Western Isles HVDC Link

MEA Addendum

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Scottish & Southern Electricity Networks

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1. Introduction

1.1. Project Background

Scottish and Southern Electricity Networks - Transmission (SSEN Transmission), the trading name for Scottish Hydro Electric Transmission plc ('the Applicant'), hold a licence under the Electricity Act 1989 for the transmission of electricity in the north of Scotland. As the licensed electricity Transmission Owner (TO) for this region, the Applicant has a statutory duty to provide an economic and efficient system for the transmission of energy and to ensure that its assets are installed and maintained to enable a safe, secure and reliable transmission of power.

In February 2021, the Applicant gained consent for the construction of the Western Isles High Voltage Directional Current (HVDC) Link ('the Project') through a Marine Licence (MS-00008738) issued under Part 4 of the Marine (Scotland) Act 2010. The Project is part of the wider Western Isles Connection Project and will reinforce the electrical network connection between the Western Isles and the Scottish Mainland to provide the increased capacity required to accommodate generation from renewable energy projects connected to the Western Isles. The Project represents the subsea component of the Western Isles Connection Project and encompasses a new subsea new transmission link between Arnish Point (Stornoway) on the Isle of Lewis, and Dundonnell on the Scottish mainland.

The key components of the Project include:

- Installation of two HVDC cables and one fibre optic cable as a single bundle of 82 km in length;
- Landfall works, including the installation of ducts and Horizontal Directional Drilling (HDD) at both landfalls;
- Cable burial via ploughing, mechanical cutting or water jetting to a target depth of lowering between 0.6 and 1.5 m; and
- Installation of cable protection, including up to 40 concrete mattresses, 1.5 km of cast iron shells and up to 162,874 tonnes of rock armour.

In addition to the Project, the other key elements of the Western Isles Connection Project include:

- HVDC converter station near Beauly and associated civil works;
- HVDC converter station near Arnish and associated civil works;
- Alternating Current (AC) substation near Arnish and Beauly; and
- Approximately 77 km of underground land cable.

This document considers the marine components of the Project up to mean high water springs (MHWS) at both landfalls. The onshore aspects above MHWS are consented separately and are not considered in this document.

1.2. Purpose and Scope of this Document

Following the development and refinement of Project specifications and design, the Applicant is seeking a variation to the existing Marine Licence for the Project (see Section 2). The Marine Licence variation request encompasses several Project modifications and additions, hereafter collectively referred to as the 'Project Design Refinements'.

This document is an addendum to the Marine Environmental Appraisal (MEA) which supported the Marine Licence application for the Project (submitted to the Marine Scotland Licensing Operations Team (MS-

LOT)[1] in October 2018), referred to throughout this document as the 'original MEA'. This MEA Addendum describes and assesses potential material changes to the findings of the original MEA, which may result from the Project Design Refinements, and supports the request to MD-LOT for the proposed variation of the Project's Marine Licence.

The scope of this MEA Addendum was informed by a Gap Analysis (Section 3 and Appendix A), a screening exercise to assess the potential impacts of the Project Design Refinements against the assessments of the original MEA. The topics and impacts requiring further assessment within this MEA Addendum were identified through the Gap Analysis, as those with the potential to be materially altered by the Project Design Refinements.

This document should be read in conjunction with the following documents which informed the determination of Marine Licence MS-00008738:

- Western Isles Connection Project Environmental Appraisal (Xodus Document Number A-100336S00-REPT-004); and
- LT14 Western Isles HVDC Link - Post Application Support Pockmark Cable Routing (Xodus Document Number: A-10336-S04-TECH-002).

1.3. Structure of this Document

The structure of the MEA Addendum is provided in Table 1.

Table 1 Structure of this MEA Addendum

Section	Title	Summary
1	Introduction	Summary of the Project background and purpose of this MEA Addendum.
2	Project Design Refinements	Description of the Project Design Refinements which encompass the scope of the Marine Licence variation request.
3	Gap Analysis Summary	Summary of the Gap Analysis screening exercise, presented in full in Appendix A. This summary outlines the topics and impacts that require further assessment within this MEA Addendum.
4	Impact Assessment for the Project Design Refinements	Impact assessment for the topics and impacts identified as requiring further assessment within this MEA Addendum, informed by the Gap Analysis screening exercise.
5	Conclusion	Concluding remarks.
6	References	References.
7	Acronyms	Acronyms.
Appendix A	Gap Analysis Report	Screening exercise undertaken to inform the MEA Addendum and assess the potential impacts of the Project Design Refinements against the assessments of the original MEA. A summary is provided in Section 3.

[1] Marine Scotland - Licensing Operations Team (MS-LOT) are now known as Marine Directorate – Licensing Operations Team (MD-LOT).

Section	Title	Summary
Appendix B	Western Isles HVDC Link Electromagnetic Field and Compass Deviation Study Technical Note	Electromagnetic Field and Compass Deviation Study Technical Note (Evolv Energies, 2025) to present the results of the modelled Electromagnetic Field (EMF) intensities associated with the proposed increase in the capacity and voltage of the cable (see Section 2). A summary of the key findings is provided in Section 2.2.
Appendix C	Amended Project Cable Corridor Coordinates	Coordinates for the amended Project cable corridor, reflecting the proposed refinement to the consented Project cable corridor detailed in Section 2.8.

2. Project Design Refinements

2.1. Overview

The Project Design Refinements reflect the modifications and additions to the consented Project that the Applicant is requesting as part of a Marine Licence variation request. A summary of the Project Design Refinements is provided in Table 2 to clearly outline the proposed changes being sought by the Applicant. In addition to the changes outlined in Table 2, the Applicant is also seeking to incorporate the ability to discharge the Marine Licence conditions at the following discrete stages:

- Nearshore geotechnical boreholes;
- Debris removal;
- Landfall installation (including HDD); and
- Cable installation and protection (including route and seabed preparation).

As the phased discharge of the Marine Licence is purely administrative and procedural, and thus does not reflect a change in the consented Project design, this aspect of the Marine Licence variation request has not been included in Table 2.

Table 2 Proposed Changes to the Consented Project

Project Component	Project Design Parameter	Consented Project Design Envelope	Summary of Project Design Refinement	Proposed Change
Installation	Installation period	Marine Licence end date of 9th February 2026.	Marine Licence end date of 31st December 2030.	Extension of Marine Licence end date from 9th February 2026 to 31st December 2030 to reflect a construction programme change. See Section 2.2.
	Debris removal	Debris removal via Pre-Lay Grapnel Run (PLGR).	Debris removal via PLGR, subsea crane (with 'orange peel' grab) or Remote Operated Vehicle (ROV).	Addition of subsea crane (with 'orange peel' grab) or ROV for debris removal. See Section 2.3.
	Drilling and backfilling of nearshore boreholes at the Arnish Point and Dundonnell landfalls	Not included.	Drilling and backfilling of up to 14 boreholes (6 plus 1 contingency at each landfall).	Addition of drilling and backfilling of up to 14 nearshore boreholes. See Section 2.4.
Cable specifications and design	Northern feather star mitigation (Condition 3.2.11 and 3.37 of the Marine Licence)	As per Conditions 3.2.11 and 3.3.7 of the Marine Licence.	Refinement of Condition 3.2.11 to reflect the following (proposed additions highlighted with blue text and deletions highlighted with strikethrough): • *The Licensee must carry out a pre-lay survey within the Wester Ross MPA [Marine Protected Area]. This survey must collect images to ascertain if any northern feather star (Leptometra celtica) aggregations are present within the cable corridor.* • *If any* ***high probability*** *northern feather star* ***areas***[1] ~~***aggregations***~~ *are present, every attempt must be made to micro-route the cable to avoid these features* ***by 100 m. If this is not possible, this 100 m buffer may be reduced to 50 m or 25 m****;* • ~~***If avoidance is not possible, the CBPP, required under condition 3.2.8, must include surface laying of the cable with external Uraduct (or similar) protection in areas of northern feather star aggregations in order to minimise the footprint of the construction and avoid / minimise disturbance of the feature***~~ ***If avoidance by 25 m is not possible, jet trenching will be used within high probability northern feather star areas as the method of installation to minimise the footprint of the construction and avoid / minimise disturbance of the feature;*** • ***Only where trenching is not possible, due to the presence of ground conditions that prevent adequate depth of lowering via jet trenching, will external cable protection, including rock berms and tubular cable protection systems (where feasible) be used to protect the cable.*** The Applicant is also seeking to remove Condition 3.3.7 of the Marine Licence to allow for trenching within northern feather star aggregations, if avoidance is not possible: ~~***"The Licensee must ensure that no trenching takes place within 100 m of any northern feather star aggregations".***~~	Change in the mitigation approach for northern feather star aggregations in the Wester Ross Nature Conservation Marine Protected Area (NCMPA). This change is being sought to reflect the greater extent and abundance of northern feather star aggregations identified in the Project cable corridor[2]. It may not be possible to avoid all northern feather star aggregations within the Wester Ross NCMPA and as a result the Applicant has consulted NatureScot on this approach and concluded that jet trenching represents the least impactful protection method where northern feather star aggregations cannot be avoided. Recovery of northern feather star aggregations is expected within five years following the removal of substratum, surface abrasion or siltation, associated with the temporary impact of jet trenching (Table 13; NatureScot, 2025). Conversely, the use of external protection including rock berms and tubular protection results in a habitat change which is considered to be a long term/permanent impact. Surface laying with external protection is also not technically or commercially feasible for the Applicant in these areas. Surface-laid cables are vulnerable to various hazards, including damage from fishing activities, vessel anchors, and natural events. Subsea cables are a critical part of UK infrastructure, where damage can cause a risk to national security and/or energy security. Protection via trenching reduces the vulnerability of subsea cables. Therefore, the Applicant is seeking to vary Condition 3.2.11 of the Marine Licence, in line with the mitigation hierarchy, and also to allow for a proportionate approach to cable installation and protection. A variation to remove Condition 3.3.7 to allow trenching within northern feather star aggregations (where avoidance is not possible) is also being sought. See Section 2.5.
	[redacted]	[redacted]	[redacted]	[redacted]
	Transmission capacity	600 megawatts (MW)	2 gigawatts (GW)	Increase in transmission capacity of 1,400 MW. See Section 2.7.
	Voltage	320 kilovolts (kV)	525 kV	Increase in cable voltage by 205 kV. See Section 2.7.
	Corridor boundary	As per coordinates listed in Marine Licence (MS-00008738).	As per coordinates listed in Appendix C.	Minor extension and widening of the Project cable corridor at the Dundonnell landfall to optimise landfall design and exclude existing aquaculture lease area. See Section 2.8 and Appendix C.

[1] Northern feather star aggregations are considered to be represented by 'high probability' areas of northern feather stars, defined as regions with >0.5 probability of northern feather star occurrence in the Ocean Infinity (2024) species distribution model. Regions with a lower probability than 0.5 on the species distribution model are not considered to reflect the northern feather star aggregation on mixed substrata protected feature of the Wester Ross NCMPA. Further detail is provided in Section 2.5, Box 1.
[2] No northern feather stars were recorded in the 2016 site-specific surveys that informed the original MEA. Instead, the overlap of the Project cable corridor with this habitat was based on publicly available records in Moore (2014).

2.2. Extension of the Marine Licence End Date

The current Marine Licence is valid until 9th February 2026. The Applicant is seeking an extension to this Marine Licence end date, to reflect a shift in the construction programme to 31st December 2030.

An indicative installation programme is provided in Table 3.

Table 3 Indicative Installation Programme

Installation Activity	Indicative Time Period
Pre-lay surveys	Q3 2027
HDD	Q1 2028 – Q1 2029
Seabed preparation works	Q1 – Q3 2029
Marine cable installation (cable lay, burial, and protection)	Q3 2029 – Q1 2030
Post-installation survey	Q1 2030

2.3. Removal and Disposal of Marine Debris via Subsea Crane and ROV

Several areas of derelict fishing-related debris have been identified along the Project cable corridor. The assessment within the original MEA considered debris removal via PLGR, the subsequent recovery to the vessel, and disposal through licensed onshore facilities (see Sections 9.9.2 and 11.11.1 of the original MEA).

In addition to the PLGR, the Applicant is seeking to consent debris clearance via ROV or subsea crane with an orange peel grab under the Marine Licence variation request. The recovery and disposal of any debris would be undertaken as per the process outlined within the original MEA.

2.4. Nearshore boreholes at Arnish Point and Dundonnell

As the design and risk management strategy of the Project has evolved, there is a need to further understand the nature of the overburden and rock geology at the landfalls to inform the landfall HDD design. The Applicant plans to undertake two geotechnical surveys which will involve the drilling and backfilling of nearshore geotechnical boreholes at both landfalls. The exact number and locations of the boreholes are not yet known, however, as a worst-case, a maximum of 14 boreholes (6 plus 1 contingency at each landfall) will be drilled. The boreholes will be drilled to depths of between 45-60 m below the seabed using push or piston sampling, with mobile rotary sonic heads, where required. A 101 - 102 mm diameter core will be used to collect a soil sample at each borehole location of up to 0.48 m^3 (total extracted volume of 6.72 m^3 for 14 boreholes). Once the drilling is complete, the boreholes will be backfilled using cement and bentonite (a swelling clay material), with a maximum backfill volume of up to 1.47 m^3 per borehole (total backfill volume of 20.6 m^3 for 14 boreholes). The grout will terminate 1 m below the seabed to allow for natural backfilling with marine sediments.

It is proposed that jack-up vessels will be used for the drilling of nearshore boreholes, however, a small barge or drill ship vessel may also be used. The jack-up vessels will have four circular legs, approximately 0.762 m in diameter, resulting in an impacted area of approximately 1.82 m^2 at each sampling location (total of 25.62 m^2 impacted across all 14 boreholes). Prior to the settlement of the jack-up vessel legs on the seabed, known sensitive seabed features of benthic habitats will be avoided where practical, including protected features of relevant NCMPAs, informed by data from previous benthic surveys.

As per the Marine Licensing (Exempted Activities) (Scottish Inshore Region) Order 2011 (as amended), sediment sampling is exempt from requiring a Marine Licence under the Marine (Scotland) Act 2010, where:

- The volume of sediment removed is less than 1 cubic metre (per sample);
- It is not likely to cause a danger or obstruction to navigation;
- It is a plan or project not likely (either alone or in combination with other plans or projects) to have a significant effect on a European site; a Ramsar site; the protected features of an MPA; or any process on which the conservation of any protected feature of a MPA is dependent.

The drilling of nearshore boreholes at both landfalls is not considered to result in any likely danger or obstruction to navigation or any likely significant effect on any designated site (see Section 4 and Appendix A). Therefore, this activity is considered to be exempt from requiring a Marine Licence under the Marine (Scotland) Act 2010.

Under the Marine Licensing (Exempted Activities) (Scottish Inshore Region) Order 2011 (as amended), deposits of material and chemicals (e.g. grout and bentonite) are also exempt under certain conditions, such as that no deposit must be made in an area of the sea of a depth of less than 20 m or within one Nautical Mile (NM) of any such area except with the approval of the Scottish Ministers. As some of the nearshore boreholes may be located within (or within 1 NM of) waters of less than 20 m depth, the backfilling of boreholes with grout material is considered a licensable activity that the Applicant is seeking to consent as part of the Marine Licence variation request.

2.5. Refinement of Northern Feather Star Mitigation

The Project cable corridor overlaps the Wester Ross NCMPA, designated for a range of biodiversity and geodiversity features; including northern feather star aggregations, maerl beds, flame shell beds, burrowed mud, circalittoral muddy sand communities, kelp and seabed communities on sublittoral sediment, maerl or coarse gravel with burrowing sea cucumbers, seabed fluid and gas seep, marine geomorphology of the Scottish shelf seabed, quaternary of Scotland and submarine mass movement.

None of the protected features of the Wester Ross NCMPA were identified as being present in the Project cable corridor during the 2016 site-specific surveys that informed the original MEA, with the exception of 'burrowed' mud habitats on the approach to Little Loch Broom within the Project cable corridor (see Section 9.5 of the original MEA). The Project cable corridor was estimated to traverse approximately 300 m of northern feather star aggregations within the Wester Ross NCMPA, based on previous records in Little Loch Broom mapped by Moore (2014).

Condition 3.2.11 of the Marine Licence details the mitigation requirements to reduce disturbance to the northern feather star aggregations of the Wester Ross NCMPA:

> *The Licensee must carry out a pre-lay survey within the Wester Ross MPA [Marine Protected Area]. This survey must collect images to ascertain if any northern feather star (Leptometra celtica) aggregations are present within the cable corridor. If any northern feather star aggregations are present, every attempt must be made to micro-route the cable to avoid these features. If this is not possible, the CBPP, required under condition 3.2.8, must include surface laying of the cable with external Uraduct (or similar) protection in areas of northern feather star aggregations in order to minimise the footprint of the construction and avoid / minimise disturbance of the feature.*

Condition 3.3.7 further states:

> *The Licensee must ensure that no trenching takes place within 100 m of any northern feather star aggregations.*

In accordance with Condition 3.2.11, further surveys were conducted within the section of the Project cable corridor that overlaps the Wester Ross NCMPA. Reach Subsea AS ('Reach') were contracted by the Applicant to undertake a detailed geophysical and visual inspection survey of the Project cable corridor (Reach *et al.,* 2024). The data from the geophysical and visual inspection surveys were used to inform a northern feather star enumeration and aggregation assessment undertaken by Ocean Infinity (2024) along a 36 km section of the Project cable corridor, within the Wester Ross NCMPA. Ocean Infinity (2024) carried out visual data analysis of the survey data collected across three parallel orthomosaic transects (along the centreline of the Project cable corridor and two wing lines) and fourteen 200 m crossline transects.

In addition, Ocean Infinity (2024) developed a species distribution model to predict the probability of northern feather star presence within the section of the Project cable corridor that overlaps the Wester Ross NCMPA (Figure 3). The species distribution model used the confirmed locations of northern feather stars, identified through the visual data analyses described above, to predict the probability of northern feather star presence using the following explanatory variables: bathymetry, slope, eastness, northness and a Terrain Ruggedness Index (TRI). Further details on the methodology and results of the Ocean Infinity (2024) northern feather star enumeration and aggregation assessment are provided in Section 1.2 of Appendix A.

A higher abundance of northern feather star individuals and aggregations was recorded within the Project cable corridor compared to the previous assessment in the original MEA based on the Moore (2014) data. The Ocean Infinity (2024) study recorded a total of 27,406 northern feather stars across all transects and the most prevalent northern feather star aggregations were identified within outer Little Loch Broom and northwest of Gruinard Bay (Ocean Infinity, 2024). The identified northern feather stars from the Ocean Infinity (2024) study are shown in Figure 2, alongside the previous records of northern feather star aggregations considered for the original MEA.

The species distribution model identified that muddy sediments with an absence of large-scale seabed features are associated with a lower probability of northern feather star occurrence. Conversely, areas of a higher topographic heterogeneity coincided with a higher probability of northern feather star occurrence (Reach *et al.,* 2024).

Due to the significantly higher abundance and distribution of northern feather stars within the Wester Ross NCMPA, it may not be possible to avoid all aggregations during cable installation. Furthermore, it is also not technically or commercially feasible for the Applicant to surface lay the cable with a tubular protection system in these areas (see below).

As detailed in the Gap Analysis (Appendix A), the Applicant initially proposed to surface lay the cable with alternative external protection methods (e.g. rock placement or nature inclusive mattresses) where avoidance of northern feather star aggregations was not possible. However, following consultation with NatureScot, the Applicant concluded that jet trenching represented the least impactful cable protection method, as this allows for the recovery of this habitat via regeneration of damaged individuals, larval recruitment and adult immigrants.

Therefore, the Applicant is seeking to vary Condition 3.2.11 and remove Condition 3.3.7 of the Marine Licence, in line with the proposed mitigation hierarchy (Figure 1), to allow for a proportionate approach to northern feather star mitigation, while facilitating effective cable installation and protection (see Table 2):

- **Condition 3.2.11**:
  - Firstly, the Applicant proposes to refine Condition 3.2.11 to avoid 'high probability' northern feather star areas, as predicted by the Ocean Infinity (2024) species distribution model (see Box 1 for a definition of 'high probability') by a buffer of 100 m, if possible. If avoidance by 100 m is not possible, the avoidance buffer may be reduced to 50 m or 25 m; and
  - Secondly, where high probability northern feather star areas cannot be avoided by a buffer of 25 m, the Applicant is seeking to remove the requirement to surface lay and protect the cable

with a tubular cable protection system. Instead, the Applicant proposes to jet trench in these areas, with external cable protection only being used where the minimum target DoL cannot be achieved (further details will be provided in the CBPP, required under Condition 3.2.8 of the Marine Licence).

With regard to minimising disturbance or long-term loss of northern feather star aggregations within the Wester Ross NCMPA, jet trenching has been identified as the least impactful method of protection, compared to the use of external protection. This is because there is the potential for this habitat to recover following temporary disturbance from jet trenching, whereas the use of external protection results in the introduction of a new substrate which is a long term/permanent impact (see Table 13).

The Applicant is seeking this change as a result of the significantly expanded distribution of high probability northern feathery star areas identified within the cable installation corridor. This is because it is only feasible to install tubular cable protection systems, listed within Condition 3.2.11, over short distances (≤1,000 m, with the use of intermediary anchors, such as rock bags or clump weights). As such, if trenching is prohibited within unavoidable high probability northern feather star areas, extensive rock berms would be required to protect the cables. Surface laying of the cable over extended lengths poses a risk to cable integrity and increases the vulnerability to external threats, which may hinder the Applicant's ability to fulfil their statutory duty to provide an economic and efficient system for the transmission of electricity. It is also likely that cables protected using tubular protection systems will move laterally on the seabed during their operational life, for example due to subsea currents, which will result in continuous disturbance of northern feather star aggregations. Overall, the Applicant considers that jet trenching represents the most suitable option for cable protection, where avoidance of high probability northern feather star areas is not possible.

- **Condition 3.3.7**:
  - For the reasons detailed above, the Applicant is seeking to remove this condition to allow for trenching within high probability northern feather star areas, where avoidance is not possible.

It is also noted that the total footprint and volume of cable protection is expected remain within the consented quantities of the original Marine Licence. Further details on the cable protection requirements will be provided within the CBPP, required under Condition 3.2.8.

High probability areas: Areas of high probability are defined as regions classified as >0.5 probability of northern feather star occurrence in the Ocean Infinity (2024) species distribution model. Areas mapped as >0.5 probability of northern feather star occurrence in the species distribution tool (i.e. 'high probability') are considered to conform to the definition of 'northern feather star aggregations on mixed substrata' qualifying feature of the Wester Ross NCMPA.
Low probability areas: Areas of low probability are defined as regions classified as <0.5 probability of northern feather star occurrence in the species distribution model (i.e. densities of northern feather star would not be to an extent that would qualify as the 'northern feather star aggregations on mixed substrata' protected feature of the Wester Ross NCMPA).

Box 1 High and Low Probability Definitions for Northern Feather Star Aggregations

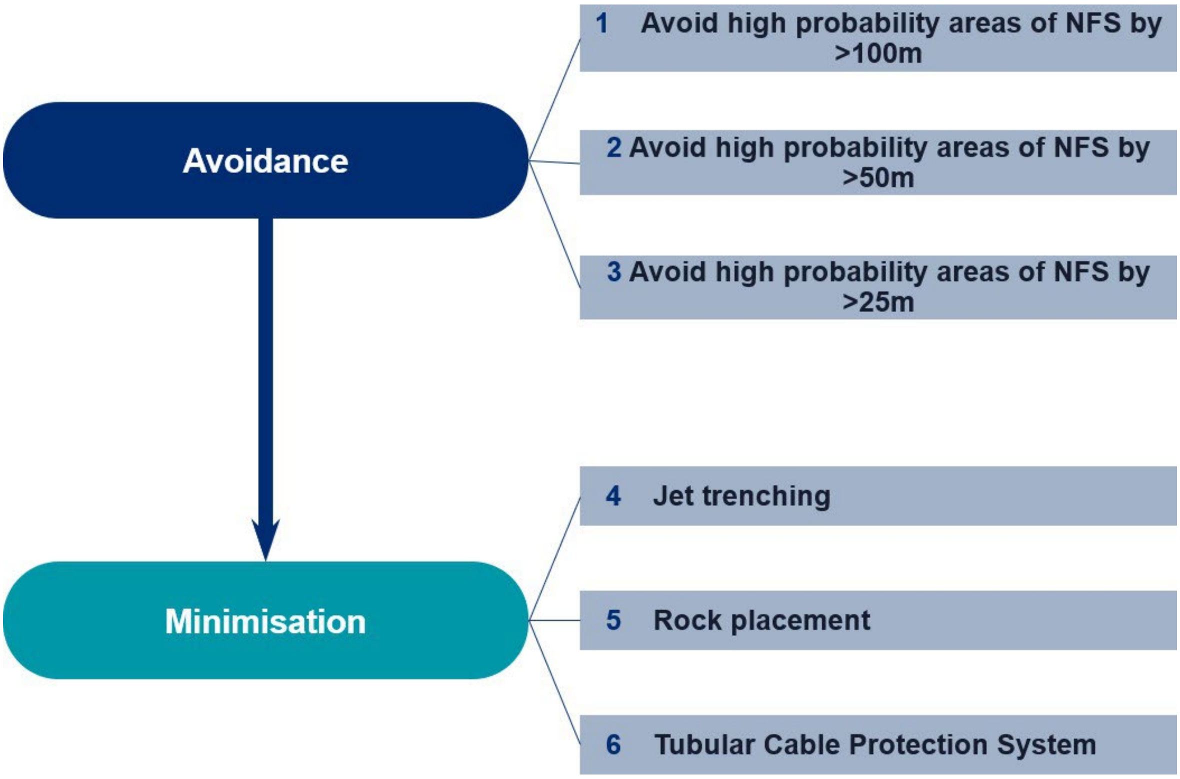

Figure 1 Proposed Mitigation Hierarchy for Northern Feather Star (NFS) Aggregations in the Wester Ross NCMPA

(See Box 1 for Definition of High Probability Areas of Northern Feather Star)

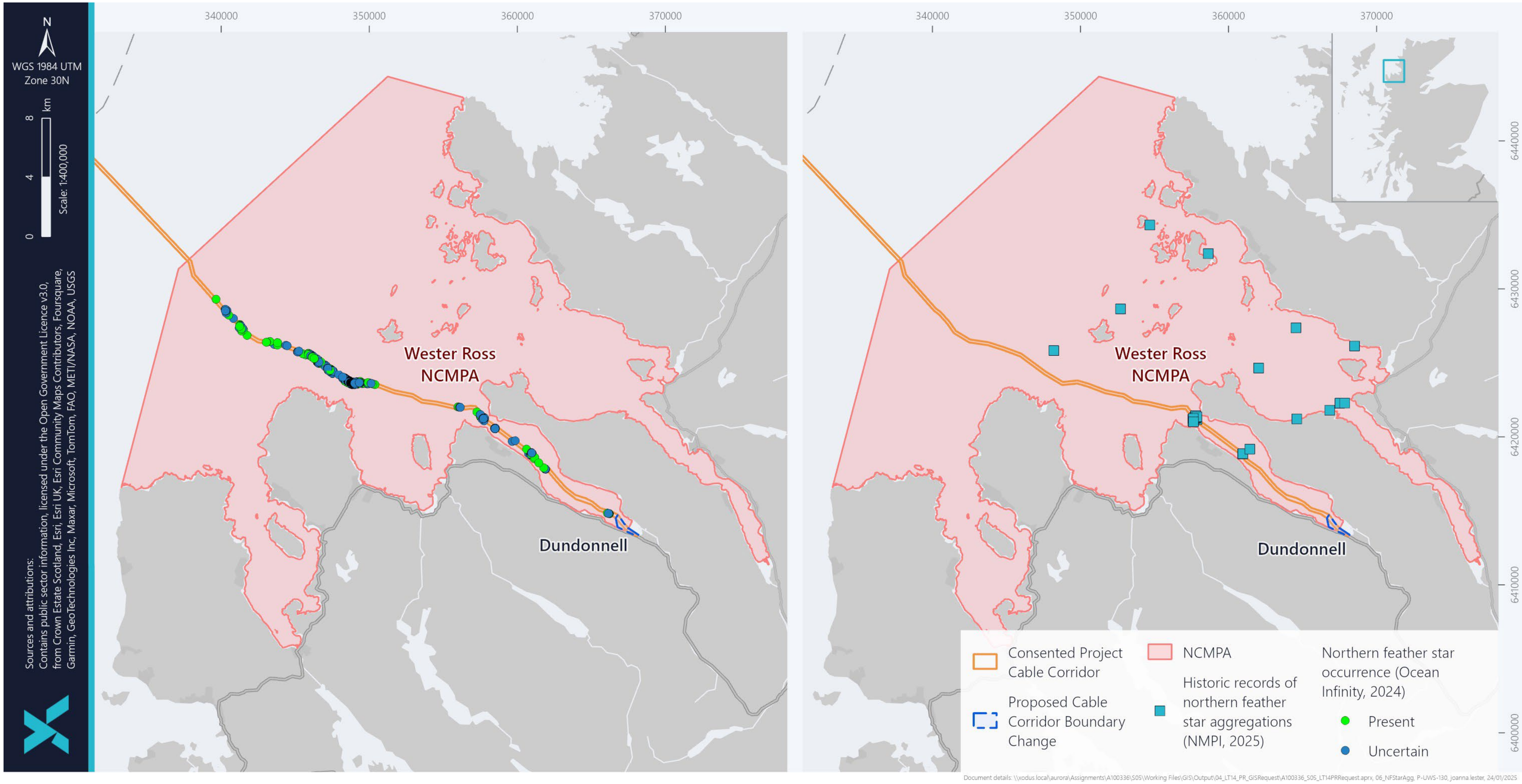

Figure 2 Northern feather stars identified in the Ocean Infinity (2024) Study (Left Panel) and the Historic Records on NMPI (2025) (Right Panel)

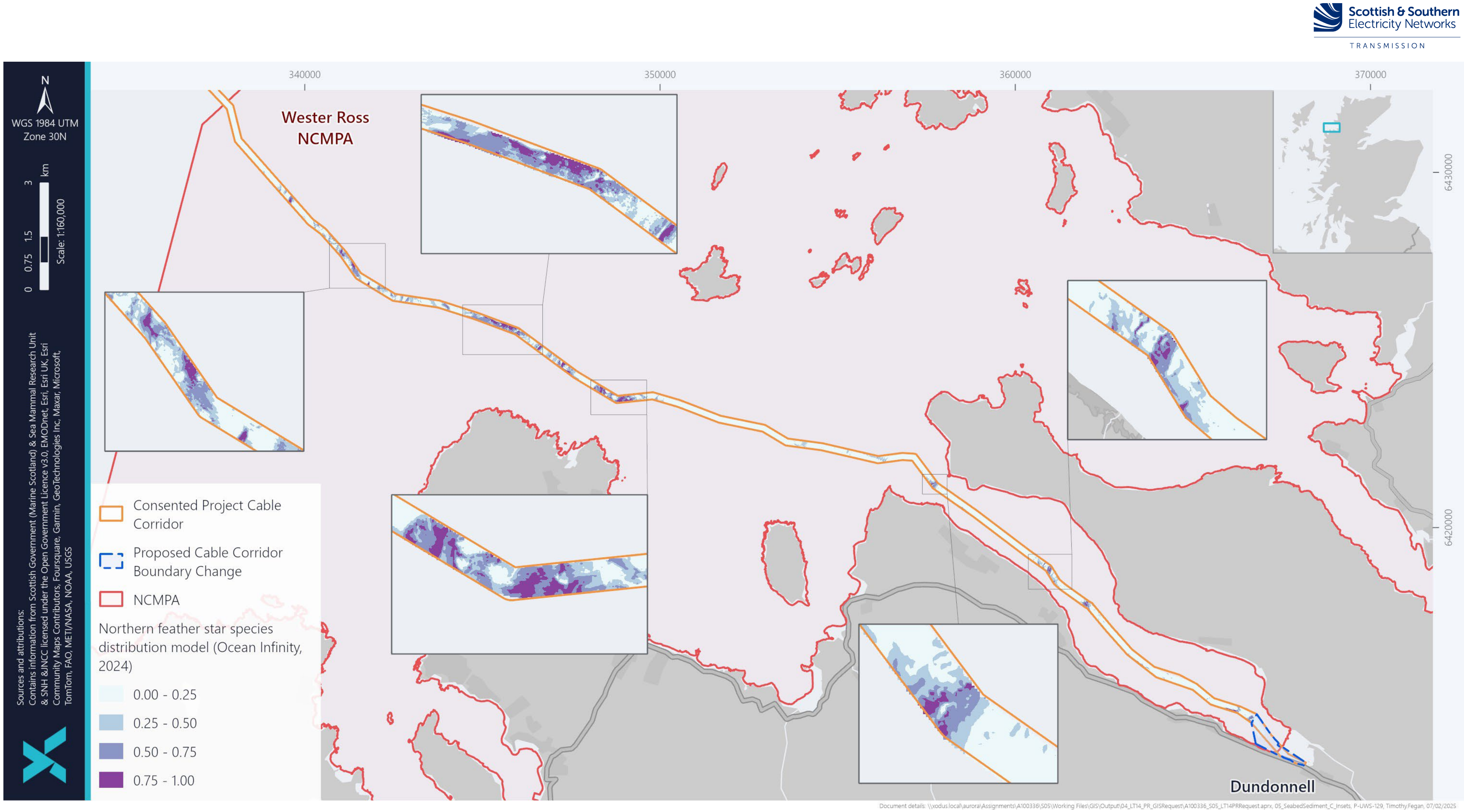

Figure 3 Northern Feather Star Probability of Occurrence (Ocean Infinity, 2024)

2.6. [redacted]

[redacted]

2.7. Increased Transmission Capacity and Voltage

The Applicant is seeking to 1) increase the transmission capacity of the Project from 600 MW to 2 GW; and 2) increase the operating voltage from 320 kV to 525 kV. The proposed increase in cable voltage and transmission capacity will result in a localised change in the EMF intensities and magnetic compass deviations associated with the Project.

In order to understand the implications of the proposed increase in cable voltage and transmission capacity, the Applicant commissioned an Electromagnetic Field and Compass Deviation Study Technical Note (Appendix B) to model the EMF intensities and magnetic compass deviation from the consented (600 MW; 320 kV) and refined (2 GW; 525 kV) cable designs. For full details on the methodology and assumptions used for the Electromagnetic Field and Compass Deviation Study Technical Note, please see Appendix B.

The Electromagnetic Field and Compass Deviation Study outputs are summarised in Table 4 below, showing a comparison of the consented 320 kV cable and the refined 525 kV cable design. The maximum magnetic field (B-field) intensities resulting from the cable designs, combined with the Earth's natural geomagnetic field (GMF), at distances of 0 to 10 m from the cables are presented. The summarised Kilometre Points (KPs) in Table 4 were chosen to be representative of different target DoLs (0.6 m, 1 m, or surface laid) and cable configurations (bundled or separated) which comprise the current Project design parameters. The seabed between KP 50 to KP 60 and around KP 70 have been identified as northern feather star regions. At the time of the Electromagnetic Field and Compass Deviation Study, it was assumed that cables may be surface laid in northern feather star regions. Therefore, the modelling has assumed a surface laid configuration throughout the northern feather star regions (as the worst case, considering the fact that the cables will largely be trenched, subject to the mitigation requirements detailed in Section 2.5). At the HDD pop-outs at both landfalls, it is assumed the cables will be separated for a short distance, and thereafter the cables will be bundled.

The 525 kV cable design has higher EMF intensities and compass deviations at every KP presented in Table 4. The highest EMF intensity and compass deviation occurs at the HDD pop out locations, where the cables will be separated and surface laid for a short distance. The implications of the increased transmission capacity and voltage, and associated increase in EMF intensity and compass deviation are considered in Sections 3 and 4.

Table 4 Electromagnetic Field and Compass Deviation Study Outputs (Evolv Energies, 2025)

(grey shaded cells = consented 320 kV cable design, Light blue shaded cells = refined 525 kV cable design, see Appendix B)

KP	Region	Water depth (m)	Target Depth of Lowering (DoL) (m)	Configuration of cables	Maximum EMF intensity above seabed (microtesla; µT) for the 320 kV cable (original MEA)				Maximum EMF intensity above seabed (µT) for the 525 KV cable (MEA Addendum)				Maximum compass deviation at sea level (degrees) for the 320 kV cable	Maximum compass deviation at sea level (degrees) for the 525 kV cable
					0 m	1 m	5 m	10 m	0 m	1 m	5 m	10 m		
0.660	Arnish Point HDD pop out	21.77	Surface laid	Separated	3,268.27	205.14	86.91	65.07	6,197.50	456.22	141.20	86.59	8.652	20.411
1.0	Subsea cable route	27.15	1.0	Bundled	71.86	55.97	51.3	50.9	120.02	67.88	52.61	51.28	0.054	0.174
40.3	Subsea cable route	121.73	0.6	Bundled	109.85	59	51.39	50.91	243.18	77.72	52.91	51.33	0.002	0.008
50.3	Northern feather star region	83.32	Surface laid	Bundled	3,251.91	69.6	51.54	50.93	6,156.04	110.53	53.38	51.4	0.006	0.019
69	Northern feather star region	59.625	Surface laid	Bundled	3,252.6	69.75	51.55	50.93	6,156.58	110.77	53.4	51.4	0.008	0.026
72	Subsea cable route	66.21	0.6	Bundled	109.96	59.04	51.4	50.91	243.34	77.82	52.92	51.34	0.006	0.021
80	Subsea cable route	35.91	0.6	Bundled	109.83	58.98	51.40	50.91	242.97	77.70	52.91	51.33	0.029	0.090
80.773	Dundonnell HDD pop out	10.00	Surface laid	Separated	3,270.39	206.78	87.07	65.13	6,199.63	458.14	141.44	86.69	36.200	87.030

2.8. Refinement of the Project Cable Corridor

Following a review of the cable route, the Applicant is proposing a minor modification to the consented Project cable corridor at the approach to the Dundonnell landfall. This modification includes:

- A refinement to avoid the aquaculture Crown Estate Scotland (CES) lease area to the north of the landfall; and
- Widening on the approach to the Dundonnell landfall to optimise landfall design.

The amended Project cable corridor is presented in Figure 4 and a coordinate list of the boundary points is provided in Appendix C.

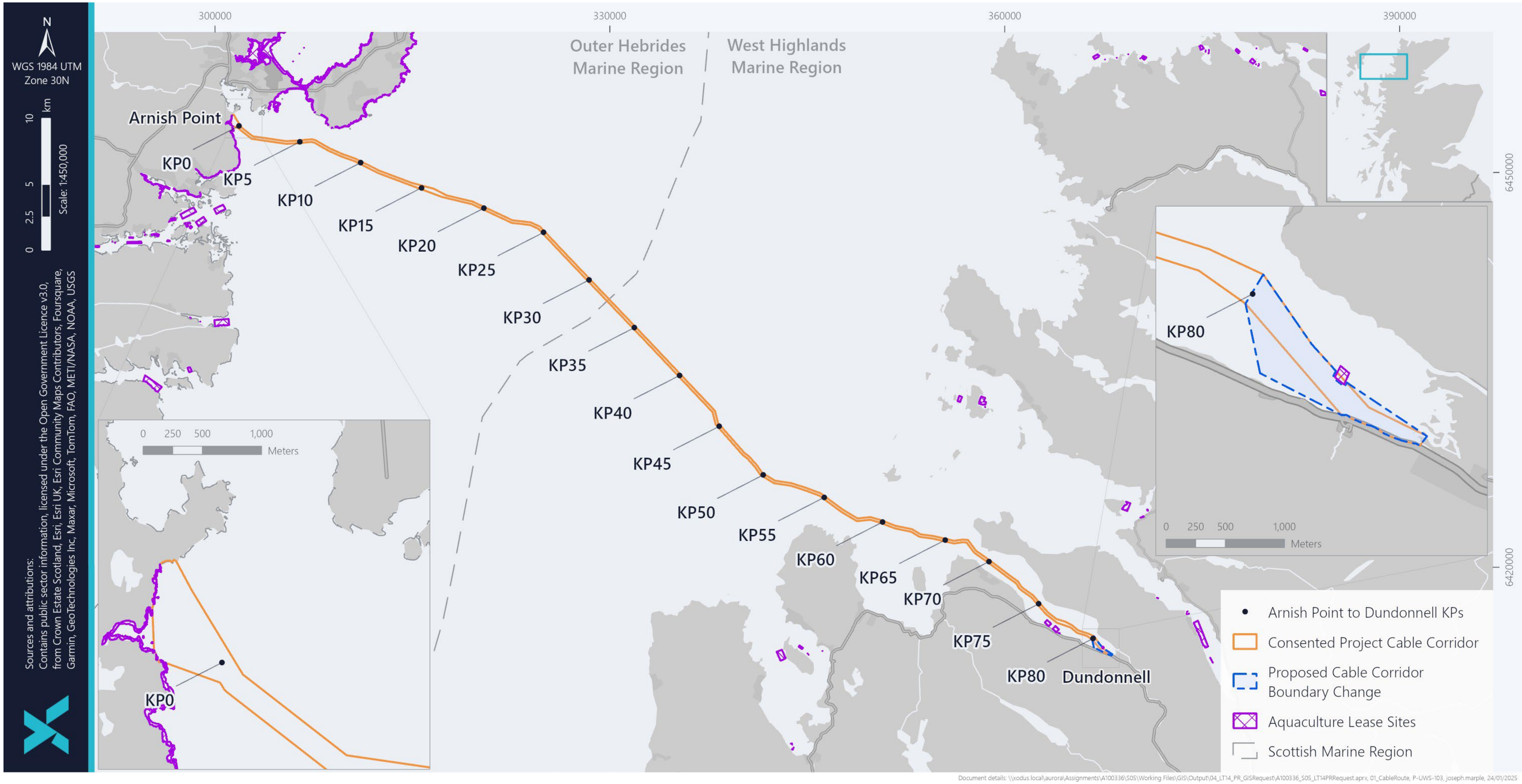

Figure 4 Proposed Changes to the Consented Project Cable Corridor

2.9. Phased Discharge of the Marine Licence

As currently written, the conditions of the Marine Licence must be discharged prior to, during or upon completion of the Licensed Activity, defined as “any activity or activities listed in section 21 of the 2010 Act which is, or are authorised under the licence”. Therefore, all conditions listed under Section 3.2 “Prior to the commencement of Licence Activity” must be discharged prior to any works authorised under the Marine Licence commencing.

The Applicant is seeking to incorporate the ability to discharge the Marine Licence at the following discrete stages:

- Nearshore geotechnical boreholes;
- Debris removal;
- Landfall installation (including HDD); and
- Cable installation and protection (including route and seabed preparation).

A phased discharge of the Marine Licence will provide the Applicant with greater flexibility for the Project schedule, which is critical to meet regulatory deadlines. This request is procedural and administrative and therefore does not reflect a change in the consented Project design.

The proposed conditions to be discharged at each of the four discrete stages listed above are outlined in Table 5. New proposed conditions have been provided for the nearshore geotechnical boreholes, debris removal, and landfall installation (including HDD) stages to enable the commencement of these activities ahead of the cable installation and protection stage.

All other conditions listed in the Marine Licence will be implemented as required, prior to and during each Licensed Activity (Conditions 3.2.1 - 3.2.4, 3.3.1 - 3.3.14). All conditions to be discharged under Section 3.4 “Upon Completion of the Licensed Activity” of the Marine Licence will be discharged upon completion of the cable installation and protection stage (i.e. the last stage).

Table 5 Proposed Phased Discharge of the Marine Licence

Project Phase	Conditions to be Discharged
Nearshore geotechnical boreholes	**New Proposed Condition**: The Licensee must, prior to and no less one month before the Commencement of the Licensed Activity, provide the proposed locations, depths and sample sizes of the nearshore geotechnical boreholes.
Debris removal	**3.2.7**. The Licensee must submit a Construction Environmental Management Plan ("CEMP") to the Licensing Authority for its written approval at least two months prior to Commencement of the Licensed Activity, or less if agreed by the Licensing Authority. The CEMP must be consistent with the marine licence application and supporting documents and must contain, but not be limited to, the following: a) Measures to minimise, recycle and reuse waste; b) Ecology Management Plan; c) Protocol for Archaeological Discoveries; and d) Marine Mammal Protection Plan. All works must proceed in accordance with the approved CEMP. Any updates or amendments made to the CEMP must be submitted, in writing, to the Licensing Authority for its written approval no later than two months or at such a time as agreed with the Licensing Authority, prior to the planned implementation of the proposed amendments. It is not permissible for any works to commence prior to approval of the CEMP.
	3.2.9. The Licensee must submit a Fisheries Liaison and Mitigation Action Plan to the Licensing Authority no later than two months prior to the commencement of operations relating to the licence, for its written approval. It is not permissible for works relating to the licence to commence prior to the granting of such approval. In granting such approval, the Licensing Authority may consult any such advisors, organisations or stakeholders as may be required at its discretion. All operations relating to the licence must be undertaken and operated in accordance with the approved Fisheries Liaison and Mitigation Action Plan. Any updates or amendments made to the Fisheries Liaison and Mitigation Action Plan by the Licensee must be submitted, in writing, by the Licensee to the Licensing Authority for its written approval. The Fisheries Liaison and Mitigation Action Plan must include employment of a Fisheries Liaison Officer, details regarding how the Licensee intends to engage with the local small craft sector and use of guard vessels to perform the following functions: a) Alerting other sea users of the cable laying vessel's presence; b) Guard any free ends of the cable on the seabed while the cable laying vessel reloads; and c) Guard the unprotected cable between lay and burial.

Project Phase	Conditions to be Discharged
	<u>3.2.10.</u> The Licensee must submit a Communication Strategy to the Licensing Authority no later than two months Prior to the Commencement of the Licensed Activity, for their written approval. It is not permissible for operations to commence prior to the granting of such approval. The Communication Strategy must document clearly defined procedures for the distribution of information relating to all cable construction, protection and survey activities to the fishing industry and other legitimate users of the sea. All works must proceed in accordance with the approved Communication strategy. The Communication Strategy must include the following:– a) Details of the timing, format and method(s) of distribution of notices of all operations relating to the licence including, but not limited to, horizontal directional drilling, boulder clearance, trenching, cable laying, backfill, surveys and additional protection; b) Details of the timing, format and method(s) of distribution of notices of hazards to other legitimate users of the sea; c) Details of the timing, format and method(s) of distribution of details of any protection requirements including expected berm heights relative to the sea bed (this information must be distributed at least four weeks prior to the commencement of any rock placement); and d) Details of the timing, format and method(s) of distribution of as laid position of cables and protection including berm heights relative to the sea bed.
Landfall installation (including HDD)	**<u>New Proposed Condition</u>**: The Licensee must submit a Landfall Method Statement to the Licensing Authority for its written approval at least two months prior to the Commencement of the Licensed Activity, or less if agreed by the Licensing Authority. The Landfall Method Statement must contain, but not be limited to, the following: • Method statement including vessel, equipment, and contractor requirements; • Details of drilling fluids and chemicals to be used; and • Details of measures to reduce the risk of marine pollution (e.g. from release of drill fluids or accidental releases of hazardous substances).

Project Phase	Conditions to be Discharged
Cable installation and protection (including route and seabed preparation)	**3.2.6.** The Licensee must undertake a desk study to establish the levels of electromagnetic deviation affecting ship compasses and other navigation systems caused by the cable. Should the desk study establish unacceptable deviation, a deviation survey plan must be submitted to Licensing Authority for its approval. In granting such approval, the Licensing Authority may consult any such advisors, organisations or stakeholders as may be required at its discretion.
	3.2.8. The Licensee must submit a Cable Burial and Protection Plan (CBPP) to the Licensing Authority for its written approval no later than two months prior to the commencement of operations relating to the licence. It is not permissible for operations relating to the licence to commence prior to the granting of such approval. In granting such approval, the Licensing Authority may consult any such other advisors, organisations or stakeholders as may be required at their discretion. The CBPP must be consistent with the marine licence application and supporting information. All works must proceed in accordance with the approved CBPP. The CBPP must include the following:– a) Details of the location of all works relating to the licence and cable laying techniques; b) Summaries of the survey work used to inform cable routing. The summaries must include geophysical, geotechnical and benthic surveys, desk top studies and cable route studies where available. A non-technical summary of this information must be provided; c) A burial plan based on survey data to show proposed burial depths throughout the whole cable route. In locations where burial is not proposed it must be demonstrated, to the satisfaction of the Licensing Authority, that burial is not feasible. In locations where burial is not feasible, cables must be suitably protected through recognised and approved measures where practicable, and as risk assessments direct; d) Proposals for survey activity and programming to ensure safety of navigation to other legitimate users of the sea, and with particular relevance to fishing activity, in line with industry best practices and guidelines. Such proposals must apply to the entire cable route; e) Proposals for further surveys to be undertaken, determined by the analysis of the data from previous survey activity and subsequent modelling and trending of seabed conditions; f) Best method of practice to minimise re-suspension of sediment during the works; g) Steps taken to ensure existing and future safe navigation is not compromised. A maximum of 5% reduction in surrounding depth referenced to Chart Datum must not be exceeded without the approval of the Licensing Authority in consultation with the Maritime and Coastguard Agency; and h) Details of any identified northern feather star aggregations, as detailed in condition 3.2.11, and the cable burial or protection methods selected to ensure any effects on these features will be minimised. The CBPP must also identify if any further pockmarks or any maerl or flame shell beds have been identified and how any effects on these features will be minimised.

Project Phase	Conditions to be Discharged
Cable installation and protection (including route and seabed preparation)	**<u>3.2.11 Proposed updated wording as per the Project Design Refinements, see Table 2:</u>** The Licensee must carry out a pre-lay survey within the Wester Ross MPA [Marine Protected Area]. This survey must collect images to ascertain if any northern feather star (*Leptometra celtica*) aggregations are present within the cable corridor. • If any high probability northern feather star areas are present, every attempt must be made to micro-route the cable to avoid these features by 100 m. If this is not possible, this 100 m buffer may be reduced to 50 m or 25 m; • If avoidance by 25 m is not possible, jet trenching will be used within high probability northern feather star areas as the method of installation to minimise the footprint of the construction and avoid / minimise disturbance of the feature; and • Only where trenching is not possible, due to the presence of ground conditions that prevent adequate depth of lowering via jet trenching, will external cable protection, including rock berms and tubular cable protection systems (where feasible) be used to protect the cable.

3. Gap Analysis Summary

A Gap Analysis screening assessment was undertaken to compare the potential impacts of the Project Design Refinements against the assessments of the consented Project design parameters in the original MEA and identify the topics or impacts requiring further assessment. Specifically, the Gap Analysis considered the following aspects to identify potential new or increased impacts which would materially change the conclusions of the original MEA:

- Changes to the Project Design Envelope (PDE), based on the Project Design Refinements (Section 2);
- Updates in legislation and policy since the original MEA submission;
- Updates to the baseline environment since the original MEA submission;
- Updates to nearby projects, plans and activities since the original MEA submission, which could result in a change to cumulative impacts as a result of the construction programme shift / extension of Marine Licence end date; and
- Updates to the evidence-base for impacts of subsea cables since the original MEA submission.

Where a new or increased impact was identified which could result in a material change to the assessment of the original MEA, the topic and impact were screened into this MEA Addendum for further assessment (see Section 4). Table 6 below summarises the findings of the Gap Analysis Report, with further information available in Appendix A.

It should be noted that the original approach considered by the Applicant for the Marine Licence variation (to surface lay the cable with alternative protection methods (e.g. rock placement or nature inclusive mattresses)) was considered at the time of the Gap Analysis (Appendix A). However, as noted in Section 2.5, following consultation with NatureScot, the Applicant later concluded that jet trenching represented the least impactful cable protection method where high probability northern feather star areas cannot be avoided. This is not considered to alter the screening conclusions of the Gap Analysis.

Table 6 Gap Analysis Summary

(Grey shaded cells = no pathway for increased or new impact (screened out of MEA Addendum), green cells = potential pathway for increased or new impact with no material change to original MEA conclusions (screened out of MEA Addendum), orange cells = potential pathway for increased or new impact that could materially change the conclusions of the original MEA (screened into MEA Addendum)

Topic	Increased Voltage and Transmission Capacity	Refinement of Northern Feather Star Mitigation	Nearshore boreholes at Arnish Point and Dundonnell	Refinement of the Project Cable Corridor	Increased Cable Protection Requirements at MoD Cable Crossing	Removal and Disposal of Marine Debris	Extension of Marine Licence End Date	Phased Discharge of the Marine Licence	Requirement for Consideration in MEA Addendum	Justification Summary
Policy and legislation									No	A detailed review of United Kingdom (UK) legislation and planning policy revealed no substantive changes that would alter the original MEA's conclusions. While the updated National Planning Framework 4 (NPF4) policies and proposed National Marine Plan 2 (NMP2) policies emphasise nature enhancement and nature-inclusive design, these objectives align with the Project's existing commitments and mitigation strategies. The Applicant will continue to consider relevant updated policies in the design and implementation of mitigation strategies as the Project approaches detailed design and construction. Consequently, updates to legislation and policy do not necessitate further consideration within the MEA Addendum. **The conclusions of the original MEA are considered to remain valid, and this topic is screened out of the MEA Addendum.**
Ecological protected sites									Yes – for the Wester Ross NCMPA and North-East Lewis NCMPA only.	The updated site-specific data for the Wester Ross NCMPA represented the key baseline update for ecological protected sites. Northern feather star aggregations were identified in the Project cable corridor through the Ocean Infinity (2024) analysis of survey data collected between February and March 2024 (see Section 2.5). The discovery of these aggregations and individuals was identified as having the potential to materially change the conclusions of the original MEA. All other baseline updates were considered immaterial to the conclusions of the original MEA. The following Project Design Refinements were identified as having the potential to result in new or increased impacts for this topic: • Protected sites with geomorphological features: – Increased seabed disturbance associated with the drilling of up to 14 boreholes (6 plus 1 contingency at each landfall) and the temporary presence of jack-up vessels or spud leg barges; – Potential disturbance or alteration to geological features from the introduction of cement bentonite grout for borehole backfilling; • Protected sites with benthic and/or fish ecology features: – A change in cable capacity and voltage altering EMF intensities; – Increased disturbance footprint for northern feather star aggregations within the Wester Ross NCMPA; – Increased seabed disturbance footprint associated with the drilling of up to 14 boreholes (6 plus 1 contingency at each landfall) and the temporary presence of jack-up vessels or spud leg barges; • Protected sites with ornithological or marine mammal features: – Increased presence of vessels in the nearshore environment for drilling of up to 14 boreholes (6 plus 1 contingency at each landfall) could increase the potential for disturbance and/or displacement of mobile species. Only impacts to protected sites with benthic and/or fish ecology features, including the Wester Ross NCMPA (designated for a range of benthic protected features) and North-East Lewis NCMPA (designated for sandeels, *Ammodytes marinus* / *Ammodytes tobianus*) were identified as requiring further assessment within this MEA Addendum. For the North-East Lewis NCMPA, only the increase in cable capacity and voltage was identified as having the potential to materially change the conclusions of the MEA for the sandeel protected feature of this NCMPA. No material changes to the in-combination effects assessments, associated with the extension of the Marine Licence end date, were identified. **The conclusions of the original MEA are considered to remain valid for all ecological protected sites with the exception of the Wester Ross NCMPA and North-East Lewis NCMPA. Impacts to the Wester Ross NCMPA (benthic protected features only) and the North-East Lewis NCMPA (sandeel protected feature) are screened in for further assessment in this MEA Addendum.**

Topic	Increased Voltage and Transmission Capacity	Refinement of Northern Feather Star Mitigation	Nearshore boreholes at Arnish Point and Dundonnell	Refinement of the Project Cable Corridor	Increased Cable Protection Requirements at MoD Cable Crossing	Removal and Disposal of Marine Debris	Extension of Marine Licence End Date	Phased Discharge of the Marine Licence	Requirement for Consideration in MEA Addendum	Justification Summary
Benthic and intertidal ecology									Yes	The updated site-specific data for the Wester Ross NCMPA represents the key baseline update for benthic and intertidal ecology (as per ecological protected sites above). The discovery of these aggregations and individuals within the Project cable corridor was identified as having the potential to materially update the conclusions of the original MEA. All other baseline updates were considered immaterial to the conclusions of the original MEA. The following Project Design Refinements were identified as having the potential to result in new or increased impacts for this topic: • A change in cable capacity and voltage altering EMF intensities; • Increased disturbance footprint for northern feather star aggregations within the Wester Ross NCMPA; and • Increased seabed disturbance footprint associated with the drilling of up to 14 boreholes (6 plus 1 contingency at each landfall) and the temporary presence of jack-up vessels or spud leg barges. All impacts were identified as having the potential to materially alter the conclusions of the original MEA for benthic and intertidal ecology topic, and therefore, all were screened in for further assessment within the MEA Addendum. No material changes to the cumulative effects assessment, associated with the extension of the Marine Licence end date, were identified. **Impacts to benthic and intertidal ecology are screened in for further assessment in this MEA Addendum.**
Physical environment and seabed conditions									No	Updated geophysical surveys conducted between February and March 2024 provide further data to characterise the seabed along the Project cable corridor. The Gap Analysis concluded that the survey data aligns closely with the characterisation established through the 2016 surveys, indicating no material changes to the seabed's structure or composition. The following Project Design Refinements were identified as having the potential to result in new or increased impacts for this topic: • Increased seabed disturbance footprint associated with the drilling of up to 14 boreholes (6 plus 1 contingency at each landfall) and the temporary presence of jack-up vessels or spud leg barges. Due to a lack of spatial overlap between nearshore boreholes and geologically sensitive features (e.g. pockmarks), it was concluded that these activities do not warrant further assessment within the MEA Addendum. No material changes to the cumulative effects assessment, associated with the extension of the Marine Licence end date, were identified. **The conclusions of the original MEA are considered to remain valid, and this topic is screened out of the MEA Addendum.**
Fish and shellfish ecology									Yes	A range of baseline updates were identified for fish and shellfish ecology, reflecting the increased research efforts for this topic in the last 10 years. The updated information largely corroborates the findings of the original MEA and did not indicate any significant changes to the sensitivity of receptors or the magnitude of potential impacts. The updated research around the sensitivity of fish and shellfish to EMF was identified as having the potential to alter the conclusions of the original MEA, and this was considered an important point of consideration within the MEA Addendum. The following Project Design Refinements were identified as having the potential to result in new or increased impacts for this topic: • A change in cable capacity and voltage altering EMF intensities; and • Increased seabed disturbance footprint associated with the drilling of up to 14 boreholes (6 plus 1 contingency at each landfall) and the temporary presence of jack-up vessels or spud leg barges. The potential change in EMF intensities associated with the Project Design Refinements was identified as having the potential to materially change the conclusions of the original MEA and therefore this impact was screened in for further assessment in the MEA Addendum. The seabed disturbance associated with nearshore drilling activities was identified as having no potential to materially alter the conclusions of the MEA Addendum. Species most sensitive to seabed disturbance, herring (*Clupea harengus*) and sandeel, were considered unlikely to be significantly affected, due to the highly localised nature of this impact and the wider availability of spawning grounds. No material changes to the cumulative effects assessment, associated with the extension of the Marine Licence end date, were identified. **Impacts to fish and shellfish ecology (changes in EMF intensities only) are screened in for further assessment in this MEA Addendum.**

Topic	Increased Voltage and Transmission Capacity	Refinement of Northern Feather Star Mitigation	Nearshore boreholes at Arnish Point and Dundonnell	Refinement of the Project Cable Corridor	Increased Cable Protection Requirements at MoD Cable Crossing	Removal and Disposal of Marine Debris	Extension of Marine Licence End Date	Phased Discharge of the Marine Licence	Requirement for Consideration in MEA Addendum	Justification Summary
Ornithology									No	Several new reports and studies have been published since the submission of the original MEA, providing updated information on seabird distributions in Scotland. However, this updated data was not identified as having any potential to result in material changes to the sensitivity of receptor or the magnitude of the potential impact with no material consequences to the original MEA conclusions. The following Project Design Refinements were identified as having the potential to result in new or increased impacts for this topic: • Increased presence of vessels in the nearshore environment for drilling of up to 14 boreholes (6 plus 1contingency at each landfall) could increase the potential for disturbance and/or displacement of mobile species. With the implementation of embedded mitigation – such as maintaining slow vessel speeds and minimising vessel lighting – no material change to the conclusions of the original MEA were identified. The additional vessel activity was judged to represent a minor increase in the overall number of vessels, which will not result in a material change to any disturbance or displacement to seabirds, beyond what was assessed in the original MEA. No material changes to the cumulative effects assessment, associated with the extension of the Marine Licence end date, were identified. **The conclusions of the original MEA are considered to remain valid, and this topic is screened out of the MEA Addendum.**
Marine mammals									No	Updated baseline information provided through various sources, including the SCANS-IV (Small Cetaceans in European Atlantic waters and the North Sea) survey (Giles *et al.,* 2023) and recent reports on seal populations (Carter *et al.,* 2022; SCOS 2022, 2023), enhances the understanding of marine mammal populations in the Project cable corridor. However, despite these updates, the overall conclusions from the original MEA were deemed to remain valid, and no material changes were identified in the assessment of sensitivity or impact magnitude. The following Project Design Refinements were identified as having the potential to result in new or increased impacts for this topic: • Increased presence of vessels in the nearshore environment for drilling of up to 14 boreholes (6 plus 1 contingency at each landfall) could increase the potential for disturbance and/or displacement of mobile species. The Applicant remains aware of the sensitivities of marine mammals, particularly in light of the recent strandings off the Isle of Lewis. However, with the implementation of mitigation measures, such as a Marine Mammal Protection Plan, impacts were expected to be temporary, localised, and minimal. The addition of a small number of vessels for the nearshore borehole drilling activities was judged to not represent a material change to the magnitude of effect, beyond what was already assessed in the original MEA. Furthermore, the underwater sound emissions associated with drilling activities were expected to be highly localised and temporary with no significant impacts predicted. With the implementation of mitigation measures, no material change to the conclusions of the original MEA were predicted. No material changes to the cumulative effects assessment, associated with the extension of the Marine Licence end date, were identified. Other relevant updates for marine mammals included the publication of updated underwater noise thresholds (Southall *et al*., 2019). The use of these updated thresholds would alter the noise modelling outputs (injury and disturbance ranges) used to inform the marine mammals impact assessment within the original MEA (Appendix C of the original MEA). Despite these potential updates to the injury and disturbance ranges presented in the original MEA, given the highly localised and temporary nature of the underwater sound impacts associated with the Project, any increase was not expected to be of an extent that would materially alter the conclusions of the MEA, when embedded mitigations (e.g. adherence to a Marine Mammal Protection Plan) were considered. **The conclusions of the original MEA are considered to remain valid, and this topic is screened out of the MEA Addendum.**

Topic	Increased Voltage and Transmission Capacity	Refinement of Northern Feather Star Mitigation	Nearshore boreholes at Arnish Point and Dundonnell	Refinement of the Project Cable Corridor	Increased Cable Protection Requirements at MoD Cable Crossing	Removal and Disposal of Marine Debris	Extension of Marine Licence End Date	Phased Discharge of the Marine Licence	Requirement for Consideration in MEA Addendum	Justification Summary
Commercial fisheries									No	The most recent fisheries landings data (2019–2023) confirm that *Nephrops norvegicus (Nephrops)* remains the most valuable targeted species in the area, alongside other species such as brown crab (*Cancer pagurus*), lobster (*Nephropidae* family), wrasse (*Labridae family*), scallop (*Pectinidae* family), herring, and haddock (*Melanogrammus aeglefinus*). These trends were deemed to be consistent with those described in the original MEA and did not introduce new considerations that would materially alter the impact assessment. Two new aquaculture sites were identified, including the Ardessie Brood Stock Fish Farm (replacement for an inactive hatchery previously identified) and new proposed Native Flat Oyster Farm near Durnamuck. Additionally, some aquaculture sites considered in the original MEA are now inactive. The original MEA identified 19 aquaculture sites, including 6 active sites, within a 2 km radius of the Project cable corridor. Currently, only four active aquaculture sites are present within 2 km of the Project cable corridor. The original MEA assessment concluded that sediment suspension on aquaculture sites, including reduced water quality and dissolved oxygen content, would be temporally and spatially limited. This justification was judged to be applicable to the new aquaculture sites and no significant impacts were anticipated. Overall, none of the updates to commercial fisheries statistics, salmon and sea trout statistics or aquaculture sites were predicted to materially change the assessment for commercial fisheries in the original MEA. The following Project Design Refinements were identified as having the potential to result in new or increased impacts for this topic: • Increased presence of vessels in the nearshore environment could increase the disturbance to other users of the sea. It was concluded that the small number of vessels involved in the drilling and backfilling of nearshore boreholes will not materially change the magnitude of effect previously assessed in the original MEA. No material changes to the cumulative effects assessment, associated with the extension of the Marine Licence end date, were identified. **The conclusions of the original MEA are considered to remain valid, and this topic is screened out of the MEA Addendum.**
Shipping and navigation / Navigational Risk Assessment (NRA)									Yes	The baseline environment for shipping and navigation was considered to remain valid, with no new key navigational features identified since the original MEA. The expected construction of the Stornoway Deep Water Terminal by 2025, which will enhance Stornoway Port facilities and support offshore wind farm operations, could potentially affect vessel traffic in the region. However, the expansion of Stornoway Port was already considered in the original MEA, and therefore, no material updates to the baseline were identified. The following Project Design Refinements were identified as having the potential to result in new or increased impacts for this topic: • Increased presence of vessels in the nearshore environment could increase the disturbance to other users of the sea; and • A change in cable capacity and voltage may alter the compass deviation effects. It was concluded that the small number of vessels involved in the drilling and backfilling of nearshore boreholes will not materially change the magnitude of effect previously assessed in the original MEA. Regarding compass deviation effects, the original MEA identified that such effects would most likely occur in shallow waters, and the likelihood of significant impacts on larger vessels would be minimal. However, given the potential changes in cable voltage and capacity, the change in compass deviation effects was identified as having the potential to materially alter the conclusions of the original MEA. No material changes to the cumulative effects assessment, associated with the extension of the Marine Licence end date, were identified. While there have been updates to relevant shipping and navigation assessment guidelines, such as MGN 654 (MCA, 2021) and the Formal Safety Assessment guidelines (IMO, 2018), no material changes to the assessment methodologies for cable projects were identified. **Impacts to shipping and navigation (changes in compass deviation effects only) are screened in for further assessment in this MEA Addendum.**

Topic	Increased Voltage and Transmission Capacity	Refinement of Northern Feather Star Mitigation	Nearshore boreholes at Arnish Point and Dundonnell	Refinement of the Project Cable Corridor	Increased Cable Protection Requirements at MoD Cable Crossing	Removal and Disposal of Marine Debris	Extension of Marine Licence End Date	Phased Discharge of the Marine Licence	Requirement for Consideration in MEA Addendum	Justification Summary
Other sea users									No	Since the original MEA submission, updated information is available on the status of these sea users, such as the continued operation of the BT telecommunication cables, [redacted] and the presence of active and inactive aquaculture sites. However, the updated information was not identified as representing a substantial change to the baseline characterisation described in the original MEA. The key features, including the subsea cables, [redacted] anchorages, and foul ground areas, remain consistent with the original assessment, and no significant new developments or changes to their operational status have occurred that would materially alter the conclusions of the original MEA. While two new aquaculture sites have been identified within Little Loch Broom, the nature and scale of these developments were not expected to result in material changes to the original assessment, as noted for the commercial fisheries topic above. The following Project Design Refinements were identified as having to potential to result in new or increased impacts for this topic: • Increased presence of vessels in the nearshore environment could increase the disturbance to other users of the sea. The addition of a small number of vessels for the nearshore drilling activities was not judged to result in a material change to the magnitude of effect beyond what was already assessed in the original MEA. No material changes to the cumulative effects assessment, associated with the extension of the Marine Licence end date, were identified. **The conclusions of the original MEA are considered to remain valid, and this topic is screened out of the MEA Addendum.**
Population and human health									No	The Project Design Refinements were not anticipated to result in any new or increased impact for the population and human health topic. **The conclusions of the original MEA are considered to remain valid, and this topic is screened out of the MEA Addendum.**

4. Impact Assessment for the Project Design Refinements

The following sections describe the assessments for the topics and impacts identified as requiring further assessment within this MEA Addendum through the Gap Analysis screening exercise (Section 3 and Appendix A). To ensure that the environmental effects of the Project Design Refinements are adequately assessed, the significance of each relevant impact is determined, taking account of the proposed changes to the Project associated with the Project Design Refinements.

The topics screened in for further assessment within this MEA Addendum and their relevant impact pathways are presented in Table 7.

Table 7 Topics Screened in for Further Assessment and Their Relevant Impact Pathways

Topics Screened in for Further Assessment	Impact Pathways Relevant to Each Receptor
Benthic and intertidal ecology	• Increased disturbance footprint for northern feather star aggregations within the Wester Ross NCMPA; • Increased seabed disturbance footprint associated with the drilling of up to 14 boreholes (6 plus 1 contingency at each landfall) and the temporary presence of jack-up vessels or spud leg barges; and • A change in cable capacity and voltage altering EMF intensities.
Fish and shellfish ecology	• A change in cable capacity and voltage altering EMF intensities.
Ecological protected sites (Wester Ross NCMPA and North-East Lewis NCMPA only)	Wester Ross NCMPA: • Increased disturbance footprint for northern feather star aggregations within the Wester Ross NCMPA; • Increased seabed disturbance footprint associated with the drilling of up to 14 boreholes (6 plus 1 contingency at each landfall) and the temporary presence of jack-up vessels or spud leg barges; and • A change in cable capacity and voltage altering EMF intensities. North-East Lewis NCMPA: • A change in cable capacity and voltage altering EMF intensities.
Shipping and navigation	• Change in cable capacity and voltage altering compass deviation effects.

4.1. Assessment Methodology

4.1.1. Impact Assessment

The impact assessment for the Project Design Refinements broadly follows the assessment methodology presented within the original MEA (see Section 7 of the original MEA). In line with standard practice, each impact is assessed by determining the following:

- Sensitivity of receptor;
- Magnitude of effect; and
- Significance of the impact.

Standard criteria have been developed to help determine the sensitivity of a receptor and the magnitude of effect in Table 8 and Table 9, respectively. The significance of the impact is then evaluated by combining the sensitivity of the receptor and the magnitude of effect (Table 10). These criteria are intended to be used as a guide, and expert judgement will be used to consider the significance of the final impact.

There are definitions and issues specific to each topic and the corresponding assessments must take this into account. Therefore, where relevant, bespoke criteria have been used for specific topics (e.g., use of Feature Activity Sensitivity Tool (FeAST) sensitivity assessments), and where this is the case, this is clearly detailed in the relevant impact assessment section.

Table 8 Definition of Receptor Sensitivity

Sensitivity of Receptor	Definition
High	• The receptor has high vulnerability and low recoverability to accommodate a particular effect; • Receptor of conservation value to an extent that is internationally or nationally important (e.g. Priority Marine Feature (PMF) species, species listed on Annex II of the Habitats Directive and / or a qualifying interest of a Special Area of Conservation (SAC) or NCMPA.
Medium	• Receptor with low capacity to accommodate a particular effect with low ability to recover or adapt (i.e. medium vulnerability); and/or • Receptor of regionally important conservation or commercial value.
Low	• Receptor has some tolerance to accommodate a particular effect or will be able to recover or adapt (i.e. low vulnerability); and/or • Receptor of locally important conservation / commercial value.
Negligible	• Receptor is generally tolerant and can accommodate a particular effect without the need to recover or adapt (i.e. not vulnerable); and/or • Receptor is widespread / common and is of low conservation / commercial value.

Table 9 Definition of Magnitude of Effect

Magnitude Criteria	Definition
High	• The impact occurs over a large spatial extent and/or is long-term or permanent in nature; and/or • The impact is very likely to occur and/or will occur at a high frequency (occurring repeatedly or continuously for a long period of time) and/or at high intensity.
Medium	• Impact occurs over a medium spatial extent and/or has a medium-term duration; and/or • Medium to high frequency and/or at moderate intensity or occurring occasionally/intermittently for short periods of time but at a moderate to high intensity.
Low	• Impact is highly localised and short-term with full rapid recovery expected to result in very slight or imperceptible changes to baseline conditions; and/or • The impact is very unlikely to occur or may occur at very low frequency or intensity.
Negligible	No change from baseline conditions.

Table 10 Significance of Impact

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

The categories provide a threshold to determine whether significant effects may result from the Project Design Refinements, with Moderate and Major effects being ‘Significant’. A typical categorisation is shown below in Table 11, noting that effects can be both beneficial or adverse.

Table 11 Definitions of consequence of effect and associated significance

Category	Definition	Significance
Major	A fundamental change to the environment or receptor, resulting in a significant effect.	Significant
Moderate	A material but non-fundamental change to the environment or receptor, resulting in a possible significant effect.	Significant
Minor	A detectable but non-material change to the environment or receptor resulting in no significant effect or small-scale temporary changes.	Not significant
Negligible	No detectable change to the environment or receptor resulting in no significant effect.	Not significant

4.1.2. Cumulative Impact Assessment

As part of the Gap Analysis (Section 3 and Appendix A), a review of the Marine Directorate, Highland Council (THC) and the Comhairle nan Eilean Siar planning websites was conducted in December 2024 and January 2025 to identify new projects, plans or activities present in the vicinity of the Project that could result in a change in the cumulative or in-combination effects assessments in the original MEA. No new plans, projects or activities were identified that had the potential to materially change the conclusions of the original MEA. Therefore, the cumulative and in-combination effects assessments presented within the original MEA are considered to remain valid and this will not be considered further within this MEA Addendum.

4.2. Embedded Mitigation

Embedded mitigation measures were identified in the original MEA to reduce the potential impact on ecological protected sites, benthic and intertidal ecology receptors, and fish and shellfish ecology receptors. These embedded mitigation measures were considered in the assessment of impacts in the original MEA. The embedded mitigation measures relevant to the assessments presented in this MEA Addendum are provided in Table 12. Table 12 also states where the Project Design Refinements result in a change to the embedded mitigation proposed in the original MEA.

Table 12 Embedded Mitigation Measures

Mitigation Measure	Description in Original MEA	Updated Description
Burial of cable along route	The cable will be buried by trenching/ploughing where the seabed sediments allow. Cables will be bundled and installed within a single trench (except at landfalls where they will separate to enter HDD ducts or Transition Joint Bay (TJB)). It is proposed to install the marine cables using HDD at the Arnish Landfall.	**Embedded mitigation remains as per original MEA.** It should be noted that HDD is also proposed as the preferred installation method at the Dundonnell landfall.

Mitigation Measure	Description in Original MEA	Updated Description
Reduce rock protection and/or mattresses to reduce the footprint of the cable	Rock protection and/or mattresses will only be deployed where adequate burial cannot be achieved to protect the cable, or at cable crossings to protect third party assets.	**Embedded mitigation remains as per original MEA.**
Avoidance of habitats and species of conservation importance	The final cable route has been designed to avoid, where possible, habitats and species of conservation importance. A pre-lay survey will be undertaken, and images of the seabed will allow for the identification of any northern feather star aggregations and the avoidance of these features wherever possible. Micro-routing will be undertaken to avoid certain habitats and species of conservation importance such as northern feather star aggregations. Where avoidance is not possible, potential impacts on habitats and species of conservation importance, including northern feather star aggregations, can also be reduced through surface laying of the cable within protective sheathing (e.g. external Uraduct) to minimise the footprint of the installation and avoid / minimise disturbance in these areas.	**Embedded mitigation requires updating to reflect proposed amendment to Conditions 3.2.11 and 3.3.7 of the Marine Licence.** The final cable route has been designed to avoid, where possible, habitats and species of conservation importance. A pre-lay survey has been undertaken, and images of the seabed were used to identify northern feather star aggregations and for the purposes of predictive modelling. The pre-lay survey and subsequent analyses allow for the avoidance of these features wherever possible. High probability northern feather star areas (see Box 1) will be avoided by a buffer of 100 m, and if this is not possible, the buffer may be reduced to 50 m or 25 m. Micro-routing will be undertaken to avoid certain habitats and species of conservation importance such as high probability northern feather star areas. Where avoidance is not possible, jet trenching will be used as the method of cable protection to minimise the footprint of the installation and avoid / minimise disturbance of the feature. Only where trenching is not possible, due to the presence of ground conditions that prevent adequate DoL via jet trenching, will external cable protection, including rock berms and tubular cable protection systems (where feasible) be used to protect the cable.

Mitigation Measure	Description in Original MEA	Updated Description
Reduction in EMF emissions	Cable installation will result in a configuration (bundled and where possible buried) that is not likely to result in substantial EMF emissions.	**Embedded mitigation remains as per original MEA.**

4.3. Benthic and Intertidal Ecology

4.3.1. Introduction

This section describes the impact assessment for benthic and intertidal ecology (see Section 3). The impacts requiring further assessment were identified through the Gap Analysis as those resulting from the Project Design Refinements with the potential to materially alter the conclusions of the original MEA (see Section 3).

A description of the original MEA assessment of the Project's potential impact on benthic and intertidal ecology receptors is provided in the Gap Analysis Report (Appendix A). In summary, the following impacts were considered for benthic and intertidal ecology in the original MEA:

- Direct disturbance and removal of feature due to substratum abrasion;
- Smothering of benthic and intertidal habitats and species from sediment suspension and re-settlement;
- Physical change in seabed type (e.g., associated with cable protection);
- Introduction of marine non-native marine species; and
- Accidental fuel release.

All of the impacts listed above were assessed as not significant (minor level of impact) due to the relatively small area of impact and widespread nature of the habitats considered. No significant cumulative effects were identified.

4.3.2. Updated Information Requiring Further Assessment

The following impacts associated with the Project Design Refinements were screened into the MEA Addendum for the benthic and intertidal ecology topic (see Section 3):

- Increased disturbance footprint for northern feather star aggregations within the Wester Ross NCMPA;
- Increased seabed disturbance footprint associated with the drilling of up to 14 boreholes (6 plus 1 contingency at each landfall) and the temporary presence of jack-up vessels or spud leg barges; and
- A change in cable capacity and voltage altering EMF intensities.

In addition, the Gap Analysis also identified that the results of the recent Ocean Infinity (2024) northern feather star enumeration and aggregation assessment (see Section 2.3 and Appendix A) warranted further consideration within this MEA Addendum. This updated site-specific survey data confirms the presence of northern feather star individuals and aggregations within the Wester Ross NCMPA that were not previously recorded during the 2016 site-specific surveys. This is considered to represent a material change to the original MEA that has the potential to affect the assessment conclusions.

4.3.3. Environmental Baseline

This section summarises the environmental baseline for benthic and intertidal ecology, informed by a combination of site-specific and desk based sources. Where relevant, a summary of the information presented in the original MEA is described, including the site-specific surveys conducted by Bibby HydroMap in 2016 and 2017. This site-specific survey data has been supplemented by more recent site-specific surveys and analysis, including the Reach *et al.* (2024) geophysical survey conducted in February and March 2024 and the Ocean Infinity (2024) northern feather star enumeration and aggregation assessment.

The 2016 marine surveys identified several geophysical features, such as glaciated channels, slide scars, pockmarks, scattered moraines and shelf deeps, along the subsea cable route. A number of these features are considered to be of geodiversity importance, and, as such, are protected as part of the Wester Ross NCMPA. During the determination period of the Marine Licence, the Project cable corridor was refined, based on feedback received from NatureScot and Marine Directorate, to facilitate the avoidance of pockmarks (see Xodus, 2021) (as per Condition 3.3.8).

According to the EUSeaMap (2023), the nearshore area off the Arnish Point landfall (between KP 0 and 25) is composed of ‘faunal communities on deep moderate energy circalittoral rock’ and ‘faunal communities on deep low energy circalittoral rock’, transitioning into ‘deep circalittoral mixed sediments’, and ‘deep circalittoral mud’. During the 2016 site-specific surveys, sub-cropping rock was identified in the nearshore area with habitats interpreted as ‘circalittoral mixed sediments’ where coarser gravelly sand, cobbles and boulders were present. The mixed sediments then become less coarse and are comprised of clayey and gravelly sand, or gravelly clay with patchy areas of cobbles and boulders. Sandy silt was recorded along the majority of the Project cable corridor between KP 0 and 25, associated with burrows, mounds and animal tracks which was consistent with the fauna found in the area. The bioturbated silty habitat identified in these areas was identified as conforming to ‘mud habitats in deep water’, listed as priority habitat of the UKBAP, and ‘seapens and burrowing megafauna communities’, listed on the OSPAR list of threatened and/or declining habitats and species.

The seabed in the subtidal section of the Project cable corridor between KP 25 and 65 is mostly classified as ‘deep circalittoral mud’, predominantly consisting of sandy clay sediments. The Project cable corridor then passes through a rich and diverse area on the approach to the west coast of mainland Scotland, with the seabed classified as ‘deep circalittoral coarse sediment’ and ‘deep circalittoral sand’ until the route reaches the entrance of Little Loch Broom. Other seabed types present in the vicinity of the Project cable corridor in this area include ‘faunal communities on deep low energy circalittoral rock’, ‘Atlantic and Mediterranean low and medium energy circalittoral rock’, and ‘circalittoral fine sand’ or ‘circalittoral muddy sand’ (EUSeaMap, 2023). Habitats consistent with ‘seapens and burrowing megafauna communities’ were also identified in this region during the site-specific surveys in 2016, as well as localised areas of stony reef (low to medium reefiness), an Annex I habitat on the EU Habitats Directive. ‘Burrowed mud’ habitats, a PMF and protected feature of the Wester Ross NCMPA, were also identified on the approach to Little Loch Broom.

Little Loch Broom contains areas of burrowed mud with seapens and burrowing megafauna communities in circalittoral fine mud, consistent with the ‘burrowed mud’ habitat PMF feature, a protected feature of the Wester Ross NCMPA. None of the other protected features of the Wester Ross NCMPA were identified in the 2016 site-specific surveys.

The 2016 inter-tidal surveys also identified the presence of 'polychaete/bivalve-dominated muddy sand shores' in the subtidal area on the approach to the Dundonnell landfall, which is related to the ‘littoral sand and muddy sand’ Annex I habitat. This was the only feature of conservation importance identified as being present within the Project cable corridor during the inter-tidal surveys (overlap of approximately 930 m) (Bibby HydroMap, 2016).

Updated information for the benthic and intertidal ecology environmental baseline is available through the geophysical surveys undertaken between February and March 2024, which further characterise the seabed and benthic conditions along the Project cable corridor (Reach *et al*., 2024). As per the 2016 surveys, areas of out- and sub-cropping bedrock were interpreted close to shore at the Arnish Point landfall, transitioning to sediments dominated by sands and clays with variable proportions of gravel that were interspersed with boulder fields, pockmarks and out-or sub- cropping bedrock. In the areas of coarser sediments the density of boulders was recorded as high.

The Applicant contracted Ocean Infinity to enumerate northern feather star individuals and assess potential aggregations within the section of the Project cable corridor overlapping the Wester Ross NCMPA, based on the outputs of the geophysical survey carried out by Reach *et al*. (2024). Ocean Infinity (2024) carried out visual data analysis across three parallel orthomosaic transects (along the cable corridor centreline and two wing lines) of the section of the Project cable corridor that overlaps the Wester Ross NCMPA and along fourteen 200 m cross lines in this zone. The northern feather star enumeration and aggregation assessment undertaken by Ocean Infinity (2024) identified a total abundance count of 27,406 individuals. The most prevalent northern feather star aggregations were identified within Little Loch Broom and northwest of Gruinard Bay (Ocean Infinity, 2024; see Figure 2). Northern feather stars were observed throughout the depth range of the corridor but were primarily located in waters between 88 – 108 m deep. The aggregations were mainly observed on muddy sand and mixed sediment of sand, gravel, shell and cobbles/boulders, and smaller aggregations were observed on rocky substrate (Ocean Infinity, 2024).

Ocean Infinity (2024) also developed a species distribution model to predict the probability of northern feather star occurrence within the region of the Project cable corridor that overlaps the Wester Ross NCMPA (see Section 2.5 of this MEA Addendum and Section 1.2 of Appendix A for further details). Areas of lower probability of occurrence corresponded with areas of muddy sediments with an absence of large- scale seabed features. Conversely, areas of a higher topographic heterogeneity coincided with a higher probability of northern feather star occurrence (Figure 3).

As noted previously, at the time of the original MEA, no northern feather star aggregations were recorded in the Project cable corridor during 2016 Project-specific surveys. Previous records of northern feather stars at the entrance to Little Loch Broom in Moore (2014) were used to inform the assessment within the original MEA, and a 300 m overlap of the Project cable corridor with northern feather star aggregations within the Wester Ross NCMPA was assumed. As outlined above, the more recent Project-specific surveys undertaken to fulfil the pre-lay survey requirements of Marine Licence Condition 3.2.11 have identified a higher abundance and distribution of northern feather star individuals and aggregations within the Project cable corridor than previously assessed in the original MEA (Figure 2).

4.3.4. Impact Assessment

Section 4.3.2 outlines the updated information identified as requiring further assessment for the benthic and intertidal ecology topic within this MEA Addendum. An impact assessment has been conducted in the context of this updated information and in support of the Marine Licence variation request to ensure the environmental effects of the Project Design Refinements are adequately and proportionately considered.

In accordance with the assessment of impacts in the original MEA, the sensitivity of receptors has been assessed with reference to the FeAST tool (NatureScot, 2025). The magnitude of effect has been assessed using the criteria set out in Section 4.1. Consideration of the embedded mitigations outlined in the original MEA (Table 12) and expert judgment have been used to inform this assessment.

4.3.4.1. INCREASED DISTURBANCE FOOTPRINT FOR NORTH FEATHER STAR AGGREGATIONS

The refinement of Condition 3.2.11 (see Section 2.5), coupled with the greater extent of northern feather star aggregations recorded within the Project cable corridor, will result in an increased temporary disturbance footprint to this protected feature within the Wester Ross NCMPA.

The probability of northern feather star occurrence near the Dundonnell landfall, where the nearshore boreholes will be located, is considered to be low (Figure 2 and Figure 3). The dominant sediment within the nearshore section of Little Loch Broom on the approach to the Dundonnell landfall (clayey silt / sand) is not consistent with the presence of northern feather stars. Moreover, northern feather star aggregations are typically found in deeper waters between 40 to 200 m, which also suggests they are unlikely to be present within this area. As a result, the impact from the drilling or backfilling of boreholes on northern feather star aggregations within the Wester Ross NCMPA is not considered further.

As outlined in Section 2.5, high probability areas of northern feather stars, which are considered to conform to the ‘northern feather star aggregations on mixed substrata’ protected feature of the Wester Ross NCMPA, will be avoided, where possible, by a 100 m buffer (reduced to 50 or 25 m buffer, where necessary). However, where avoidance is not possible, jet trenching will be used as the preferred protection method to reduce any potential disturbance and long term/permanent habitat change. The cable will only be surface laid and protected via rock placement or a tubular protection system where the minimum target DoL cannot be achieved (as per the embedded mitigation described in Table 12).

4.3.4.1.1. SENSITIVITY OF RECEPTOR

The sensitivity of northern feather star aggregations has been assessed in relation to the FeAST pressures identified for potential impacts during the cable installation phase, including:

- Surface abrasion;
- Sub-surface abrasion/ penetration;
- Removal of substratum (extraction);
- Siltation changes (high and low); and
- Physical change (to another seabed type).

The sensitivity assessment from the FeAST tool for these pressures is provided in Table 13.

Where the cable is trenched, increases in suspended sediments and associated deposition (i.e. siltation changes) may occur which have the potential to reduce the amount of oxygen available, thus causing anoxia. In addition, direct impacts associated with the physical removal of substratum, surface abrasion and sub-surface abrasion and penetration may also occur. As described in Table 13, the sensitivity of northern feather star aggregations to the relevant FeAST defined pressures range from not exposed to medium. Following disturbance, recovery of northern feather stars from these pressures is expected to occur within five years, and damaged individuals are likely to recover through the regeneration of body parts (NatureScot, 2024a; NatureScot, 2025, Table 13). The Marine Evidence-based Sensitivity Assessment (MarESA) sensitivity assessment for ‘*Leptometra celtica* assemblage on Atlantic upper bathyal coarse sediment’ also considers pressures associated with jet trenching, such as the effect of surface abrasion/disturbance. The MarESA assessment defines the sensitivity of this habitat to this pressure as medium. Surface abrasion may remove, damage, or kill northern feather stars; however, if a viable population exists nearby (i.e. the northern feather star aggregations in the vicinity of the disturbance location), it is anticipated that recovery would occur through larval settlement and adult immigrants (Last *et al.,* 2019). The same assessment applies to the pressure of smothering, where depositions may smother northern feather stars, but recovery would occur and the MarESA sensitivity is therefore assessed as medium.

Where the minimum target DoL cannot be achieved by jet trenching, the cable may be surface laid and protected via rock placement or tubular protection systems (where feasible), (as per the embedded mitigation; Table 12). Direct damage or the partial removal of suitable habitat for northern feather star aggregations may occur. The medium sensitivity of northern feather star aggregations to the FeAST defined pressure of a physical change in the seabed is predominantly related to a change in seabed type as a result of siltation and sediment deposition, rather than the introduction of artificial substrata (e.g. cable protection). However, the MarESA sensitivity assessment for northern feather stars considers the introduction of artificial substrata and assigns a sensitivity of high to the physical change (to another seabed type) pressure (Last *et al.,* 2019). Although northern feather stars can attach to a range of substrata, there is currently no evidence available to suggest that attachment to artificial substrata occurs. Therefore, it is assumed that there will be a loss of suitable habitat for northern feather star aggregations where cable protection is installed, with no potential for recovery during the operation life of the cables (Last *et al.,* 2019).

Overall, the sensitivity of northern feather star aggregations to disturbance during the cable installation phase, resulting from trenching and the installation of cable protection, is assessed as **high**.

Table 13 Sensitivity of Northern Feather Star Aggregations (NatureScot, 2025)

Receptor	Sensitivity				
	Removal of substratum (extraction)	Siltation changes (high and low)	Physical change in seabed type	Surface abrasion	Sub-surface abrasion/penetration
Northern feather star aggregations on mixed substrata	**Medium** "Although *Leptometra celtica* is free living and can swim and crawl short distances the species will be lost along with substratum removal so tolerance is assessed as low. Recovery should be possible within five years. However, the pelagic phase is fairly short (Hill, 2008) so dispersal distances may not be great and recruitment may rely on relatively local populations. Therefore, if populations are completely removed by a factor recovery may take longer than five years."	**Medium (high siltation) / Medium (light siltation)** "Smothering by 30 cm of sediment is likely to result in the death of feather-stars. Animals would be completely smothered most of the feeding and respiratory structures will become clogged. Tolerance is therefore reported to be low. Recovery is dependent on whether surviving adults remain, and if there is suitable substrate available to attach to and so in such cases recolonization could take place and recovery should be possible within five years. However, the pelagic phase is fairly short (Hill, 2008) so dispersal distances may not be great and recruitment may rely on relatively local populations. Therefore, if populations are completely removed by a factor recovery may take much longer than five years. Recovery is therefore assessed as low." "Smothering by 5 cm of sediment is likely to result in the death of feather-stars. Although the tops of arms can probably extend above the sediment most of the feeding and respiratory structures will become clogged. Tolerance is therefore reported to be low. If sediment were then removed recolonization could take place and recovery should be possible within five years. However, the pelagic phase is fairly short (Hill, 2008) so dispersal distances may not be great and recruitment may rely on relatively local populations. Therefore, if populations are completely removed by a factor recovery may take longer than five years. Recovery is assessed as medium."	**Medium** "Typically, an increase in organic particulate matter results in a reduction in species numbers, abundance and biomass (Pearson and Rosenberg, 1978). Separating the causes of such changes from additional pressures such as siltation and deoxygenation is often difficult (Pearson and Rosenberg, 1978). The sensitivity score here reflects score given for siltation pressure, but recognises that the feature probably has a low tolerance to organic enrichment in itself as suspension feeders are first to disappear in organic enriched areas (Pearson and Rosenberg, 1978). Recolonization could take place and recovery should be possible within five years, however, the pelagic phase is fairly short (Hill, 2008) so dispersal distances may not be great and recruitment may rely on relatively local populations. Therefore, if populations are completely removed by a factor recovery may take longer than five years. Recovery is assessed as medium."	**Medium** *"Leptometra celtica* is free living but can only swim and crawl short distances. The species is likely to be intolerant of abrasion as individuals are likely to be killed or damaged by due to their delicate structure. Tolerance is assessed as low. The species can regenerate body parts even when most arms and part of the disc have been lost so most damaged individuals are likely to recover. Recovery should be possible within five years. However, the pelagic phase is fairly short (Hill, 2008) so dispersal distances may not be great and recruitment may rely on relatively local populations. Therefore, if populations are completely removed by a factor recovery may take longer than five years. Recovery is assessed as medium. Northern feather stars are likely to have an interaction with demersal towed fishing gear. The potential effects include direct mortality through capture or contact with gear and possible indirect effects from smothering and/or increased suspended sediment. The magnitude of effects will depend on the gear type, substrate composition and local hydrodynamic conditions."	**Not exposed**

4.3.4.1.2. MAGNITUDE OF EFFECT

The original MEA assumed a 60 m^2 disturbance footprint for northern feather star aggregations, based on a 300 m section of cable overlapping northern feather star aggregations (representing 0.001% of the 43,360 m^2 area of this habitat recorded by Moore (2014) within the 1,000 m wide survey corridor considered in the original MEA). The updated northern feather star aggregation impact footprint is calculated based on the disturbance to high probability northern feather star areas associated with jet trenching, and disturbance and habitat loss from the installation of external cable protection.

The disturbance footprint associated with jet trenching was calculated using the following assumptions:

- High probability areas of northern feather star (see Box 1) qualify as the 'northern feather star aggregations on mixed substrata' feature of the Wester Ross NCMPA;
- **Worst-case disturbance length**:
  - Length of cable overlapping high probability areas of northern feather stars, including a 25 m buffer = 8.35 km; and
- **Worst-case disturbance width**:
  - The area of disturbance is calculated based on an assumed disturbance width of 10 m (as per original MEA).

Based on the above assumptions, the updated temporary disturbance footprint from jet trenching for the 'northern feather star aggregations on mixed substrata' protected feature of the Wester Ross NCMPA (i.e. high probability northern feather star areas) is calculated as **83,500 m^2 or 0.0835 km^2** (i.e. an increase of 83,440 m^2). This estimate is considered conservative (which aligns with the assumptions of the original MEA), as the cable installation contractor is proposing to use a trencher with a 6.4 m disturbance width, which would result in a disturbance footprint of **53 440 m^2 or 0.0544 km^2**.

The disturbance footprint associated with the installation of external cable protection was calculated with the following assumptions:

- High probability areas of northern feather star (see Box 1) qualify as the 'northern feather star aggregations on mixed substrata' feature of the Wester Ross NCMPA;
- **Worst-case external protection length:**
  - Trenching success for jet trenching is estimated at 74%, as such, 26% of the route length will require external protection where the minimum target DoL cannot be achieved (as per Table 4.2 of the original MEA).
- **Worst-case external protection width:**
  - Rock placement is considered to represent the worst-case external protection method; and.
  - The anticipated width of rock berms is up to 7 m.

Based on the above assumptions, the updated disturbance footprint as a result of the installation of external cable protection for the 'northern feather star aggregations on mixed substrata' protected feature of the Wester Ross NCMPA is calculated as **16,359 m^2 or 0.0164 km^2**. Where external cable protection is installed, there may be a loss of suitable habitat which could preclude recolonisation by surviving adults.

The overlap of the latest cable Route Position List (RPL) with the four northern feather star presence probability classes from the Ocean Infinity (2024) species distribution model was calculated (Table 14). Further route optimisation may be possible to reduce the overlap with higher probability classes, following detailed route engineering (further details will be included in the CBPP, required under Condition 3.2.8 of the Marine Licence).

Table 14 Length of Project Cable Corridor Intersecting Different Probability Classes of Northern Feather Star Species Distribution Model (Ocean Infinity, 2024)

Probability	Length of Cable Route (km)	Area within the Project Cable Corridor (km^2)	Probability Classification
0 – 0.25	27.7	5.26	Low
0.25 – 0.5	4	0.93	Low
0.5 – 0.75	2.6	0.60	High
0.75 – 1	1.5	0.26	High

The 0.0835 km^2 footprint from cable trenching corresponds to 0.49% of the 17 km^2 Project cable corridor and approximately 9.7% of the high probability northern feather star areas within the Project cable corridor. The 0.0164 km^2 footprint from external cable protection corresponds to 1.9% of the high probability areas of northern feather stars within the Project cable corridor.

The potential disturbance of the 'northern feather star aggregations on mixed substrata' feature by the Project can be further contextualised based on the presence of this feature within the Wester Ross NCMPA. The Ocean Infinity (2024) study highlighted that northern feather star occurrence corresponded with large-scale features, such as rocky outcrops and mixed sediments, as well as areas of muddy sand and/or slightly gravelly muddy sand. These sediment types are present across the Project cable corridor, as well as across the wider NCMPA based on European Marine Observation and Data Network (EMODnet) broadscale sediment data (EMODnet, 2025a) (Figure 5 and Figure 6). Therefore, it is expected that similar densities and populations of northern feather stars occur in the area outside the Project cable corridor in the NCMPA. Overall, any disturbance or loss of the 'northern feather star aggregations on mixed substrata' feature of the Wester Ross NCMPA within the Project cable corridor, is expected to affect a small proportion of this feature's extent within the wider NCMPA.

As noted in Section 2.5, the density of northern feather stars in low probability areas of northern feather star, would not be to an extent that would qualify as the 'northern feather star aggregations on mixed substrata' protected feature of the Wester Ross NCMPA. For instance, records of northern feather stars were considered as potential aggregations by Envision Mapping Ltd (2014) if they were assigned between Frequent and Abundant on the SACFOR scale[2], based on the size of individuals and density within 1 m^2 gridded cells. It is anticipated that low probability areas of northern feather stars would contain densities lower than Frequent or Abundant, given the predicted likelihood of presence is less than 50%.

The above notwithstanding, any disturbance in low probability areas of northern feather stars would be highly localised and temporary. Low probability areas of northern feather stars were mapped over a length of 32 km in the Project cable corridor (Table 14), and therefore the total disturbance footprint from cable burial for low probability areas of northern feather stars in the Wester Ross NCMPA is calculated as **320,000 m^2 or 0.32 km^2** (i.e. 5.2% of the low probability areas) . This estimate is considered conservative, as the cable contractors are proposing to use a trencher with a 6.4 m disturbance width, which would result in a disturbance footprint of **204,800 m^2 or 0.20 km^2** (i.e. 3% of the low probability areas). Overall, as

[2] A semi-quantitative abundance scale: Superabundant (S), Abundant (A), Common (C), Frequent (F), Occasional (O) and Rare (R).

described above, any direct disturbance caused by jet trenching as well as any increases in sediment suspension and associated deposition would be highly localised and temporary with recruitment and recolonisation from nearby surviving adults expected, and recovery within five years (NatureScot, 2024a; see Table 13).

Considering the above, the spatial extent of any impact to the ‘northern feather star aggregations on mixed substrata’ protected feature of the Wester Ross NCMPA is considered to be highly localised, relative to the wider occurrence of this feature within the Project cable corridor and the wider NCMPA. Recovery would be expected from any temporary impacts associated with jet trenching based on regeneration of damaged individuals along with larvae settlement and recruitment from nearby viable adult populations. The long term impacts resulting from the placement of external cable protection will only affect a very small proportion of the feature’s extent in the NCMPA.

The Applicant will adhere to the mitigation hierarchy by micro-routing to avoid high probability northern feather star areas, where practicable, and where avoidance is not possible, jet trenching be utilised as a priority over external cable protection measures, to minimise impacts to northern feather stars within the Wester Ross NCMPA and allow for recovery of the habitat. Only where the minimum target DoL cannot be achieved, will rock placement or tubular cable protection system (where practicable) be used (Table 12), and therefore, long term/permanent habitat loss will be highly localised. Overall, the footprint of installation and disturbance of the ‘northern feather star aggregations on mixed substrata’ feature of the Wester Ross NCMPA will be minimised, and this impact is assessed as being of **low** magnitude.

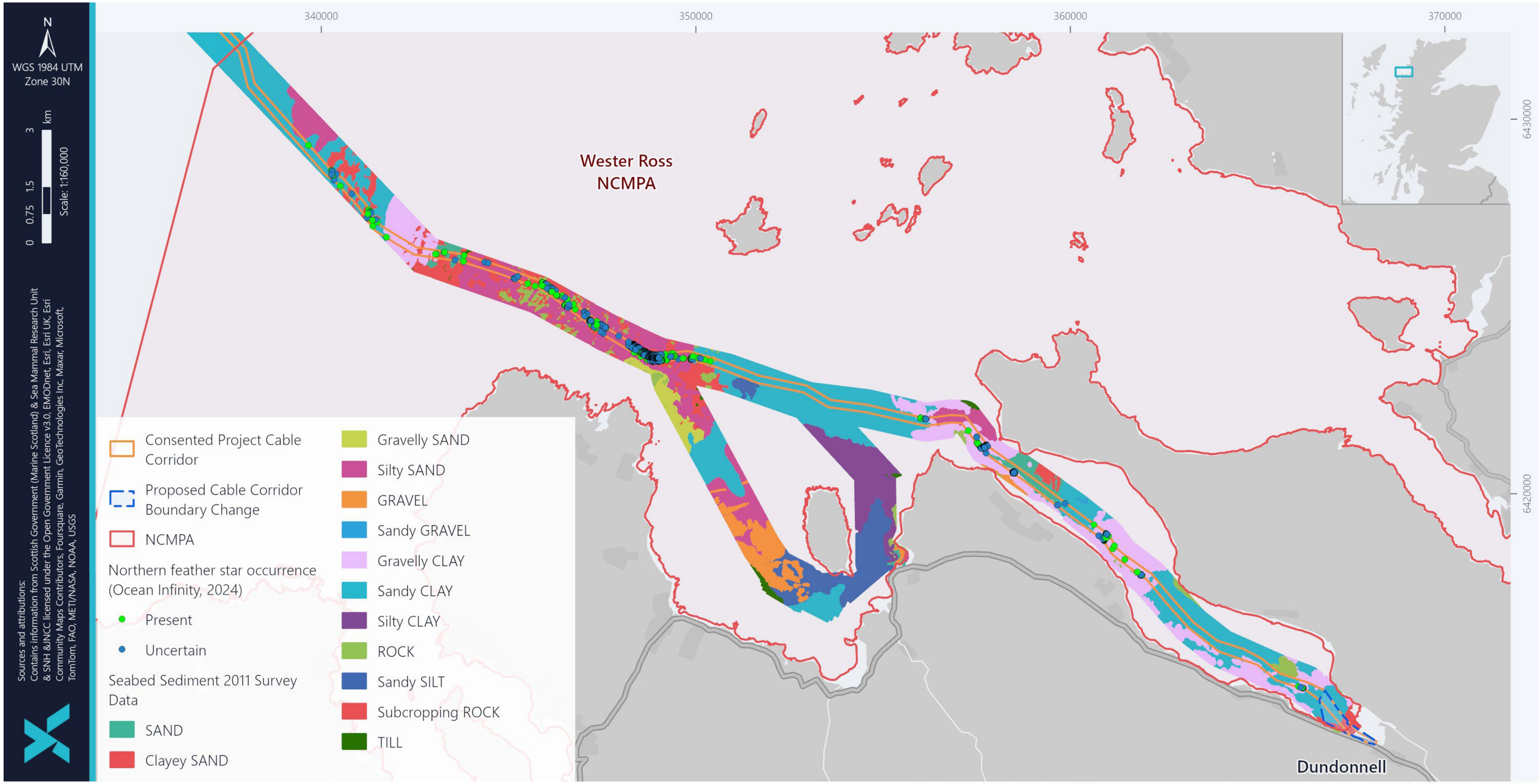

Figure 5 Sediment Type Recorded During Bibby HydroMap (2016) Surveys

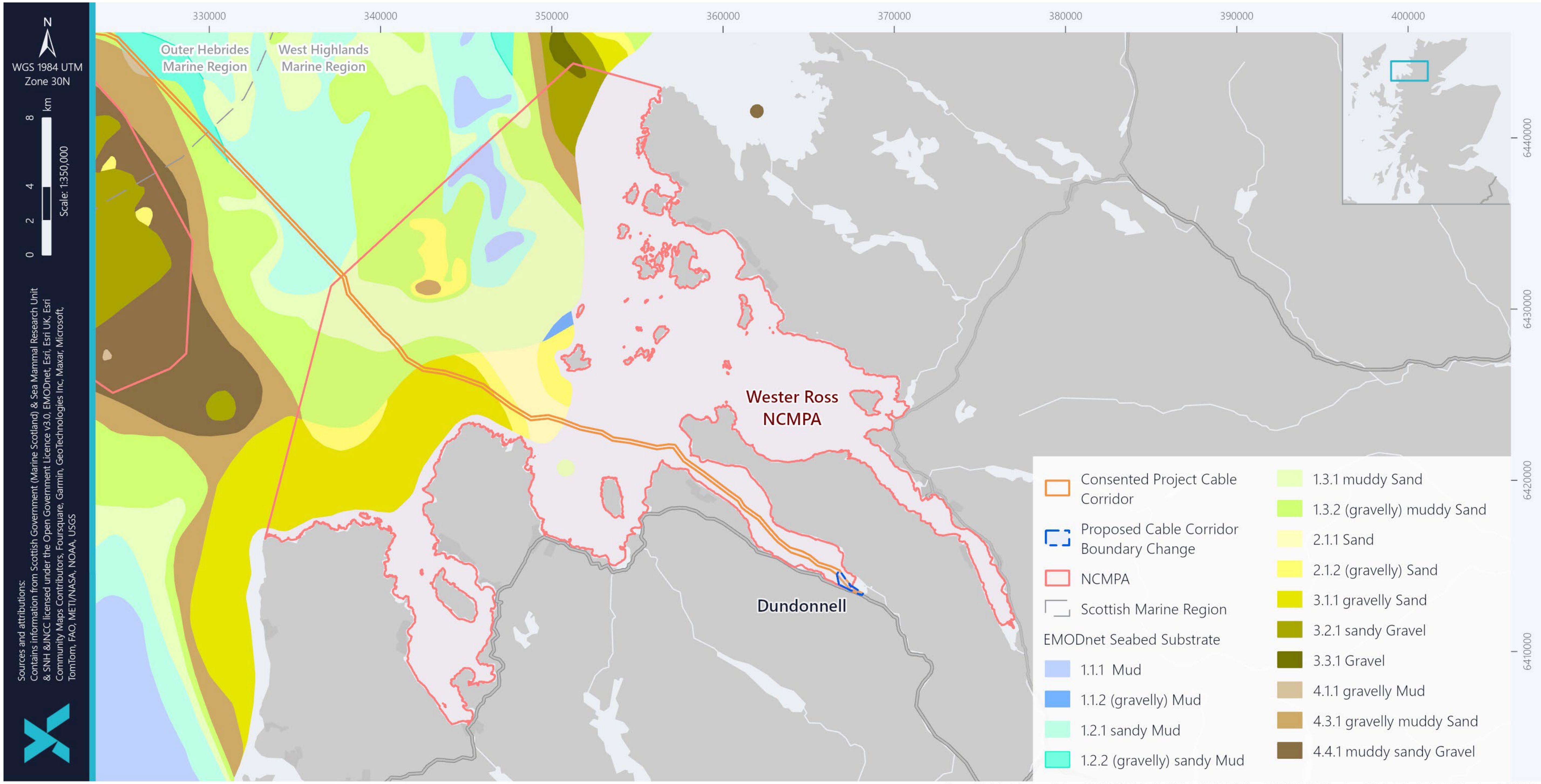

Figure 6 Sediment Types in the Wester Ross NCMPA (EMODnet, 2025a)

4.3.4.1.3. SIGNIFICANCE OF IMPACT

Taking the **high** sensitivity of northern feather star aggregations to potential impacts during cable installation and the **low** magnitude of effect, the consequence of the potential impacts to northern feather star aggregations during cable installation are assessed as **minor,** and therefore not significant. **Therefore, the conclusion of no significant impact to northern feather star aggregations in the original MEA is considered to remain valid.**

The determination of this impact significance is based on expert judgement and takes into account the Project Design Refinements described in Section 2.

4.3.4.2. SEABED DISTURBANCE FROM THE DRILLING AND BACKFILLING OF NEARSHORE BOREHOLES

The drilling and backfilling of up to 14 boreholes (6 plus 1 contingency at each landfall) may result in an increased impact for benthic habitats close to shore, in addition to those assessed in the original MEA. The features potentially impacted by the drilling and backfilling of nearshore boreholes are described below.

Site-specific surveys identified the 'polychaete/bivalve-dominated muddy sand shores' (classified as ‘littoral sand and muddy sand’ under the Annex I designation) on the approach to the Dundonnell landfall. This feature extends over a length of 930 m in the Project cable corridor, and there is the potential for the nearshore boreholes to impact this habitat (Bibby HydroMap, 2016). ‘Burrowed mud’ habitats (a protected feature of the Wester Ross NCMPA) were also identified in the nearshore area of the Dundonnell landfall, and this habitat type also has the potential to be impacted by the drilling and backfilling of nearshore boreholes. As detailed in Section 4.3.4.1, northern feather stars are not expected to be present at the Dundonnel landfall location. Furthermore, none of the other benthic protected features of the Wester Ross NCMPA were recorded as being present within Project cable corridor (Bibby HydroMap, 2016, see Section 2.5).

At the Arnish Point landfall, the initial section of the Project cable corridor is composed of sub-cropping rock and ‘circalittoral mixed sediments’. Therefore, there is the potential for disturbance of this habitat as a result of the drilling and backfilling of nearshore boreholes.

In summary, the assessment of impacts of the drilling and backfilling of nearshore boreholes focusses on the following habitat types:

- Burrowed mud habitats;
- Polychaete/bivalve-dominated muddy sand shores (classified as ‘littoral sand and muddy sand’ under the Annex I designation); and
- Circalittoral mixed sediments.

4.3.4.2.1. SENSITIVITY OF RECEPTOR

The sensitivity of the benthic habitat types has been assessed in relation to FeAST pressures identified for impacts from drilling and backfilling of nearshore boreholes, including:

- Surface abrasion;
- Sub-surface abrasion/ penetration;
- Removal of substratum (extraction); and
- Siltation changes (high and low).

The sensitivity assessment from the FeAST tool for these pressures is provided in Table 15.

As shown on Table 15, the sensitivity of ‘burrowed mud’ to all FeAST defined pressures considered was assessed as medium (NatureScot, 2025). The sensitivity of the 'polychaete/bivalve-dominated muddy sand shores' habitats to siltation and smothering was assessed as low by MarESA, with recoverability assessed as high. A moderate sensitivity to removal of substratum was assessed by MarESA for this habitat, due to potential defaunation and changes in topography. The sensitivity of circalittoral mixed sediments to the removal of substratum and subsea surface abrasion/penetration was assessed as high, whereas the sensitivity to siltation and surface abrasion was medium.

Overall, the sensitivity of the receptors to the potential impacts from the drilling and backfilling of nearshore boreholes is conservatively assessed as **high**.

Table 15 Sensitivity Assessment of Habitat Types (NatureScot, 2025; MarLIN, 2025)

Receptor	Sensitivity			
	Removal of substratum (extraction)	**Siltation changes (high and low)**	**Surface abrasion**	**Subsea abrasion/penetration**
Burrowed mud	**Medium** "The majority of the characterising species within are infaunal and so a loss in substrate will result in a loss of these species, therefore tolerance is assessed as low. The life-history of the species within this biotope vary, mobile species and burrowing megafauna may recolonise the area relatively quickly however, burrowing megafauna will take longer than five years to reach sexual maturity and recover and so a recoverability rank of medium is reported."	**Medium (high siltation) / low (light siltation)** Siltation rate changes (high): "The majority of species within this feature are burrowing megafauna (*Maxmuelleria lankesteri*, bivalves and thalassinidean crustaceans) living in the sediment and therefore are likely to be tolerant to smothering by 5 cm of sediment. Burrowing species will be able to burrow through the additional layer of sediment in hours to days, so recoverability is medium. The sea pen Virgularia mirabilis is able to withdraw rapidly into the sediment and appear to be able to recover from some smothering. Although the sea pen *Funiculina quadrangularis* is not able to withdraw into the sediment its height, up to 2m, means that it is unlikely to be affected by smothering of 5 cm of sediment. However if continued siltation occurs, then animals may be affected. Tolerance is assessed as medium with recovery as high, as this level of siltation will be less problematic." Siltation rate changes (low): "The majority of species within this feature are likely to be less tolerant to smothering by 30cm than 5 cm of sediment… …There may be an energetic cost expended to either re-establish burrow openings, or move up through the sediment though this is not likely to be significant. An increase in suspended sediment may affect the feeding efficiency of suspension filters, such as *Virgularia mirabilis*, colonies will produce an increased amount of mucus to aid sediment removal or individual colonies may retract into the sediment. The energetic cost of polyp cleaning, however, is probably low, but if feeding rates are reduced, particularly for extended periods, there may be a decline in the population. Tolerance is assessed as low with recovery as medium."	**Medium** "Abrasion and physical disturbance of surface of seabed is likely to affect mobile and sessile epifaunal and shallow burrowers. Damage to seapen species is likely to take place as a result of greater sediment disturbance as a result of towed demersal gear. However, experimental studies have shown that all three species of seapen can re-anchor themselves in the sediment if dislodged by fishing gear (Eno *et al*., 1996)… … Regeneration can come at a cost to individuals in terms of reproduction, behavior and physiological condition, and can have effects that reach beyond the individual to impact populations, communities, and ecosystems (Lindsay 2010). Tolerance is assessed as low and recovery is medium."	**Medium** "This feature supports the *Nephrops norvegicus* fishery and therefore may be subjected to heavy trawling. Nephrops populations exhibit a certain resilience to fishing pressure by the fact that juveniles and egg-carrying females remain within their burrows, therefore escaping capture… …Abrasion and physical disturbance, such as that caused by trawling or scallop dredging, is likely to affect mobile and sessile epifaunal species. Tolerance is assessed as low and recovery medium."
Polychaete/bivalve-dominated muddy sand shores (classified as 'littoral sand and muddy sand' under the Annex I designation)*	**Moderate** "Although intertidal dredging may only occur at a few sites where [littoral sand and muddy sand] has been recorded, sedimentary communities are likely to be highly intolerant of substratum removal, which will lead to partial defaunation, exposure of the underlying sediment and changes in the topography of the area (Dernie *et al*., 2003). In addition, heart urchins, molluscs and crustaceans are likely to be damaged or killed in dredging operations (Elliot et al., 1998). Dredging operations were shown to affect large infaunal and epifaunal species, decrease sessile polychaetes and reduce the abundance of burrowing heart urchins. Species living in the top layer of the sediment will be removed and subsequently perish. The remaining species, given their new position at the sediment / water interface, may be exposed to conditions to which they are not suited, i.e. unfavourable conditions.... …Recoverability will depend on the time taken for the substratum to return to prior conditions, pits or trenches to fill and recolonization to occur. The recoverability of LMS.MS is likely to be high."	**Low** "Smothering with 5 cm of sediment (that is, a rapid accumulation of sediment) for a month is unlikely to adversely affect species that can burrow through sediment, although it may clog the feeding apparatus of suspension feeding organisms. Kranz (1972, cited in Maurer, 1981) reported that tube dwelling pelecypods, that use mucous to trap food particles, and labial deposit feeders were most intolerant of burial, whereas epibenthic suspension feeders and boring species could not tolerate an addition of more than 1 cm of sediment. Infaunal non-siphonate suspension feeders escaped 5 cm but were intolerant of less than 10 cm, whereas deep burrowing siphonate species could tolerate up to 50 cm. Mortalities were higher when the smothering sediment was atypical of that area, which would dramatically change the nature of the substratum and hence the communities present, although no mention was made of the type of sediment involved. Overall, it is possible that some species may be killed by smothering at the benchmark level and, therefore, intolerance has been assessed as intermediate. On return to prior conditions, recovery of the intolerant species would most probably be high"	**Low** "Physical disturbance at the benchmark level is likely to result in mortality or removal of a proportion of the invertebrate macrofauna and an intolerance of intermediate has been recorded. The above evidence suggests that recovery is possible within a year, depending on the season in which the disturbance occurs."	**n/a – pressure not available on MarESA.**

Receptor	Sensitivity			
	Removal of substratum (extraction)	**Siltation changes (high and low)**	**Surface abrasion**	**Subsea abrasion/penetration**
Circalittoral mixed sediments**	**High** "Tillin *et al*. (2010) conclude that subtidal mixed sediments have a high sensitivity to the pressure but with no supporting evidence provided."	**Medium (high siltation) / not sensitive (light siltation)** "Tillin *et al*. (2010) consider subtidal mixed sediments to have a medium sensitivity to the pressure but with no further evidence provided. The degree to which particular examples of the habitat is sensitive to the pressure will be dependent on the species present."	**Medium** "Tillin *et al*. (2010) consider subtidal mixed sediments to have a medium sensitivity to the pressure but with no further evidence provided. The degree to which particular examples of the habitat is sensitive to the pressure will be dependent on the species present."	**High** "Tillin *et al*. (2010) consider subtidal mixed sediments to have a high sensitivity to the pressure but with no further evidence provided. The degree to which particular examples of the habitat is sensitive to the pressure will be dependent on the species present."

*As polychaete/bivalve-dominated muddy sand shores habitats are not available on the FeAST tool, this sensitivity assessment has been undertaken using the MarESA tool (MarLIN, 2025).

**The sensitivity assessment for continental shelf mixed sediments features on the FeAST tool has been used as a proxy for this habitat type.

4.3.4.2.2. MAGNITUDE OF EFFECT

As a worst-case, a maximum of 14 boreholes (6 plus 1 contingency at each landfall) is assumed, with one jack-up vessel movement per borehole. The four legs on the jack-up vessel have a footprint of 1.83 m^2 per location, with a total disturbance footprint for 14 boreholes of 25.62 m^2. Boreholes will be backfilled with grout and the top 1 m below the seabed will be left to naturally backfill with marine sediments and rapid recovery of the seabed expected over time (see Section 2.4).

Depressions from jack-up vessels may remain on the seabed for a number of years, depending on the sediments present (e.g. BOWind, 2008; EGS, 2011). Monitoring at the Barrow offshore wind farm demonstrated infilling of jack-up vessel depressions within one year (BOWind, 2008). Nevertheless, the disturbance footprint associated with the drilling and backfilling of nearshore boreholes will be highly localised (25.62 m^2). It should also be noted that the vessels used for the Project will be considerably smaller than vessels used to install the wind turbine foundations at the Barrow offshore wind farm, and as such the recovery durations identified by BOWind and EGS represent the worst case.

The original MEA assumed a total area of impact 1.1 km^2 associated with cable installation activities. Overall, the additional impact from the drilling and backfilling of 14 boreholes is considered to represent a very small proportion of the overall disturbance impact associated with the Project. Seabed recovery following drilling and backfilling of nearshore boreholes would be expected over time and no long-term impacts to benthic habitats or species is predicted. Due to the highly localised spatial extent and temporary nature of the impact, any loss or removal of any habitat or species would be minimal, and overall, the impact is assessed as being of **negligible** magnitude.

4.3.4.2.3. SIGNIFICANCE OF IMPACT

Taking the **high** sensitivity of the receptor and the **negligible** magnitude of effect, the consequence of the potential impact is assessed as **negligible**. Therefore, no significant impact is predicted, **consistent with the conclusions of the original MEA.**

4.3.4.3. CHANGE IN CABLE CAPACITY AND VOLTAGE ALTERING EMF INTENSITIES

4.3.4.3.1. SENSITIVITY OF RECEPTOR

Benthic and intertidal ecology receptors may be sensitive to increased EMF intensities associated with the change in cable voltage and capacity.

Benthic invertebrates, such as northern feather stars, are more likely to encounter B-fields associated with subsea cables compared with organisms present in the water column. Few studies have been carried out to investigate the effects of EMFs on echinoderms, and none on northern feather stars. Studies on sea urchins and starfish have shown variable results. Sea urchins show physiological changes when exposed to Direct Current (DC) B-fields of 30,000 μT (Albert *et al.,* 2020), levels which are significantly higher than those emitted by the proposed subsea cables. Coastal invertebrates, including sea stars and urchins, exposed to EMFs levels of 500 μT showed no physiological or behavioural responses to EMFs (Chapman *et al.,* 2023).

The FeAST tool does not include any sensitivity assessments for EMF changes for the benthic and intertidal ecology features identified within the Project cable corridor (Table 13). Generally, for all electro-sensitive species, the FeAST tool has benchmarked EMF changes as a change in the local B-field variation from the natural GMF of 10 μT due to anthropogenic means (NatureScot, 2025). The limited body of evidence available does not suggest that benthic invertebrates are sensitive to EMFs at levels comparable to those emitted from subsea cables. As such, benthic invertebrates, including northern feather stars, are considered to be of a **low** sensitivity.

4.3.4.3.2. MAGNITUDE OF EFFECT

The cable system will result in localised EMFs, which can potentially affect the sensory mechanisms of marine species. The impact pathway has the potential to occur along the length of the cable route, but the magnitude of effect will vary dependent on the separation of the cables and whether they are trenched, or surface laid (Table 4).

EMF intensities above the seabed for the proposed 525 kV cable will be greater along the length of the cable route than the maximum EMF intensities modelled for the original 320 kV cable design. For both cable ratings, EMF intensities are the highest directly above the seabed and when it is assumed the cables are laid separately on the surface.

EMF intensities for the 525 kV cable reach a maximum B-field strength of 6,199.63 μT directly on the seabed (0 m) for a separated surface laid configuration at the Arnish Point HDD pop out. The intensity rapidly decreases to 456.22 μT at a distance of 1 m from the seabed, reaching 86.59 μT within 10 m from the seabed. Intensities along the cable route, where the cable will be trenched, range from 120.02 – 243.34 μT. B-fields decrease to levels below the FeAST tool benchmark (+10 μT) within 5 m of the seabed for all target DoL's. In northern feather star regions, where it was conservatively assumed for the purposes of EMF modelling that the cable will be bundled and surface laid (see Section 2.7), B-field intensities are modelled to be 6,156.58 μT directly on the seabed (0 m), declining to 110 μT and 53.4 μT within 1 m and 5 m of the cables, respectively (Table 4). As per Section 2.5, the cables will mostly be protected by jet trenching, which will increase the separation distance between the receptor and the cables, exponentially reducing the received EMF intensity.

The impacts from B-fields associated with surface laid cables will be continuous and not reversible throughout the operational phase of the Project. Although the maximum B-field strengths emitted from the cables reach 6,199.63 μT at the landfalls, the impact is considered to be highly localised over a section of cable of less than 100 m in length at each landfall. The majority of the B-fields along the rest of the cable route dissipate quickly and fall below the FeAST tool benchmark within the immediate vicinity of the cables (<5 m horizontally). Furthermore, the modelling assumed the cables were operating at their maximum capacity, whereas in reality, the loading of the cables will vary. The cables will not typically operate at their maximum capacity, meaning the actual EMF intensities will be reduced compared to the model outputs. As such, impacts from B-fields are of a highly localised spatial extent, and the magnitude of effect is **low**.

Significance of impact

Taking the **low** sensitivity of the receptors and the **low** magnitude of effect, the consequence of the potential impact on benthic invertebrates from EMF from the proposed 525 kV subsea cables will be **negligible**. Therefore, no significant impact is predicted, **consistent with the conclusions of the original MEA**.

4.4. Fish and Shellfish Ecology

4.4.1. Introduction

This section describes the impact assessment for fish and shellfish ecology (see Section 3). The impacts requiring further assessment were identified through the Gap Analysis as those resulting from the Project Design Refinements with the potential to materially alter the conclusions of the original MEA (see Section 3).

A description of the assessment of the Project's potential impact on fish and shellfish ecology within the original MEA is provided in the Gap Analysis Report (Appendix A). An overview of the fish ecology baseline was provided in the original MEA, which was informed by desk-based sources. The spawning and nursery grounds identified as overlapping the Project cable corridor were identified, and the potential presence of species sensitive to noise, seabed disturbance and EMF were described.

The following impacts were considered for fish and shellfish ecology:

- Disturbance and possible alteration of migration routes due to vessel noise, noise generated during cable installation and sediment suspension during cable installation;
- Interaction with spawning/nursery grounds;
- Collision risk for basking sharks; and
- Accidental fuel release.

A detailed assessment was not conducted for this topic within the original MEA, as a conclusion of no significant impacts could be made without further assessment to determine impact significance and/or identify management or mitigation measures (see Table 7.1 of the original MEA).

4.4.2. Updated Information Requiring Further Assessment

The Project Design Refinements have the potential to result in a new or increased impact for fish ecology via a change in cable capacity and voltage altering the EMF intensities associated with the Project. There have been several recent studies investigating the potential impacts of EMF on fish and shellfish ecology receptors (e.g. Hutchison *et al.,* 2018; Scott *et al.,* 2021; Hutchison *et al.,* 2020; Harsanyi *et al*., 2022). Although these studies have been conducted on a limited number of species, primarily in a laboratory environment and with mixed results, they do indicate the potential for elasmobranchs, diadromous fish and shellfish to be receptive of EMF, and therefore, the impact assessment focusses on these species groups.

4.4.3. Environmental Baseline

This section summarises the environmental baseline for fish and shellfish ecology, informed by desk-based sources. A summary of the information presented in the original MEA is described with updated information provided, where relevant.

4.4.3.1. SPAWNING AND NURSERY GROUNDS

The key spawning grounds that overlap the Project cable corridor include sandeel, herring, cod (*Gadus morhua*), lemon sole (*Microstomus kitt*), Norway pout (*Trisopterus esmarkii*), plaice (*Pleuronectes platessa*), sprat (*Sprattus sprattus*), whiting (*Merlangius merlangus*), and *Nephrops* (Coull *et al.,* 1998; Ellis *et al.,* 2012) (Figure 7 - Figure 9). A large coastal spawning ground for sandeel is present within the North-East Lewis NCMPA, for which sandeel are a protected feature (see Section 4.5 for the assessment of potential impacts on the sandeel feature of the North-East Lewis NCMPA).

There are several other fish species that utilise the Project cable corridor for nursery grounds, including anglerfish (*Lophius piscatorius*), blue whiting (*Micromesistius poutassou*), whiting, herring, cod, European hake (*Merluccius merluccius*), haddock, lemon sole, ling (*Molva molva*), mackerel (*Scomber scombrus*), Norway pout, sandeel, and saithe (*Pollachius virens*) (Coull *et al.,* 1998; Ellis *et al.,* 2012) (Figure 7 - Figure 9).

The Essential Fish Habitat maps for Scottish waters, published by Franco *et al*. (2023), also detail the potential for fish and shellfish aggregations around Scotland (either presence or absence, lower or higher confidence). There are no aggregations with probability ranked as ‘presence (higher confidence)’ that overlap the Project cable corridor.

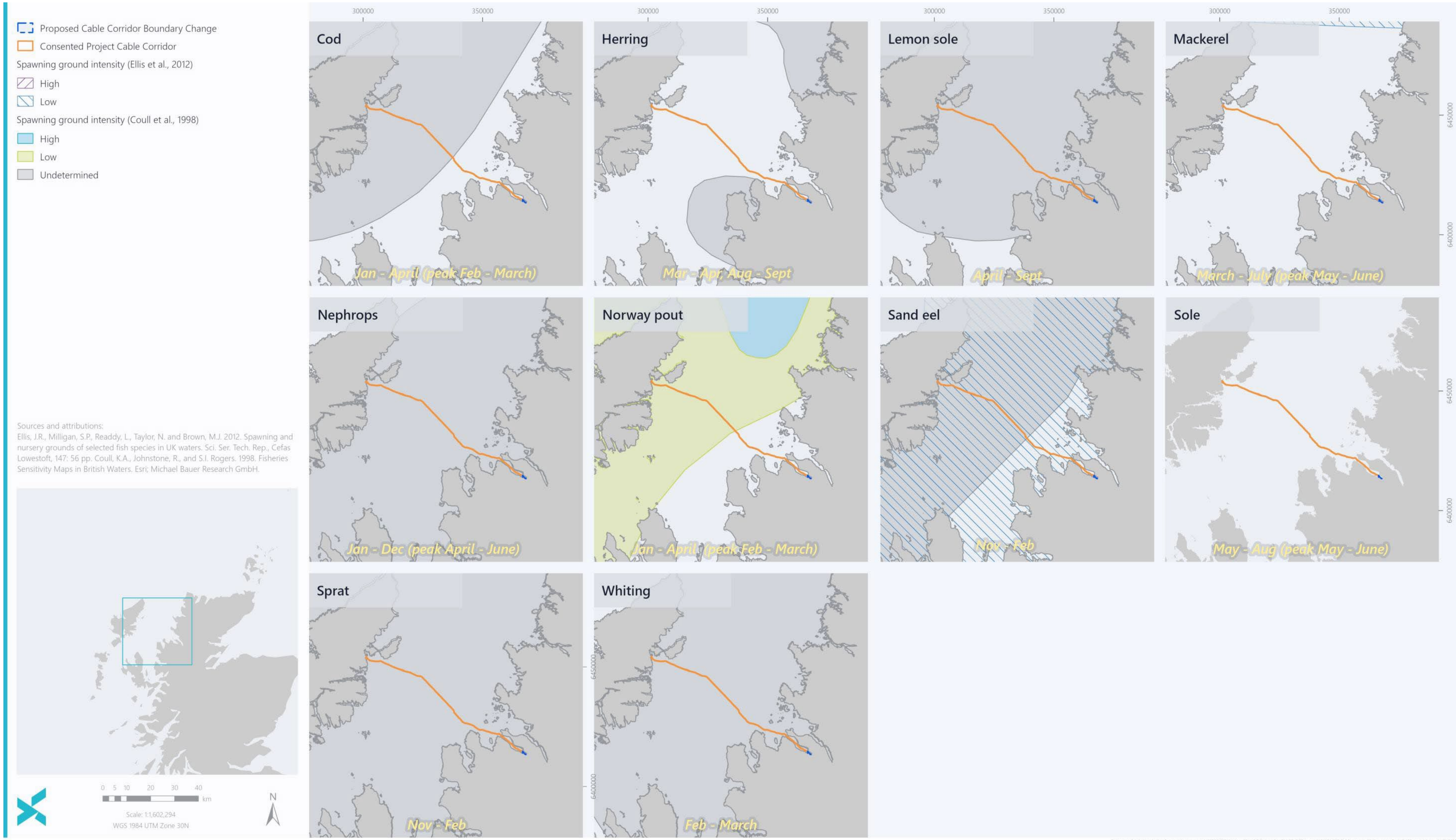

Figure 7 Fish Spawning and Nursery Grounds (Coull *et al*., 1998; Ellis *et al*., 2012) (1)

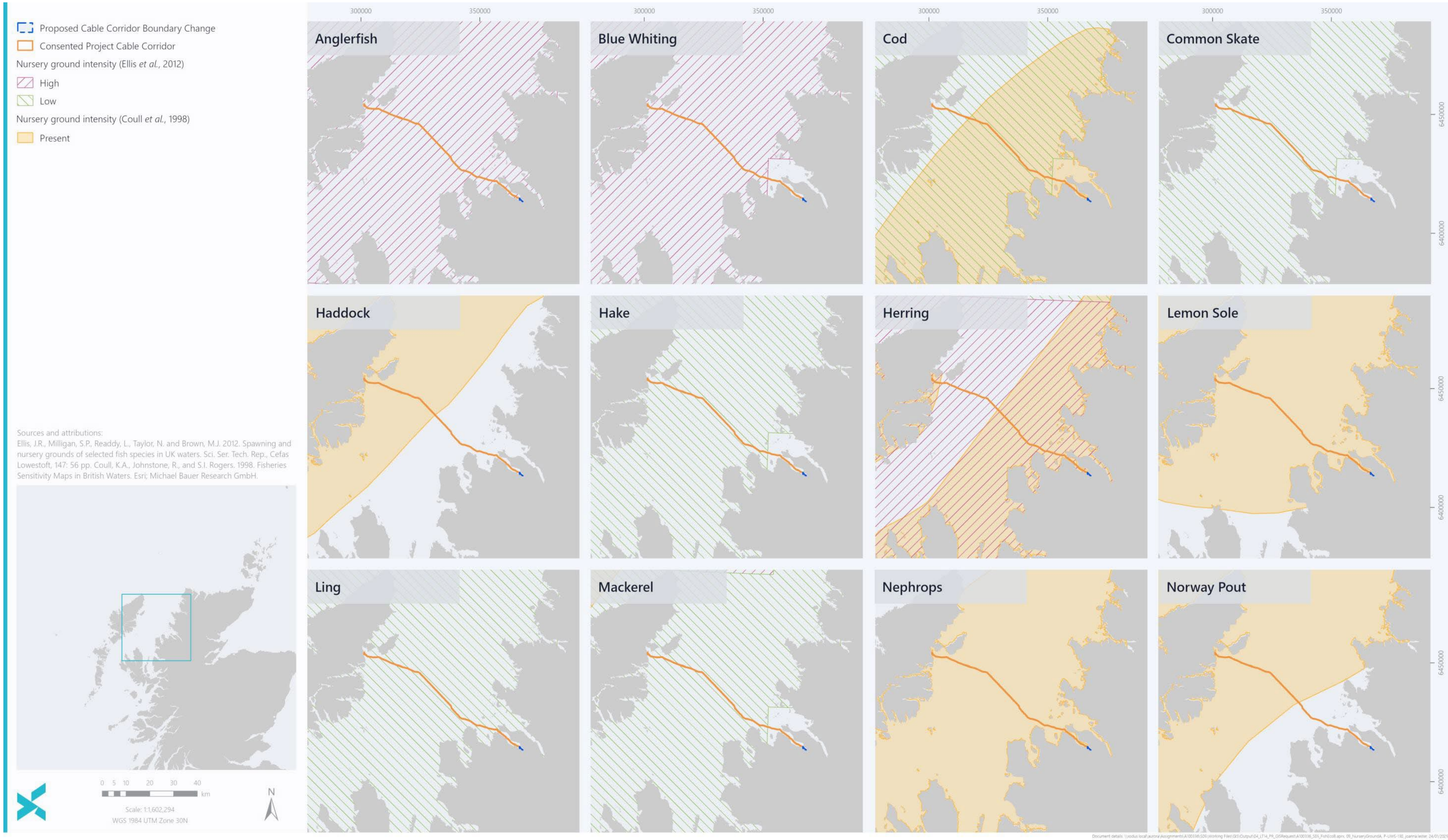

Figure 8 Fish Spawning and Nursery Grounds (Coull *et al.*, 1998; Ellis *et al.*, 2012) (2)

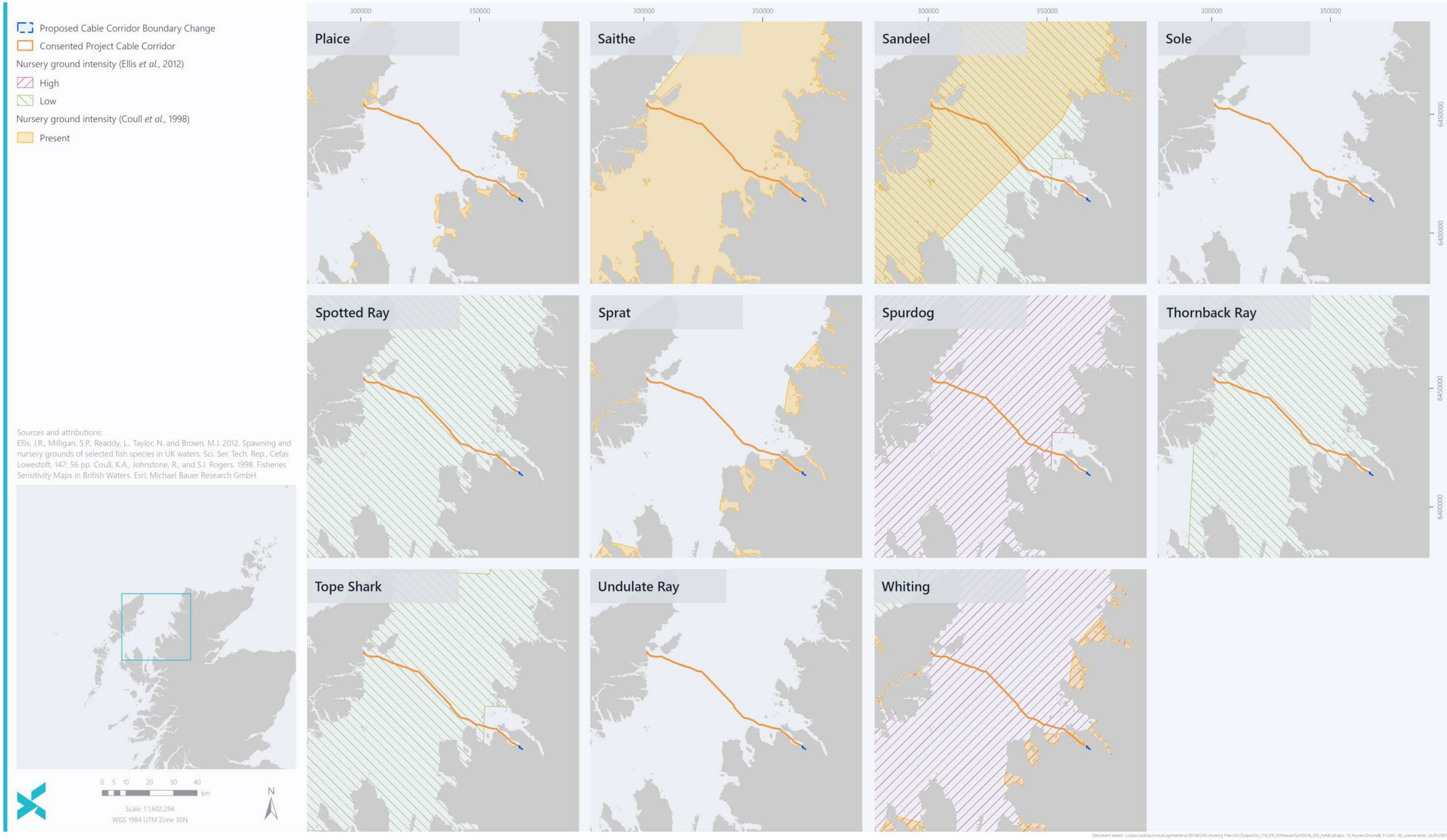

Figure 9 Fish Spawning and Nursery Grounds (Coull *et al.*, 1998; Ellis *et al.*, 2012) (3)

4.4.3.2. DIADROMOUS FISH

There are two diadromous fish species which are considered most likely to be present within the Project cable corridor, Atlantic salmon (*Salmo salar*) and sea trout (*Salmo trutta*). These two species are sympatric, meaning that they share the same rivers and tributaries for spawning (Jensen *et al*., 2012) and are highly synchronised in their migrations (Harvey *et al.,* 2020). Post-smolts (salmonids that have undergone a transformation to survival in saline conditions) migrate to deep-water offshore feeding grounds around two to three years following hatching (Heard, 2007; NatureScot, 2023), using the earth's magnetic field to orient themselves during migration (Gill & bartlett, 2010). They will return to their natal river after spending between one and five years at sea. Tracking studies have indicated that salmon are distributed widely around the west coast of Scotland using a variety of different migratory routes (Atlantic Salmon Trust, 2022).

Important salmon and trout rivers have been identified in the vicinity of the Project cable corridor and near both landfalls (Figure 10), including the Dundonnell River (Cunningham & Simpson, 2022), whose mouth is located approximately 700 m from the Dundonnell landfall site, and the River Creed system near Stornoway.

Atlantic salmon and sea trout are both listed as PMFs in Scotland (NatureScot, 2020). Atlantic salmon are also protected under Annex II of the Habitats Directive, and on the OSPAR list of threatened and/or declining species and are considered a species of cultural and conservation importance.

4.4.3.3. ELASMOBRANCHS

As outlined in Section 4.4.3.1, the Project cable corridor overlaps with low intensity nursery grounds for common skate (now considered as two separate species, flapper skate (*D. intermedius*) and blue skate (*D. flossada*[3]), spotted ray, thornback ray, and tope shark and high intensity nursery grounds for spurdog (Figure 7 - Figure 9).

A recent review of elasmobranch distributions in Scottish waters presented species distribution models for nine elasmobranch species (Régnier *et al*., 2024). The species distribution models indicate that the most likely elasmobranch species in the Project cable corridor are common skate, cuckoo ray, spotted ray, thornback ray, spurdog, black mouthed dogfish (*Galeus melastomus*), lesser spotted dogfish (*Scyliorhinus canicula*) and starry smooth hound (*Mustelus asterias*). Generally, the distribution models indicate that the west coast of Scotland is an area which contains a relatively high abundance of elasmobranchs.

Basking shark (*Cetorhinus maximus*) may also be present in the vicinity of the Project cable corridor. Studies mapping areas of suitable habitat for basking shark show that the Project cable corridor is located within an area of low to moderate habitat suitability for this species (Austin *et al.,* 2019). Furthermore, an updated analysis of the Basking Shark Watch public sightings database (1987 – 2020) showed that sightings in the Sea of the Hebrides NCMPA (to the south of the Project cable corridor) are relatively high, with a lower number of sightings in the Project cable corridor itself (Pikesley *et al*., 2024).

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[3] Although common skate is now considered to be two separate species (flapper skate and blue skate), due to lack of species-specific distribution / sensitivity date for these two separate species, reference is made to common skate in the subsequent sections of this document.

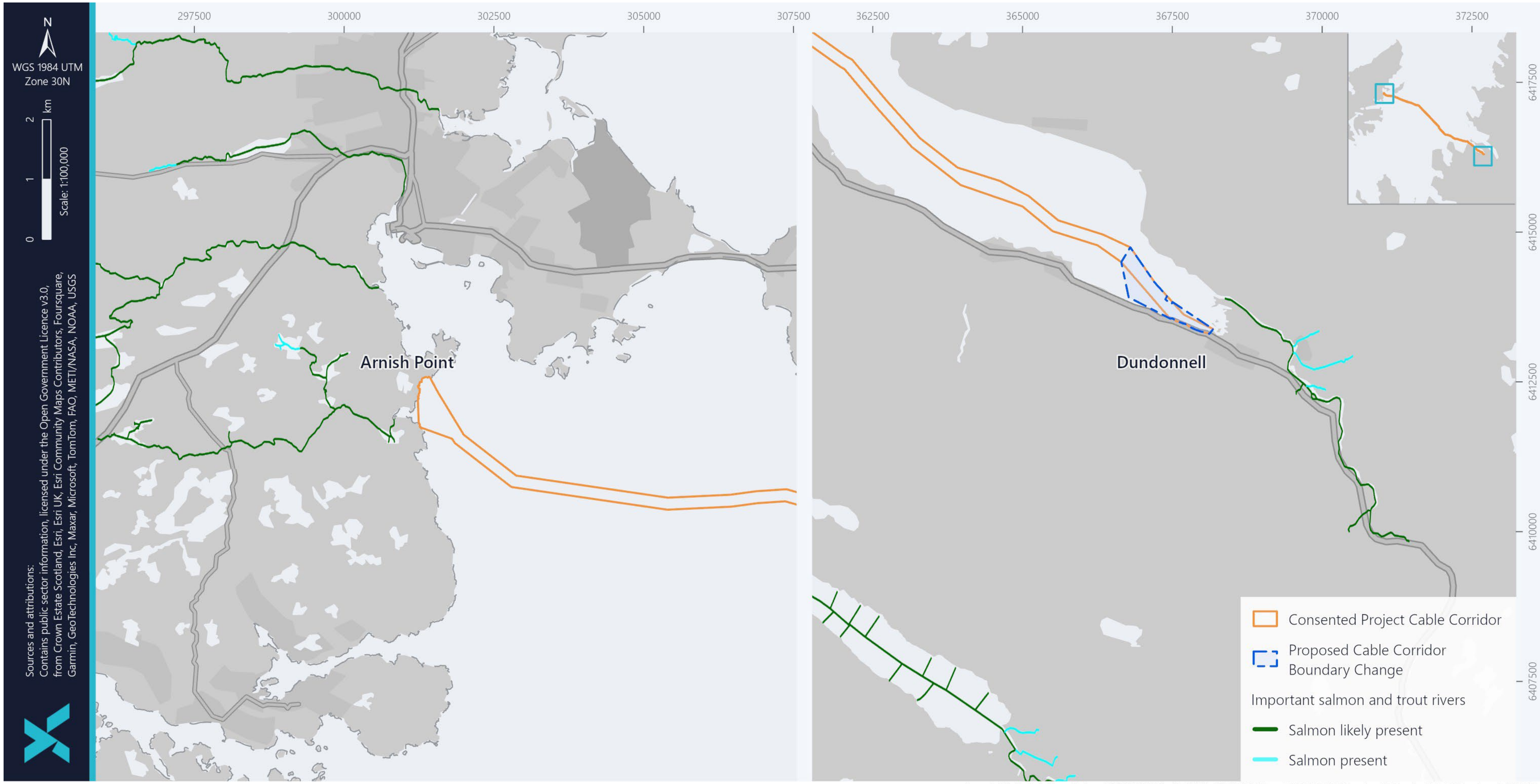

Figure 10 Key Salmon and Trout Rivers in the Vicinity of the Project Cable Corridor

4.4.3.4. SHELLFISH

The shellfish species considered within this MEA Addendum include larger crustaceans, such as *Nephrops*, lobster, and crab. These species are of commercial importance around the Isle of Lewis and the Scottish mainland, where they are targeted by static gear (e.g. creels), and *Nephrops* are also targeted by demersal trawlers. Brown crab and *Nephrops* are the most valuable species landed in the relevant ICES rectangles (44E4, 45E3, and 45E4; Marine Management Organisation (MMO), 2024), with live weights of 336.5 tonnes (value of £10,819,777) and 1,389 tonnes (value of £846,625) in 2023, respectively.

4.4.4. Impact Assessment

Section 4.4.2 outlines the updated information identified as requiring further assessment for the fish and shellfish ecology topic within this MEA Addendum. An impact assessment has been conducted in the context of this updated information and in support of the Marine Licence variation request to ensure the environmental effects of the Project Design Refinements are adequately considered. The only impact screened in for further assessment was the change in cable voltage and transmission capacity altering the EMF intensities of the Project.

The cable system will result in highly localised EMFs, which can potentially affect the sensory mechanisms of certain fish and shellfish species, particularly elasmobranchs, diadromous fish, and lobsters and crabs (Hutchison *et al.,* 2021). The impact pathway has the potential to occur along the length of the cable route, but the magnitude of effect may vary dependent on whether the cables are trenched, surface laid, separated, or bundled. The receptors will have different levels of sensitivity based on the species group, such that the sensitivity assessment has been split into key receptor groups (elasmobranchs, diadromous fish, and shellfish).

Generally, for all electro-sensitive species, the FeAST tool has benchmarked EMF changes as a change in the local B-field variation from the natural GMF of 10 μT due to anthropogenic means (NatureScot, 2020). The assignment of sensitivity and magnitude has been undertaken using the criteria set out in Section 4.1.

4.4.4.1.1. SENSITIVITY OF RECEPTOR

<u>Elasmobranchs</u>

Elasmobranch species utilise both coastal and offshore waters and can be found at close proximity to the seabed. As such, elasmobranchs may encounter elevated B-fields from subsea cables.

Elasmobranchs possess electroreceptors which can detect electric and magnetic fields for orientation, navigation, and prey detection (Anderson *et al.*, 2017; Hermans, *et al.,* 2024) and are considered more responsive to magnetic fields than other species (Hutchison *et al.,* 2020). Elasmobranchs respond to small changes in the direction, intensity, and/or inclination of a magnetic field and use it to detect prey and predators, for communication, and migration (Nordmann *et al*., 2017; Hutchison *et al.,* 2020; Keller *et al.,* 2021).

Gill *et al.* (2009) found that thornback rays and spurdog responded to a High Voltage Alternating Current (HVAC) cable EMF strength of 8 μT above the natural GMF but noted unpredictability in the responses and that no response occurred in some instances. Exposure to EMFs of 65.3 μT (total magnetic field including the natural GMF (measured as 51.3 μT)) in controlled experiments on little skates show increased exploratory behaviour (Hutchison *et al.,* 2018; Hutchison *et al*., 2020), however, the cable did not represent a barrier to movement (Hutchison *et al.,* 2018).

Overall, the influence of EMFs on elasmobranchs is variable. Critical knowledge gaps remain in the literature, and the general consensus suggests that there is the potential for habituation to varying EMF levels. Elasmobranchs are considered to have some capacity to accommodate the effects of EMFs depending on their life stage and species, without significantly altering their behaviour, although some change in behaviour and physiology may occur (Hermans *et al*., 2024). For a population level effect to occur, this would have to result in reduced health, survival or reproductive success (Gill & Desender, 2020).

Nursery grounds for elasmobranch species are widespread throughout the Project cable corridor and off the west coast of Scotland. Spotted ray, thornback ray, spurdog, and tope shark nursery grounds overlap with the entirety of the Project Cable Corridor, noting high intensity nursery grounds for spurdog. Exposure to EMF may result in potential developmental, genetic, behavioural and physiological impacts (Hermans, *et al.,* 2024). For instance, exposure to changing EMF intensities may cause reduced yolk-sac absorption and abnormalities in cell development (Hermans, *et al.,* 2024). In general, existing evidence from laboratory studies suggests that potential developmental, genetic and physiological impacts for early life stages (e.g. elasmobranch eggs) may occur from exposure to B-fields in the milli Tesla range (Gill & Desender, 2020; Copping *et al*., 2021). The modelled EMF intensities of this magnitude for the proposed 525 kV subsea cables (6,199.63 μT) are extremely spatially limited, occurring at only sections of separately laid cables of less than 100 m in length at each HDD pop out, and where it was assumed that cables could be surface laid in northern feather star regions (see Section 2.7). As per Section 2.5, the cables will mostly be protected by jet trenching, increasing the separation between the receptors and the cables, and hence exponentially reducing the received EMF intensities.

Although elasmobranch responses to EMFs are found to be variable and unpredictable, they are identified as being more responsive to EMF than other species (Scottish Government, 2022). Considering this, along with the fact that PMF elasmobranchs (e.g. common skate and spurdog) may utilise the seabed in the Project cable corridor due to the presence of their nursery grounds, overall, the sensitivity of elasmobranchs is considered to be **medium.**

<u>Diadromous fish</u>

Diadromous fish, such as Atlantic salmon and sea trout, have magnetically sensitive material (known as magnetite) within their skeletal structure that is used for navigation using earth's GMF (Diebel *et al*., 2000; Gill & Bartlett, 2010). As such, anthropogenic EMF introduced by cables may alter behaviour during migration, potentially resulting in attraction, avoidance, or stress, all of which can cause an increase in energy expenditure.

Salmonids generally swim within the top five metres of the water column (Godfrey *et al*., 2015). As such they are unlikely to encounter anthropogenic EMFs generated by subsea cables in deeper offshore waters (Honkanen *et al*., 2024). Nonetheless, in shallower waters, such as the landfall locations, the potential for these receptors to encounter EMFs associated with the cable is increased. While the exact migratory pathways of Atlantic salmon and sea trout are unclear, it is likely that these salmonids will cross over the Project cable corridor when migrating to deeper waters and returning to their natal rivers, such as those along the coastline near both landfalls (Figure 10).

Laboratory studies on Atlantic salmon assessing their response to EMF intensities of up to 95 μT above natural GMFs did not find any behavioural or physiological effects in either post-smolts or adults, suggesting that exposure to EMF would not impede migration or increase mortality risk (Armstrong *et al*., 2015). Wyman *et al*. (2018) investigated the effects of an operational DC cable on Chinook salmon (*Oncorhynchus tshawytscha*) and concluded that the resultant EMFs did not have a significant effect on adult salmon migration success and survival, although some deviations from typical migration routes were observed. Rainbow trout (*Oncorhynchus mykiss*) larvae were exposed to an EMF intensity of 1,000 μT and showed an attraction behaviour, but no stress response following exposure (Jakubowska *et al*., 2021). Exposure of rainbow trout eggs to EMF levels of 1,000 μT during embryonic and larvae development showed no effects on mortality, hatching time, larval growth, or fitness, although yolk-sac absorption rates increased following exposure (Fey *et al.*, 2019). Anthropogenic EMF can influence the spatial orientation of sea trout embryos, where embryos showed a tendency in aligning with an axis consistent with the direction of the EMF, however effects on mortality are still not fully understood (Krzystolik *et al.,* 2024).

Based on existing studies, there is no clear evidence of physiological response to EMFs and limited evidence of behavioural responses to EMFs by diadromous fish. Nonetheless, as Atlantic salmon is a PMF feature and there are important salmonoid rivers located in close proximity to the landfalls, the sensitivity of diadromous fish is considered to be **medium**.

Shellfish

Mobile shellfish, such as crabs and lobster, are more likely to encounter EMFs associated with subsea cables due to their habitancy on the seabed. Evidence suggests that crustaceans can detect GMFs and EMFs (Lohmann *et al*., 1995; CSA, 2019). However, studies have shown mixed results.

In controlled experiments, crabs showed no responses to energised and unenergised cables, with evidence of crabs walking over subsea cables of EMF intensities of around 100 μT above natural GMFs (Love *et al.,* 2017), suggesting that EMF sources do not act as barriers to movement.

At EMF intensities of 500 μT, modelled for a surface laid cable, velvet swimming crab (*Necora puber*) showed no behavioural or physiological responses (Chapman *et al*., 2023). Scott *et al.* (2018) assessed the effects of a 2,800 – 40,000 μT B-field on edible crab (*Cancer pagurus (L.*)), finding reduced roaming and attraction to the source of EMF, as well as physiological changes, however, these EMF intensities are significantly higher than those emitted from the proposed 525 kV subsea cables (with the exception of short sections of separately laid cables at the landfalls). Research on brown crabs in laboratory conditions (Scott *et al.,* 2021) found no adverse physiological or behavioural impacts with EMF intensities of 250 μT. However, with exposures to 500 to 1,000 μT, crabs showed an attraction to EMFs and increased time spent roaming. Similarly, American lobster show subtle behavioural responses to EMFs emitted by HVDC cables (Hutchison *et al*., 2018; 2020). Deformities in lobster and brown crab larvae have also been observed due to the exposure of EMF levels of 2,800 μT during embryonic development although there were no effects on mortality, fitness, or the number of hatched larvae (Harsanyi *et al*., 2022).

Brown crab and *Nephrops* are commercially important species present within the Project cable corridor. Although the body of literature on the effects of EMF on shellfish is varied, it is agreed that sensitivity to EMFs is highly species specific, with adverse physiological effects only found during laboratory experiments conducted at significantly higher EMF strengths than those modelled for the 525 kV subsea cables, with the exception of limited separated, or surface laid sections. Shellfish are therefore considered to be of **low** sensitivity.

4.4.4.1.2. MAGNITUDE OF EFFECT

EMF intensities above the seabed for the proposed 525 kV cable will be greater along the length of the cable route than the maximum EMF intensities originally assessed for the 320 kV cable. For both cable ratings, EMF intensities are the highest directly above the seabed and when the cable is laid in a surface separated configuration.

EMF intensities for the 525 kV cable reach a maximum strength of 6,199.63 μT directly on the seabed (0 m) for a separated surface laid configuration at the Arnish Point HDD pop out. The intensity exponentially decreases with distance to 456.22 μT, at a distance of 1 m from the seabed, reaching 86.59 μT within 10 m from the seabed. EMF intensities along the cable route, where the cables will be trenched, range from 120.02 – 243.34 μT (based on a 0.6 and 1 m target DoL, respectively). EMF intensities decrease to levels below the FeAST tool benchmark (+10 μT) within 5 m of the seabed for all target DoLs. In northern feather star regions, where it was conservatively assumed for the purposes of EMF modelling that the cable will be bundled and surface laid (see Section 2.7), B-field intensities are modelled to be 6,156.58 μT directly on the cables' surface (0 m), declining to 53.4 μT within 5 m of the cables (Table 4).

The impacts from B-fields associated with the surface laid subsea cables will be continuous and not reversible throughout the operational phase of the Project. Although the maximum EMF strengths emitted from the cables reach 6,199.63 μT at the landfalls, the impact is considered to be highly localised to the landfalls over a section of cable of less than 100 m in length at each landfall. The majority of the EMF intensities along the rest of the cable route dissipate quickly with distance and fall below the FeAST tool benchmark within the immediate vicinity of the cables (<5 m horizontally).

Embedded mitigation measures were proposed within the original MEA (Table 12), including trenching of the cable at a target DoL of between 0.6 and 1.6 m. In areas where the cable will be surface laid, it will be protected by either rock protection or tubular protection system. These measures will increase the separation distance to receptors and as such, exponentially reduce the EMF intensities they are exposed to.

The impacts from B-fields associated with the subsea cables will be continuous and not reversible throughout the operational phase of the Project. However, given the highly localised nature of the impact, where B-field intensities above the FeAST tool benchmark only occur within metres of the cables, the magnitude of effect is **low**.

4.4.4.1.3. SIGNIFICANCE OF IMPACT

Elasmobranchs

Taking the **medium** sensitivity of the receptor and the **low** magnitude of effect, the consequence of the potential impact on elasmobranchs from EMFs associated with the proposed 525 kV subsea cables will be **minor**, and therefore not significant, **consistent with the conclusions of the original MEA.**

Diadromous fish

Taking the **medium** sensitivity of the receptor and the **low** magnitude of effect, the consequence of the potential impact on diadromous fish from EMFs associated with the proposed 525 kV subsea cables will be **minor**, and therefore, not significant**, consistent with the conclusions of the original MEA.**

Shellfish

Taking the **low** sensitivity of the receptor and the **low** magnitude of effect, the consequence of the potential impact on shellfish from EMFs associated with the proposed 525 kV subsea cables will be **negligible**, and therefore, not significant, **consistent with the conclusions of the original MEA.**

4.5. Ecological Protected Sites

4.5.1. Introduction

This section describes the impact assessment for the ecological protected sites screened in for further assessment within this MEA Addendum (see Section 3), including the Wester Ross NCMPA and the North-East Lewis NCMPA. The impact pathways associated with the Project Design Refinements identified as requiring further assessment by the Gap Analysis are those with the potential to materially alter the conclusions of the original MEA (see Section 3). For all other ecological protected sites and impact pathways, there is considered to be no potential for the Project Design Refinements to materially alter the conclusions of the original MEA. This assessment makes direct reference to other relevant assessments included within this MEA Addendum, where appropriate.

Under section 82 of the Marine (Scotland) Act 2010, MD-LOT is required to consider whether a licensable activity is capable of affecting (other than insignificantly) a protected feature in a NCMPA, or any ecological or geomorphological process on which the conservation of any protected feature in an NCMPA is dependent. As required under the Marine (Scotland) Act 2010, the original MEA described the NCMPA appraisal exercise undertaken to determine whether there was the potential for the Project to affect, other than insignificantly, the achievement of the conservation objectives of any relevant NCMPA, including the Wester Ross NCMPA and North-East Lewis NCMPA, which both overlap the Project cable corridor. A risk of significantly affecting the achievement of the conservation objectives of the Wester Ross NCMPA could not be ruled out. However, further assessment of effects concluded that with consideration of the proposed mitigation measures (Table 12), the Project would not result in any adverse effect on the conservation objectives of this NCMPA, both for the Project alone and in-combination with other projects, plans and activities (mainly *Nephrops* trawling). For the North-East Lewis NCMPA, only impacts to the Risso's dolphin feature of the NCMPA were taken forward for further assessment in the original MEA. Due to the localised nature of any seabed disturbance associated with the Project, a full assessment of impacts on the sandeel feature of this NCMPA was not deemed necessary and it was concluded that any impact to this protected feature presented no risk of significantly affecting the achievement of the conservation objectives of the NCMPA.

4.5.2. Details of Ecological Protected Sites

The Wester Ross NCMPA (benthic protected features only) and North-East Lewis NCMPA (sandeel protected feature only) are being taken forward for further assessment in this MEA Addendum. A description of the sites, and the relevant features identified as requiring further assessment in this MEA Addendum, is provided in Table 16.

As noted in Section 4.3 and in Section 4.5.4, the Project Design Refinements are anticipated to impact the 'burrowed mud' and 'northern feather star aggregations on mixed substrata' feature of the Wester Ross NCMPA only, and therefore, only these features have been taken forward for further assessment.

Table 16 Conservation Objectives of the Ecological Protected Sites Identified as Requiring Further Assessment in this MEA Addendum

Site	Site Description	Designated Feature of Relevance to this MEA Addendum	Conservation Objectives for the Site
Wester Ross NCMPA	Designated for a range of biodiversity and geodiversity features including northern feather star aggregations, maerl beds, flame shell beds, burrowed mud, circalittoral muddy sand communities, kelp and seabed communities on sublittoral sediment, maerl or coarse gravel with burrowing sea cucumbers, seabed fluid and gas seep, marine geomorphology of the Scottish shelf seabed, quaternary of Scotland and submarine mass movement.	Burrowed mud (favourable condition) and northern feather star aggregations on mixed substrata (favourable condition).	The Conservation Objectives of the Wester Ross MPA, are that the protected features: • so far as already in favourable condition, remain in such condition; • so far as not already in favourable condition, be brought into such condition, and remain in such condition. "Favourable condition", with respect to a marine habitat, means that a) its extent is stable or increasing; and b) its structures and functions, its quality, and the composition of its characteristic biological communities are such as to ensure that it is in a condition which is healthy and not deteriorating. In paragraph (b) the reference to the composition of the characteristic biological communities of a marine habitat includes a reference to the diversity and abundance of species of marine flora and fauna forming part of, or inhabiting, that habitat. "Favourable condition", with respect to a low or limited mobility species of marine fauna, means that the quality and quantity of its habitat and the composition of its population are such that they ensure that the population is maintained in numbers which enable it to thrive. Any temporary reduction in numbers of a low or limited mobility species of marine fauna is to be disregarded if the population of that species is thriving and sufficiently resilient to enable its recovery from such reduction. Any temporary deterioration in condition is to be disregarded if the habitat is sufficiently healthy and resilient to enable its recovery from such deterioration (NatureScot, 2024a).

Site	Site Description	Designated Feature of Relevance to this MEA Addendum	Conservation Objectives for the Site
North-East Lewis NCMPA	Designated for Risso's dolphin (*Grampus griseus*) and sandeels (*Ammodytes marinus / Ammodytes tobianus*) as well as geomorphology features (marine geomorphology of the Scottish shelf seabed and quaternary of Scotland).	Sandeel (favourable condition)	The updated Conservation Objectives 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 (NatureScot, 2024b). "Favourable condition", with respect to a mobile species of marine fauna, means that a) the species is conserved or, where relevant, recovered to include the continued access by the species to resources provided by the MPA for, but not restricted to, feeding, courtship, spawning or use as nursery grounds; b) the extent and distribution of any supporting features upon which the species is dependent is conserved or, where relevant, recovered; and c) the structure and function of any supporting feature, including any associated processes supporting the species within the MPA, is such as to ensure that the protected feature is in a condition which is healthy and not deteriorating (NatureScot, 2024b).

4.5.3. Updated Information Requiring Further Assessment

The following impacts associated with the Project Design Refinements were screened into the MEA Addendum for the benthic protected features of the Wester Ross NCMPA and the sandeel protected feature of the North-East Lewis NCMPA (see Section 3):

- **Wester Ross NCMPA**:
  - A change in cable capacity and voltage altering EMF intensities;
  - Increased disturbance footprint for northern feather star aggregations within the Wester Ross NCMPA;
  - Increased seabed disturbance footprint associated with the drilling of up to 14 boreholes (6 plus 1 contingency at each landfall) and the temporary presence of jack-up vessels or spud leg barges.
- **North-East Lewis NCMPA**:
  - A change in cable capacity and voltage altering EMF intensities.

Furthermore, as noted above for benthic and intertidal ecology in Section 4.3, the Ocean Infinity (2024) northern feather star enumeration and aggregation assessment (see Section 2.3 and Appendix A) identified northern feather star aggregations within the Wester Ross NCMPA that were not previously recorded during the 2016 site-specific surveys. The Gap Analysis considered this updated site-specific survey data to represent a material change to the original MEA that has the potential to affect the conclusions of the assessment.

Therefore, further assessments of the potential impact of the Project Design Refinements on the benthic protected features of the Wester Ross NCMPA and sandeel protected feature of the North-East Lewis NCMPA are provided in the section below, including conclusions of the potential for the Project Design Refinements to hinder the conservation objectives of the NCMPAs.

4.5.4. Impact Assessment

4.5.4.1. WESTER ROSS NCMPA

The Project cable corridor directly overlaps the Wester Ross NCMPA. The site-specific surveys undertaken in 2016 investigated the potential presence of the benthic protected features of the Wester Ross NCMPA within the Project cable corridor. No maerl beds, flame shell beds or northern feather star aggregations were encountered within the Project cable corridor. A historical survey undertaken in 1991 shows that some small areas of the Project cable corridor within Little Loch Broom were colonised by maerl bed aggregations, observed on muddy sand and amongst consolidated sediments formed by flame shells. However, these features were not confirmed in the 2016 site-specific surveys (Bibby HydroMap, 2016). It was concluded that the only benthic protected feature of the Wester Ross NCMPA confirmed to be present during the 2016 site-specific surveys was 'burrowed mud'.

No northern feather star aggregations were recorded in the Project cable corridor during the 2016 site-specific surveys which informed the original MEA. Instead, the Project cable corridor was estimated to traverse approximately 300 m of northern feather star aggregations within the Wester Ross NCMPA, based on previous records in Little Loch Broom mapped by Moore (2014).

As outlined in Section 2.5, the Ocean Infinity (2024) study identified the presence of northern feather star aggregations within the Project cable corridor, which represents a change to the baseline presented within the original MEA. Further detail on the presence of this protected feature within the Wester Ross NCMPA is provided in Section 4.3.3.

4.5.4.1.1. INCREASED DISTURBANCE FOOTPRINT FOR NORTHERN FEATHER STAR AGGREGATIONS

The refinement of Conditions 3.2.11 and 3.3.7 (see Section 2.5), coupled with the greater extent of northern feather star aggregations recorded within the Project cable corridor, will result in an increased disturbance footprint to the 'northern feather star aggregations on mixed substrata' protected feature within the Wester Ross NCMPA.

As outlined in Section 4.3.4.1, northern feather star aggregations are considered to have a **high** sensitivity to potential impacts during cable installation, through increased suspended sediment and associated deposition, physical removal and surface abrasion from jet trenching and a physical change in seabed type from the introduction of external cable protection.

As explained in Section 4.3.4.1, only a small proportion of the 'northern feather star aggregations on mixed substrata' feature is anticipated to be affected. The Applicant will adhere to the mitigation hierarchy by micro-routing to avoid high probability northern feather areas, where practicable, and where avoidance is not possible, jet trenching be utilised as a priority over external cable protection measures, to minimise impacts to northern feather stars within the Wester Ross NCMPA and allow for recovery of the habitat. The spatial extent of any impacts to the 'northern feather star aggregations on mixed substrata' protected feature of the Wester Ross NCMPA is considered to be highly localised, relative to the wider occurrence of this feature within the Project cable corridor and the wider NCMPA. Considering the extent of the northern feather stars identified in the Ocean Infinity (2024) study, recruitment and recolonisation from nearby surviving adults would be expected, with recovery within five years (NatureScot, 2024a; see Table 13). Overall, the magnitude of effect is predicted to be **low** (Section 4.3.4.1).

As per Table 16, the conservation objective for the 'northern feather star aggregations on mixed substrata' feature of the Wester Ross NCMPA is to conserve their favourable condition. Although the recovery of impacted northern feather star aggregations is slow, the proposed mitigation (Table 12) aims to minimise the disturbance to northern feather star aggregations. As a result, a relatively low proportion (~9.7 %) of high probability northern feather star areas will be affected by temporary disturbance from jet trenching and a very low proportion (1.9%) will be affected from the placement of external cable protection which may result in the long term/permanent loss of suitable habitat. As such, the 'northern feather star aggregations on mixed substrata' feature is expected to be maintained in a favourable condition.

Therefore, any potential impacts arising from the Project Design Refinements on the 'northern feather star aggregations on mixed substrata' will not affect, other than insignificantly, the achievement of the conservation objectives of the Wester Ross NCMPA. **This is consistent with the findings of the assessment presented within the original MEA.**

4.5.4.1.2. SEABED DISTURBANCE FROM THE DRILLING AND BACKFILLING OF NEARSHORE BOREHOLES

The drilling and backfilling of up to 14 boreholes (6 plus 1 contingency at each landfall) may result in an increased impact to the benthic protected features of the Wester Ross NCMPA. With the exception of 'northern feather star aggregations on mixed substrata' (assessed above), the only other benthic protected feature of the Wester Ross NCMPA recorded as being present within the Project cable corridor was 'burrowed mud' (Bibby HydroMap, 2016). Furthermore, northern feather star aggregations are not predicted to be present in the nearshore area adjacent to the Dundonnell landfall, as explained in Section 4.3.4.1. Therefore, the drilling and backfilling of nearshore boreholes are only predicted to have the potential to impact the 'burrowed mud' protected feature of the Wester Ross NCMPA.

The sensitivity of 'burrowed mud' to removal of substratum, siltation changes, surface abrasion and subsea abrasion/penetration was assessed as medium under the FeAST tool (NatureScot, 2025) (Table 15). Overall, given the protected nature of this habitat, the sensitivity is conservatively assessed as **high** (Section 4.3.4.2.1).

Given the highly localised nature of any impact associated with the drilling and backfilling of nearshore boreholes in ‘burrowed mud’ habitat, the magnitude of effect is assessed as **negligible** (Section 4.3.4.2.2).

As per Table 16, the conservation objectives for the designated habitats (e.g burrowed mud) of the Wester Ross NCMPA are to maintain the features in a favourable condition, with respect to the extent and structure and function of each habitat. The proportion of the feature impacted is very low compared to the area of the available feature within the Wester Ross NCMPA. Therefore, it is considered that the impacts on the ‘burrowed mud’ feature of the Wester Ross NCMPA would not have the potential to affect, other than insignificantly, the conservation objectives of the Wester Ross NCMPA. **This is consistent with the findings of the assessment presented within the original MEA.**

4.5.4.1.3. IMPACTS ON BENTHIC PROTECTED FEATURES AS A RESULT OF INCREASED EMF INTENSITIES

The change in cable capacity and voltage, and associated increased EMF intensities, has the potential to affect northern feather star aggregations within the Wester Ross NCMPA. This impact has been assessed for benthic features, including northern feather stars, in Section 4.3.4.3.

The FeAST tool does not include any sensitivity assessments for electromagnetic changes for the northern feather star aggregations. Generally, for all electro-sensitive species, the FeAST tool has benchmarked EMF changes as a change in the local B-field variation from the natural GMF of 10 μT due to anthropogenic means (NatureScot, 2025). The limited body of evidence available does not suggest that benthic invertebrates are sensitive to EMFs at levels comparable to those emitted from subsea cables. As such, northern feather star aggregations are considered to be of **low** sensitivity.

The cable system will result in localised EMFs, which can potentially affect the sensory mechanisms of marine species. The impact pathway has the potential to occur along the length of the cable route, but the magnitude of effect will vary dependent on the separation of the cables and whether they are trenched, or surface laid. As part of the embedded mitigation (Table 12), the cable installation will result in a configuration (bundled and where possible trenched) to reduce EMF emissions. As described in Section 4.3.4.3, impacts from B-fields are of a highly localised spatial extent, and as such the magnitude of effect is considered **low.**

As per Table 16, the conservation objective for the northern feather star aggregations of the Wester Ross NCMPA is to conserve their favourable condition, where favourable condition means that the quality and quantity of the habitat, and the composition of the population, ensure that the population is maintained in numbers that enable it to thrive (NatureScot, 2024a). The proportion of northern feather star aggregations impacted by EMF will be very low compared to the area of the available habitat within the Wester Ross NCMPA. Overall, it is concluded that potential effects resulting from increased EMF intensities will not affect, other than insignificantly, the conservation objectives of the Wester Ross NCMPA. **This is consistent with the findings of the assessment presented within the original MEA.**

4.5.4.2. NORTH-EAST LEWIS NCMPA

The Project cable corridor directly overlaps the North-East Lewis NCMPA. Data from Coull *et al*. (1998) and Ellis *et al.* (2012) indicate that there is potential for sandeel to spawn throughout the Minch, including within the section of this NCMPA that is overlapped by the Project cable corridor, although the intensity of spawning is considered to be low (see Section 4.4.3).

A recent species distribution model for sandeel burrow density and probability of presence in Scottish waters shows that where the Project cable corridor overlaps the North-East Lewis NCMPA, the sandeel burrow density and probability of presence is low (Langton *et al.,* 2021) (Figure 11). A large coastal sandeel spawning ground has been identified off the Butt of Lewis, as shown on Figure 11, and this is the reason for inclusion of sandeel as a qualifying feature of this NCMPA. The Project cable corridor avoids this sandeel ground, and therefore, the potential for sandeel spawning within the Project cable corridor is considered to be low.

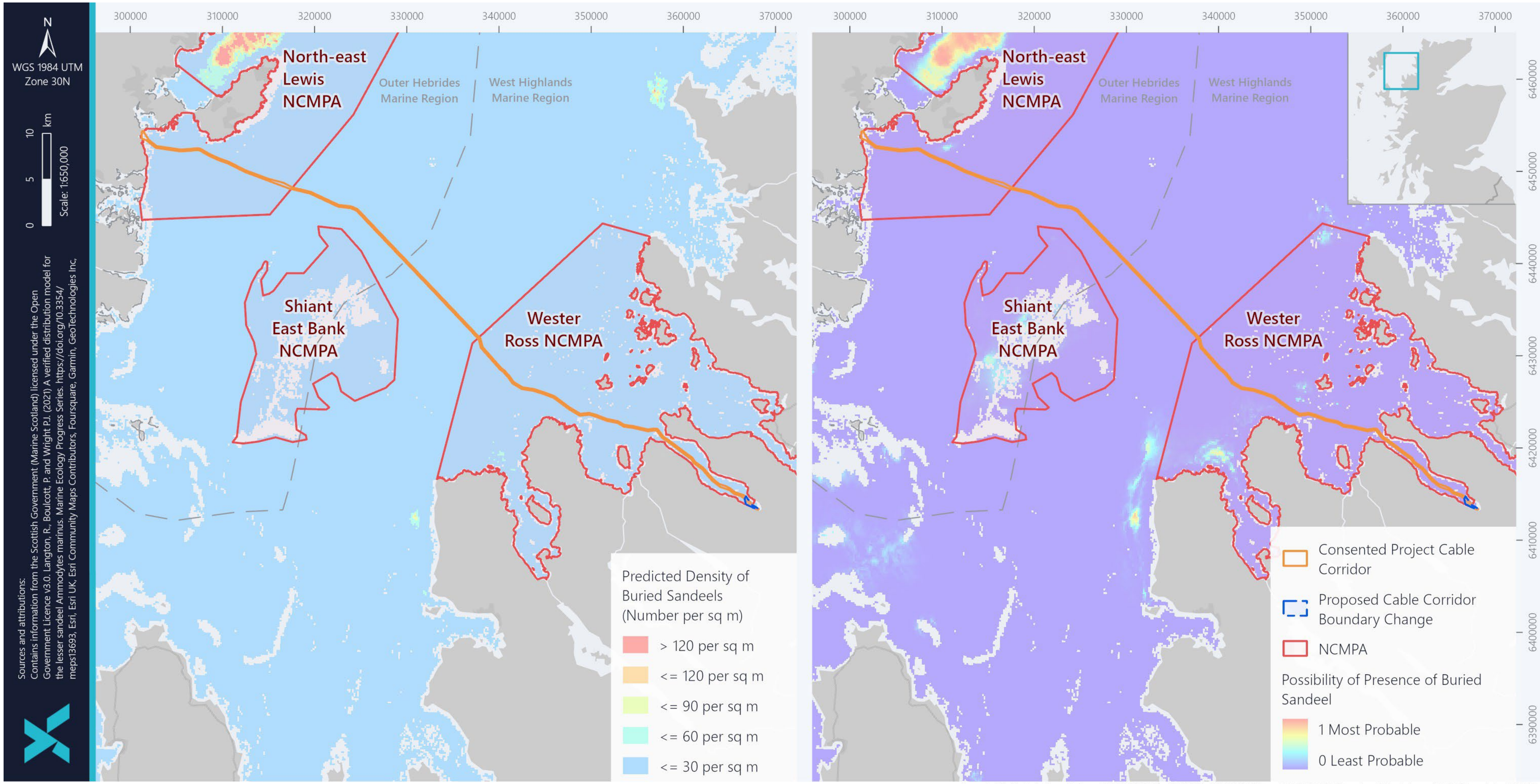

Figure 11 Sandeel burrow probability of presence and predicted density (Langton *et al.*, 2021)

4.5.4.2.1. CHANGE IN CABLE CAPACITY AND VOLTAGE ALTERING EMF INTENSITIES

Generally, for all electro-sensitive species, the FeAST tool has benchmarked EMF changes as a change in the local B-field variation from the natural GMF of 10 μT due to anthropogenic means (NatureScot, 2025). Sandeels are more likely to encounter EMFs associated with subsea cables as they spend a large part of their lifetime burrowed into the sediment. Sandeels spawn directly on the seabed, and sandeel larvae will drift in the current before settling. Studies on the effects of EMF on sandeel larvae showed no response in swim speed, spatial distribution, acceleration, or distance moved to exposure to a field gradient of 50-150 μT, suggesting that sandeel larvae would not be attracted nor repelled from HVDC subsea cables (Cresci *et al*., 2022).

Laboratory studies investigating the effects of EMFs on eggs of rainbow trout (Fey *et al.,* 2019; Krzystolik *et al.,* 2024) and haddock (Guillebon *et al*., 2025) show no effects on hatching success, mortality or malformations, although eggs do show sensitivities to EMF. Therefore, sandeel eggs are unlikely to be highly sensitive to EMFs. Based on existing studies on sandeel and fish eggs and larvae, there is no clear evidence of a physiological or behavioural response to EMFs on sandeel. However, as sandeel are a designated feature of the North-East Lewis NCMPA, the sensitivity of sandeel is considered to be **medium.**

The magnitude of the effect associated with the subsea cables will be continuous and not reversible throughout the operational phase of the Project. However, given the highly localised nature of the impact, where B-field intensities above the FeAST tool benchmark only occur within metres of the cables, the magnitude of effect is **low** (Section 4.4.4.1.2).

As per Table 16, the conservation objective for sandeel in the North-East Lewis NCMPA is to maintain the feature in a favourable condition. The Project cable corridor does not overlap with the key sandeel ground off the Butt of Lewis in the North-East Lewis NCMPA, and the potential for sandeel presence in the Project cable corridor is considered to be low. In conjunction with the highly localised footprint of EMF effects and the magnitude of effect being assessed as low, there is not considered to be any impact to sandeels or the supporting features of this species, that would possibly hinder the objective to maintain this feature in a favourable condition. Overall, it is concluded that potential impacts on sandeel from EMFs from the proposed 525 kV subsea cables will not hinder (other than insignificantly) the conservation objectives of the North-East Lewis NCMPA. **This is consistent with the conclusions of the original MEA.**

4.6. Shipping and Navigation

4.6.1. Introduction

This section describes the impact assessment for shipping and navigation (see Section 3). The impacts requiring further assessment were identified through the Gap Analysis as those resulting from the Project Design Refinements with the potential to materially alter the conclusions of the original MEA (see Section 3).

A description of the assessment of Project impacts on shipping and navigation within the original MEA is provided in the Gap Analysis Report (Appendix A). An NRA was presented in Appendix B of the original MEA, which includes a baseline characterisation of existing navigation features and shipping and navigation activities along the length of the Project cable corridor, with the significance of impact associated with the construction and operational phases of the Project determined in line with the Formal Safety Assessment Process (IMO, 2002).

The impacts assessed for shipping and navigation receptors included:

- Construction phase:
  - Collision of passing (third party) vessel with a vessel associated with the cable installation;
  - Cable installation causing disruption to passing vessel routeing / timetables;
  - Cable installation causing disruption to fishing activities; and
  - Cable installation causing disruption to military exercises.
- Operational phase:
  - A vessel drags anchor over the cable;
  - A vessel drops anchor in an emergency over the cable;
  - A vessel founders (sinks) onto the cable;
  - A vessel drops an object, e.g., container, onto the cable;
  - A vessel engaged in fishing snags its gear on the cable;
  - Collision of a passing vessel with a vessel associated with maintenance works / monitoring of the cable; and
  - EMF interference with navigational equipment on-board passing traffic.

With consideration given to a series of embedded mitigation measures applied to the construction and operational phases of the Project, all impacts were assessed as either Tolerable or Broadly Acceptable. The following recommendations to minimise impacts on shipping and navigation receptors were made:

- Targeted circulation of information about the project to regular commercial operators (e.g., ferry), and local small vessel stakeholders (fishing and recreation) two weeks prior to offshore work commencing; and
- Stornoway Harbour should be kept consulted throughout the Project to manage access issues and any impacts on anchorages.

4.6.2. Updated Information Requiring Further Assessment

The Project Design Refinements have the potential to result in a new or increased impact to shipping and navigation receptors as a result of a change in cable capacity and voltage altering compass deviation effects.

4.6.3. Environmental Baseline

The NRA conducted to inform the original MEA (Anatec, 2018), presented a baseline assessment for navigational features and shipping activity, informed by Automatic Identification System (AIS) data (2017), Vessel Monitoring System (VMS) data (2014-2017) and UK admiralty charts. Meetings were held with the Maritime and Coastguard Agency (MCA) and Northern Lighthouse Board (NLB) on shipping and navigation issues which were also used to inform the NRA.

Along the length of the Project cable corridor, the average number of unique vessels per day was recorded as 42 in summer and 27 in winter. During the summer survey period fishing vessels (43%), cargo vessels (22%) and recreational vessels (15%) were the most frequently recorded vessel types along the length of the cable route. During the winter survey period cargo vessels (39%), fishing vessels (32%) and tankers (9%) were the most frequently recorded vessel types. Along the length of the Project cable corridor, demersal trawlers were the most commonly operated fishing gear type, accounting for 71% of all fishing effort along the cable route (Anatec, 2018).

The average vessel length along the length of the cable route was 51 m in summer and 66 m in winter, with a larger number of recreational and fishing vessels recorded during to the summer period attributing to this variation in average vessel length. Throughout the 12 week total survey period, approximately 15% and 9% of vessels were <15 m in length during the summer and winter months respectively (Anatec, 2018).

Along the length of the Project cable corridor, it was concluded that vessel density was higher on the approach to Stornoway Harbour, with a higher density of vessels recorded on the west coast of Scotland during the summer months compared to winter (attributed to the higher number of fishing and recreational vessels recorded during the summer period) (Anatec, 2018). The highest density of demersal fishing activity is located within the coastal waters off the Isle of Lewis and along the north of the cable route (Anatec, 2018).

As presented within the Gap Analysis (Appendix A), the baseline environment presented within the NRA (Anatec, 2018) is expected to remain valid and no additional navigational features have been identified as part of this MEA Addendum. AIS data for 2019 to 2023 presented through EMODnet (2025b) generally corroborates the baseline description presented within the NRA, highlighting cargo, fishing and passenger vessels as the most common vessel types along the length of the cable route. While the ongoing development of the Stornoway Deep Water Terminal will provide improved facilities for larger vessels within the region, any potential changes in vessel activity as a result of these works were already considered as part of the original MEA assessment (see Section 3 of Appendix B of the original MEA).

4.6.4. Impact Assessment

Within the original MEA it was concluded that compass deviation effects were most likely to occur in shallow waters and therefore unlikely to affect larger vessels operating AIS equipment. However, given the proposed increase in cable voltage and capacity it was concluded that an assessment of compass deviation effects should be undertaken along the length of the Project cable corridor for all shipping and navigation receptors. In line with IMO (2022) Formal Safety Assessment methodology, the “severity of consequence” and “frequency of occurrence” from compass deviation effects associated with the Project has been determined.

EMFs emitted from subsea cables during the operational phase have the potential to interact with the earth’s natural magnetic field, therefore resulting in potential interference effects with a vessel’s navigational equipment, specifically, magnetic compasses. Most commercial vessels operate a range of navigational instruments which are not influenced by EMFs (e.g. gyro compasses and Global Positioning Systems (GPS)). However, some smaller and recreational vessels which may rely solely on magnetic compass instruments for navigation are likely to experience magnified EMF interferences effects, particularly when operating within shallow waters.

As presented within the Electromagnetic Field and Compass Deviation Study Technical Note (Appendix B), EMF and compass deviation calculations have been undertaken for both the 320 kV cables (as applied for under the original MEA) and the 525 kV cables included within this MEA addendum (see Section 2.2). For compass deviation, it is common to consider if thresholds of 3 and 5 degrees are exceeded along the Project cable corridor. Guidance from the Maritime and Coastguard Agency (MCA) on acceptable levels of compass deviation resulting from subsea cables advises that compass deviation should not exceed 3 degrees of compass deviation for 95% of the subsea cable route, with the remaining 5% of the route not exceeding 5 degrees (see Appendix B).

Table 4 presents the EMF intensities and maximum compass deviation at sea level for both the original 320 kV cable design and the 525 kV cable design (Evolv Energies, 2025). As presented within Table 4, the maximum compass deviation at sea level for the 525 kV cable are at the Arnish Point HDD pop out (20 degrees) and the Dundonnell HDD pop out (87 degrees) (Table 4). The corresponding maximum compass deviation at sea level at these locations for the 320 kV cable configuration is 8 degrees and 36 degrees, respectively. Therefore, in these areas the 5 degree MCA threshold is exceeded, this notwithstanding, for the 525 kV cable system, less than 0.15% of the cable route exceeded 5 degrees of compass deviation, with deviation for the remaining 99.85% of the route length remaining below 3 degrees.

For the Dundonnell landfall, the highly localised (less than 100m in length) exceedance of the 5 degree compass deviation threshold is not considered to pose a threat to navigation, given the location of the HDD popout in shallow water at the head of Little Loch Broom, in an area subject to very limited vessel activity. At the Arnish Point landfall, while the exceedance of the 5 degree threshold is equally localised in extent, it is located in the vicinity of the approaches to Stornoway Harbour, and as such is subject to higher levels of vessel activity, including smaller recreational and fishing vessels which may not be equipped with gyro compasses or GPS. This could result in navigational errors leading to allision with the nearby coastline and associated damage to vessels, foundering, injury and at worst loss of life.

Potential effects resulting from EMFs and associated magnetic compass deviation are anticipated to be highly localised to the immediate vicinity of the cable, decreasing exponentially with increasing distance horizontally from the cables. Owing to the high density of vessels operating within coastal waters off the Isle of Lewis and along the north of the cable route (Section 4.6.3), the severity of consequence for the compass deviation exceeding 5 degrees at the Arnish HDD popout location is assessed as **serious**. For the remainder of the cable corridor, the severity is assessed as **negligible**, given the fact that compass deviation is less than 3 degrees, for over 98% of the route length, and the lack of vessel activity at the Dundonnell HDD popout location where a localised exceedance of the 5 degree threshold occurs.

Sole reliance on magnetic compasses for navigation at any location along the length of the cable route is considered unlikely, with the majority commercial vessels using gyro compasses, and very high prevalence of GPS navigation aids on both commercial and recreational vessels. As such it is considered that the frequency of occurrence of EMF and compass deviation effects along the length of the cable route is **extremely unlikely** for all vessels. Therefore, the risk associated with EMFs and compass deviation effects to shipping and navigation receptors is assessed as **tolerable** for the Arnish HDD popout location, and **broadly acceptable** for the rest of the Project cable corridor, including the Dundonnell HDD exit point.

This represents an increase from the previous assessment within the original MEA of broadly acceptable for the full Project cable corridor. To reduce the risk resulting from compass deviation at the Arnish HDD popout location to As Low as Reasonably Practicable (ALARP), the Applicant will undertake the following mitigation measures:

- Consult with the MCA to identify appropriate mitigation measures to minimise the risk, for example reporting to United Kingdom Hydrographic Office (UKHO) for inclusion in admiralty charts; and
- Liaison with the Stornoway Harbour Authority.

5. Conclusions

This MEA Addendum supports the Applicant's request to MD-LOT for the proposed variations to the Marine Licence and assesses the potential impact of the Project Design Refinements against the impact assessments of the original MEA. Firstly, the Project Design Refinements were reviewed as part of a Gap Analysis to screen topics and impacts in and out of the MEA Addendum depending on whether there was a potential for a material change to the conclusions of the original MEA (Table 17).

The aspects of the Project Design Refinements screened in for further assessment were assessed for each relevant topic identified as potentially being materially affected by the proposed Project Design Refinements. The assessment has concluded that no potential significant impacts are anticipated as a result of any of the changes described.

The assessment of compass deviation effects, supported by the Electromagnetic Field and Compass Deviation Study Technical Note (Appendix B), identified an increase in the significance of the effect compared with the original MEA. Mitigation measures to reduce this risk to ALARP have been recommended.

Overall, this MEA Addendum concludes that no significant impacts would occur as a result of the Project Design Refinements.

Table 17 Summary of Impact Assessment for the Project Design Refinements

Topic for Consideration	Aspects Requiring Further Assessment	Assessment Section	Assessment Summary	Additional Mitigation Requirements
Benthic and Intertidal Ecology	• Increased disturbance footprint for northern feather star aggregations within the Wester Ross NCMPA.	Section 4.3.4.1.	Sensitivity of receptor was assessed as high and the magnitude of effect as low. Overall, the consequence was determined as minor and not significant.	No further mitigations required in addition to the embedded mitigation presented in Table 12.
	• Increased seabed disturbance footprint associated with the drilling of up to 14 boreholes (6 plus 1 contingency at each landfall) and the temporary presence of jack-up vessels or spud leg barges.	Section 4.3.4.2.	Sensitivity of receptor was assessed as high and the magnitude of effect as negligible. Overall, the consequence was determined as negligible and not significant.	No further mitigations required in addition to the embedded mitigation presented in Table 12.
	• The change in cable capacity and voltage altering the EMF intensities.	Section 4.3.4.3.	Sensitivity of receptor was assessed as low and the magnitude of effect as low. Overall, the consequence was determined as negligible and not significant.	No further mitigations required in addition to the embedded mitigation presented in Table 12.
Fish and Shellfish	• The change in cable capacity and voltage altering EMF intensities.	Section 4.4.3.4.	The sensitivity of receptor was assessed as medium for elasmobranchs and diadromous fish and low for shellfish. The magnitude of effect was assessed as low, and therefore the consequence was determined as minor for elasmobranchs and diadromous fish and negligible for shellfish.	

Therefore, the impact was judged to be not significant for all receptors.	No further mitigations required in addition to the embedded mitigation presented in Table 12.

Topic for Consideration	Aspects Requiring Further Assessment	Assessment Section	Assessment Summary	Additional Mitigation Requirements
Ecological Protected Sites	**Wester Ross NCMPA**			
	• Increased disturbance footprint for northern feather star aggregations within the Wester Ross NCMPA.	Section 4.5.4.1.1.	The sensitivity of the receptor was assessed as high and the magnitude of effect as low. Overall, it was concluded that the potential impacts on northern feather star aggregations would not affect, other than insignificantly, the achievement of the conservation objectives of the Wester Ross NCMPA.	No further mitigations required in addition to the embedded mitigation presented in Table 12.
	• Increased seabed disturbance footprint associated with the drilling of up to 14 boreholes (6 plus 1 contingency at each landfall) and the temporary presence of jack-up vessels or spud leg barges.	Section 4.5.4.1.2.	The sensitivity of the receptor (burrowed mud as the only feature identified as potentially being affected) was assessed as high and the magnitude of effect as negligible. Overall, it was concluded that the potential impacts on burrowed mud from drilling and backfilling of nearshore boreholes would not affect, other than insignificantly, the achievement of the conservation objectives of the Wester Ross NCMPA.	No further mitigations required in addition to the embedded mitigation presented in Table 12.
	• The change in cable capacity and voltage altering the EMF intensities.	Section 4.5.4.1.3.	Sensitivity of receptor was assessed as low and the magnitude of effect as low. Overall, it was concluded that the potential impacts from the increased EMF intensities would not affect, other than insignificantly, the achievement of the conservation objectives of the Wester Ross NCMPA.	No further mitigations required in addition to the embedded mitigation presented in Table 12.

Topic for Consideration	Aspects Requiring Further Assessment	Assessment Section	Assessment Summary	Additional Mitigation Requirements
Ecological Protected Sites	**North East Lewis NCMPA**			
	• The change in cable capacity and voltage altering the EMF intensities.	Section 4.5.4.2.1.	Sensitivity of receptor (sandeel protected feature) was assessed as medium and the magnitude of effect as low. Overall, it was concluded that the potential impacts from the increased EMF intensities would not affect, other than insignificantly, the achievement of the conservation objectives of the North-East Lewis NCMPA.	No further mitigations required in addition to the embedded mitigation presented in Table 12.
Shipping and Navigation	• The change in cable capacity and voltage may alter the compass deviation effects.	Section 4.6.4.	Severity of consequence was assessed as serious at the Arnish HDD pop out location and negligible along the remainder of the Project cable corridor. The frequency of occurrence was assessed as extremely likely. Therefore, the risk associated with EMFs and compass deviation effects to shipping and navigation receptors is assessed as tolerable for the Arnish HDD popout location, and broadly acceptable for the rest of the cable corridor, including the Dundonnell HDD exit point. With the implementation of additional mitigation, the risk was reduced to ALARP.	• Consult with the MCA to identify appropriate mitigation measures to minimise the risk, for example reporting to United Kingdom Hydrographic Office (UKHO) for inclusion in admiralty charts; and • Liaison with the Stornoway Harbour Authority.

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7. Acronyms

Term	Definition
AC	Alternating Current
AIS	Automatic Identification System
ALARP	As Low as Reasonably Practicable
B-field	Magnetic Field
CBPP	Cable Burial and Protection Plan
CEMP	Construction Environmental Management Plan
CES	Crown Estate Scotland
DC	Direct Current
DoL	Depth of Lowering
EMF	Electromagnetic Field
EMODnet	European Marine Observation and Data Network
FeAST	Feature Activity Sensitivity Tool
GMF	Geomagnetic Field
GPS	Global Positioning Systems
GW	Gigawatt
HDD	Horizontal Directional Drilling
HDPE	High Density Polyethylene
HRA	Habitats Regulations Appraisal
HVAC	High Voltage Alternating Current
HVDC	High Voltage Direct Current
iE-field	Induced Electric Field
JNCC	Joint Nature Conservation Committee
km	Kilometre
KP	Kilometre Point
kV	Kilovolt
LSE	Likely Significant Effect
m	Metre
mm	Millimetre

Term	Definition
MarESA	Marine Evidence-based Sensitivity Assessment
MarLIN	Marine Life Information Network
MCA	Maritime and Coastguard Agency
MD-LOT	Marine Directorate Licensing Operations Team
MEA	Marine Environmental Appraisal
MHWS	Mean High Water Springs
MMMP	Marine Mammal Protection Plan
[redacted]	[redacted]
MPA	Marine Protected Area
MS-LOT	Marine Scotland Licensing Operations Team
MW	Megawatt
NRA	Navigational Risk Assessment
NSA	National Scenic Area
NCMPA	Nature Conservation Marine Protected Area
NLB	Northern Lighthouse Board
NM	Nautical Miles
NMPi	National Marine Plan interactive
NSA	National Scenic Area
PDE	Project Design Envelope
PEXA	Practice and Exercise Area
PLGR	Pre-Lay Grapnel Run
PMF	Priority Marine Feature
ROV	Remote Operated Vehicle
SAC	Special Area of Conservation
SCANS	Small Cetaceans in European Atlantic waters and the North Sea
SHE	Scottish Hydro Electric
SNH	Scottish Natural Heritage
SPA	Special Protected Area
SSEN	Scottish and Southern Electricity Networks

Term	Definition
SSSI	Site of Special Scientific Interest
TJB	Transition Joint Bay
TO	Transmission Owner
TRI	Terrain Ruggedness Index
UK	United Kingdom
μT	Microtesla
μV/m	Microvolt per metre
V/m	Volt per metre
VMS	Vessel Monitoring System

Appendix A: Gap Analysis Report

Western Isles HVDC Link Marine Licence Variation

Gap Analysis

Document Classification | **Public**

Scottish & Southern Electricity Networks

TRANSMISSION

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Xodus Document Number: A-100336-S05-A-REPT-002.

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Acronyms

Term	Definition
AIS	Automatic Identification System
CBPP	Cable Burial and Protection Plan
CES	Crown Estate Scotland
CnES	Comhairle nan Eilean Siar
EMF	Electromagnetic Field
EPS	European Protected Species
EU	European Union
FSA	Formal Safety Assessment
GHG	Greenhouse Gas
HDD	Horizontal Directional Drilling
HRA	Habitats Regulations Appraisal
HVDC	High Voltage Directional Current
IMO	International Maritime Organisation
JNCC	Joint Nature Conservation Committee
kV	Kilo Volts
LSE	Likely Significant Effect
MCA	Maritime and Coastguard Agency
MD-LOT	Marine Directorate - Licensing Operations Team
MD-SEDD	Marine Directorate – Science Evidence, Data and Digital
MEA	Marine Environmental Appraisal
[redacted]	[redacted]
MS-LOT	Marine Scotland - Licensing Operations Team
MW	Mega Watts
NCMPA	Nature Conservation Marine Protected Area
NLB	Northern Lighthouse Board
NM	Nautical Mile
NMP2	National Marine Plan 2

Term	Definition
NMPi	National Marine Plan interactive
NPF3	National Planning Framework 3
NPF4	National Planning Framework 4
NRA	Navigational Risk Assessment
NSA	National Scenic Area
PDE	Project Design Envelope
PLGR	Pre Lay Grapnel Run
PMF	Priority Marine Feature
PTS	Permanent Threshold Shift
ROV	Remotely Operated Vehicle
SAC	Special Area of Conservation
SCANS	Small Cetaceans in European Atlantic Waters and the North Sea
SDG	Sustainable Development Goal
SNH	Scottish Natural Heritage
SPA	Special Protection Area
SSEN Transmission	Scottish and Southern Electricity Networks - Transmission
SSSI	Site of Special Scientific Interest
TO	Transmission Owner
TTS	Temporary Threshold Shift
UN	United Nations
VMS	Vessel Monitoring System

1. Introduction

1.1. Background

Scottish and Southern Electricity Networks - Transmission (SSEN Transmission), the trading name for Scottish Hydro Electric Transmission plc (‘the Applicant’), hold a licence under the Electricity Act 1989 for the transmission of electricity in the north of Scotland. As the licenced electricity Transmission Owner (TO) for this region, the Applicant has a statutory duty to provide an economic and efficient system for the transmission of energy, and to ensure that its assets are installed and maintained to enable a safe, secure and reliable transmission of power.

In February 2021, the Applicant gained consent for the construction of the Western Isles High Voltage Directional Current (HVDC) Link (‘the Project’) through a Marine Licence (MS-00008738) issued under Part 4 of the Marine (Scotland) Act 2010. The Project is part of the wider Western Isles Connection Project that will reinforce the electrical network connection between the Western Isles and the Scottish Mainland. The Western Isles Connection Project will provide a new transmission link between Arnish (Stornoway) on the Isle of Lewis and Beauly (near Inverness), on the Scottish mainland, and the Project represents the subsea component of this link (Figure 1).

[redacted]

Figure 1 Project location

1.2. Proposed Marine Licence Variation Request

1.2.1. Overview

To reflect the current status of the Project, following the development and refinement of the Project specifications and design, the Applicant are seeking a variation to the existing Marine Licence for the Project. The Marine Licence variation request encompasses the following Project modifications and additions, hereafter collectively referred to as the 'Project Design Refinements':

- Modifications to the Project Design Envelope (PDE):
  - Increase the Project's transmission capacity from 600 Mega Watts (MW) to 2,000 MW;
  - Increase the Project's operating voltage from 320 kilo Volts (kV) to 525 kV;
  - Refinement of the mitigation measures to reduce disturbance to northern feather star (*Leptometra celtica*) aggregations (Condition 3.2.11 of the Marine Licence) (see Section 1.2.2); and
  - Refinement of the Project cable corridor at the Dundonnell landfall to optimise landfall design and exclude the existing Crown Estate Scotland (CES) aquaculture lease area.
- Additions to the PDE:
  - Drilling of up to six (+ one contingency) nearshore geotechnical boreholes at the Arnish Point landfall and up to six (+ one contingency) nearshore geotechnical boreholes at the Dundonnell landfall (14 in total) to inform Horizontal Directional Drilling (HDD) design;
  - [redacted]
  - Debris clearance via Remotely Operated Vehicle (ROV) or subsea crane (with 'orange peel' grab) in addition to the Pre-Lay Grapnel Run (PLGR) which was included in the original PDE.
- Extension of Marine Licence duration:
  - Extend the Marine Licence end date from the 9th February 2026 to the 31st December 2030.
- Phased discharge of Marine Licence:
  - Incorporate the ability to discharge the Marine Licence at the following discrete stages:
    - Nearshore geotechnical boreholes;
    - Debris removal;
    - Landfall installation (including HDD); and
    - Cable installation and protection (including route and seabed preparation).

1.2.2. Refinement of Northern Feather Star Mitigation

1.2.2.1. Overview of Condition 3.2.11 and 3.3.7

Condition 3.2.11 of the Marine Licence details the mitigation requirements to reduce disturbance to the northern feather star aggregations of the Wester Ross Nature Conservation Marine Protected Area (NCMPA):

> "*The Licensee must carry out a pre-lay survey within the Wester Ross MPA. This survey must collect images to ascertain if any northern feather star aggregations are present within the cable corridor. If any northern feather star aggregations are present, every attempt must be made to micro-route the cable to avoid these features. If this is not possible, the CBPP, required under condition 3.2.8, must include surface laying of the cable with external Uraduct (or similar) protection in areas of northern feather star aggregations in order to minimise the footprint of the construction and avoid / minimise disturbance of the feature.*"

Condition 3.3.7 further states:

“The Licensee must ensure that no trenching takes place within 100 m of any northern feather star aggregations.”

1.2.2.2. Northern Feather Star Aggregation Assessment

In accordance with Condition 3.2.11, further surveys have been conducted within the section of the Project cable corridor that overlaps the Wester Ross NCMPA. Reach Subsea AS (‘Reach’) were contracted by the Applicant to undertake a detailed geophysical survey of the Project cable corridor (Reach *et al*., 2024). During the geophysical survey, data was collected along a 200 m wide survey corridor via multibeam echo sounder, side-scan sonar, sub-bottom profiler, gradiometer / magnetometer and photogrammetry / video.

The data from the geophysical survey was used to inform a northern feather star enumeration and aggregation assessment undertaken by Ocean Infinity (2024) along a 36 km section of the Project cable corridor, including within the Wester Ross NCMPA. Ocean Infinity (2024) carried out visual data analysis across three parallel orthomosaic transects along the centreline of the Project cable corridor and fourteen 200 m crossing transects. Each observation of a northern feather star was assigned a point to inform the enumeration. To support the description of northern feather star aggregations and assist with the aggregation assessment the Project cable corridor was divided into 32 segments, each of 1 km in length (Figure 2). It should be noted that the segment references are coordinated east to west, whereas the KP references (as shown in Figure 1) run west to east.

The results of the Ocean Infinity (2024) enumeration assessment identified a higher abundance of northern feather star aggregations within the Project cable corridor than had previously been recorded, ranging from 227 individuals (segment 13) to 12,136 individuals (segment 19) (Figure 2). The most prevalent northern feather star aggregations were identified within Little Loch Broom (segments 6, 8, and 11 to 13) and northwest of Gruinard Bay (segments 18 to 21) (Ocean Infinity, 2024; Figure 2).

The visual data analyses were used to categorise the northern feather star aggregations on a semi-quantitative SACFOR abundance scale: Superabundant (S), Abundant (A), Common (C), Frequent (F), Occasional (O) and Rare (R)based on growth form (crust/meadow vs massive/turf), size of individuals and density within 1 m2 gridded cells. Observed northern feather star aggregations along the Project cable corridor were assigned as Abundant and Common on the SACFOR scale, with densities of 1-9 individuals per m^2 and 1-99 individuals per m^2, respectively (Table 1 and Figure 3).

Table 1 Summary of SACFOR categories and the number of gridded cells for each category (Ocean Infinity, 2024)

SACFOR category	Number of areas
S	0
A	1,106
C	1,938
F	0
O	0
R	0

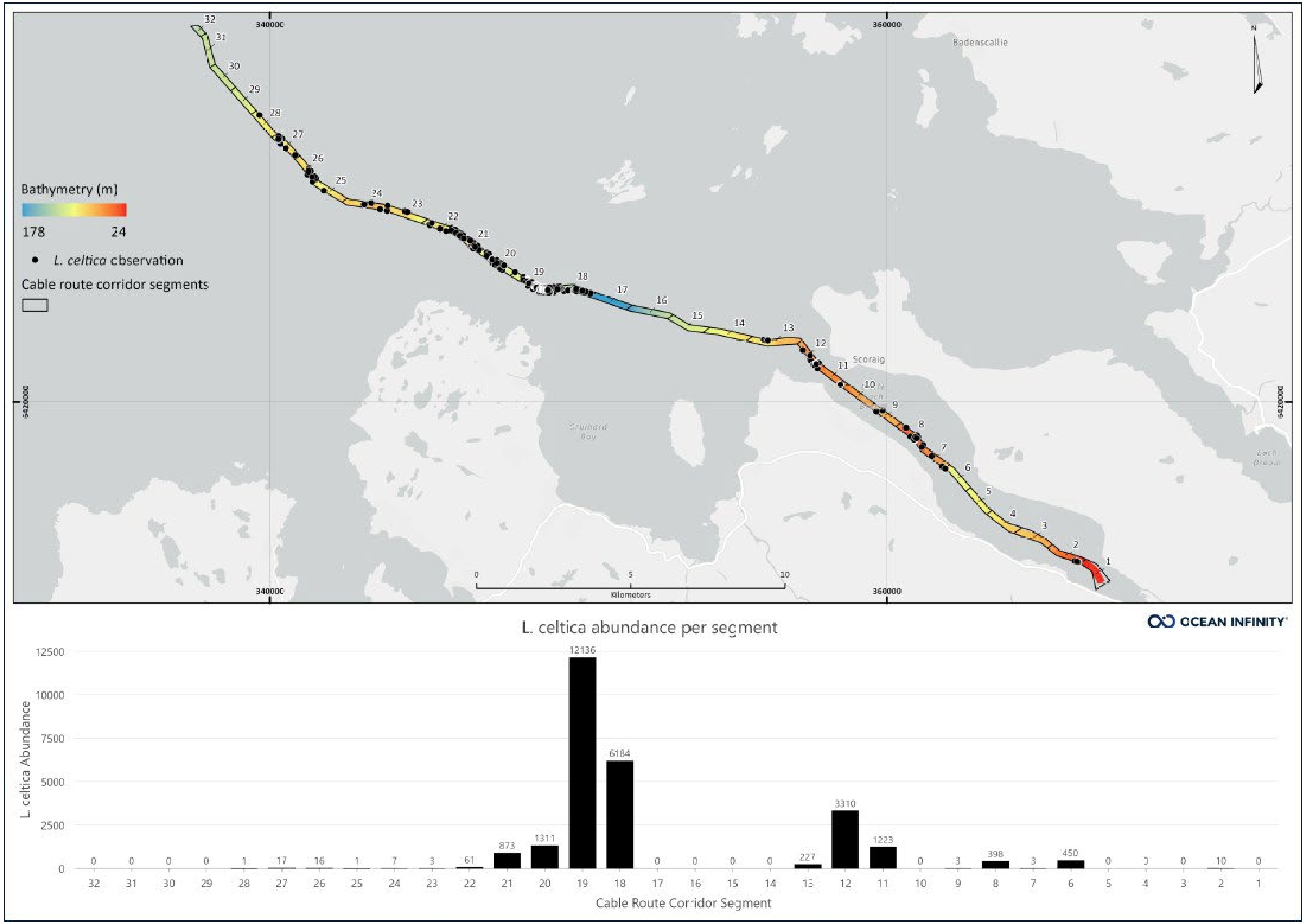

Figure 2 Ocean Infinity (2024) recordings of northern feather star aggregations and abundance per segment across the Project cable corridor

The influence of seabed substrate and topography on northern feather star presence was investigated. Overall, northern feather stars were observed to occur on various substrates with an increased abundance on muddy sand, mixed sediments and coarse substrate. A Vector Ruggedness Measure (VRM) model was created to model seabed roughness and to understand the influence of topography on northern feather star presence. Within segments 6 to 13 (at the entrance to Little Loch Broom), northern feather star individuals were generally associated with large scale seabed features (e.g. rocky outcrops and mixed sediments). A similar pattern was also observed between segments 18 to 22, although aggregations were also recorded in the intermediate areas between these seabed features. Overall, it was interpreted that in areas with a homogenous topography, without the presence of large-scale seabed features, the presence of northern feather star individuals was limited.

Ocean Infinity (2024) also developed a species distribution model to predict the probability (i.e. higher and lower) of northern feather star occurrence within the region of the Project cable corridor which overlaps the Wester Ross NCMPA, based on the following explanatory variables: bathymetry, slope, eastness, northness and a Terrain Ruggedness Index (TRI) (Figure 4). Areas of lower probability of occurrence corresponded with areas of muddy sediments with an absence of large-scale seabed features. On the contrary, areas of a higher topographic heterogeneity coincided with a higher probability of northern feather star occurrence.

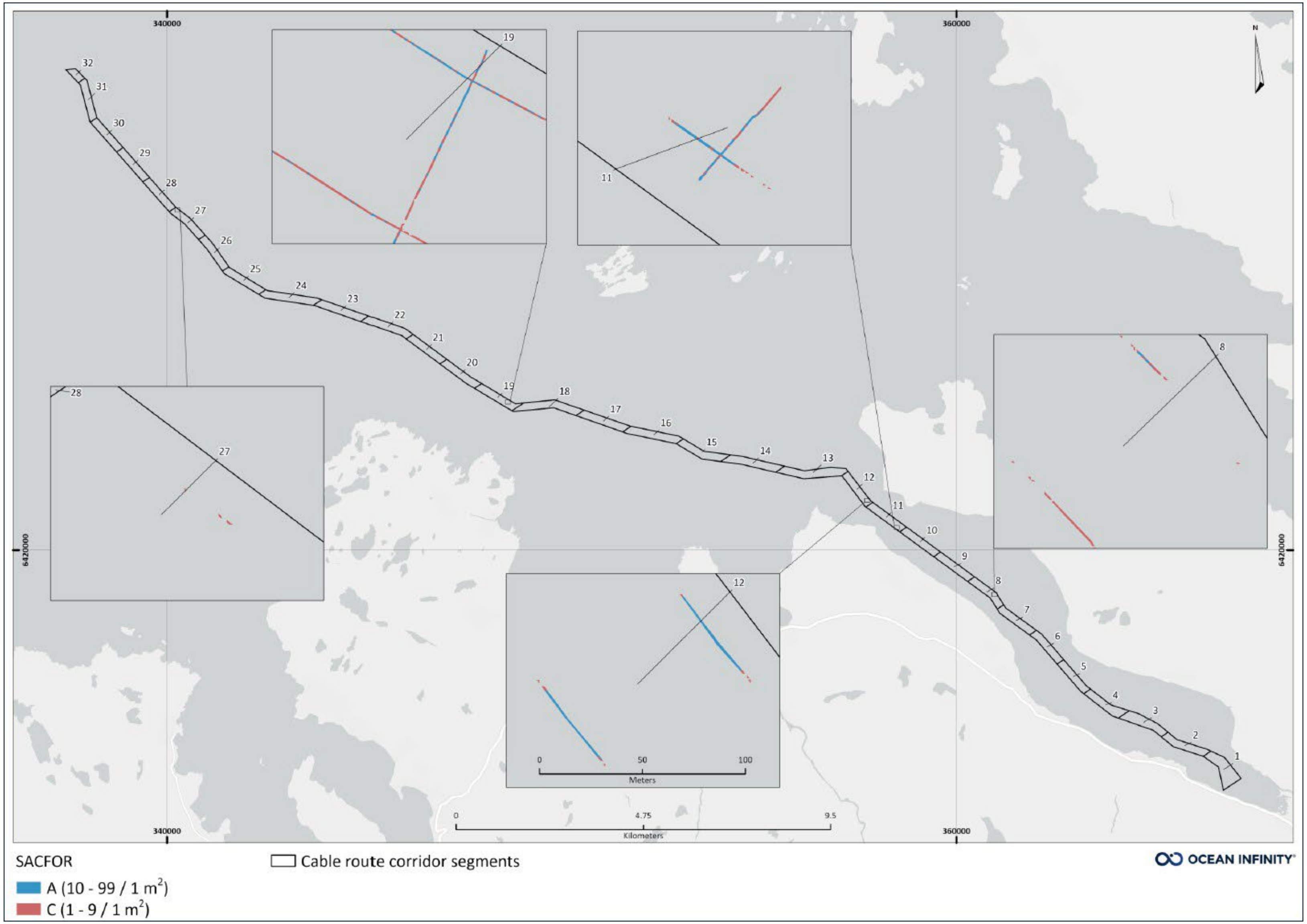

Figure 3 Overview of assigned SACFOR categories in the Project cable corridor (Ocean infinity, 2024)

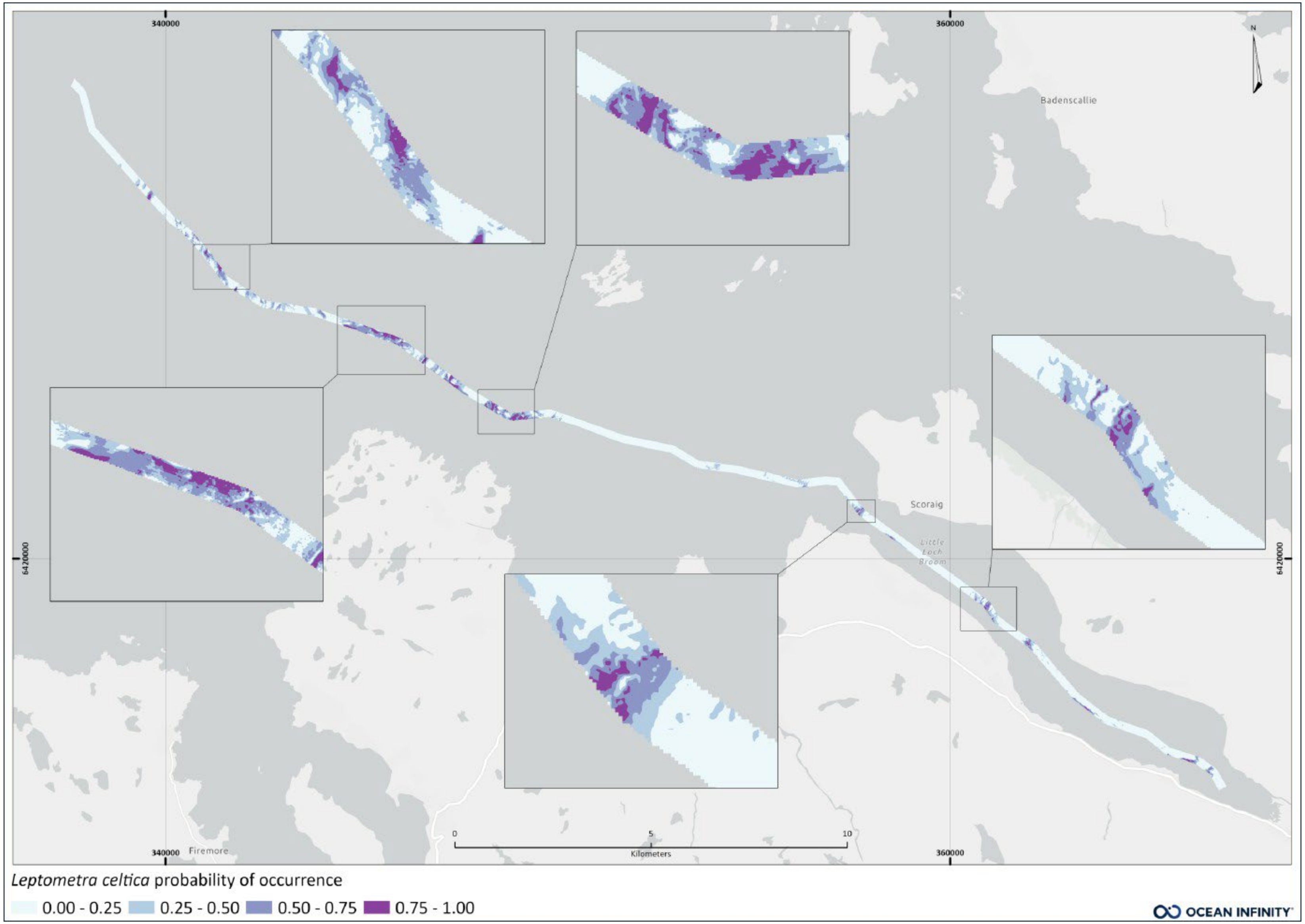

Figure 4 Species distribution model results across the Project cable corridor (Ocean Infinity, 2024)

1.2.2.3. Proposed Refinement

At the time of the original MEA, no northern feather star aggregations were recorded in the Project cable corridor during Project-specific surveys. Previous records of northern feather stars at the entrance to Little Loch Broom in Moore (2014) were used to inform the assessment within the original MEA, and a 300 m overlap of the Project cable corridor with northern feather star aggregations within the Wester Ross NCMPA was assumed. As outlined above, the more recent Project-specific surveys have identified a higher abundance of northern feather star individuals within the Project cable corridor than previously assessed (up to 99 individuals per m^2). Sections of the Project cable corridor have been identified as being Common or Abundant on the SACFOR scale, which are considered to qualify as the 'Northern feather star aggregations on mixed substrata' protected feature of the Wester Ross NCMPA.

It may not be possible to avoid all northern feather star aggregations within the Wester Ross NCMPA and it is also not technically or commercially feasible for the Applicant to surface lay the cable with a tubular protection system (Uraduct or similar) in these areas. Therefore, the Applicant is seeking to vary Conditions 3.2.11 and 3.3.7 of the Marine Licence, in line with the mitigation hierarchy, and also to allow for a proportionate approach to cable installation and protection. The Applicant proposes that these varied conditions would align with the following:

- **High density areas** - including where aggregations are greater than Common on the SACFOR scale or in areas defined as having a high probability of northern feather star presence (>0.5 on the species distribution model) within the Wester Ross NCMPA:
  - Every attempt of avoidance via micro-routing will be made. Where possible, avoidance of high density areas plus a 100 m buffer will be attempted. Where avoidance by 100 m is not possible, this buffer will be reduced to 50 m or 25 m;
  - Where avoidance of high density areas plus a 25 m buffer is not possible, the cable will be surface laid and protected by one of the following protection methods:
    - Rock protection;
    - Nature inclusive cable protection; or
    - Tubular protection system.
- **Low density areas** – including areas defined as having a low probability of northern feather star occurrence (<0.5 based on the species distribution model) within the Wester Ross NCMPA:
  - Trenching via jetting will be conducted as a priority to reduce any potential disturbance to northern feather stars.

Further details on the proposed wording of the refined conditions will be included within the MEA Addendum.

1.3. Purpose of this Document

A Marine Environmental Appraisal (MEA) supported the original Marine Licence application submitted to the Marine Scotland - Licensing Operations Team (MS-LOT)[1] in October 2018. Following refinement of the Project specifications and design (the Project Design Refinements, as outlined above), the Applicant intends to issue an MEA Addendum to support a request to vary the Marine Licence.

[1] Marine Scotland - Licensing Operations Team (MS-LOT) are now known as Marine Directorate – Licensing Operations Team (MD-LOT).

The MEA Addendum will describe the Project Design Refinements in more detail and update the assessments provided within the original MEA, as required, to ensure that the environmental effects of the Project Design Refinements are adequately considered.

This Gap Analysis precedes the MEA Addendum and describes the screening exercise undertaken to assess the potential impacts of the Project Design Refinements against the assessments of the original MEA.

2. Gap Analysis

2.1. Methodology

This Gap Analysis utilises publicly available information and expert judgement to identify which environmental impacts require further assessment within the MEA Addendum. The Gap Analysis is arranged by the topics considered within the original MEA, including:

- Protected sites;
- Physical environment and seabed conditions;
- Benthic and intertidal ecology;
- Fish and shellfish ecology;
- Ornithology;
- Marine mammals;
- Commercial fisheries;
- Shipping and navigation;
- Other sea users; and
- Population and human health.

The Gap Analysis considers relevant updates to the baseline environment and impact assessment for the topics above. Specifically, the Gap Analysis considers the following aspects to identify where there is the potential for new or increased impacts which would materially change the conclusions of the original MEA:

- Changes to the PDE, based on the Project Design Refinements (Section 1.2);
- Updates in legislation and policy since the original MEA submission;
- Updates to the baseline environment since the original MEA submission;
- Updates to nearby projects, plans and activities since the original MEA submission, which could result in a change to cumulative impacts; and
- Updates to the evidence-base for impacts of subsea cables since the original MEA submission.

The potential pathways for the Project Design Refinements to result in new or increased impacts are outlined in Table 2.

Where a new or increased impact is identified which could result in a material change to the assessment of the original MEA, the topic and impact are screened into the MEA Addendum, and the proposed approach for the updated assessment is described. Where no material changes are identified, it is proposed that the topic and/or impact is screened out of the MEA Addendum.

Table 2 Pathways for the Project Design Refinements to result in new or increased impacts

Project design refinement	Pathway for new or increased impact	Relevant topics
Increased Project transmission capacity from 600 MW to 2,000 MW and increased operating voltage from 320 kV to 525 kV	**Increased impact**: a change in cable capacity and voltage may alter the Electromagnetic Field (EMF) effects associated with the Project.	• Ecological protected sites designated for benthic or fish and shellfish ecology features; • Benthic and intertidal ecology; and • Fish and shellfish ecology.
	Increased impact: a change in cable capacity and voltage may alter the compass deviation effects associated with the Project.	• Shipping and navigation.
Refinement to northern feather star mitigation	**Increased impact:** the original MEA assessed a 60 m^2 disturbance footprint for northern feather star aggregations. This footprint was calculated based on a 300 m section of cable overlapping northern feather star aggregations and being surface laid and protected by a tubular protection system. The greater extent of northern feather star aggregations in the Project cable corridor, as identified by Ocean Infinity (2024), and the proposed refinement to the mitigation measures for this feature (including for Condition 3.2.11 of the Marine Licence) (see Section 1.2.2) may result in an increased disturbance footprint for northern feather star aggregations within the Wester Ross NCMPA.	• Ecological protected sites designated for benthic and intertidal ecology features; and • Benthic and intertidal ecology.
[redacted]	[redacted]	

Project design refinement	Pathway for new or increased impact	Relevant topics
Refinement of the Project cable corridor at the Dundonnell landfall	**No pathway for new or increased impact:** the refinement of the Project cable corridor at the Dundonnell landfall represents an immaterial update to the Project boundary to optimise landfall design and exclude the existing CES aquaculture lease area. HDD will be underneath the seabed within the extended area and the HDD pop out / exit pit will be within the consented Project cable corridor. Therefore, the refinement of the Project cable corridor has no implications on the assessments presented within the original MEA and does not require consideration in the MEA Addendum.	
Drilling of nearshore boreholes at the Arnish Point and Dundonnel landfalls	**New Impact:** introduction of cement bentonite grout for borehole backfilling may result in disturbance or alteration of geological features (the grout will terminate 1 m below seabed level to allow the borehole to backfill naturally).	• Ecological protected sites designated for geomorphological features; and • Physical environment and seabed conditions.
Drilling of nearshore boreholes at the Arnish Point and Dundonnel landfalls	**Increased impact:** increased seabed disturbance associated with the drilling of up to 14 boreholes and the temporary presence of jack-up vessels or spud leg barges.	• Ecological protected sites designated for geomorphological, benthic or fish and shellfish ecology features; • Physical environment and seabed conditions; • Benthic and intertidal ecology; and • Fish and shellfish ecology.
	Increased impact: increased presence of vessels in the nearshore environment could increase the potential for disturbance and/or displacement of mobile species due to vessel presence.	• Ecological protected sites designated for ornithological or marine mammal features; • Ornithology; and • Marine mammals.
	Increased impact: increased presence of vessels in the nearshore environment could increase the disruption to other users of the sea.	• Commercial fisheries; • Shipping and navigation; and • Other sea users.
Route clearance via ROV or subsea crane in addition to PLGR	**No pathway for new or increased impacts:** the inclusion of this methodology for route clearance will be within the footprint of impact assessed for the boulder clearance plough (15 m width). Furthermore, the recovery and removal of debris from the seabed and subsequent disposal through licensed onshore facilities was already considered within the original MEA via PLGR. Therefore, there is no additional impact.	

Project design refinement	Pathway for new or increased impact	Relevant topics
Extension of Marine Licence validity from 09 February 2026 to 31 December 2030	**Increased impact:** the extension of the Marine Licence will not result in change in impacts. The overall expected duration of the installation programme has not been extended from the original MEA. However, the shift in the construction programme may alter any cumulative impacts assessed in the original MEA.	• All topics.
Phased discharge of the Marine Licence	**No pathway for new or increased impact:** this has no implications on the assessments presented within the original MEA and is purely an administrative change.	

2.2. Gap Analysis

Table 3 presents the results of the Gap Analysis, including justifications for any topics or impacts that do not require further consideration within the MEA Addendum.

Table 3 Gap Analysis

(blue shaded cells = topic screened into MEA Addendum, grey shaded cells = topic screened out of MEA Addendum)

Summary of Original MEA Assessment	Updated Information and Screening Assessment for MEA Addendum	Included in MEA Addendum?
Policy and Legislation		
The planning policy and legislative framework section of the MEA outlines the key planning policies and legislation relevant to the Project, including: • Legislation and policy underpinning the marine planning framework; • National Planning Framework 3 (NPF3); and • Nature conservation legislation.	European Union (EU) Exit: EU Exit has resulted in numerous updates to UK legislation. The key updates relevant to the Project include: • The UK European Sites are no longer part of the Natura Site Network and are now part of the UK National Site Network. The same strict protection for protected sites and species will, however, remain; and • The UK is no longer party to the Common Fisheries Policy which has been replaced by the Fisheries Act 2020. Non-UK vessels now require a licence to fish in UK waters. Similar restrictions were already in place for non-UK fishing vessels within the 12 Nautical Mile (NM) limit, within which the Project will be located. Scotland's National Marine Plan 2: In 2022, the Scottish Government began the process of updating Scotland's National Marine Plan to produce the National Marine Plan 2 (NMP2). At the time of writing, NMP2 has not yet been adopted, however, the vision, high-level objectives, and policy ideas for NMP2 were published as part of the consultation being undertaken for the NMP2 Planning Position Statement and cover climate change mitigation and adaptation, nature, sustainable marine economy, accessibility and wellbeing, and implementation (Scottish Government, 2024a). There is generally a greater emphasis on nature enhancement and nature-inclusive design, in line with NPF4 Policy 3 (detailed below). National Planning Framework 4: The National Planning Framework 4 (NPF4) was adopted in February 2023 (Scottish Government, 2023a). NPF4 outlines the national spatial strategy, and associated national planning policies, for reducing Greenhouse Gas (GHG) emissions, adapting to future impacts of climate change and aligning with the delivery of United Nations (UN) Sustainable Development Goals (SDGs) up until 2045. Eighteen national developments support the NPF4, including *Strategic Renewable Electricity Generation and Transmission Infrastructure,* to support the delivery of the spatial strategy for the North and West Coast and Islands area. NPF4 introduces policy principles on biodiversity including nature restoration and biodiversity enhancement. For example, NPF4 Policy 3 includes requirements for development proposals to contribute to biodiversity enhancement and integrate nature-based solutions, where possible. The National Islands Plan: The National Islands Plan (Scottish Government, 2019) was published in 2019 under the Islands (Scotland) Act 2018 (and was therefore not considered within the original MEA but available at the time of consent being granted). The plan sets out 13 strategic objectives that aim to address crucial sectors within island communities, including in relation to socio-economic issues such as population decline, housing and services, education, culture, and environment. Conclusion: Although there have been numerous updates to UK legislation and planning policy, none have the potential to result in any changes to the sensitivity of receptors or the magnitude of effect assessed within the original MEA. Therefore, updates to policy and legislation since the original MEA do not have the potential to alter the conclusions of the original MEA and **will not** be considered further within the MEA Addendum. The above notwithstanding, the Applicant acknowledges the NPF4 policies relating to nature enhancement and nature-inclusive design, and the similar policies proposed for NMP2. The Applicant is fully committed to aligning with these policies, as per the 'Nature' policy of the Applicant's recently published 'Sustainability Strategy – Pathway to 2030' (SSEN Transmission, 2024). This Nature policy contains commitments relating to nature restoration, loss of biodiversity and biodiversity net gain, and the Applicant intends of fulfilling these requirements as part of the Project. These aspects will be addressed when identifying and prescribing mitigation requirements within the MEA addendum.	No

Summary of Original MEA Assessment		Updated Information and Screening Assessment for MEA Addendum	Included in MEA Addendum?
Ecological Protected Sites			
Baseline Environment	As required under the Habitats Directive and the Marine (Scotland) Act 2010, the original MEA described the Habitats Regulations Appraisal (HRA) screening and NCMPA appraisal exercise undertaken to determine whether there was the potential for the Project to result in a Likely Significant Effect (LSE) on any relevant European site or a significant risk of hindering the achievement of the conservation objectives of any relevant NCMPA. The European sites identified as potentially being impacted by the Project included: • Priest Island and Shiant Isles Special Protected Areas (SPAs), both of these sites are also designated as Sites of Special Scientific Interest (SSSIs) (2 km and 20 km from the Project, respectively); • The Inner Hebrides and the Minches Special Area of Conservation (SAC) (overlapping the Project), a candidate SAC at the time of the original MEA, designated for harbour porpoise (*Phocoena phocoena*). The NCMPAs identified as potentially being impacted by the Project included: • Wester Ross NCMPA (overlapping the Project), designated for a range of biodiversity and geodiversity features including northern feather star aggregations, maerl beds, flame shell beds, burrowed mud, circalittoral muddy sand communities, kelp and seabed communities on sublittoral sediment, maerl or coarse gravel with burrowing sea cucumbers, seabed fluid and gas seep, marine geomorphology of the Scottish shelf seabed, quaternary of Scotland and submarine mass movement; • North-East Lewis NCMPA (overlapping the Project), a possible NCMPA at the time of the original MEA, designated for Risso's dolphin (*Grampus griseus*) and sandeels (*Ammodytes marinus* / *Ammodytes tobianus*) as well as geomorphology features (marine geomorphology of the Scottish shelf seabed and quaternary of Scotland); and • Shiant East Bank NCMPA, a possible NCMPA at the time of the original MEA, designated for a range of biodiversity and geodiversity features including northern sea fan and sponge communities, shelf banks and mounds, circalittoral sand and mixed sediment communities, and quaternary of Scotland. The Shiant East Bank NCMPA is located 2 km from the Project. The original MEA also considered the potential impact of the Project on other protected sites, including National Scenic Areas (NSAs), seal haul-outs and breeding grey seal sites. Three relevant NSA Coastal Sites were identified as potentially being impacted by the Project, including Wester Ross, Assynt Coigach and South Lewis, Harris and Nor Uist. Three seal haul-outs (Sgeirean Glasa, Carn nan Sgeir, Glas-Leac Mor, and Iolla Mhor) and one grey seal breeding site (Glas-Leac Beag) were all identified as being relevant to the Project.	<u>Status of protected sites:</u> The Inner Hebrides and the Minches SAC is now fully designated since December 2018. Additionally, the North East Lewis and Shiant East Bank NCMPAs are also fully designated, as of December 2020. The updated statuses of these protected sites from candidate SACs and possible NCMPAs to fully designated sites make no material changes to the original MEA, as impacts to these sites were already fully considered. Therefore, updated statuses of protected sites **will not** be considered further in the MEA Addendum. <u>Updated site-specific survey data:</u> In accordance with Condition 3.2.11 of the Marine Licence for the Project, the Applicant has conducted a survey across a 36 km section of the Project cable corridor, including within the Wester Ross NCMPA (see Section 1.2.2). Visual benthic and geophysical survey data were acquired which informed a northern feather star enumeration and aggregation assessment (Ocean Infinity, 2024). 27,406 northern feather star individuals were recorded across the survey area in addition to four prevalent aggregations. Analysis using a species distribution model highlighted a high probability of occurrence or habitat suitability in areas with topographic heterogeneity and a low probability of occurrence in areas of flatter topography (Ocean Infinity, 2024). The updated site-specific survey data confirms the presence of northern feather star individuals and aggregations that were not previously recorded. This is considered to represent a material change to the original MEA that has the potential to affect the assessment conclusions. Therefore, this baseline update **will be** considered further in the MEA Addendum. <u>Lewis Peatlands SPA:</u> The red throated diver (*Gavia stellata*) is a designated feature of the Lewis Peatlands SPA and is potentially vulnerable to disturbance. This SPA was already designated at the time of the original MEA, however, as a result of the increasing stakeholder concern around the impacts to red throated divers, impacts to this SPA are considered here. The estimated foraging range for red throated diver is 9 km (NatureScot, 2023), with the Lewis Peatlands SPA being 6 km from its closest point to the Project. Red throated diver have a high sensitivity to disturbance from shipping activity and may take flight at distances of up to 300 m – 1 km when disturbed, potentially increasing energetic cost with implications on survival or breeding success (Goodship and Furness, 2022). The potential connectivity between the Project and red-throated diver designated in the Lewis Peatlands SPA is acknowledged, however, the disturbance associated with the Project will be highly localised and temporary in nature. A single disturbance event is considered unlikely to have an immediate effect on the survival or breeding productivity of an individual bird, and this would only be expected with repeated disturbance over an extended period of time. Burt *et al*. (2022) investigated the impact of shipping on red throated diver in the Liverpool Bay SPA and suggest that disturbance primarily occurs within 2 km of the vessel. Therefore, any disturbance from the Project will be localised to the vicinity of Project vessels that will only be present in the short-term. Furthermore, the Arnish Point landfall is in close proximity to Stornoway Port and the Arnish Fabrication yard, which is subject to existing vessel and industrial activity. The addition of a small number of vessels for the Project in comparison to the traffic levels already experienced in the area represents negligible change from baseline conditions. Therefore, no LSE to the Lewis Peatlands SPA will occur and hence impacts to this SPA **will not** be considered further in the MEA Addendum.	Yes

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<tr><th></th><th>Summary of Original MEA Assessment</th><th>Updated Information and Screening Assessment for MEA Addendum</th><th>Included in MEA Addendum?</th></tr>
<tr><td>Impact Assessment</td><td>
LSE could not be ruled out for the Inner Hebrides and the Minches SAC. Further assessment of the impacts of the Project on this site concluded no adverse effect on the integrity when the implementation of embedded mitigation was considered. No LSE was concluded for the Priest Island and Shaint Isles SPAs.
A significant risk of hindering the achievement of conservation objectives could not be ruled out for all NCMPAs outlined above. However, further assessment of the impacts concluded that the Project would not result in any adverse effect on the conservation objectives of any NCMPA.
No likely impact to any of the NSAs in the vicinity of the Project was anticipated, therefore, no further assessment was undertaken within the MEA.
Given the distance of the Project to the closest seal haul-out (4.5 km), and considering the implementation of embedded mitigation (Marine Mammal Protection Plan), no significant disturbance to seals at seal haul-outs was predicted.
The in-combination effects assessment focussed on seabed disturbance from Nephrops trawlers, which are known to trawl the seabed in the Minch area and in some specific areas of the Wester Ross NCMPA. It was assessed that the small proportion of the seabed impacted by the Project within the NCMPA was unlikely to act cumulatively with Nephrops trawlers to result in significant impacts that would compromise the conservation objectives of the site. Overall, no significant cumulative effects were identified for any protected site.
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The Project Design Refinements have the potential to result in new or increased impacts for ecological protected sites via the following pathways (see Table 2):

<u>Protected sites with geomorphological features:</u>

Increased seabed disturbance associated with the drilling of up to 14 boreholes and the temporary presence of jack-up vessels or spud leg barges;
Potential disturbance or alteration to geological features from the introduction of cement bentonite grout for borehole backfilling;

<u>Protected sites with benthic and/or fish ecology features:</u>

A change in cable capacity and voltage altering EMF intensities;
Increased disturbance footprint for northern feather star aggregations within the Wester Ross NCMPA;
Increased seabed disturbance footprint associated with the drilling of up to 14 boreholes and the temporary presence of jack-up vessels or spud leg barges;

<u>Protected sites with ornithological or marine mammal features:</u>

Increased presence of vessels in the nearshore environment for drilling of up to 14 boreholes could increase the potential for disturbance and/or displacement of mobile species.

Additionally, there is the potential for updates in nearby plans, projects or activities to change the conclusions of the in-combination effects assessment presented in the original MEA.
As the Project is located 2 km from the Shiant East Bank NCMPA, the Project will not directly impact this protected site and there is no change anticipated to the assessment presented in the original MEA. Therefore, impacts to this protected site will not be considered further in the MEA Addendum.
<u>Protected sites with geomorphological features:</u>
The Project overlaps with the Wester Ross and North-East Lewis NCMPAs, both of which are designated for geomorphological features. Seabed disturbance may result from the compression of seabed sediments within the footprint of jack-up vessels and spud leg barges which will use dynamic positioning. Depressions from jack-up vessels or spud leg barges will infill over time but may remain on the seabed for a number of years, as evidenced by monitoring studies (e.g. BOWind, 2008; EGS, 2011), depending on the sediments present. For example, monitoring at the Barrow offshore wind farm demonstrated infilling of jack-up vessel depressions within one year (BOWind, 2008). Nevertheless, the disturbance footprint of the jack-up vessels or spud leg barges associated with the borehole activities will be highly localised, noting that these vessels are expected to be considerably smaller than static vessels associated with the wind turbine foundation used for the Barrow offshore wind farm. Furthermore, the locations of the nearshore boreholes are close to shore, with no overlap with the geomorphological features of these designated sites expected (except glacial scour in the North-East Lewis NCMPA although this feature is not sensitive to pressures from human activities) (NatureScot, 2024). The top 1 m of the boreholes will be left to backfill naturally, and recovery of the seabed would be expected over time. Therefore, no impacts to the geomorphological features of the Wester Ross and North-East Lewis NCMPAs are anticipated as a result of the nearshore drilling and backfilling of boreholes, and this will not be considered further in the MEA Addendum.
<u>Projected sites with benthic and/or fish ecology features:</u>
The benthic features of the Wester Ross NCMPA are potentially sensitive to any seabed disturbance associated with the drilling of nearshore boreholes and the temporary presence of jack-up vessels or spud leg barges. The northern feather star aggregations in the Wester Ross NCMPA may also be subjected to an increased disturbance footprint as a result of the proposed change to the mitigation measures for this feature (see Section 1.2.2). Therefore, seabed disturbance from the drilling of boreholes and the change in mitigation for northern feature star aggregations will be considered further in the MEA addendum for the Wester Ross NCMPA.
The seabed disturbance resulting from nearshore drilling of boreholes has the potential to disturb the sandeel populations designated in the North-East Lewis NCMPA; however, given that the drilling of the boreholes will be close to the Arnish Point landfall, there is no overlap with the sandeel grounds in the North-East Lewis NCMPA (NatureScot, 2024). Therefore, this impact will not be considered further within the MEA Addendum.
Additionally, the increase in cable voltage and capacity also has the potential to result in greater EMF intensities than those assessed in the original MEA. The benthic ecology features of the Wester Ross NCMPA and the sandeel populations of the North-East Lewis NCMPA are potentially sensitive to this impact. Therefore, this will be considered further in the MEA Addendum.
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Summary of Original MEA Assessment		Updated Information and Screening Assessment for MEA Addendum	Included in MEA Addendum?
		Protected sites with ornithological or marine mammal features: The increased presence of vessels associated with the drilling of nearshore boreholes (located within 1,500 m from shore) has the potential to disturb or displace mobile species close to shore, including the ornithological features of the Priest Island and Shiant Isles SPAs, Risso's dolphin of the North-East Lewis NCMPA, harbour porpoise of the Inner Hebrides and the Minches SAC and seals at nearby designated seal haul-out sites. However, the addition of a small number of vessels for this activity will not result in a material change to the magnitude of impact, beyond what was already assessed in the original MEA. Therefore, this impact **will not** be considered further within the MEA Addendum. In-combination effects: A review of the Marine Directorate, Highland Council (THC) and the Comhairle nan Eilean Siar planning websites was conducted in December 2024 and January 2025 to identify new projects, plans or activities present in the vicinity of the Project that could have the potential to result in in-combination effects. Due to the large volume of planning applications on the THC and Comhairle nan Eilean Siar planning websites, a focus was placed on Environmental Impact Assessment (EIA) projects or other major projects which would have the greatest potential to result in a significant in-combination effect with the Project. This review focussed on projects, plans and activities which entered into planning since the submission of the original MEA (i.e. since October 2018). The review of planning applications on the Marine Directorates website identified the Stornoway Port extension as a potential cumulative project that entered planning following the original MEA submission. The extension of the Stornoway Port is still ongoing (including the Deep Water Terminal, now consented, and the Deep Water South project, at Scoping). It is predicted that the Deep Water Port Terminal will be constructed by November 2025, prior to construction of the Project (Stornoway Port, 2024a). No publicly available information was identified for the timelines of the construction of the Deep Water South project. However, the Deep Water South Scoping Report outlines that no potential significant effects are predicted in relation to underwater noise (the key cumulative impact with the Project) (Stornoway Port, 2024b). Taking the temporary and highly localised nature of the underwater noise impacts resulting from the Project into account, there is considered to be no potential for a significant cumulative effect with the Deep Water South project. Furthermore, it would be expected that the Project would be considered, as required, in the cumulative and in-combination effects assessments within the EIA for this development. A recent Screening Request was identified for a new aquaculture farm within Little Loch Broom, operated by the Oyster Restoration Company (THC planning reference 23/05105/SCRE). This development would comprise of a new native flat oyster farm near Durnamuck. The planning application has not yet been made; however, it is anticipated that this development would be constructed over three phases with a combined area of 0.5 km^{2}[2]. In addition, a replacement brood stock fish farm, near Ardessie is also proposed, and currently under construction. The Ardessie brood stock fish farm replaces the inactive hatchery at Ardessie that was identified in the original MEA. The planning application for the Ardessie brood stock fish farm facility was granted in 2024 and this development is expected to be operational in 2025, prior to the Project's construction (THC planning reference: 22/06182/FUL). Considering the localised nature of any impacts associated with these aquaculture developments, combined with the highly localised nature of any impacts associated with the Project, there are no significant in-combination effects anticipated as a result of these new projects, plans and activities that were not considered in the original MEA. Overall, considering the above, in-combination effects with other projects, plans and activities **will not** be considered further in the MEA Addendum.	
Benthic and Intertidal Ecology			
Baseline Environment	The information used to inform the baseline description for benthic and intertidal ecology includes a mixture of desk-based sources (UK SeaMap 2016, Joint Nature Conservation Committee (JNCC) data and reports, National Marine Plan interactive (NMPi), Scottish Natural Heritage (SNH, now NatureScot) reports, MarLIN, and FEAST), consultation (SNH and Scottish Ministers) and site-specific surveys conducted in 2016 (Bibby HydroMap).	EUSeaMap 2023: The JNCC now recommend using the EUSeaMap 2023 for the most up-to-date data on broadscale seabed habitats (JNCC, 2024). No material changes have been identified based on a comparison between UK SeaMap 2016 and EUSeaMap 2023 for the Project cable corridor, e.g. EUSeaMap (2023) identifies habitats consisting of primarily Atlantic offshore circalittoral mud, sand and mixed sediment which aligns with that reported in the original MEA. Therefore, this baseline update **will not** be considered further within the MEA Addendum.	Yes

[2] https://www.ross-shirejournal.co.uk/news/wester-ross-shellfish-aquaculture-farm-bid-wont-need-eia-337862/

	Summary of Original MEA Assessment	Updated Information and Screening Assessment for MEA Addendum	Included in MEA Addendum?
	The sediments, and benthic and intertidal habitats and species present within the Project cable corridor were described. Key sensitive habitats and species identified included Priority Marine Features (PMFs) such as maerl beds, flame shell beds, burrowed mud, kelp and seaweed communities on sublittoral sediment, maerl or coarse shell gravel with burrowing sea cucumbers, northern feather star aggregations, sandeels and submarine structures made by leaking gases, all of which are also protected features of the Wester Ross NCMPA.	<u>Update to EUNIS habitat classification:</u> The European Environment Agency's EUNIS marine habitat classification was reviewed and revised in 2019 and further updated in 2021, (European Environment Agency, 2022). These updates focused on habitat classification name changes and benthic group definitions. The updated information to the EUNIS habitat classification does not result in any material change to the MEA. Therefore, this baseline update **will not** be considered further within the MEA Addendum. <u>Site-specific survey data:</u> As described in Section 1.2.2, the Applicant contracted Ocean Infinity to enumerate northern feather star individuals and assess potential aggregations within the section of the Project cable corridor overlapping the Wester Ross NCMPA, based on the outputs of the geophysical survey carried out by Reach *et al.,* (2024). A greater extent of northern feather star individuals and aggregations were recorded within the Project cable corridor, compared to the previous surveys undertaken to inform the original MEA. This is considered to represent a material change to the original MEA that has the potential to affect the conclusions of the assessment. Therefore, the implications of the updated site-specific data **will be** considered further in the MEA Addendum.	
Impact Assessment	The following impacts were considered for benthic and intertidal ecology: • Direct disturbance and removal of feature due to substratum abrasion; • Smothering of benthic and intertidal habitats and species from sediment suspension and re-settlement; • Physical change in seabed type (e.g., associated with cable protection); • Introduction of marine non-native marine species; and • Accidental fuel release. All of the impacts listed above were assessed as not significant (minor level of impact) due to the relatively small area of impact and widespread nature of the habitats considered. Key mitigations relevant to this conclusion include micro-siting to avoid certain habitats and species of conservation importance, such as northern feather star aggregations. Where it was not possible to avoid northern feather star aggregations (as informed by a pre-lay survey), it was assumed that the cable would be surface laid with an external tubular protection system (Uraduct or similar), in order to minimise the footprint of the installation and avoid / minimise disturbance in these areas (as per Condition 3.2.11). Furthermore, during the determination period of the Marine Licence, the Project cable corridor was refined, based on feedback received from NatureScot and Marine Directorate, to facilitate the avoidance of pockmarks (see Xodus, 2021) (as per Condition 3.3.8). The cumulative effects assessment considered seabed disturbance from *Nephrops* trawlers, which are known to trawl the seabed in the Minch area and in some specific areas of the Wester Ross NCMPA. It was assessed that the small proportion of the seabed impacted by the Project works within the NCMPA is unlikely to act cumulatively with *Nephrops* trawlers and result in significant impacts that would compromise the conservation objectives of the Wester Ross NCMPA. Overall, no significant cumulative effects were identified.	<u>Project Design Refinements:</u> The Project Design Refinements have the potential to result in new or increased impacts for benthic and intertidal ecology via the following pathways (see Table 2): • A change in cable capacity and voltage altering EMF intensities; • Increased disturbance footprint for northern feather star aggregations within the Wester Ross NCMPA; and • Increased seabed disturbance footprint associated with the drilling of up to 14 boreholes and the temporary presence of jack-up vessels or spud leg barges,. Benthic and intertidal ecology receptors may be sensitive to seabed disturbance associated with drilling of up to 14 boreholes (including jack-up vessel or spud leg barge) and increased EMF intensities associated with the change in cable voltage and capacity. Additionally, as noted above for ecological protected sites, northern feather star aggregations in the Wester Ross NCMPA may also be subjected to an increased disturbance footprint as a result of the proposed change to the mitigation for this feature. Therefore, seabed disturbance and EMF effects **will be** considered further in the MEA addendum for benthic and intertidal ecology receptors. <u>Cumulative effects:</u> Additionally, there is the potential for updates in nearby plans, projects or activities to change the conclusions of the cumulative effects assessment presented in the original MEA. There are two new aquaculture sites identified within Little Loch Broom since the original MEA (see ecological protected sites above), however, given the small scale of these developments and the Project, no significant cumulative effects are predicted. Therefore, cumulative effects with other projects, plans and activities **will not** be considered further in the MEA Addendum. In relation to seabed disturbance associated with fishing activity, the results of the geophysical survey show trawl scars present throughout the Project cable corridor (Reach *et al.,* 2024). The potential for cumulative effects on seabed disturbance from the Project with *Nephrops* trawlers was assessed within the original MEA and concluded that no significant cumulative effects were identified. Therefore, cumulative effects with *Nephrops* trawlers (or other fishing methods) **will not** be considered further within the MEA Addendum.	

	Summary of Original MEA Assessment	Updated Information and Screening Assessment for MEA Addendum	Included in MEA Addendum?
Physical Environment and Seabed Conditions			
Baseline Environment	Data sources used to inform the baseline description of the physical environment and seabed conditions include a mixture of desk-based sources and site-specific benthic, geophysical and geotechnical surveys conducted in 2016. Results from the survey found that the bathymetry and geology of the Project cable corridor was highly variable. Rock outcrops were recorded at both ends of the landfall locations, gradually giving way to granular, softer sediments with increasing depth and distance from the shore. Fine sediments were dominant, with variable proportions of sands and gravels. Occasional mixed sediment was recorded, as well as cobbles and boulders. The marine survey also identified several geological features, such as glaciated channels, slide scars, pockmarks, scattered moraines and shelf deeps, along the subsea cable route. A number of these features are considered to be of geodiversity importance, and, are protected as part of the Wester Ross NCMPA that the Project overlaps.	Geophysical surveys were undertaken between February and March 2024 to further characterise the seabed and benthic conditions along the Project cable corridor (Reach *et al.*, 2024). Water depths along the Project cable corridor ranged from 0 to 178 m. As per the 2016 surveys, areas of out- and sub-cropping bedrock were interpreted close to shore, transitioning to sediments dominated by sands and clays with variable proportions of gravel that were interspersed with boulder fields, pockmarks (three in total) and out-or sub- cropping bedrock. Overall, there are considered to be no material changes to the seabed characterisation within the original MEA as a result of this updated survey data. Therefore, there are no material updates to the baseline characterisation, and this **will not** be considered further within the MEA Addendum.	No
Impact Assessment	Overall, due to the high recoverability of the seabed within the Project location and the temporary duration of the works, it was agreed in consultation prior to the MEA that the Project had no potential to result in significant impacts for physical environment and seabed conditions. Scottish Ministers concluded that this topic could be scoped out of the MEA.	<u>Project Design Refinements:</u> The Project Design Refinements have the potential to result in new or increased impacts for physical environment and seabed conditions via the following pathway (see Table 2): • Increased seabed disturbance footprint associated with the drilling of up to 14 boreholes and the temporary presence of jack-up vessels or spud leg barges. As described within the original MEA, for direct damage to have an impact on the integrity of the structure, scale and nature of a geological feature of interest, the impact would need to be of sufficient magnitude to result in a physical alteration of said feature. Seabed disturbance associated with up to 14 boreholes, their associated backfilling and the temporary presence of jack-up vessels or spud leg barges represents a highly localised and short-term impact. Boreholes will be backfilled with grout, however, the top 1 m below the seabed will be left to naturally backfill. As such, no permanent effects at the seabed surface are predicted. There is no overlap between the nearshore boreholes and geologically sensitive features (e.g. pockmarks), as such there is no mechanism for impact. Therefore, the conclusion to scope out impacts to physical environment and seabed conditions remains valid and this topic **will not** be considered further within the MEA Addendum. <u>Cumulative effects:</u> Additionally, there is the potential for updates in nearby plans, projects or activities to change the conclusions of the cumulative effects assessment presented in the original MEA. There are two new aquaculture sites identified within Little Loch Broom since the original MEA (see ecological protected sites above), however, given the small scale of these developments and the Project, no significant cumulative effects are predicted. Therefore, cumulative effects with other projects, plans and activities **will not** be considered further in the MEA Addendum.	

Summary of Original MEA Assessment		Updated Information and Screening Assessment for MEA Addendum	Included in MEA Addendum?
Fish and Shellfish			
Baseline Environment	An overview of the fish ecology baseline was provided in the original MEA, which was informed by desk-based sources. The spawning and nursery grounds overlapping the Project cable corridor were identified and the potential presence of basking sharks (*Cetorhinus maximus*), noise-sensitive and electro-sensitive species were described. The Project cable corridor was identified as overlapping with spawning grounds for herring (*Clupea harengus*) and sandeel (*Ammodytes spp*.), both species potentially sensitive to seabed disturbance due to their specific seabed habitat requirements. Noise sensitive species potentially present along the Project cable corridor were identified as cod (*Gadus morhua*), herring and Atlantic salmon (*Salmo salar*). EMF sensitive species potentially present were identified as common skate (*Dipturus batis*), spotted ray (*Raja montagui*), spurdog (*Squalus acanthias*), thornback ray (*Raja clavata*) and tope shark (*Galeorhinus galeus*). A baseline description for shellfish was predominantly described under the commercial fisheries topic. Key commercial species were noted as *Nephrops* (*Nephrops norvegicus*), brown crab (*Cancer pagurus*), lobster (*Nephropidae* family), and to a lesser extent scallops (*Pectinidae* family).	Please note that the fish ecology topic in the original MEA focussed on fish species and impacts to shellfish were predominantly considered under the commercial fisheries topic. In line with standard practice, it is proposed that any further assessments in the MEA Addendum would consider impacts to the 'Fish *and* Shellfish Ecology' topic. <u>Diadromous fish:</u> There have been several recent studies conducted by Marine Directorate – Science Evidence, Data and Digital (MD-SEDD) for diadromous fish in the north of Scotland which provide more information on diadromous migratory fish patterns and their potential interaction with the Project. The Atlantic Salmon Trust launched 'The West Coast Tracking Project' in 2021, whereby salmon smolts were tagged with acoustic tags to track migratory patterns. This study indicates that salmon distribute widely around the west coast of Scotland using a variety of different migratory routes (Atlantic Salmon Trust, 2022). "*Diadromous Fish in the Context of Offshore Wind – Review of Current Knowledge & Future Research*" (Honkanen *et al.,* 2024) summarises the most up to date evidence base on diadromous fish marine use and builds on the information presented within the original MEA. <u>Elasmobranch distribution:</u> There are also several recent data sources which provide further information on the distribution of elasmobranchs in Scottish waters. A recent article predicting habitat suitability for basking sharks indicates that the Project cable corridor is located within an area of low to moderate habitat suitability for this species (Austin *et al.,* 2019). Furthermore, Pikesley *et al.*, (2024) provide an updated analysis of the basking shark watch public sightings database (1987 – 2020). Sightings in the Inner Hebrides and Minches NCMPA (to the south of the Project) are relatively high, with a lower number of sightings in the Project cable corridor. Furthermore, a recent review of elasmobranch distributions in Scottish waters was also published in 2024 (Régnier *et al.,* 2024). The review presents species distribution models for nine elasmobranch species and indicates that the most likely elasmobranch species in the Project cable corridor are common skate (*Dipturus batis*) (now considered as two separate species, flapper skate (*D. intermedius*) and blue skate (*D. flossada*)), cuckoo ray (*Leucoraja naevus*), spotted ray, thornback ray, spurdog, black mouthed dogfish (*Galeus melastomus*), lesser spotted dogfish (*Scyliorhinus canicula*) and starry smooth hound (*Mustelus asterias*). Generally, the distribution models indicate that the west coast of Scotland contains a relatively high abundance of elasmobranchs. <u>Other fish ecology species:</u> The key baseline update for other fish ecology species are the Essential Fish Habitat maps for Scottish waters published by Franco *et al.* (2023). These maps detail the potential for fish and shellfish aggregations around Scotland (either presence or absence, lower or higher confidence). The highest potential for aggregations is represented by the ranking 'presence (higher confidence)'. There were no aggregations of a probability ranked as 'presence (higher confidence)' that overlap the Project cable corridor. Langton *et al.* (2021) also provides a species distribution model for sandeel in Scottish waters, including for predicted sandeel burrow density and probability of presence. The predicted density and probability of presence is low across the Project cable corridor. <u>Electro-sensitive species:</u> There has been considerable research in recent years investigating the potential impact of EMF on fish and shellfish ecology receptors. Garavelli *et al*. (2024) provides a summary of the research gained since 2020 and Gill and Desender (2020) summarise the knowledge gained between 2016 and 2020 (also see Hutchison *et al.* (2020) for a summary of the impact of EMF on bottom-dwelling organisms). Between 2016 and 2020 interest in EMFs grew significantly and there were several research studies undertaken to further understand the potential impact of EMF on the marine environment, focussing on fish and shellfish. Examples of such studies include Hutchison *et al.,* (2018) who investigated the impact of EMFs from a 300 kV HVDC transmission cable on little skate (*Leucoraja erinacea*) and American lobster (*Homarus americanus*). The study concluded that exposure to EMF resulted in subtle behavioural changes in American lobster and strong behavioural changes in little skate (without acting as a barrier to movement). Interest in EMFs continued to grow between 2020 and 2024 with the publication of several key studies and reviews. Harsanyi *et al.* (2022) investigated the potential effects of EMF exposure (2.8 millitesla (mT)) on European lobster (*Homarus gammarus*) and brown crab. This study found that exposure to EMF did not alter embryonic development time, larval release time, or vertical swimming speed for either species. However, when exposed throughout embryonic development, an increase in larval deformities was observed and a reduced swimming test success rate amongst lobster larvae. It should be noted that at 2.8 mT, the EMF intensities investigated in Harsanyi *et al.* (2022) are significantly higher than, and thus not comparable to, the subsea cables associated with the Project.	Yes

Summary of Original MEA Assessment	Updated Information and Screening Assessment for MEA Addendum	Included in MEA Addendum?
	Conclusion: Additional baseline studies and reports, as outlined above, provide further information on the fish and shellfish receptors present at the Project cable corridor. However, for the most part, this updated baseline information builds on the information presented within the original MEA, and therefore, would not materially change any assessments of sensitivity or impact magnitude. Therefore, no material changes related to the additional baseline studies or reports are anticipated, and these **will not** be considered further in the MEA Addendum. However, the updated research around the sensitivity of fish and shellfish to EMF has the potential to alter the conclusions of the original MEA and therefore **will be** considered within the MEA Addendum.	
Impact Assessment Most fish species are highly mobile. Therefore, impacts from cable installation activities on the majority of fish species were assessed as highly unlikely. The assessment focussed on species sensitive to seabed disturbance (e.g. those directly dependent upon the seabed environment for important life-stages (e.g. spawning or burrowing)), noise, or EMF. The following impacts were considered: • Disturbance and possible alteration of migration routes due to vessel noise, noise generated during cable installation and sediment suspension during cable installation; • Interaction with spawning/nursery grounds; • Collision risk for basking sharks; and • Accidental fuel release. A detailed assessment was not conducted for this topic within the original MEA, as conclusions of no significant impact could be made without further assessment to determine impact significance and/or identify management/mitigation measures (see Table 7.1 of the original MEA). Consideration of impacts to commercial fish and shellfish species were also considered under the commercial fisheries topic (see below).	Project Design Refinements: The Project Design Refinements have the potential to result in new or increased impacts for fish and shellfish via the following pathways (see Table 2: • A change in cable capacity and voltage altering EMF intensities; and • Increased seabed disturbance footprint associated with the drilling of up to 14 boreholes and the temporary presence of jack-up vessels or spud leg barges. As noted above, there have been several recent studies investigating the potential impacts of EMF on fish and shellfish ecology receptors (e.g. Hutchison *et al.,* 2018; Scott *et al.,* 2021; Hutchison *et al*., 2020; Harsanyi *et al.,* 2022). Although these studies have been conducted on a limited number of species, primarily in a laboratory environment and with mixed results, they do indicate the potential for elasmobranchs, Atlantic salmon and shellfish to be receptive to EMF. It is proposed that EMF effects **will be** considered further in the MEA Addendum. Fish and shellfish ecology receptors, in particular herring and sandeel, may be sensitive to any seabed disturbance associated with nearshore drilling of boreholes (including jack-up vessel or spud leg barge presence). Herring and sandeel prefer gravelly sediments habitats and coarse sands with low silt content, respectively. The seabed sediments near the Dundonnell landfall is primarily comprised of mud and muddy sand which are of less importance to these species. At the Arnish Point landfall, coarser sediments are present which may indicate potential suitability for herring spawning. Nevertheless, given the mobile nature of these species and the wide distribution of coarse sands and gravelly sediment habitats available to them, the highly localised and short-term seabed disturbance associated with the nearshore drilling activities is not anticipated to have a significant impact on any fish ecology receptor. Therefore, the increased footprint of seabed disturbance resulting from the nearshore drilling activities is not anticipated to materially change the conclusions of the original MEA. Therefore, seabed disturbance **will not** be considered further in the MEA Addendum. Cumulative effects: Additionally, there is the potential for updates in nearby plans, projects or activities to change the conclusions of the cumulative effects assessment presented in the original MEA. There are two new aquaculture sites identified within Little Loch Broom since the original MEA (see ecological protected sites above). However, given the small scale of these developments and the Project, no significant cumulative effects are predicted. Therefore, cumulative effects with other projects, plans and activities **will not** be considered further in the MEA Addendum.	

Summary of Original MEA Assessment		Updated Information and Screening Assessment for MEA Addendum	Included in MEA Addendum?
Ornithology			
Baseline Environment	The baseline description was informed by desk-based data sources and consultation, and no site-specific surveys were conducted for this topic. There were two designated sites with ornithological qualifying features considered in the original MEA: Shaint Isles SPA, which is designated for seabird aggregations and Priest Island SPA, designated for European storm petrel (*Hydrobates pelagicus*). Of the species potentially present along the Project cable corridor, the great cormorant (*Phalacrocorax carbo*) and shag (*Phalacrocorax aristotelis*) were considered to be most sensitive to disturbance from the presence of vessels, on the basis that they demonstrate flushing responses to vessels at distances of less than 500 m (moderate flushing distance) (Furness *et al*., 2012). Common guillemot (*Uria aalge*) and razorbill (*Alca torda*) both display avoidance behaviours to vessels at short range (e.g. less than 200 m) and are therefore also considered to have moderate sensitivity to vessel disturbance (Furness *et al*., 2012).	A number of new reports and studies have been released since the original MEA submission which can be used to update the baseline characterisation for ornithology. Key data sources on the distribution of seabirds include: • Waggit *et al*., (2020) – presents species distribution maps for Atlantic puffin (*Fratercula arctica*), black-legged kittiwake (*Rissa tridactyla*), herring gull (*Larus argentatus*), lesser black-backed gull (*Larus fuscus*), common guillemot, shag, manx shearwater, northern fulmar (*Fulmarus glacialis*), storm petrel (Hydrobates family), great skua (*Stercorarius skua*), northern gannet (*Morus bassanus*) and razorbill. These maps indicate that kittiwake, Atlantic puffin, common guillemot, northern fulmar and gannet are present in the Minch at a moderate to high density. This is consistent with the information presented within the original MEA; and • Cleasby *et al*., (2020) – presents utilisation distribution maps to identify hotspots of higher density areas for black-legged kittiwake, common guillemot, shag and razorbill. Hotspots for common guillemot and razorbill were identified around the Project cable corridor. Although the original MEA does not specifically state the importance of the area for these species, these species are noted as being present in the area and the assessment considers the potential impacts on these species. Considering the localised and temporary nature of the impacts to seabirds from the Project, this updated information does not materially change the assessment outcomes of the original MEA. While the additional studies outlined above provide further information on the ornithology receptors present at the Project cable corridor, no substantial changes have been identified that would alter the sensitivity or magnitude assessments of the original MEA. The slow speed of the vessels (maximum of a few knots), short duration and temporary nature of the installation activities, and the mitigations proposed (e.g. lighting kept to a minimum), result in no potential for significant impacts on seabirds, even when these baseline updates are considered. Therefore, these baseline updates **will not** be considered further in the MEA Addendum. As noted above for ecological protected sites, the red-throated diver is a designated feature of the Lewis Peatlands SPA and is potentially vulnerable to disturbance (Furness *et al.,* 2012). There has been increasing stakeholder concern in relation to impacts to this species. Red-throated diver have a high sensitivity to disturbance from shipping activity. Individuals may take flight at distances of up to 300 m – 1 km when disturbed (Goodship and Furness, 2022). A single disturbance event is considered unlikely to have an immediate effect on the survival or breeding productivity of an individual bird, and this would only be expected with repeated disturbance over an extended period of time. Burt *et al*. (2022) investigated the impact of shipping on red throated diver in the Liverpool Bay SPA and suggest that disturbance primarily occurs within 2 km of the vessel. Therefore, any disturbance from the Project will be localised to the vicinity of the Project vessels that will only be present in the short-term. Furthermore, the Arnish Point landfall is in close proximity to Stornoway Port and the Arnish Fabrication yard, which is subject to existing vessel and industrial activity (e.g. the annual average vessel density is reported as very high (Marine Directorate, 2024a)). Therefore, the vessel activity associated with nearshore drilling activities does not represent a substantial change from baseline vessel activity. Therefore, impacts to red-throated diver **will not** be considered further in the MEA Addendum. Lastly, it is relevant to note the potential impact of highly pathogenic avian influenza (HPAI) on seabird species in Scottish seas, including terns, gannets, great skuas, and puffins. The recent outbreak of HPAI between 2021 and 2023 was the largest outbreak recorded in the UK, although cases have now declined (RSPB, 2025). NatureScot have raised concerns around the current strain of avian flu and the potential impacts to important seabird populations. Due to the limited potential for the Project to impact seabirds, due to temporary and short-term nature of Project activities, any potential impact from avian flu will not result in any material changes to the findings of the original MEA. Therefore, the influence of avian flu **will not** be considered further in the MEA addendum.	No

Summary of Original MEA Assessment		Updated Information and Screening Assessment for MEA Addendum	Included in MEA Addendum?
Impact Assessment	The following impacts were considered within the original MEA: • Temporary and short term physical disturbance / displacement due to vessel presence and noise (offshore) and presence of heavy machinery and vehicles at landfall; and • Accidental fuel release. No significant impacts were identified given the slow speed of vessels (maximum of a few knots) and the short term and temporary nature of the impacts. A detailed assessment was not conducted for this topic within the original MEA, as a conclusion of no significant impacts could be made without further assessment to determine impact significance and/or identify management/mitigation measures (see Table 7.1 of the original MEA).	<u>Project Design Refinements:</u> The Project Design Refinements have the potential to result in a new or increased impact for ornithology via the following pathway (see Table 2): • Increased presence of vessels in the nearshore environment for drilling of up to 14 boreholes could increase the potential for disturbance and/or displacement of mobile species. The increased presence of vessels associated with the nearshore drilling activities has the potential to disturb or displace mobile species, including seabirds. However, the addition of a small number of vessels for the drilling activities will not result in a material change to the impact magnitude, beyond what was already assessed in the original MEA. The mitigation presented within the original MEA (e.g. slow vessel speeds and lighting being kept to a minimum) will also be applied to the vessels undertaking drilling activities. Any disturbance to birds will be highly localised and temporary and is not expected to result in long-term impacts on survival or breeding success. Therefore, this impact **will not** be considered further within the MEA Addendum. <u>Cumulative effects:</u> Additionally, there is the potential for updates in nearby plans, projects or activities to change the conclusions of the cumulative effects assessment presented in the original MEA. There are two new aquaculture sites identified within Little Loch Broom since the original MEA (see ecological protected sites above) and these sites could have the potential to disturb or displace seabirds or present a risk of entanglement to diving birds, such as red-throated diver (Marine Directorate, 2024b). However, given the small scale of these developments and the Project, no significant cumulative effects are predicted. Therefore, cumulative effects with other projects, plans and activities **will not** be considered further in the MEA Addendum. <u>Other relevant updates:</u> The foraging ranges calculated by Thaxter *et al.,* (2012) were updated by Woodward *et al.,* (2019), resulting in increased mean maximum foraging ranges for black-legged kittiwake, razorbill, great skua and great black-backed gull (*Larus marinus*). This could increase the number of seabirds potentially identified as having connectivity with the Project. Nevertheless, the conclusion of no significant impact within the original MEA are based on the temporary and highly localised nature of any disturbance to seabirds, as well as the proposed mitigation measures, including the slow speed of vessels (maximum of a few knots) and keeping lighting on board vessels to a minimum. These conclusions will not be changed by the increased mean maximum foraging ranges presented in Woodward *et al*., (2019) and therefore this update **will not** be considered within the MEA Addendum. Goodship and Furness (2022) presents an updated review of disturbance distances for protected birds (breeding and non-breeding) including swans, geese and ducks (*Anatidae*), grouse (*Tetraonidae*), divers and grebes (*Gaviidae* and *Podicipedidae*), diurnal raptors (*Accipitridae* and *Falconidae*), waders (*Charadriidae,Haematopodidae, Phalaropidae* and *Scolopacidae*), terns (*Sternidae*), owls (*Strigidae* and *Tytonidae*) and some other species (e.g. *Caprimulgidae, Coraciiformes, Fringillidae, Paridae* and *Rallidae)*. The original MEA notes that the species most sensitive to disturbance in the Project cable corridor are likely to be the great cormorant and shag (<500 m disturbance distance), common guillemot and razorbill (<200 m disturbance distance) and red and black-throated diver (1 km disturbance distance), and disturbance distances were informed by Furness *et al.* (2012). Of the species noted as being most relevant to the Project in the original MEA, Goodship and Furness (2022) provide updated disturbance distances for red-throated and black-throated divers: 1 km in the non-breeding season and 750 m in the breeding season. No updated disturbance distances were provided for the other species most likely to be present within the Project cable corridor. As the red-throated and black-throated disturbance distance aligns with the assumptions of the original MEA, this update does not represent a material change to the original MEA and **will not** be considered within the MEA Addendum.	

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<tr><th></th><th>Summary of Original MEA Assessment</th><th>Updated Information and Screening Assessment for MEA Addendum</th><th>Included in MEA Addendum?</th></tr>
<tr><td colspan="4">Marine Mammals</td></tr>
<tr><td>Baseline Environment</td><td>The baseline description for marine mammals was informed by desk-based data sources and consultation with Marine Scotland (now Marine Directorate) and SNH (now NatureScot). Key cetaceans for the region were identified as bottlenose dolphin (Tursiops truncatus), harbour porpoise (Phocoena phocoena), common dolphin (Delphinus delphis), white-beaked dolphin (Lagenorhynchus albirostris), minke whale (Balaenoptera acutorostrata), Risso's dolphin, grey seal (Halichoerus grypus) and harbour seal (Phoca vitulina).</td><td><u>SCANS-IV abundance estimates:</u>

The most recent Small Cetaceans in European Atlantic Waters and the North Sea (SCANS) survey was conducted in 2022 (SCANS-IV). This survey provides the most up to date estimates for cetacean abundance within European Atlantic waters. The Project cable corridor overlaps SCANS-IV survey block CS-H where the following cetaceans were recorded: harbour porpoise (0.3911 animals per km^2), bottlenose dolphin (0.3421 animals per km^2), Risso's dolphin (0.0244 animals per km^2), white-beaked dolphin (0.1380 animals per km^2), white-sided dolphin (Lagenorhynchus acutus) (0.0279 animals per km^2), common dolphin (0.9266 animals per km^2), beaked whale (all species) (0.0034 animals per km^2), and minke whale (0.0353 animals per km^2) (Giles et al., 2023). The species, and associated densities, in the SCANS-IV survey block CS-H generally align with the baseline description of the original MEA.

<u>Other regional density estimates and reports:</u>

Hague et al., (2020) and Waggit et al., (2020), are two peer reviewed articles of importance to the Project baseline environment which have been published since the original MEA. Hague et al., (2020) indicates the presence of the following cetacean species in the Outer Hebrides area: harbour porpoise, Risso's dolphin, white-beaked dolphin, and common dolphin – with harbour porpoise densities being the highest for this region.

Waggit et al (2020) provides updated habitat modelling of cetacean species density estimates, indicating that harbour porpoise, common dolphin, white-beaked dolphin and minke whale are present at the highest densities at the Project cable corridor.

In general, the information presented in Hague et al. (2020) and Waggit et al. (2020) is consistent with the information presented within the original MEA.

<u>Marine mammal management unit updates:</u>

IAMMWG (2015) described the marine mammal management unit boundaries and abundance estimates at the time of the original MEA. IAMMWG (2015) was superseded by IAMMWG (2022), predominantly to update management unit abundance estimates and also by IAMMWG (2023) to update management unit boundaries (Hammond et al., 2021). There are not considered to be any material changes from the original MEA conclusions as a result of these updates.

<u>Seals:</u>

The most recent information on seal at-sea usage is provided by Carter et al., (2022) which supersedes Russel et al., (2017). Carter et al., (2022) show an at-sea harbour seal population of 0.001-0.05% per 25 km^2 along the Project cable corridor and a grey-seal at-sea population estimate of 0-0.025% per 25 km^2. The information presented within SCOS (2022) provides the most up to date seal population estimates in Scotland. The SCOS (2023) interim report also provides detailed advice on potential impacts to seals, ongoing research and conservation issues[3]. It is noted in SCOS (2022) that populations of harbour seal and grey seal in Western Scotland and the Western Isles are stable or increasing. This updated information does not materially change the assessment conducted within the MEA. The original MEA does not provide any at-sea seal population estimates but does note that grey and harbour seals may potentially be present in the Project cable corridor. This marine mammal baseline update is not considered to materially alter the conclusions of the original MEA.

<u>Conclusion:</u>

Additional studies and reports, as outlined above, provide further information on the marine mammal receptors present in the vicinity the Project cable corridor. The updated baseline information provides more up-to-date information on the expected density and distribution of marine mammals in the Project cable corridor and builds on the information presented within the MEA. Therefore, the updated baseline information does not materially change any assessment of sensitivity or impact magnitude. The Applicant is cognisant of the sensitivities of marine mammals in the region and the recent strandings off the Isle of Lewis[4]. However, mitigations will be applied to minimise any impacts from the Project, with the implementation of a Marine Mammal Protection Plan. Any impacts to marine mammals will be temporary and highly localised, and the baseline updates will not alter this conclusion. Overall, baseline updates are not considered to materially change the conclusions of the MEA and will not be considered further in the MEA Addendum.</td><td>No</td></tr>
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[3] The SCOS (2022) annual meeting was held in January 2023, due to a change in the SCOS meeting timings during the COVID-19 pandemic. The SCOS (2023) was scheduled for August 2023 (i.e. aligned pre-COVID-19 meeting schedule). Due to the short intervening period between January and August 2023, no new seal population estimates were available for SCOS (2023). Therefore, the SCOS (2023) interim report discusses matters relation to conservation and management of seals.

[4] https://bdmlr.org.uk/pilot-whale-mass-stranding-isle-of-lewis

Summary of Original MEA Assessment		Updated Information and Screening Assessment for MEA Addendum	Included in MEA Addendum?
Impact Assessment	The following impacts were considered for the original MEA: • Increased sediment suspension affecting ability to forage; and • Injury and/or disturbance from underwater noise emissions (including from vessel and cable lay and geophysical survey activities). Increased sediment suspension affecting the ability to forage was assessed as being not significant (minor level of impact). Underwater noise models were used to quantify potential injury or disturbance ranges from geophysical survey activities, using Southall et al. (2007) "*Marine Mammal Noise Exposure Criteria: Initial Scientific Recommendations*". The noise propagation models indicated that although thresholds for injury were not exceeded for vessels and cable lay operations. Disturbance was predicted out to approximately 5 km, but a strong disturbance response was only predicted within 500 m. Thresholds for injury were predicted to be exceeded for Multi-Beam Echosounder (MBES), Side-Scan Sonar (SSS) and Sub-Bottom Profiler (SBP). However, when considering the implementation of embedded mitigation measures, including a Marine Mammal Protection Plan and the establishment of a 500 m marine mammal mitigation zone, injury to marine mammals was considered unlikely. Potential disturbance impacts were assessed as only being likely to occur within 330 m of the noise source. Overall, it was concluded that any disturbance caused was unlikely to compromise regional movements, breeding, feeding or other life functions. Cumulative impacts with other projects, plans and activities were also assessed. Considering the localised and short-term nature of the underwater noise impacts associated with vessel and cable lay operations, it was concluded that a significant cumulative impact was unlikely. Additionally, no significant cumulative impacts were predicted from a geophysical survey perspective due to the highly directional nature of this sound source.	Project Design Refinements: The Project Design Refinements have the potential to result in a new or increased impact for marine mammals via the following pathway (see Table 2): • Increased presence of vessels in the nearshore environment for drilling of up to 14 boreholes could increase the potential for disturbance and/or displacement of mobile species. The increased presence of vessels associated with the nearshore drilling activities has the potential to disturb or displace mobile species, including marine mammals. However, the addition of a small number of vessels for the nearshore drilling activities will not result in a material change to the magnitude of impact, beyond what was already assessed in the original MEA. The mitigations presented within the original MEA (e.g. implementation of Marine Mammal Protection Plan, as required) would also be applied to the vessels undertaking the nearshore drilling activities. Furthermore, there is already vessel activity in the region, such as at the Arnish Point landfall, which is in close proximity to Stornoway Port and the Arnish Fabrication yard, (e.g. the annual average vessel density is reported as very high (Marine Directorate, 2024a). Therefore, the vessel activity associated with drilling activities does not represent a substantial change from baseline vessel activity. Therefore, this impact **will not** be considered further within the MEA Addendum. It is also possible for nearshore drilling of boreholes to introduce underwater sound to the marine environment which could impact marine mammals. Huang *et al.* (2023) investigated the impact of nearshore drilling of boreholes, using in-field measurements of hammering, vibrating and drilling. It was found that sound levels only marginally exceeded the injury thresholds for VHF cetaceans and seals at 18 m from the source, and reduced to below injury thresholds for all cetaceans and seals at 280 m. In terms of disturbance impacts, Huang *et al.* (2023) recorded that hammering sounds were undetectable beyond 1.9 km from the noise source. This represents the distance at which sound was detectable above background levels, rather than the distance at which disturbance impacts would occur, which would be at a lesser distance than 1.9 km. Considering the highly localised and temporary nature of the underwater sound impacts associated with nearshore drilling, no significant impacts would be anticipated on marine mammals, and this impact **will not** be considered further within the MEA Addendum. Cumulative effects: Additionally, there is the potential for updates in nearby plans, projects or activities to change the conclusions of the cumulative effects assessment presented in the original MEA The extension of the Stornoway Port is still ongoing (including the Deep Water Terminal, now consented, and the Deep Water South project, at Scoping). It is predicted that the Deep Water Port Terminal will be constructed by November 2025, which will be prior to construction commencing for the Project (Stornoway Port, 2024a). No publicly available information was identified for the timelines of the construction of the Deep Water South project. However, the Deep Water South Scoping Report outlines that no potential significant effects are predicted in relation to underwater noise (the key cumulative impact with the Project) (Stornoway Port, 2024b). There are two new aquaculture sites identified within Little Loch Broom since the original MEA (see ecological protected sites above). Taking the temporary and highly localised nature of the underwater noise into account, there is considered to be no potential for a significant cumulative effect from the Project with the Deep Water South project and the two new aquaculture sites. Therefore, cumulative effects with other projects, plans and activities **will not** be considered further in the MEA Addendum. Other relevant updates: In addition to the above, the impact assessment methodology for assessing underwater noise impacts on marine mammals has changed since the original MEA. The underwater noise assessments within the original MEA adopted the Southall *et al.,* (2007) noise thresholds, which are now superseded by Southall *et al*., (2019). The Southall *et al.,* (2019) noise thresholds consider four hearing groups (low, high, and very high frequency cetaceans and phocid carnivores in water), whereas the Southall *et al.,* (2007) considered low, mid and high frequency cetaceans and phocid carnivores in water. Southall *et al.,* (2019) also updates marine mammal hearing ranges and Permanent Threshold Shift (PTS) and Temporary Threshold Shift (TTS) onset criteria and derive new auditory weighting criteria. The use of these updated thresholds would alter the noise modelling outputs used to inform the marine mammals impact assessment within the original MEA (Appendix C of the original MEA). Despite these potential updates to the injury and disturbance ranges presented in the original MEA, given the highly localised and temporary nature of the underwater sound impacts associated with the Project, any increase is not expected to be of an extent that would materially alter the conclusions of the MEA, when embedded mitigations (e.g. adherence to a Marine Mammal Protection Plan) are considered. Furthermore, the Applicant will apply for relevant European Protected Species (EPS) licences for any activities that have the potential to injure or disturb EPS, supported by an EPS risk assessment which would consider the most up to date noise thresholds, with appropriate mitigations proposed. As a result, the update to the underwater noise modelling thresholds **will not** be considered in the MEA Addendum.	

Summary of Original MEA Assessment		Updated Information and Screening Assessment for MEA Addendum	Included in MEA Addendum?
Commercial Fisheries			
Baseline Environment	The baseline description for commercial fisheries identified that a range of fishing methods were operated along the Project cable corridor (i.e. International Council for the Exploration of the Sea (ICES) rectangles 44E4, 45E3 and 45E4). *Nephrops* were the most valuable species, with other important species including brown crab (*Cancer pagurus*), velvet crab (*Necora puber*), lobsters, scallop, wrasses (*Labridae* family), herring, haddock (*Melanogrammus aeglefinus*), monkfish (*Lophius* family) and saithe (*Pollachius virens*). With regards to salmon and sea trout fisheries, only the rod fishery was operational in 2016 in the Outer Hebrides and North-West fishery regions, with approximately 9,055 sea trout and salmon caught in 2016. Additionally, the commercial fisheries chapter considers potential impacts on aquaculture sites. There were 19 aquaculture sites identified within 2 km of the Project cable corridor, mostly located within Little Loch Broom.	<u>Commercial fisheries statistics:</u> The most recent landings data (2019 - 2023) indicates that *Nephrops* remain as the most valuable targeted species within the area, with other important species being brown crab, lobsters, wrasse, scallop, herring and haddock, consistent with the baseline described within the original MEA (MMO, 2024). <u>Salmon and sea trout fisheries statistics:</u> There continues to be no net fisheries in the Outer Hebrides and North-West fishery region since 2015, in line with the prohibition of coastal salmon netting in Scotland since 2016. Based on the most recent salmon and sea trout fishery statistics for 2023 (Scottish Government, 2024), total reported rod catch of wild salmon is the lowest since records began in 1952 and fifth lowest for sea trout. A total of 5,288 salmon and sea trout were caught via rod in 2023 in the Outer Hebrides and North-West fisheries regions, which is less than the 2016 data presented in the original MEA. This is reflective of the general decline in salmon and sea trout across Scotland (Scottish Government, 2024). <u>Aquaculture sites:</u> Two new aquaculture sites have been identified within Little Loch Broom: the replacement brood stock fish farm at Ardessie[5] (22/06182/FUL) and the proposed new native flat oyster farm near Durnamuck (23/05105/SCRE). Additionally, the Badluarach (ID: SS0823) and LLB (ID: SS0895) aquaculture sites that were previous active at the time of the original MEA are now inactive. <u>Conclusion:</u> None of the updates to commercial fisheries statistics, salmon and sea trout statistics or aquaculture sites are predicted to materially change the assessment of commercial fisheries in the original MEA and therefore the assessment within the original MEA remains valid. The original MEA concluded that sediment suspension would be temporally and spatially limited and therefore would not affect the nearest aquaculture site, located 114 m away. This justification is applicable to the new aquaculture sites and therefore no sediment suspension impacts are anticipated. Nevertheless, the Applicant will engage with the operators to ensure impacts are minimised as far as is reasonably practicable. Considering this, no significant impacts would be expected on the two new aquaculture sites. Therefore, these baseline updates **will not** be considered in the MEA Addendum.	No
Impact Assessment	The following impacts were considered for the original MEA: • Loss of access to fishing grounds; • Sediment suspension (aquaculture); and • Change in distribution of target species. All impacts were assessed as not significant (minor level of impact). During installation and maintenance and repair activities, it was assessed that any loss of access will be temporary in nature and localised to the proposed cable works. During operation, any permanent loss of access was assessed as minor, given the limited footprint of the cable in the context of the wider availability of fishing grounds. Sediment redistribution impacts during installation were assessed as being limited in temporal and spatial scale with no significant impact predicted on fish populations or local aquaculture sites. Additionally, no significant impacts were identified as a result of changes in the distribution of target species.	<u>Project Design Refinements:</u> The Project Design Refinements have the potential to result in a new or increased impacts for commercial fisheries via the following pathway (see Table 2): • Increased presence of vessels in the nearshore environment could increase the disturbance to other users of the sea. The addition of a small number of vessels for the borehole drilling activities will not result in a material change to the magnitude of impact beyond what was already assessed in the original MEA. Therefore, this impact **will not** be considered further within the MEA Addendum. In addition to rock protection, there is potential to surface lay the cable with other external protection methods within the Wester Ross NCMPA (e.g. nature inclusive protection and tubular protection systems) which could pose a greater risk to demersal fishing activity (see Section 1.2.2). Nevertheless, interaction with demersal fishing gear will be taken into account in the design of all external protection, in line with industry best practice guidance. The Applicant's general position is that fishing over operational cables should be avoided, in line with the MGN 661 (MCA, 2021a) and the NP100 Mariner's Handbook (UKHO, 2023). Furthermore, given the highly localised spatial footprint of the subsea cable and associated protection, and with consideration of the fact that the location of the cable and protection will be chartered, a surface laid cable within the Wester Ross NCMPA does not represent a material change to the magnitude of impact beyond what was already assessed in the original MEA. Therefore, this **will not** be considered further within the MEA Addendum.	

[5] The Ardessie brood stock fish farm replaces the inactive hatchery at Ardessie that was identified in the original MEA.

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<tr><td></td><td></td><td><u>Cumulative effects:</u>

Additionally, there is the potential for updates in nearby plans, projects, or activities to change the conclusions of the cumulative effects assessment presented in the original MEA. There are two new aquaculture sites identified within Little Loch Broom since the original MEA (see ecological protected sites above), however, given the small scale of these developments and the Project, no significant cumulative effects are predicted. Therefore, cumulative effects with other projects, plans and activities will not be considered further in the MEA Addendum.</td><td></td></tr>
<tr><td colspan="4">Shipping and Navigation</td></tr>
<tr><td>Baseline Environment</td><td>Appendix B of the original MEA presents the Navigational Risk Assessment (NRA) for the Project. The NRA presents a baseline assessment for navigational features and shipping activity, informed by Automatic Identification System (AIS) data (2017), VMS data (2014-2017) and UK admiralty charts. Meetings were held with the Maritime and Coastguard Agency (MCA) and Northern Lighthouse Board (NLB) on shipping and navigation issues to inform the NRA.

Key navigational features identified include Ullapool and Stornoway harbours, anchorage areas and aids to navigation at the approach to both landfalls, routing measures in the North Minch [redacted]. Baseline shipping analysis identified that the most frequently recorded vessels at the Project cable corridor were fishing vessels, cargo vessels and recreational vessels. The busiest areas in terms of shipping were aligned with the recommended northbound/southbound routes used by commercial vessels transiting through the North Minch and the ferry routes between Ullapool and Stornoway. Stornoway Harbour was also identified as a busy area due to vessels entering and leaving the harbour and the approach to the landfall at Arnish Point is located within the Statutory Harbour Limits for this harbour.</td><td>The baseline environment is expected to remain valid, and no additional navigational features were identified. Shipping density data available through EMODnet (2023), derived from AIS data for 2019 to 2023, generally corroborate the shipping baseline analysis presented in the original MEA, showing cargo vessels travelling through the North Minch, fishing vessels in the vicinity of the Project cable corridor and a passenger vessel route between Ullapool and Stornoway. Since the original MEA, Ullapool Harbour Trust has submitted a planning application for the inner harbour development at Ullapool harbour including 400 m of additional berthing. Stornoway Deep Water Terminal is expected to be constructed by 2025 and will provide facilities for larger vessels at the Stornoway Port and for servicing offshore wind farm and renewable project sites. This could alter the vessel activity present in the region. However, the potential expansion of the Stornoway Port was already considered within the original MEA, as highlighted during consultation (see Section 3 of Appendix B of the original MEA). Although there may be some changes in vessel traffic associated with the Stornoway Port expansion, the area around the Stornoway Port was already assessed as a busy commercial area. The additional mitigation proposed in the NRA, including consultation with Stornoway Harbour and targeted circulation of information, will ensure impacts to nearby vessels (including those associated with the Stornoway Port expansion) will be effectively managed. Furthermore, a cumulative assessment with consideration of the Stornoway Port expansion was carried out within the original NRA and concluded that no significant effects are anticipated. Therefore, these baseline updates, mainly the Stornoway Port expansion, will not result in a material change to what was assessed in the original MEA.

Therefore, no material change from the original MEA have been identified and baseline updates for shipping and navigation will not be considered in the MEA Addendum.</td><td>Yes</td></tr>
<tr><td>Impact Assessment</td><td>The NRA was conducted in accordance with using International Maritime Organisation (IMO) Formal Safety Assessment (FSA) Methodology (IMO, 2002), and MGN 543 Offshore Renewable Energy Installations – Guidance on UK Navigational Practice, Safety and Emergency Response Issues (MCA, 2016). The following impacts were considered in the NRA that informed the original MEA:

• Collision of a passing (third party) vessel with a vessel associated with the cable installation;
• Cable installation causing disruption to passing vessel routeing/timetables;
• Cable installation causing disruption to fishing activities;
• Cable installation causing disruption to military exercises;
• A vessel drags anchor over the cable;
• A vessel drops anchor in an emergency over the cable;
• A vessel founders (sinks) onto the cable;
• A vessel drops an object, e.g., container, onto the cable;
• A vessel engaged in fishing snags its gear on the cable;
• Collision of a passing vessel with a vessel associated with maintenance works/monitoring of the cable; and
• EMF interference with navigational equipment on-board passing traffic (i.e. compass deviation).

All impacts were assessed as tolerable or broadly acceptable. Cumulative impacts with the Stornoway Port were also considered, including in the scenario where construction of this port overlaps with the construction of the Project. It recommended that consultation is undertaken with Stornoway Port to ensure both construction projects are managed to minimise disruption and collision risk.</td><td><u>Project Design Refinements:</u>

The Project Design Refinements have the potential to result in new or increased impacts for shipping and navigation via the following pathways (see Table 2):

• Increased presence of vessels in the nearshore environment could increase the disturbance to other users of the sea; and
• A change in cable capacity and voltage may alter the compass deviation effects.

The addition of a small number of vessels for the nearshore drilling activities will not result in a material change to the magnitude of impact beyond what was already assessed in the original MEA. Therefore, this impact will not be considered further within the MEA Addendum.

The original MEA presents an assessment of compass deviation, highlighting that compass deviation effects are most likely to occur in shallow waters, and therefore unlikely to affect larger vessels broadcasting AIS. Considering the potential increase in cable voltage and capacity, compass deviation impacts will be considered in the MEA Addendum.

<u>Cumulative effects:</u>

The extensions of the Stornoway Port are still ongoing (including the Deep Water Terminal, now consented, and the Deep Water South project, at Scoping). It is predicted that the Deep Water Port Terminal will be constructed by November 2025, which will be prior to construction commencing for the Project (Stornoway Port, 2024a). No publicly available information was identified for the timelines of the construction of the Deep Water South project. The expansion of the Stornoway Port was already considered within the original NRA, and a recommendation was made to consult Stornoway Harbour to ensure disruption and collision risk impacts are managed, and this recommendation remains valid. With the implementation of this recommendation, no significant cumulative impacts with the Stornoway Port would be predicted. In addition, two new aquaculture sites within Little Loch Broom have been identified since the original MEA, and vessel traffic associated with these sites could act cumulatively with the Project. However, given the small scale of these aquaculture sites, and considering that the majority of the vessel traffic would be minimal and local to the site and onshore base, no significant cumulative effects with these sites would be predicted. Therefore, cumulative effects with other projects, plans and activities will not be considered further in the MEA Addendum.</td><td></td></tr>
</table>

Summary of Original MEA Assessment		Updated Information and Screening Assessment for MEA Addendum	Included in MEA Addendum?
	The following recommendations to minimise impacts on shipping and navigation receptors were made: • Targeted circulation of information about the project to regular commercial operators (e.g., ferry), and local small vessel stakeholders (fishing and recreation) two weeks prior to offshore work commencing; and • Stornoway Harbour should be kept consulted throughout the Project to manage access issues and any impacts on anchorages.	<u>Other relevant updates:</u> In addition to the above, revised guidance from the MCA (2021b) on assessing shipping and navigation impacts on offshore renewable energy installations was published in 2021 (MGN 654: Safety of Navigation: Offshore Renewable Energy Installations (OREIs) - Guidance on UK Navigational Practice, Safety and Emergency Response). The FSA guidelines were also updated in April 2018 (IMO, 2018). The updates to these guidance documents have the potential to result in updates to the NRA presented in the original MEA. However, there are no material changes to the assessment methodologies applicable to cable projects compared to previous guidance, e.g. the methodology used in the Original MEA is in line with the updated guidance, and considering the temporary and localised nature of any impacts, the conclusions within the original NRA remain valid. Therefore, this update **will not** be considered in the MEA Addendum.	
Other Sea Users			
Baseline Environment	Relevant other sea users identified within the original MEA included: • Telecommunication cables – BT HIE telecommunication which follows a similar route across the Minch between Stornoway to Ullapool, and two BT cables which run north-south through Little Loch Broom; • [redacted] • Anchorages – large unchartered anchorage located off Arnish Point Landfall – used by vessels transiting through the Minch, other smaller chartered anchorages located within the Project area included along north shores of Little Loch Broom; • Aquaculture sites – several aquaculture sites in the vicinity of the Project cable corridor, mainly shellfish, predominantly located in Little Loch Broom; and • Area of foul ground located just offshore from Arnish Point – used for disposal of harbour dredge material is currently used by fishermen for disposing of trawling wires and debris.	KIS-ORCA (2024) indicates that the BT HIE telecommunications cable and two BT cables are still active. [redacted] A number of anchor berths and anchorage areas are located nearshore around Arnish Point / Stornoway and within Loch Broom (i.e. the development of 400 m of berthing as part of the Ullapool marina development) and Little Loch Broom (Marine Directorate, 2024a). Two new aquaculture sites have been identified within Little Loch Broom, including the replacement brood stock fish farm at Ardessie and the proposed native flat oyster farm near Durnamuck (THC planning references 22/06182/FUL and 23/05105/SCRE), as outlined for commercial fisheries above. Several active sites at the time of the original MEA are now inactive. Overall, the updated information to the baseline environment since the original MEA submission does not represent a substantial change, given that the characterisation of subsea cables, [redacted] anchorages and areas of foul ground in the original MEA are still applicable. As outlined above for commercial fisheries, there are not expected to be any material changes to the original MEA as a result of the additional aquaculture sites in Little Loch Broom. Therefore, baseline updates for other sea users **will not** be considered further in the MEA Addendum.	No
Impact Assessment	The following impacts were considered within the original MEA: • Interaction with recreational vessels and those making use of known anchorages; and • Interaction with other subsea infrastructure. Due to the highly localised nature and short-term duration of the works, no significant impacts against other sea users were predicted. Impacts to this topic were not assessed further to determine and/or identify management/mitigation measures (see Table 7.1 of the original MEA).	<u>Project Design Refinements:</u> The Project Design Refinements have the potential to result in a new or increased impact for other sea users via the following pathway (see Table 2): • Increased presence of vessels in the nearshore environment could increase the disturbance to other users of the sea. The addition of a small number of vessels for the nearshore drilling activities will not result in a material change to the magnitude of impact beyond what was already assessed in the original MEA. Therefore, this impact **will not** be considered further within the MEA Addendum. <u>Cumulative effects:</u> Additionally, there is the potential for updates in nearby plans, projects, or activities to change the conclusions of the cumulative effects assessment presented in the original MEA. There are two new aquaculture sites identified within Little Loch Broom since the original MEA (see ecological protected sites above), however, given the small scale of these developments and the Project, no significant cumulative effects are predicted. Therefore, cumulative effects with other projects, plans and activities **will not** be considered further in the MEA Addendum.	

Summary of Original MEA Assessment	Updated Information and Screening Assessment for MEA Addendum	Included in MEA Addendum?
Population and Human Health		
As part of the consultation to inform the Scottish Ministers opinion, Comhairle nan Eilean Siar (Local Planning Authority), responded that the application would benefit from consideration of the potential effects of the Project on population and human health. Impacts scoped in for the assessment included: • Impacts on employment, business, and residents; • Direct and indirect impacts on tourism and recreational issues in the vicinity (including countryside and coastal access); and • Community attitudes, perceptions, and aspirations. Any impacts from subsea cable installation works are expected to be very limited due to the localised nature and short duration of the works. Only minor impacts on tourism or recreation are expected during the time of works, predominantly at the landfalls, including to the Dundonnell hotel which is in close proximity to the Scottish Mainland landfall. In relation to community attitudes, perceptions and aspirations, the original MEA notes that community views varied between the Isle of Lewis and the Scottish Mainland. The aspirations of the community on the Isle of Lewis were that the Project could facilitate the development of renewable energy potential on Lewis, and secure skilled jobs. The Dundonnell community raised some concerns around potential environmental impacts and recommended that the landfall point for the cable was made at Dundonnell and not Mungasdale, which was a previous option for the Project. The fishing community had also raised concerns, all of which the Project aimed to address through the cable design, Cable Burial and Protection Plan (CBPP) and as part of ongoing consultation throughout the Project.	No baseline characterisation is specifically presented within the original MEA and the assessment of impacts to population and human health mainly draw on consultation with relevant communities at Dundonnell and the Isle of Lewis. The assessment is considered to remain valid and there will be no significant deviation from the original MEA conclusions as a result of the Project Design Refinements. Therefore, impacts to population and human health **will not** be considered further in the MEA Addendum.	No

3. Conclusions

The Gap Analysis in Section 2 presents a review of the information within the original MEA for the Project submitted to MS-LOT in 2018 and identifies the impacts and topics that require further consideration within the MEA Addendum to support the Marine Licence variation request.

In most instances, it was assessed that the Project Design Refinements will not result in any material changes to the assessment or conclusions presented within the original MEA, and therefore, will not require consideration within the MEA Addendum. The topics identified as requiring consideration in the MEA Addendum are listed Table 4, along with a proposed approach to the assessment.

Table 4 Topics for consideration in the MEA Addendum

Topic for consideration	Impacts requiring further assessment	Proposed approach
Ecological Protected Sites	• The change in cable capacity and voltage altering the EMF intensities; • Increased disturbance footprint for northern feather star aggregations within the Wester Ross NCMPA; and • Increased seabed disturbance footprint associated with the drilling of up to 14 boreholes and the temporary presence of jack-up vessels or spud leg barges.	The MEA Addendum will present a new EMF effects assessment, supported by a Project-specific EMF modelling study for the updated cable voltage and capacity. The EMF effects assessment will include consideration of the effects on the benthic features of the Wester Ross NCMPA (benthic invertebrate only) and the sandeel features of the North-East NCMPA. An updated assessment will be presented to account for the additional seabed disturbance caused by the drilling of nearshore boreholes (including jack-up vessel or spud leg barge) on benthic features of the Wester Ross NCMPA. An updated assessment will also be presented to account for the larger disturbance footprint for northern feather star aggregations in the Wester Ross NCMPA as a result of the proposed change to the mitigation for this feature (see Section 1.2.2). The assessment for northern feather star aggregations will be informed by the latest 2024 surveys and the Ocean Infinity (2024) analysis.
Benthic and Intertidal Ecology	• The change in cable capacity and voltage altering the EMF intensities; • Increased disturbance footprint for northern feather star aggregations within the Wester Ross NCMPA; and • Increased seabed disturbance footprint associated with the drilling of up to 14 boreholes and the temporary presence of jack-up vessels or spud leg barges.	The MEA Addendum will present a new EMF effects assessment, supported by a Project-specific EMF modelling study for the updated cable voltage and capacity. The EMF assessment will include consideration of the effects on benthic receptors potentially present in the Project cable corridor. An updated assessment will be presented to account for the additional seabed disturbance caused by the drilling of nearshore boreholes (including jack-up vessel or spud leg barge) on benthic and intertidal ecology receptors. An updated assessment will also be presented to account for the larger disturbance footprint for northern feather star aggregations in the Wester Ross NCMPA as a result of the proposed change to the mitigation for this feature (see Section 1.2.2). The assessment for northern feather star aggregations will be informed by the latest 2024 surveys and the Ocean Infinity (2024) analysis.

Topic for consideration	Impacts requiring further assessment	Proposed approach
Fish and Shellfish	• The change in cable capacity and voltage altering EMF intensities.	A new EMF effects assessment will be described within the MEA Addendum, supported by a Project-specific EMF modelling study for the updated cable voltage and capacity. This assessment will focus on electro-sensitive species (e.g. diadromous fish, shellfish and elasmobranchs).
Shipping and Navigation	• The change in cable capacity and voltage may alter the compass deviation effects.	A new compass deviation assessment will be described within the MEA Addendum to assess effects on shipping and navigation receptors. This will be supported by a Project-specific compass deviation study.

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Appendix B: Western Isles HVDC Link Electromagnetic Field and Compass Deviation Study Technical Note

Scottish and Southern Electricity Networks – Transmission

Western Isles HVDC Link: Electromagnetic Field and Compass Deviation Study Technical Note

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REVISIONS & APPROVALS

REV	DATE	DESCRIPTION	ISSUED	CHECKED	APPROVED	CLIENT
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A02	11/02/2025	Re-Issued for Use	JG	JA	JG	SSEN-T
A01	20/01/2025	Issued for Use	MS	JG	JA	SSEN-T
R01	10/01/2025	Issued for Review	DC	MS	JA	SSEN-T

CONTENTS

ACRONYMS

ACRONYM	DEFINITION
DC	Direct Current
DoL	Depth of Lowering
EMF	Electromagnetic Field
GIS	Geographic Information System
HDD	Horizontal Directional Drilling
HVDC	High Voltage Direct Current
Km	Kilometre
KP	Kilometre Point
kV	Kilovolt
m	Metre
MCA	Maritime and Coastguard Agency
NKT	Nordiske Kabel og Traadfabriker
NOAA	National Oceanic and Atmospheric Administration
RPL	Route Position List
SSEN	Scottish and Southern Electricity Networks
µT	Micro-Tesla

1 INTRODUCTION

Scottish and Southern Electricity Networks - Transmission (SSEN Transmission), the trading name for Scottish Hydro Electric Transmission plc ('The Applicant'), hold a licence under the Electricity Act 1989 for the transmission of electricity in the north of Scotland. In February 2021, SSEN Transmission gained consent for the construction of the Western Isles High Voltage Directional Current (HVDC) Link ('the Project') through a Marine Licence (MS-00008738) issued under Part 4 of the Marine (Scotland) Act 2010. The Project is part of the wider Western Isles Connection Project that will reinforce the electrical network connection between the Western Isles and the Scottish Mainland.

This report provides calculation outputs for Electromagnetic Field (EMF) emissions and compass deviations along the subsea cable route of the Project between Arnish Point and Dundonnell (hereafter 'subsea cable route'). Two High Voltage Direct Current (HVDC) systems have been compared. Both would operate as a bipole system either at ±525 kilovolt (kV) or ±320 kV. One cable will be the positive pole and the other cable the negative pole, both carrying the same magnitude current.

With the exception of Arnish Point and Dundonnell landfalls, cables will be installed a bundled pair. Parameters provided by SSEN Transmission for EMF and compass deviation calculations are outlined in Table 1.

Table 1. Parameters provided for the proposed HVDC subsea cable systems

Parameter	Input		Unit
System voltage	±525	±320	kV
Current	2330	937	A
Cable outside diameter	152.6	116.9	mm
Bundled cables separation distance	0.1526	0.1169	m
Separate laid cables spacing	10.0		m

Installation arrangements of the cables and geomagnetic field intensities and directions were determined. The input model parameter used in this assessment are summarised as:

- Kilometre Point (KP) locations along the subsea cable route;
- Proposed Route Position List (RPL);
- Geomagnetic field intensities and directions at each assessment location;
- The circuit angle with respect to Magnetic North at each assessment location;
- Seawater depth between mean seabed level and sea surface at each assessment location;
- Target Depth of Lowering (DoL) at each assessment location; and
- Installation configuration of bundled or separate lay.

Calculations of EMF intensities were made at the seabed surface and at heights of; 1.0 m, 5.0 m and 10.0 m above the seabed surface. Compass deviations were calculated at the seawater surface (representing the worst case, given that ships' compasses are located in the bridge or wheelhouse, some point above the sea level), based on water depths, cable configurations and target DoL.

All calculations of EMF intensities and compass deviations included allowance for the Earth's geomagnetic field intensities, field directions and the angle of declination between Magnetic North with True North. The subsea cable route between Dundonnell and Arnish Point is shown in Figure 1.

The diagram in Figure 2 illustrates Horizontal Direction Drilling (HDD) exit pits locations, target DoLs, KP locations and cable installation configurations along the subsea cable route across the Minch, between Arnish point and Dundonnell. These details were taken from information supplied by SSEN Transmission.

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Figure 1. Western Isles HVDC subsea cable route map between Arnish Point and Dundonnell

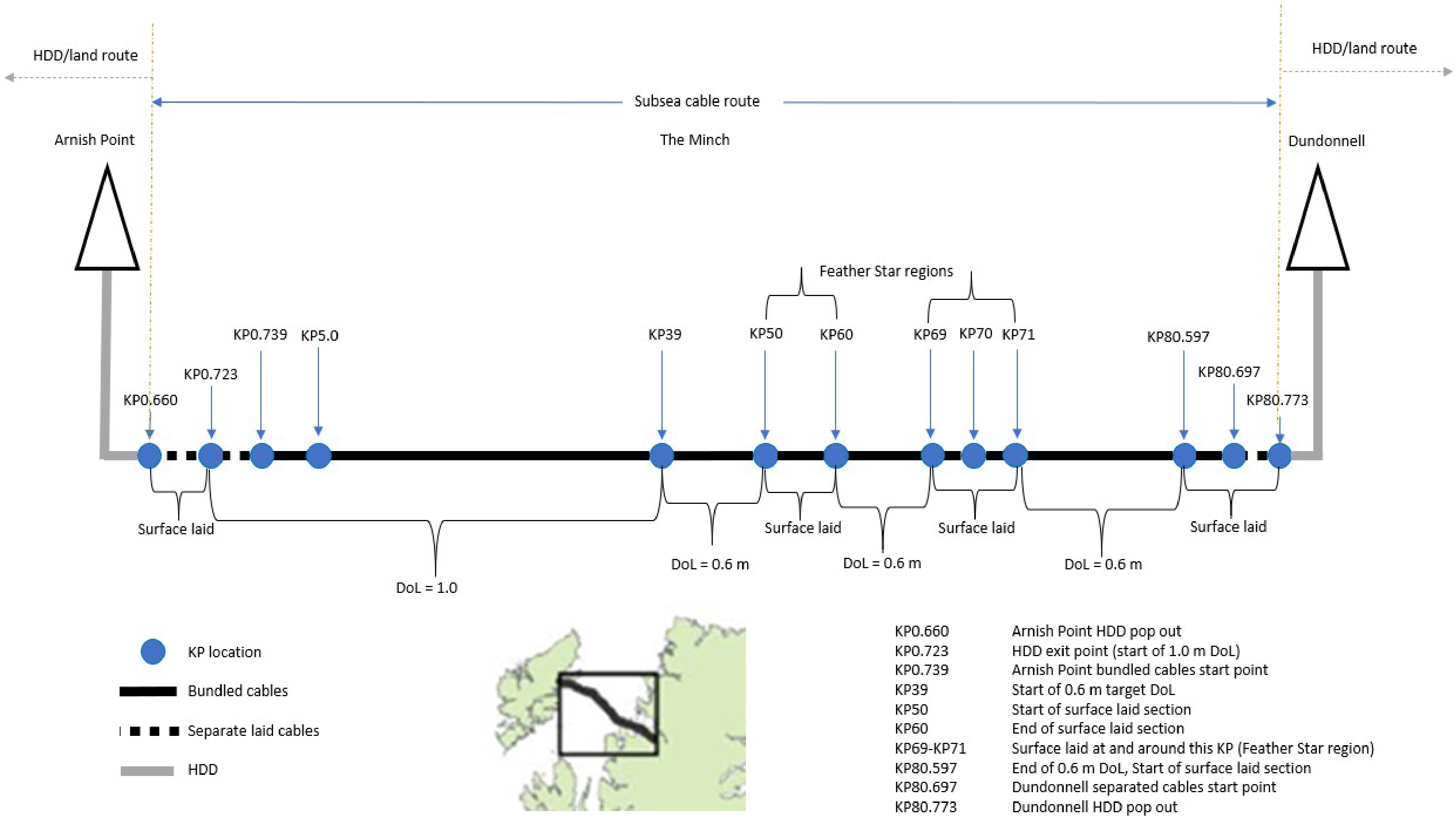

Figure 2. Illustration of target DoL, KP locations and cable configurations along the subsea cable route

EMF intensity from the cables and associated compass deviations were calculated between the HDD pop outs at Arnish Point and Dundonnell.

The configuration of the cables is taken as buried or surface laid according to target DoLs indicated in Figure 2. The seabed between KP50 to KP60 and around KP70 have been identified as Northern feather star (*Leptometra celtica*) regions and cables may be surface laid, the modelling has assumed surface laid configuration in these regions as a worst case. Calculations were performed every 1.0 kilometre (km) in these regions to provide additional detail.

For the remainder of the subsea cable route, the resolution for EMF and compass deviation calculations has been determined according to seawater depth as stated in Table 2.

Table 2. EMF and Compass deviation calculation resolution criteria

Water depth (m)	Resolution criteria for calculations (m)
< 30	100
30-50	500
50-70	1000
> 70	2000

2 THEORY

2.1 The Geomagnetic Field

The Earth generates its own magnetic field (geomagnetic field) which varies in intensity and orientation according to position. The geomagnetic field slightly varies in time, although it is referred to as the 'static' geomagnetic field. The geomagnetic field is at maximum intensity where field lines converge at the poles, and weakest at the equator where field lines tend to diverge.

The Earth's geomagnetic field has North and South poles, termed as the magnetic North and South pole. Figure 3 represents Earth's orthogonal, three-dimensional coordinate system which is applied for EMF and compass deviation calculations. Declination angle 'D' indicates angular difference between True North and Magnetic North.

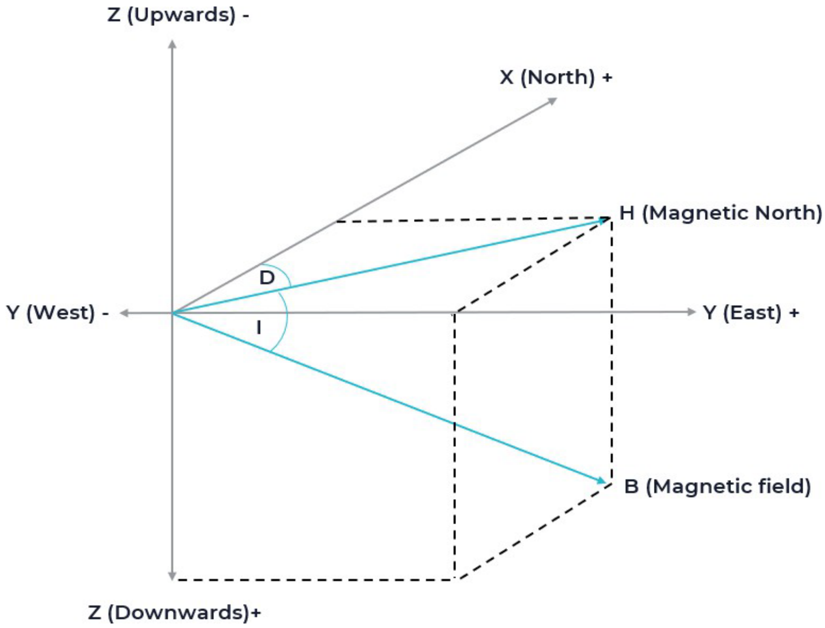

Figure 3. Geomagnetic field components and compass directions

The declination angle is applied to ensure that the EMF generated by the subsea cables is aligned with Magnetic North.

The compass direction along each of the X, Y and Z axes indicates if the EMF component vector is positive or negative. The geomagnetic field at the assessment locations was determined and added to calculated EMF intensities from the cable. The components shown in Figure 3 are such that:

- Declination positive when East of North, negative when West of North;
- Inclination positive in the Downward direction;
- X-axis positive in the North direction, negative in the South direction;
- Y-axis positive in the East direction, negative in the West direction; and
- Z-axis positive in the downward direction, and negative in the upward direction.

For all EMF and compass deviation calculations along the subsea cable route an average geomagnetic field intensity of 50.722 micro-Tesla (μT) has been applied. Average EMF intensities were considered applicable as there is limited variation along subsea cable route. Table 3 provides the geomagnetic field intensities and directions used for the EMF and compass deviation calculations.

Table 3. Geomagnetic field directions and intensities applied for calculations

Geomagnetic field vector	EMF intensity X (μT)	EMF intensity Y (μT)	EMF intensity Z (μT)
Minimum	16.2323	-0.6456	47.9447
Maximum	16.3918	-0.4915	48.0846
Variation	0.1595	0.1541	0.1399
Average over KP0.7 to KP81	16.2974	-0.5792	48.0289

2.2 Electromagnetic Fields from Cables

When a current passes through a conductor an EMF is generated around the conductor and propagates into the surrounding environment. An electric field is produced by the applied voltage and contained by the shielded construction of the cable, within the insulation system and managed by conductor and insulation screens.

The intensity of the magnetic field is proportional to current flowing through the conductor, and inversely proportional to distance from the cable. The magnetic field from a current carrying conductor may be viewed as concentric, closed loops that reduce in intensity as distance to the conductor is increased. This is described by Ampere's Law and calculated according to the Biot-Savart Law, given in Equation 1.

$$B = \frac{\mu_0 \mu_r I}{r} \tag{1}$$

Where:

B	Magnetic field	(μT)
μ_0	Absolute permeability	(H/m)
μ_r	Relative permeability	
I	Current	(A)
r	Distance to point of interest	(m)

The calculations in this report have assumed that magnetic relative permeability of seawater, the seabed and all cable layers is 1.0 [3], i.e., relative permeability μ_r= 1.0.

Current and magnetic field vectors form an orthogonal vector space. The resultant EMF from the cable is always perpendicular to current flow direction. The worst case (for EMF intensities) is when the EMF generated by the cable aligns exactly with the direction of magnetic North. This occurs when the cable is installed at approximately 90 degrees to the geomagnetic field's horizontal intensity component.

For HVDC systems, EMF calculations require superposition of the geomagnetic field, and combined interactions of both pole cables' EMFs.

2.3 Compass Deviation

The static EMF generated by a subsea HVDC cable modifies the direction and intensity of horizontal field components near the cable. For compass deviation assessment, only horizontal components of the field in the North-South and

East-West directions are required. The Z-axis EMF component acts in the vertical plane, so does not influence compass deviation.

Compass deviation tends to zero when the cable is installed approximately in the East-West direction. This arrangement allows the cable's horizontal field component to align more closely with Magnetic North. Compass deviation is greatest when the cable is installed approximately North-South, as the cable's horizontal field component is then approximately ninety degrees to Magnetic North. The cable configuration and water depth also significantly influence the resulting compass deviation.

Figure 4 shows true compass directions and how earth's geomagnetic field and cable EMF north-south and East-West vectors combine in the horizontal plane [4]. A negative compass deviation angle is to the West of North, and a positive angle to the East.

To assess the influence of the resulting static EMF from subsea HVDC cables, it is common to consider if compass deviation thresholds of 3 and 5 degrees are exceeded along the offshore route. Compass deviations of 5 degrees and 3 degrees were considered by the Maritime and Coastguard Agency (MCA) as thresholds of acceptance for other HVDC subsea connection projects [1, 2]. These thresholds are based on providing acceptable reference headings. Guidance from the MCA on acceptable levels of compass deviation resulting from subsea cables allows no more than 3 degrees of compass deviation for 95% of the subsea cable route, with the remaining 5% of the route not exceeding five degrees.

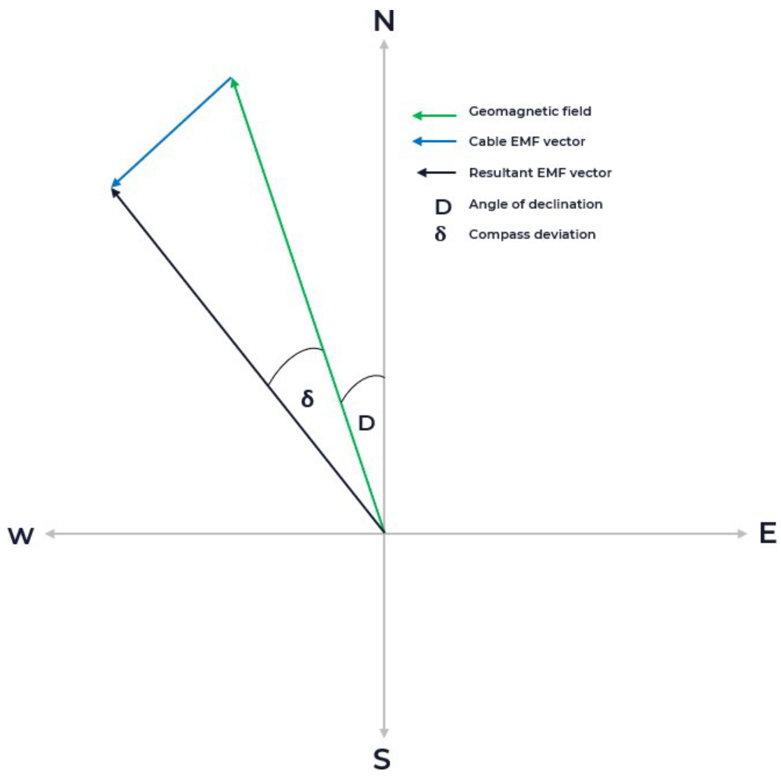

Figure 4. Compass deviation illustration due to interaction with a HVDC cable EMF

The EMF from the cables is vectorially added to the geomagnetic field. The geomagnetic field intensities and directions are aligned with Magnetic North according to the circuit angle and declination. In Figure 4, the vectors and angles are illustrated in the X-Y horizontal plane:

- Geomagnetic field – The vector shown in green is the geomagnetic horizontal intensity field vector, pointing towards Magnetic North;
- Cables EMF vector – The vector shown in blue is the resultant EMF horizontal vector generated by the cables only;
- Resultant EMF vector – The vector shown in black is the combined, resultant vectors for the geomagnetic field and cables;
- Angle of declination – The angle D is the angle between Magnetic North and geographic North (N); and
- Compass deviation – The angle δ is between the horizontal intensity geomagnetic field vector and the resultant-combined EMF vector.

Calculation of compass deviation is performed in the horizontal plane only, and requires using EMF components from the cables (Y_{Cable}) and the geomagnetic field (Y_{GM}) [4]. The trigonometric tangent function is applied with horizontal components from the cable and the geomagnetic horizontal intensity vector. The angle of compass deviation is derived from Equation 2.

$$\delta = arctan\,\left(\frac{Y_{CABLE}}{\sqrt{X_{GM}^2 + Y_{GM}^2}}\right) \qquad (2)$$

Where:

δ	Compass deviation	(degrees);
D	Angle of Declination	(degrees);
Y_{Cable}	Y component of the cables EMF	(μT);
Y_{GM}	Y component of the geomagnetic field	(μT);
X_{Cable}	X component of the cables EMF	(μT); and
X_{GM}	X component of the geomagnetic field	(μT).

In Equation 2, the horizontal EMF component from the cable would comprise the addition of horizontal components from both pole cables.

3 METHODOLOGY

3.1 Calculation Requirements

This section outlines requirements and assumptions made for EMF and compass deviation studies. The following assumptions have been made:

- Current flow is within the conductor and is assumed constant;
- No harmonic currents, transient signals or Direct Current (DC) ripple have been included or their effects modelled;

- Power core positions are modelled as bundled along the subsea cable route, unless stated as separated;
- No distortion causes by external influences is included, such as other cables, pipelines, nearby metallic structures and magnetic anomalies;
- Calculations do not include any EMF attenuation caused by armour wire layers or metallic sheath;
- Target DoL is assumed between top of the cable and mean seabed level and is taken as constant;
- No allowance is made for seabed mobility;
- Coordinates of latitude and longitude were used by the Xodus geospatial team to determine accurate circuit angles and water depths, then applied within the National Oceanic and Atmospheric Administration (NOAA) online calculator [4] and used to calculate earth's magnetic field at KP locations;
- The seabed and seawater are assumed homogenous and magnetic permeability of the seabed and seawater is taken as $\mu_r = 1.0$. No allowance has been made for Basalt, Hematite or Magnetite sedimentary compositions, which may slightly increase magnetic permeability; and
- Trench back-fill material is assumed to have the same properties of the surrounding seabed.

3.2 Electromagnetic Field Calculations

This section describes how the cables EMF is added to Earth's geomagnetic field. The cables are assumed buried within the Y-Z plane (or surface laid where indicated), with current flow in the X-axis direction. To allow the addition of the cables EMF to the geomagnetic field, the coordinate system shown in Figure 3 is applied to EMF component vectors, with respect to Magnetic North.

The cable is centred at the origin, and interactions between current and the magnetic field are described by Ampere's Law. The Biot-Savart Law provides a method to calculate the EMF generated by the current. These vector relations are according to "Fleming's left hand and right-hand rules" with regards to EMF and current directions.

Figure 5 shows a pair of buried HVDC pole cables, separated between centres by distance 'd' in the Y-Z plane. Distance 'd' is equal to the cable outside diameter for a bundled pair. The grey circle represents the point of calculation where EMF intensities are determined. Dashed lines show the pole cable resultant distances to the point of calculation and EMF component vectors, calculated with a Pythagorean identity for each pole cable.

The coordinate axis for the Y-Z plane is shown in grey, with direction signs in brackets. The calculation point is referenced to the seabed level and target DoL. The target DoL is taken as the vertical distance from mean seabed level to top of the cables. The geomagnetic field at the KP of calculation is indicated in green.

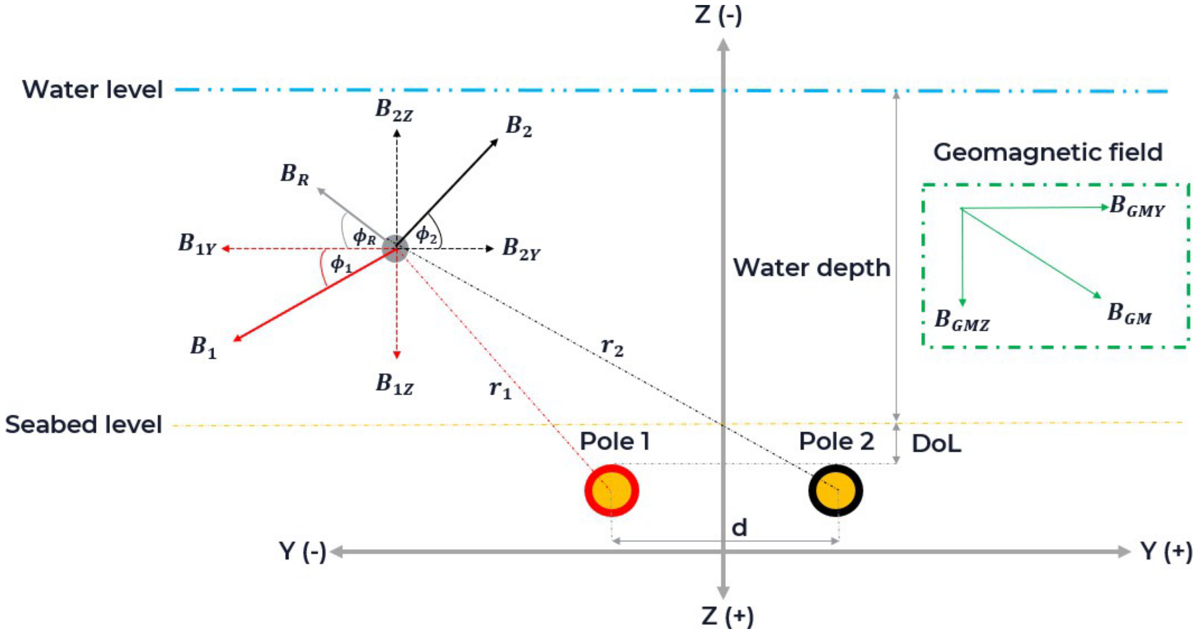

Figure 5. Magnetic field vectors for a pair of HVDC pole cables

In Figure 5 current flow is assumed in the X-axis (out of or into the page) with vectors, distances and relations:

Pole 1	Positive pole cable with current flow out of the page;
Pole 2	Negative pole cable with current flow into the page;
Y-axis	East-West directions axis;
Z-axis	Upwards-downwards directions axis;
d	Separation distance between pole cable centres;
DoL	Target Depth of Lowering
B_R	Resultant combined EMF vector;
B_{1Y}	Pole 1 EMF component vector in the Y-axis;
B_{1Z}	Pole 1 EMF component vector in the Z-axis;
B_1	Pole 1 resultant EMF vector;
B_2	Pole 2 resultant EMF vector;
B_{2Y}	Pole 2 EMF component vector in the Y-axis;
B_{2Z}	Pole 2 EMF component vector in the Z-axis;
B_{GMY}	Geomagnetic field component vector in the Y-axis;
B_{GMZ}	Geomagnetic field component vector in the Z-axis;
B_{GM}	Resultant geomagnetic field;
r_1	Resultant distance from pole 1 centre to calculation point;
r_2	Resultant distance from pole 2 centre to calculation point;
ϕ_1	Angle between pole 1 resultant EMF and horizontal axis;
ϕ_2	Angle between pole 2 resultant EMF and horizontal axis; and
ϕ_R	Angle between resultant EMF and horizontal axis.

As illustrated in Figure 5 the resultant EMF vector from each pole cable is split into horizontal and vertical components. This allows addition of pole cable EMFs with Earth's geomagnetic field components and hence, the combined resultant EMF to be calculated.

3.3 Compass Deviation Calculations

Compass deviation calculations have been carried out at the seawater surface level for KP locations. The EMF component perpendicular to the cable, in the Z-axis direction is not considered, as it will not affect magnetic compass orientation [3].

At the assessment locations, the mean seawater depths were applied along with the circuit angles with respect to Magnetic North. The geomagnetic field component directions and intensities were calculated by Xodus geospatial team using the NOAA online tool [4]. The circuit angles and water depths were determined using the RPL and the project's bathymetric survey data using Arc GIS Pro.

Calculation of compass deviation is performed in the horizontal plane only, and requires using components of EMFs from the cable (Y_{Cable}) and that of the geomagnetic field as given by Equation 2.

4 RESULTS

4.1 Electromagnetic Field Calculations

This section summarises outputs from EMF calculations for the 320 kV cables and the 525 kV cables. Calculations of EMF were performed according to target DoLs and bundled or separated configurations as indicated in Figure 2. For surface laid cables, a maximum EMF at 0 m is equivalent to the cable outside surface, whereas for buried cables, this relates to the seabed surface level, based on target DoL.

4.1.1 NKT 320 kV 1,130 mm^2 cable

Calculations were performed for a Nordiske Kabel og Traadfabriker (NKT) subsea cable "320 kV AXBLTV 1×1,130 mm^2" with an outside diameter of 116.9 mm. The technical specification was provided by SSEN Transmission. A separation distance between pole cable centres of 10.0 m has been applied for the Arnish Point and Dundonnell landfalls, as illustrated in Figure 2.

Table 4 provides a summary of EMF intensities calculated for the 320 kV cable along the subsea cable route at the seabed level and representative heights above it. The summarised points were chosen based on altering DoL, cable configuration, Northern feather star regions and HDD pop outs. All EMF calculations were performed between KP0.660 and KP80.773 at a resolution according to Table 2. The configurations in Table 4 cover all arrangements of installation.

Full results from EMF calculations for the NKT 320 kV cable along the subsea cable route between KP0.660 and KP80.773 are tabulated and provided in Appendix A.1.

Table 4. Summary of NKT 320 kV cable EMF intensities along and above the seabed for KP locations

KP	Region	Water depth (m)	Target DoL (m)	Configuration of cables	Maximum EMF intensity above seabed (μT)			
					0 m	1 m	5 m	10 m
0.660	Arnish Point HDD pop out	21.77	Surface laid	Separated	3,268.27	205.14	86.91	65.07
1.0	Subsea cable route	27.15	1.0	Bundled	71.86	55.97	51.3	50.9
40.3	Subsea cable route	121.73	0.6	Bundled	109.85	59	51.39	50.91
50.3	Northern feather star region	83.32	Surface laid	Bundled	3,251.91	69.6	51.54	50.93
69	Northern feather star region	59.625	Surface laid	Bundled	3,252.6	69.75	51.55	50.93
72	Subsea cable route	66.21	0.6	Bundled	109.96	59.04	51.4	50.91
80	Subsea cable route	35.91	0.6	Bundled	109.83	58.98	51.40	50.91
80.773	Dundonnell HDD pop out	10.00	Surface laid	Separated	3,270.39	206.78	87.07	65.13

4.1.2 NKT 525 kV 2,800 mm^2 cable

Calculations were performed for an NKT subsea cable "525 kV 1x2,800 mm^2 FXBLTV" with an outside diameter of 152.6 mm. The technical specification was provided by SSEN Transmission.

Table 5 provides a summary of EMF intensities calculated for the NKT 525 kV cable along the subsea cable route at the seabed level and at representative heights above it.

Full results from EMF calculations for the NKT 525 kV cable along the subsea cable route between KP0.660 and KP80.773 are tabulated and provided in A.3.

Table 5. NKT 525 kV cable EMF intensities along and above the seabed for KP locations

KP	Region	Water depth (m)	Target DoL (m)	Configuration of cables	Maximum EMF intensity above seabed (µT)			
					0 m	1 m	5 m	10 m
0.660	Arnish Point HDD pop out	21.77	Surface laid	Separated	6,197.50	456.22	141.20	86.59
1.0	Subsea cable route	27.15	1.0	Bundled	120.02	67.88	52.61	51.28
40.3	Subsea cable route	121.73	0.6	Bundled	243.18	77.72	52.91	51.33
50.3	Northern feather star region	83.32	Surface laid	Bundled	6,156.04	110.53	53.38	51.4
69	Northern feather star region	59.625	Surface laid	Bundled	6,156.58	110.77	53.4	51.4
72	Subsea cable route	66.21	0.6	Bundled	243.34	77.82	52.92	51.34
80	Subsea cable route	35.91	0.6	Bundled	242.97	77.70	52.91	51.33
80.773	Dundonnell HDD pop out	10.00	Surface laid	Separated	6,199.63	458.14	141.44	86.69

4.2 Compass Deviation Calculations

This section summarises outputs from compass deviation calculations for the NKT 320 kV cables and the 525 kV cables. Calculations of compass deviation were performed according to target DoLs and bundled or spaced arrangements as indicated in Figure 2.

4.2.1 NKT 320 kV 1130 mm^2 cable

Table 6 provides a summary of compass deviations calculated for the NKT 320 kV cable along the subsea cable route at the sea level. All compass deviation calculations were carried out between KP0.660 and KP80.773 (where water depth reaches 0 m).

Table 6. NKT 320 kV cable maximum compass deviations at sea level for KP locations along the subsea cable route

KP	Region	Water depth (m)	Target DoL (m)	Configuration of cables	Angle of Declination (Degrees)	Maximum compass deviation at sea level (Degrees)
0.66	Arnish Point HDD pop out	21.77	Surface laid	Separated	-2.273	8.652
1.0	Subsea cable route	27.15	1.0	Bundled	-2.272	0.054
40.3	Subsea cable route	121.73	0.6	Bundled	-1.993	0.002
50.3	Northern feather star region	83.32	Surface laid	Bundled	-1.933	0.006
69	Northern feather star region	59.63	Surface laid	Bundled	-1.802	0.008
72	Subsea cable route	66.21	0.6	Bundled	-1.78	0.006
80	Subsea cable route	35.91	0.6	Bundled	-1.72	0.029
80.773	Dundonnell HDD pop out	10.00	Surface laid	Separated	-1.720	36.200

The plot of Figure 6 shows maximum compass deviations and water depths along KP locations of the subsea cable route. Target DoLs are indicated with a background colour. The full results from compass deviation calculations are tabulated for locations between KP0.66 and KP80.773 and provided in A.2.

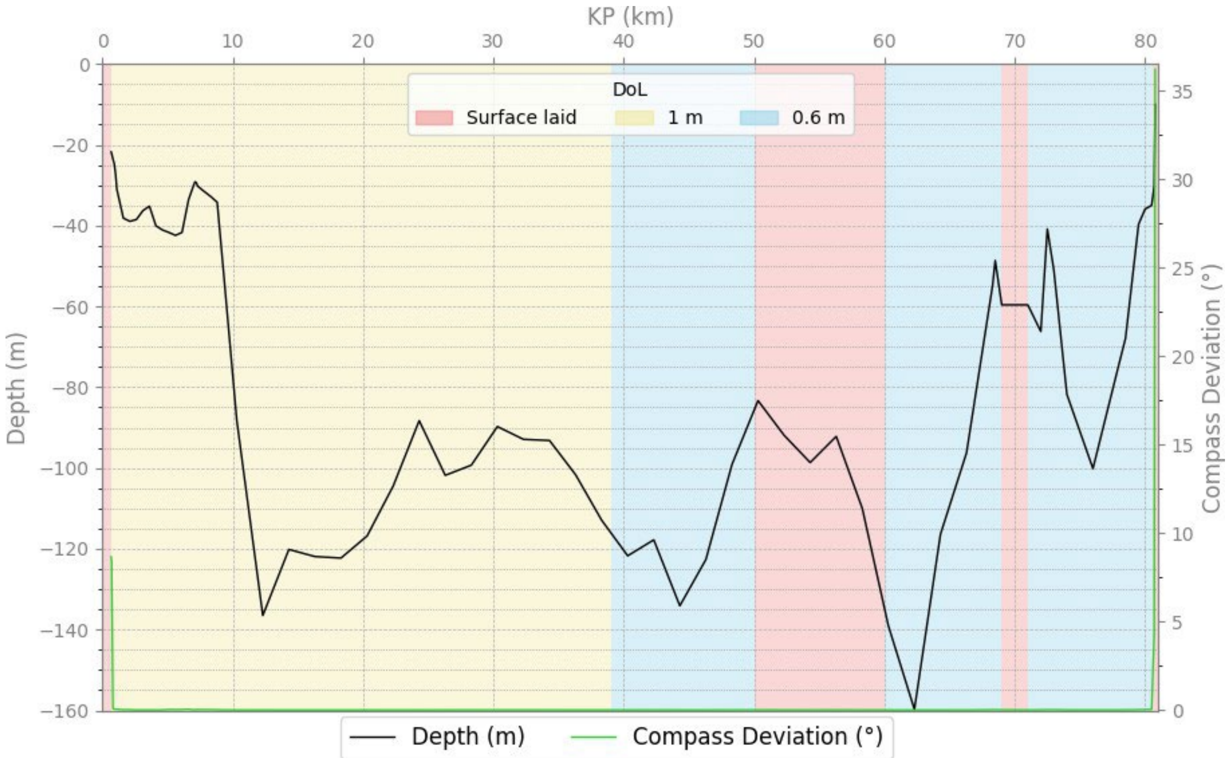

Figure 6. NKT 320 kV cable maximum compass deviations along the subsea cable route indicating water depths

4.2.2 NKT 525 kV 2800 mm^2 cable

Table 7 provides a summary of compass deviations calculated for the NKT 525 kV cable along the subsea cable route at the sea level.

Table 7. NKT 525 kV maximum compass deviations at sea level for KP locations along the subsea cable route

KP	Region	Water depth (m)	Target DoL (m)	Configuration of cables	Angle of Declination (Degrees)	Maximum compass deviation at sea level (Degrees)
0.66	Arnish Point HDD pop out	21.77	Surface laid	Separated	-2.273	20.411
1.0	Subsea cable route	27.15	1.0	Bundled	-2.272	0.174
40.3	Subsea cable route	121.73	0.6	Bundled	-1.993	0.008
50.3	Northern feather star region	83.32	Surface laid	Bundled	-1.933	0.019
69	Northern feather star region	59.63	Surface laid	Bundled	-1.802	0.026
72	Subsea cable route	66.21	0.6	Bundled	-1.78	0.021
80	Subsea cable route	35.91	0.6	Bundled	-1.72	0.090
80.773	Dundonnell HDD pop out	10.00	Surface laid	Separated	-1.720	87.030

The plot of Figure 7 shows maximum compass deviations and water depths along KP locations of the subsea cable route. Full results from compass deviation calculations are tabulated for locations between KP0.660 and KP80.773 and provided in A.4.

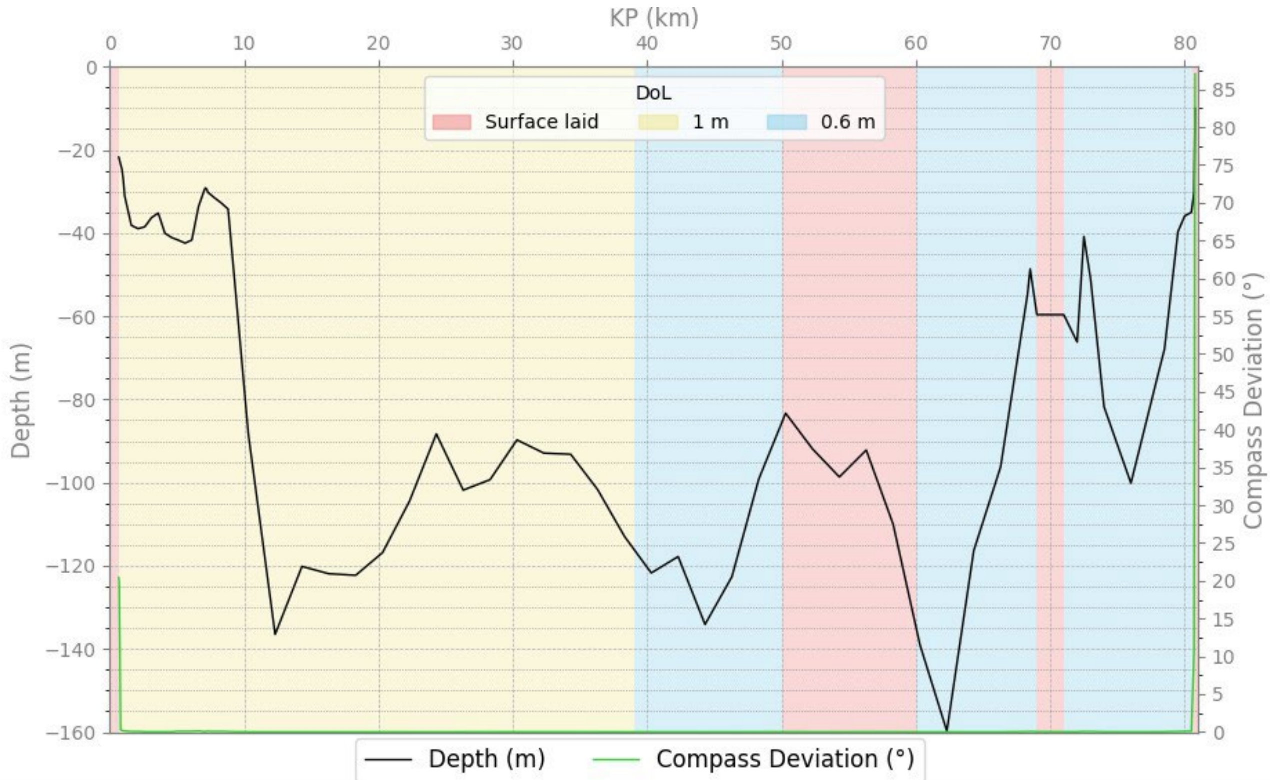

Figure 7. NKT 525 kV cable maximum compass deviations along the subsea route indicating water depths

5 DISCUSSION

This report has provided theoretical EMF and compass deviation calculations for assessment locations along the subsea cable route for the Project between Arnish Point and Dundonnell. Cable dimensions, system configurations and current flows were provided by SSEN Transmission. Circuit angle, water depths and geomagnetic field intensities and directions were determined by Xodus. The Xodus geospatial team derived precise circuit angles and water depths using ArcGIS Pro, based on data provided by the SSEN Transmission.

Calculations showed that EMF intensities for the 320 kV cable would be lower, in comparison to the 525 kV cable. This is attributed to a reduced power transmission capacity of the 320 kV system, resulting in a lower system current. For both the 320 kV and 525 kV systems, an increased DoL provided increased mitigation of EMF intensities at the seabed and in the water column above the cables. At 10 m above the cable, calculated EMF intensities are similar to the background geomagnetic field, as are EMF intensities at the seabed at 10 m horizontal distances from the cables. The exception is when cables are separated and surface laid, where the EMF intensity is initially calculated at the cable surface.

Bundling of pole cables generally produces more field cancellations between poles, resulting in a decreased overall EMF intensity, in comparison to separately laid cables. For a significant length of the subsea cable route between Arnish Point and Dundonnell, the cables will be bundled. Only 255 m of the route is proposed to have the cables installed separately, on the approach to the HDD exit pits at each landfall.

Compass deviation is influenced by current, water depth and angle between magnetic North and the cables. When the cables are installed approximately East-West, the horizontal EMF component from the cables align with the direction of Magnetic North, resulting in little or no compass deviation. Most of the subsea cable route between Arnish Point and Dundonnell is approximately in an East-West direction.

An increased resolution of compass deviation calculation was provided according to water depths along the subsea cable route. However, all calculations for the bundled cables showed that compass deviations were below three degrees for both the 320 kV and 525 kV systems. A 5 degrees compass deviation was exceeded for both the 320 kV and 525 kV system at KP0.66, KP0.7 and KP80.773, where cables were modelled as surface laid and separated by 10 m.

Compass deviations were increased for the 525 kV cable, in comparison to the 320 kV cable. For the 525 kV cable route, less than 0.15% of the values exceed 5 degrees where the cables are separated at the HDD, with the remaining 99.85% of the route remaining below 3 degrees. For the 320 kV cable route, less than 0.15% of the values were above 5 degrees where the cables are separated at the HDD, 0.1% exceeded 3 degrees and the remaining 99.75% were below 3 degrees.

6 REFERENCES

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APPENDIX A

A.1 EMF intensities for the NKT 320 kV cable

Table 8. NKT 320 kV cable maximum EMF intensities between KP0.7 to KP81.1

KP	Circuit angle West (Degrees)	Sea water depth (m)	Declination (Degrees)	Target DoL (m)	Configuration of cables	Maximum EMF intensity above the cable (µT)			
						0 m	1 m	5 m	10 m
0.660	31.82	21.77	-2.27387	0	Surface laid/separate	3268.27	205.14	86.91	65.07
0.7	31.82	22.16	-2.27387	0	Surface laid/separate	3268.27	205.14	86.91	65.07
0.8	31.82	23.50	-2.27331	1	Bundled	71.84	55.97	51.30	50.90
0.9	31.82	24.66	-2.27276	1	Bundled	71.86	55.97	51.3	50.9
1.0	31.82	27.15	-2.2722	1	Bundled	71.86	55.97	51.3	50.9
1.1	32.54	31.02	-2.27164	1	Bundled	71.86	55.98	51.3	50.9
1.6	52.64	38.16	-2.26825	1	Bundled	72.03	56.03	51.31	50.9
2.1	52.64	38.94	-2.26472	1	Bundled	72.03	56.03	51.31	50.9
2.6	82.29	38.50	-2.26106	1	Bundled	72.2	56.1	51.32	50.9
3.1	82.29	36.30	-2.25726	1	Bundled	72.2	56.1	51.32	50.9
3.6	82.28	35.19	-2.25346	1	Bundled	72.2	56.1	51.32	50.9
4.1	82.28	40.06	-2.24966	1	Bundled	72.2	56.1	51.32	50.9
4.6	82.28	41.08	-2.24586	1	Bundled	72.2	56.1	51.32	50.9
5.1	3.27	41.71	-2.24211	1	Bundled	71.74	55.93	51.3	50.89
5.6	3.26	42.42	-2.23846	1	Bundled	71.74	55.93	51.3	50.89
6.1	8.26	41.69	-2.23484	1	Bundled	71.75	55.93	51.3	50.89
6.6	4.37	33.62	-2.23129	1	Bundled	71.74	55.93	51.3	50.89
7.0	74.71	29.94	-2.22837	1	Bundled	72.17	56.09	51.32	50.9
7.1	74.71	29.16	-2.22761	1	Bundled	72.17	56.09	51.32	50.9
7.2	59.47	29.38	-2.22684	1	Bundled	72.08	56.05	51.31	50.9
7.3	58.83	30.23	-2.22611	1	Bundled	72.07	56.05	51.31	50.9
7.8	61.36	31.55	-2.22243	1	Bundled	72.09	56.06	51.31	50.9
8.3	61.36	32.79	-2.21872	1	Bundled	72.09	56.06	51.31	50.9
8.8	66.35	34.24	-2.21496	1	Bundled	72.13	56.07	51.32	50.9
9.3	66.35	51.99	-2.21118	1	Bundled	72.13	56.07	51.32	50.9
10.3	71.27	88.13	-2.20355	1	Bundled	72.16	56.08	51.32	50.9
12.3	63.64	136.51	-2.18853	1	Bundled	72.11	56.06	51.32	50.9
14.3	69.92	120.16	-2.17339	1	Bundled	72.15	56.08	51.32	50.9
16.3	69.91	121.92	-2.15821	1	Bundled	72.15	56.08	51.32	50.9

KP	Circuit angle West (Degrees)	Sea water depth (m)	Declination (Degrees)	Target DoL (m)	Configuration of cables	Maximum EMF intensity above the cable (μT)			
						0 m	1 m	5 m	10 m
18.3	76.97	122.29	-2.14301	1	Bundled	72.18	56.09	51.32	50.9
20.3	65.27	116.83	-2.12782	1	Bundled	72.12	56.07	51.32	50.9
22.3	65.26	104.5	-2.11285	1	Bundled	72.12	56.07	51.32	50.9
24.3	83.01	88.29	-2.09786	1	Bundled	72.2	56.1	51.32	50.9
26.3	43.77	101.81	-2.08368	1	Bundled	71.95	56	51.31	50.9
28.3	43.76	99.30	-2.0708	1	Bundled	71.95	56	51.31	50.9
30.3	44.06	89.74	-2.05791	1	Bundled	71.95	56	51.31	50.9
32.3	44.06	92.91	-2.04502	1	Bundled	71.95	56	51.31	50.9
34.3	44.05	93.19	-2.03215	1	Bundled	71.95	56	51.31	50.9
36.3	44.04	101.66	-2.01929	1	Bundled	71.95	56	51.31	50.9
38.3	43.73	112.92	-2.00647	1	Bundled	71.95	56.01	51.31	50.9
40.3	43.73	121.73	-1.99368	0.6	Bundled	109.85	59	51.39	50.91
42.3	43.72	117.79	-1.98092	0.6	Bundled	109.85	59	51.39	50.91
44.3	43.71	134.11	-1.96816	0.6	Bundled	109.85	59	51.39	50.91
46.3	41.74	122.64	-1.95818	0.6	Bundled	109.85	59	51.39	50.91
48.3	41.73	99.15	-1.94577	0.6	Bundled	109.85	59	51.39	50.91
50.3	35.06	83.32	-1.93314	0	Bundled/ surface laid	3251.91	69.6	51.54	50.93
52.3	81.81	91.90	-1.91951	0	Bundled/ surface laid	3253.11	69.89	51.56	50.94
54.3	72.45	98.65	-1.90454	0	Bundled/ surface laid	3253	69.86	51.56	50.93
56.3	53.75	92.18	-1.88998	0	Bundled/ surface laid	3252.56	69.74	51.55	50.93
58.3	59.30	110.00	-1.87596	0	Bundled/ surface laid	3252.72	69.78	51.56	50.93
60.3	73.98	139.04	-1.86164	0.6	Bundled	110.16	59.1	51.41	50.91
62.3	78.65	159.76	-1.84672	0.6	Bundled	110.2	59.11	51.41	50.91
64.3	82.60	116.39	-1.83205	0.6	Bundled	110.22	59.12	51.41	50.91
66.3	77.22	96.23	-1.81714	0.6	Bundled	110.19	59.11	51.41	50.91
68.3	37.05	54.78	-1.80363	0.6	Bundled	109.76	58.96	51.39	50.91
68.5	37.05	48.63	-1.80248	0.6	Bundled	109.76	58.96	51.39	50.91
69.0	55.05	59.62	-1.79923	0	Bundled/ surface laid	3252.6	69.75	51.55	50.93
70.0	55.05	59.62	-1.79923	0	Bundled/ surface laid	3252.6	69.75	51.55	50.93

KP	Circuit angle West (Degrees)	Sea water depth (m)	Declination (Degrees)	Target DoL (m)	Configuration of cables	Maximum EMF intensity above the cable (μT)			
						0 m	1 m	5 m	10 m
71.0	55.05	59.62	-1.79923	0	Bundled/ surface laid	3252.6	69.75	51.55	50.93
72.0	54.79	66.21	-1.77856	0.6	Bundled	109.96	59.04	51.4	50.91
72.5	54.78	40.82	-1.7765	0.6	Bundled	109.96	59.04	51.4	50.91
73.0	32.25	51.05	-1.77222	0.6	Bundled	109.7	58.94	51.39	50.91
74.0	54.65	81.77	-1.7655	0.6	Bundled	109.96	59.04	51.4	50.91
76.0	52.20	100.14	-1.7531	0.6	Bundled	109.94	59.03	51.4	50.91
78.0	63.75	74.25	-1.73891	0.6	Bundled	110.06	59.07	51.4	50.91
78.5	50.70	67.88	-1.73553	0.6	Bundled	109.92	59.02	51.4	50.91
79.5	54.86	39.67	-1.72828	0.6	Bundled	109.96	59.04	51.4	50.91
80	42.30	35.91	-1.72483	0.6	Bundled	109.829	58.98	51.4	50.91
80.5	40.90	35.00	-1.72181	0.6	Bundled	109.811	58.977	51.4	50.91
80.7	39.18	30.25	-1.72002	0	Surface laid/separate	3270.01	206.48	87.04	65.12
80.773	40.90	10.00	-1.72002	0	Surface laid/separate	3270.39	206.78	87.07	65.13

A.2 Compass deviations for the NKT 320 kV cable

Table 9. NKT 320 kV cable maximum compass deviations along the seabed between KP0.660 and KP80.773

KP	Circuit angle West (Degrees)	Sea water depth (m)	Declination (Degrees)	Target DoL (m)	Configuration of cables	Maximum compass deviation at sea surface (Degrees)
0.660	19.50	21.77	-2.27387	0	Surface laid/separate	8.652
0.7	31.82	22.16	-2.27387	0	Surface laid/separate	8.412
0.8	31.82	23.50	-2.27331	1	Bundled	0.082
0.9	31.82	24.66	-2.27276	1	Bundled	0.065
1.0	31.82	27.15	-2.2722	1	Bundled	0.054
1.1	32.54	31.02	-2.27164	1	Bundled	0.041
1.6	52.64	38.16	-2.26825	1	Bundled	0.02
2.1	52.64	38.94	-2.26472	1	Bundled	0.019
2.6	82.29	38.50	-2.26106	1	Bundled	0.004
3.1	82.29	36.30	-2.25726	1	Bundled	0.005
3.6	82.28	35.19	-2.25346	1	Bundled	0.005
4.1	82.28	40.06	-2.24966	1	Bundled	0.004
4.6	82.28	41.08	-2.24586	1	Bundled	0.004
5.1	3.27	41.71	-2.24211	1	Bundled	0.027

KP	Circuit angle West (Degrees)	Sea water depth (m)	Declination (Degrees)	Target DoL (m)	Configuration of cables	Maximum compass deviation at sea surface (Degrees)
5.6	3.26	42.42	-2.23846	1	Bundled	0.026
6.1	8.26	41.69	-2.23484	1	Bundled	0.027
6.6	4.37	33.62	-2.23129	1	Bundled	0.042
7.0	74.71	29.94	-2.22837	1	Bundled	0.014
7.1	74.71	29.16	-2.22761	1	Bundled	0.014
7.2	59.47	29.38	-2.22684	1	Bundled	0.029
7.3	58.83	30.23	-2.22611	1	Bundled	0.027
7.8	61.36	31.55	-2.22243	1	Bundled	0.023
8.3	61.36	32.79	-2.21872	1	Bundled	0.021
8.8	66.35	34.24	-2.21496	1	Bundled	0.016
9.3	66.35	51.99	-2.21118	1	Bundled	0.007
10.3	71.27	88.13	-2.20355	1	Bundled	0.002
12.3	63.64	136.51	-2.18853	1	Bundled	0.001
14.3	69.92	120.16	-2.17339	1	Bundled	0.001
16.3	69.91	121.92	-2.15821	1	Bundled	0.001
18.3	76.97	122.29	-2.14301	1	Bundled	0.001
20.3	65.27	116.83	-2.12782	1	Bundled	0.001
22.3	65.26	104.5	-2.11285	1	Bundled	0.002
24.3	83.01	88.29	-2.09786	1	Bundled	0.001
26.3	43.77	101.81	-2.08368	1	Bundled	0.003
28.3	43.76	99.30	-2.0708	1	Bundled	0.004
30.3	44.06	89.74	-2.05791	1	Bundled	0.004
32.3	44.06	92.91	-2.04502	1	Bundled	0.004
34.3	44.05	93.19	-2.03215	1	Bundled	0.004
36.3	44.04	101.66	-2.01929	1	Bundled	0.003
38.3	43.73	112.92	-2.00647	1	Bundled	0.003
40.3	43.73	121.73	-1.99368	0.6	Bundled	0.002
42.3	43.72	117.79	-1.98092	0.6	Bundled	0.003
44.3	43.71	134.11	-1.96816	0.6	Bundled	0.002
46.3	41.74	122.64	-1.95818	0.6	Bundled	0.002
48.3	41.73	99.15	-1.94577	0.6	Bundled	0.004
50.3	35.06	83.32	-1.93314	0	Bundled/surface laid	0.006
52.3	81.81	91.90	-1.91951	0	Bundled/surface laid	0.001
54.3	72.45	98.65	-1.90454	0	Bundled/surface laid	0.002
56.3	53.75	92.18	-1.88998	0	Bundled/surface laid	0.003
58.3	59.30	110.00	-1.87596	0	Bundled/surface laid	0.002
60.3	73.98	139.04	-1.86164	0.6	Bundled	0.001
62.3	78.65	159.76	-1.84672	0.6	Bundled	0
64.3	82.60	116.39	-1.83205	0.6	Bundled	0
66.3	77.22	96.23	-1.81714	0.6	Bundled	0.001
68.3	37.05	54.78	-1.80363	0.6	Bundled	0.013
68.5	37.05	48.63	-1.80248	0.6	Bundled	0.016
69.0	55.05	59.62	-1.79923	0	Bundled/surface laid	0.008
70.0	54.56	59.62	-1.79923	0	Bundled/surface laid	0.007

KP	Circuit angle West (Degrees)	Sea water depth (m)	Declination (Degrees)	Target DoL (m)	Configuration of cables	Maximum compass deviation at sea surface (Degrees)
71.0	53.01	59.62	-1.79923	0	Bundled/surface laid	0.005
72.0	54.79	66.21	-1.77856	0.6	Bundled	0.006
72.5	54.78	40.82	-1.7765	0.6	Bundled	0.017
73.0	31.62	51.05	-1.77222	0.6	Bundled	0.016
74.0	32.25	81.77	-1.7655	0.6	Bundled	0.004
76.0	54.65	100.14	-1.7531	0.6	Bundled	0.003
78.0	52.20	74.25	-1.73891	0.6	Bundled	0.004
78.5	63.75	67.88	-1.73553	0.6	Bundled	0.007
79.5	50.70	39.67	-1.72828	0.6	Bundled	0.018
80.0	54.86	35.91	-1.72483	0	Bundled	0.028
80.5	42.30	35.00	-1.72181	0	Bundled	0.032
80.7	40.90	30.25	-1.72002	0	Surface laid/separate	4.302
80.773	39.18	10.00	-1.72002	0	Surface laid/separate	36.200

A.3 EMF intensities for the NKT 525 kV cable

Table 10. NKT 525 kV maximum EMF intensities along the seabed for KP0.7 to KP81.1

KP	Circuit angle West (Degrees)	Sea water depth (m)	Declination (Degrees)	Target DoL (m)	Configuration of cables	Maximum EMF intensity above the cable (μT)			
						0 m	1 m	5 m	10 m
0.660	19.50	21.77	-2.27387	0	Surface laid/separate	6197.50	456.22	141.20	86.59
0.7	31.82	22.16	-2.27387	0	Surface laid/separate	6197.50	456.22	141.20	86.59
0.8	31.82	23.50	-2.27331	1	Bundled	120.02	67.88	52.61	51.28
0.9	31.82	24.66	-2.27276	1	Bundled	120.02	67.88	52.61	51.28
1.0	31.82	27.15	-2.2722	1	Bundled	120.02	67.88	52.61	51.28
1.1	32.54	31.02	-2.27164	1	Bundled	120.02	67.88	52.61	51.28
1.6	52.64	38.16	-2.26825	1	Bundled	120.27	68.03	52.64	51.29
2.1	52.64	38.94	-2.26472	1	Bundled	120.27	68.03	52.64	51.29
2.6	82.29	38.50	-2.26106	1	Bundled	120.54	68.18	52.66	51.3
3.1	82.29	36.30	-2.25726	1	Bundled	120.54	68.18	52.66	51.3
3.6	82.28	35.19	-2.25346	1	Bundled	120.54	68.18	52.66	51.3
4.1	82.28	40.06	-2.24966	1	Bundled	120.54	68.18	52.66	51.3
4.6	82.28	41.08	-2.24586	1	Bundled	120.54	68.18	52.66	51.3
5.1	3.27	41.71	-2.24211	1	Bundled	119.84	67.77	52.6	51.28
5.6	3.26	42.42	-2.23846	1	Bundled	119.84	67.77	52.6	51.28
6.1	8.26	41.69	-2.23484	1	Bundled	119.85	67.78	52.6	51.28
6.6	4.37	33.62	-2.23129	1	Bundled	119.84	67.77	52.6	51.28
7.0	74.71	29.94	-2.22837	1	Bundled	120.5	68.16	52.66	51.3

KP	Circuit angle West (Degrees)	Sea water depth (m)	Declination (Degrees)	Target DoL (m)	Configuration of cables	Maximum EMF intensity above the cable (µT)			
						0 m	1 m	5 m	10 m
7.1	74.71	29.16	-2.22761	1	Bundled	120.5	68.16	52.66	51.3
7.2	59.47	29.38	-2.22684	1	Bundled	120.35	68.07	52.64	51.3
7.3	58.83	30.23	-2.22611	1	Bundled	120.35	68.07	52.64	51.3
7.8	61.36	31.55	-2.22243	1	Bundled	120.38	68.08	52.65	51.3
8.3	61.36	32.79	-2.21872	1	Bundled	120.38	68.08	52.65	51.3
8.8	66.35	34.24	-2.21496	1	Bundled	120.43	68.11	52.65	51.3
9.3	66.35	51.99	-2.21118	1	Bundled	120.43	68.11	52.65	51.3
10.3	71.27	88.13	-2.20355	1	Bundled	120.48	68.14	52.66	51.3
12.3	63.64	136.51	-2.18853	1	Bundled	120.4	68.1	52.65	51.3
14.3	69.92	120.16	-2.17339	1	Bundled	120.46	68.13	52.65	51.3
16.3	69.91	121.92	-2.15821	1	Bundled	120.46	68.13	52.65	51.3
18.3	76.97	122.29	-2.14301	1	Bundled	120.52	68.16	52.66	51.3
20.3	65.27	116.83	-2.12782	1	Bundled	120.42	68.11	52.65	51.3
22.3	65.26	104.5	-2.11285	1	Bundled	120.42	68.11	52.65	51.3
24.3	83.01	88.29	-2.09786	1	Bundled	120.54	68.18	52.66	51.3
26.3	43.77	101.81	-2.08368	1	Bundled	120.17	67.96	52.63	51.29
28.3	43.76	99.30	-2.0708	1	Bundled	120.17	67.96	52.63	51.29
30.3	44.06	89.74	-2.05791	1	Bundled	120.17	67.96	52.63	51.29
32.3	44.06	92.91	-2.04502	1	Bundled	120.17	67.96	52.63	51.29
34.3	44.05	93.19	-2.03215	1	Bundled	120.17	67.96	52.63	51.29
36.3	44.04	101.66	-2.01929	1	Bundled	120.17	67.96	52.63	51.29
38.3	43.73	112.92	-2.00647	1	Bundled	120.17	67.96	52.63	51.29
40.3	43.73	121.73	-1.99368	0.6	Bundled	243.18	77.72	52.91	51.33
42.3	43.72	117.79	-1.98092	0.6	Bundled	243.18	77.72	52.91	51.33
44.3	43.71	134.11	-1.96816	0.6	Bundled	243.18	77.72	52.91	51.33
46.3	41.74	122.64	-1.95818	0.6	Bundled	243.17	77.7	52.91	51.33
48.3	41.73	99.15	-1.94577	0.6	Bundled	243.17	77.7	52.91	51.33
50.3	35.06	83.32	-1.93314	0	Bundled/ surface laid	6156.04	110.53	53.38	51.4
52.3	81.81	91.90	-1.91951	0	Bundled/ surface laid	6156.97	111	53.43	51.41
54.3	72.45	98.65	-1.90454	0	Bundled/ surface laid	6156.88	110.94	53.42	51.41
56.3	53.75	92.18	-1.88998	0	Bundled/ surface laid	6156.55	110.76	53.4	51.4
58.3	59.30	110.00	-1.87596	0	Bundled/ surface laid	6156.67	110.82	53.41	51.4
60.3	73.98	139.04	-1.86164	0.6	Bundled	243.53	77.97	52.94	51.34
62.3	78.65	159.76	-1.84672	0.6	Bundled	243.56	77.99	52.95	51.34
64.3	82.60	116.39	-1.83205	0.6	Bundled	243.58	78.01	52.95	51.34
66.3	77.22	96.23	-1.81714	0.6	Bundled	243.56	77.99	52.94	51.34
68.3	37.05	54.78	-1.80363	0.6	Bundled	243.14	77.66	52.9	51.33
68.5	37.05	48.63	-1.80248	0.6	Bundled	243.14	77.66	52.9	51.33
69.0	55.05	59.62	-1.79923	0	Bundled/ surface laid	6156.58	110.77	53.4	51.4

KP	Circuit angle West (Degrees)	Sea water depth (m)	Declination (Degrees)	Target DoL (m)	Configuration of cables	Maximum EMF intensity above the cable (μT)			
						0 m	1 m	5 m	10 m
70.0	54.56	59.62	-1.79923	0	Bundled/ surface laid	6156.58	110.77	53.4	51.4
71.0	53.01	59.62	-1.79923	0	Bundled/ surface laid	6156.58	110.77	53.4	51.4
72.0	54.79	66.21	-1.77856	0.6	Bundled	243.34	77.82	52.92	51.34
72.5	54.78	40.82	-1.7765	0.6	Bundled	243.34	77.82	52.92	51.34
73.0	31.62	51.05	-1.77222	0.6	Bundled	243.11	77.62	52.9	51.33
74.0	32.25	81.77	-1.7655	0.6	Bundled	243.33	77.82	52.92	51.34
76.0	54.65	100.14	-1.7531	0.6	Bundled	243.3	77.8	52.92	51.33
78.0	52.20	74.25	-1.73891	0.6	Bundled	243.44	77.9	52.93	51.34
78.5	63.75	67.88	-1.73553	0.6	Bundled	243.28	77.79	52.92	51.33
79.5	50.70	39.67	-1.72828	0.6	Bundled	243.34	77.82	52.92	51.34
80	54.86	35.91	-1.72483	0.6	Bundled	242.97	77.70	52.91	51.33
80.5	42.30	35.00	-1.72181	0.6	Bundled	242.94	77.69	52.90	51.33
80.7	40.90	30.25	-1.72002	0	Surface laid/separate	6199.24	457.79	141.39	86.67
80.773	39.18	10.00	-1.72002	0	Surface laid/separate	6199.63	458.14	141.44	86.69

A.4 Compass deviations for the NKT 525 kV cable

Table 11. NKT 525 kV cable maximum compass deviations along the seabed between KP0.663 and KP80.773

KP	Circuit angle West (Degrees)	Sea water depth (m)	Declination (Degrees)	Target DoL (m)	Configuration of cables	Maximum compass deviation at sea surface (Degrees)
0.660	19.50	21.77	-2.27387	0	Surface laid/separate	20.411
0.7	31.82	22.16	-2.27387	0	Surface laid/separate	19.712
0.8	31.82	23.50	-2.27331	1	Bundled	0.248
0.9	31.82	24.66	-2.27276	1	Bundled	0.209
1.0	31.82	27.15	-2.2722	1	Bundled	0.174
1.1	32.54	31.02	-2.27164	1	Bundled	0.133
1.6	52.64	38.16	-2.26825	1	Bundled	0.064
2.1	52.64	38.94	-2.26472	1	Bundled	0.062
2.6	82.29	38.50	-2.26106	1	Bundled	0.014
3.1	82.29	36.30	-2.25726	1	Bundled	0.016
3.6	82.28	35.19	-2.25346	1	Bundled	0.017
4.1	82.28	40.06	-2.24966	1	Bundled	0.013
4.6	82.28	41.08	-2.24586	1	Bundled	0.012
5.1	3.27	41.71	-2.24211	1	Bundled	0.089
5.6	3.26	42.42	-2.23846	1	Bundled	0.086
6.1	8.26	41.69	-2.23484	1	Bundled	0.088

KP	Circuit angle West (Degrees)	Sea water depth (m)	Declination (Degrees)	Target DoL (m)	Configuration of cables	Maximum compass deviation at sea surface (Degrees)
6.6	4.37	33.62	-2.23129	1	Bundled	0.135
7.0	74.71	29.94	-2.22837	1	Bundled	0.045
7.1	74.71	29.16	-2.22761	1	Bundled	0.047
7.2	59.47	29.38	-2.22684	1	Bundled	0.089
7.3	58.83	30.23	-2.22611	1	Bundled	0.086
7.8	61.36	31.55	-2.22243	1	Bundled	0.073
8.3	61.36	32.79	-2.21872	1	Bundled	0.068
8.8	66.35	34.24	-2.21496	1	Bundled	0.052
9.3	66.35	51.99	-2.21118	1	Bundled	0.023
10.3	71.27	88.13	-2.20355	1	Bundled	0.007
12.3	63.64	136.51	-2.18853	1	Bundled	0.004
14.3	69.92	120.16	-2.17339	1	Bundled	0.004
16.3	69.91	121.92	-2.15821	1	Bundled	0.004
18.3	76.97	122.29	-2.14301	1	Bundled	0.002
20.3	65.27	116.83	-2.12782	1	Bundled	0.005
22.3	65.26	104.5	-2.11285	1	Bundled	0.006
24.3	83.01	88.29	-2.09786	1	Bundled	0.002
26.3	43.77	101.81	-2.08368	1	Bundled	0.011
28.3	43.76	99.30	-2.0708	1	Bundled	0.012
30.3	44.06	89.74	-2.05791	1	Bundled	0.014
32.3	44.06	92.91	-2.04502	1	Bundled	0.013
34.3	44.05	93.19	-2.03215	1	Bundled	0.013
36.3	44.04	101.66	-2.01929	1	Bundled	0.011
38.3	43.73	112.92	-2.00647	1	Bundled	0.009
40.3	43.73	121.73	-1.99368	0.6	Bundled	0.008
42.3	43.72	117.79	-1.98092	0.6	Bundled	0.008
44.3	43.71	134.11	-1.96816	0.6	Bundled	0.006
46.3	41.74	122.64	-1.95818	0.6	Bundled	0.008
48.3	41.73	99.15	-1.94577	0.6	Bundled	0.012
50.3	35.06	83.32	-1.93314	0	Bundled/surface laid	0.019
52.3	81.81	91.90	-1.91951	0	Bundled/surface laid	0.003
54.3	72.45	98.65	-1.90454	0	Bundled/surface laid	0.005
56.3	53.75	92.18	-1.88998	0	Bundled/surface laid	0.011
58.3	59.30	110.00	-1.87596	0	Bundled/surface laid	0.007
60.3	73.98	139.04	-1.86164	0.6	Bundled	0.002
62.3	78.65	159.76	-1.84672	0.6	Bundled	0.001
64.3	82.60	116.39	-1.83205	0.6	Bundled	0.002
66.3	77.22	96.23	-1.81714	0.6	Bundled	0.004
68.3	37.05	54.78	-1.80363	0.6	Bundled	0.042
68.5	37.05	48.63	-1.80248	0.6	Bundled	0.053
69.0	55.05	59.62	-1.79923	0	Bundled/surface laid	0.026
70.0	54.56	59.62	-1.79923	0	Bundled/surface laid	0.022
71.0	53.01	59.62	-1.79923	0	Bundled/surface laid	0.017
72.0	54.79	66.21	-1.77856	0.6	Bundled	0.021

KP	Circuit angle West (Degrees)	Sea water depth (m)	Declination (Degrees)	Target DoL (m)	Configuration of cables	Maximum compass deviation at sea surface (Degrees)
72.5	54.78	40.82	-1.7765	0.6	Bundled	0.055
73.0	31.62	51.05	-1.77222	0.6	Bundled	0.051
74.0	32.25	81.77	-1.7655	0.6	Bundled	0.014
76.0	54.65	100.14	-1.7531	0.6	Bundled	0.010
78.0	52.20	74.25	-1.73891	0.6	Bundled	0.013
78.5	63.75	67.88	-1.73553	0.6	Bundled	0.022
79.5	50.70	39.67	-1.72828	0.6	Bundled	0.058
80.0	54.86	35.91	-1.72483	0	Bundled	0.090
80.5	42.30	35.00	-1.72181	0	Bundled	0.097
80.7	40.90	30.25	-1.72002	0	Surface laid/separate	10.742
80.773	39.18	10.00	-1.72002	0	Surface laid/separate	87.030

A.5 Compass deviation vs circuit angle plots for the NKT 320 kV and 525 kV cables

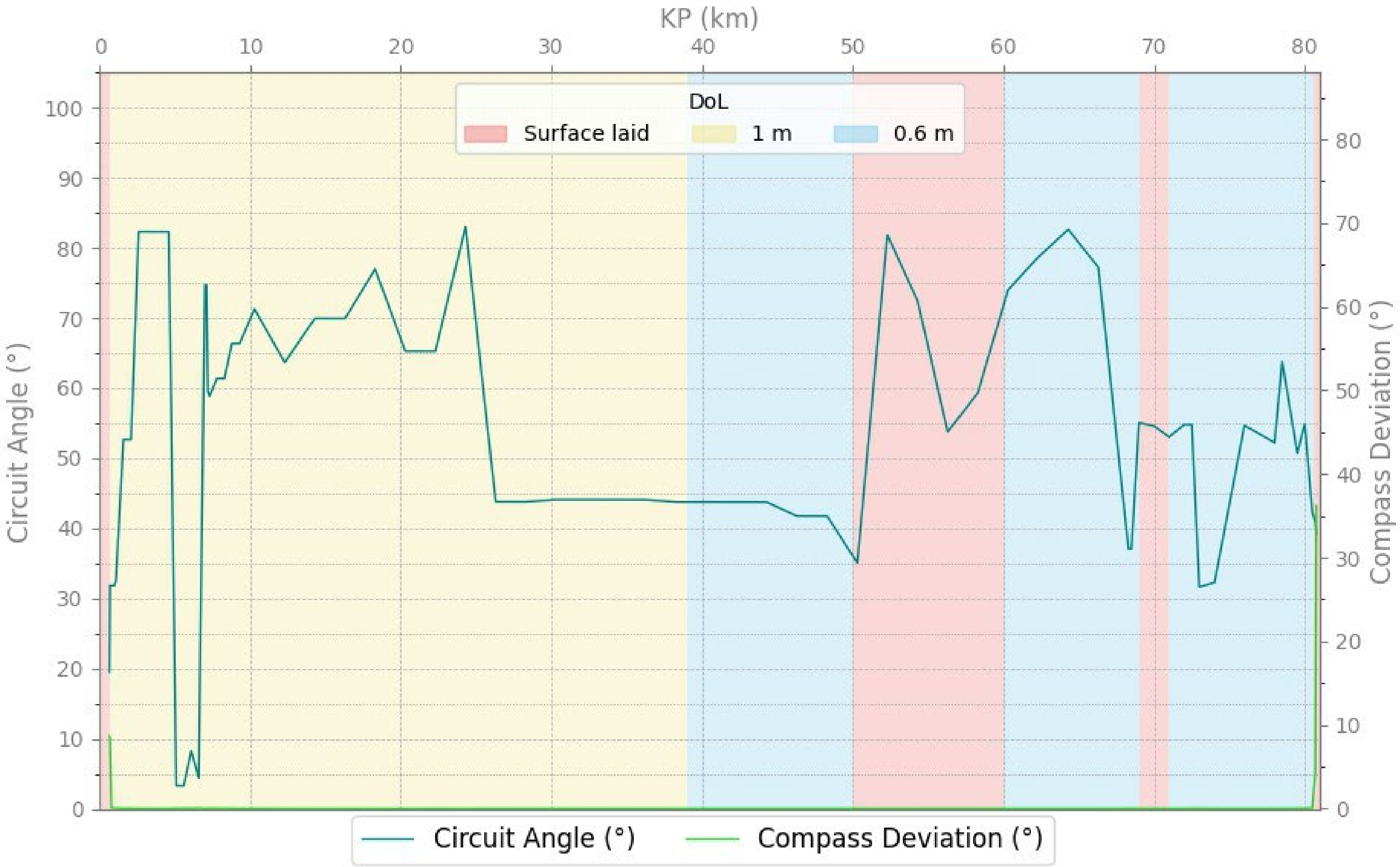

Figure 8. NKT 320 kV cable compass deviations and circuit angle along the subsea cable route

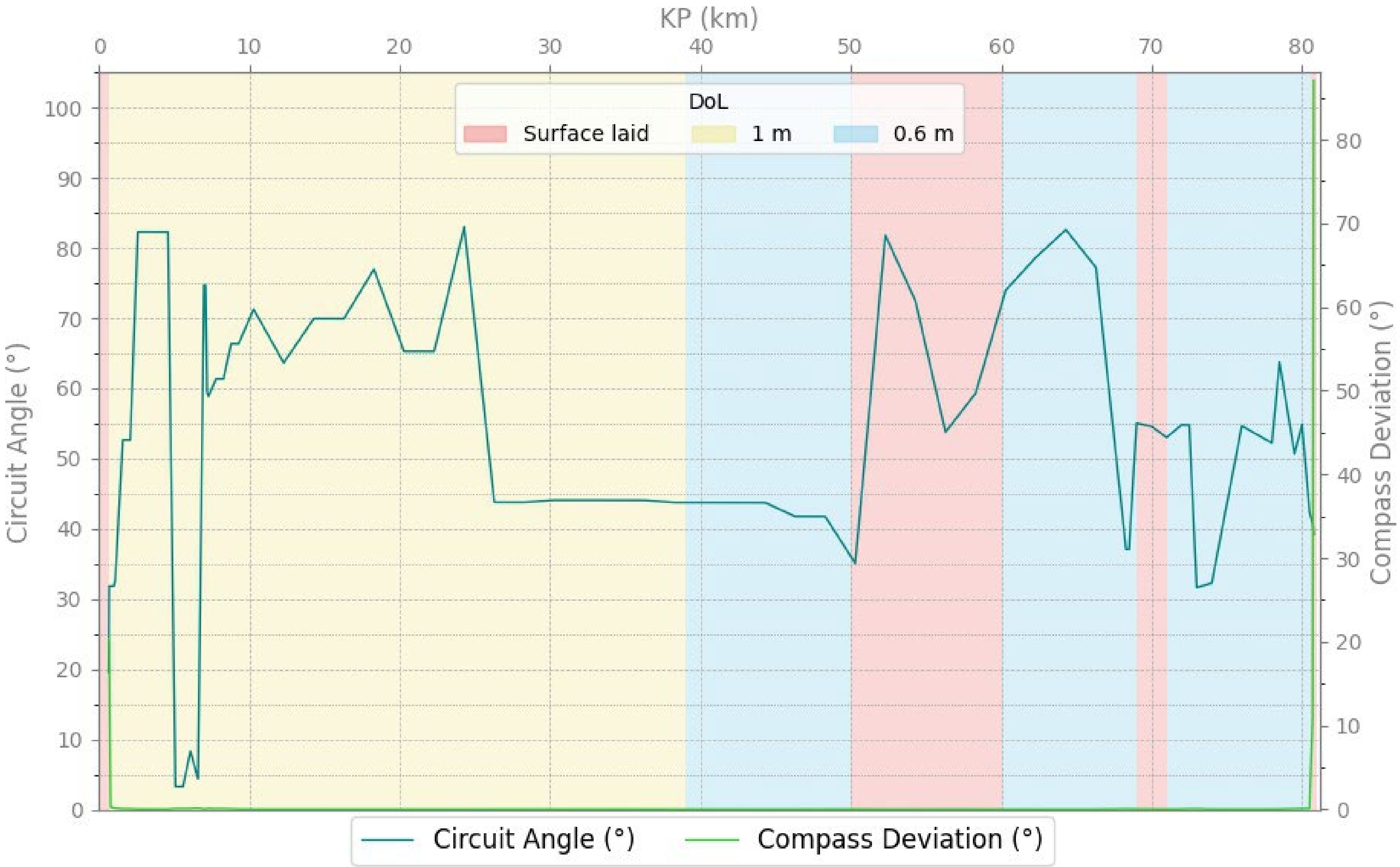

Figure 9. NKT 525 kV cable compass deviations and circuit angles along the subsea route

Appendix C: Amended Project Cable Corridor Coordinates

Coordinates for the Amended LT14 Western Isles HVDC Link Installa tion Corridor (WGS 84)[1]						
Point	Decimal Degrees		Degrees, Minutes and Seconds		Degrees and Decimal Minutes	
	Longitude	Latitude	Longitude	Latitude	Longitude	Latitude
[1] Landward boundaries of the survey corridor are defined by Mean High Water Springs (MHWS) due to the requirement to reduce the number of vertices.						
1	-5.275364	57.860325	5° 16' 31.3104" W	57° 51' 37.17" N	5° 16.52184' W	57° 51.6195' N
2	-5.293146	57.863293	5° 17' 35.3256" W	57° 51' 47.8548" N	5° 17.58876' W	57° 51.79758' N
3	-5.307047	57.868684	5° 18' 25.3692" W	57° 52' 7.2624" N	5° 18.42282' W	57° 52.12104' N
4	-5.326701	57.879986	5° 19' 36.1236" W	57° 52' 47.9496" N	5° 19.60206' W	57° 52.79916' N
5	-5.34274	57.885794	5° 20' 33.864" W	57° 53' 8.8584" N	5° 20.5644' W	57° 53.14764' N
6	-5.34698	57.889168	5° 20' 49.128" W	57° 53' 21.0048" N	5° 20.8188' W	57° 53.35008' N
7	-5.401856	57.908967	5° 24' 6.6816" W	57° 54' 32.2812" N	5° 24.11136' W	57° 54.53802' N
8	-5.412248	57.91578	5° 24' 44.0928" W	57° 54' 56.808" N	5° 24.73488' W	57° 54.9468' N
9	-5.428613	57.914822	5° 25' 43.0068" W	57° 54' 53.3592" N	5° 25.71678' W	57° 54.88932' N
10	-5.455523	57.917587	5° 27' 19.8828" W	57° 55' 3.3132" N	5° 27.33138' W	57° 55.05522' N
11	-5.472421	57.918465	5° 28' 20.7156" W	57° 55' 6.474" N	5° 28.34526' W	57° 55.1079' N
12	-5.483787	57.921752	5° 29' 1.6332" W	57° 55' 18.3072" N	5° 29.02722' W	57° 55.30512' N
13	-5.504712	57.923617	5° 30' 16.9632" W	57° 55' 25.0212" N	5° 30.28272' W	57° 55.41702' N
14	-5.536653	57.928848	5° 32' 11.9508" W	57° 55' 43.8528" N	5° 32.19918' W	57° 55.73088' N
15	-5.553858	57.927635	5° 33' 13.8888" W	57° 55' 39.486" N	5° 33.23148' W	57° 55.6581' N
16	-5.574403	57.93361	5° 34' 27.8508" W	57° 56' 0.996" N	5° 34.46418' W	57° 56.0166' N
17	-5.602922	57.943958	5° 36' 10.5192" W	57° 56' 38.2488" N	5° 36.17532' W	57° 56.63748' N
18	-5.640134	57.949994	5° 38' 24.4824" W	57° 56' 59.9784" N	5° 38.40804' W	57° 56.99964' N
19	-5.66169	57.951263	5° 39' 42.084" W	57° 57' 4.5468" N	5° 39.7014' W	57° 57.07578' N
20	-5.679452	57.956477	5° 40' 46.0272" W	57° 57' 23.3172" N	5° 40.76712' W	57° 57.38862' N
21	-5.687344	57.961952	5° 41' 14.4384" W	57° 57' 43.0272" N	5° 41.24064' W	57° 57.71712' N
22	-5.697283	57.967417	5° 41' 50.2188" W	57° 58' 2.7012" N	5° 41.83698' W	57° 58.04502' N

Coordinates for the Am ended LT14 Western Isles HVDC Link Installation Corridor (WGS 84)[1]						
Point	Decimal Degrees		Degrees, Minutes and Seconds		Degrees and Decimal Minutes	
	Longitude	Latitude	Longitude	Latitude	Longitude	Latitude
23	-5.703552	57.969736	5° 42' 12.7872" W	57° 58' 11.0496" N	5° 42.21312' W	57° 58.18416' N
24	-5.739568	57.989732	5° 44' 22.4448" W	57° 59' 23.0352" N	5° 44.37408' W	57° 59.38392' N
25	-5.744278	57.998017	5° 44' 39.4008" W	57° 59' 52.8612" N	5° 44.65668' W	57° 59.88102' N
26	-5.978363	58.118004	5° 58' 42.1068" W	58° 7' 4.8144" N	5° 58.70178' W	58° 7.08024' N
27	-5.988938	58.120269	5° 59' 20.1768" W	58° 7' 12.9684" N	5° 59.33628' W	58° 7.21614' N
28	-6.012901	58.121207	6° 0' 46.4436" W	58° 7' 16.3452" N	6° 0.77406' W	58° 7.27242' N
29	-6.065504	58.132775	6° 3' 55.8144" W	58° 7' 57.99" N	6° 3.93024' W	58° 7.9665' N
30	-6.104944	58.136785	6° 6' 17.7984" W	58° 8' 12.426" N	6° 6.29664' W	58° 8.2071' N
31	-6.18768	58.1509	6° 11' 15.648" W	58° 9' 3.24" N	6° 11.2608' W	58° 9.054' N
32	-6.219016	58.15831	6° 13' 8.4576" W	58° 9' 29.916" N	6° 13.14096' W	58° 9.4986' N
33	-6.235782	58.160938	6° 14' 8.8152" W	58° 9' 39.3768" N	6° 14.14692' W	58° 9.65628' N
34	-6.253012	58.164507	6° 15' 10.8432" W	58° 9' 52.2252" N	6° 15.18072' W	58° 9.87042' N
35	-6.271248	58.169478	6° 16' 16.4928" W	58° 10' 10.1208" N	6° 16.27488' W	58° 10.16868' N
36	-6.275353	58.169981	6° 16' 31.2708" W	58° 10' 11.9316" N	6° 16.52118' W	58° 10.19886' N
37	-6.308698	58.167869	6° 18' 31.3128" W	58° 10' 4.3284" N	6° 18.52188' W	58° 10.07214' N
38	-6.352803	58.170096	6° 21' 10.0908" W	58° 10' 12.3456" N	6° 21.16818' W	58° 10.20576' N
39	-6.370546	58.176876	6° 22' 13.9656" W	58° 10' 36.7536" N	6° 22.23276' W	58° 10.61256' N
40	-6.37926	58.17827	6° 22' 45.336" W	58° 10' 41.772" N	6° 22.7556' W	58° 10.6962' N
41	-6.380983	58.184516	6° 22' 51.5388" W	58° 11' 4.2576" N	6° 22.85898' W	58° 11.07096' N
42	-6.378021	58.18599	6° 22' 40.8756" W	58° 11' 9.564" N	6° 22.68126' W	58° 11.1594' N
43	-6.367336	58.177575	6° 22' 2.4096" W	58° 10' 39.27" N	6° 22.04016' W	58° 10.6545' N
44	-6.351889	58.171851	6° 21' 6.8004" W	58° 10' 18.6636" N	6° 21.11334' W	58° 10.31106' N
45	-6.308644	58.169669	6° 18' 31.1184" W	58° 10' 10.8084" N	6° 18.51864' W	58° 10.18014' N
46	-6.275451	58.171782	6° 16' 31.6236" W	58° 10' 18.4152" N	6° 16.52706' W	58° 10.30692' N
47	-6.270137	58.171183	6° 16' 12.4932" W	58° 10' 16.2588" N	6° 16.20822' W	58° 10.27098' N
48	-6.251704	58.166164	6° 15' 6.1344" W	58° 9' 58.1904" N	6° 15.10224' W	58° 9.96984' N
49	-6.23461	58.162623	6° 14' 4.596" W	58° 9' 45.4428" N	6° 14.0766' W	58° 9.75738' N

Coordinates for the Am ended LT14 Western Isles HVDC Link Installation Corridor (WGS 84)[1]						
Point	Decimal Degrees		Degrees, Minutes and Seconds		Degrees and Decimal Minutes	
	Longitude	Latitude	Longitude	Latitude	Longitude	Latitude
50	-6.217833	58.159996	6° 13' 4.1988" W	58° 9' 35.9856" N	6° 13.06998' W	58° 9.59976' N
51	-6.186551	58.152595	6° 11' 11.5836" W	58° 9' 9.342" N	6° 11.19306' W	58° 9.1557' N
52	-6.144382	58.145395	6° 8' 39.7752" W	58° 8' 43.422" N	6° 8.66292' W	58° 8.7237' N
53	-6.115178	58.142036	6° 6' 54.6408" W	58° 8' 31.3296" N	6° 6.91068' W	58° 8.52216' N
54	-6.098611	58.137943	6° 5' 54.9996" W	58° 8' 16.5948" N	6° 5.91666' W	58° 8.27658' N
55	-6.06447	58.13449	6° 3' 52.092" W	58° 8' 4.164" N	6° 3.8682' W	58° 8.0694' N
56	-6.011995	58.122949	6° 0' 43.182" W	58° 7' 22.6164" N	6° 0.7197' W	58° 7.37694' N
57	-5.988265	58.122038	5° 59' 17.754" W	58° 7' 19.3368" N	5° 59.2959' W	58° 7.32228' N
58	-5.976665	58.119575	5° 58' 35.994" W	58° 7' 10.47" N	5° 58.5999' W	58° 7.1745' N
59	-5.741599	57.999138	5° 44' 29.7564" W	57° 59' 56.8968" N	5° 44.49594' W	57° 59.94828' N
60	-5.736749	57.990761	5° 44' 12.2964" W	57° 59' 26.7396" N	5° 44.20494' W	57° 59.44566' N
61	-5.701229	57.971044	5° 42' 4.4244" W	57° 58' 15.7584" N	5° 42.07374' W	57° 58.26264' N
62	-5.69505	57.968771	5° 41' 42.18" W	57° 58' 7.5756" N	5° 41.703' W	57° 58.12626' N
63	-5.684842	57.96316	5° 41' 5.4312" W	57° 57' 47.376" N	5° 41.09052' W	57° 57.7896' N
64	-5.67738	57.957916	5° 40' 38.568" W	57° 57' 28.4976" N	5° 40.6428' W	57° 57.47496' N
65	-5.66072	57.953001	5° 39' 38.592" W	57° 57' 10.8036" N	5° 39.6432' W	57° 57.18006' N
66	-5.639358	57.951744	5° 38' 21.6888" W	57° 57' 6.2784" N	5° 38.36148' W	57° 57.10464' N
67	-5.601526	57.945602	5° 36' 5.4936" W	57° 56' 44.1672" N	5° 36.09156' W	57° 56.73612' N
68	-5.572643	57.935144	5° 34' 21.5148" W	57° 56' 6.5184" N	5° 34.35858' W	57° 56.10864' N
69	-5.5531	57.929433	5° 33' 11.16" W	57° 55' 45.9588" N	5° 33.186' W	57° 55.76598' N
70	-5.536276	57.930646	5° 32' 10.5936" W	57° 55' 50.3256" N	5° 32.17656' W	57° 55.83876' N
71	-5.503882	57.925361	5° 30' 13.9752" W	57° 55' 31.2996" N	5° 30.23292' W	57° 55.52166' N
72	-5.482668	57.92346	5° 28' 57.6048" W	57° 55' 24.456" N	5° 28.96008' W	57° 55.4076' N
73	-5.47161	57.920225	5° 28' 17.796" W	57° 55' 12.81" N	5° 28.2966' W	57° 55.2135' N
74	-5.454963	57.919359	5° 27' 17.8668" W	57° 55' 9.6924" N	5° 27.29778' W	57° 55.16154' N
75	-5.428395	57.916626	5° 25' 42.222" W	57° 54' 59.8536" N	5° 25.7037' W	57° 54.99756' N
76	-5.417195	57.91764	5° 25' 1.902" W	57° 55' 3.504" N	5° 25.0317' W	57° 55.0584' N

Coordinates for the Am ended LT14 Western Isles HVDC Link Installation Corridor (WGS 84)[1]						
Point	Decimal Degrees		Degrees, Minutes and Seconds		Degrees and Decimal Minutes	
	Longitude	Latitude	Longitude	Latitude	Longitude	Latitude
77	-5.410676	57.917471	5° 24' 38.4336" W	57° 55' 2.8956" N	5° 24.64056' W	57° 55.04826' N
78	-5.399682	57.910353	5° 23' 58.8552" W	57° 54' 37.2708" N	5° 23.98092' W	57° 54.62118' N
79	-5.344725	57.890524	5° 20' 41.01" W	57° 53' 25.8864" N	5° 20.6835' W	57° 53.43144' N
80	-5.340328	57.887063	5° 20' 25.1808" W	57° 53' 13.4268" N	5° 20.41968' W	57° 53.22378' N
81	-5.324487	57.881357	5° 19' 28.1532" W	57° 52' 52.8852" N	5° 19.46922' W	57° 52.88142' N
82	-5.304786	57.87002	5° 18' 17.2296" W	57° 52' 12.072" N	5° 18.28716' W	57° 52.2012' N
83	-5.293936	57.865805	5° 17' 38.1696" W	57° 51' 56.898" N	5° 17.63616' W	57° 51.9483' N
84	-5.281909	57.864021	5° 16' 54.8724" W	57° 51' 50.4756" N	5° 16.91454' W	57° 51.84126' N
85	-5.273676	57.861894	5° 16' 25.2336" W	57° 51' 42.8184" N	5° 16.42056' W	57° 51.71364' N
86	-5.265127	57.8584	5° 15' 54.4572" W	57° 51' 30.24" N	5° 15.90762' W	57° 51.504' N
87	-5.25232	57.856471	5° 15' 8.352" W	57° 51' 23.2956" N	5° 15.1392' W	57° 51.38826' N
88	-5.244664	57.85473	5° 14' 40.7904" W	57° 51' 17.028" N	5° 14.67984' W	57° 51.2838' N
89	-5.233885	57.847595	5° 14' 1.986072" W	57° 50' 51.341168" N	5° 14.033101' W	57° 50.855686' N
90	-5.234315	57.847098	5° 14' 3.533827" W	57° 50' 49.551493" N	5° 14.058897' W	57° 50.825858' N
91	-5.232557	57.846403	5° 13' 57.203544" W	57° 50' 47.051452" N	5° 13.953392' W	57° 50.784191' N
92	-5.23229	57.846746	5° 13' 56.243057" W	57° 50' 48.285146" N	5° 13.937384' W	57° 50.804752' N
93	-5.220625	57.842882	5° 13' 14.25" W	57° 50' 34.3752" N	5° 13.2375' W	57° 50.57292' N
94	-5.221624	57.842144	5° 13' 17.8464" W	57° 50' 31.7184" N	5° 13.29744' W	57° 50.52864' N
95	-5.232856	57.844263	5° 13' 58.2816" W	57° 50' 39.3468" N	5° 13.97136' W	57° 50.65578' N
96	-5.24465	57.847239	5° 14' 40.74" W	57° 50' 50.05964" N	5° 14.679' W	57° 50.834327' N
97	-5.247057	57.852475	5° 14' 49.4052" W	57° 51' 8.91" N	5° 14.82342' W	57° 51.1485' N
98	-5.253842	57.854857	5° 15' 13.8312" W	57° 51' 17.4852" N	5° 15.23052' W	57° 51.29142' N
99	-5.266589	57.856764	5° 15' 59.7204" W	57° 51' 24.3504" N	5° 15.99534' W	57° 51.40584' N
100	-5.275364	57.860325	5° 16' 31.3104" W	57° 51' 37.17" N	5° 16.52184' W	57° 51.6195' N