researched opinion using computer simulation techniques with respect to the displacement of traffic and, in particular, the creation of 'choke points' in areas of high traffic density and nearby or consented OREI sites not yet constructed.	✓	Not applicable for subsea cable.
xvi. With reference to xv. above, the number and type of incidents to vessels which have taken place in or near to the proposed site of the OREI to assess the likelihood of such events in the future and the potential impact of such a situation.	✓	Historical incidents presented in section 6.4.
xvii. Proximity of the site to areas used for recreation which depend on specific features of the area	✓	Recreational activity presented within the vessel traffic analysis (see section 6.3.1.3).
4.7 Predicted Effect of OREI on traffic and Interactive Boundaries – where appropriate, the following should be determined:		
a. The safe distance between a shipping route and OREI boundaries.	✓	Not applicable
b. The width of a corridor between sites or OREIs to allow safe passage of shipping.	✓	Not applicable
4.8. OREI Structures – the following should be determined:		
a. Whether any feature of the OREI, including auxiliary platforms outside the main generator site, mooring and anchoring systems, inter-device and export cabling could pose any type of difficulty or danger to vessels underway,	✓	Impacts relating to anchor or fishing gear snagging are assessed in section 8.

MGN Section	Yes/No	Comments
performing normal operations, including fishing, anchoring and emergency response.		
b. Clearances of fixed or floating wind turbine blades above the sea surface are *not less than 22 metres (*above MHWS for fixed). Floating turbines allow for degrees of motion.	✓	Not applicable
c. Underwater devices i. changes to charted depth ii. maximum height above seabed iii. Under Keel Clearance	 ✓ ✓ ✓	Specifics not known at this stage, however a CBRA will be undertaken to address changes in water depth and identify any areas of reduced under keel clearance.
d. Whether structure block or hinder the view of other vessels or other navigational features.	✓	Not applicable
4.9 The Effect of Tides, Tidal Streams and Weather: It should be determined whether:		
a. Current maritime traffic flows and operations in the general area are affected by the depth of water in which the proposed installation is situated at various states of the tide i.e. whether the installation could pose problems at high water which do not exist at low water conditions, and vice versa.	✓	
b. The set and rate of the tidal stream, at any state of the tide, has a significant effect on vessels in the area of the OREI site.	✓	
c. The maximum rate tidal stream runs parallel to the major axis of the proposed site layout, and, if so, its effect.	✓	
d. The set is across the major axis of the layout at any time, and, if so, at what rate.	✓	
e. In general, whether engine failure or other circumstance could cause vessels to be set into danger by the tidal stream, including unpowered vessels and small, low speed craft.	✓	
f. The structures themselves could cause changes in the set and rate of the tidal stream.	✓	
g. The structures in the tidal stream could be such as to produce siltation, deposition of sediment or scouring, affecting navigable water depths in the wind farm area or adjacent to the area	✓	
h. The site, in normal, bad weather, or restricted visibility conditions, could present difficulties or dangers to craft, including sailing vessels, which might pass in close proximity to it.	✓	
i. The structures could create problems in the area for vessels under sail, such as wind masking, turbulence or sheer.	✓	
j. In general, taking into account the prevailing winds for the area, whether engine failure or other circumstances could cause vessels to drift into danger, particularly if in conjunction with a tidal set such as referred to above.	✓	
4.10 Assessment of Access to and Navigation Within, or Close to, an OREI To determine the extent to which navigation would be feasible within the OREI site itself by assessing whether:		

MGN Section	Yes/No	Comments
a. Navigation within or close to the site would be safe:		
i. for all vessels, or ii. for specified vessel types, operations and/or sizes. iii. in all directions or areas, or iv. in specified directions or areas. v. in specified tidal, weather or other conditions	✓ ✓ ✓ ✓ ✓	Not applicable
b. Navigation in and/or near the site should be prohibited or restricted:		
i. for specified vessels types, operations and/or sizes. ii. in respect of specific activities, iii. in all areas or directions, or iv. in specified areas or directions, or v. in specified tidal or weather conditions,	✓ ✓ ✓ ✓ ✓	Not applicable
c. Where it is not feasible for vessels to access or navigate through the site it could cause navigational, safety or routeing problems for vessels operating in the area e.g. by preventing vessels from responding to calls for assistance from persons in distress	✓	Not applicable
d. Guidance on the calculation of safe distance of OREI boundaries from shipping routes has been considered	✓	Not applicable
4.11 Search and rescue, maritime assistance service, counter pollution and salvage incident response.		
The MCA, through HM Coastguard, is required to provide Search and Rescue and emergency response within the sea area occupied by all offshore renewable energy installations in UK waters. To ensure that such operations can be safely and effectively conducted, certain requirements must be met by developers and operators.		
a. An ERCoP will be developed for the construction, operation and decommissioning phases of the OREI.	✓	
b. The MCA's guidance document *Offshore Renewable Energy Installation: Requirements, Advice and Guidance for Search and Rescue and Emergency Response* for the design, equipment and operation requirements will be followed.	✓	
c. A SAR checklist will be completed to record discussions regarding the requirements,	✓	

MGN Section	Yes/No	Comments
recommendations and considerations outlined in the above document (to be agreed with MCA)		
4.12 Hydrography - In order to establish a baseline, confirm the safe navigable depth, monitor seabed mobility and to identify underwater hazards, detailed and accurate hydrographic surveys are included or acknowledged for the following stages and to MCA specifications:		
i. Pre-construction: The proposed generating assets area and proposed cable route	✓	
ii. On a pre-established periodicity during the life of the development	✓	
ii. Post-construction: Cable route(s)	✓	
iii. Post-decommissioning of all or part of the development: the installed generating assets area and cable route	✓	
4.13 Communications, Radar and Positioning Systems - To provide researched opinion of a generic and, where appropriate, site specific nature concerning whether:		
a. The structures could produce radio interference such as shadowing, reflections or phase changes, and emissions with respect to any frequencies used for marine positioning, navigation and timing (PNT) or communications, including GMDSS and AIS, whether ship borne, ashore or fitted to any of the proposed structures, to:	✓	Not applicable
i. Vessels operating at a safe navigational distance	✓	Not applicable
ii. Vessels by the nature of their work necessarily operating at less than the safe navigational distance to the OREI, e.g. support vessels, survey vessels, SAR assets.	✓	
iii. Vessels by the nature of their work necessarily operating within the OREI.	✓	Not applicable
b. The structures could produce radar reflections, blind spots, shadow areas or other adverse effects: i. Vessel to vessel;	✓	Not applicable
ii. Vessel to shore;	✓	Not applicable
iii. VTS radar to vessel	✓	Not applicable
iv. Racon to/from vessel	✓	Not applicable
c. The structures and generators might produce sonar interference affecting fishing, industrial or military systems used in the area.	✓	Not applicable
d. The site might produce acoustic noise which could mask prescribed sound signals.	✓	Not applicable
e. Generators and the seabed cabling within the site and onshore might produce electro-magnetic fields affecting compasses and other navigation systems.	✓	Electromagnetic interference and compass effects are considered within the risk assessment.
4.14 Risk mitigation measures recommended for OREI during construction, operation and decommissioning.		
Mitigation and safety measures will be applied to the OREI development appropriate to the level and type of risk determined during the Environmental Impact Assessment (EIA).The specific measures to be employed will be selected	✓	Mitigation measures listed in section 4.3.

MGN Section	Yes/No	Comments
in consultation with the Maritime and Coastguard Agency and will be listed in the developer's Environmental Statement (ES). These will be consistent with international standards contained in, for example, the Safety of Life at Sea (SOLAS) Convention - Chapter V, IMO Resolution A.572 (14)[3] and Resolution A.671(16)[4] and **could include any or all** of the following:		
i. Promulgation of information and warnings through notices to mariners and other appropriate maritime safety information (MSI) dissemination methods.	✓	Mitigation measures listed in section 4.3 include NtMs.
ii. Continuous watch by multi-channel VHF, including Digital Selective Calling (DSC).	✓	Mitigation measures listed in section 4.3 include Channel 16 VHF reporting.
iii. Safety zones of appropriate configuration, extent and application to specified vessels[3]	✓	
iv. Designation of the site as an area to be avoided (ATBA).	✓	Not applicable
v. Provision of AtoN as determined by the GLA	✓	Not applicable
vi. Implementation of routeing measures within or near to the development.	✓	Not applicable
vii. Monitoring by radar, AIS, CCTV or other agreed means	✓	Not applicable
viii. Appropriate means for OREI operators to notify, and provide evidence of, the infringement of safety zones.	✓	Not applicable
ix. Creation of an Emergency Response Cooperation Plan with the MCA's Search and Rescue Branch for the construction phase onwards.	✓	
x. Use of guard vessels, where appropriate	✓	Mitigation measures listed in section 4.3 include use of guard vessels where required.
xi. Update NRAs every two years e.g. at testing sites.	✓	Not applicable
xii. Device-specific or array-specific NRAs	✓	Not applicable
xiii. Design of OREI structures to minimise risk to contacting vessels or craft	✓	Not applicable
xiv. Any other measures and procedures considered appropriate in consultation with other stakeholders.	✓	Mitigation measures listed in 4.3.

[3] As per SI 2007 No 1948 "The Electricity (Offshore Generating Stations) (Safety Zones) (Application Procedures and Control of Access) Regulations 2007.

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APPENDIX H: HDD POP OUTS SAFETY JUSTIFICATION

APPENDIX I: CABLE BURIAL RISK ASSESSMENT (CBRA)

ERM HAS OVER 160 OFFICES ACROSS THE FOLLOWING COUNTRIES AND TERRITORIES WORLDWIDE

Argentina
Australia
Belgium
Brazil
Canada
China
Colombia
France
Germany
Ghana
Guyana
Hong Kong
India
Indonesia
Ireland
Italy
Japan
Kazakhstan
Kenya
Malaysia
Mexico
Mozambique
The Netherlands
New Zealand
Peru
Poland
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