ALTEMAR

Marine & Environmental Consultancy

Assessments of Impacts of the Marine Usage Report (AIMUR) for the proposed main lay of the 2Africa Submarine Fibre-Optic Cable System within the Irish EEZ.

15th December 2023

Prepared by: [redacted](MCIEEM) of Altemar Ltd.
On behalf of: Apollo Submarine Cable System Limited.

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Document Control Sheet			
Project	Assessments of Impacts of the Marine Usage Report for the proposed main lay of the 2Africa Submarine Fibre-Optic Cable System within the Irish EEZ.		
Report	Assessments of Impacts of the Marine Usage Report		
Date	15th December 2023		
Project No: 2 Africa		Document Reference: V3	
Version	Author	Reviewed	Date
Draft 01	[redacted]	[redacted]	15th December 2023

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1. Introduction

The following Assessment of Impacts of the Maritime Usage (AIMU) Report has been prepared by **Altemar Ltd.** for **Apollo Submarine Cable System Limited, a Vodafone Group Services Limited company** as part of this Maritime Usage Licence request (MUL) application. The AIMU report follows the Maritime Area Regulatory Authority (Mara) (2023) guidance '*Obtaining a Licence to Carry Out Specified Maritime Usages in the Maritime Area under the Maritime Area Planning Act 2021 Applicant Technical Guidance Note*.' The MUL application relates to the proposed installation and operation of the 2Africa Submarine Cable System within the Irish Exclusive Economic Zone (EEZ). The planned cable will extend from Widemouth Bay in Cornwall to a number of countries in Europe, Africa, and the Middle East. Within the Irish EEZ the proposed fibreoptic cable will traverse through the offshore environment and through the newly designated offshore Southern Canyons candidate SAC.

The purpose of this AIMU Report is to determine the impact, if any, of the installation and operation of the proposed submarine cable system within the Irish EEZ, individually or cumulatively with projects. A Supporting Information for Screening for Appropriate Assessment (SISAA) Report, Natura Impact Statement (NIS) and Annex IV Report have also been prepared by Altemar Ltd. as part of this MARA licence application. These reports are standalone documents and accompany this AIMU Report. As per MARA guidelines the following report is laid out as follows:

1. Introduction
2. Project Description
3. Need & Alternatives
4. Planning & Development
5. Land & Soils
6. Water
7. Biodiversity
8. Fisheries and Aquaculture
9. Air Quality
10. Noise & Vibration
11. Landscape/Seascape
12. Traffic & Transport
13. Cultural Heritage
14. Population & Human Health
15. Major Accidents & Disasters
16. Climate
17. Waste
18. Material Assets
19. Interactions
20. Summary of Mitigations
21. Consideration and Reasoned Conclusions in relation to the: EIA Directive (not of a class)/WFD Directive/ MSFD Directive

1.1 Altemar Ltd.

Since its inception in 2001, Altemar has been delivering ecological and environmental services to a broad range of clients. Operational areas include: residential; infrastructural; renewable; oil & gas; private industry; Local Authorities; EC projects; and, State/semi-State Departments. [redacted] the managing director of Altemar, is an Environmental Scientist, Marine Mammal Observer (MMO) and Marine Biologist with 28 years' experience working in Irish terrestrial and aquatic environments, providing services to the State, Semi-State and industry. He is currently contracted to Inland Fisheries Ireland as the sole "External Expert" to environmentally assess internal and external projects. He is also chair of an internal IFI working group on environmental assessment. [redacted] (MCIEEM) holds a MSc in Environmental Science, BSc (Hons.) in Applied Marine Biology, NCEA National Diploma in Applied Aquatic Science and a NCEA National Certificate in Science (Aquaculture). [redacted] has been involved in eleven international sub marine fibre optic cable projects within Irish and UK waters, many of which involved Horizontal Directional Drills within designated sites and all works required ecological supervision.

2. Project Description

2.1 Description of the Proposed Project

2.1.1 Project Overview

2Africa is a new submarine cable system over 45,000km in length that will connect the UK to a number of countries in Europe, Africa, the Middle East and Asia to support global data growth. The level of broadband traffic is growing exponentially. Consumer appetites for new applications like cloud computing, on-demand video and social media appear limitless. The demand for new connectivity is driven by a business environment in which ultra-broadband access is essential for sustainable growth and development. The purpose of the submarine cable project is to significantly increase the capacity, quality and availability of internet connectivity between Africa and the rest of the world. This is of particular significance for a continent that has historically been behind the global average in internet penetration.

By directly connecting numerous countries around the entire coast of Africa to Europe and the Middle East region, businesses and consumers will benefit from enhanced capacity and reliability for services such as telecommuting, HD TV broadcasting, internet services, video conferencing, advanced multimedia and mobile video applications. The project will also underpin future mobile and fixed broadband access. This will help African leaders to implement their 2030 visions and to meet many of the Sustainable Development Goal (SDG) challenges related to or depending on internet connectivity.

Alcatel Submarine Networks (ASN) have been contracted by the 2Africa Consortium to engineer, manufacture and install the cable system, which is expected to be ready for service in 2024 (Figure 2.1). The system is to extend from a landfall in the UK through the Irish Exclusive Economic Zone (EEZ) as shown in Figures 2.2 and 2.3. The cable will contain optical repeaters powered by high-voltage Power Feed Equipment (PFE) which is located in the existing Cable Landing Station (CLS) at Bude, UK.

2.1.2 Project Installation Timeframes

The 2Africa cable installation within Ireland's EEZ and the Southern Canyon SAC was planned for December 2023, and is now being rescheduled for Q2 2024.

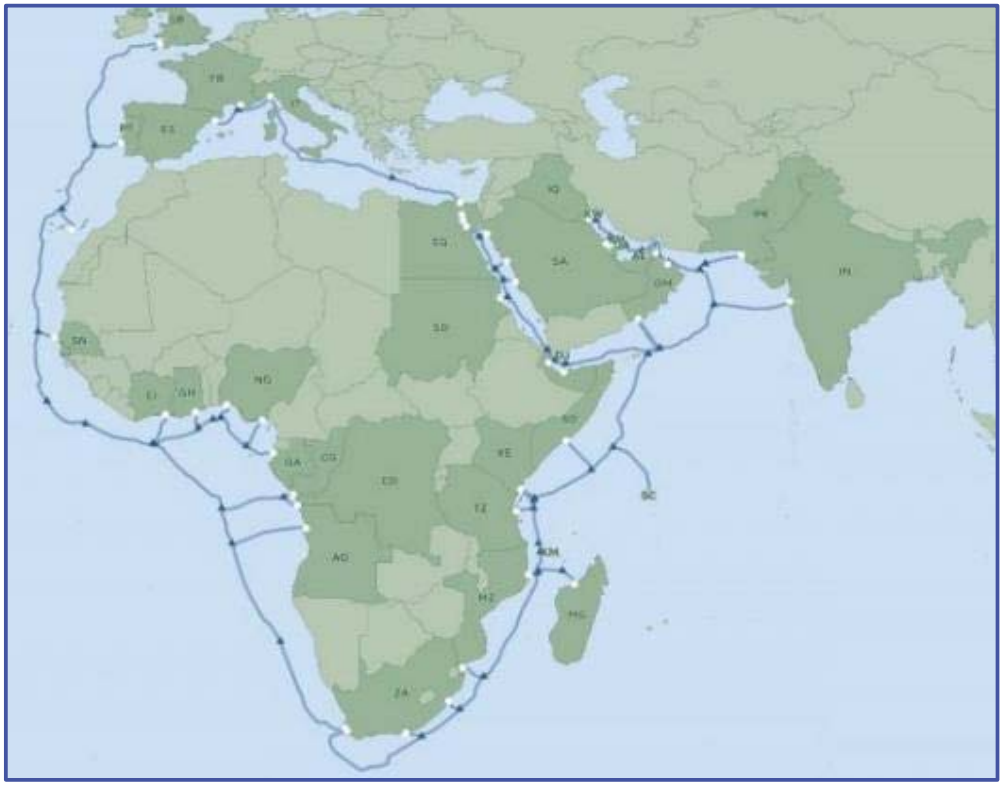

***Figure 2.1**: 2Africa Overview Chart (Source: ASN, 2021)*

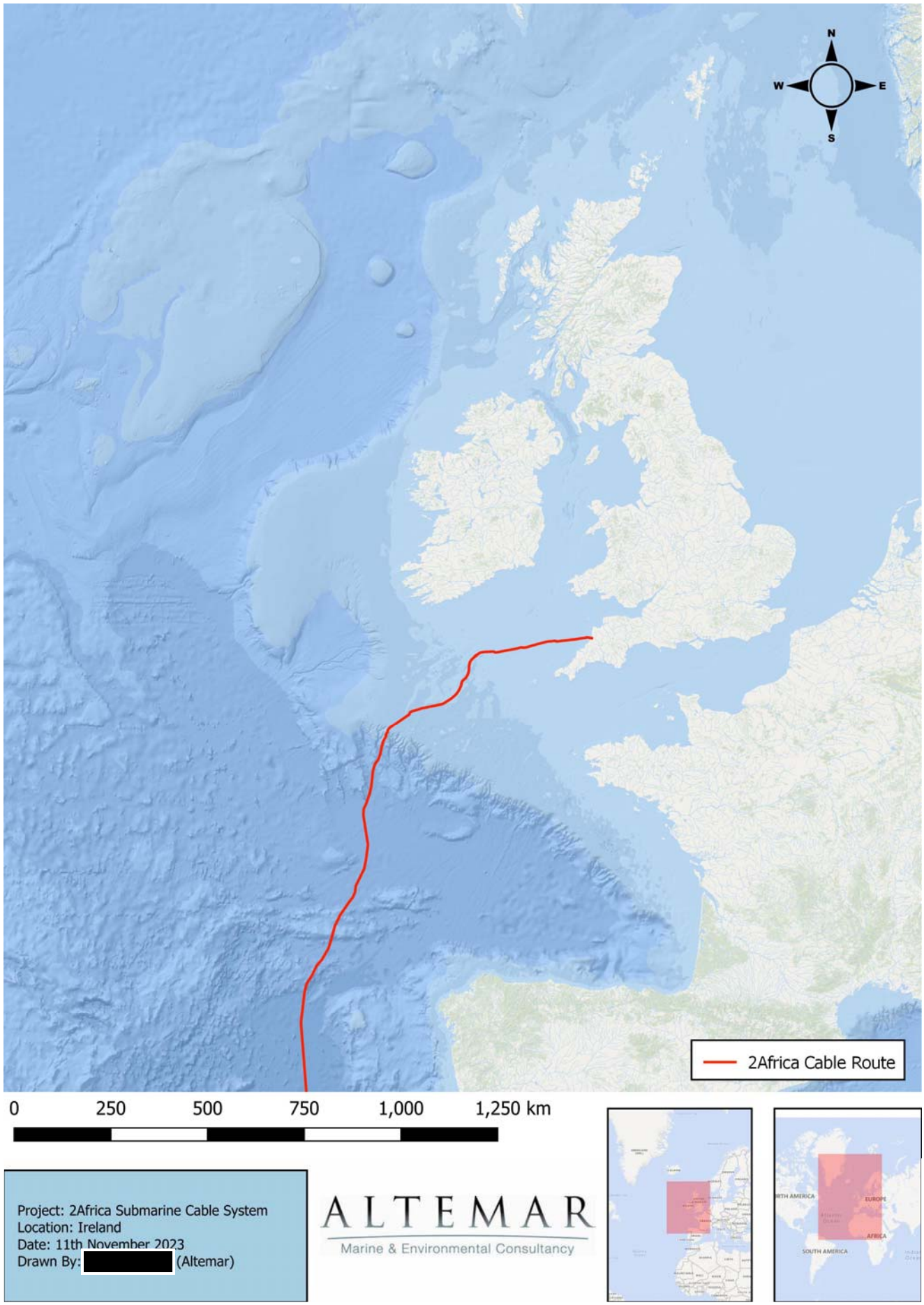

Figure 2.2. *Schematic of the proposed network*

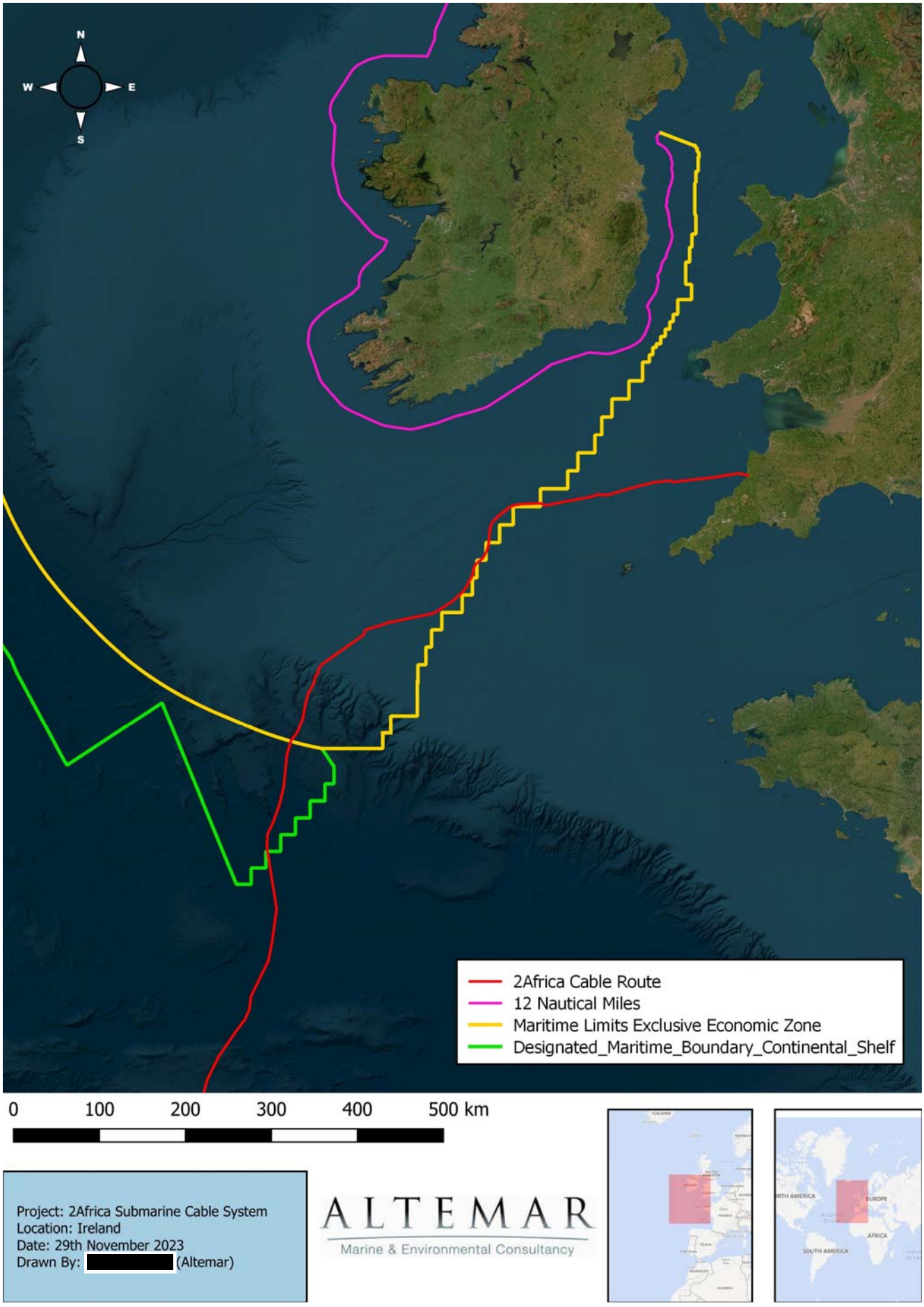

Figure 2.3. *Proposed route through Irish waters*

2.1.3 2Africa Subsea Cable Design

The subsea fibre optic cable installed for the 2Africa system in the UK will be the OALC4 cable, developed and manufactured by ASN. One of the functions of submarine cables is to protect the fibre pairs they contain to ensure data can be transmitted across the system. They also contain metallic elements which power the repeaters in the system as well as feed an electric current to enable cable breaks to be localised so any issues can be identified and fixed quickly, minimising disruption.

To meet these functions, submarine cables contain fibre optic pairs that float freely in a hydrophobic jelly which are then encased in a stainless-steel tube. Two layers of steel wires are wrapped around the outside of the tube to protect against pressure, any contact with the cable and to provide tensile strength. This is then contained in a hermetically sealed conductor tube and insulated with a layer of polyethylene to form the basic Light Weight (LW) cable that is used in deep-sea environments. The polyethylene layer provides high voltage electrical insulation. In shallow water or high-risk areas, additional layers of steel armour wires are added to further protect the cable from external factors such as anchor damage and trawling.

All components encased within the cable package are environmentally benign and stable. There is no possibility of any chemical leaching or similar.

There are five types of protection available for the OALC4 cable: Light Weight (LW), Light Weight Protected (LWP), Single Armour (SA), Double Armour (DA) and Double Armour Heavy (DAH). Figures 2.4 and 2.5 show the specifications of each of these cables.

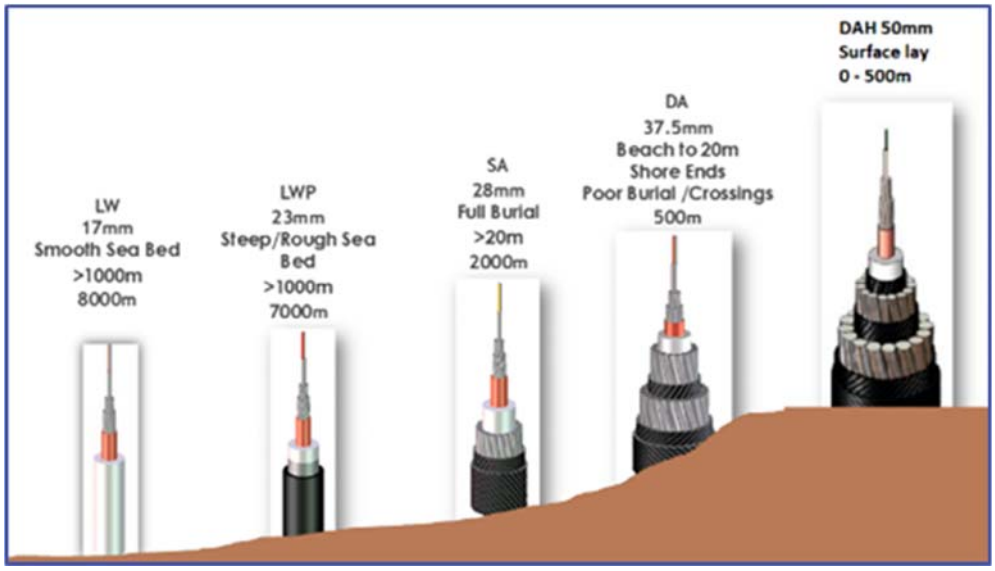

***Figure 2.4**: Protection choices and conditions of the OALC4 cable (Source: ASN, 2021)*

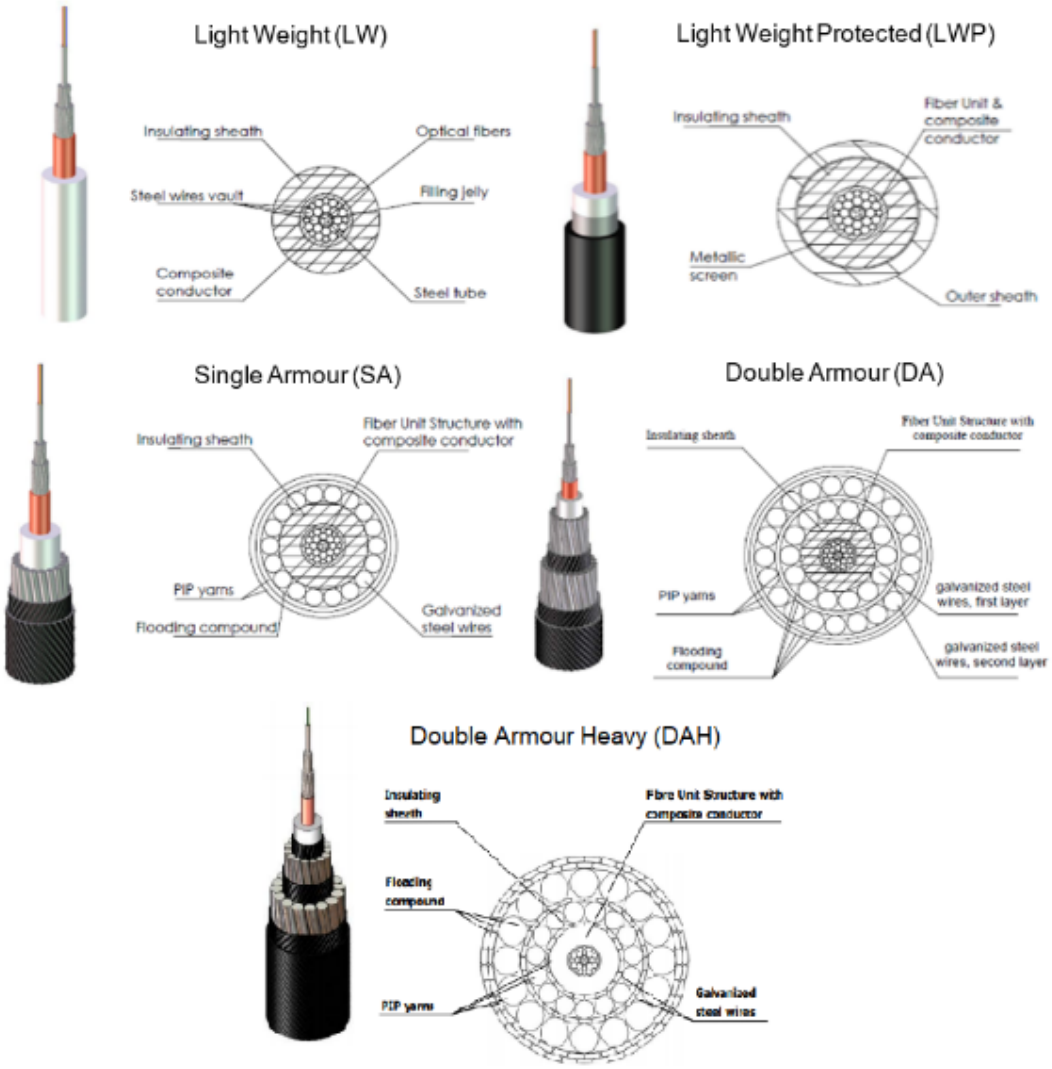

***Figure 2.5**: Cross sections of OALC4 cable types (Source: ASN, 2021)*

2.1.4 Installation of 2Africa in the Southern Canyons SAC and Through the Irish EEZ

Work Performed Prior to Installation

Cable Route Selection & Cable Engineering

During the planning and engineering stage, desktop studies were completed to assess site-specific conditions and areas to avoid when routing the cable, as well as identifying key stakeholders in the area. Some of the key factors assessed during the desktop study include anthropogenic factors (such as fishing, shipping and anchoring), meteorological conditions, oceanographic conditions, geological conditions, marine protected areas, permitting and marine operations. The desktop study was conducted in July 2020; it did avoid all established marine protected areas proximate to the 2Africa route within the Irish EEZ and Continental Shelf, however at that time the Southern Canyons cSAC had not been established. It was declared on 18th November 2022. A key output of the study includes a Route Position List (RPL) which was used for initial planning, approximate cable quantities and the subsequent cable route survey operations. The RPL is a list of coordinates, normally referred to the WGS84 Datum, that describes the planned cable route via a number of alter courses positions, cable slack, cable type, water depth, heading, maritime boundaries, cable body placement (where appropriate), planned burial locations, and crossing locations of other undersea cables.

Cable Route Survey

The geophysical and geotechnical surveys for the UK section of the proposed 2Africa subsea cable system were conducted by Fugro between December 2020 and March 2021. This data informed further route engineering within the survey swathe to find the optimum route for the cable, avoiding known hazards and rough topography. The RPL was subsequently revised to present the optimum route based on the survey data.

As part of the preliminary work and the cable route survey, cable crossings along the proposed route were identified. The 2Africa system crosses 6 in-service cables within the Ireland EEZ, but none are situated within the Southern Canyons cSAC. This route also avoids underwater archaeology (Appendix I).

Stakeholder Engagement

Fisheries

Brown & May Marine Ltd (BMML) were contracted to act as Fishery Liaison Consultants for the 2Africa cable survey operations. Fisheries liaison will continue prior to and throughout cable installation.

Marine Aggregates

There will be no interaction with any marine aggregates activity.

Offshore Energy

There will be no interaction with any offshore energy activity within Irish waters or the Southern Canyon cSAC during cable installation.

Oil and Gas

There will be no interaction with any offshore oil and gas activity within Irish waters or the Southern Canyon cSAC during cable installation.

4.2.4.2 Cable Laying Operations through Ireland's EEZ and Southern Canyons SAC

Cable Route Selection & Cable Engineering

The 2Afica cable first enters the Irish EEZ at position 50° 31.7852'N, 007° 36.000'W.

Thereafter, the cable sequentially exits the Irish EEZ, re-enter the UK EEZ at several locations.. The reason for the several exit/entry points is due to the stepped nature of the UK and Ireland EEZ boundary in this area.

The positions are as follows:

Exit UK EEZ/Enter Ireland EEZ - 50° 31.7852'N, 007° 36.0000'W.

Exit Ireland EEZ/Enter UK EEZ - 50° 10.0000'N, 008° 21.5637'W.

Exit UK EEZ/Enter Ireland EEZ - 50° 04.3746'N, 008° 24.0000'W.

Exit Ireland EEZ/Enter UK EEZ - 50° 00.0000'N, 008° 28.7633'W.

Exit UK EEZ/Enter Ireland EEZ - 49° 58.3420'N, 008° 32.0226'W.

Enter Southern Canyons SAC - 49° 01.3370'N, 010° 46.1588'W.

Exit Ireland EEZ to High Seas - 48° 15.1144'N, 011° 15.9334'W

Exit Southern Canyons SAC - 48° 10.8165'N, 011° 17.8675'W.

See Figure 2.6 below.

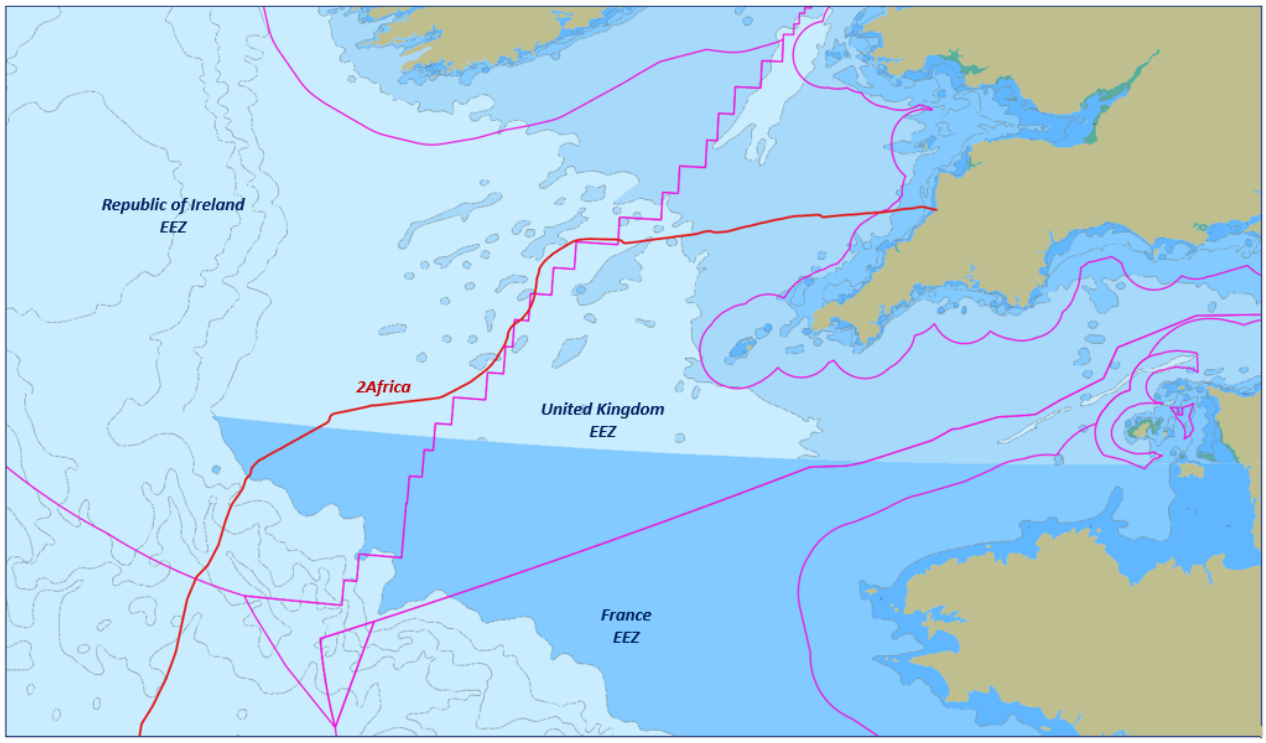

***Figure 2.6**: Entry & Exit Points of the Irish EEZ*

The 2Africa cable system will be predominantly buried by cable plough (see Figure 2.8) in water depths to 1,470 metres, at which point, ploughing operations will cease. The main rationale for plough burial is to protect the cable against external aggression; in this case demersal fishing activities i.e. bottom trawling. Without such protection, the cable could become easily damaged by fishing activities, requiring unnecessary, costly and time-consuming cable repairs. Cable protection/burial by plough has proven to be a very effective protection methodology, with a very low seabed surface area affected and is extensively utilised worldwide.

At crossings with other in-service cables, the plough is recovered and the short unburied section is latterly buried by means of a water jetting Remotely Operated Vehicle (ROV) see Figure 2.12.

In some limited areas within Ireland's EEZ, cable burial cannot be conducted due to unavoidable hard bottom conditions or areas of steep seabed slopes, high relief, or similar.

Pre-Lay Grapnel Run (PLGR) Operations

Prior to the cable installation and burial activities, a PLGR operation campaign will be conducted only in areas of burial to detect and clear any possible objects or debris along the route so that the trenching tools can operate safely and to maximise burial potential. Examples of debris can include old out-of-service telecommunications cables (usually telegraph) which may have been broken and pulled out of position, old fishing gear, rope and anchor chains.

A towed grapnel will be used (see Figures 2.7 and 2.8), the type of which are selected depending on the seabed conditions. Adjustments may be made to the grapnel train offshore subject to site experience – for instance, more chain may be added to weigh down the leading end of the assembly. This is determined by the Master/Officer on Watch, based on the seabed and tension feedback recorded.

The operations will follow the recommendations set out in ICPC Recommendation No. 2 (ICPC, 2015). Any debris recovered during the PLGR operations will be disposed of appropriately onshore. The PLGR operations can be performed by the cable ship or another vessel with specific equipment fitted and the same specification navigation and positioning system as the main lay vessel.

***Figure 2.7**: Spearpoint Grapnel & Giffords*

***Figure 2.8:** Typical PLGR rigging (Source: ASN, 2021)*

Main Lay Operations

Within Ireland's EEZ and through the Southern Canyons SAC, the 2Africa cable system will be installed using a dedicated cable lay vessel. Where the cable is to be buried, a plough will be used to a target burial depth of 2m (depending on seabed conditions). The cable will be surface laid whilst traversing an area of hard ground with some boulders at the entry point to the SAC. From KP 544 – 553, the cable will be surface laid from the edge of the shelf break to deeper water due to steep side slopes and high relief etc., from the 264 to 440 metre water depth contours (Table 2.1). Within this surface laid section, cable slack is engineered such that the cable accurately conforms to the seabed contours, eliminating the potential for any lateral movement of the cable and ensuring its stability on the seabed. No trawl scars have been noted within this area. At the end of last section of plough burial at KP577, the cable will be surface laid thereon to the exit of the Southern Canyons SAC at KP 632 at a water depth of 4,003 metres. During surface lay operations, the cable slack i.e. the excess cable paid out vs. ground covered is laid slightly positive at c. 3%, such that the cable thus closely follows the seabed contours and remains in contact with it. This laying methodology ensures that the cable remains stable on the seabed without any lateral movement. The cable lay vessel will use a dual high accuracy Differential Global Positioning System (DGPS) navigation system to lay the cable as per the target route shown in the RPL.

KP[1] range	Latitude/Longitude	Water Depth (metres)	Comments
528	49° 01.3370'N 010° 46.1588'W	**155**	**Enter Southern Canyons SAC – no plough burial due to boulders**
529	49° 01.1268'N 010° 46.6925'W	**156**	**Commence plough burial**
531	49° 00.7114'N 010° 47.7468'W	156	Trawl scar north of cable line
536	48° 58.6362'N 010° 50.5012'W	158	Trawl scars across cable route
536 - 542	48° 58.6362'N 010° 50.5012'W to 48° 55.6511'N 010° 51.9127'W	158 - 194	Very heavy accumulation of trawl scars
544 - 553	48° 54.6941'N 010° 52.5352'W to 48° 50.3281'N 010° 55.2881'W	**264 - 550**	**No plough burial due side slopes, steep slopes, high relief at shelf break**
553	48° 50.3281'N 010° 55.2881'W	550	Resume plough burial
557	48° 48.4750'N 010° 56.7500'W	730	Trawl scars
558	48° 48.4700'N 010° 57.0000'W	780	Trawl scars
561 - 567	48° 46.4259'N 010° 58.1431'W to 48° 43.7171'N 011° 00.3797'W	836 – 1,000	Numerous trawl scars
568.5	48° 43.0000'N 011° 00.9000'W	1,060	Trawl scars
571	48° 41.4721'N 011° 01.4836'W	1,150	Trawl scars
573 - 574	48° 40.5011'N 011° 01.8722'W to 48° 40.0955'N 011° 01.9962'W	1,210 – 1,270	Numerous trawl scars
577	48° 38.5311'N 011° 02.5770'W	**1,470**	**End of plough burial**
580	48° 36.9968'N 011° 03.1443'W	1,733	Cable transition from Single Armoured Light (SAL) to Lightweight Protected cable (LWP)
622	48° 16.2646'N 011° 15.1230'W	3,781	Cable transition from LWP to Lightweight cable (LW)
632	48° 10.8165'N 011° 17.8675'W	**4,003**	**Exit Southern Canyons SAC**

[1] KP refers to "kiliometre point" and refers to the distance from the beach manhole (BMH) at Widemouth, UK.

Table 2.1: *Lengths of cable to be buried and surface laid within Southern Canyons SAC.*

Onboard, the cable will be stowed into the integrated cable storage tank(s). The cable lay vessel is also equipped with high-end cable laying equipment to load and lay the fibre optic cable. The cable lay vessel will be dynamic positioning (DP) controlled. One of these vessels or similar will be used to install the 2Africa cable system.

During main lay operations, the average operational speed of the vessel during plough burial is 0.3 knots and up to 4 knots (averaging around 500m / hour) for surface lay in waters shallower than 1500m water depth. The speed may need to be adjusted during installation depending on the topography of the area and weather conditions.

Burial Operations

Beyond the 15m water depth where burial is proposed, a jetting plough will be used for burial, with a target burial depth of between 1.5m and 2m (or to bedrock, whichever is reached first). The plough is in contact with the seabed using its four plough skids and the plough share, which is approximately 0.2m wide. The jets on the plough lubricate the ploughshare to reduce friction between the plough and the seabed during burial operations. The jets naturally fluidise the seabed ahead of the ploughshare and cable burial, making the burial operation smoother and potentially improving the burial depth (although burial depth is dependent on the nature of the seabed). Temporary track marks are left from the plough which will disappear over time leaving the seabed to its natural state due to sediment movement. Figure 2.9 shows a jetting plough setup.

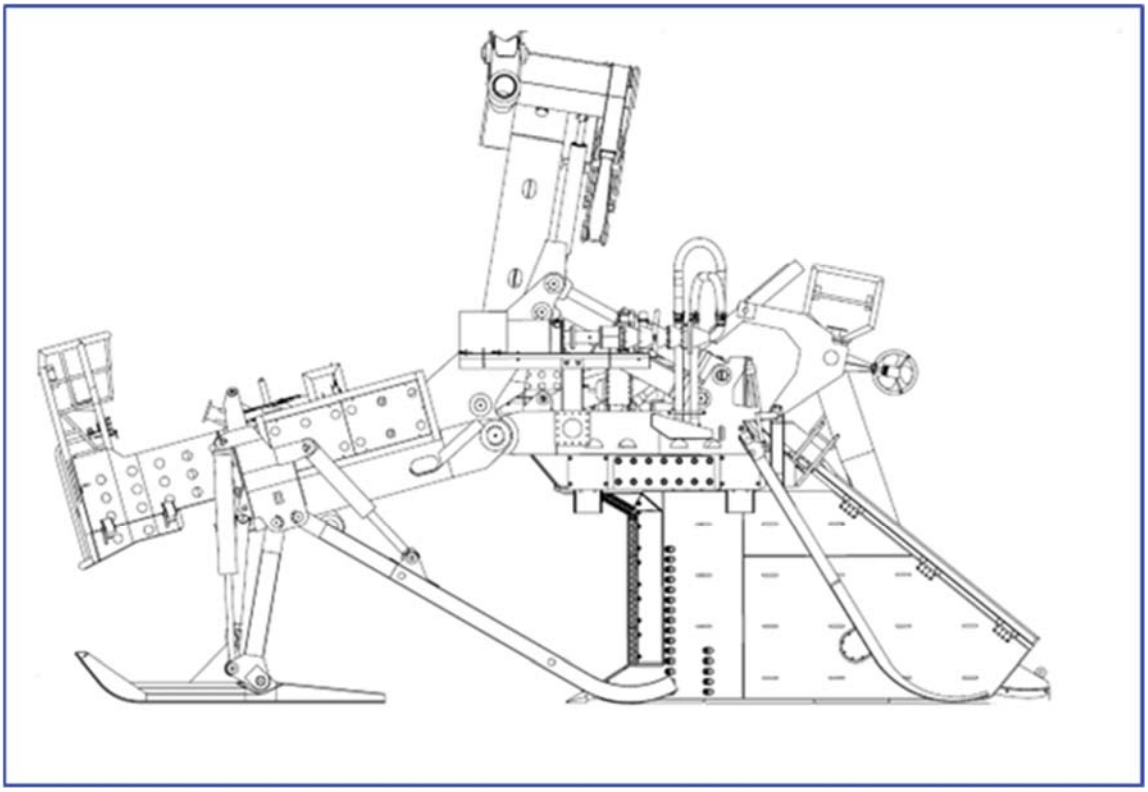

Figure 2.9: *Jetting plough diagram (Source: ASN, 2021)*

Cable laying commences at a slow speed to ensure correct grade-in of the burial tool, i.e. 10m horizontal movement per 1m grade-in. During grade-in, the cable tension is continuously monitored at the deck tensioner and the catenary is continuously monitored at the chute of the vessel. If there is too much tension in the cable, the pay-out speed of cable needs to be increased accordingly to reduce the tension in the cable such that the cable can approach the natural catenary shape. One of the aims of the jetting plough is to reduce the cable tension at the point of burial.

The cable lay vessel will proceed at a steady speed along the cable route. Typically, during the lay the plough is towed 2-3 times the water depth behind the vessel in a straight line except at alter course positions. Acoustic positioning is used to ensure the plough follows the planned route as precisely as possible. The plough's position behind the vessel is calculated using acoustic positioning, the tow wire length deployed and the water depth in the area.

The tension on the cable will be constantly monitored during this lay operation, along with the cable slack compared to relative ship movement, and the position and orientation of the cable. These measures prevent the formation of loops and help to ensure the minimum bending radius is not compromised.

Key data for monitoring purposes include:

- Cable length;
- Departure angle (visual monitoring);
- Tension at the tensioner;
- Water depth;
- Position of the burial tool; and
- Cable burial depth.

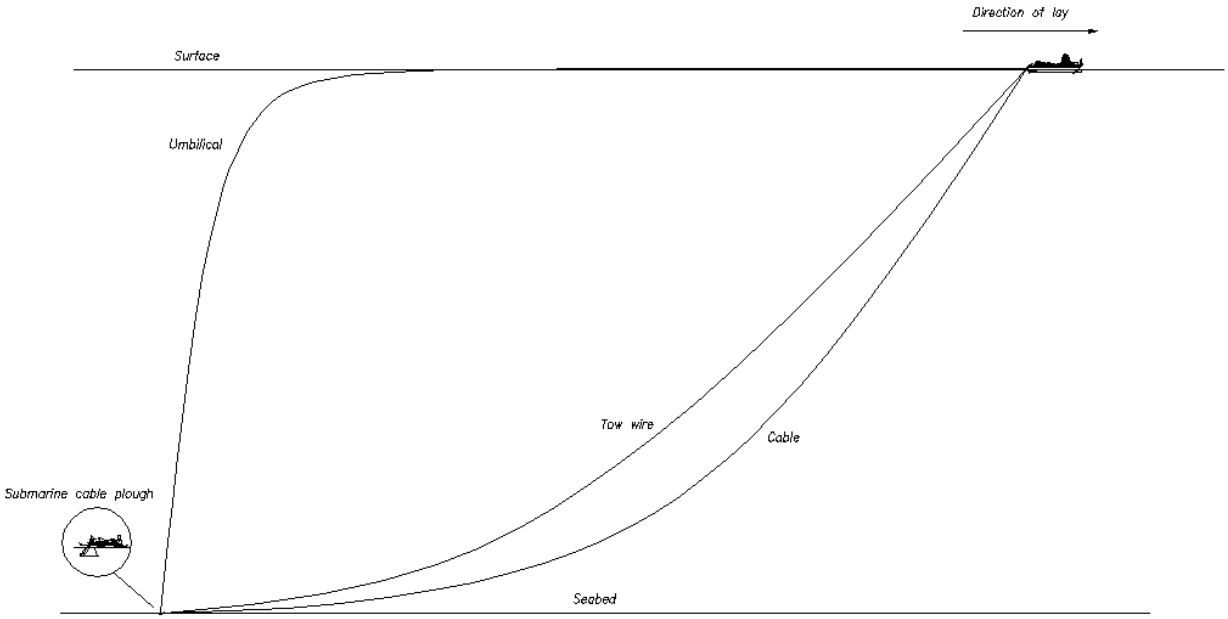

Figure 2.10: *Diagram of plough operations (Source: ASN, 2021)*

Surface Lay Operations

During the surface lay operations within the Southern Canyons SAC and into deeper water, the surface lay precision on the seabed is +/- 1% of water depth from the centreline. The surface lay and touchdown positioning is calculated using a force based 2D model which is used across the industry as a standard calculation method to ensure that the cable naturally conforms to the seabed contours. The cable will have very limited movement on the seabed once installed as it is held in position under its own weight.

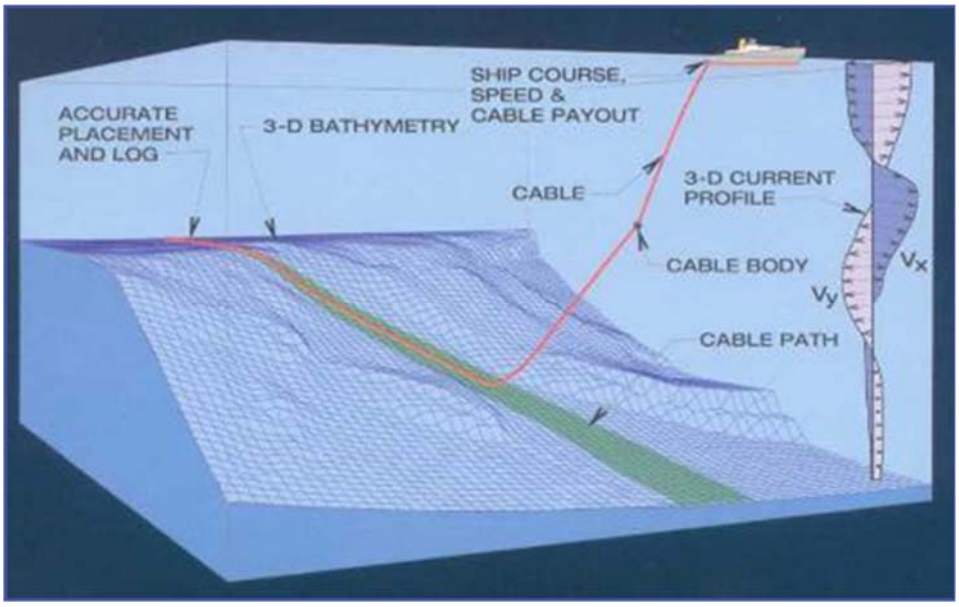

Figure 2.11: *Surface lay operations diagram (Source: ASN, 2021)*

Post Lay Inspection & Burial (PLIB) Operations

Post Lay Inspection and Burial (PLIB) operations may be carried out in some areas along the route. A visual inspection will be dependent on visibility at the time of the inspection, alternatively the inspection will use cable tracking sensors and forward-facing sonar to determine the burial.

Post lay burial operations will be carried out in plough burial areas at several locations:

- At in-service cable crossings (none planned within the Southern Canyons SAC, but there are 6 in-service cable crossings within the Ireland EEZ);
- Initial, intermediate and final splices;
- Unplanned plough skips; and
- Areas where seabed slopes are not suited for ploughing and jetting burial is viable (not planned within the Southern Canyons SAC).

A remotely operated vehicle (ROV) will be deployed to bury the cable (in areas identified in the bullet points above) using a jetting tool.

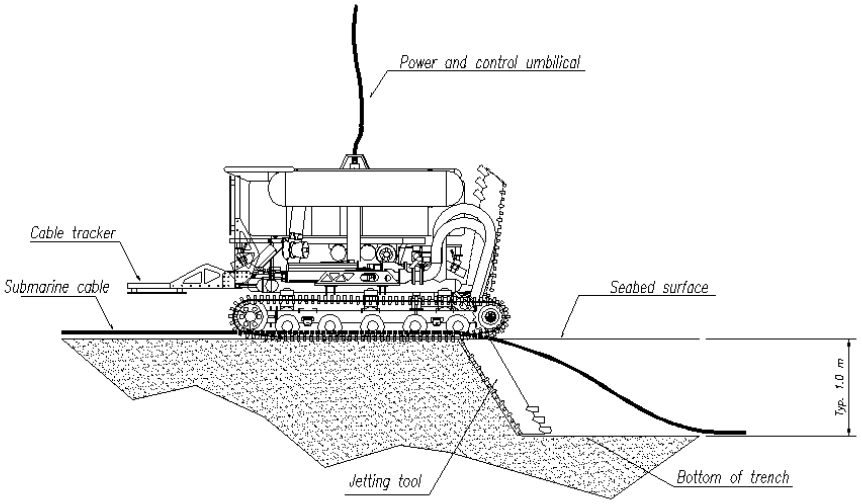

Figure 2.12: *ROV jetting operations diagram (Source: ASN, 2021)*

2.1.5 Time in Irish waters and in Southern Canyons SAC

The following is an outline of the perceived time spent in Irish waters and the activities that will be carried out:

	Activity	Time	Within SAC
	Enter EEZ		
	Ploughing 8.7 km	0.6 days	No
	Plough up	0.3 days	No
	Cable Crossing	0.3 days	No
	Plough Down	0.3 days	No
	Ploughing 13.5 km	1.1 day	No
	Plough up	0.3 days	No
	Surface Lay 2.1km	0.3 days	No
	Plough Down	0.3 days	No
	Ploughing 0.6km km	0.04 day	No
	Plough up	0.3 days	No
	Cable Crossing	0.3 days	No
	Plough Down	0.3 days	No
	Ploughing 49.4km km	3.4 day	No
	Plough up	0.3 days	No
	Cable Crossing	0.3 days	No
	Plough Down	0.3 days	No
	Ploughing 43km km	3 day	No
	Plough up	0.3 days	No
	Cable Crossing	0.3 days	No
	Plough Down	0.3 days	No
	Ploughing 31.8km km	2.2 day	No
	Plough up	0.3 days	No
	Cable Crossing	0.3 days	No
	Plough Down	0.3 days	No
	Ploughing 52km km	3.6 day	No
	Plough up	0.3 days	No
	Cable Crossing	0.3 days	No
	Plough Down	0.3 days	Yes
	Ploughing 14.6km km	**1.0 day**	**Yes**
	Plough up	0.3 days	Yes
	Surface Lay 9km	0.3 days	Yes
	Plough Down	0.3 days	Yes
	Ploughing 23.9km km	**1.7 day**	**Yes**
	Plough up	0.3 days	Yes
	Surface Lay 52.3km	0.3 days	Yes
	Exit EEZ		No

Table 2.2. *Outline of the perceived time spent in Irish Waters (red within Southern Canyons SAC)*

2.1.6 Plough Deployment Procedure

When commencing ploughing operations, the plough is loaded with the telecommunications cable on the deck of the cable ship. The plough is then lifted from deck and slowly deployed overboard vis the use of an 'A' frame.

Once overboarded, the plough is then very slowly lowered into the water column, utilising the towing wire. The plough is then slowly lowered to the seabed vertically while paying out the tow wire, the plough control umbilical and the telecommunications cable. The USBL would be activated at the point of lowering to the seabed in order to monitor the plough position relative to the cable ship.

Once on the seabed, the plough is then reconfigured into full ploughing mode. The tow wire, umbilical and telecommunications cables are all paid out slowly to reposition the plough directly behind the cable ship to be able to commence ploughing. At the same time, the cable ship commences to transition into forward motion, towing the plough behind the cable ship and the plough share grades into the seabed to the predetermined burial depth and burial thus commences. The plough positioning behind the cable ship is monitored by means of the USBL and navigation positioning systems.

The plough deployment is conducted in a very slow, determined manner to avoid the potential for damage to the plough or telecommunications cable. The deployment can take up to 12 hours.

Plough recovery is a reverse process whereby the cable ship slowly stops burial, the plough share is graded out of the seabed at the same time. Once the cable ship is positioned directly over the plough, the plough is then lifted from the seabed by the tow wire and the plough is slowly recovered to deck. This operation may also take up to 12 hours.

2.1.7 Future Maintenance Activities

In the waters of Ireland's Exclusive Economic Zone (EEZ) and within the Southern Canyons Special Area of Conservation (SAC), the 2Africa cable system may require repairs primarily due to external factors like fishing activities e.g. fishing gear strikes, and occasionally, product failures. The precise frequency of these repairs cannot be accurately anticipated. The location and extent of future repairs are difficult to predict but is not expected to exceed five repairs over the 25 year design life within Irish Waters but is expected to be considerably fewer.

2.1.8 Decommissioning

There is no definitive position on decommissioning of telecommunication submarine cables. UNEP-WCMC (United Nations Environment Program) document, CARTER *et al,* 2009, points out that the removal of submarine telecommunication cables should be evaluated on a case-by-case basis, as the procedures for withdrawal and some local conditions (soil type, crossing with other cables, etc.) can often have a greater environmental impact than the procedures related to the installation itself. In some cases, cables that have a depleted business life may serve research and teaching purposes, which in other words is an extension of their “useful life”, but now under the responsibility of another owner / manager.

The system has a system design life of 25 years however cable system can operate long after this period, and its deactivation can only be performed by the shutdown of the electrical / electronic system and disabling the transmission of information. There are no plans to recover the cable as part of the decommissioning plan.

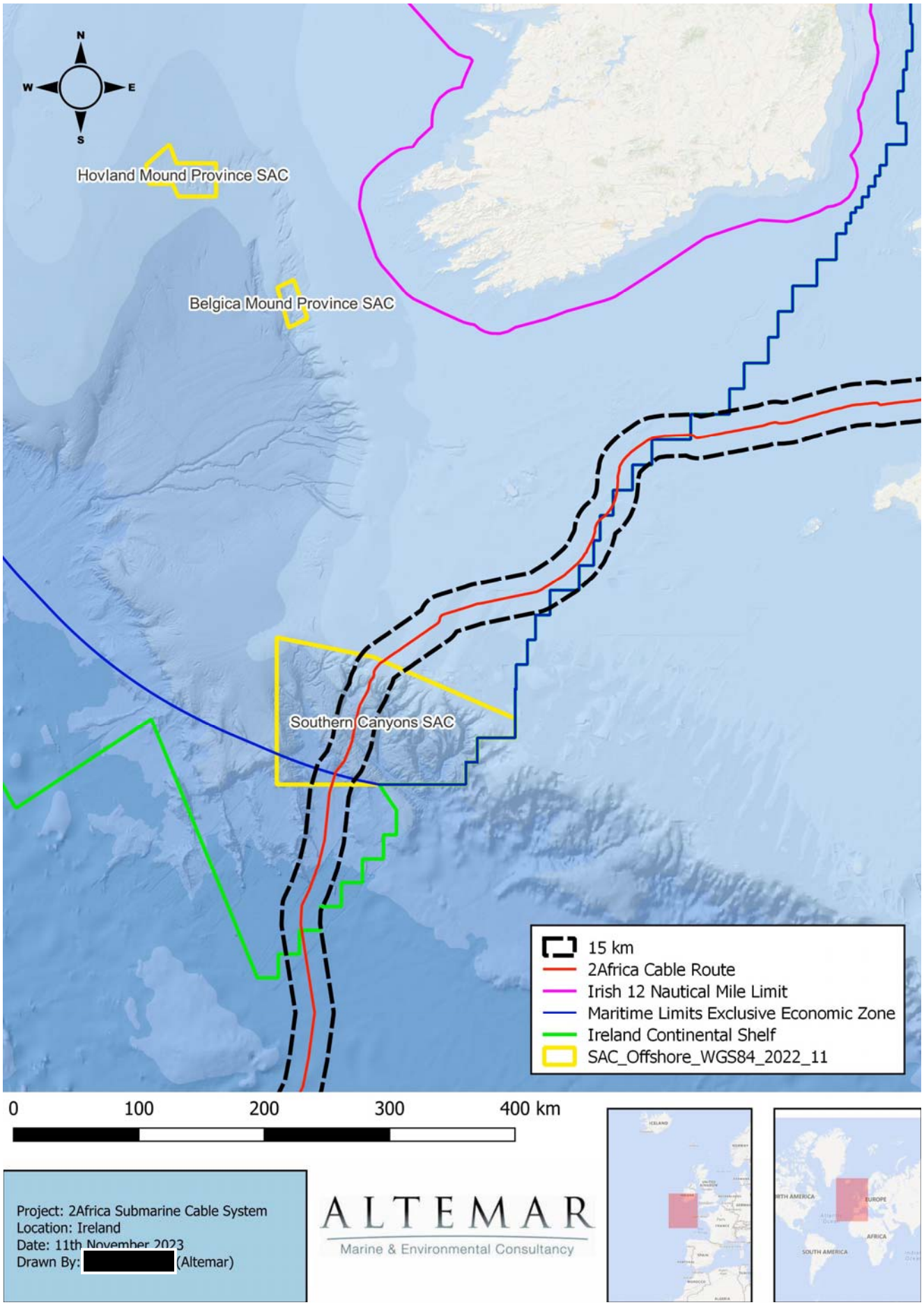

Figure 2.13. *2Africa cable route in relation to the Irish EEZ, Designated Irish Continental Shelf, and Offshore SACs*

3 Need & Alternatives

The 2Africa cable is compelled to make this submission to MARA under unusual circumstances. The initial notification for the cable installation was submitted to the Embassy of Ireland in January 2023 where ASN advised that the installation of the 2Africa Submarine cable within the Exclusive Economic Zone (EEZ) of Ireland was planned for Q4 of 2023. The submarine fibre optic cable will be installed on the seabed by a cable laying vessel along the route shown in Figure 2.13. It is important to note that the cable route does not cross the Territorial Seas of Ireland at any point and there was no requirement for a Foreshore Licence at that time. The freedom to lay such cables in EEZs is governed by the United Nations Law of the Sea (UNCLOS), of which Ireland ratified on 21st June 1996. It is customary, however, for coastal states to be notified of cable installations across their EEZs.

This notification was made prior to the official establishment of the Maritime Area Regulatory Authority (MARA) on 17th July 2023. It is worth noting that the planning for the 2Africa cable system commenced well before 2019, and the marine cable survey for this system began in 2020. This predates the enactment of the Maritime Area Planning Act 2021. The results of this survey played a critical role in ensuring that the cable's route aligns with stringent safety protocols, environmental considerations, proximity to existing cables, navigational requirements, and other essential factors influencing cable routing. During the pre-application meeting there was a question raised on if the cable could be rerouted to avoid the Candidate Special Area of Conservation (cSAC) (Figure 2.13). At such a late stage this needs careful consideration due to its impact on technical integrity, environmental factors, and overall commercial project viability. It is also important to note that the wider cable installation has commenced and the Irish element forms part of the main trunk element of the project. It is therefore essential to the overall project that the Irish element is installed without delay, to prevent repercussions across the entire 2 Africa project.

Rerouting Technical Challenges:

The cable has been manufactured, and the system engineering has already been optimised; therefore, rerouting would compromise the optimised solution. Elements of the wider cable installation have been installed and optimised based on the pre-defined route. Rerouting poses a significant technical challenge, primarily because it can adversely affect signal quality and system stability. The addition of extra length to a cable segment introduces considerable attenuation, a phenomenon that can seriously compromise signal strength. The increase in route length could be potentially over 50km and extending the cable length degrades the overall signal power (attenuation), and different parts of this signal (laser light wavelengths) may degrade by differing amounts, as such the system will be compromised in its performance. Such deviations during the commissioning process have profound consequences, causing operational setbacks and imposing a substantial financial burden.

Increasing the route length (deviating from the most efficient route) inherently increases the risk of failure by the fact of there being more cable vulnerable to external aggression. The associated increased repair burden equates to greater environmental and financial impact.

The established route has been designed as a compromise to avoid stakeholders and seabed users established at the time of route design. Existing submarine cables severely constrain the remaining available seabed available for efficient routing. UK Marine Protected Areas established at the time of route design were also avoided where possible, including:

- East of Haig Fras
- Greate Haig Fras
- South West Deeps
- North-West Of Jones Bank
- The Canyons

Adjusting the route at this stage requires revaluation of each of these establishes assessments, with significant feasibility uncertainty.

Environmental Considerations:

While subsea telecoms cables are known for their low environmental impact, maintaining the most direct route on the seabed further minimises this impact. Rerouting introduces additional environmental effects, involving the transportation of the cable segment back to the factory. This necessitates a reconsideration of the associated carbon footprint. Additionally, the potential need for rebuilding and manufacturing more cables and repeaters involves additional manufacturing processes, materials, and energy, contributing further to environmental impact. The

additional survey vessel and cable ship time also leads to increased fuel consumption and costs. It is also important to note that routing of the cable to an alternative route within the Irish EEZ to avoid the Southern Canyons cSAC is likely to involve a westerly deviation in the route which would result in ploughing down the continental slope, rather than surface laying down the slope in the current configuration. In addition, additional marine survey would have to be carried out to assess the alternative route prior to main lay.

Commercial Viability:
From a commercial standpoint, factors such as the cost of raw materials for cable and repeater manufacture, the remobilisation of a survey vessel (including MARA licence for survey activities) for a >320km length shallow and deep-water survey, re-designing the route, re-engineering the already manufactured cable and the knock-on effects on suppliers and the cable owner, impacting other crucial projects and causing revenue loss, all come into play. The failure to pass commissioning due to system signal degradation incurs costs related to rectification, amounting to several million Euros and a delay of 3-4 years in deploying the entire 2Africa WEST cable system, resulting in further financial loss and inconvenience to countries that have scheduled their internal infrastructure for predefined commencement dates.

4 Planning and Development

At 45,000 km long, 2Africa will be one of the world's largest subsea cable projects and will interconnect Europe (eastward via Egypt), Asia (via Saudi Arabia), and Africa. The system will deliver more than the total combined capacity of all subsea cables serving Africa today, with a design capacity of up to 180Tbps. 2Africa will deliver much needed internet capacity and reliability across large parts of Africa, supplement the fast-growing capacity demand in the Middle East, and underpin the further growth of 4G, 5G and fixed broadband access for billions of people. The delivery of the 2Africa Submarine Cable System is in line with the National Marine Planning Framework (NMPF) and strategic investment priorities for communications outlined in the National Development Plan (NDP). Permission has been provided throughout all other waters where the cable is to be laid. Because of the introduction of MARA in mid 2023 and the new requirements for permissions to be sought between the 12nm limit and the EEZ, the permissions within the Irish EEZ are the final permissions to be sought.

National Marine Planning Framework

Although the proposed project is not making landfall in Ireland, Ireland will be connected to the 2Africa cable via the UK and Irish Sea cables, providing high capacity international connectivity for all major data centres in Ireland, supporting inward investment and high-tech jobs in Ireland. As outlined in the Telecommunications chapter of National Marine Planning Framework (March 2021), '*Guaranteeing existing and future international telecommunications connectivity is critically important to support the future needs of society and enterprise in Ireland. The value of the digital economy is estimated at €12.3bn or 6% of GDP and is expected to grow significantly.'*

'High quality access to international telecommunications networks is a key driver in social, economic and industrial growth and development of the regions, and of the State as a whole. Such connections can lead to increased attractiveness for foreign direct investment and create favourable conditions for small and medium-sized enterprises (SMEs) and start-ups. In that regard, it is essential that there is sufficient capacity into the future to cater to the demand for services. It is also important to note that as well as capacity, diversity is important – to ensure multiple routes providing network resilience in the event of a route failure.'

National Development Plan

As outlined in the High-Quality International Connectivity chapter of the NDP (2021-2030), '*High quality, secure and reliable connectivity to global telecommunications networks is of significant strategic importance to the Irish State.*

By strengthening international connectivity and developing an agile and resilient digital infrastructure, it will allow Ireland to embrace digital transformation enabling sustainable economic growth and positive social dividends.'

Legislative Background

The proposed project has been informed by a number of key items of legislation:

- Maritime Area Planning Act 2021.
- The Planning and Development, Maritime and Valuation Act 2022.
- S.I. No. 402/2023 – Maritime Area Usage (Licence Fees) Regulations 2023.
- S.I. No. 508/2023 – Maritime Area Consent (Certain Application Fees) (No.2) Regulations 2023.
- S.I. No. 530/2023 – Maritime Area Usage (Licence Conditions) Regulations 2023.

5 Land and Soils

The proposed cable installation works within the Irish EEZ are located exclusively in the offshore subtidal, 127km from the Irish shoreline at its nearest point (Figure 5.1). Given the localised nature of the proposed works, potential impacts are foreseen within the immediate vicinity of the proposed cable route, inert nature of the construction and operational effects and the extensive distance between the proposed works area and the Irish shoreline (min. 127km), no impact on land and soils within Ireland's terrestrial environment are foreseen as a result of the proposed project.

Figure 5.1. *Nearest point to Irish shoreline (Source: Alcatel Submarine Networks)*

During plough burial works (down to depth of 1500m), seabed sediment will be disturbed within a 0.3m wide and 2.0m below sea floor trench during installation of the cable and will be immediately back-filled. Seabed sediments will undergo minor disturbance during surface lay works. Given the nature of the proposed works, and the limited range of potential disturbance impacts on seabed sedimentation, in the absence of mitigation measures, the project will have no significant impact on land or soils.

6 Water

As demonstrated in Figure 5.1, the proposed cable route is located 127km from the Irish shoreline (at its nearest point), no significant impacts on the water quality of watercourses, transitional waterbodies, and coastal waterbodies are foreseen. The project will not affect surface water, groundwater, or wastewater. The proposed project will not negatively impact on the environmental objectives of the Water Framework Directive (WFD). The cable itself is inert in nature and does not emit pollutants or chemicals to the marine environment or sediment.

The Marine Strategy Framework Directive (MSFD) sets out a target for "Good Environmental Status" of Ireland's seas. As reported in the EPA Ireland's Environment: An Integrated Assessment 2020 Report (Chapter 8: The Marine Environment), Ireland's offshore waters are predominately clean, healthy, and biologically diverse. Out of an abundance of caution, it is considered that there is the potential for the proposed works to have a minor negative impact on offshore water quality within the Irish EEZ. This is as a result of the potential for accidental small scale chemical, hydraulic and fuel spillages during main lay operations, which may negatively impact locally on the surrounding water quality. However, the fuel and hydraulic fluids onboard are common to vessels of this size and cable lay operations do not require any fuel or hydraulic fluid specific to cable lay activity. In the event of accidental spills, in the absence of onsite mitigation these be would be expected to be minor in nature and would by no means be at the scale to impact on water quality status. All vessels involved in the 2Africa installation operations will be operating under the International Convention for the Prevention of Pollution from Ships (MARPOL) protocols.

The installation of the proposed 2Africa cable will be undertaken by custom designed modern vessels which comply with EU requirements in terms of operational controls and environmental standards. The proposed project will comply with standards outlined in the MSFD. No significant negative effects on water quality within offshore waters of the Irish EEZ are foreseen as a result of the proposed project following compliance with the MSFD and MARPOL. It should be noted that a Marine Mammal Observer (MMO) will be onboard the vessel in Irish waters.

7 Biodiversity

7.1 Methodology

7.1.1 Desk Study

A desk study was undertaken to gather and assess ecological data. It should be noted that the proposed project is in the offshore environment and will not make landfall in Ireland. Sources of datasets and information included:

- The National Parks and Wildlife Service
- National Biodiversity Data Centre
- Marine Institute
- INFOMAR data (e.g. backscatter and multibeam) (WMS data)
- Irish Whale and Dolphin Group
- Bord Iascaigh Mhara
- Environmental Protection Agency (Water Quality Data)
- Bing Maps (ArcGIS)
- EU marine habitat data

A provisional desk based assessment of the potential subtidal habitats was carried out. This included a detailed assessment of INFOMAR data (backscatter, multibeam and LIDAR) in addition to Marine Strategy Framework Directive habitat mapping of the off-shore area, Admiralty charts, NPWS Data, broadscale habitat data, Sea Rover ROV data and project acquired survey data including sidescan sonar, backscatter, processed data including charts and multibeam.

7.1.2 Field Survey

The geophysical and geotechnical surveys of the proposed 2Africa subsea cable system within the Irish EEZ were conducted by Fugro between December 2020 and May 2021. These data informed further route engineering to find the optimum route for the cable, avoiding known hazards and rough topography. The avoidance of hazards includes locally routing of the proposed cable route to avoid sonar contacts that included boulders that could potentially form reef habitat. These provide the highest resolution continual dataset for the assessment.

7.1.3 Consultation

The National Parks and Wildlife Service (NPWS) were consulted in relation to species and sites of conservation interest. The National Biological Data Centre (NBDC) (Appendix II) and Irish Whale and Dolphin Group (IWDG) records were consulted for species of conservation significance.

7.1.4 Spatial Scope and Zone of Influence

IEEM (2006) defined the zone of influence as “the areas/resources that may be affected by the biophysical changes caused by activities associated with a project”. In order to define the extent of the study area for ecological assessment, all elements of the project were assessed and reviewed in order to identify the spatial scale at which ecological features could be impacted. Due to the limited temporal and geographical scale of the project and the use of Best Available Techniques (BAT), modern vessel (Appendix III), the slow speed of the cable lay (4kn), it is considered that the potential impacts of the proposed works could only extend beyond 500 m of the subtidal elements of the project due to noise generation and potential disturbance of sediment. However, as outlined in IEEM (2010) “in the marine environment it is more difficult to define the geographical framework precisely and to accommodate all factors that should influence the definition of value, e.g. size or conservation status of populations or the quality of habitats.” As a result, “it is very unlikely that the impacts on integrity can be evaluated without considering functions and processes acting outside the site’s formal boundary.” It is important to note that unlike other maritime operations during main lay cable installation works, the installation vessel speed will be very slow (0.3 knots during plough burial and 4 knots during surface lay). In light of this, and based on the localised nature of the cable laying impacts, the Zone of Influence in the subtidal was extended to 2 km either side of the cable route to take into account localised resuspension due to cable laying activity. It should be noted that the noise generated from the vessel laying activity is relatively minor, similar in nature to trawling activity. The proposed project is for main lay operations and not marine survey. However, despite the lack of extensive underwater acoustics, that would be used in a tradition marine survey, the project has the potential to introduce noise into the marine environment particularly through the

use of a USBL (Ultra Short Baseline) equipment used to locate underwater equipment e.g. plough and ROV's etc. which may extend the effects of the project beyond 2km.

7.1.5 Impact Assessment Significance Criteria

This section examines the potential causes of impact that could result in likely significant effects to the species and habitats that occur within the ZOI of the proposed development. These impacts could arise during either the construction or operational phases of the proposed development. The following terms are derived from EPA (2022) EIAR Guidance and are used in the assessment to describe the predicted and potential residual impacts on the ecology by the construction and operation of the proposed development.

Magnitude of effect and typical descriptions

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

Criteria for Establishing Receptor Sensitivity/Importance

Importance	Ecological Valuation
International	Sites, habitats or species protected under international legislation e.g. Habitats and Species Directive. These include, amongst others: SACs, SPAs, Ramsar sites, Biosphere Reserves, including sites proposed for designation, plus undesignated sites that support populations of internationally important species.
National	Sites, habitats or species protected under national legislation e.g. Wildlife Act 1976 and amendments. Sites include designated and proposed NHAs, Statutory Nature Reserves, National Parks, plus areas supporting resident or regularly occurring populations of species of national importance (e.g. 1% national population) protected under the Wildlife Acts, and rare (Red Data List) species.
Regional	Sites, habitats or species which may have regional importance, but which are not protected under legislation (although Local Plans may specifically identify them) e.g. viable areas or populations of Regional Biodiversity Action Plan habitats or species.
Local/County	Areas supporting resident or regularly occurring populations of protected and red data listed-species of county importance (e.g. 1% of county population), Areas containing Annex I habitats not of international/national importance, County important populations of species or habitats identified in county plans, Areas of special amenity or subject to tree protection constraints.
Local	Areas supporting resident or regularly occurring populations of protected and red data listed-species of local importance (e.g. 1% of local population), Undesignated sites or features which enhance or enrich the local area, sites containing viable area or populations of local Biodiversity Plan habitats or species, local Red Data List species etc.
Site	Very low importance and rarity. Ecological feature of no significant value beyond the site boundary

Quality of Effects	Effect Description
Negative /Adverse Effect	A change which reduces the quality of the environment (for example, lessening species diversity or diminishing the reproductive capacity of an ecosystem; or damaging health or property or by causing nuisance).
Neutral Effect	No effects or effects that are imperceptible, within normal bounds of variation or within the margin of forecasting error.
Positive Effect	A change which improves the quality of the environment (for example, by increasing species diversity, or improving the reproductive capacity of an ecosystem, or by removing nuisances or improving amenities).

Significance of Effects

Significance of Effect	Description of Potential Effect
Imperceptible	An effect capable of measurement but without significant consequences.
Not significant	An effect which causes noticeable2 changes in the character of the environment but without significant consequences.
Slight Effects	An effect which causes noticeable changes in the character of the environment without affecting its sensitivities.
Moderate Effects	An effect that alters the character of the environment in a manner that is consistent with existing and emerging baseline trends.
Significant Effects	An effect which, by its character, magnitude, duration or intensity alters a sensitive aspect of the environment.
Very Significant	An effect which, by its character, magnitude, duration or intensity significantly alters most of a sensitive aspect of the environment.
Profound	An effect which obliterates sensitive characteristics.

Duration and Frequency of Effect	Description
Momentary	Effects lasting from seconds to minutes
Brief	Effects lasting less than a day
Temporary	Effects lasting less than a year
Short-term	Effects lasting one to seven years.
Medium-term	Effects lasting seven to fifteen years.
Long-term	Effects lasting fifteen to sixty years.
Permanent	Effects lasting over sixty years
Reversible	Effects that can be undone, for example through remediation or restoration

Describing the Probability of Effects	Description
Likely Effects	The effects that can reasonably be expected to occur because of the planned project if all mitigation measures are properly implemented.
Unlikely Effects	The effects that can reasonably be expected not to occur because of the planned project if all mitigation measures are properly implemented.

7.2 Results

7.2.1 Proximity to Designated Conservation Sites

Onshore and inshore Special Areas of Conservation (SAC) are seen in Figure 7.1. The locations of onshore and inshore Special Protection Areas (SPA) are seen in Figure 7.2. The cable route, Irish territorial waters and Irish Contiguous Zone, with a 15km buffer showing proximity to Offshore SAC's is seen in Figure 7.3. Natural Heritage Areas and Ramsar sites are seen in Figure 7.4 and 7.5. The proposed route passes through the newly designated Southern Canyons cSAC. Table 7.1 outlines the designated conservation sites within 100km of the proposed route.

Code	NATURA 2000 Site	Distance
Special Areas of Conservation		
Offshore		
002267	Southern Canyons cSAC	Route passes through site
Special Protection Areas		
N/A	None	N/A
NHAs / pNHAs		
N/A	None	N/A
Ramsar Sites		
N/A	None	N/A

Table 7.1. *Proximity to designated sites of conservation importance within 100km of the proposed cable route.*

7.2.2 Marine Survey and Desktop data

There are limited data currently available in relation to the detailed conservation objectives of this SAC. As outlined in the Site Synopsis '*The ecology of the Southern Canyons is understandably complex. There are areas of hard rocky substrate and areas of muddy or sandy sediment. Along the top of the canyon systems, sediment is the dominant substrate. In the canyons, depending on slope, it grades away to bedrock. Bottom currents also play a strong role in the type of fauna observed. Marine snow flushes through the canyons providing a rich food resource for various invertebrates and vertebrates. This material forms from degradation and flocculation of phytoplankton and excreta in the productive shelf waters. In areas where muddy sediments dominate, there was evidence of pteropod mollusc burrows and occasional emergent sea fans (Distichoptilum) and soft corals (Anthomastus). An extensive field of sea pens, including Pennatula sp. and Kophobelemnon sp., interspersed with bamboo coral Acanella (both fir tree and bushlike forms) also occurs. In coarse sand, which can form quite prominent sand ridge features due to the action of bottom currents, the fauna include Swiftia, Desmophyllum, large barnacles, sea pens, and ophiuroids. Where there was sufficient anchoring, fauna consists of clumps of live Desmophyllum and occasionally Madrepora. Octocorals or soft corals included a lot of clavulariids and canthogorgia. The echinoid Cidaris is abundant over sand with some prominent anemones and occasional errant hermit crabs and galatheid crabs. The numerous fish species include elasmobranchs, grenadiers, orange roughy and eels*.'

As previously outlined in the Site Synopsis '*An extensive offshore survey of this site was completed in 2019 using the RV Celtic Explorer and the Holland I ROV. This survey was completed by a team of internationally recognised deep sea ecologists. A total of 50 dives were completed during this leg of the survey. The canyon systems cutting into the continental shelf were formed by sediment erosion events that scoured deep canyons with flanking escarpments. The thalwegs of these canyons exit thousands of meters deep into the abyssal plains below. The SAC boundaries have been designed to encompass this unique habitat, which is exceptional in a European context.*'

Habitats noted based on 2Africa marine survey in Southern Canyons SAC down to 1500m (burial depth) are seen in Figure 7.6. It should be noted that beneath 1470m the cable is surface laid. Based on 2Africa survey data the habitats observed in the cSAC are seen in Figure 7.6. These primarily consisted of fine sediment, course sediment and hard ground. The proposed cable route (burial and surface lay) through Southern Canyons SAC including detailed Backscatter and Sonar Contact data is demonstrated in Figures 7.7 and 7.8. The proposed cable route through Southern Canyons SAC showing sonar contacts (e.g boulders) and trawl marks are seen in Figures 7.9 and 7.10. It should be noted that the routing of the cable has been modified to take these into account. It should be noted that

evidence of fishing is noted in the SAC along the proposed route where the cable is to be buried. This enforces the requirement for burial in these areas. It should also be noted that the routing of the cable avoids the majority of sonar contacts. Figures 7.11 and 7.12 show the marine backscatter in the deeper section of the SAC which will be surface laid. Infomar shaded relief of the routh through the SAC is seen in Figures 7.13-7.14. The main burial zone in the cSAC is seen in Figure 7.14.

As can be seen from the data in figures 7.6 to 7.14 burial of the cable is within a relatively flat sediment based area between 156m & 264m and 550m & 1500m. Outside these areas the cable will be surface laid. The location of Sea Rover ROV dives are seen in Figure 7.15 (Appendix IV). Infomar sediment samples along the route are seen in Figures 7.16 & 7.17. These indicate that habitats in the vicinity of the cable within the SAC are sand on the top of the continental slope and clay down the slope. Additional information on the project marine survey are seen in Appendix V.

As seen in Figures 7.18-7.23, EUSEAMAP, MSFD and Infomar habitat maps have limited data within the Southern Canyons SAC and primarily rate the area in general habitat terms according to depth range, as unclassified or simply seabed. Figure 7.23 and 7.24 note the offshore geology morphology and geologic features, while Figure 7.25 shoes the bathymetric outline of the canyons down the continental slope. Coral records are seen in Figures 7.26-2.30. The Global Distribution of Cold-water Corals dataset shows of the global distribution of cold-water corals (UNEP, Cold Corals 2017). Occurrence records are given for the subclass Octocorallia (octocorals; also known as Alcyonaria) and four Orders (in Class Anthozoa): Scleractinia (reef-forming corals), Antipatharia (black corals), Zoanthidae (encrusting or button polyps), and Pennatulacea (sea pens). Occurrence records are also available for the order sub-Order Filifera (lace corals) in Class Hydrozoa. These records are primarily associated with canyons and mound features that allow for increased current speeds and clear ground for settlement rather than sediment based seabed where ploughing is proposed.

Modelled Bottom currents within the Southern Canyons cSAC are seen in Appendix VI. The results from the analysis conclude that bottom currents throughout the Southern Canyon Special Areas of Conservation pose minimal if any risk of significant sediment movement or smothering during the installation of the 2 Africa cable system. As a result, it would not be expected that currents would result in extensive plumes of sediment. These effects are summarised in Table 3.

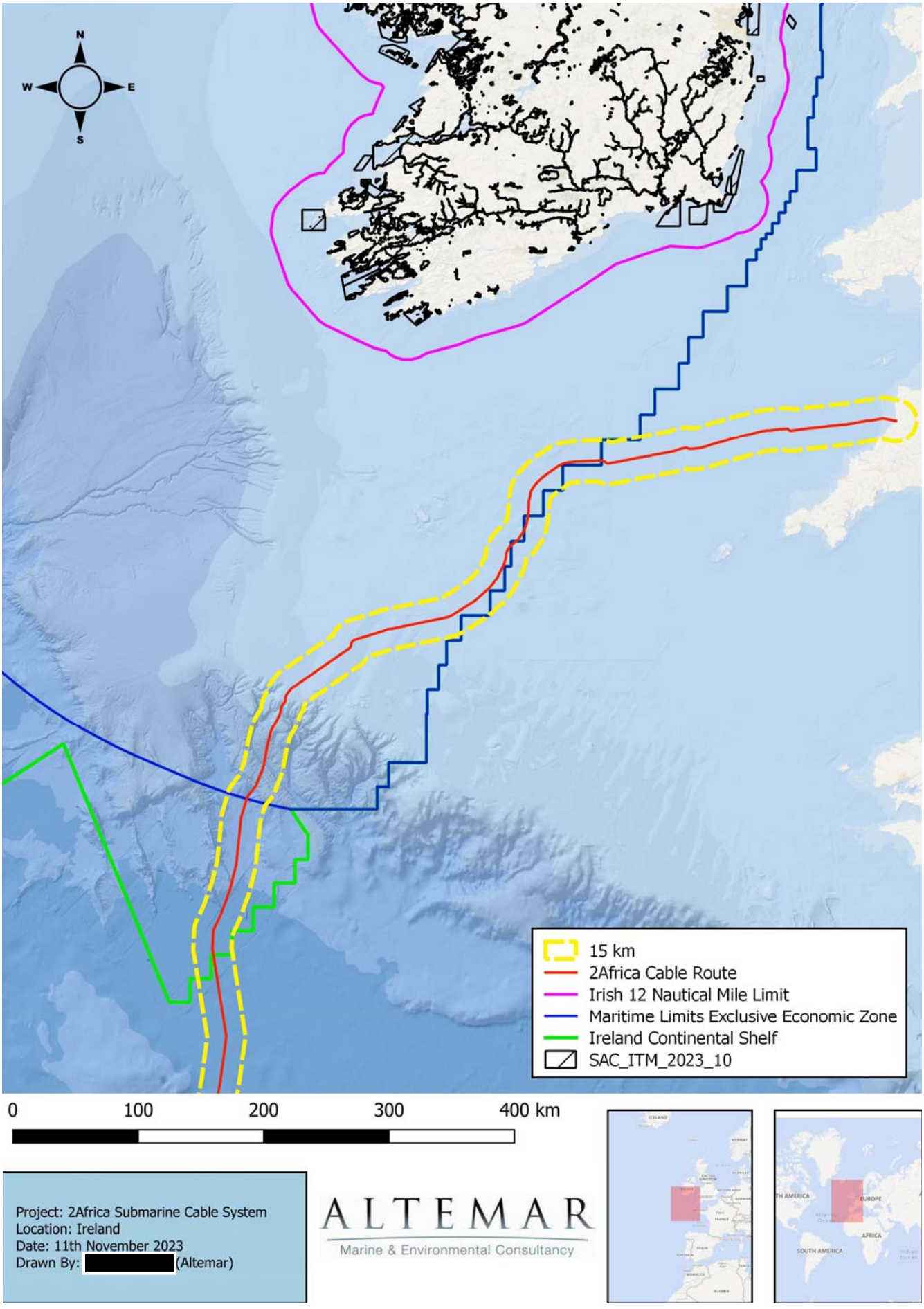

Figure 7.1. *2Africa cable route in relation to the Irish EEZ, Designated Irish Continental Shelf, and SACs*

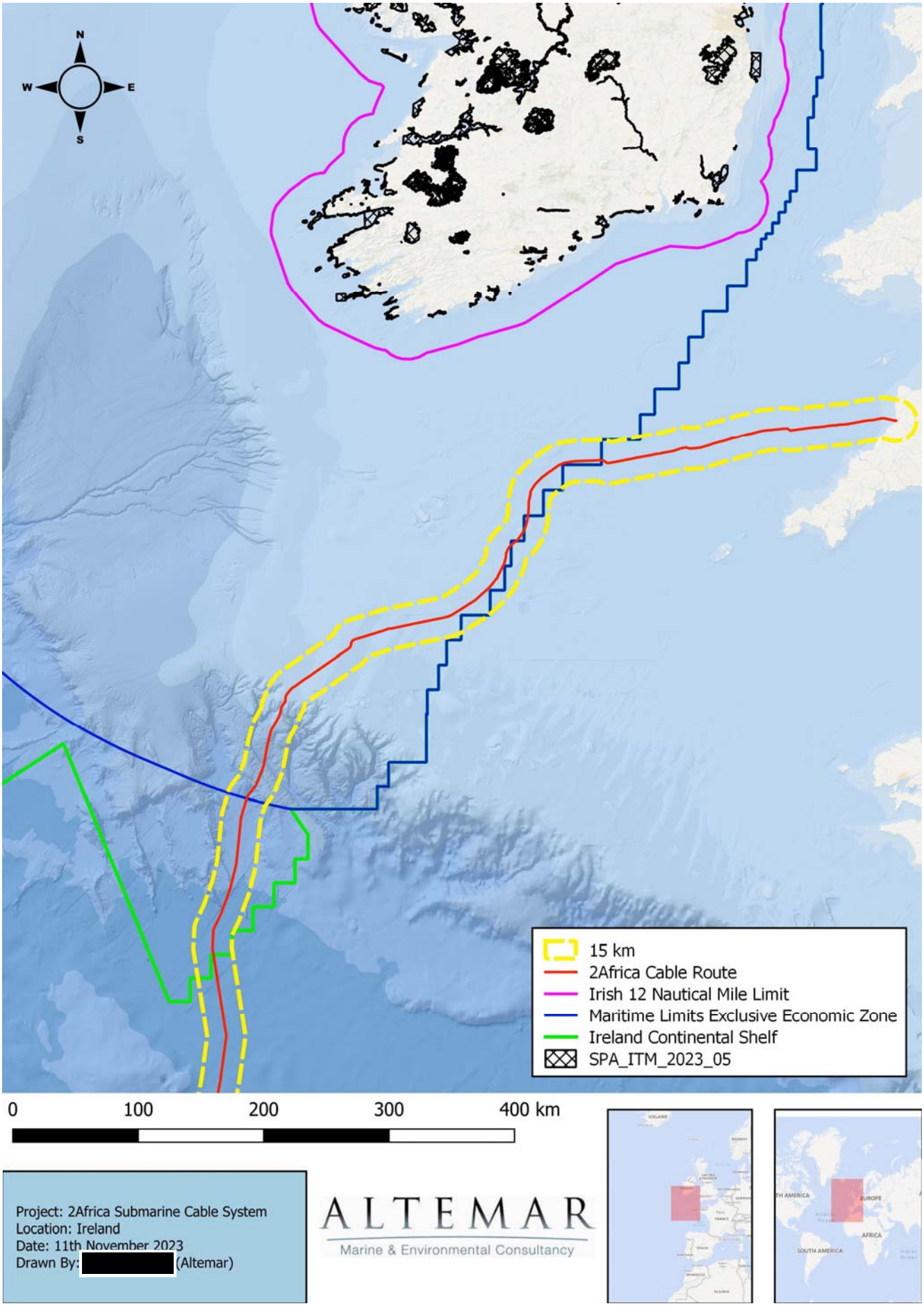

Figure 7.2. *2Africa cable route in relation to the Irish EEZ, Designated Irish Continental Shelf, and SPAs*

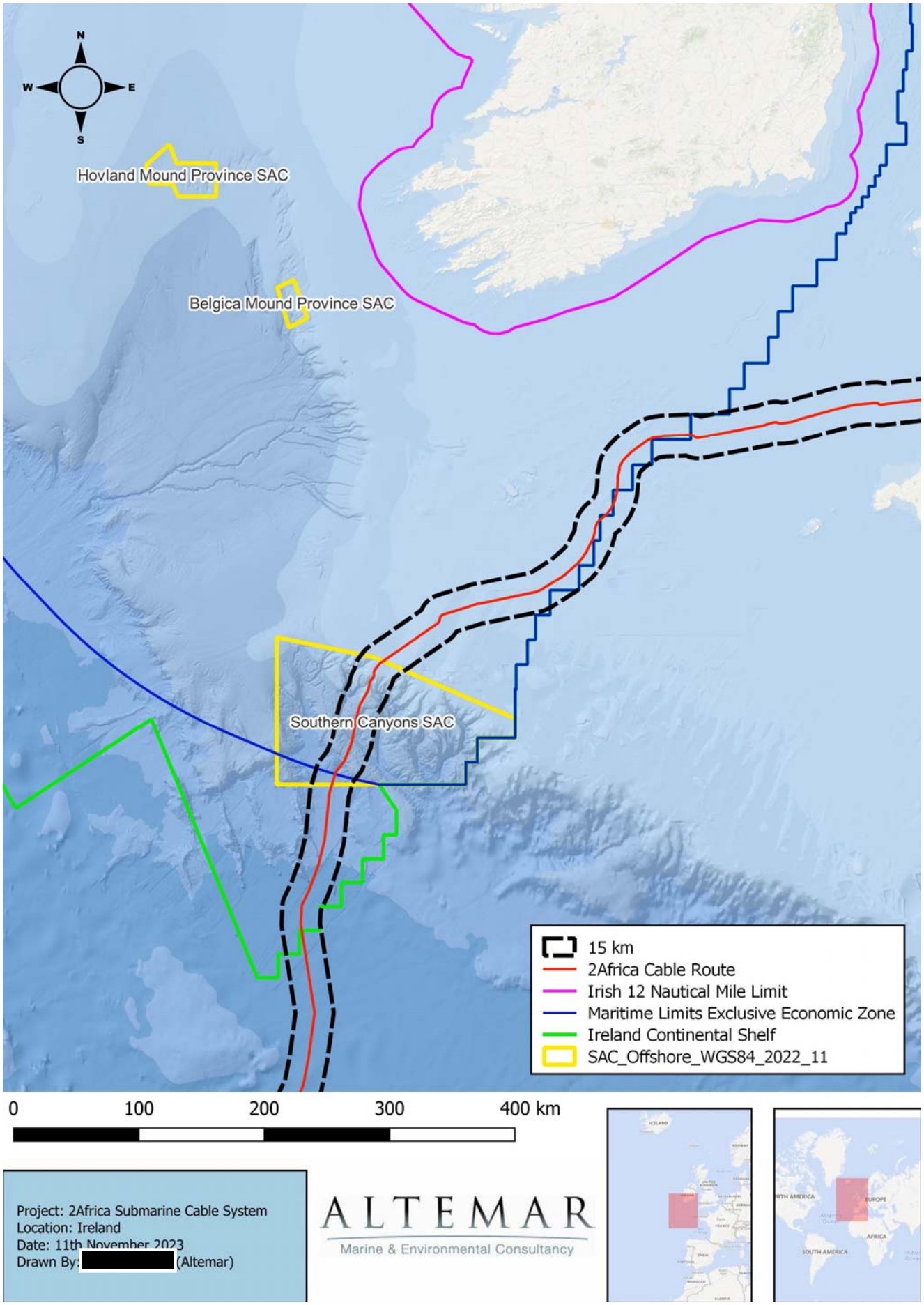

Figure 7.3. *2Africa cable route in relation to the Irish EEZ, Designated Irish Continental Shelf, and Offshore SACs.*

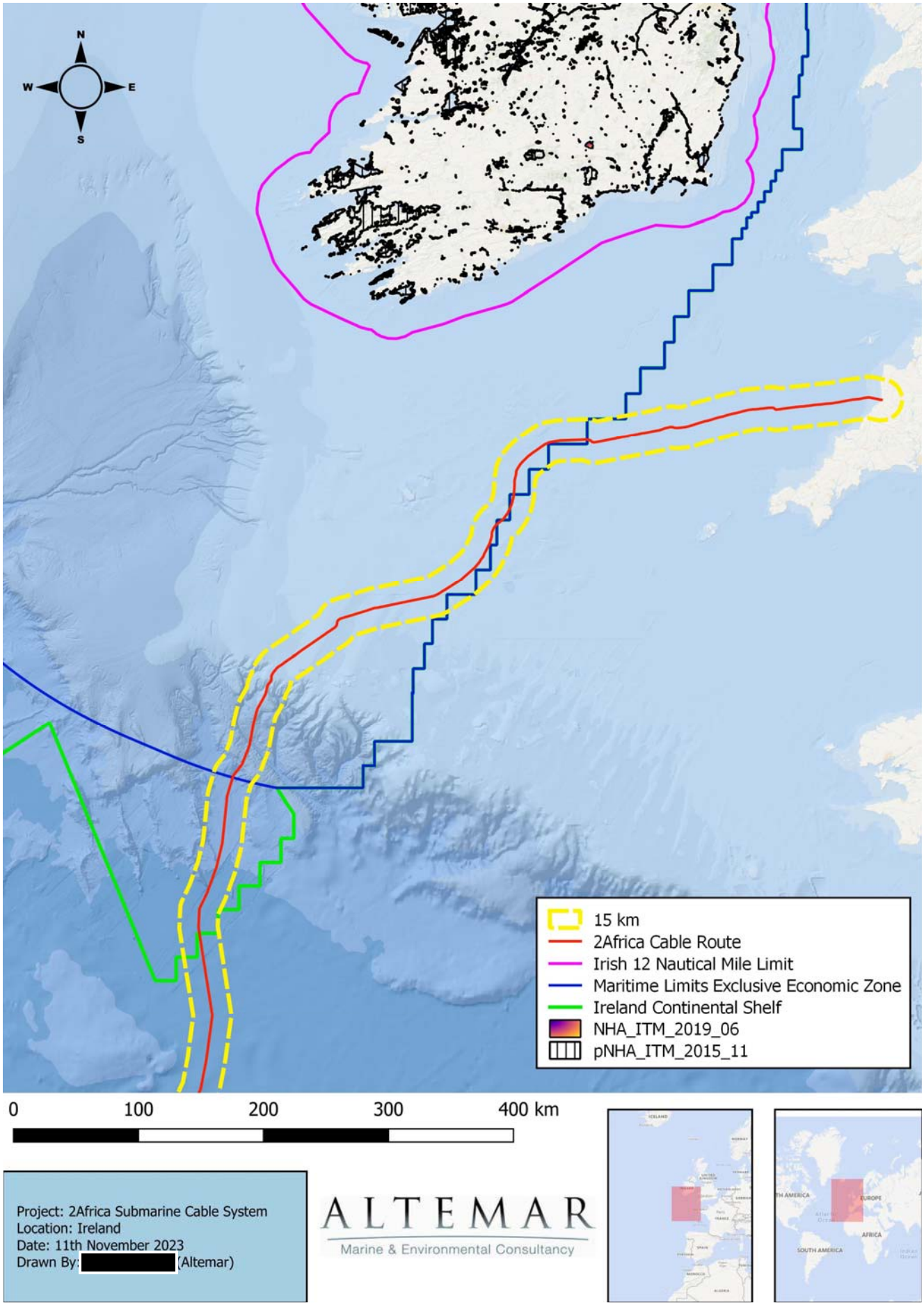

Figure 7.4. *2Africa cable route in relation to the Irish EEZ, Designated Irish Continental Shelf, and NHAs / pNHAs*

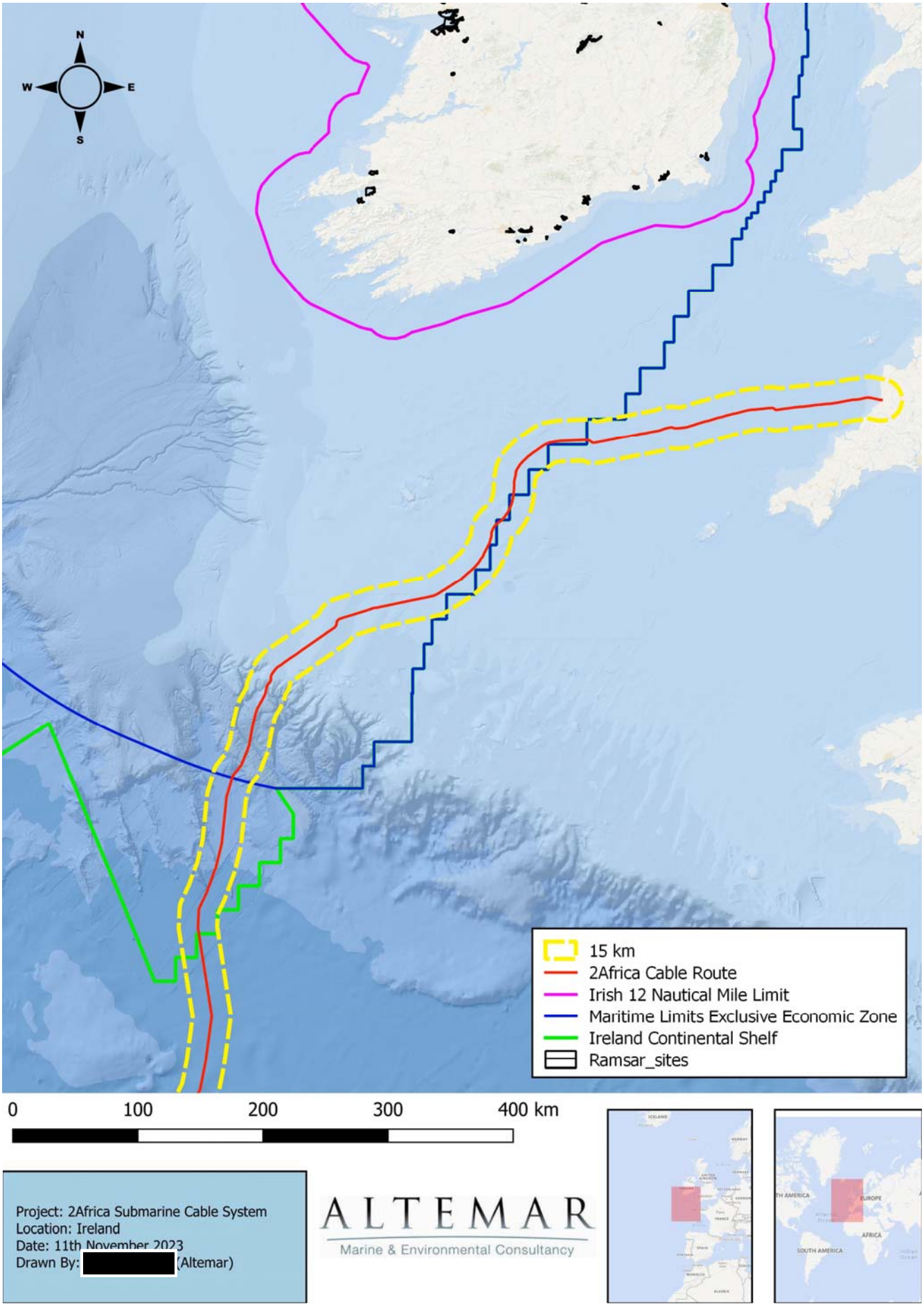

Figure 7.5. *2Africa cable route in relation to the Irish EEZ, Designated Irish Continental Shelf, and Ramsar Sites.*

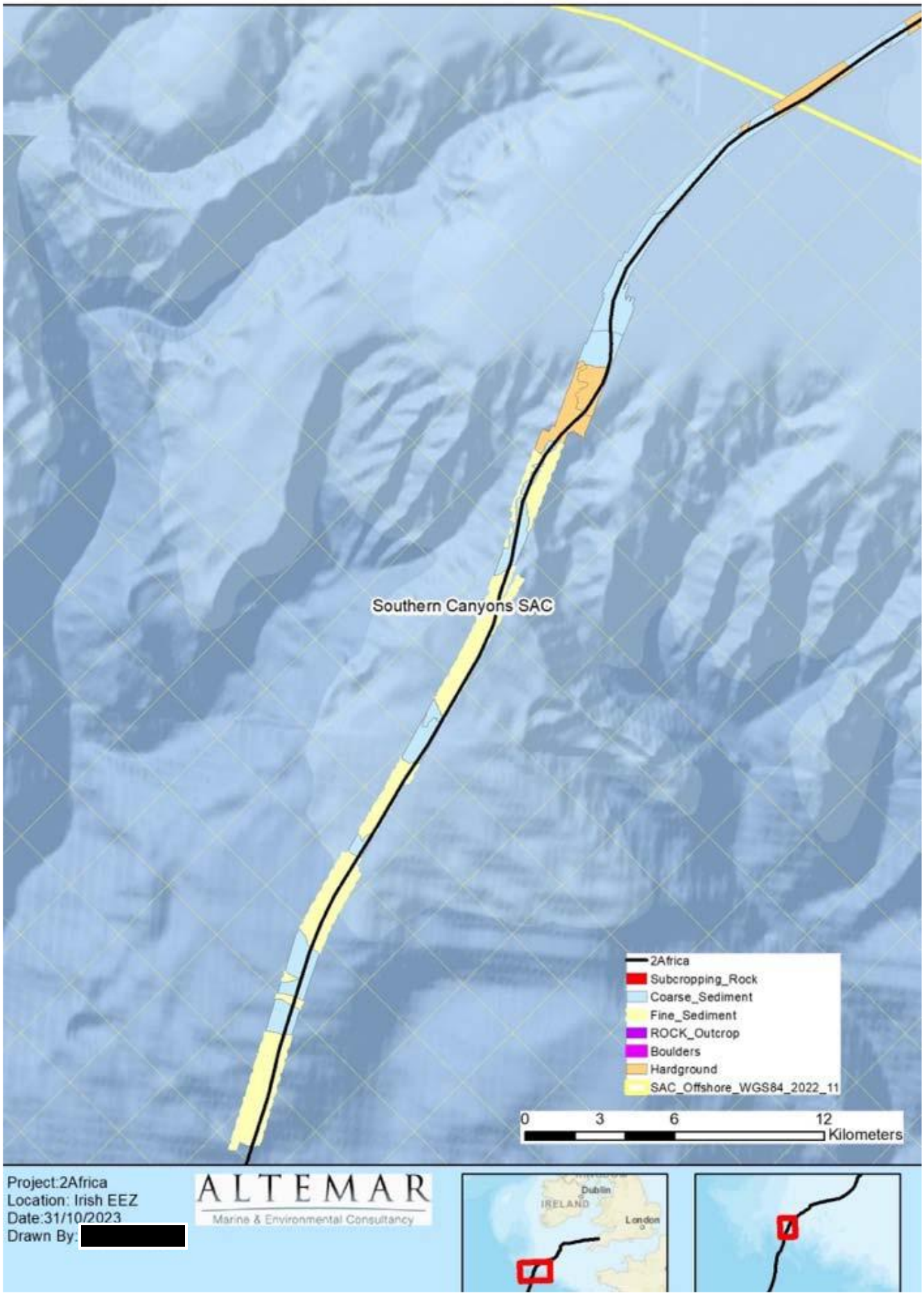

Figure 7.6. *Habitats noted based on 2Africa Marine survey in Southern Canyons SAC down to 1500m (burial depth)*

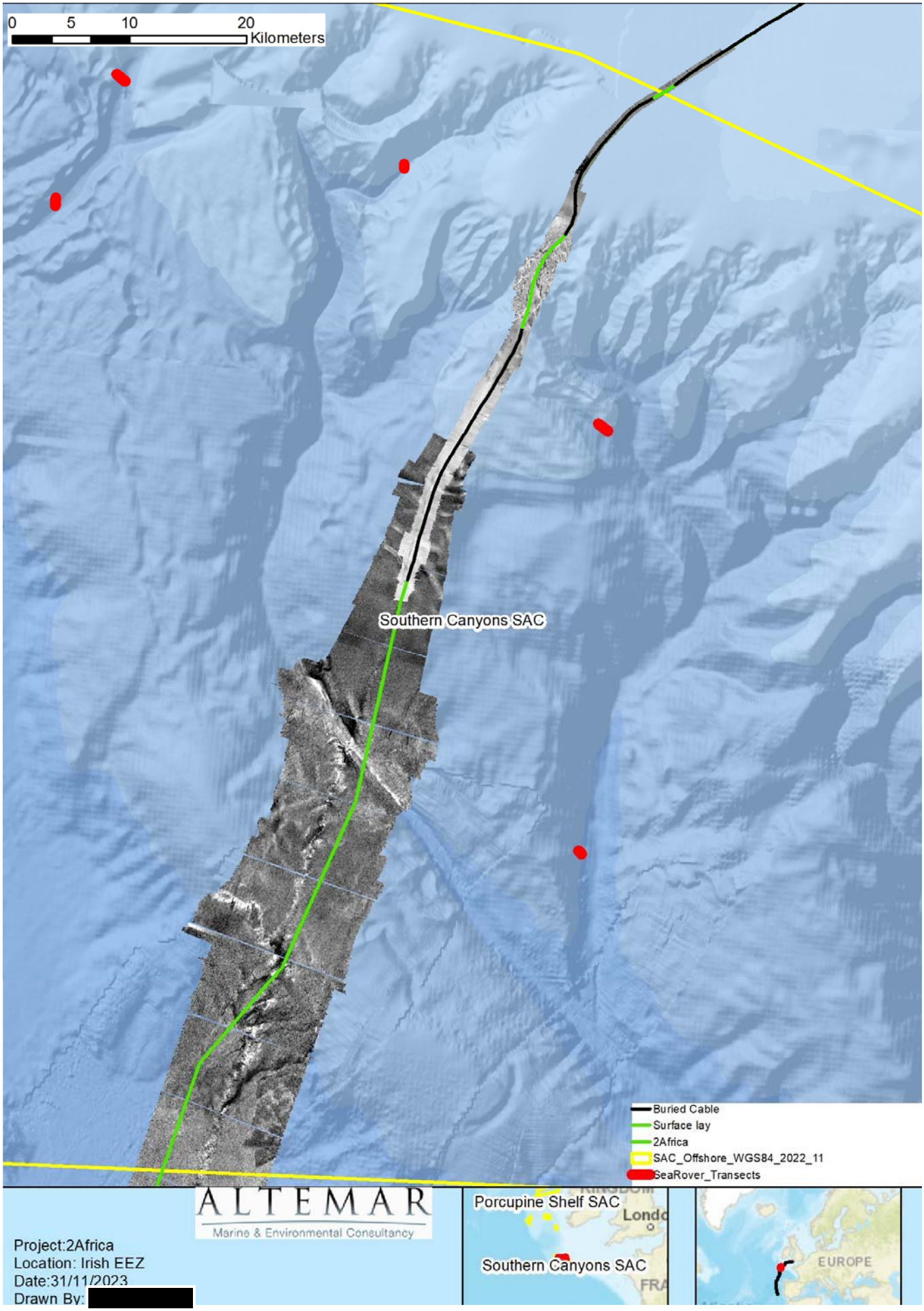

Figure 7.7. *Cable burial and surface lay, sidescan sonar and backscatter in Southern Canyons SAC.*

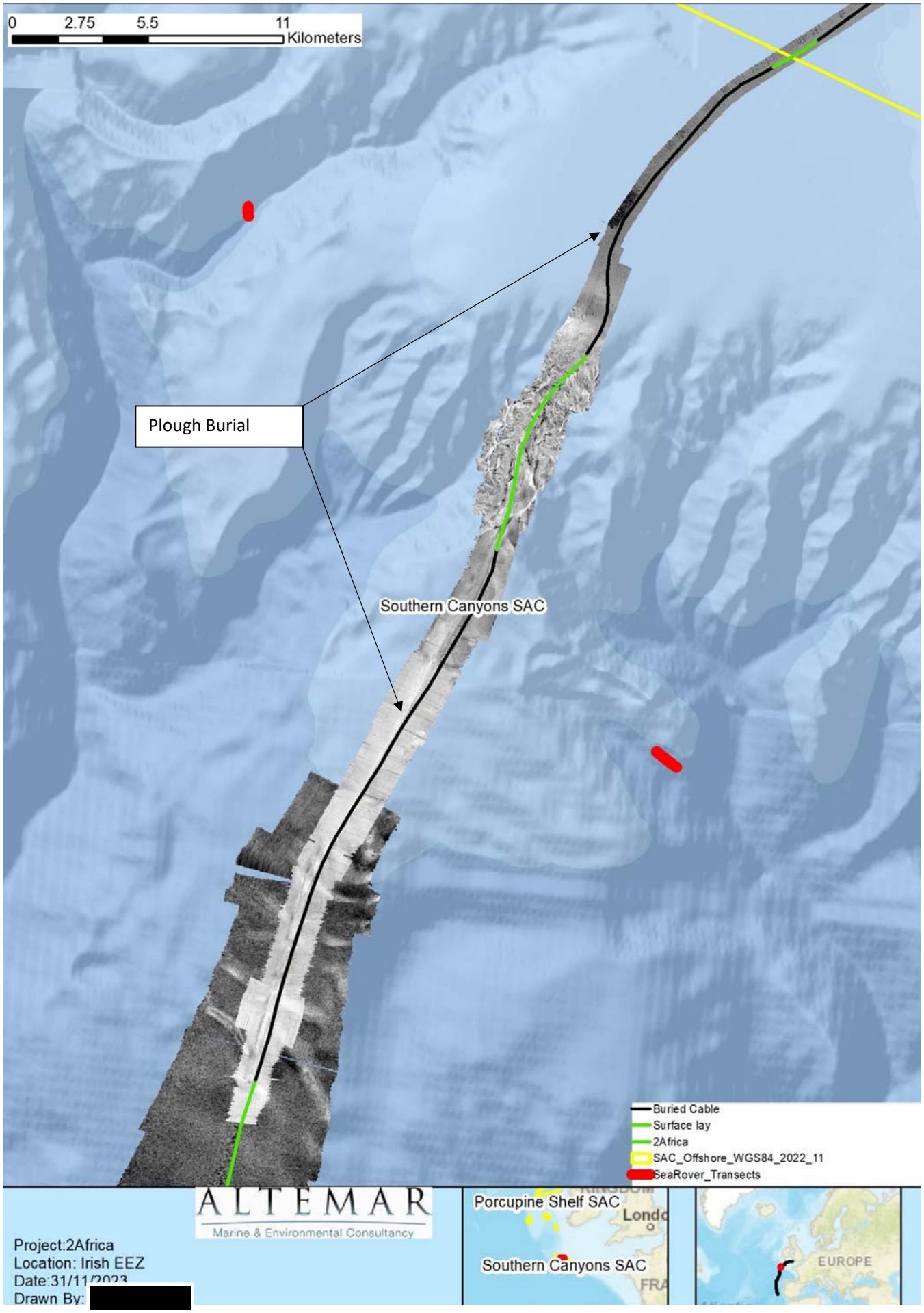

Figure 7.8. *Cable burial and surface lay, sidescan sonar and backscatter in Southern Canyons SAC.*

Figure 7.9. *Sidescan, trawl marks (blue) and sonar contacts (e.g. boulder) in the Southern Canyons SAC.*

Figure 7.10. *Sidescan, trawl marks (blue) and sonar contacts (e.g. boulder) in the Southern Canyons SAC..*

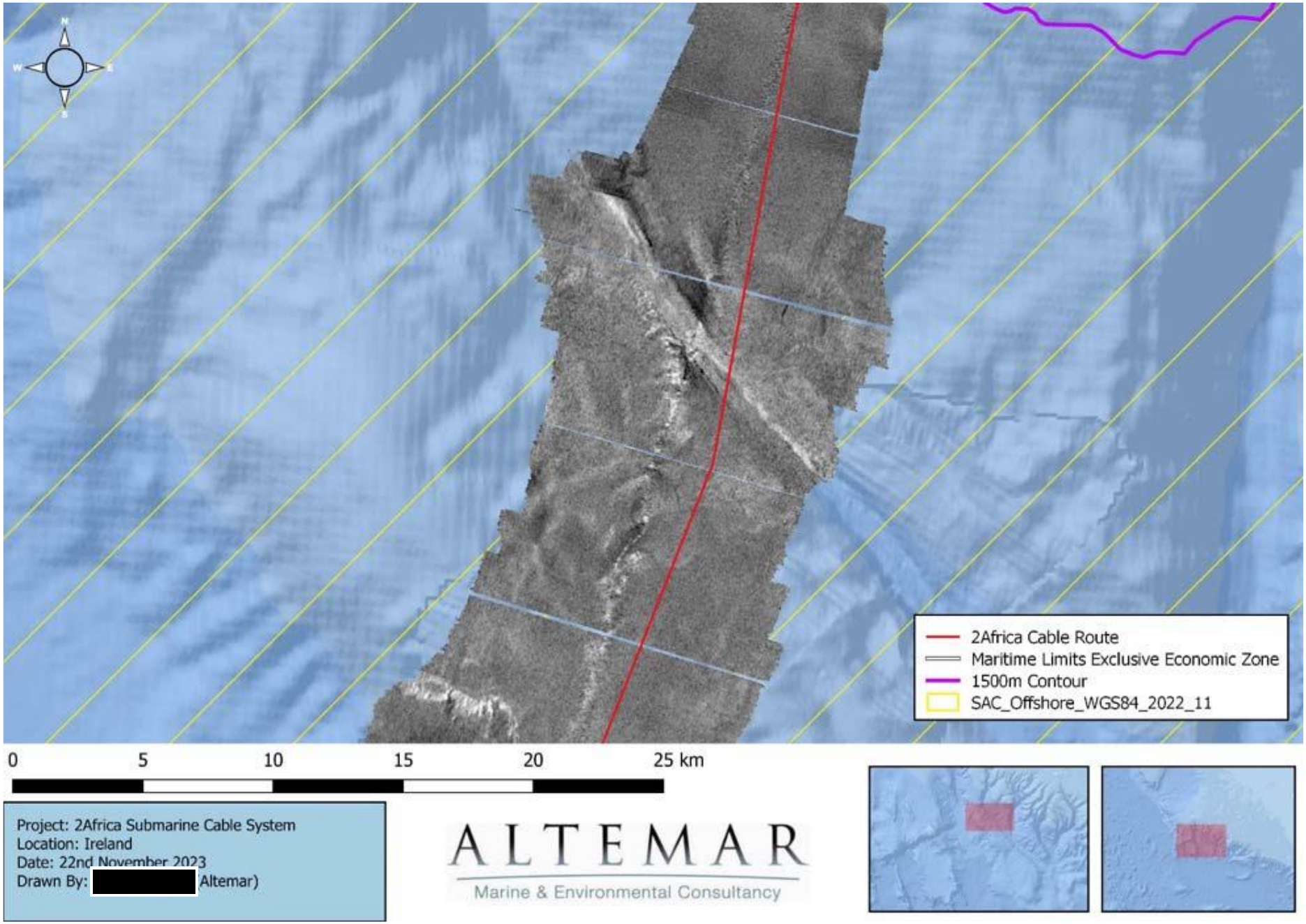

Figure 7.11. *Surface lay 2Africa cable route and backscatter in deeper portion of cSAC)*

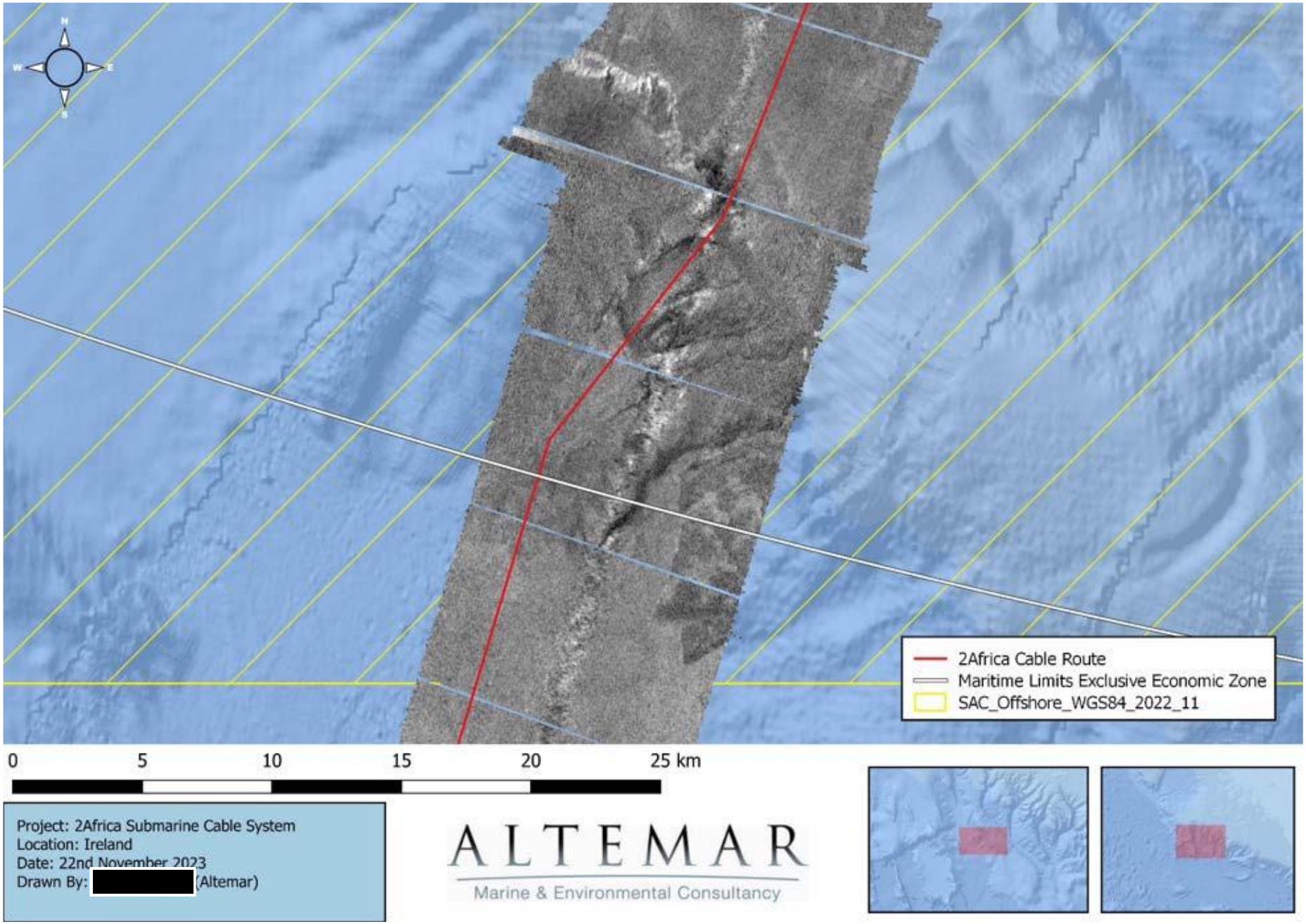

Figure 7.12. *Surface lay 2Africa cable route and backscatter in deeper portion of cSAC*

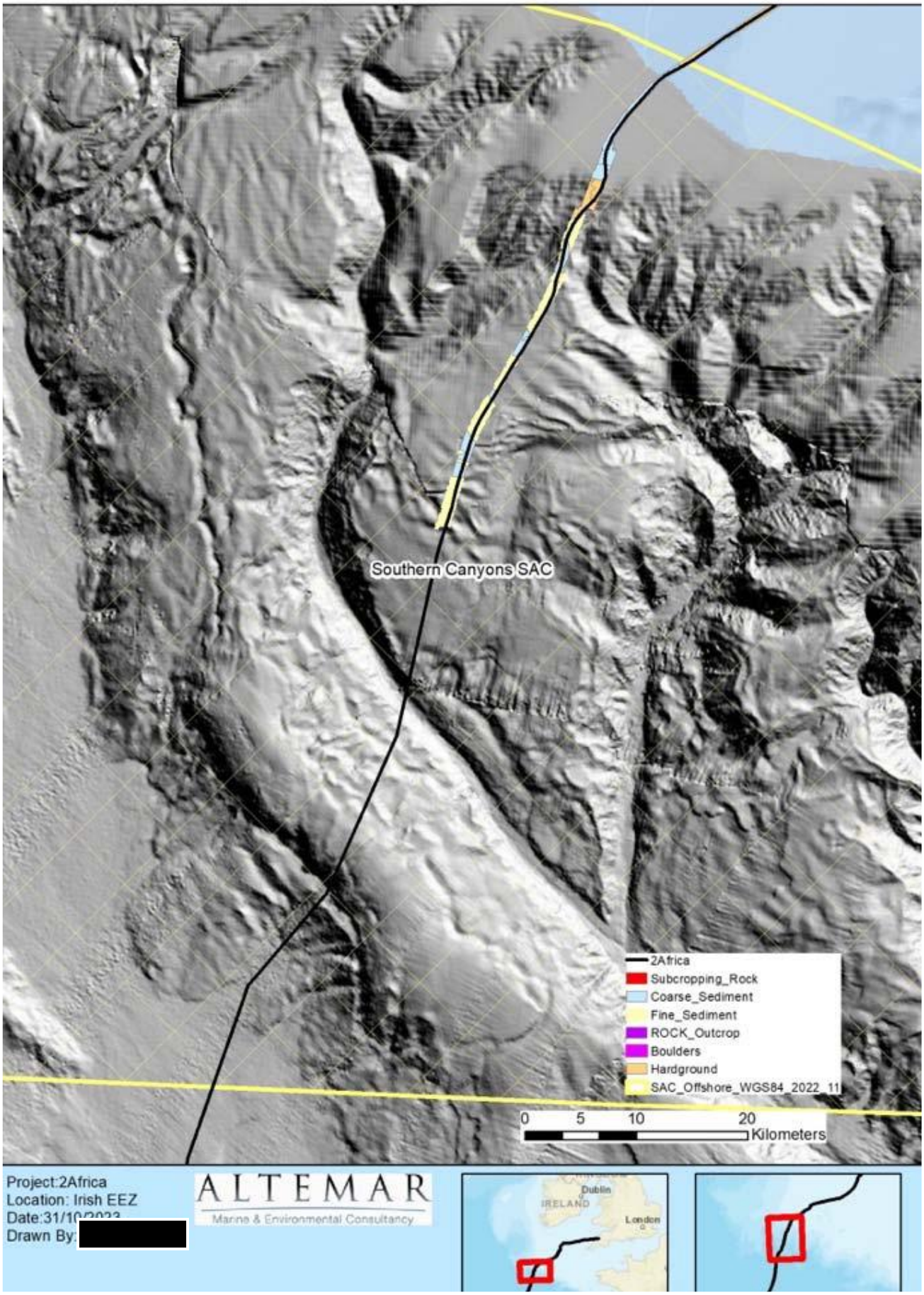

Figure 7.13. *Surface lay 2Africa cable route and shaded relief in deeper portion of cSAC)*

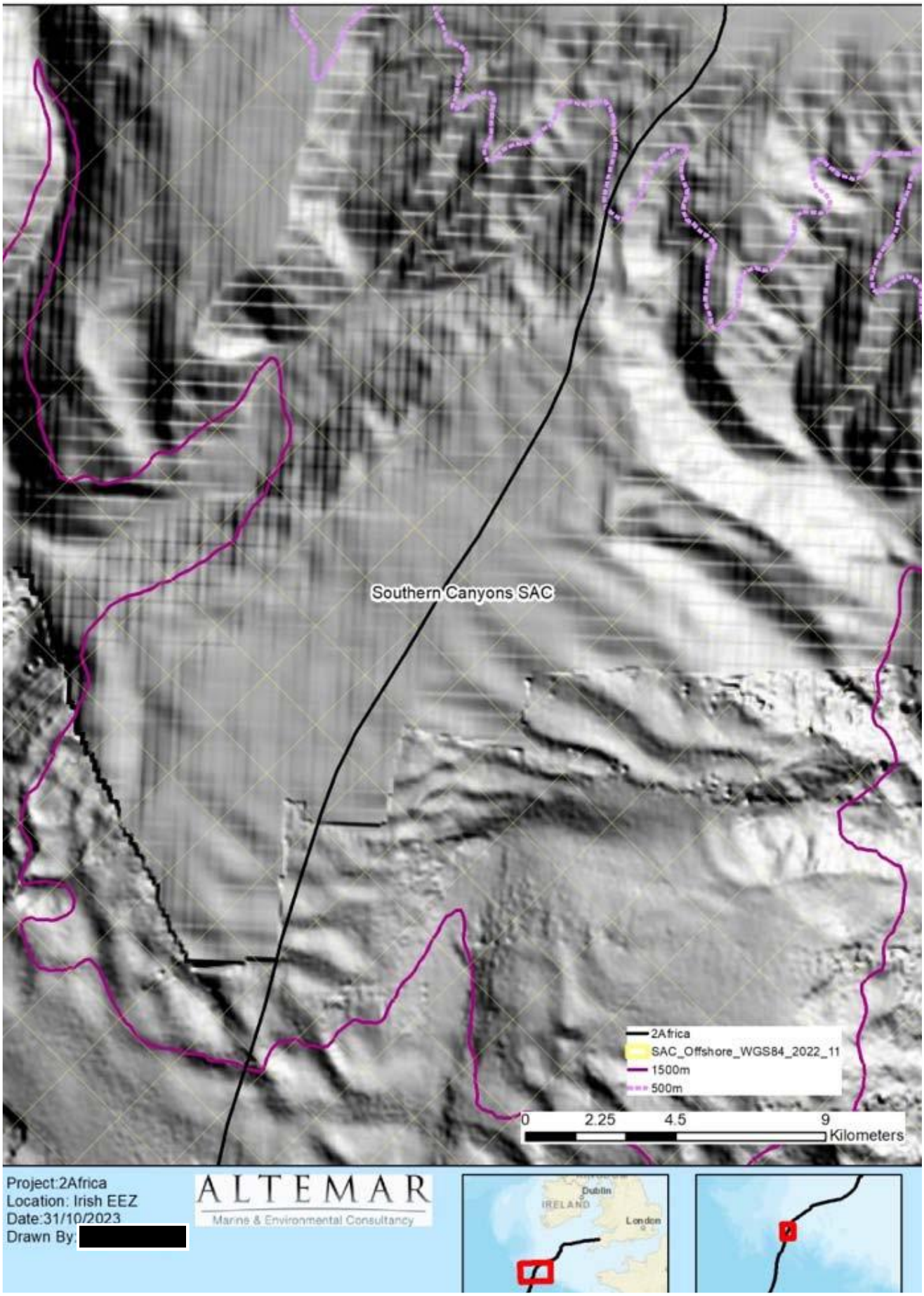

Figure 7.14. *Proposed cable route through Southern Canyons SAC (Informar Shaded Relief)*

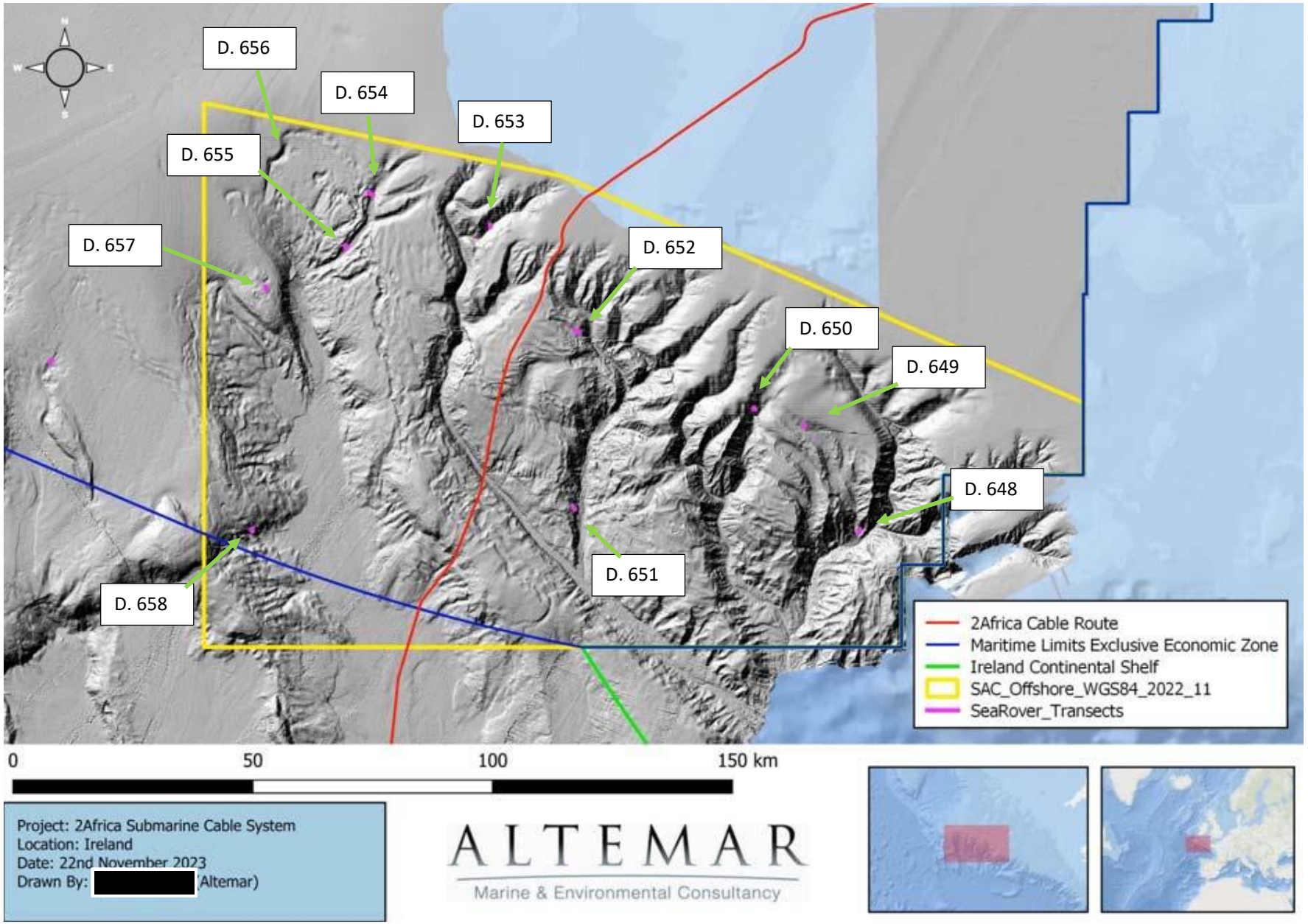

Figure 7.15: Position of offshore fibre optic route in relation to the Irish EEZ, Designated Irish Continental shelf, Offshore SAC's, SeaRover 2019 Dives (Infomar Shaded Relief).

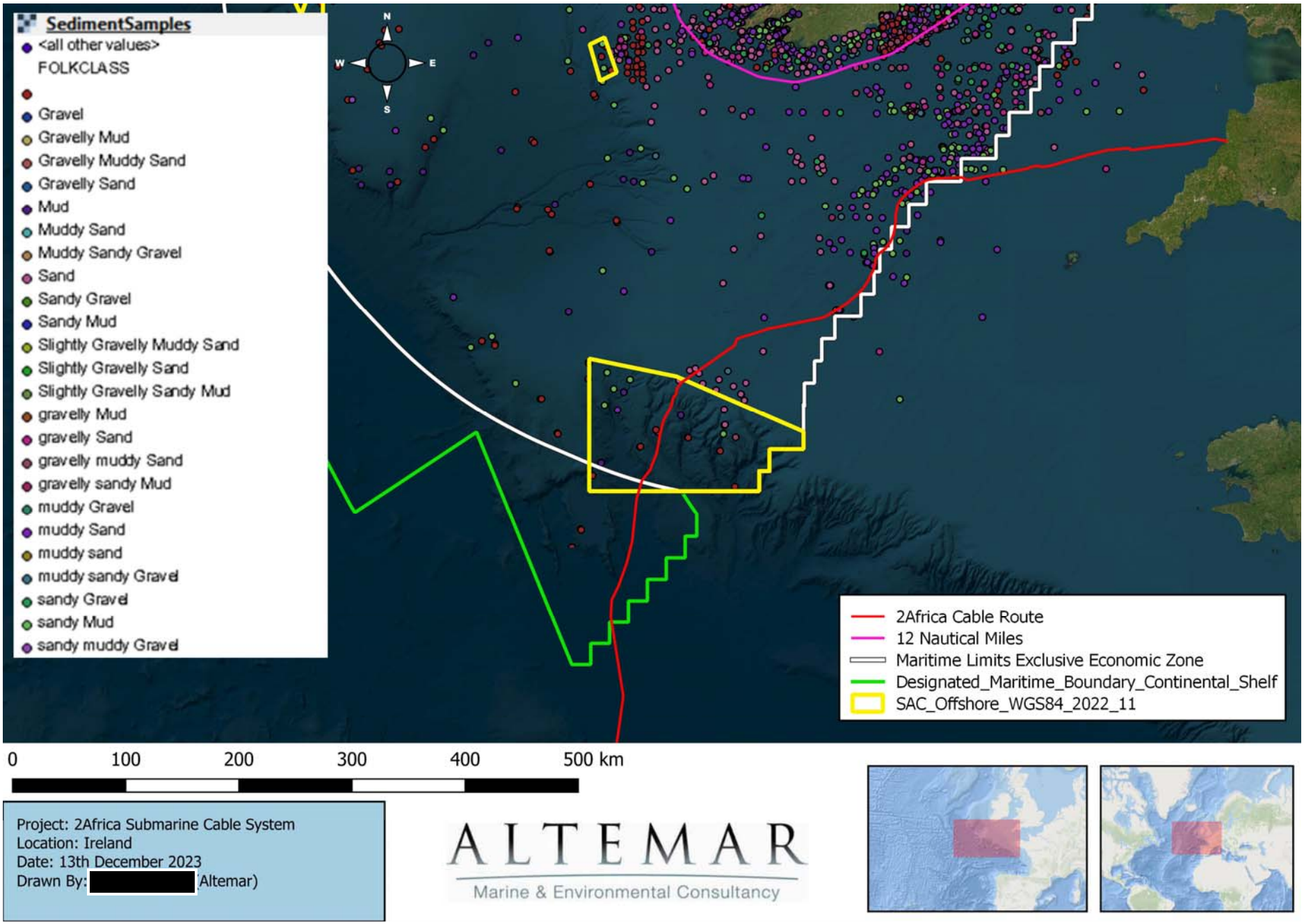

Figure 7.16. *Infomar sediment samples on the proposed cable.*

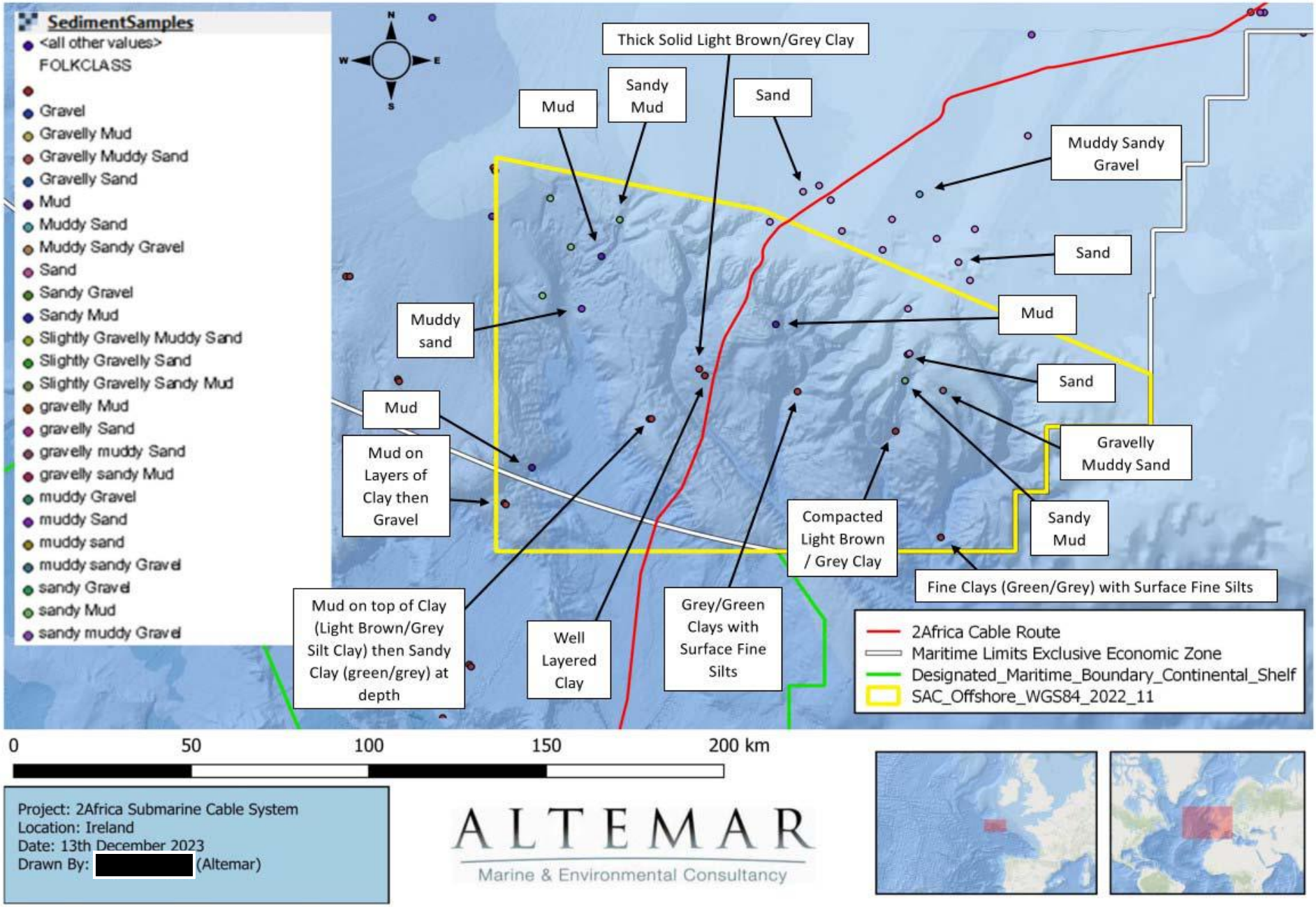

Figure 7.17. Infomar sediment samples on the proposed cable route within the Southern Canyons SAC

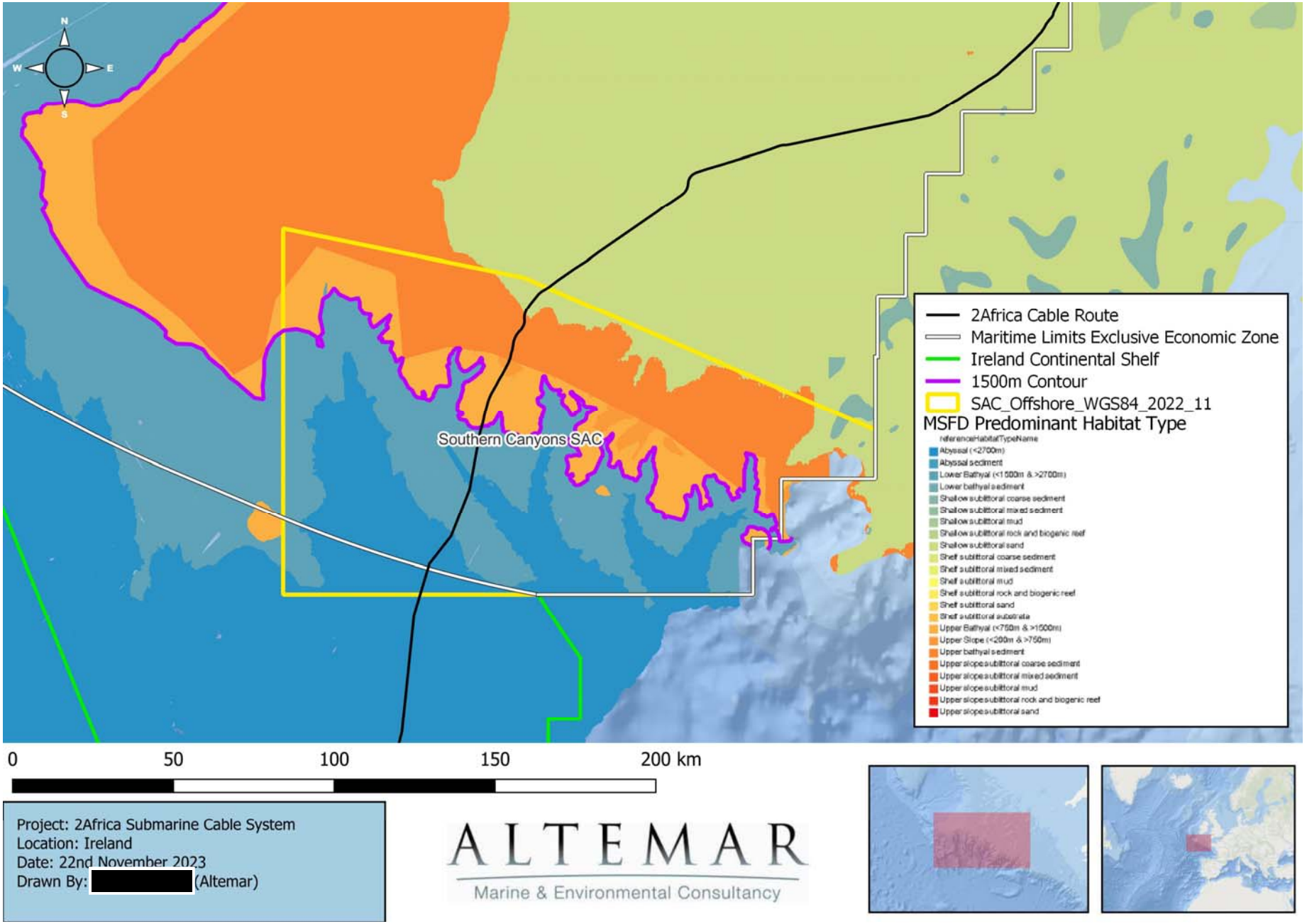

Figure 7.18. MSFD Predominant Habitat Types

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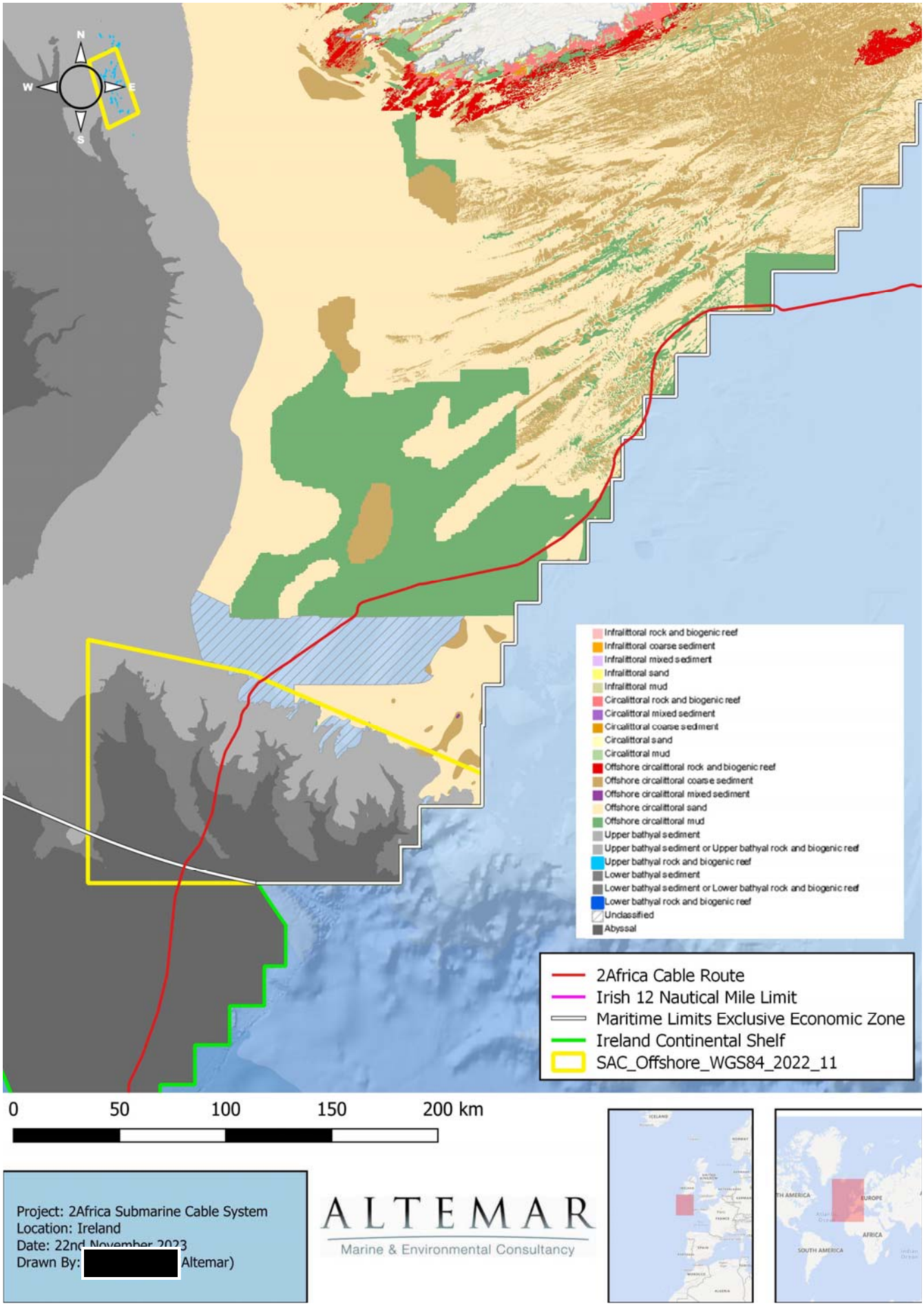


Figure 7.19. MSFD Benthic Boad Habitat Types along the proposed cable.

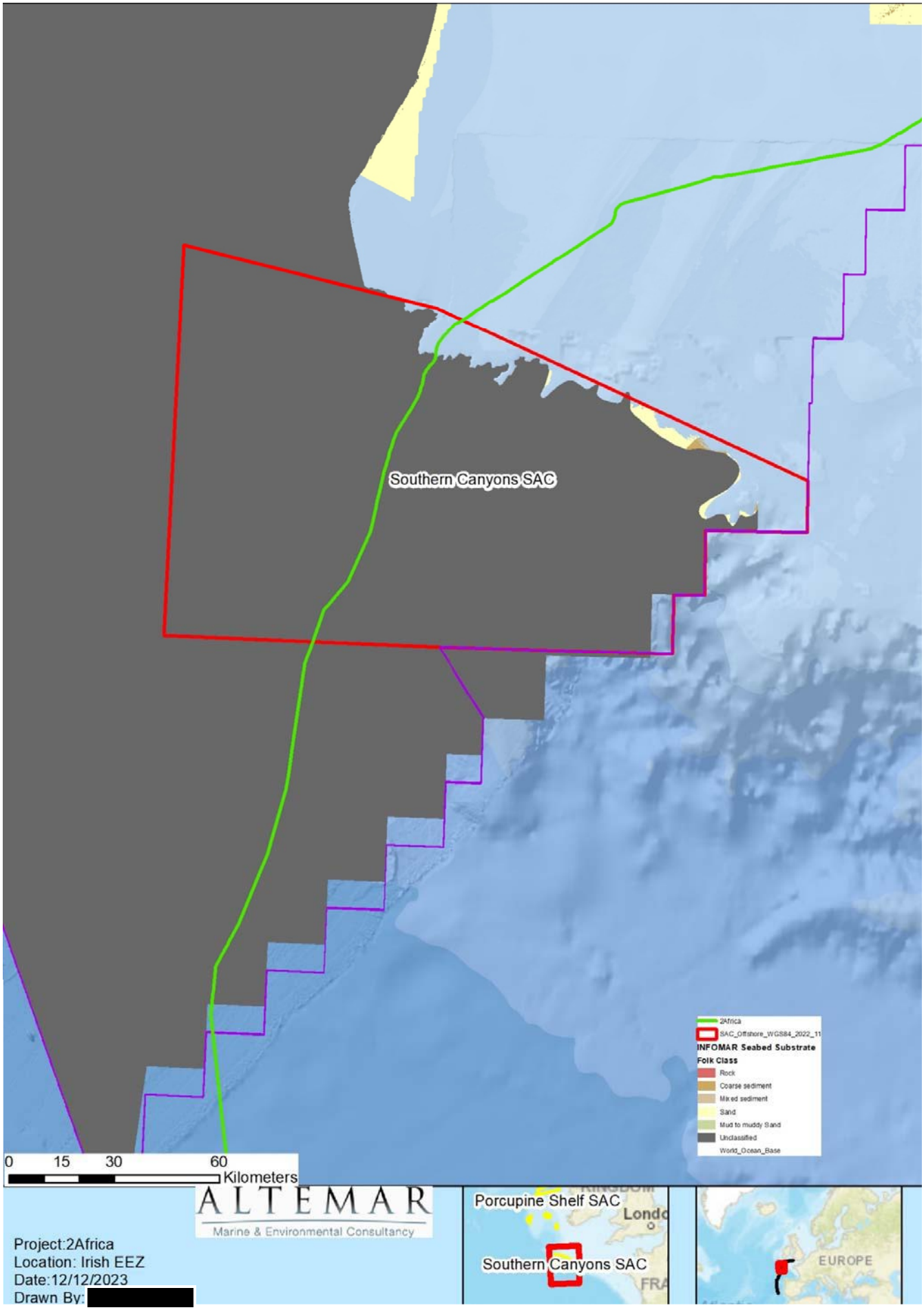


Figure 7.20. Infomar Seabed Substrate.

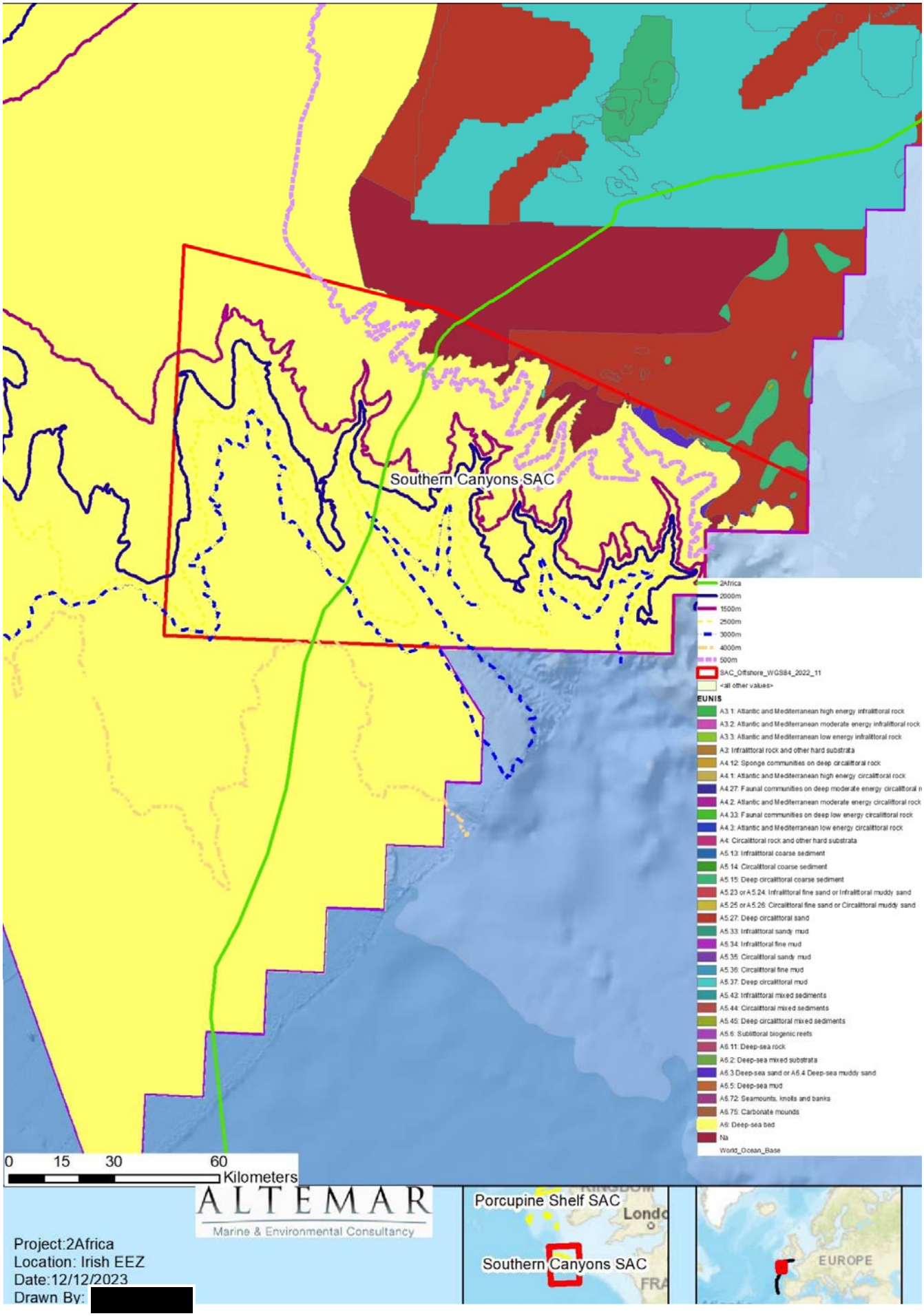


Figure 7.21. EUSEAMAP Eunis Classification within SAC.

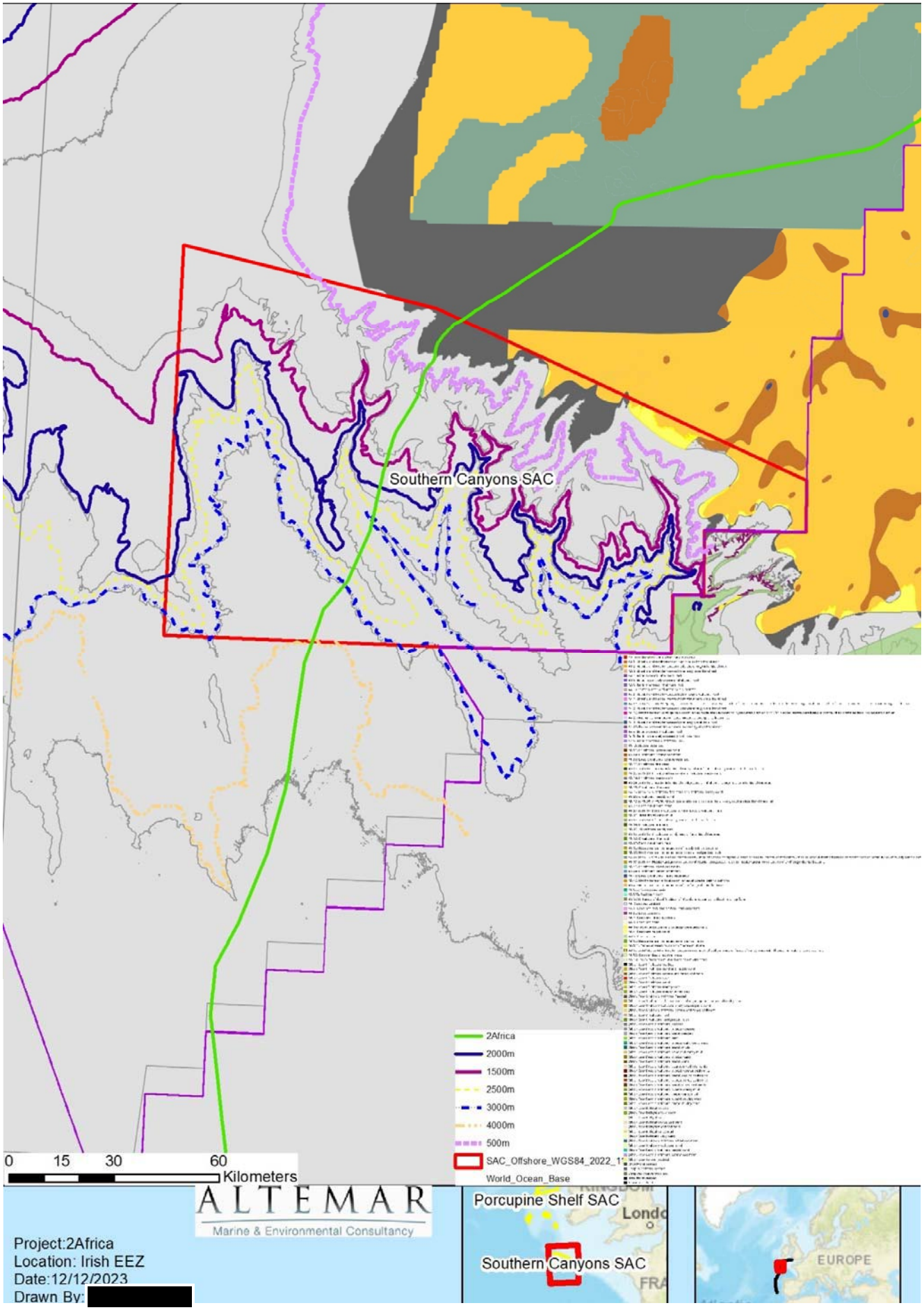


Figure 7.22. EUSEAMAP broadscale predictive habitat and seabed contours.

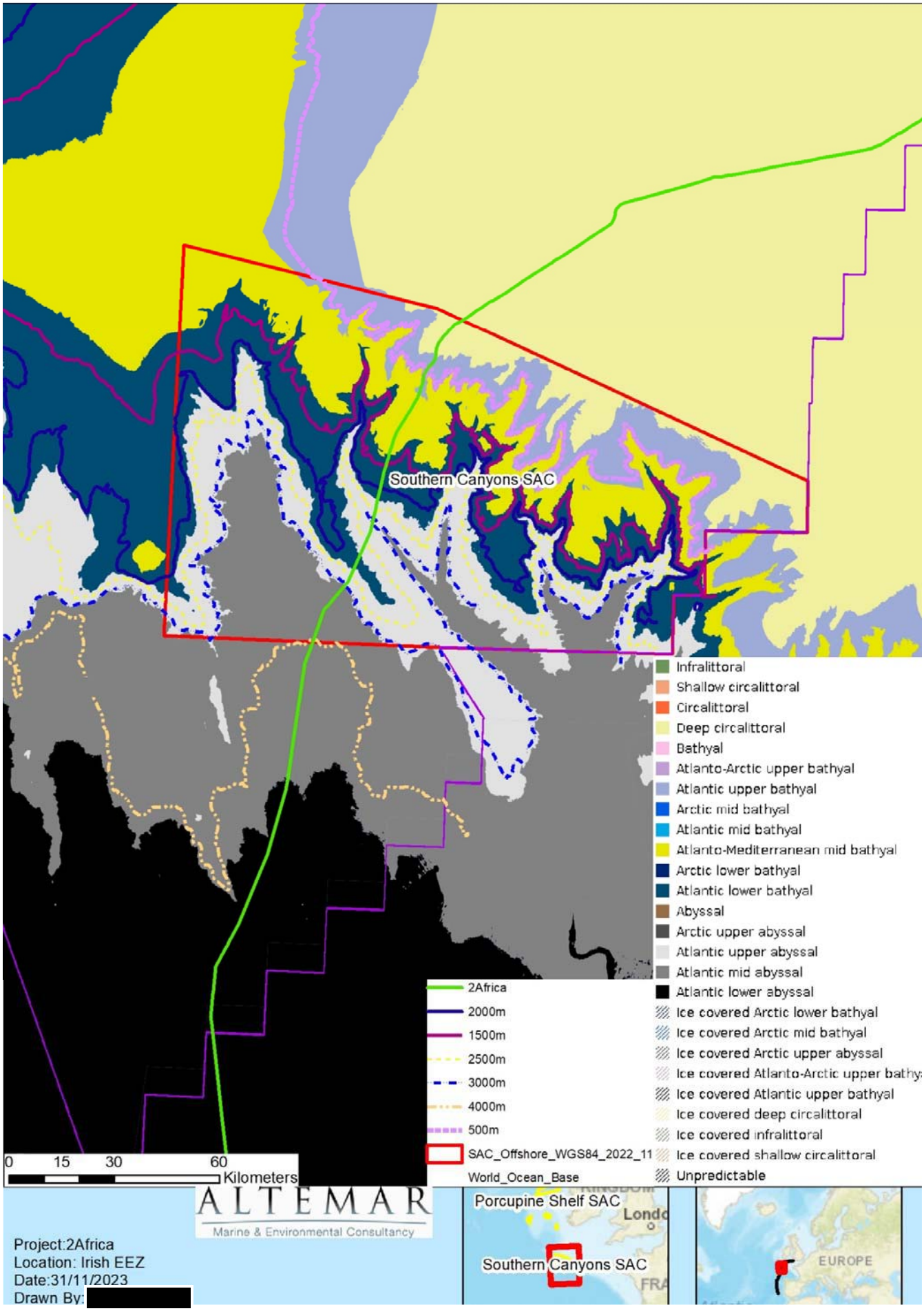


Figure 7.23. EUSEAMAP Biozone Habitat Descriptor and contours.

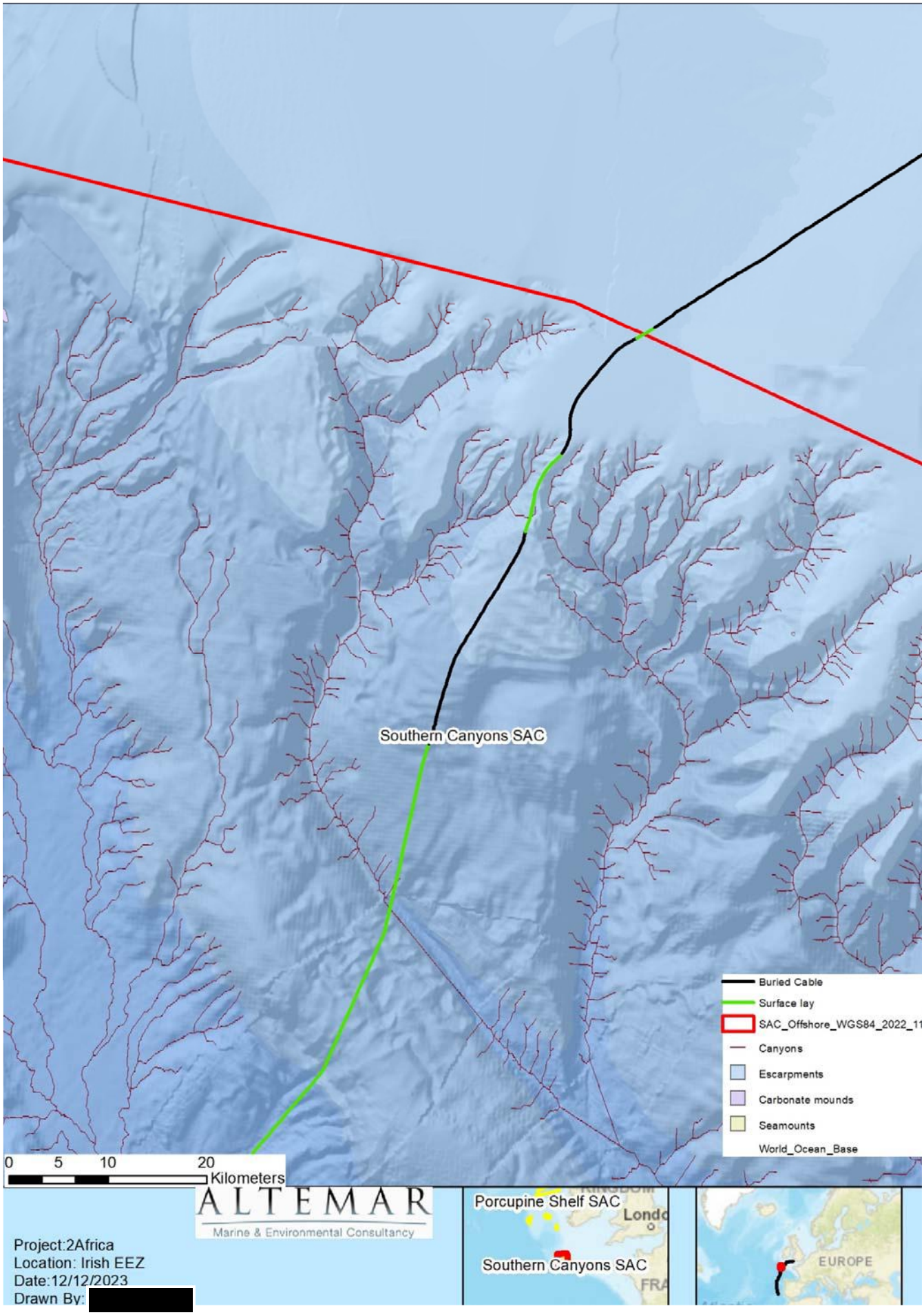


Figure 7.24. Irish Marine Atlas Offshore Geology-Morphology.

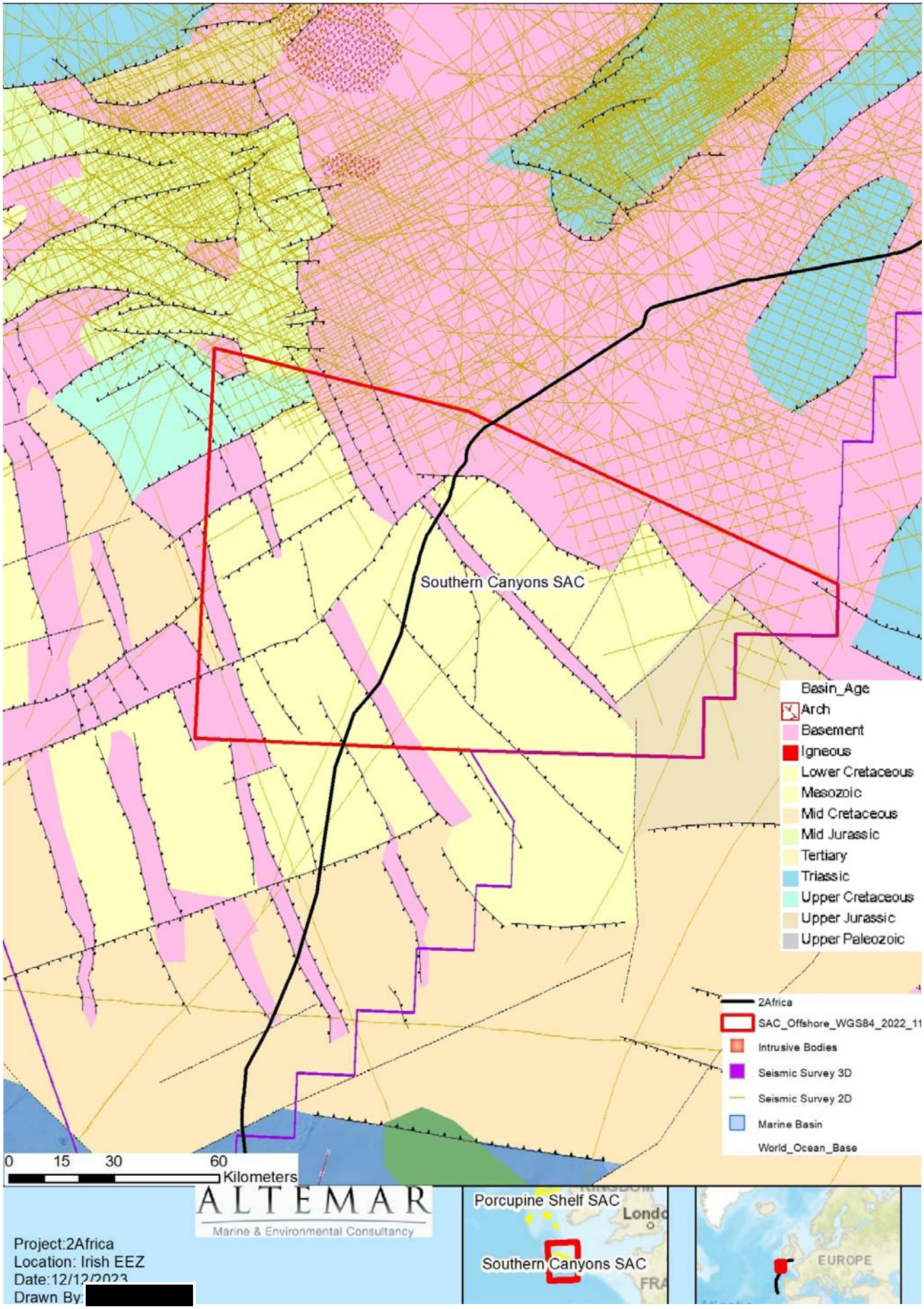


Figure 7.25. Irish Marine Atlas Offshore Geology-Geologic Features.

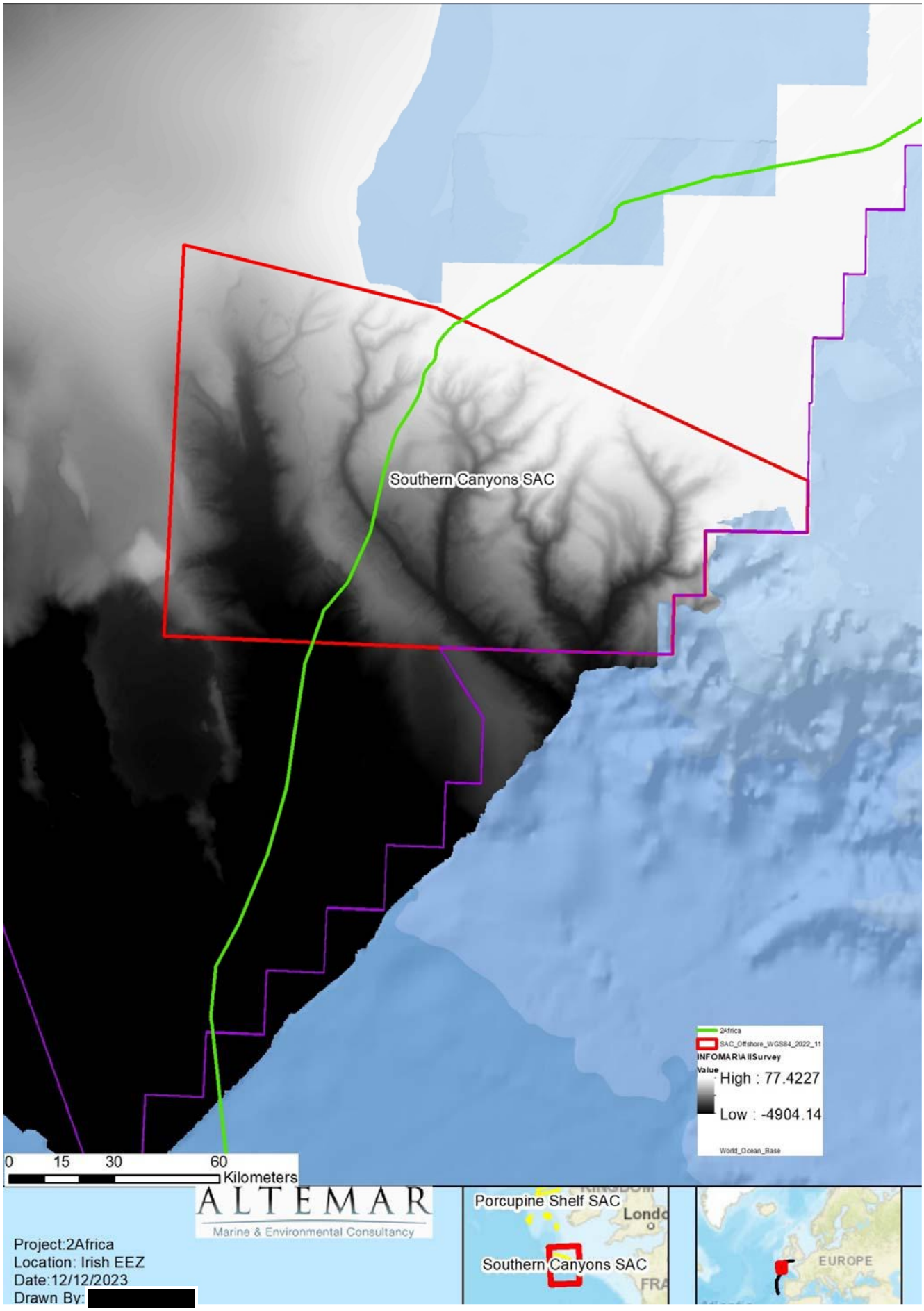


Figure 7.25. Infomar bathymetry of the Southern Canyons SAC.

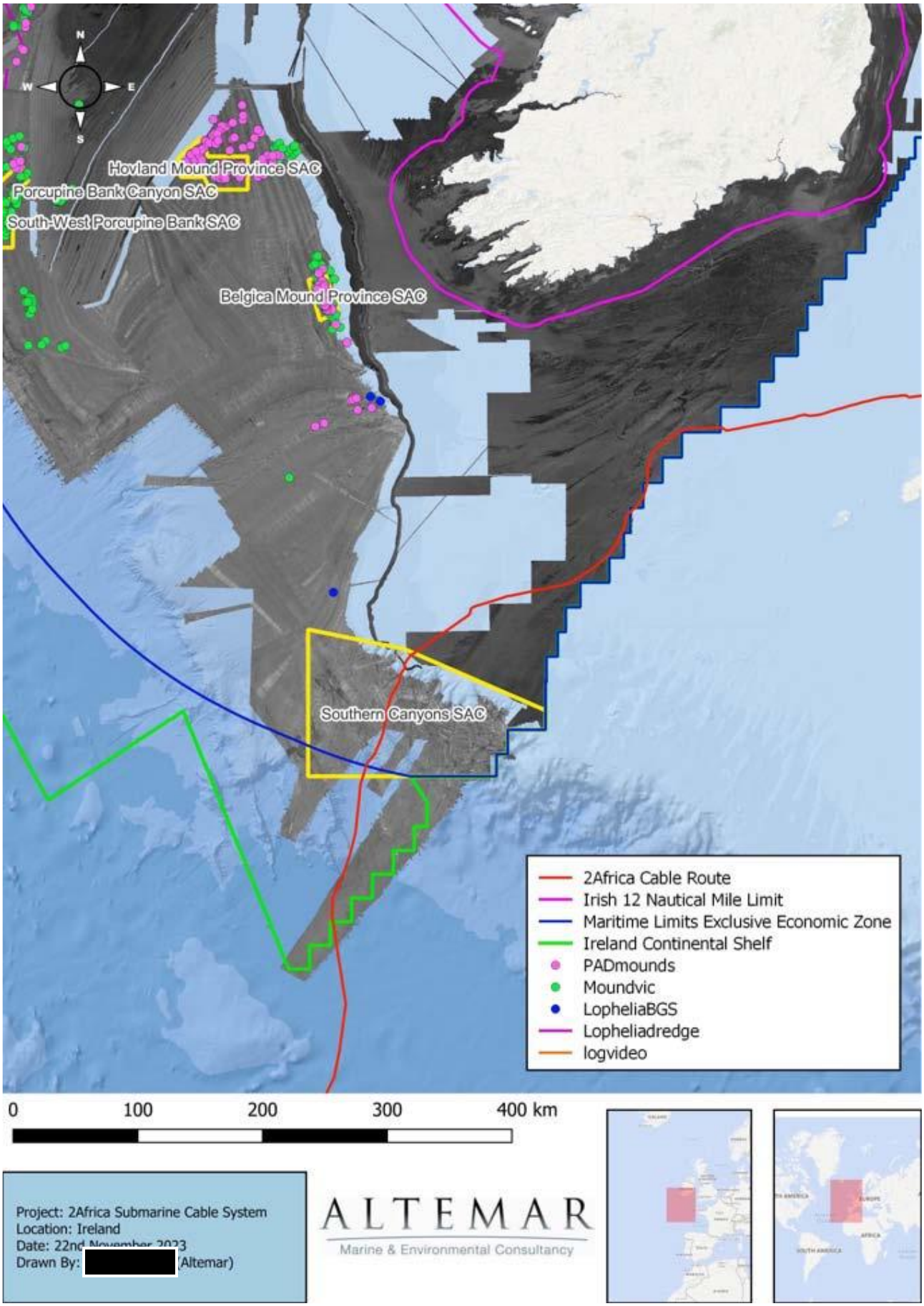


Figure 7.26: Position of offshore fibre optic route in relation to the Irish EEZ, Designated Irish Continental shelf, Offshore SAC's, carbonate mounds or potential biogenic reefs in the offshore area (Infomar Backscatter).

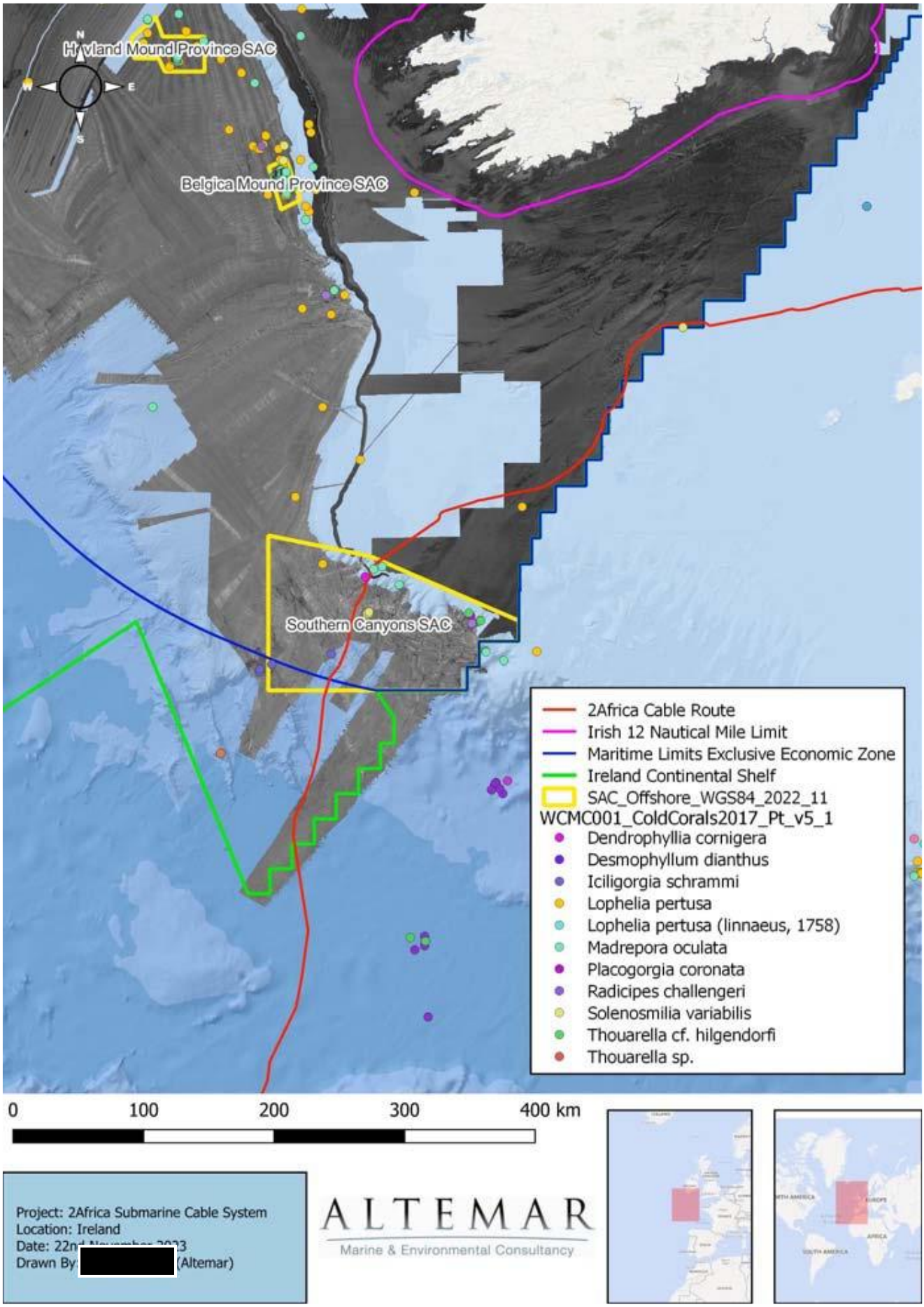


Figure 7.27. Position of offshore fibre optic route in relation to the Irish EEZ, Designated Irish Continental shelf and Offshore SAC's (Cold Corals 2017 data) (INFOMAR Backscatter)

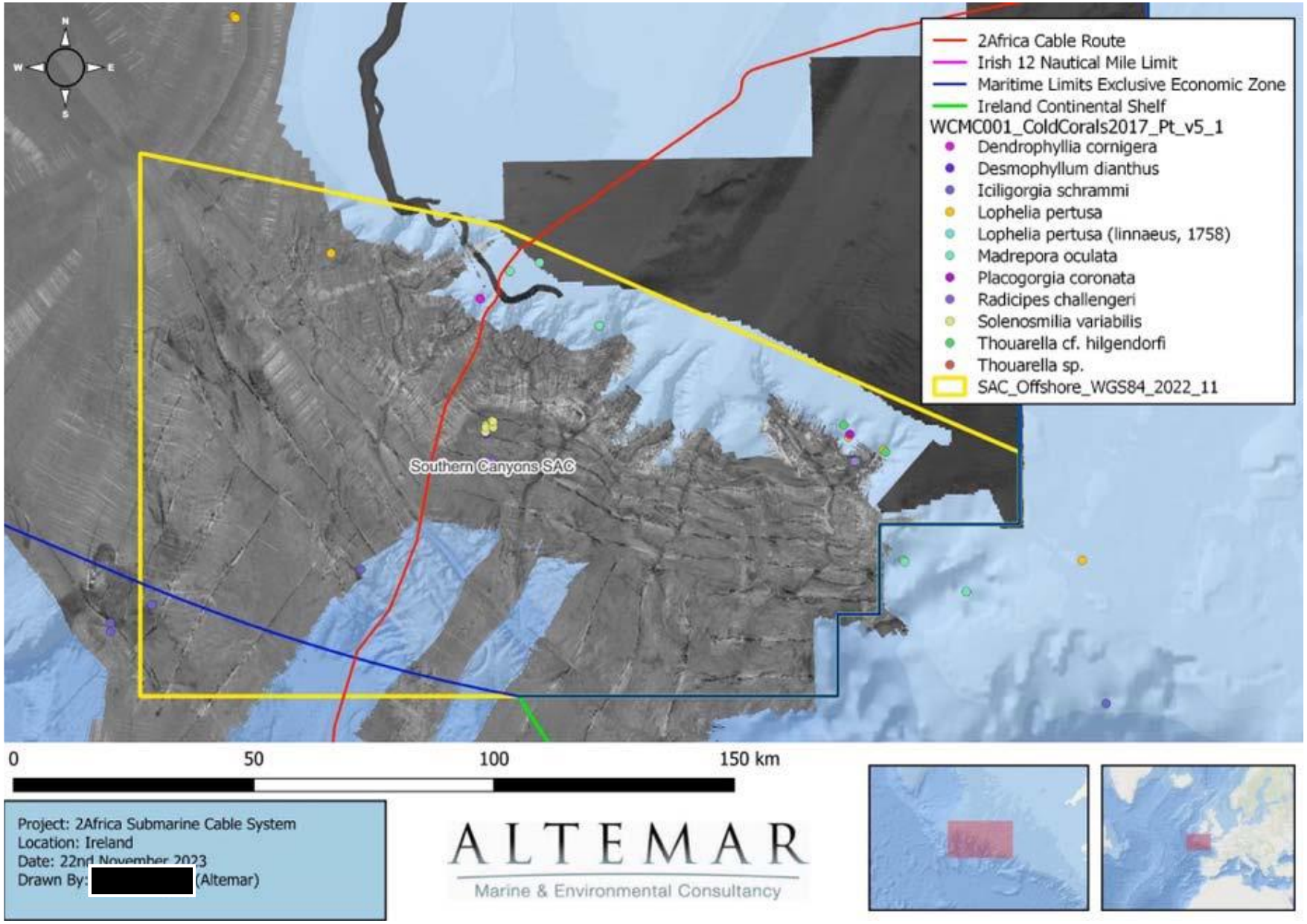


Figure 7.28. Proposed location of the fibre optic cable route in relation to SAC's, carbonate mounds or potential biogenic reefs in the offshore area (Infomar Backscatter) (Cold Corals 2017 data)

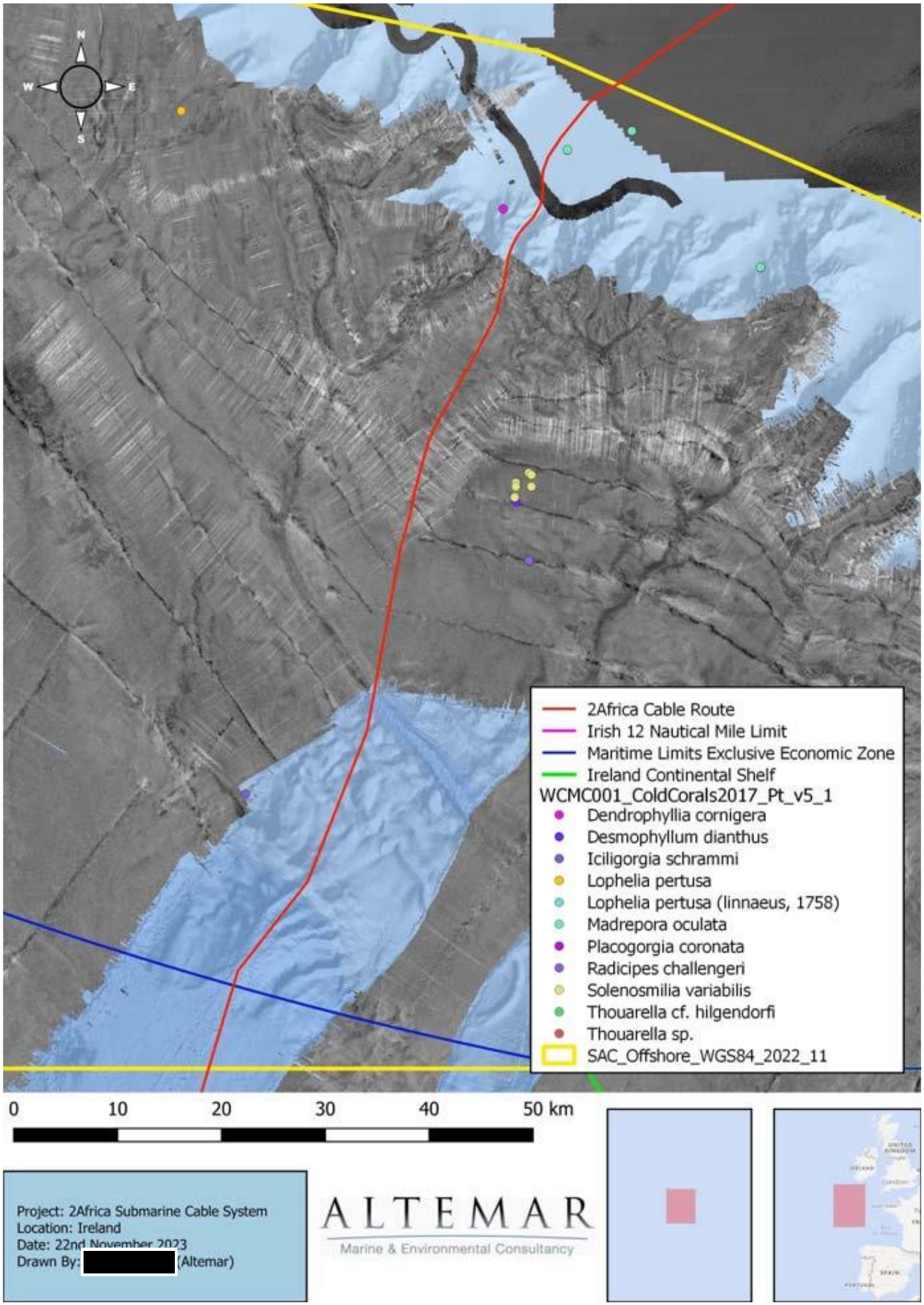


Figure 7.29. Proposed location of the fibre optic cable route in relation to SAC's, carbonate mounds or potential biogenic reefs in the offshore area (Infomar Backscatter) (Cold Corals 2017 data)

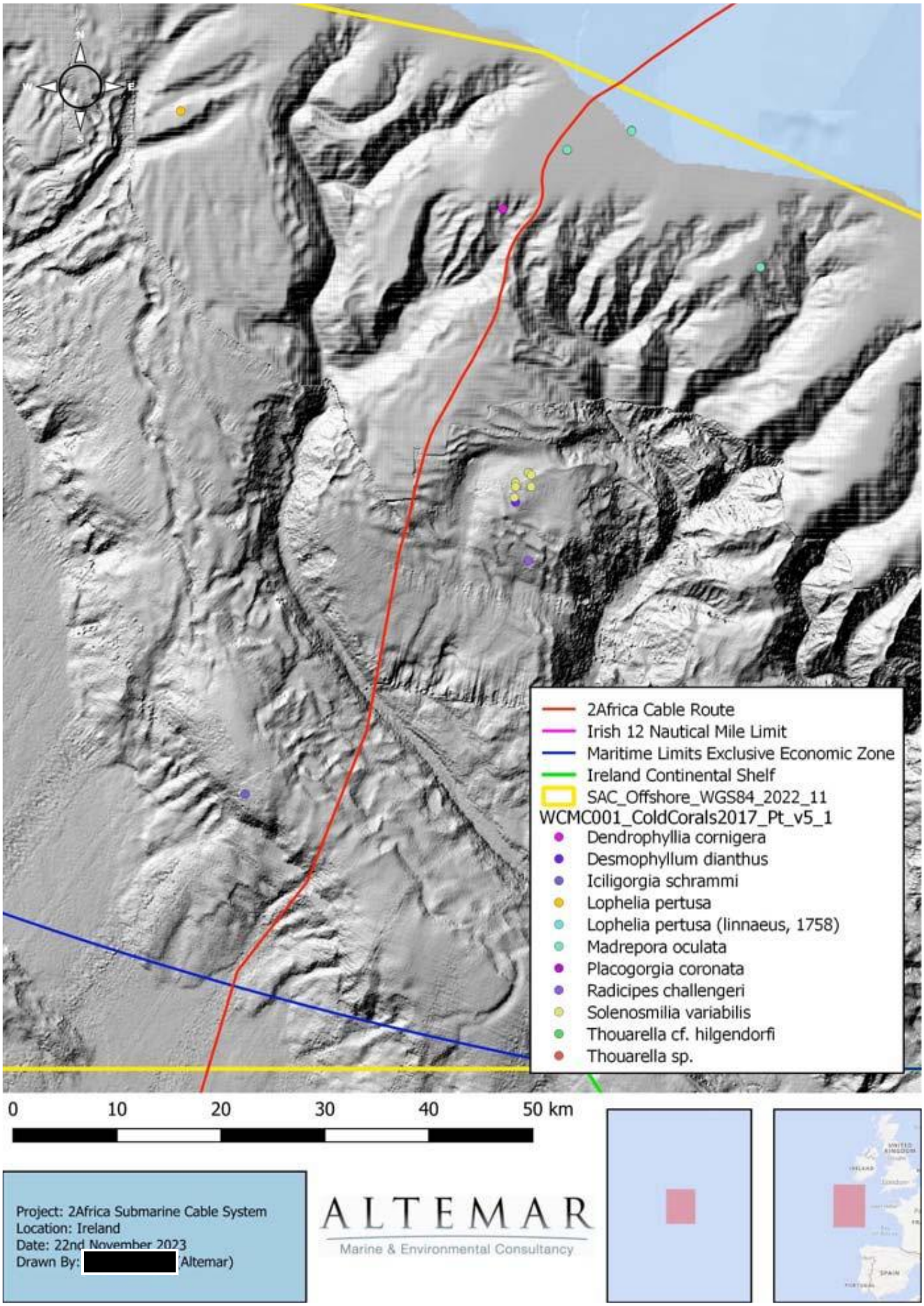


Figure 7.30. Proposed location of the fibre optic cable route in relation to SAC's, carbonate mounds or potential biogenic reefs in the offshore area (Infomar Shaded Relief) (Cold Corals 2017 data)

7.2.3 Marine Mammals

As outlined in NPWS[1] "*Cetaceans account for 48% of all the native species of mammals, both marine and terrestrial, recorded in Ireland and Irish waters are thought to contain important habitats for cetaceans within the northeast Atlantic. To date, 24 species of cetacean, or 28% of species described worldwide, have been recorded in Ireland. Irish cetaceans include six species of baleen whale and eighteen species of toothed whale, including five species of beaked whale. Twenty-two of these have been reported stranded ashore and 20 species observed at sea. Two species (Pygmy sperm whale and Gervais' beaked whale) are only known from stranded individuals and two species (Northern right whale and White whale/beluga) have only been recorded historically, with neither species occurring in the stranding record so far.*

Ireland also has two species of seals, the Common Seal (or Harbour Seal) and the Grey Seal. Whilst both species haul out on land for key stages of their life history, the majority of their time is spent in the marine environment.

In Ireland, the 1992 EC Habitats Directive as transposed by the European Communities (Birds and Natural Habitats) Regulations 2011 (S.I. No. 477 of 2011) requires that both seal species and all cetaceans occurring in Ireland are maintained at favourable conservation status. Under Article 12 of the Directive, all cetaceans should receive strict protection within the Exclusive Economic Zone. Under Article 4 of the Directive, Special Areas of Conservation (SACs) must be proposed for the following species:"

- Bottlenose Dolphin
- Harbour Porpoise
- Common Seal
- Grey Seal

The protection afforded to marine mammals in Ireland is summarised below:

- Harbour Porpoise Annex II of EC Habitats Directive Annex IV of EC Habitats Directive/Protected species of Wildlife (Amendment) Act/OSPAR List of Threatened and Declining Species and Habitats
- Bottlenose Dolphin Annex II of EC Habitats Directive/Annex IV of EC Habitats Directive/Protected species of Wildlife (Amendment) Act
- All Cetacea Annex IV of EC Habitats Directive/Protected species of Wildlife (Amendment) Act
- Grey Seal/Harbour Seal Annex II of EC Habitats Directive/Protected species of Wildlife (Amendment) Act

Marine mammals are afforded protection under the Habitats Directive. The proposed project has the potential to introduce noise into the marine environment and mitigation measures are required to protect marine mammals. Figure 7.31 shows all cetacean species and Figure 7.32 shows monthly activity trends, in the vicinity of the proposed cable route, as recorded by IWDG sightings scheme. Cetacean activity has been seen in the vicinity of the cable route corridor. Species seen in the area and along the cable route include Fin Whale (Balaenoptera physalus), Long-finned pilot whale (*Globicephala melas*), and common dolphin (*Delphinus delphis*). Harbour porpoise (*Phocoena phocoena*) and minke whale (*Balaenoptera acutorostrata*) were noted over 50km from the proposed cable route.

Beaked whales (*Ziphiidae*) are a family of odontocete cetaceans that typically live in deep offshore waters and perform long, deep dives in search of their prey (Quick *et al.,* 2020; Hooker *et al.,* 2019). Due to their preference for deep waters and given that they perform long, deep dives, beaked whales are difficult to study and little information is available on their distribution and population structure (Rogan et al., 2017). Studies indicate that the distribution of these species is associated with steep continental slope habitats in the Northeast Atlantic and have been recorded in northwestern areas of Ireland's offshore waters[2]. Beaked whales are sensitive to anthropogenic noise (Barile et al., 2021), and their diving and hunting behaviours can be impacted by increased underwater noise. Beaked whale species recorded in Irish waters include Cuvier's beaked whale (*Ziphius cavirostris*), Sowerby's beaked whales (*Mesoplodon bidens*), True's beaked whales (*Mesoplodon mirus*), and Northern bottlenose whale (*Hyperoodon ampullatus*). Records of beaked whales in Irish waters are seen in Figures 7.33-7.35 and are noted along the continental slope edge and potentially in the vicinity of the proposed cable route.

[1] https://www.npws.ie/marine/marine-species/cetaceans

[2] https://oap.ospar.org/en/ospar-assessments/intermediate-assessment-2017/biodiversity-status/marine-mammals/abundance-distribution-cetaceans/abundance-and-distribution-cetaceans/

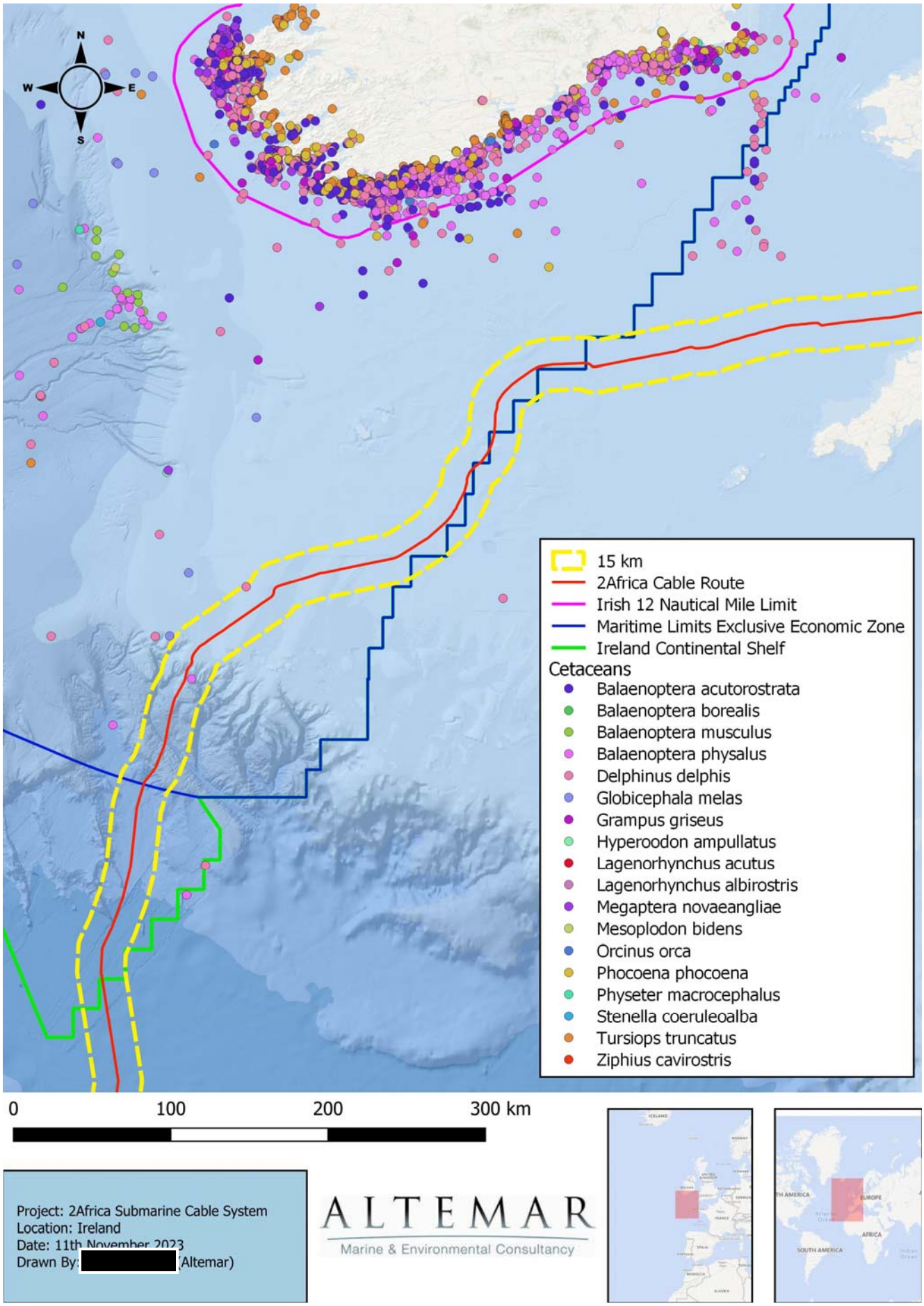


Figure 7.31. *Recorded cetaceans species sightings (IWDG)*

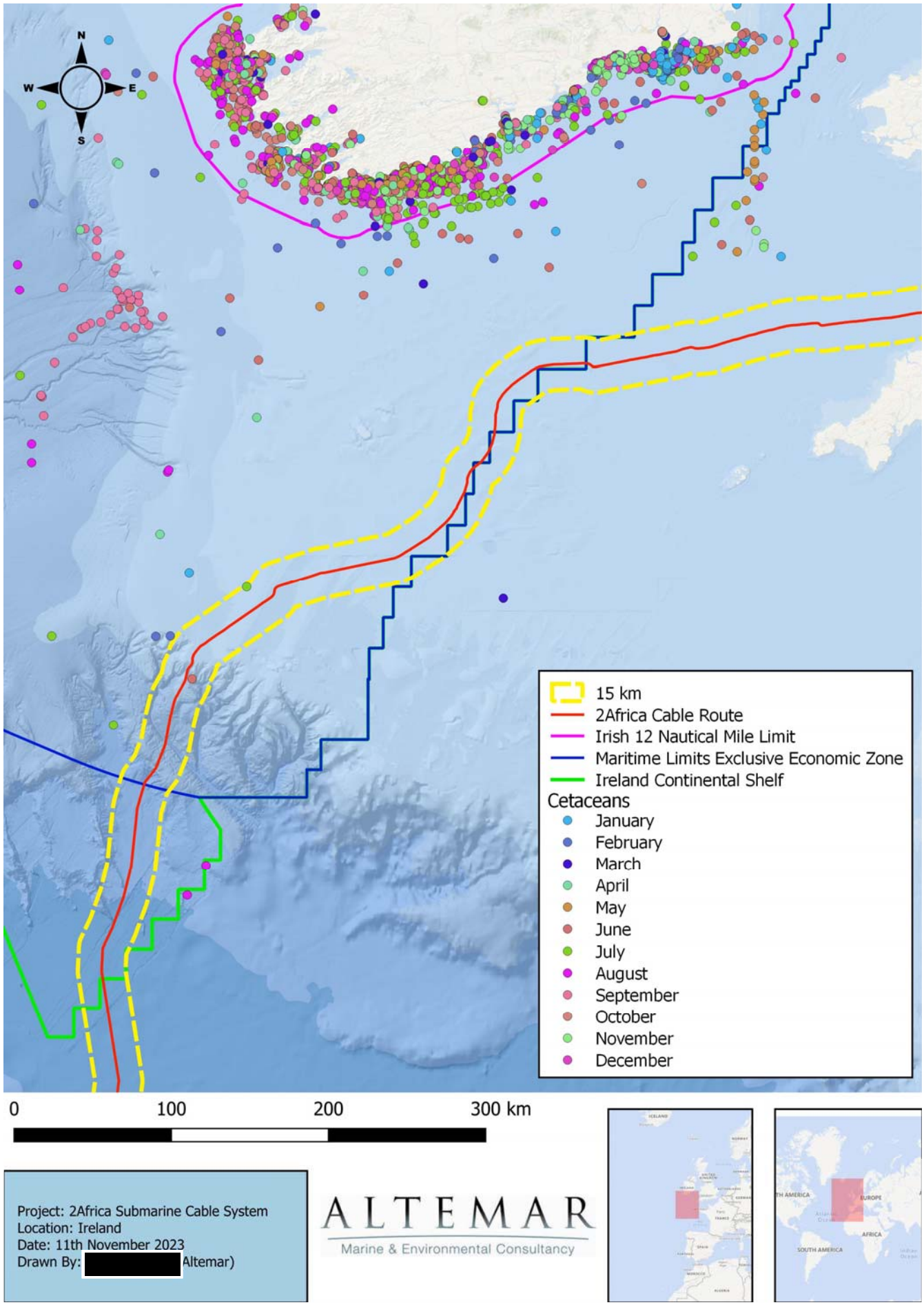


Figure 7.32. *Recorded cetaceans species sightings (IWDG) during the 12 months of the year*

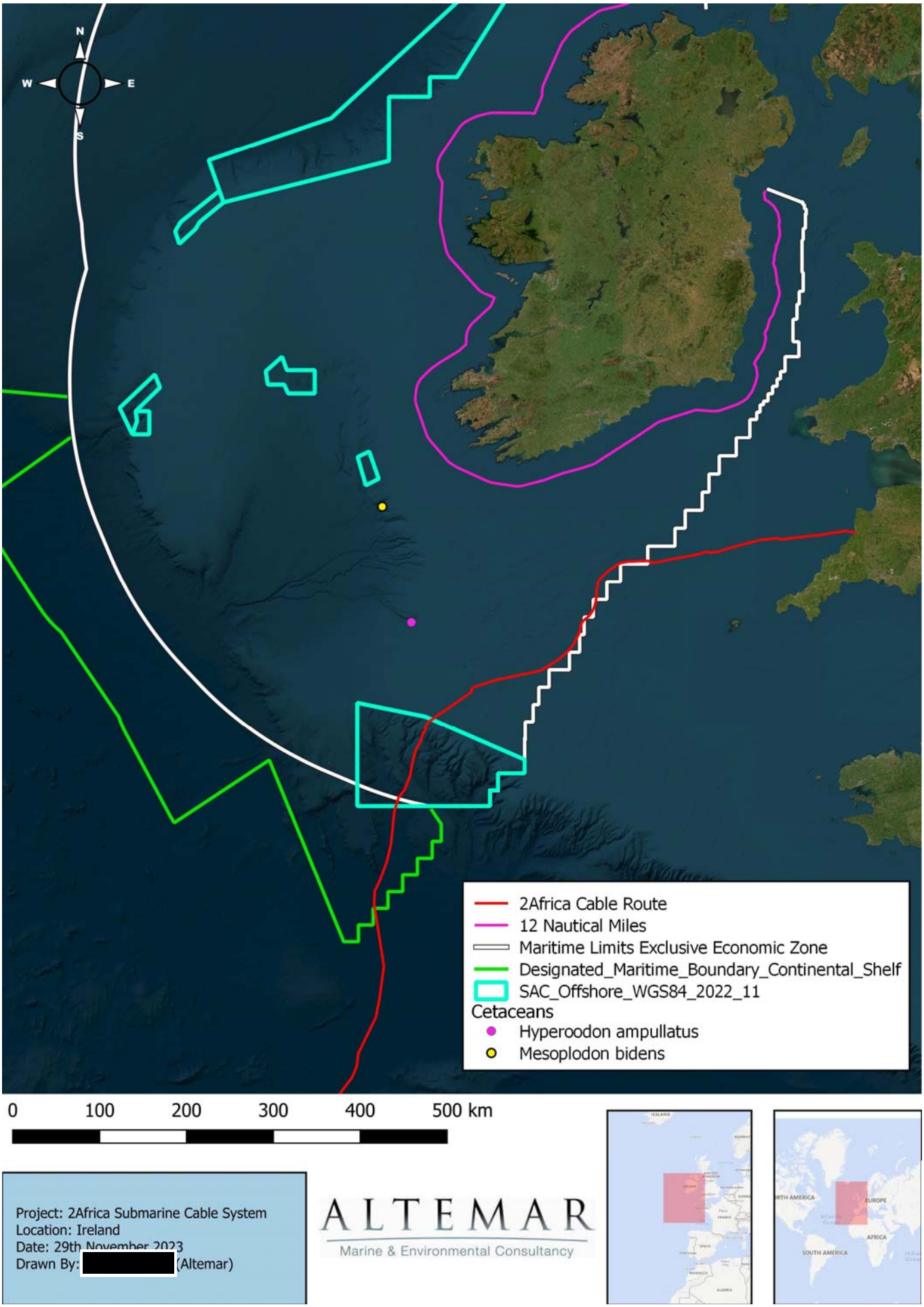


Figure 7.33. *Recorded sightings of beaked whales in Irish waters (IWDG)*

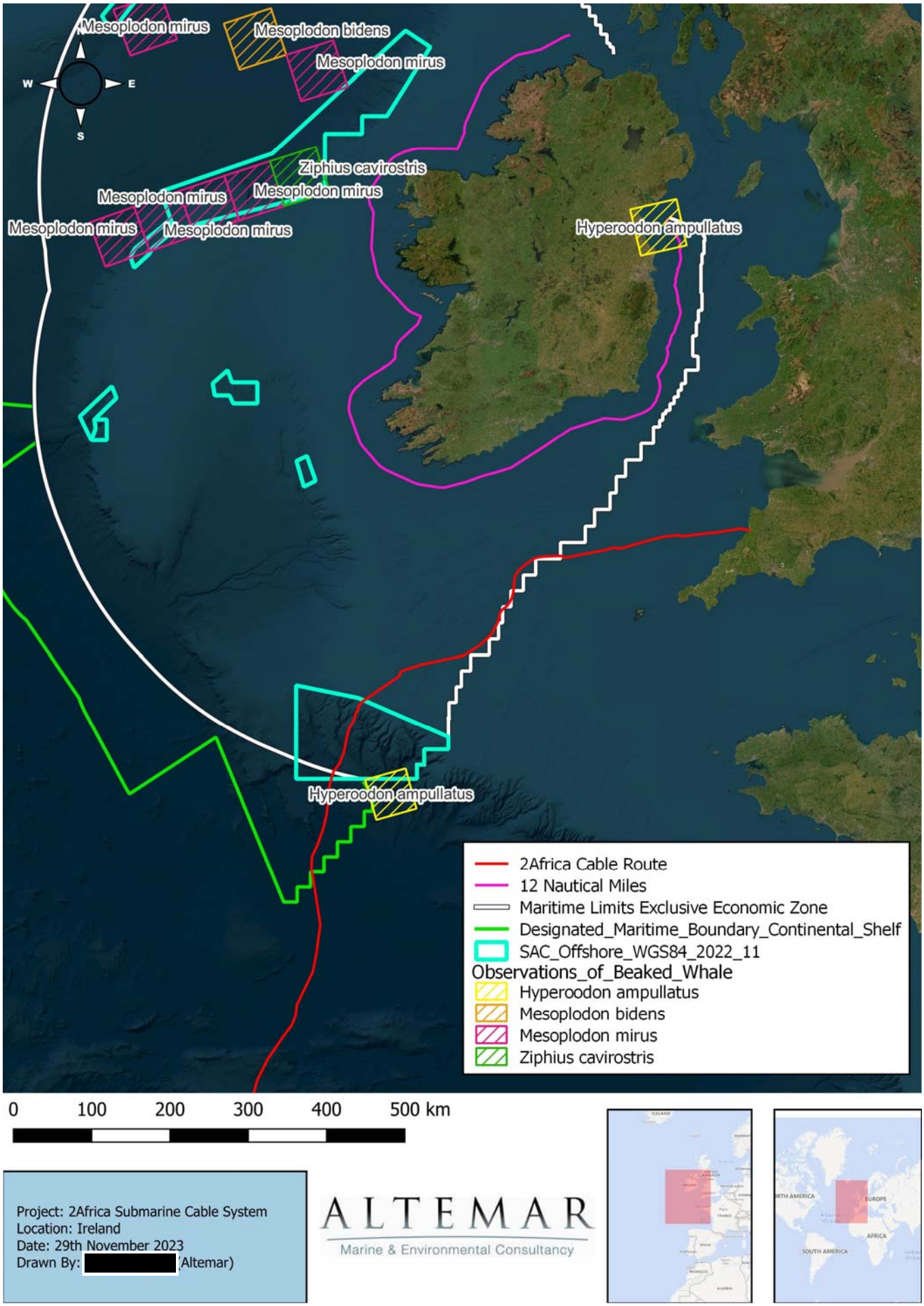


Figure 7.34. *Observations of Beaked Whales (Marine Institute data)*

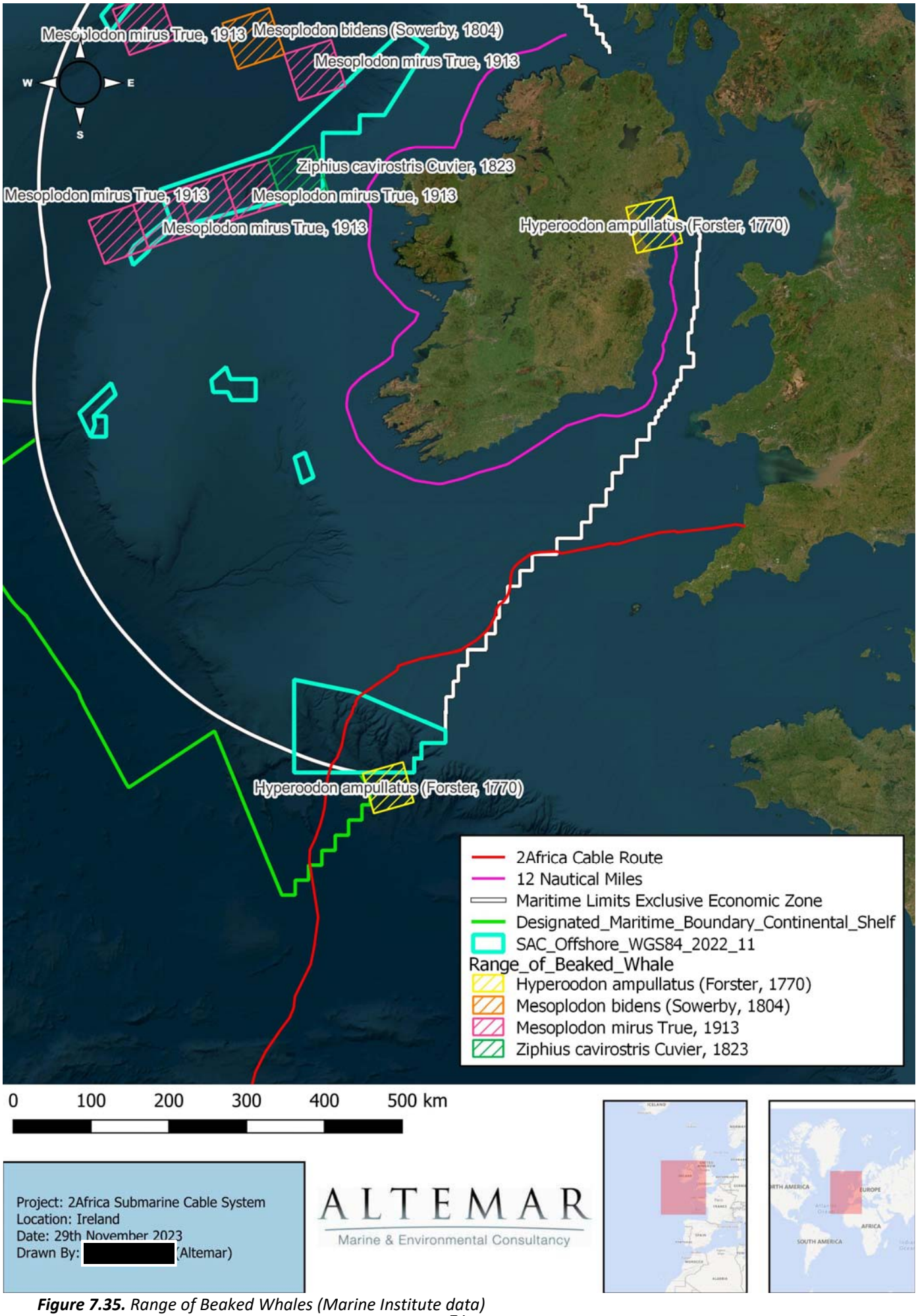


Figure 7.35. *Range of Beaked Whales (Marine Institute data)*

National Biodiversity Data Centre

The National Biodiversity Data Centre's online viewer was consulted in order to determine whether there have been recorded beaked whale sightings proximate to the 2Africa cable route and the Southern Canyons SAC. This is visually represented in Figures 7.36 & 7.37.

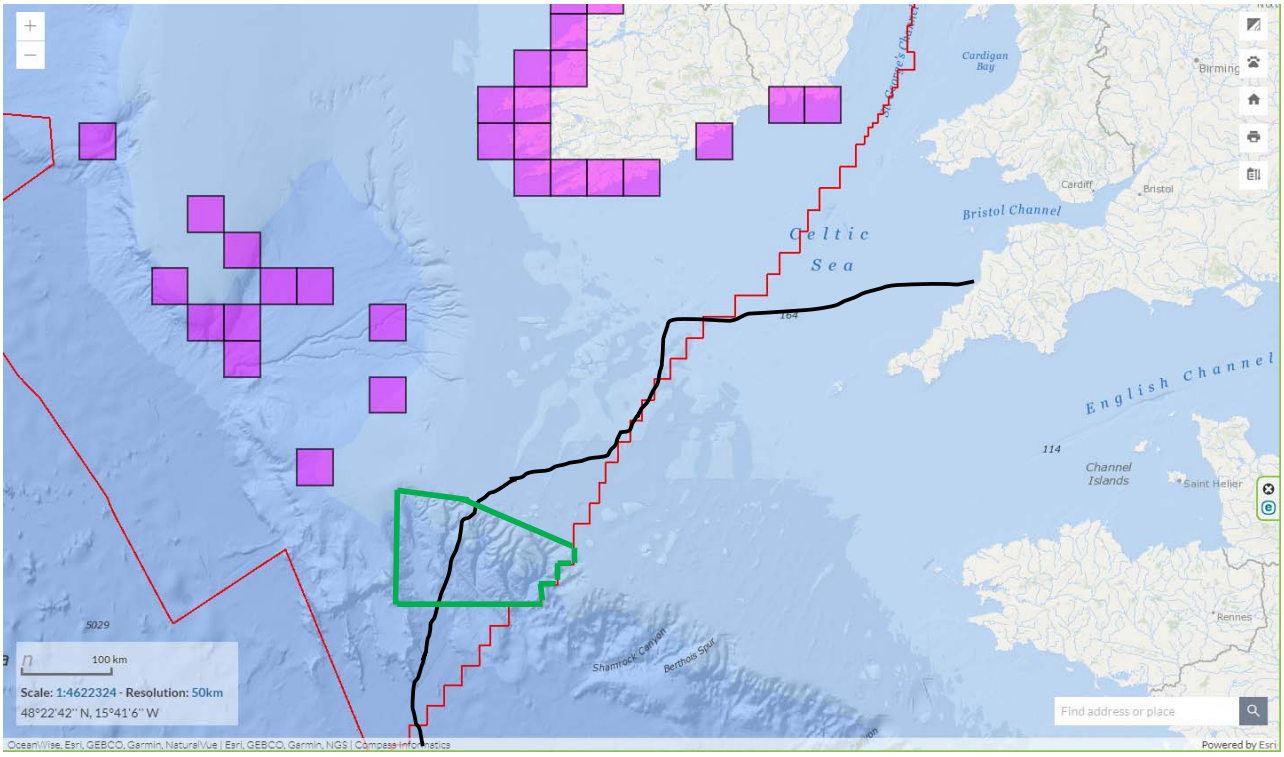


Figure 7.36. Cuvier's beaked whale (*Ziphius cavirostris*) (purple) (Source: NBDC) (Approx. cable route: Black line) (Southern Canyons SAC: Green line)

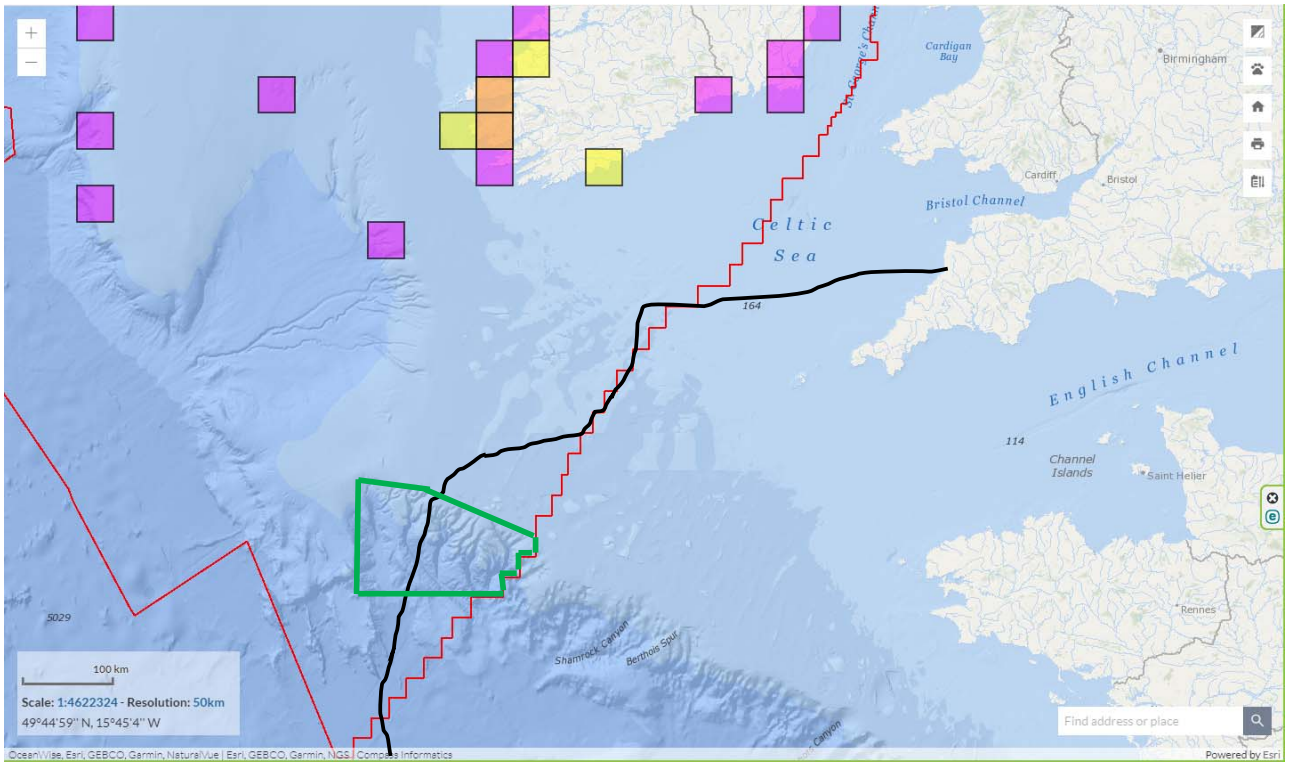


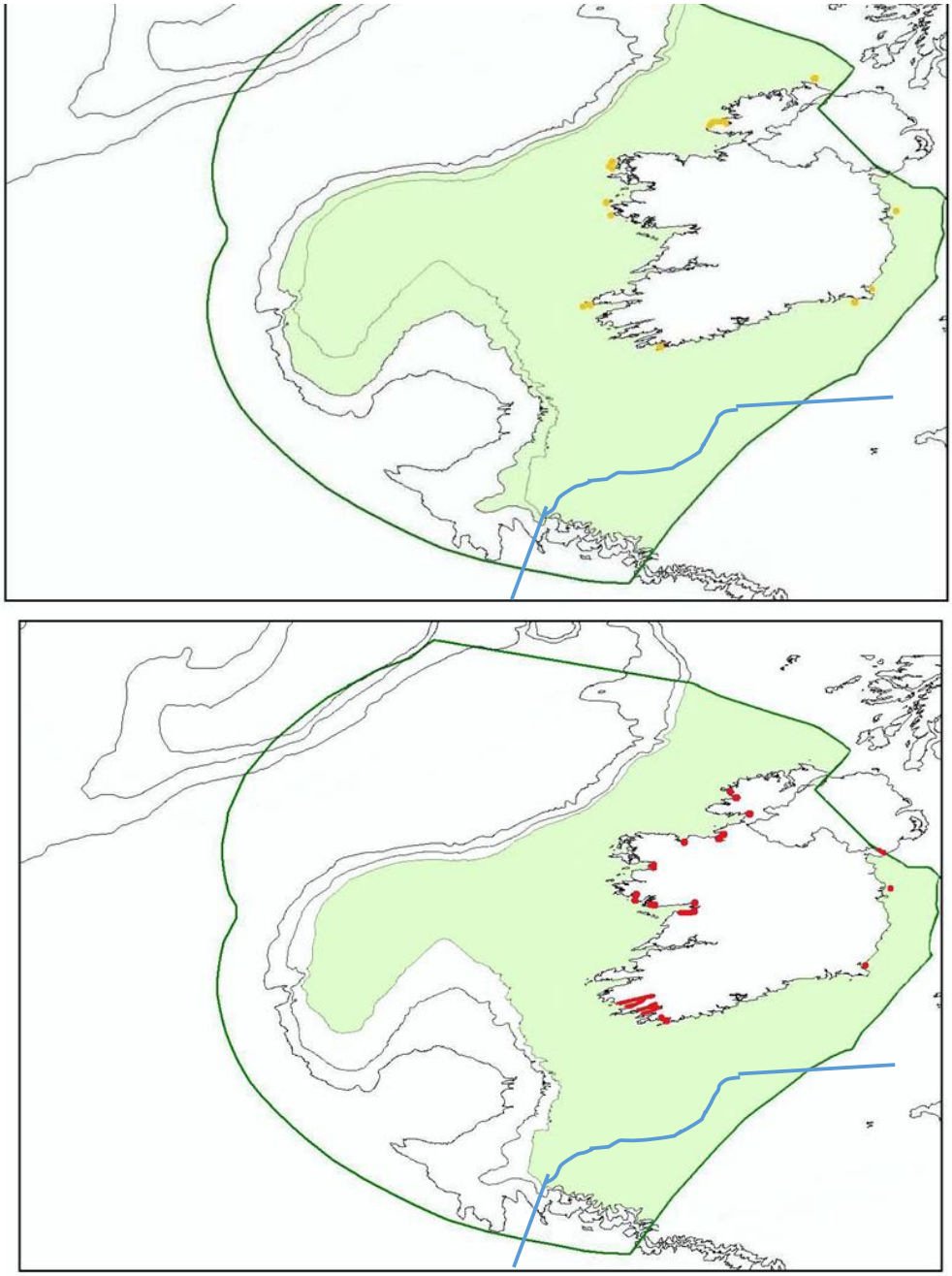
Figure 7.37. True's beaked whale (*Mesoplodon mirus*) (yellow), Sowerby's beaked whale (*Mesoplodon bidens*) (purple), and both True's beaked whale and Sowerby's beaked whale (orange) (Source: NBDC) (Approx. cable route: Black line) (Southern Canyons SAC: Green line)

7.2.4 Additional information on species/habitats

Harbour Seals and Grey Seals

As can be seen from Figure 27, the proposed cable route is not in the vicinity of resting, moulting or breeding sites. However, it is noted that as outlined in NPWS 2013 "*in acknowledging the limited understanding of aquatic habitat use by the species within the site, it should be noted that all suitable aquatic habitat is considered relevant to the species range and ecological requirements at the site and is therefore of potential use by harbour seals*." As a result, despite the location of the cable route outside key activity areas, the cable laying teams will need to be cognisant of this and take into account due diligence in relation to seal disturbance when deploying and recovering equipment.

Figure 7.38. Harbour seal (red) and grey seal (yellow) distribution (green) and haul-out sites in the inshore area. (NPWS). Proposed cable route (approx..) is the blue line.



7.2.5 NBDC Data

The National Biodiversity Data Centre's online viewer was consulted in order to determine the extent of biodiversity and/or species of interest in the area. Following this, the offshore 50km^2 grids that include the proposed cable route was assessed. This data is demonstrated in Appendix II.

7.3 Potential Impacts

The installation of a deep sea fibre-optic cable is a complex and challenging procedure. From the beginning of the planning stage to the final installation of the cable, careful thought has gone into ensuring the longevity of the cable and uninterrupted service. This, in tandem with licencing and environmental legislation, results in the placement of the cable in as stable an environment as possible that will have minimal impact on the environment and threat of anthropogenic disturbance. In summary, within the Irish EEZ, the laying of the cable, with the exception of the continental slope, will involve ploughing in sediment down to a depth of 1470m and surface laying on ground deeper than 1470m.

During the initial baseline assessment of the route, discussions took place in relation to sensitive habitats/designations that may be present along the proposed cable route. At the time of these assessment the Southern Canyons cSAC was not designated. Designation of this cSAC did not take place until November 2022. However, the proposed route is considered to be the optimal route for a fibre optic cable from an ecological and logistical perspective. It is important to note that the marine survey allowed for the fine routing of the cable to avoid boulders, where possible, areas of bedrock reef for ploughing. No bedrock was noted along the route within Irish waters.

Sidescan sonar imagery along the burial route in the SAC is seen in Figures 7.9 and 7.10. The location of the refined cable route within the SAC in relation to the sonar contacts and trawl scars are noted in these images. The route avoids a parallel ridge (noted in side scan) where numerous trawl scars and sonar contacts were noted. As seen in Figures 7.9 and 7.10 the route therefore avoids the vast majority of sonar contacts e.g. boulders classed as reef within the SAC. It should be noted that a substantial number of trawl scars are noted within the cSAC across the areas that ploughing will take place. These appear on the raised ridge to the west of the proposed route and also indicate a sedimentary based habitat with potential for boulders on the ridge, which is being avoided by the ploughing.

7.3.1 Construction Impacts

Ploughing and surface lay will take place within Irish waters. In addition, several cable crossings are noted in the Irish EEZ, but these are outside the Southern Canyons SAC. Ploughing will involve the disturbance of the seabed. Immediate backfilling is a feature of the plough to be used. In the subtidal the process will involve a ship moving at a speed of approximately 0.3kn and generating acoustic noise akin to dredging activity. A plume of sediment will be generated. However, due to the speeds and equipment (on skids) involved, this plume will be very localised. No rock armour will be carried out in Irish waters. ROV burial at cable crossings involve localised ROV jetting.

It is important to note that when equipment is deployed e.g. plough (for burial) or ROV (for burial at cable crossings) a USBL is required so that the ship can locate the position of the equipment. This does emit underwater noise that could potentially impact on marine mammals. Further details are provided in the Noise and Vibration Section of the AIMU report (Section 10).

Disturbance of cetaceans may occur due to the presence of the vessel and USBL. However, at the speeds involved injury to marine mammals is unlikely. There is only little information on potential noise impacts due to the installation (or removal) and operation of sub-sea cables (OSPAR 2008a). Sound emissions associated with the installation, removal or operation of submarine cables are considered as less harmful compared to activities such as seismic surveys, military activities or construction work involving pile driving. Generally, maximum sound pressure levels related to the installation or operation of cables are moderate to low (OSPAR, 2012). Though modern equipment and installation techniques can reduce the re-suspension of sediment during cable burial or removal, remaining suspended sediment may nonetheless - depending on percentage of silt fraction and background levels - obstruct the filtration mechanisms of some benthic and pelagic organisms at least temporarily (OSPAR 2009). It can also affect the growth of the macrobenthos and may have a lethal effect on some species. Some mobile benthic species (for example, crabs) are able to avoid most disturbance whereas sessile (bivalves, tubeworms etc.) and sensitive species (such as slower growing or fragile species) will be more impacted (OSPAR, 2012). Contamination arising from seabed disturbance is only a risk in heavily contaminated locations (OSPAR 2009, COOPER et al. 2007a, 2007b). By surface laying over difficult ground or deeper than 1500m the cable will only create a narrow footprint on the seabed that may inhibit growth of marine flora and fauna due to the presence of the cable. It should also be noted that best available data relating to sightings of cold corals (including *Lophelia pertusa*)

have been examined, and the proposed cable route has been designed to avoid ploughing in canyons and areas where coral species have been found.

Localised impacts would be foreseen in the vicinity of the plough burial areas. The marine survey has resulted in the fine tuning of the route to avoid boulders where possible. Due to the nature of the burial using a sled, if dropstones or localised boulders in these areas are encountered it would be expected that the sled would move these features aside but would not bury or alter the level of reef habitat available within the cSAC. It is important to note that detailed assessment and fine resolution routing of the cable has been carried out in all areas where plough burial is proposed. However, given that there are proposed works within the offshore Southern Canyons SAC, mitigation measures are required to ensure that there are no significant impacts on this SAC. Further, there is potential for marine mammals to be in the vicinity of the proposed works. Mitigation measures for the protection of marine mammals are required. Additional information on Marine mammals and noise are seen in the NIS and in the Noise and vibration section of this report. Potential impacts on habitats and species and the extent of these impacts that could potentially be encountered during the construction phase are seen in Table 7.2a (habitats) and 7.2b (species). Mitigation measures are proposed.

Where burial is not possible the cable will be surface laid. A detailed assessment of the proposed route has been carried out. It should be noted that vessel speeds are slow and surface laying over reef simply involves lifting the plough off the seabed. In these areas it will not be possible to plough. The lifting of the plough is easily managed as there will a camera onboard the plough and upcoming obstacles are seen. As can be seen from the data in figures 7.6 to 7.14 burial of the cable is within a relatively flat sediment based area between 156m & 264m and 550m & 1500m. Outside these areas the cable will be surface laid which will have minimal impact. Localised impacts would be foreseen in the vicinity of the plough burial areas.

As outlined in Carter *et al.* (2009) (UNEP-WCMC) '*On the continental shelf, burial to c.1 m depth in soft to firm sediment typically leaves a ploughed strip, c.0.3 m wide, in which the cable is entirely covered. However, burial in consolidated substrates may result in only partial closure of the furrow, with displaced sediment deposited at the furrow margins (NOAA, 2005). The skids that support the plough can also leave their footprint on the seabed, particularly in zones of soft sediment (Chapter 3). Potential effects are increased sediment compaction and the disruption of marine fauna. Overall, the disturbance strip produced by the plough-share and skids in direct contact with the seabed ranges from c.2 m to c.8 m wide, depending on plough size*.' The plough to be used on 2Africa will be c.2m wide.

Due to the nature of the burial using a sled, if dropstones or localised boulders in these areas are encountered it would be expected that the sled would move these features aside but would not be expected to bury or alter the level of reef habitat available. If boulders are encountered, localised damage to epifauna may occur if present at the face of the boulder to the plough. It should be noted that the route avoids a parallel ridge (noted in side scan) where numerous trawl scars and sonar contacts were noted. The route therefore avoids the vast majority of sonar contacts e.g. boulders classed as reef within the SAC.

Table 7.2a. Potential impacts on habitats during installation

Habitat	Habitats Directive	Rating	Instillation Impact	Impact Significance in the absence of mitigation
Atlantic upper bathyal (200 - 600 m)/ Atlantic mid bathyal (600m -1300m)/Atlantic lower bathyal (1300-2100m)/Atlantic upper abyssal (2100 - 3100 m)/Atlantic mid abyssal (3100 - 4100 m)- rock and other hard substrata	"Reef - 1170"	A	No bedrock outcrops were noted in the marine survey within the Irish EEZ. Sonar contacts were noted and were primarily avoided. Some localised boulders may be encountered and moved by sled. If bedrock is encountered surface laying will occur on this habitat in offshore bedrock areas. In areas of cobble ploughing may be carried out. No impact is foreseen on the structural integrity of this habitat. Temporary disturbance would occur due to cobbles or boulders, if present, being moved. Mitigation is required on the continental slope. A marine biologist ashore will monitor the vessel progress to ensure the selected route is being followed.	Minor Adverse/ localised/short-term/not significant.
Atlantic upper bathyal (200 - 600 m)/ Atlantic mid bathyal (600m -1300m)/Atlantic lower bathyal (1300-2100m)/Atlantic upper abyssal (2100 - 3100 m)/Atlantic mid abyssal (3100 - 4100 m)- coarse or sand or mud or mixed sediment		C	Ploughing will occur in this area offshore. A temporary alteration in sediment layering would follow the ploughing process. Infauna may be damaged or displaced in the vicinity of the plough. No mitigation is required.	Minor Adverse/ localised/short-term/not significant.
Atlantic upper bathyal (200 - 600 m)/ Atlantic mid bathyal (600m -1300m)/Atlantic lower bathyal (1300-2100m)/Atlantic upper abyssal (2100 - 3100 m)/Atlantic mid abyssal (3100 - 4100 m)- biogenic structure	"Reef - 1170"	A	As noted by JNCC[3]"*A biogenic structure is formed when reef-forming species, such as cold water corals, attach to any hard substrate present and grow over the surrounding area forming a secondary substrate over the top. This changes the composition of the associated community as it provides a stable surface for epifauna to attach. Biogenic structure includes only areas where the seafloor is completely covered, not isolated structures, such as sponge aggregations or discrete corals*." The route has been designed to avoid hard substrates. No impact is foreseen on the structural integrity of this habitat. Temporary disturbance would occur due to silt. However, current and vessel speeds are slow and silt disturbance is expected to be localised. Mitigation is required on the continental slope. A marine biologist ashore will monitor the vessel progress to ensure the selected route is being followed.	Minor Adverse/ localised/short-term/not significant.

Table 7.2b. Potential impacts on habitats during construction.

[3] https://mhc.jncc.gov.uk/biotopes/jnccmncr00002231

Species	Rating	Construction Impact	Impact Significance in the absence of mitigation
Mammal-Cetaceans	A	Subtidal survey and cable laying may be carried out in vicinity of cetaceans. Localised disturbance may occur due to the presence of the vessel and acoustic noise generated from cable laying activities on the sea floor. A MMO will be on vessel at all times (Seen NIS for more detail).	Minor Adverse/ localised/short-term/not significant.
Mammal-Seals	A	Subtidal survey and cable laying may be carried out in vicinity of seals. Localised disturbance may occur due to the presence of the vessel and acoustic noise generated from cable survey and laying activities. Cable laying is to be carried out outside of breeding and haul out areas for Grey Seal and Harbour seals. Vessel speeds will be slow. A MMO will be on board the vessel to enforce mitigation measures.	Minor Adverse/ localised/short-term/not significant.
Mammal-Bats	A	The proposed works are located within the deep offshore subtidal of the Irish EEZ. No terrestrial elements of the project are proposed within Ireland's terrestrial habitats. No bat foraging or roosting habitats will be impacted by the proposed works. No impacts on bat species are foreseen as a result of the proposed works.	Neutral
Mammals-Terrestrial	A-D	The proposed works are located within the deep offshore subtidal of the Irish EEZ. No terrestrial elements of the project are proposed within Ireland's terrestrial habitats. Given that the proposed cable route is located 127km from the Irish shoreline at its nearest point, no otter species are expected to be located within the vicinity of the proposed cable route. No impacts on terrestrial mammal species are foreseen as a result of the proposed	Neutral
Birds	A	The proposed works are located within the deep offshore subtidal of the Irish EEZ. No terrestrial elements of the project are proposed within Ireland's terrestrial habitats. No breeding sites for birds will be impacted by the proposed works in the Irish EEZ. In the event that there are foraging / migrating proximate to the main lay vessel, vessel speeds will be low and disturbance impacts would be minimal. No significant impact on bird species are foreseen as a result of the proposed works.	Neutral
Amphibians	B	The offshore subtidal is not a suitable habitat for amphibian species. No amphibians are expected to be proximate to the proposed works. No impacts on amphibian species are foreseen from the proposed development.	Neutral
Terrestrial Flora	-	There are no terrestrial elements proposed on Ireland's terrestrial habitats or within the Irish EEZ. The proposed development will not impact on flora species within Ireland's terrestrial habitats.	Neutral
Marine algae	D	Subtidal marine algae are primarily associated with hard substrata in the intertidal and shallow subtidal. No marine algae will be present along the proposed cable route.	Neutral
Fish Species	A	Localised disturbance of marine species may occur due to ploughing and ROV based burial activities. Vessel speeds are very slow and no significant impacts on fish are expected. Post lay , fish may be attracted to the area due to the disturbed sediment.	Minor Adverse/ localised/short-term/not significant.

Table 7.3a. Potential impacts on habitats during operation.

Habitat	Habitats Directive	Rating	Operation Impact	Impact Significance in the absence of mitigation
Atlantic upper bathyal (200 - 600 m)/ Atlantic mid bathyal (600m -1300m)/Atlantic lower bathyal (1300-2100m)/Atlantic upper abyssal (2100 - 3100 m)/Atlantic mid abyssal (3100 - 4100 m)- rock and other hard substrata	"Reef - 1170"	A	No significant heat or EMF emissions into the marine environment are foreseen. The structural integrity of the habitat will not be impacted.	Neutral
Atlantic upper bathyal (200 - 600 m)/ Atlantic mid bathyal (600m -1300m)/Atlantic lower bathyal (1300-2100m)/Atlantic upper abyssal (2100 - 3100 m)/Atlantic mid abyssal (3100 - 4100 m)- coarse or sand or mud or mixed sediment		C	The cable will be buried in the marine sediment and no long term impacts are foreseen. Invertebrate biodiversity may be negatively impacted in the short term by ploughing.	Neutral
Atlantic upper bathyal (200 - 600 m)/ Atlantic mid bathyal (600m -1300m)/Atlantic lower bathyal (1300-2100m)/Atlantic upper abyssal (2100 - 3100 m)/Atlantic mid abyssal (3100 - 4100 m)- biogenic structure	"Reef - 1170"	A	No significant heat or EMF emissions into the marine environment are foreseen. The structural integrity of the habitat will not be impacted.	Neutral.

Table 7.3b. Potential impacts on habitats during operation.

Species	Rating	Operational Impact	Impact Significance in the absence of mitigation
Mammal-Cetaceans	A	No acoustic noise is generated from the cable whilst in operation. Studies have shown that the danger of entanglement in modern cables is extremely remote due to the use of BAT in surface laying, burial and cable design.	Neutral
Mammal-Seals	A	No acoustic noise is generated from the cable whilst in operation. Studies have shown that the danger of entanglement in modern cables is extremely remote due to the use of BAT in surface laying, burial and cable design.	Neutral
Mammal-Bats	A	The cable will be laid in the deep offshore subtidal within the Irish EEZ. No impact is foreseen.	Neutral
Mammals-Terrestrial	A-D	The cable will be laid in the deep offshore subtidal within the Irish EEZ. No impact is foreseen.	Neutral
Birds	A	The cable will be laid in the deep offshore subtidal within the Irish EEZ. No impact is foreseen.	Neutral
Amphibians	B	The cable will be laid in the deep offshore subtidal within the Irish EEZ. No impact is foreseen.	Neutral
Terrestrial Flora	-	The cable will be laid in the deep offshore subtidal within the Irish EEZ. No impact is foreseen.	Neutral
Marine algae	D	The cable will be laid in the deep offshore subtidal within the Irish EEZ. No impact is foreseen.	Neutral
Fish Species	A	The cable will be laid in the deep offshore subtidal within the Irish EEZ. No impact is foreseen.	Neutral

7.4 Mitigation Measures & Monitoring

Minor short-term impacts may result as a consequence of the project, but these are believed not to be at the scale to impact on the integrity of the Natura 2000 sites, species or the Site Specific Conservation Objectives. However, following the precautionary principle, substantial mitigation measures have been developed to minimise the ecological impacts of the project, not only in relation to Natura 2000 Annex habitats and species, but also additional species and habitats of conservation importance that have been recorded in the area, including marine mammals offshore.

Mitigation measures are proposed including having an MMO present on the cable laying vessel to ensure marine mammals are not disturbed by the proposed works. The cable route would see invertebrate mortalities in the vicinity of the subtidal plough burial areas. However, during surface lay these effects would be expected to be extremely limited. These effects would be limited in nature and would be short term.

Pre cable laying mitigation

Route Planning

A strict route selection process was carried out to assess the optimal route within the Irish EEZ, taking into account the lowest environmental impact and highest resource efficiency on the basis of sound and comparable data. This included addressing engineering issues as well as environmental concerns which included assessing existing infrastructure.

The proposed cable route passes through an offshore Natura 2000 site of conservation significance (cSAC[1]). The conservation significance of the features of interest of the Natura 2000 sites was assessed. The route was deemed to be the optimal route of satisfying conservation significance (within the designated site) the optimal from an engineering perspective and for the stability and longevity of the cable. The cable route has been selected to avoid habitats of significant ecological interest since the routeing avoids areas of steep relief and harder substrates e.g. reef. This routeing of the cable is then strictly adhered to during the ploughing and surface lay processes. In the unlikely event that significant route alterations are required during the cable installation within the Southern Canyons SAC, the on-call marine biologist/project ecologist, will be consulted prior to any route amendments being made. It is important to note that burial within the cSAC is limited to between 550 metres water depth (mwd) and 1470mwd, across a mud plain, in additional to smaller area of between 156mwd and 264mwd. There will be no burial down the shelf between 264mwd and 550mwd and deeper than 1470mwd.

Construction phase mitigation measures

Subtidal

Mitigation impacts are primarily concerned with the cable laying as minimal impacts are foreseen during the operation phase, with the exception of human intervention in relation to a break or fault in the cable. Impacts in a decommissioning stage are similar to those of the cable laying phase. Repairing the cable may involve several scenarios, such as the use of a grapnel to lift the cable on board so that repairs can be carried out at sea. As a result, the following mitigation measures will be implemented:

1. During all cable operations within Irish waters, the cable lay vessel will be operating at idle /minimal wake speeds which reduces potential collision risk with marine mammals and turtle species. Surface lay operations will typically not exceed 7,500 meters/hour (~4 knots). Plough operations will typically not exceed 400 meters/ hour (~0.22kn) and PLIB / ROV activity will typically not exceed 200 meters / hour (0.1 kn) (note no PLIB / ROV activity anticipated with Irish waters).
2. A MMO will be onboard the vessel at all times in Irish waters to implement standard NPWS marine mammal mitigation measures. “Guidance to Manage the Risk to Marine Mammals from Man-made Sound Sources in Irish Waters” (NPWS, 2014) will be applied to ensure noise introduced into the marine environment have minimum effect. Plough launch, seabed ploughing and plough recoveries will be conducted in consultation with the MMO.
3. Mitigation measures will include the presence of a MMO onboard the vessel. The purpose of the MMO is to ensure that there is no disturbance of seal /cetacean or other Annex IV species e.g. marine turtles, to ensure that project anthropogenic noise is minimised.

4. Sufficient resources will be made immediately available on the vessel to deal with accidental oil spills, including hydraulic hoses bursting etc. and reported to the on board MMO and the onshore marine biologist.
5. Ballast water discharges from project vessels will be managed under the International Convention for the Control and Management of Ships' Ballast Water and Sediments standard (International Maritime Law: Ballast Water Management Convention).
6. The cable route along the continental slope traverses a primarily sedimentary habitat, that possibly contains minor reef e.g boulder areas. The cable route has been meticulously engineered, as outlined in the pre-lay mitigation, to avoid burial attempts in habitats such as steep relief and harder substrates, that may contain ecologically sensitive species. This route engineering is undertaken in accordance with the mitigation hierarchy and is to also ensure the security of the cable and avoid potential damage to laying equipment. It is also in the projects interest to ensure burial in sediment where possible, down to 1500m. The planned route will be strictly followed as to do otherwise could result not only in suboptimal cable burial but also result in impacts on sensitive habitats. Monitoring of vessel movements, via automatic identification system (AIS), will be carried out by the on-call marine biologist/project ecologist. It is important to note that no ploughing will occur in areas where the bedrock reef is at the surface, whether in large bedrock areas or where small bedrock outcrops emerge through the sediment. In such areas, the cable will be surface laid. Localised disturbance is anticipated in the slope area near the cable route. It's important to note that the plough is equipped with an underwater camera, aiding in obstacle avoidance. The proposed approach for surface laying over bedrock areas if encountered, involves lifting the plough off the seabed and continuing to lay the cable on the surface. Burial recommences once the bedrock is clear. However, based on the marine survey no bedrock was noted in the proposed ploughing area within the Southern Canyons SAC. In the unlikely event that significant route alterations are required during the cable installation within the Southern Canyons SAC, the on-call marine biologist/project ecologist, will be consulted prior to any route amendments being made.

Post-lay Monitoring

Given the location of the cable, buried in marine sediments or laid across reef areas, physical monitoring of the cable would pose an impact on the marine environment. Underwater cables by their nature are passive on/within the seabed. It is not expected that the cable will move, deteriorate or impact on marine habitats over time, unless impacted by anthropogenic /storm influence. As outlined by Carter et al. (2009) '*Unless a cable fault develops, the seabed may not be disturbed again within the system's design life.*' Problems, if they arise would be expected to result in a loss of signal and subsequent location of the break/damage and repair. The optical fibres and electrical supply in the cable are monitored 24hours a day from the terminal station, as this is a fundamental function of the cable.

Ecological supervision

In order to ensure the integrity of Annex habitats and additional habitats/species of importance are retained in the vicinity of the planned project, the following is recommended:

a. A MMO will be present during cable laying to minimise any impact on marine mammals.
b. A marine biologist/ecologist will be in daily contact with the lay vessel within the Southern Canyons SAC. An ecological clerk of works report will be prepared and submitted to NPWS within 2 month of the vessel leaving Irish waters.
c. Daily reports will be submitted to the project ecologist during works in the Southern Canyons SAC.

7.5 Adverse Effects likely to occur from the project (post mitigation)

Standard and specific mitigation measures are proposed. These would ensure that any of the proposed works do not adversely affect any of the habitats or fauna proximate to the cable route. However, early implementation of ecological supervision and consultation with NPWS, prior to the commencement of works, is seen as an important element to the project.

With the successful implementation of standard and specific mitigation measures to limit impacts on biodiversity, no significant impacts are foreseen from the works of the proposed project on terrestrial or aquatic ecology. Residual impacts of the proposed project will be localised to the immediate vicinity of the proposed works.

The mitigation proposed for the development satisfactorily addresses the mitigation of potential impacts on aquatic biodiversity through the application of the standard controls as outlined above. In particular, mitigation measures to ensure compliance with the Guidance to Manage the Risk to Marine Mammals from Man-made Sound Sources in Irish Waters. It is essential that these measures outlined are complied with, to ensure that the proposed development does not have environmental impacts and significant impacts on local biodiversity.

Residual effect: Minor Adverse/ localised/short-term/Not significant.

7.6 Cumulative Impacts

As outlined by (OSPAR, 2012) "*Cumulative effects, the combined effect of more than one activity, may reinforce the impacts of a single activity due to temporal and/or spatial overlaps*". The potential for cumulative impacts within the ZoI that may occur as a result of the proposed project, during and post works were assessed. It should be noted that no terrestrial works are proposed on the island of Ireland. The proposed cable installation works within the Irish EEZ are located exclusively in the offshore subtidal, 127km from the Irish shoreline at its nearest point.

Table 7.4. *Foreshore licence applications in vicinity of the 2Africa Cable*

Reference	Title	Year	Location	Activity	Status
FS007621	Péarla Offshore Wind Limited – Site Investigations for Export Cable Corridor for a proposed Offshore Wind Farm Project	2022	Off County Waterford	Site Investigations	Applied
FS007575	Kinsale Offshore Wind Limited Site Investigations for Export Cable Corridor for proposed Offshore Wind Farm	2022	Off County Cork	Site Investigations	Consultation
FS007488	Celtic Offshore Renewable Energy Site Investigations for proposed Offshore Wind Farm	2022	Off Counties Waterford and Wexford	Site Investigations	Applied
FS007471	Floating Cork Offshore Wind Limited Site Investigations for proposed Offshore Wind Farm	2022	Off County Cork	Site Investigations	Applied
FS007464	Bore Array Ltd., Site Investigations for Bore Array Offshore Wind Farm	2022	Off County Wexford	Site Investigations	Applied
FS007445	Blackwater Offshore Wind – Marine Surveys	2022	Wexford	Marine Surveys	Applied
FS007436	Voyage Offshore Array Limited Site Investigations for proposed Offshore Wind Farm	2022	Off Counties Waterford and Wexford	Site Investigations	Applied
FS007431	Tulca Offshore Array Limited Site Investigations for proposed Offshore Wind Farm	2022	Off County Cork	Site Investigations	Applied
FS007384	Celtic Horizon Offshore Wind Farm Limited Site Investigations for proposed Offshore Wind Farm	2021	Off Counties Wexford and Waterford	Site Investigations	Applied

FS007374	Mainstream Renewable Power Ltd.	2021	Off County Wexford	Site Investigations	Consultation
FS007361	Beaufort Sub-sea Fibre Optic Cable System	2022	Off Wexford Coast	Installation of Sub-sea Fibre Optic Cable	Consultation
FS007354	Kinsale Offshore Wind Ltd, Site Investigations for the proposed Kinsale Project offshore wind farm	2022	Off County Cork	Site Investigations	Consultation
FS007318	RWE Renewables Ireland East Celtic Ltd., Site Investigations for proposed East Celtic Offshore Wind Park	2021	Off Counties Wexford and Waterford	Site Investigations	Applied
FS007232	DP Energy – Latitude 52 Offshore Windfarm Ltd.	2021	Off Counties Wicklow and Wexford	Site Investigations	Applied
FS007135	ESB Wind Development Ltd. Site Investigations at Loch Garman Offshore Wind	2021	County Wexford	Site Investigations	Consultation
FS006916	EirGrid Celtic Interconnector Electricity Cable	2021	Co. Cork	Installation of Subsea Cable	Determination

7.7 Residual Impacts and Conclusion

The mitigation proposed for the proposed works satisfactorily addresses the mitigation of potential impacts on the sensitive receptors through the application of standard controls. The overall impact on the ecology of the proposed development will result in a short term minor adverse not significant residual effect on the ecology of the area and locality overall.

8. Fisheries and Aquaculture

8.1 Proximity to Fisheries and Aquaculture

Fisheries

The proposed cable route passes through a known black-bellied monkfish (*Lophius budegassa*) nursery area (Figure 8.1). This nursery ground spans for much of the Celtic shelf off the south of Ireland and therefore the area through which the license application is proposed is not of specific importance to this species.

The proposed cable route passes through the southern extent of a known blue whiting (*Micromesistius poutassou*) nursery and spawning grounds (Figure 8.2). Known blue whiting nursery grounds span large areas along the continental shelf in Ireland's western and southern Exclusive Economic Zone, and therefore the grounds in which the license application area is proposed is not of specific importance to this species. Spawning of this mesopelagic fish occurs from February in the south of the range, to May in the north, at depths from 180m to 360m.

The proposed cable route passes through known hake (*Merluccius merluccius*) nursery and spawning grounds (Figure 8.3). This fish is a demersal species. Hake nursery grounds span a large portion of Irish waters, including the majority of the Celtic Sea and seas off southwest and northwest of Ireland, and so the grounds in which the cable route is proposed are therefore not of specific importance to this species.

The proposed cable route and license application area passes through horse mackerel (*Trachurus trachurus*) nursery and spawning grounds (Figure 8.4). Horse mackerel nursery grounds span a large proportion of Irish waters, including the majority of the Celtic Sea, the entirety of the Irish Sea, and much of continental shelf to the north, west and south of Ireland, and so the grounds in which the cable route is proposed are therefore not of specific importance to this species.

The proposed cable route passes through known megrim (*Lepidorhombus whiffiagonis*) nursery and spawning grounds (Figure 8.9). Megrim (demersal species) nursery grounds span a large proportion of Irish waters, including a large proportion of the Celtic Sea, and the majority of the continental shelf (including Porcupine Bank) to the north, west and south of Ireland, and so the grounds in which the cable main lay is proposed are therefore not of specific importance to this species.

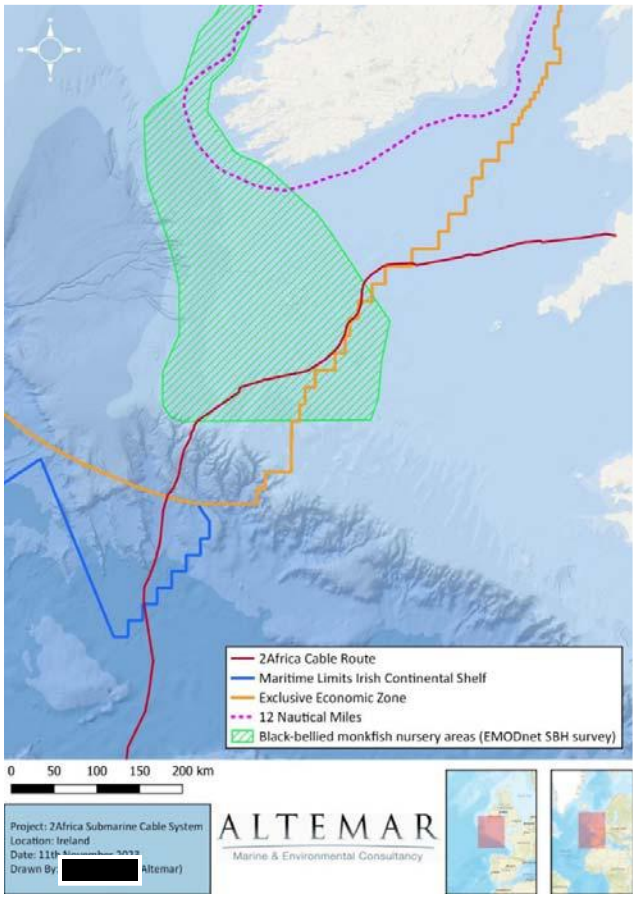
The proposed cable route passes through known *Nephrops norvegicus* (Dublin Bay Prawn) (demersal) grounds (FU2021 Labadie) (Figure 8.10). Given the scale of these grounds in comparison to the footprint of the proposed cable main lay route, no significant impact on these grounds is foreseen.

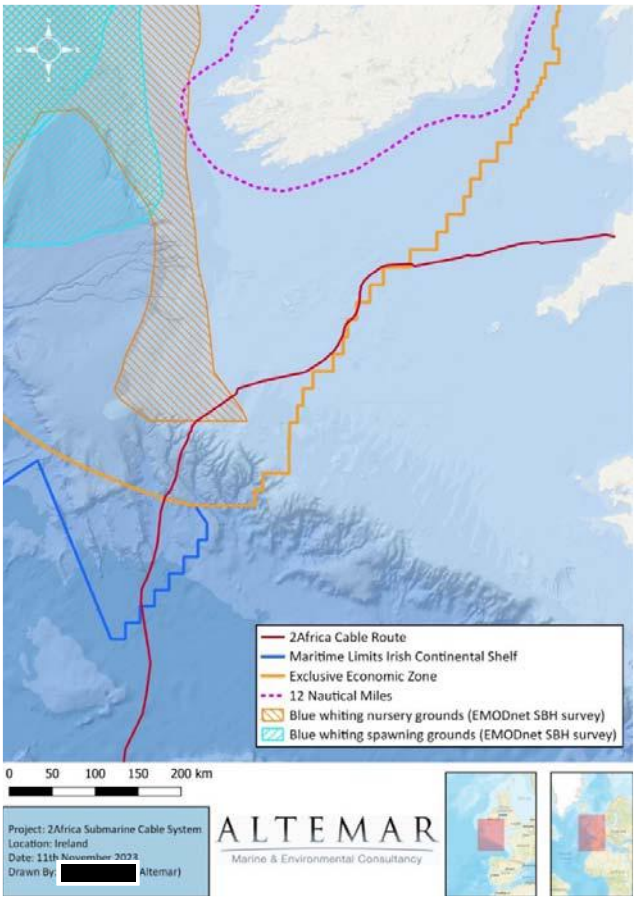
The proposed cable route passes through a known white monkfish (*Lophius piscatorius*) (demersal) nursery area (8.11). This nursery ground spans for much of the Celtic shelf off the northwest, west and south of Ireland and therefore the proposed cable route is not of specific importance to this species.

The proposed cable route passes through the range of wild Atlantic salmon (*Salmo salar*) (Figure 8.12). Salmon native to catchments in Ireland, other European countries, and the UK utilise Irish waters as transitional habitat. Atlantic salmon will be present within the proposed survey routes year-round, peaking in June when out-migrating smolts overlap with adults returning to spawn. Due to the extent of the range of Atlantic salmon and transitory nature of the species in this region, the proposed cable route is not of specific importance to this species.

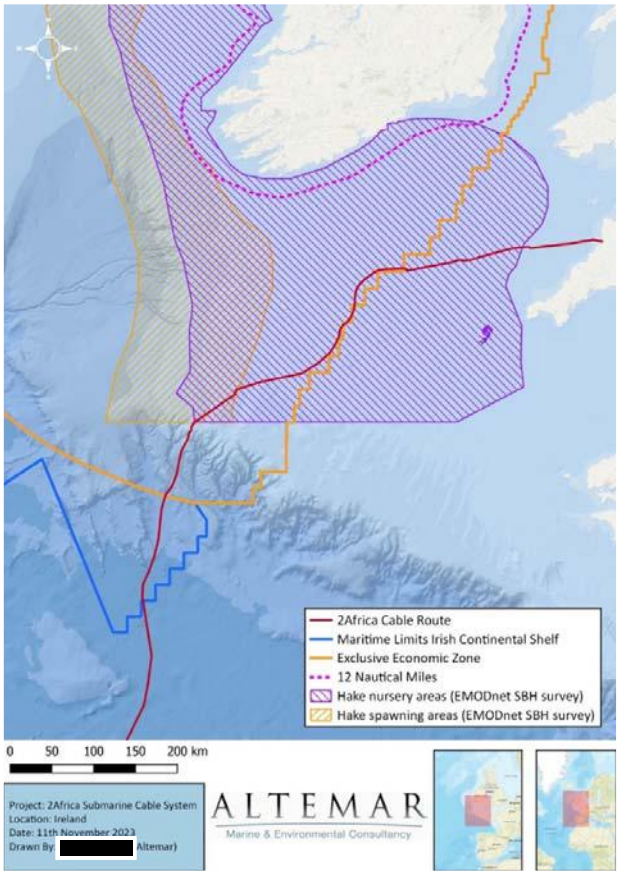
Aquaculture

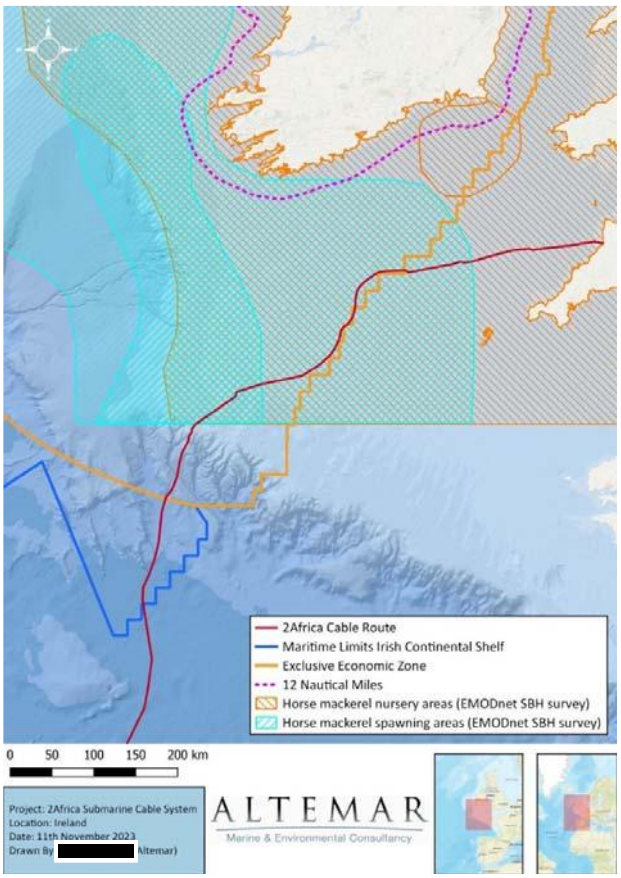
The proposed cable route is located in the open offshore environment and not located proximate to any Irish aquaculture site. The nearest aquaculture site to the 2Africa cable route is a Pacific oyster farm in Kinsale Harbour (Site ID: T05-081), located 135km away. Irish aquaculture sites in relation to the proposed 2Africa cable route are demonstrated in Figures 8.19 & 8.20.



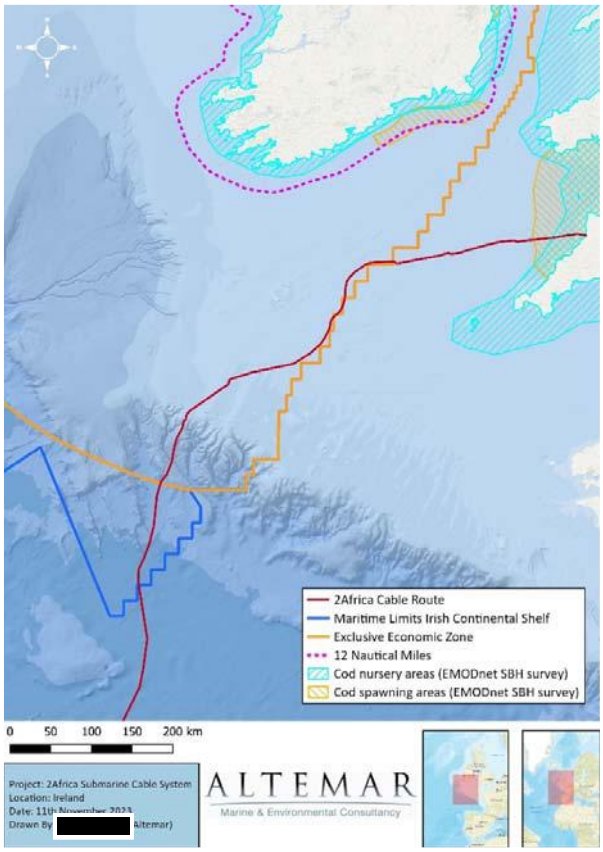


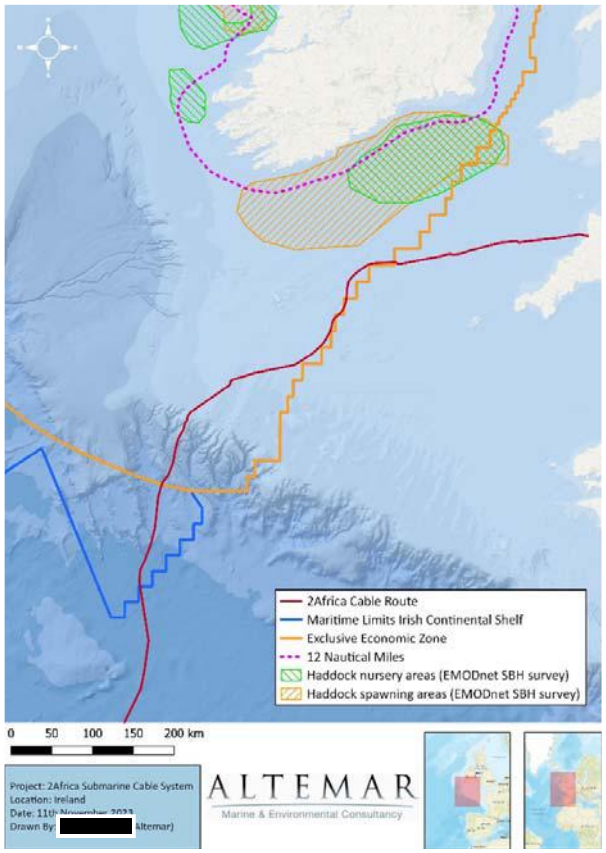
Figures 8.2 & 8.2. *2Africa cable route in relation to Black-bellied monkfish nursery grounds and Blue whiting spawn and nursery grounds*



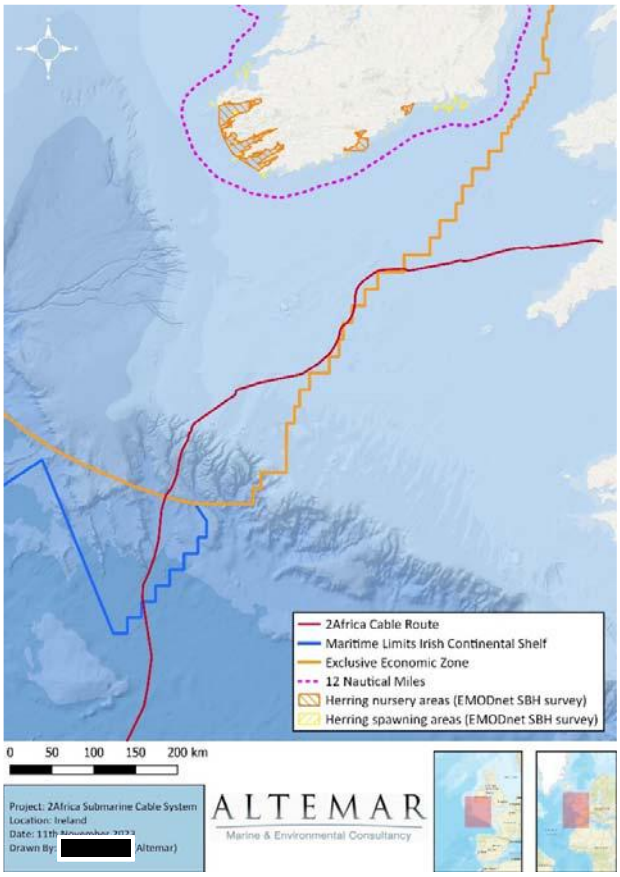


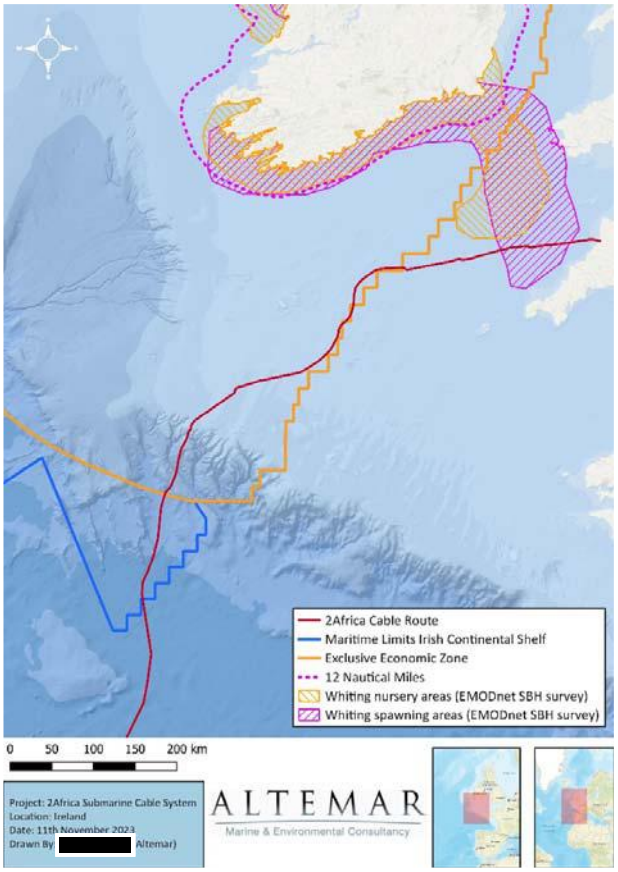
Figures 8. 3 & 8.4. *2Africa cable route in relation to Hake and Horse mackerel spawn and nursery grounds*



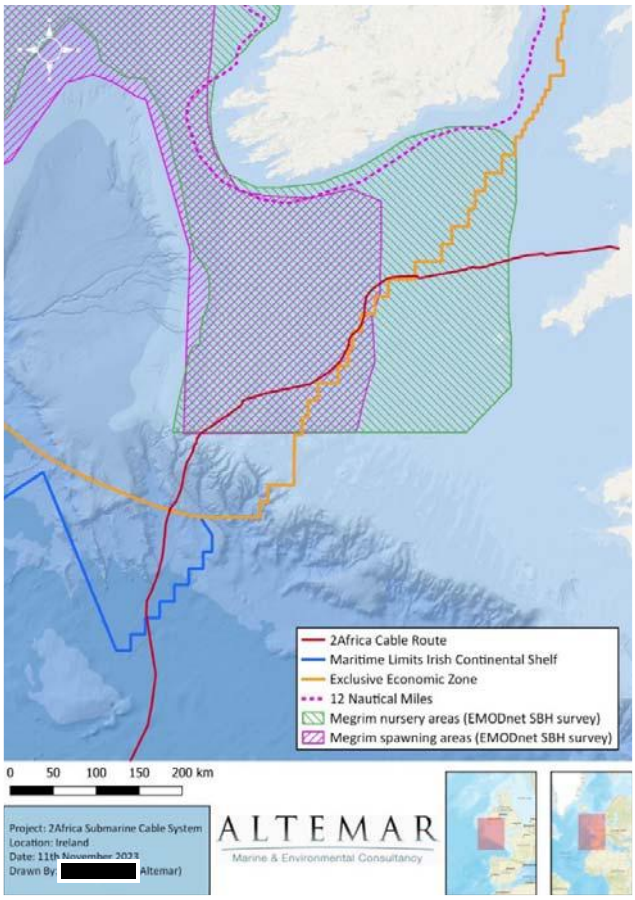


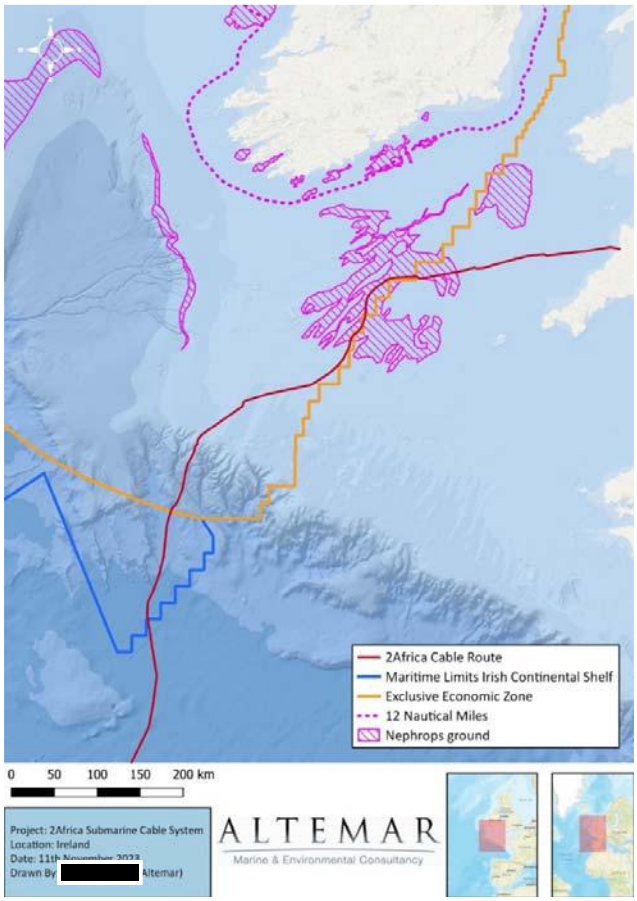
Figures 8.5 & 8.6. *2Africa cable route in relation to Cod and Haddock spawn and nursery grounds*



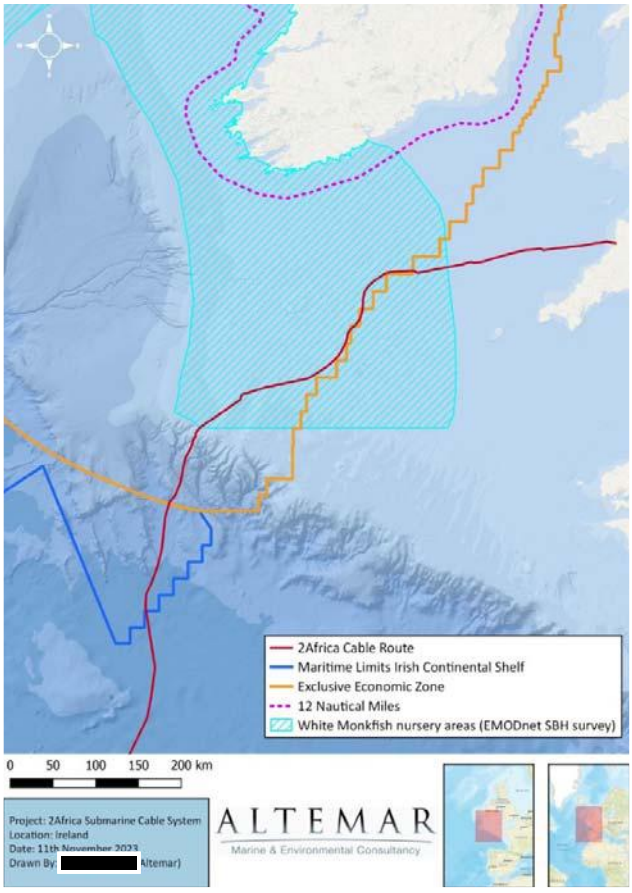


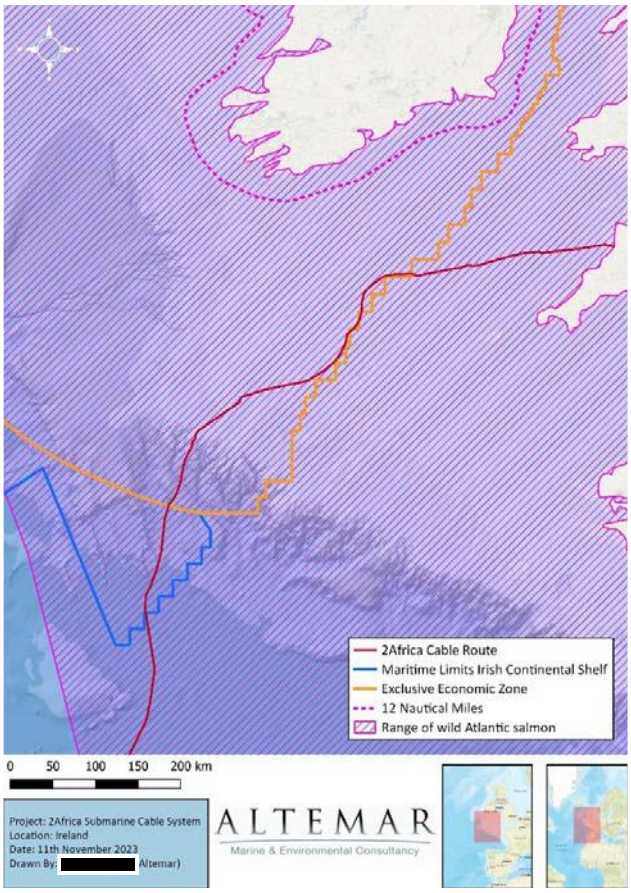
Figures 8.7 & 8.8. *2Africa cable route in relation to Herring and Whiting spawn and nursery grounds*



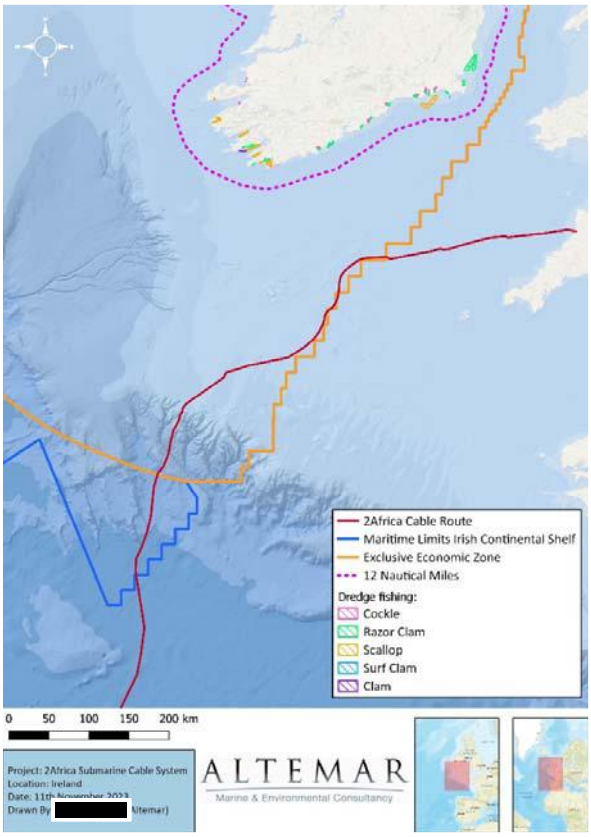


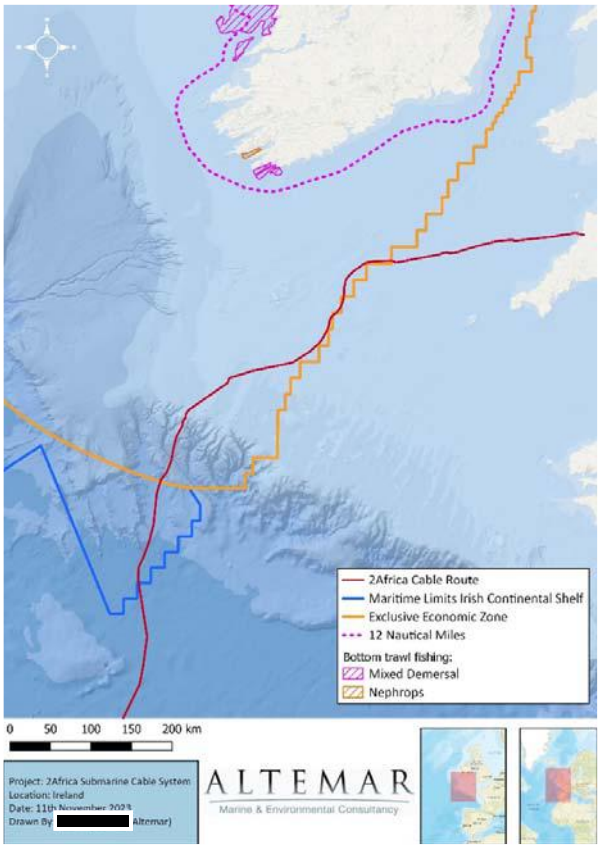
Figures 8.9 & 8.10. *2Africa cable route in relation to Megrim spawn and nursery grounds and Nephrops grounds*



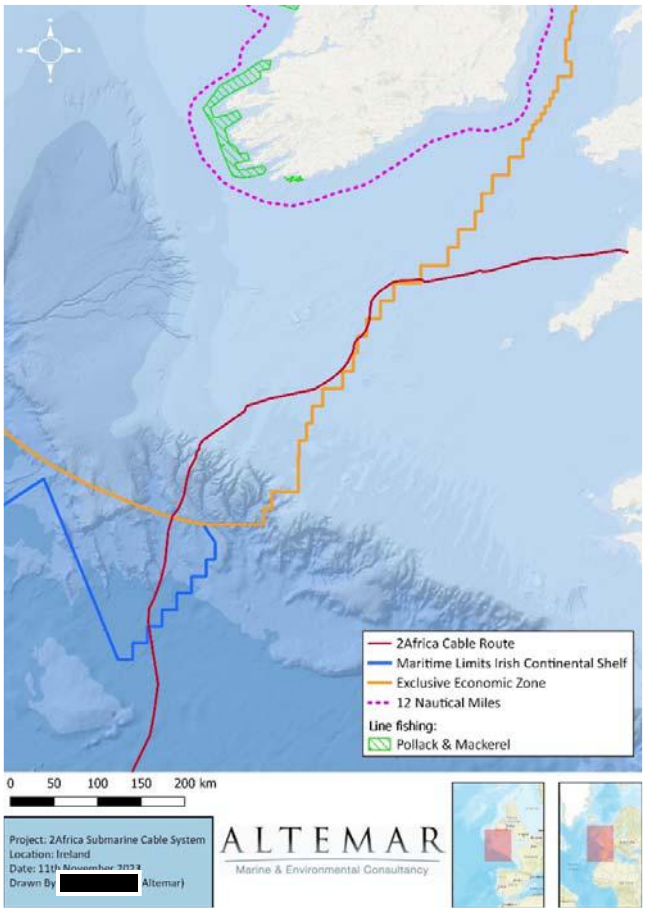


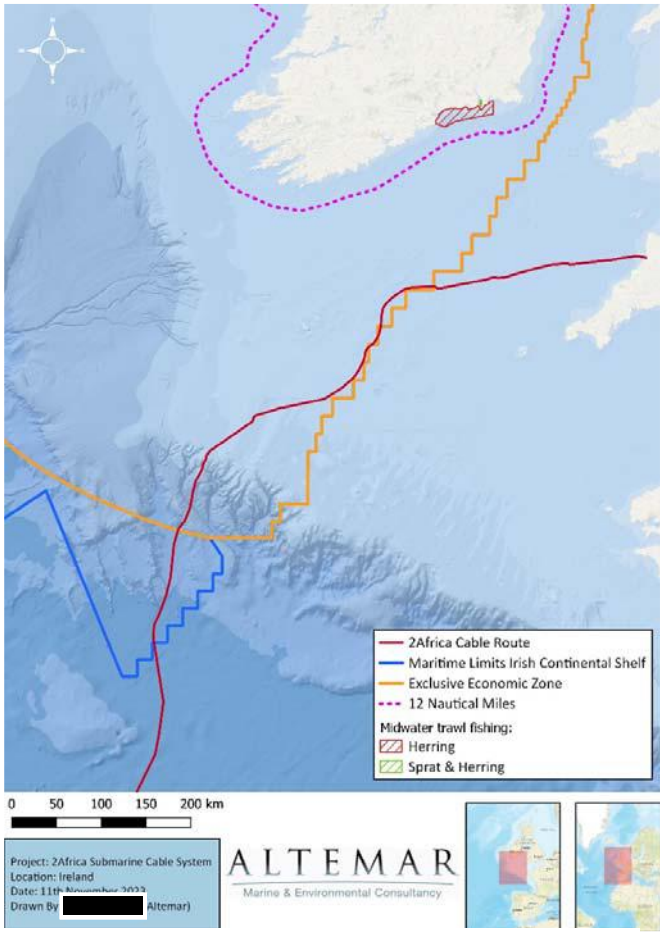
Figures 8.11 & 8.12. *2Africa cable route in relation to White monkfish nursery areas and range of wild Atlantic salmon*



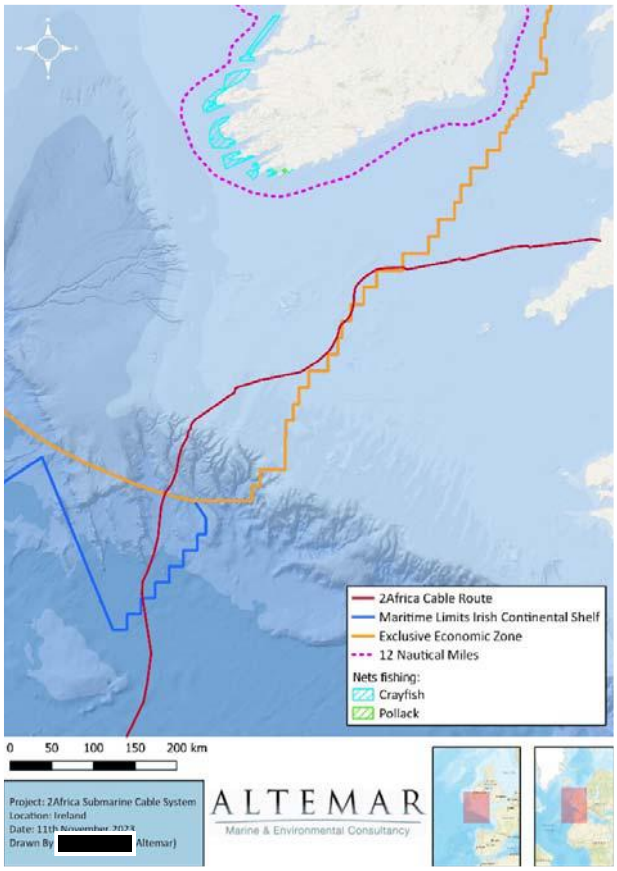


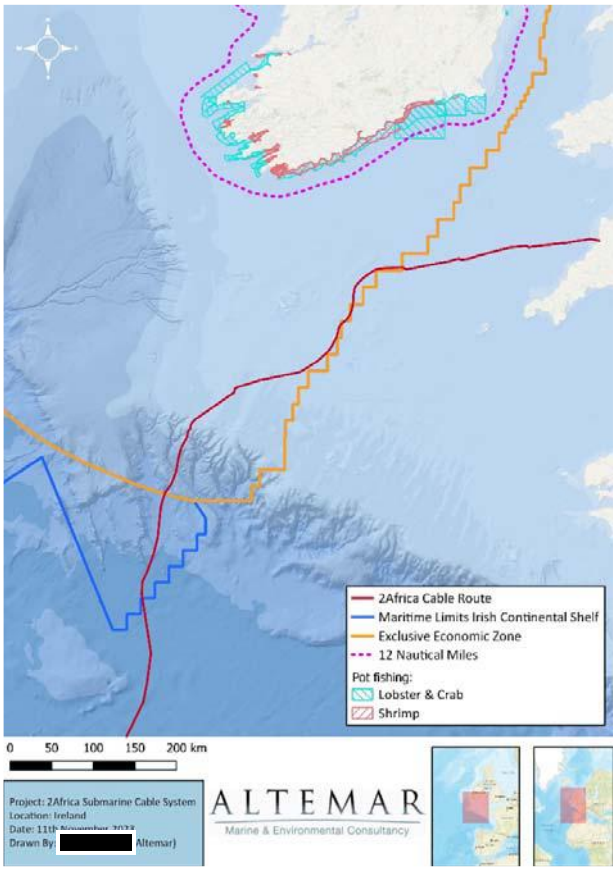
Figures 8.13 & 8.14. *2Africa cable route in relation to bottom trawl and dredge fishing areas*



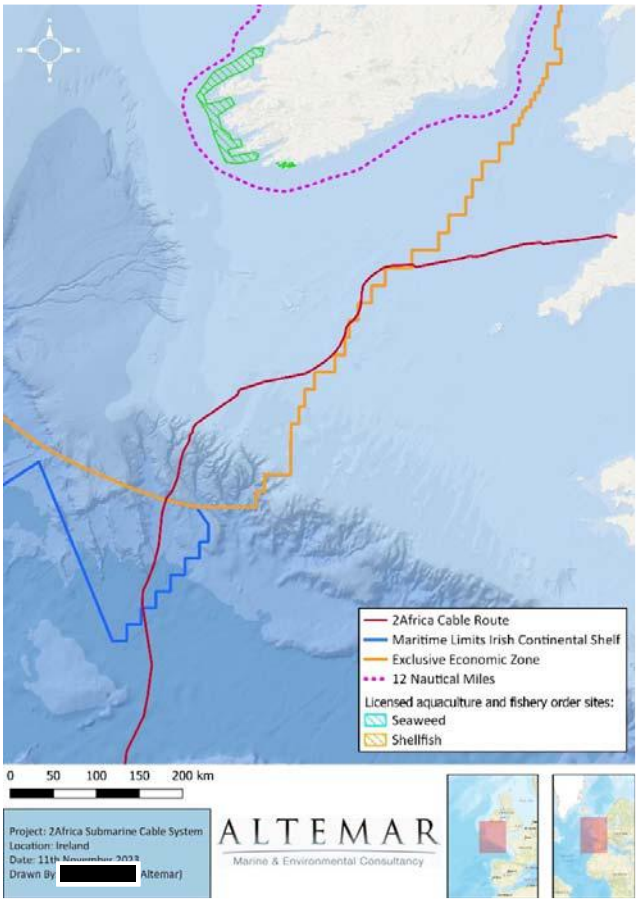


Figures 8.15 & 8.16. *2Africa cable route in relation to line and midwater trawl fishing areas*

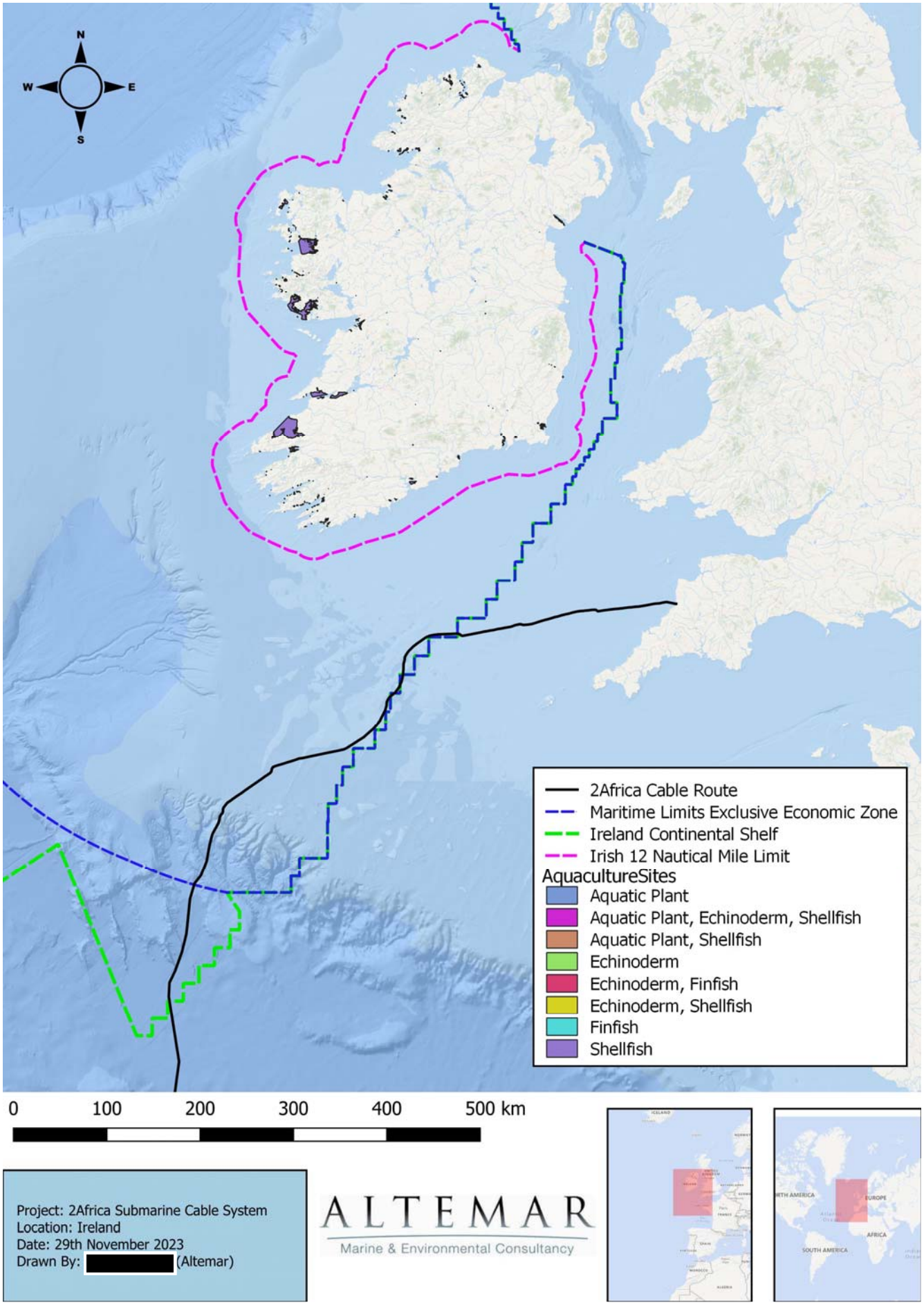




Figures 8.17 & 8.18. *2Africa cable route in relation to nets and pot fishing areas*



Figures 8.19. *2Africa cable route in relation to aquaculture sites: Seaweed and shellfish*



Figures 8.20. *2Africa cable route in relation to Irish Aquaculture sites (Marine Institute data)*

8.2 Potential Impacts

Fisheries

There is the potential for short-term disturbance on fishing activities in the area of the proposed cable route.

Aquaculture

Given that the nearest Irish aquaculture site is located 135km from the proposed 2Africa cable route (Pacific oyster farm in Kinsale Harbour [Site ID: T05-081]), in the absence of mitigation measures, no significant adverse effects on aquaculture is foreseen.

8.3 Mitigation

Fisheries

The proposed cable main lay would not be expected to result in the direct mortality of any fish species due to the slow-moving nature of the main lay vessel. The ploughing and USBL will emit localised underwater noise. This is would not be expected to be greater than that during fishing activity or scientific surveys utilising ROV only. There is a minor short-term not significant disturbance to fish spawning areas through which the proposed route passes. This is highest in February, March, May and June. Therefore, the time frames for which the proposed cable main lay route would least impact known fish spawning activities are April, and July through January. No significant impacts on fish nursery areas are predicted. A fishery liaison will be in place.

Aquaculture

No mitigation measures in relation to Irish aquaculture are required. No significant impacts on Irish aquaculture are predicted.

9 Air Quality

Installation of the proposed 2Africa cable will be undertaken by custom designed vessels which comply with EU requirements in terms of operational controls and environmental standards. The proposed project will comply with Ambient Air Quality standards in Directives 2008/50/EC and 2004/107/EC). Vessel movements during main lay activities will be slow, and will therefore emit relatively low emissions into the offshore marine environment. The proposed project will comply with the International Convention for the Prevention of Pollution from Ships (MARPOL), in particular Annex VI – (Air Pollution). The project will have no significant impact on air quality.

10 Noise & Vibration

The proposed marine cable project will not be actively involved in marine surveying as these elements have been previously carried out and has resulted in an optimal route being selected. The project is involved in the laying of a marine fibreoptic cable. The use of underwater acoustics is therefore limited. It should be noted that vibration impacts will be localised to immediate vicinity of the plough location when it is used. Little vibration impacts are foreseen during the proposed surface lay operations.

There is however the potential for noise impacts on marine mammal species as a result of the proposed project. As is standard operations during the use of underwater equipment i.e. marine plough (Cable lay) and ROV (cable crossings using jetting) an ultra-short baseline (USBL) will be used. This system is similar to that used by the Celtic Voyager during the Sea Rover surveys in 2019 in this area and allows for the position fixing of the equipment underwater.

All cetaceans are listed under Annex IV of the Habitats Directive, which means that they are protected wherever they occur. Bottle-nosed Dolphin and Harbour Porpoise are also listed under Annex II of the Directive. Annex II species require that core areas of their habitat are designated as sites of Community importance. As outlined by O'Brien (2005), "*sound travels 4.5 times faster in water than in air and low frequency sounds travel farther underwater than high frequency sounds*."

Southall *et al*. (2019) outlined in their publication "*Marine Mammal Noise Exposure Criteria: Updated Scientific Recommendations for Residual Hearing Effects*" revised the marine mammal hearing groups, which are seen in Table 10.1.

Table 10.1. *Marine Mammal Functional Hearing Groups and Estimated Functional Hearing groups Proposed by Southall et al. (2019)*

Marine mammal hearing group	Auditory weighting function	Genera (or species) included
Low-frequency cetaceans	LF	*Balaenidae (Balaena, Eubalaenidae spp.); Balaenopteridae (Balaenoptera physalus, B. musculus)*
		Balaenopteridae (Balaenoptera acutorostrata, B. bonaerensis, B. borealis, 1 B. edeni, B. omurai; Megaptera novaeangliae); Neobalenidae (Caperea);Eschrichtiidae (Eschrichtius)
High-frequency cetaceans	HF	*Physeteridae (Physeter); Ziphiidae (Berardius spp., Hyperoodon spp., Indopacetus, Mesoplodon spp., Tasmacetus, Ziphius); Delphinidae (Orcinus)*
		Delphinidae (Delphinus, Feresa, Globicephala spp., Grampus, 2 Lagenodelphis, Lagenorhynchus acutus, L. albirostris, L. obliquidens, L. obscurus, Lissodelphis spp., Orcaella spp., Peponocephala, Pseudorca, Sotalia spp., Sousa spp., Stenella spp., Steno, Tursiops spp.); Montodontidae (Delphinapterus, Monodon); Plantanistidae (Plantanista)
Very high frequency cetaceans	VHF	*Delphinidae (Cephalorhynchus spp.; Lagenorhynchus cruciger, L. australis); Phocoenidae (Neophocaena spp., Phocoena spp., Phocoenoides); Iniidae (Inia); Kogiidae (Kogia); Lipotidae (Lipotes); Pontoporiidae (Pontoporia)*
Phocid carnivores in water	PCW	*Phocidae (Cystophora, Erignathus, Halichoerus, Histriophoca, Hydrurga,Leptonychotes, Lobodon, Mirounga spp., Monachus, Neomonachus, Ommatophoca, Pagophilus, Phoca spp., Pusa spp.)*

The Technical Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing (NOAA, 2018) outlined the hearing groups of marine mammals including the generalised hearing range of these cetacean groups (Table 10.2). They also noted that "*Exposures exceeding the specified respective criteria level for any exposure metric are interpreted as resulting in predicted temporary threshold shift (TTS) or permanent threshold shift (PTS) onset*." The onset of PTS on marine mammals was also outlined in NOAA 2018 (Table 10.3). The updated figures for PTS and TTS for are outlined in Table 10.4.

Table 10.2. Hearing Groups of Marine Mammals (NOAA, 2018)

Hearing Group	Generalized Hearing Range*
Low-frequency (LF) cetaceans (baleen whales)	7 Hz to 35 kHz
Mid-frequency (MF) cetaceans (dolphins, toothed whales, beaked whales, bottlenose whales)	150 Hz to 160 kHz
High-frequency (HF) cetaceans (true porpoises, Kogia, river dolphins, cephalorhynchid, Lagenorhynchus cruciger & L. australis)	275 Hz to 160 kHz
Phocid pinnipeds (PW) (underwater) (true seals)	50 Hz to 86 kHz
Otariid pinnipeds (OW) (underwater) (sea lions and fur seals)	60 Hz to 39 kHz

***** Represents the generalized hearing range for the entire group as a composite (i.e., all species within the group), where individual species' hearing ranges are typically not as broad. Generalized hearing range chosen based on ~65 dB threshold from normalized composite audiogram, with the exception for lower limits for LF cetaceans (Southall et al. 2007) and PW pinniped (approximation).

Table 10.3. Onset of PTS in Marine mammals

	PTS Onset Thresholds (Received Level)	
Hearing Group	Impulsive[1]	Non-impulsive[2]
Low-Frequency (LF) Cetaceans	Cell 1 *Lpk,flat:* 219 dB *LE,LF,24h:* 183 dB	Cell 2 *LE,LF,24h:* 199 dB
Mid-Frequency (MF) Cetaceans	Cell 3 *Lpk,flat*: 230 dB *LE,MF,24h:* 185 dB	Cell 4 *LE,MF,24h*: 198 dB
High-Frequency (HF) Cetaceans	Cell 5 *Lpk,flat:* 202 dB *LE,HF,24h:* 155 dB	Cell 6 *LE,HF,24h:* 173 dB
Phocid Pinnipeds (PW) (Underwater)	Cell 7 *Lpk,flat:* 218 dB *LE,PW,24h*: 185 dB	Cell 8 *LE,PW*,24h: 201 dB
Otariid Pinnipeds (OW) (Underwater)	Cell 9 *Lpk,flat:* 232 dB *LE,OW,24h:* 203 dB	Cell 10 *LE,OW,24h:* 219 dB

[1]Impulsive: produce sounds that are typically transient, brief (less than 1 second), broadband, and consist of high peak sound pressure with rapid rise time and rapid decay (ANSI 1986; NIOSH 1998; ANSI 2005).

[2]Non-impulsive: produce sounds that can be broadband, narrowband or tonal, brief or prolonged, continuous or intermittent) and typically do not have a high peak sound pressure with rapid rise/decay time that impulsive sounds do (ANSI 1995; NIOSH 1998).

Table 10.4. Southall *et al.* (2019) TTS- and PTS-onset thresholds for marine mammals exposed to impulsive noise: SEL thresholds in dB re 1 µPa^{2}s under water and dB re (20 µPa)^{2}s ; and peak SPL thresholds in dB re 1 µPa under water.

Hearing Group	**Impulsive Noise**		**Non-impulsive Noise**
	Unweighted SPLpeak(dB re 1 µPa)	Weighted SELcum (dB re 1 µPa^{2}s)	Weighted SELcum (dB re 1 µPa^{2}s)
PTS Criteria			
Low-frequency (LF) cetaceans	219	183	199
High-frequency (HF) cetaceans	230	185	198
Very-frequency cetaceans (VHF)	202	155	173
Phocid carnivores in water (PCW)	218	185	201
TTS Criteria			
Low-frequency cetaceans	213	168	179
High-frequency cetaceans	224	170	178
Very high-frequency cetaceans	196	140	153
Phocid carnivores in water	212	170	181

The hearing ranges and sensitivity of marine mammals differ from one species to another depending on their audiogram. "*For example, harbour porpoises are sensitive from 3 kHz to 130 kHz, with peak sensitivity at 125-130 kHz, and bottlenose dolphins from 5-110 kHz, with peak sensitivity at 40 and 60-116 kHz*" (Southall *et al.,* 2007). Common seals are sensitive 4-45 kHz (peak sensitivity at 32 kHz) and grey seals 8-40 kHz. Humans are sensitive only to frequencies from 20 Hz to 16-18 kHz but with peak sensitivity from 2-4 kHz. Most small cetaceans, excluding harbour porpoise, have an auditory bandwidth of 150 HZ to – 160 kHz, while harbour porpoise have an auditory bandwidth within 200 Hz to 180 kHz. Pinnipeds in water are thought to have an auditory bandwidth of between of 75 Hz to 75 kHz and from 75 Hz to 30 kHz in air (Southall et al. 2007)."

The proposed USBL equipment and the noise frequency emissions are seen in Table 10.5. The low frequencies emitted from the equipment (18-36 kHz) are below the auditory range of the high and very frequency cetaceans but are within the hearing range of low frequency cetaceans that would be seen on the cable route.

Table 10.5. Details of the proposed types of geophysical equipment which emit sound

Equipment Type	**Typical Source Pressure Level (dB re 1 µPa @ 1 m)**	**Potential for auditory injury?**	**Typical Frequency Range (kHz)**
USBL System (Transducers)	< 220	Potential risk	18-36
USBL Beacons (Transponders)	< 206	Potential risk	18-36

The noise emitted from a USBL is above the TTS- and PTS-onset threshold injury levels indicated by Southall *et al.* (2019), negative impacts may be foreseen if Low Frequency Cetaceans are close enough to the equipment to receive sound levels above this indicative threshold.

The operations would comply with the NPWS (2014) "*Guidance to manage the risk to marine mammals from man-made sound sources in Irish waters*". These guidelines would be deemed adequate to mitigate the negative impacts of the proposed works. Marine mammals in the vicinity of the vessel during start up procedures would be given ample time to leave the site with the soft start procedures outlined in the guidelines. In addition, vessel speeds are extremely slow which would give marine mammals ample opportunity to move from the area.

The Technical Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing

Southall (2019) outlined the main differences between their publication and previous publications including NOAA (2018) which was referenced as NMFS (2018) in Southall (2019). Southall (2019) states that "*The noise criteria here represent the next step in a sequential process of evolution of the criteria proposed by Southall et al. (2007), substantially modified with new analytical methods by Finneran (2016), and recently adopted as U.S. regulatory guidance by the NMFS (2016, 2018). While the quantitative process described herein and the resulting exposure criteria here are based on, and in many respects are identical to, those derived by Finneran (2016) and adopted by the NMFS (2016, 2018), there are a number of significant distinctions. The exposure criteria here appear in a peer-reviewed publication and include all marine mammal species for all noise exposures, both under water and in air for amphibious species. NMFS (2016, 2018) provides regulatory guidance only for the subset of marine mammals under their jurisdiction and do not include criteria for aerial noise exposures, an important consideration in many locations for which some earlier assessments were made (Finneran & Jenkins, 2012). The exposure criteria here, while based on the Finneran (2016) quantitative method and consistent with the NMFS (2016, 2018) guidance where they overlap, are thus more broadly relevant, peer-reviewed, and less subject to potential changes in national regulatory policy*."

Southall (2019) also stated that "*It should be noted that this results in some proposed differences in the terminology of hearing groups relative to those used in Finneran (2016) and NMFS (2016, 2018). These proposed differences in nomenclature may be confusing, but we believe they are justified (see the "Marine Mammal Hearing Groups and Estimated Group Audiograms" section and Appendices 1-6) and will support future criteria as new information emerges*."

The difference in nomenclature between NOAA 2018 and Southall (2019) is that NOAA (2018)[4] classified cetaceans as Low-frequency (LF) cetaceans (baleen whales), Mid-frequency (MF) cetaceans (dolphins, toothed whales, beaked whales, bottlenose whales) and High-frequency (HF) cetaceans (true porpoises, Kogia, river dolphins, cephalorhynchid, Lagenorhynchus cruciger & L. australis) while Southall reclassified these groups to Low-frequency cetaceans, High-frequency cetaceans, Very high-frequency cetaceans. As outlined in Southall (2019) "*The distinction between HF and VHF cetacean groups (as opposed to mid- and high-frequency) reflects the regions of best hearing sensitivities within these groups, often including frequencies approaching or exceeding 100 kHz; these frequencies would be more appropriately described within marine bioacoustics as high to very high. Further, as discussed in more detail below, a number of anatomical and sound production properties suggest a potential distinction of very low-(VLF) and LF cetaceans among mysticetes. Some evidence also suggests a potential segregation of mid-frequency (MF) and HF cetaceans in addition to the distinction of HF and VHF cetaceans*." This is in effect a relabelling of Mid-Frequency (MF) Cetaceans and High-Frequency (HF) Cetaceans to High-frequency cetaceans and Very high-frequency cetaceans respectively. It should be clearly noted that the PTS values within the updated groups were identical between NOAA, 2018 and Southall 2019 and it was in effect a renaming of the groups.

Lurton (2016) modelled the sound field radiated by multibeam echosounders for acoustical impact assessment. He stated that "*considering the injury criteria, the results illustrate that injury hazards are possible only at very short distances from the source: e.g. about 5 m for maximum Sound Pressure Level and 12 m for cumulative Sound Exposure Level in the case of a 240-dB source level, considering cetaceans. For behavioural response criteria, the corresponding values are 9 m and 70 m.*"

[4] NOAA 2018 Revision to: Technical Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing (Version 2.0) Underwater Thresholds for Onset of Permanent and Temporary Threshold Shifts. NOAA Technical Memorandum NMFS-OPR-59 April 2018.

Based on these data it is concluded that an underwater source noise level of 220dB (which the proposed main lay will not exceed) does not result in injury hazards once a minimum separation distance of 12 metres is maintained between the source of the noise and a cetacean. Equally there is no behavioural response once a minimum separation distance of 70 metres is maintained between the source of the noise and a cetacean. The proposed survey guidelines (DAHG, 2014) require a 1000m distance between the vessel and cetaceans prior to the commencement of vessel operations.

The operations would comply with the NPWS (2014) "*Guidance to manage the risk to marine mammals from man-made sound sources in Irish waters*". These guidelines would be deemed adequate to mitigate the negative impacts of the proposed works. Cetaceans in the vicinity of the vessel during start up procedures would be given ample time to leave the site with the soft start procedures outlined in the guidelines. It should be noted that the vessel will be operating at a very slow speed on a 24 hour basis with a MMO on board. It is considered that due to the fact that the ship will be operating on this basis, a MMO will be onboard operating to NPWS guidance procedures, it will be providing significant time for cetaceans to leave the area. In addition, vessel speeds are extremely slow which would give marine mammals ample opportunity to move from the area.

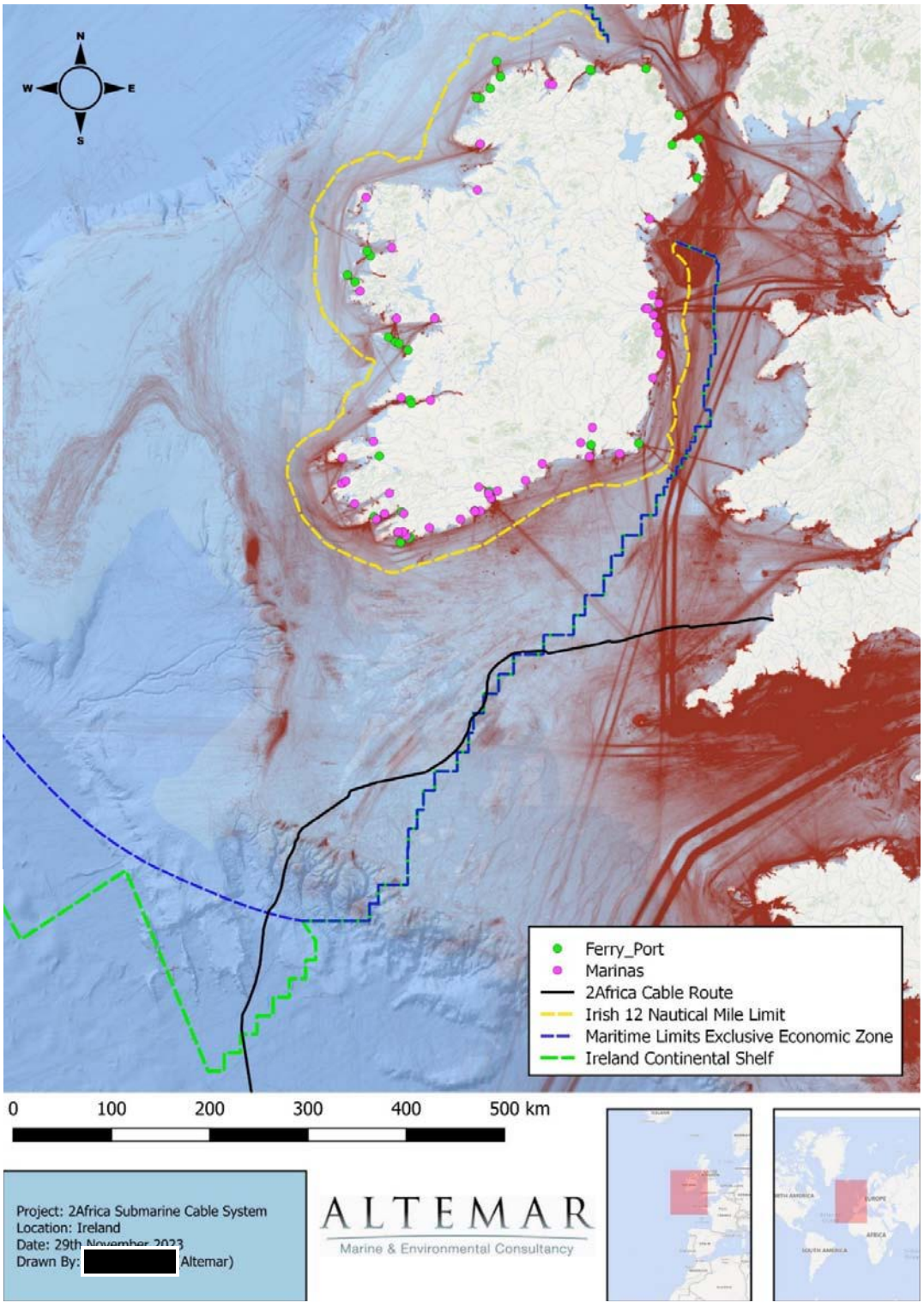
11 Landscape / Seascape

The proposed cable will be buried beneath the seabed or surface laid. It is foreseen that the proposed 2Africa cable will naturally be buried by sediments over time as a result of deep-sea ocean currents. However, the only exceptions to this would be where the cable is free spanning over reef outcrops. This is not expected within the Irish EEZ. No significant negative impacts on the Landscape / Seascape character are foreseen in the deep offshore areas of the Irish EEZ.

12 Traffic & Transport

12.1 Marine Traffic and Ports

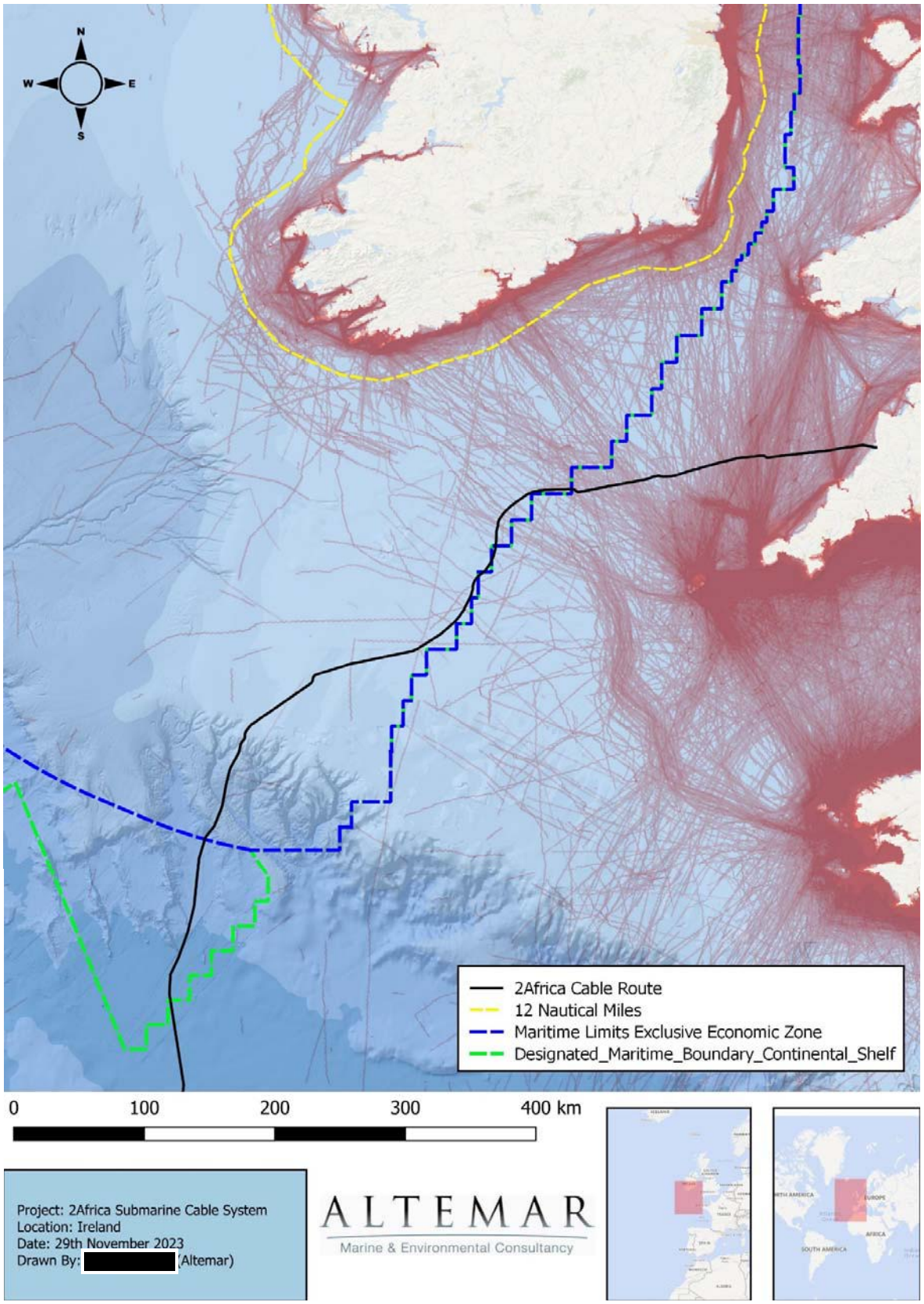
Following a review of the EMODnet's marine traffic density data, it was confirmed that the pattern of shipping movements in seas traversed by the cable system is not particularly dense. As demonstrated in Figure 12.1, there is relatively little vessel activity along the proposed 2Africa cable route within the Irish EEZ. The cable route is also located at a minimum of 134km from the nearest marina or ferry port (Courtmacsherry Harbour, Co. Cork). No significant effects on marine traffic or marine ports are likely as a result of the proposed project.



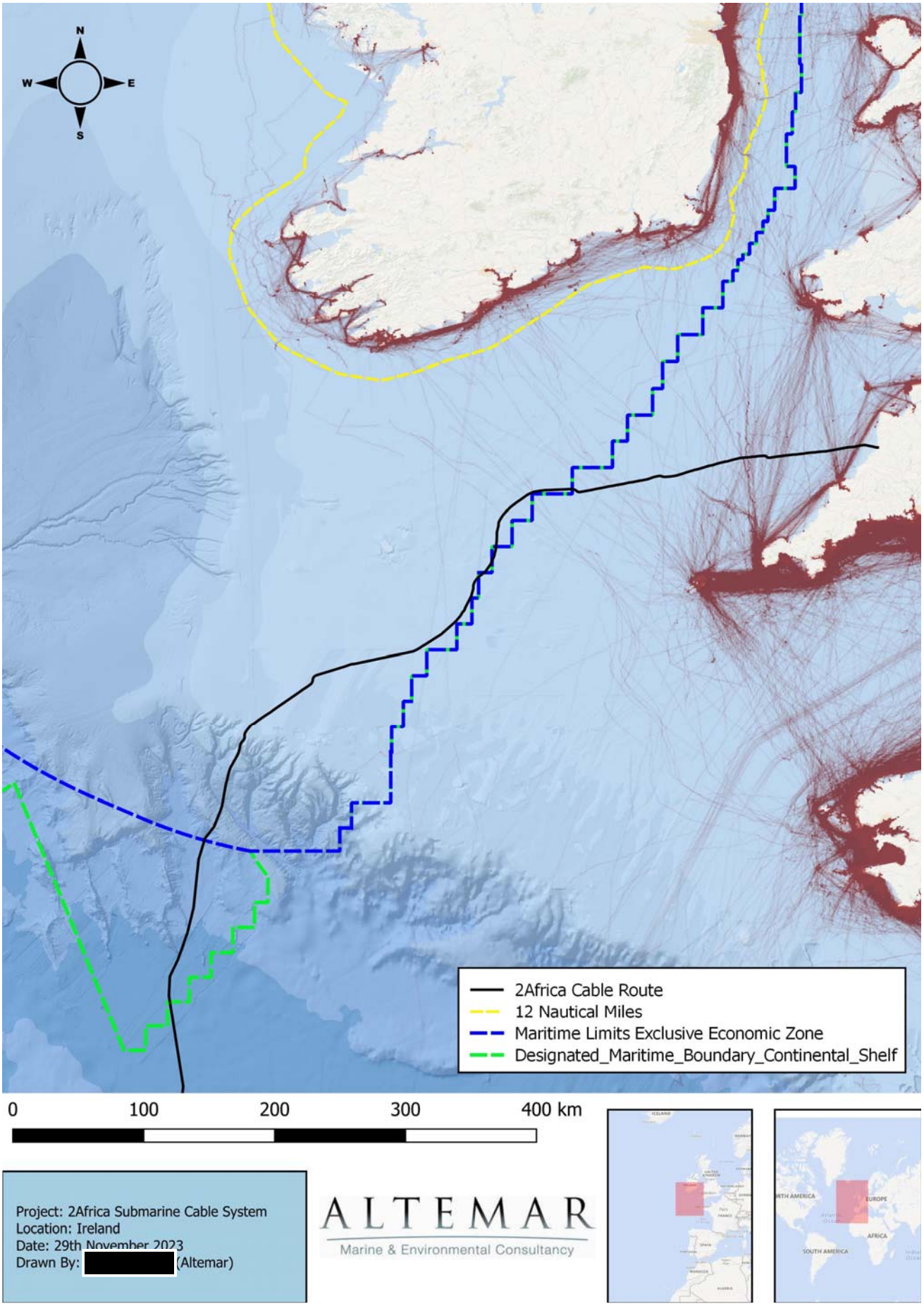
Figures 32.1. *2Africa cable route in relation to Vessel Traffic Density (2022) (EMODnet data), Marinas, and Ferry Ports*

12.2 Recreational Vessels

Sailing and Pleasure Craft vessel activity data acquired from EMODnet has been examined. As demonstrated in Figures 12.2 & 12.3, the proposed 2Africa cable route is located in the offshore environment and is not proximate to any coastal area that experiences a high density of recreational vessel activity. No significant effects on recreational vessels are likely as a result of the proposed project.



Figures 42.2. *2Africa cable route in relation to Sailing (2022) (EMODnet data)*



Figures 52.3. *2Africa cable route in relation to Pleasure Crafts (2022) (EMODnet data)*

12.3 Navigation

In developing the planned route for the 2Africa cable, attention has been given to:

- Physical characteristics of the seabed that could impact on the cable, including bathymetry and seabed geology.
- Anthropogenic influences on the cable route, such as; shipping, fishing, wrecks, offshore oil and gas, offshore developments, subsea power and telecommunications cables, and underwater archaeology.

The proposed 2Africa cable route has been designed to avoid navigational features such as anchorages, navigational aids, restricted areas, dump sites etc. It should be noted that, as demonstrated in Figure 12.1, there is relatively little vessel activity along the proposed 2Africa cable route within the Irish EEZ. Further, the cable route is also located at a minimum of 134km from the nearest marina or ferry port (Courtmacsherry Harbour, Co. Cork). As a result, the main traffic routes to affect the cable route in Irish Territorial Waters will be the movement of fishing vessels in the offshore marine environment. These vessel movements pose a navigational risk and care is required as the Main-Lay vessel will be crossing the coastal traffic in particular. Navigational risk is short term in nature and limited to the cable installation and any future cable maintenance operations. A fishery liaison will be in place.

12.4 Mitigation of Navigation Risk

The following mitigation measures relating to navigation risk will be implemented:

- Vessel speed will be of the order of 0.3 knots during plough burial and 4 knots during surface lay.
- The Main Lay will be undertaken by a single, purpose-built vessel.
- The vessel will be equipped with Automatic Identification Systems (AIS) and AIS monitoring.
- The vessel will install cable on a 24 hour per day basis and a full operational crew will be on duty at all times.
- The vessel will comply fully with all requirements of the International Regulations for Preventing Collisions at Sea.
- Arrangements will be made for the publication of a formal Marine Notice through the Department of Transport and the notice will provide vessel and contact details together with a general description of operations and approximate dates of commencement and completion.
- A Fisheries Liaison Officer will be employed to ensure co-operation between fishing operations and cable installation activities as the work proceeds.
- The project will comply with Convention on the International Regulations for Preventing Collisions at Sea (COLREGs).
- A Risk Control Log will be compiled for navigational risk.
- Prior to commencement of installation, the Dept. of the Environment, Climate, and Communications will be notified of the planned start and the estimated completion dates for the operation.

13 Cultural Heritage

An Underwater Archaeology Impact Assessment by Geophysical and Geotechnical Surveys report has been prepared by Coracle Archaeology (Appendix I). The document was prepared to provide a baseline assessment of known sites and features proximate to the 2Africa cable survey corridor within Irish waters. This assessment determined that there is the potential for impacts on the following five known cultural heritage assets along the planned survey corridor:

'*SS Vapper (CA1) was an Estonian registered steam ship of 4,543 gross registered tonnage (grt). Built in 1913 by Ropner Shibuiliding & Co., Stockton-on-Tees, UK, the vessel was formerly known as the Pilcot and then the Seapool before it was purchased by the Tallin Shipping Co. On 6 July 1940 the Vapper was struck by a torpedo fired by German U-boat U-34, whilst en route from Cardiff to Buenos Aires with a cargo of coal. One crew member was lost. The wreck is considered live, and lies at a depth of c. 125m (wrecksite.eu)*.'

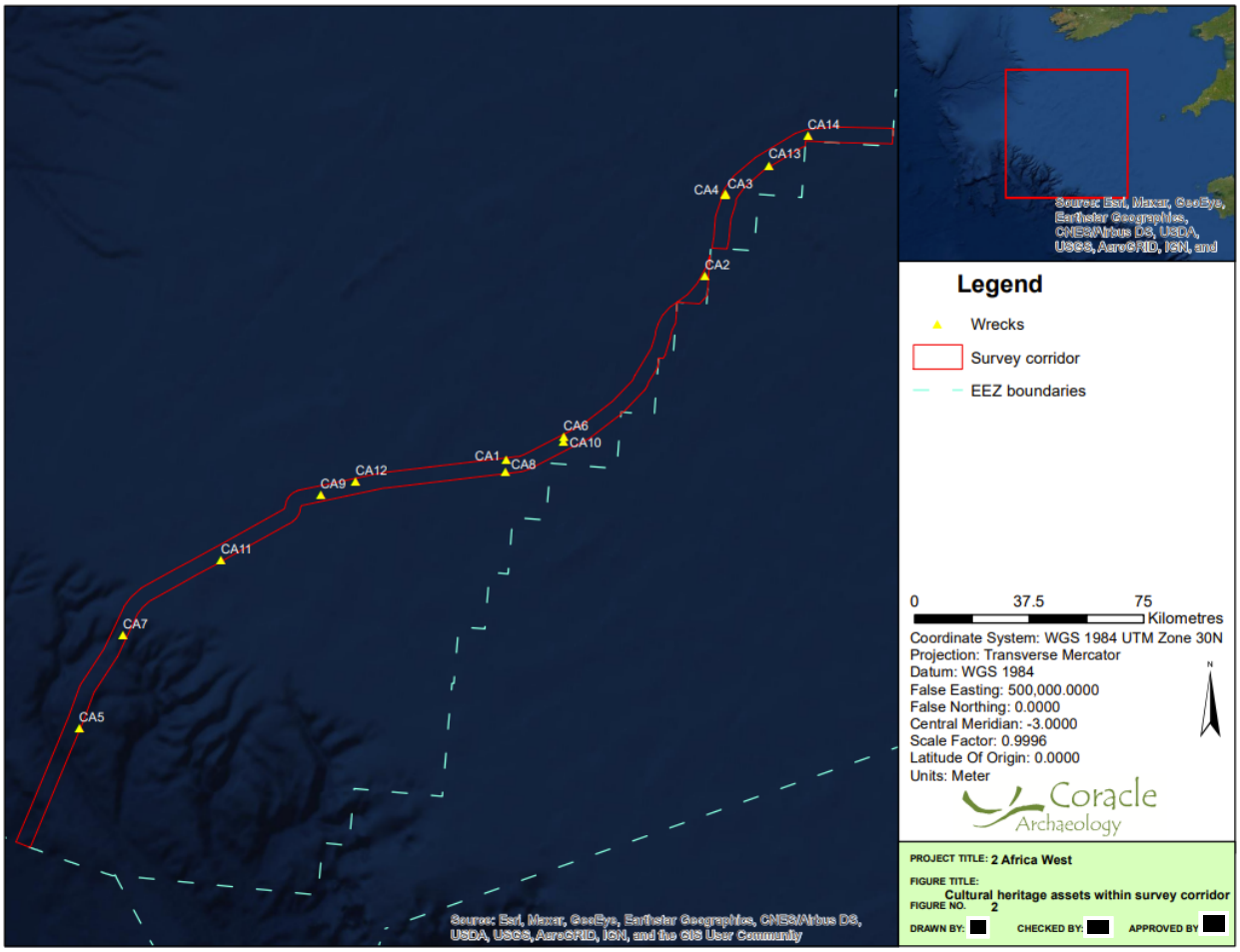


Figure 13.1. Known cultural heritage in the vicinity of the vessel route.

The Kruguen (CA2) was a French fishing trawler reported missing on 12 March 1976. Despite an extensive search no trace was found of the trawler or her crew. The wreck is considered live, although the location is listed as unreliable by the UKHO (wrecksite.eu).

The San Julian (CA3 & CA4) was a French fishing trawler that foundered on the 27 July 1992 and was subsequently abandoned. The wreck is considered live, and lies at a depth of c.120m (wrecksite.eu). The wreck is recorded at two different locations c. 75m apart on the NMS wreck database (wreck numbers W10010 & W10011). There is no indication that the wreck is in two pieces, nor that these are different wrecks. In accordance with the National Monuments Service database, the San Julian has nevertheless been assigned two CA numbers, and is mapped at both of the suggested locations.

The Sonia Nancy (CA5) was a small Irish fishing vessel. On the 4 January 2002 it was abandoned after the engine failed in bad weather and later sank. The wreck is considered live (wrecksite.eu).'

Table 13.1. *Cultural heritage assets within the proposed survey corridor*

CA number	Name	Status	Date	Latitude	Longitude	Source & ref
CA1	*SS Vapper*	Live	1940	49.5	-9.25	NMS 11658; WS*
CA2	*Kruguen*	Live	1976	50.08333	-8.41667	NMS 09798; WS
CA3	*San Julian*	Live	1992	50.32833	-8.35	NMS 10010; WS
CA4	*San Julian*	Live	1992	50.32883	-8.35067	NMS 10011; WS
CA5	*Sonia Nancy*	Live	2002	48.6	-11.03333	NMS 10049; WS

Table 13.2. *Assessment of significance and proposed mitigation*

CA number	Name	Significance	Magnitude of impact	Significance of potential effect	Proposed mitigation	Residual effect
CA1	*Vapper (SS)*	High	High	Moderate	100m AEZ	Negligible
CA2	*Kruguen (MFV)*	High	High	Moderate	100m AEZ	Negligible
CA3	*San Julian*	High	High	Moderate	100m AEZ	Negligible
CA4	*San Julian*	High	High	Moderate	100m AEZ	Negligible
CA5	*Sonia Nancy*	High	High	Moderate	100m AEZ	Negligible

This report details the following mitigation measures to prevent impacts on the five known live wrecks:

'*an archaeological exclusion zone (AEZ) of 100m has been imposed around each of these assets. After mitigation, the effect on these historic assets has been assessed to be negligible.'*

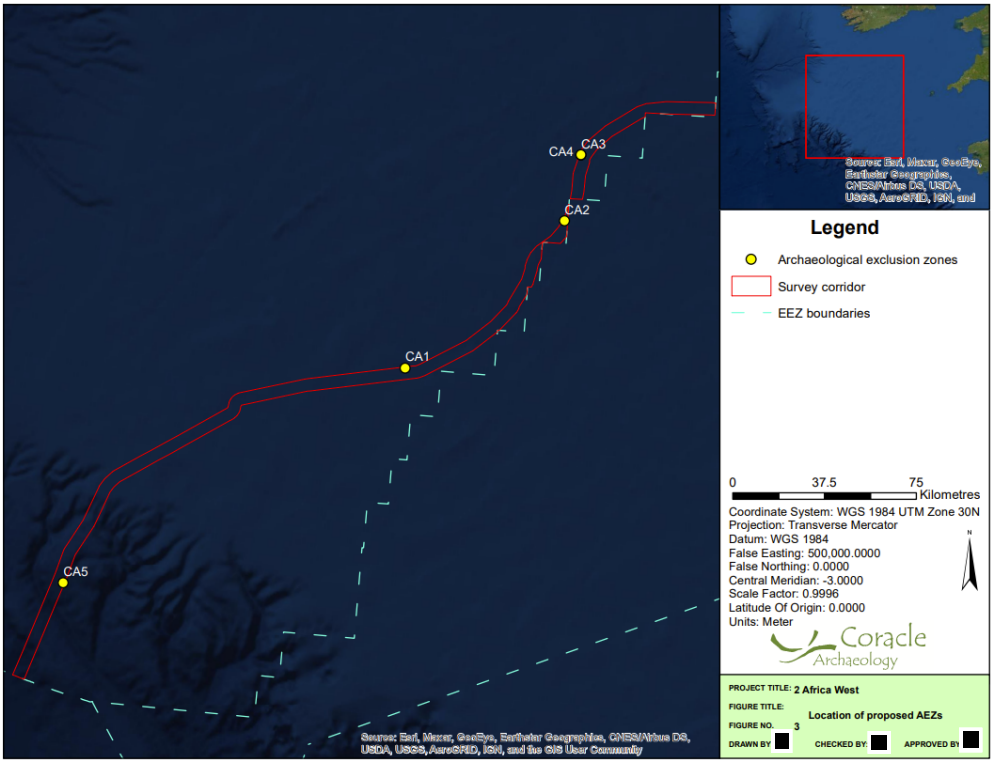


Figure 13.2. Location of AEZ's

'*AEZs have been defined following professional recommendations (Dix 2008) and converted into circular AEZs, with a defined centre point to encapsulate the required AEZ. The extent of the suggested circular AEZ is therefore sufficiently large to encompass the area that would be defined by a polygon, following the procedures outlined in Dix (2008). The use of a centre point and set radius has been deemed the most robust method when attempting to incorporate AEZs into different vessel navigation systems. This reduces the risk of accidental incursions into AEZs, and possible impacts on the potential asset within, during site works.*

The implementation of a reporting protocol for archaeological discoveries is also recommended. The protocol would simply:

- *outline what actions need to be undertaken in the event that any unexpected archaeology should be encountered;*
- *the likely nature of any potential discoveries;*
- *the roles and responsibilities of the survey teams; and*
- *contact details for the archaeological consultant (who would then liaise as necessary with the Underwater Archaeology Unit (UAU)*'

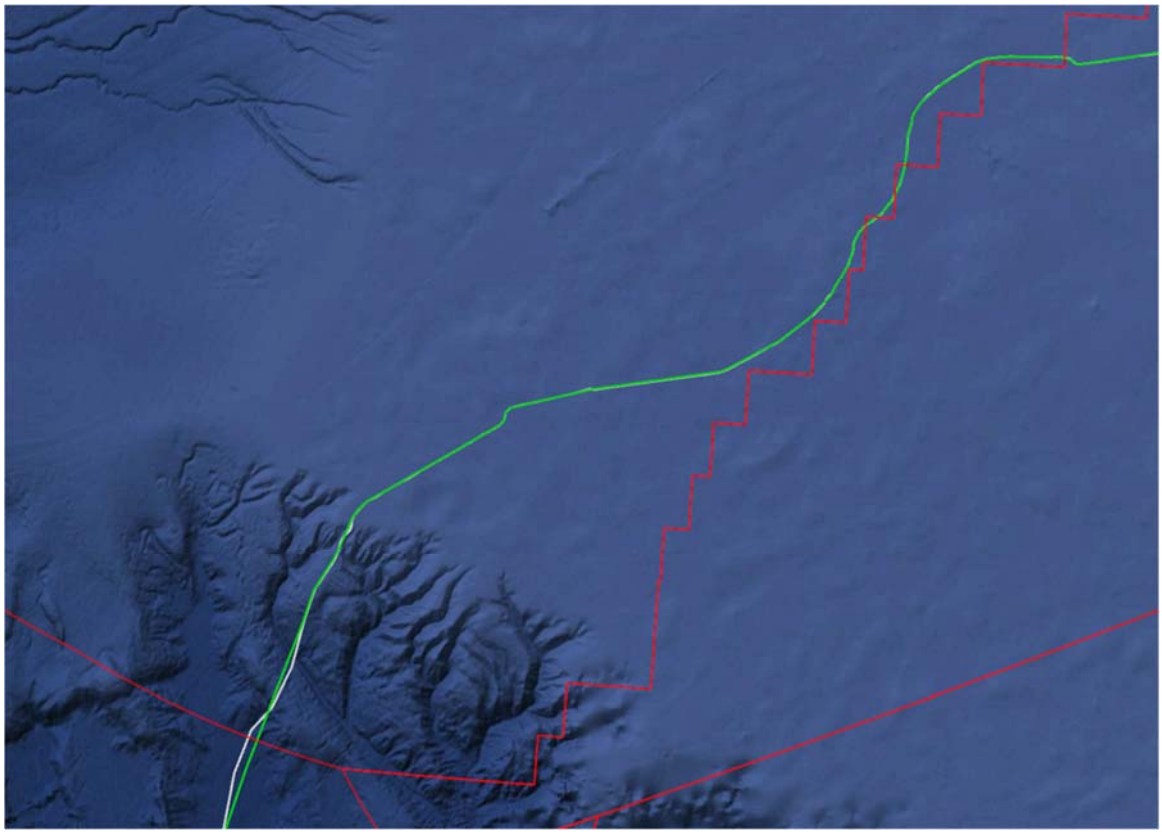


Figure 13.3. Pre-survey route for Archeology assessment (green) and white current route.

Following the implementation of the mitigation measures outlined in this Underwater Archaeology Impact Assessment by Geophysical and Geotechnical Surveys report, no significant impacts on historical or cultural heritage sites are foreseen as a result of the proposed development.

14 Population and Human Health

The project relates to the proposed installation of a subsea cable system within the deep offshore subtidal of the Irish EEZ, at least 127km from the nearest point on the Irish shoreline. The cable route and the proposed works do not traverse or are proximate to any populated area in Ireland. There are no landfall elements in Ireland. In the absence of mitigation, the proposed project will not have any impact on human health within Ireland. However, the importance of this cable system cannot be underestimated particularly within the African continent where the project would be seen to have a major positive impact on Population and Human Health through providing a catalyst for internet based economy within countries that may currently have poor internet infrastructure connections to global markets and internet based activities including access to medical expertise.

15 Major Accidents & Disasters

The project involves the subsea burial and installation of an inert cable. Out of an abundance of caution, and considering possible worst-case scenarios, there is a remote potential for loss of life or injury to employees and potential for damage to the environment. However, it should be noted that the vessels to be used are modern cable lay vessels and would have to comply with standard marine shipping pollution requirements. Standard procedures will be in place to identify, avoid and mitigate risks of accidents which would affect human health or the environment.

16 Climate

Installation and operation of the proposed 2Africa cable will be undertaken by custom designed vessels which comply with EU requirements in terms of operational controls and environmental standards. Vessel movements during main lay activities will be slow, and will therefore emit relatively low emissions into the offshore marine environment. The proposed project will comply with relevant EU Directives and the International Convention for the Prevention of Pollution from Ships (MARPOL), in particular Annex VI – (Air Pollution). The project will have no significant impact on air quality. The operation of the cable would be expected to have a positive impact on the Climate as it would provide increased connectivity between and within both Europe and Africa. This would for example be expected to reduce journey requirements for meetings etc.

17 Waste

The cable does not release pollutants or hazardous toxic and noxious wastes into the marine environment. Installation of the proposed 2Africa cable will be undertaken by custom designed vessels which comply with EU requirements in terms of operational controls and environmental standards. The proposed project will comply with waste management and disposal standards outlined in the Waste Framework Directive 2008/98/EC. The proposed project will comply with the International Convention for the Prevention of Pollution from Ships (MARPOL), including Annex IV (Sewage) and Annex V – (Garbage). No waste will be discarded overboard from the main lay vessel. The system has a system life span about 25-40 years however cable system can operate long after this period, and its deactivation can only be performed by the shutdown of the electrical / electronic system and disabling the transmission of information. There are no plans to withdraw from the seafloor cable is in the sea area. In the event that the 2Africa cable is decommissioned, decommissioning works will be subject to further licensing and the potential for impacts will be further assessed at this stage. No significant environmental impacts are foreseen as a result of waste from the proposed project.

18 Material Assets

18.1 Oil and Gas

The proposed 2Africa cable route does not traverse through any of these oil and gas areas. Current Authorisations are demonstrated in Figure 18.1. This figure identifies the location of current petroleum exploration and production authorisations as issued by the Minister for Communications, Energy and Natural Resources under the Petroleum and Other Minerals Development Act, 1960. The location of offshore wells drilled in the Irish Exclusive Economic Zone including the Irish Sea, Saint Georges Channel, Celtic Sea and the North Atlantic Ocean. Offshore wells recorded between 1970 and 2019 are also seen in Figure 18.1. The proposed route in not proximate to areas previously noted as interest to the Oil and Gas industry. The proposed 2Africa cable route is not located proximate to any offshore gas pipelines (Figure 18.2).

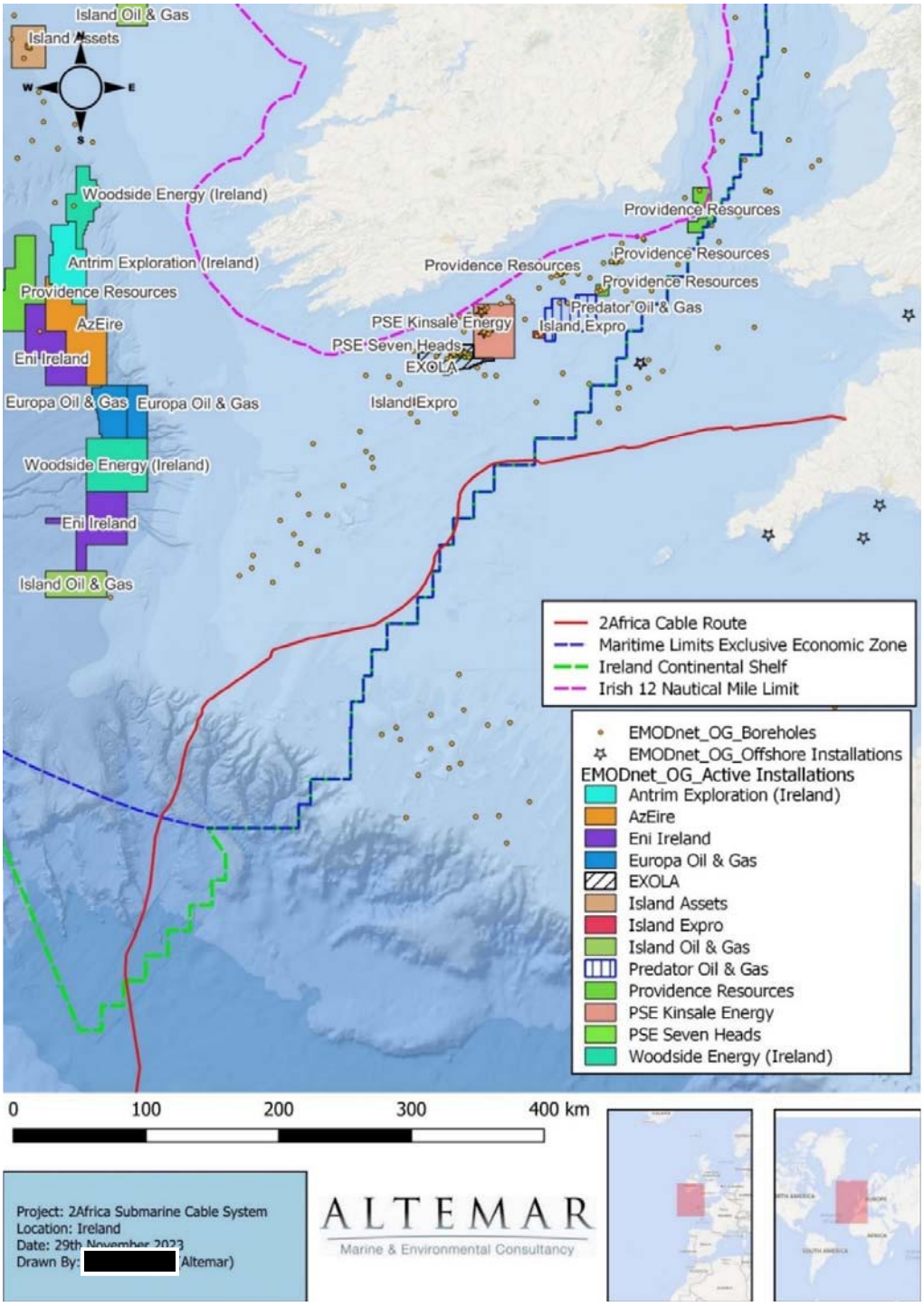
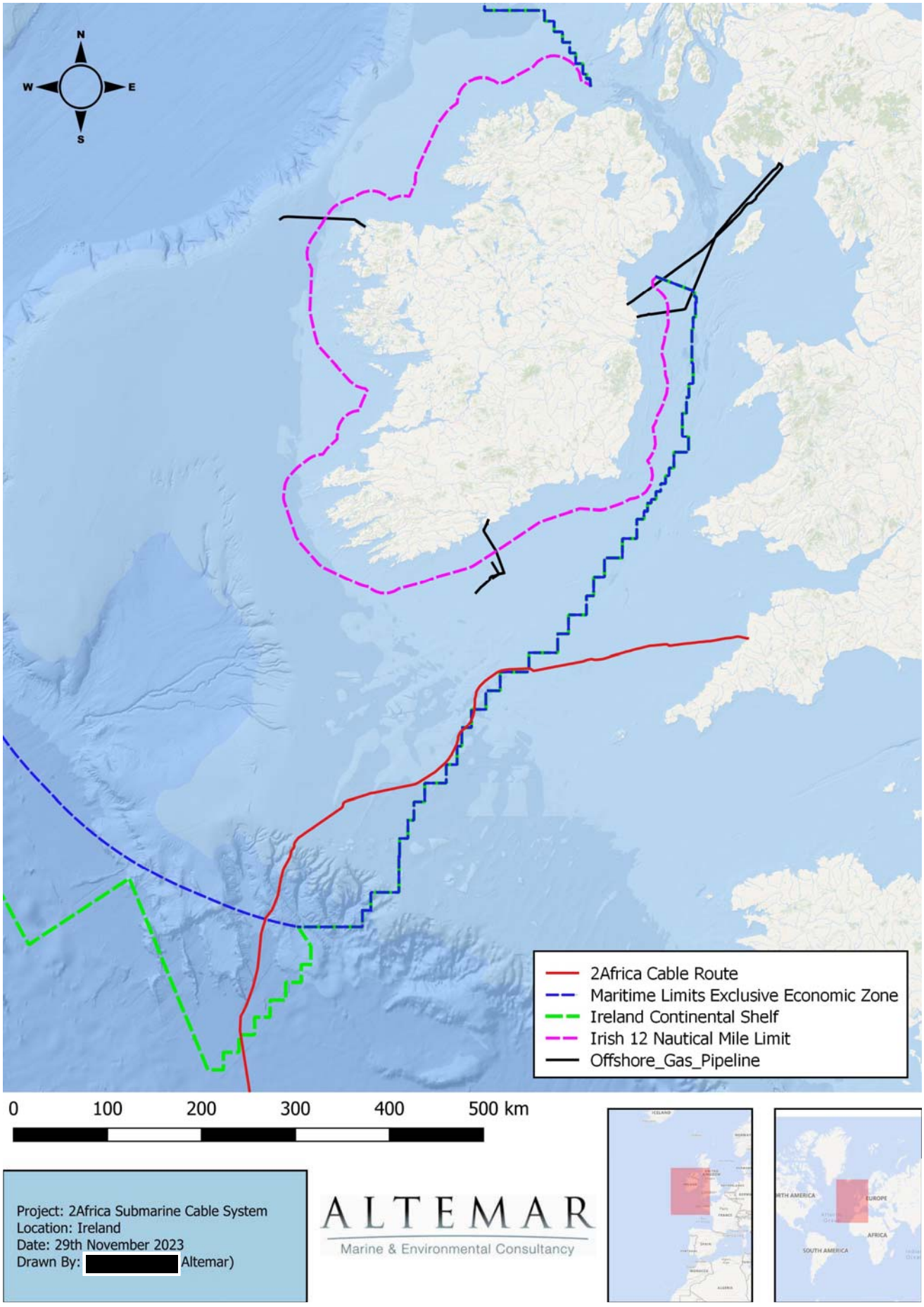


Figure 68.1. *2Africa cable route in relation to oil and gas active installations, boreholes, and offshore installations (EMODnet data)*



Figures 78.2. *2Africa cable route in relation to offshore gas pipelines (Marine Institute data)*

18.2 Offshore Renewables

There are a number of offshore wind farms/applications located within Irish waters. This dataset in Figure 18.3 shows the location or potential locations of marine renewable energy sites (wind farm authorisations) in Irish waters. This is based upon formal applications submitted to the foreshore licence application office. Further, there are a number of proposed offshore windfarms within Irish waters that are currently within the planning process (2021)[5]. The proposed 2Africa cable route does not traverse through areas designated for offshore energy (Figure 18.3). It should be noted that the proposed cable route is in the offshore environment in depths from 156m to 4000m which is currently beyond the ability of the offshore renewable industry in Ireland.

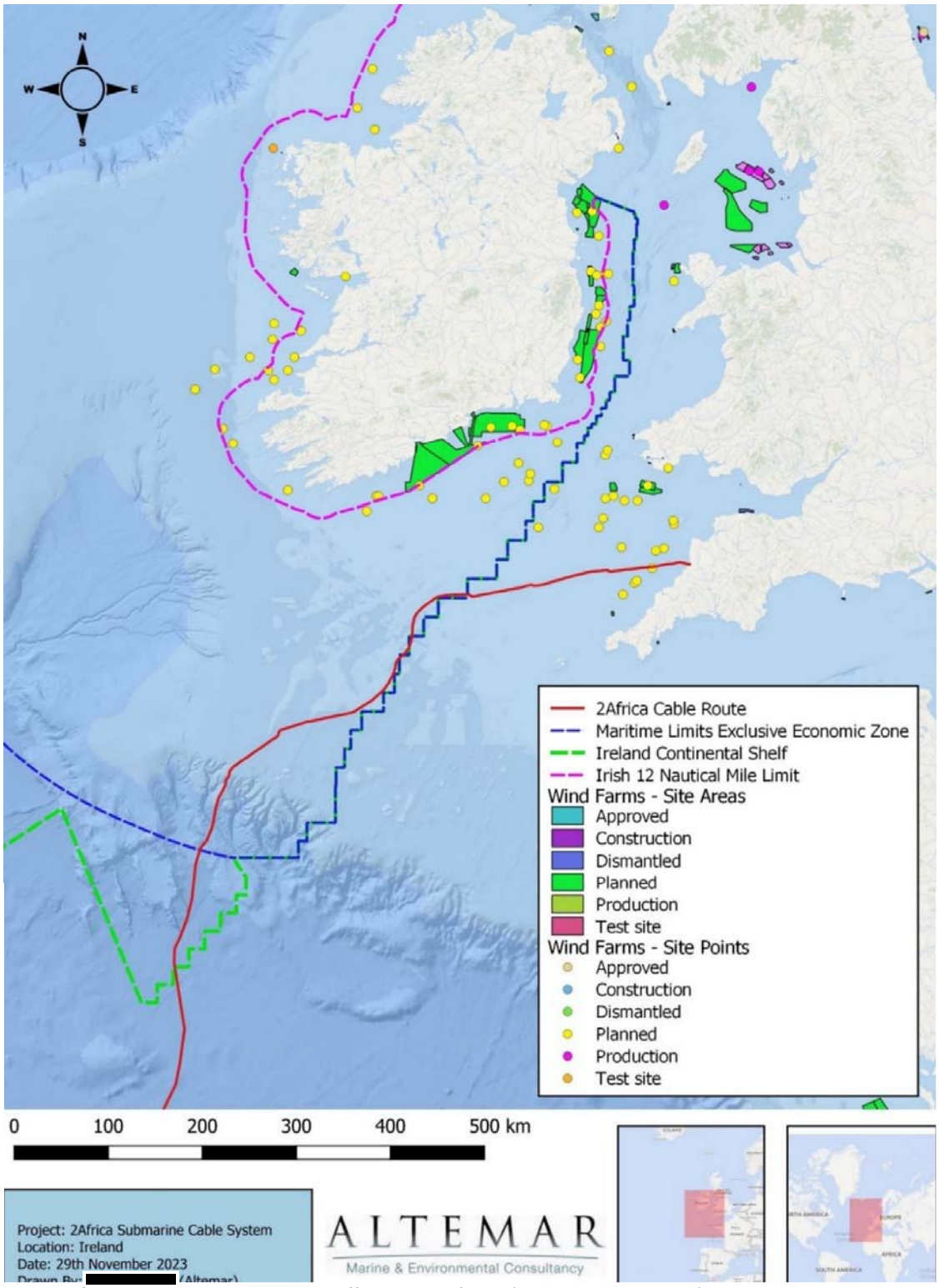


Figure 88.3. *2Africa cable route in relation to offshore wind farms (Marine Institute data)*

[5] Additional license applications are noted in the In section 18.5.

18.3 Military Activities

There are three offshore areas designated for military purposes around the Irish coast (Figure 18.4). The proposed 2Africa cable route is in the offshore environment not located proximate to any of these locations. The project will be a minimum of 120km from these sites during cable laying.

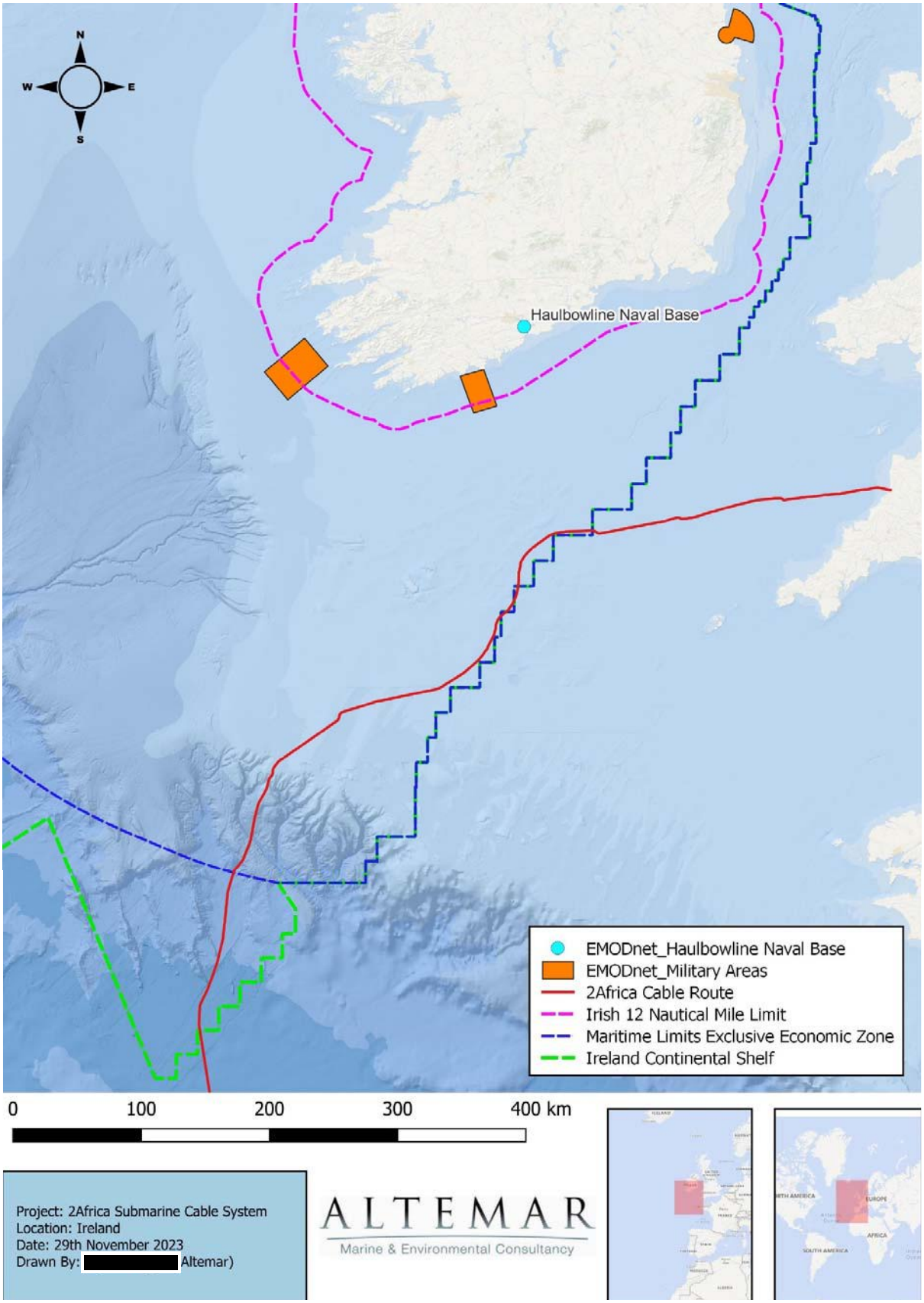


Figure 98.4. *2Africa cable route in relation to Irish offshore military areas (EMODnet data)*

18.4 Submarine Cables

The proposed 2Africa cable route crosses a number of existing submarine cables. Submarine cables identified by Alcatel Submarine Networks to be proximate to the proposed 2Africa cable are demonstrated in Figure 18.5. Available EMODnet data was also examined. Telecommunication cables identified by EMODnet to be proximate to the proposed 2Africa cable are also demonstrated in Figure 18.5. Existing submarine cables have been taken into account in the design of the proposed cable route, and appropriate measures will be taken to ensure that there will be no damage to existing submarine cables as a result of the proposed project. Crossings will be made by ROV jetting.

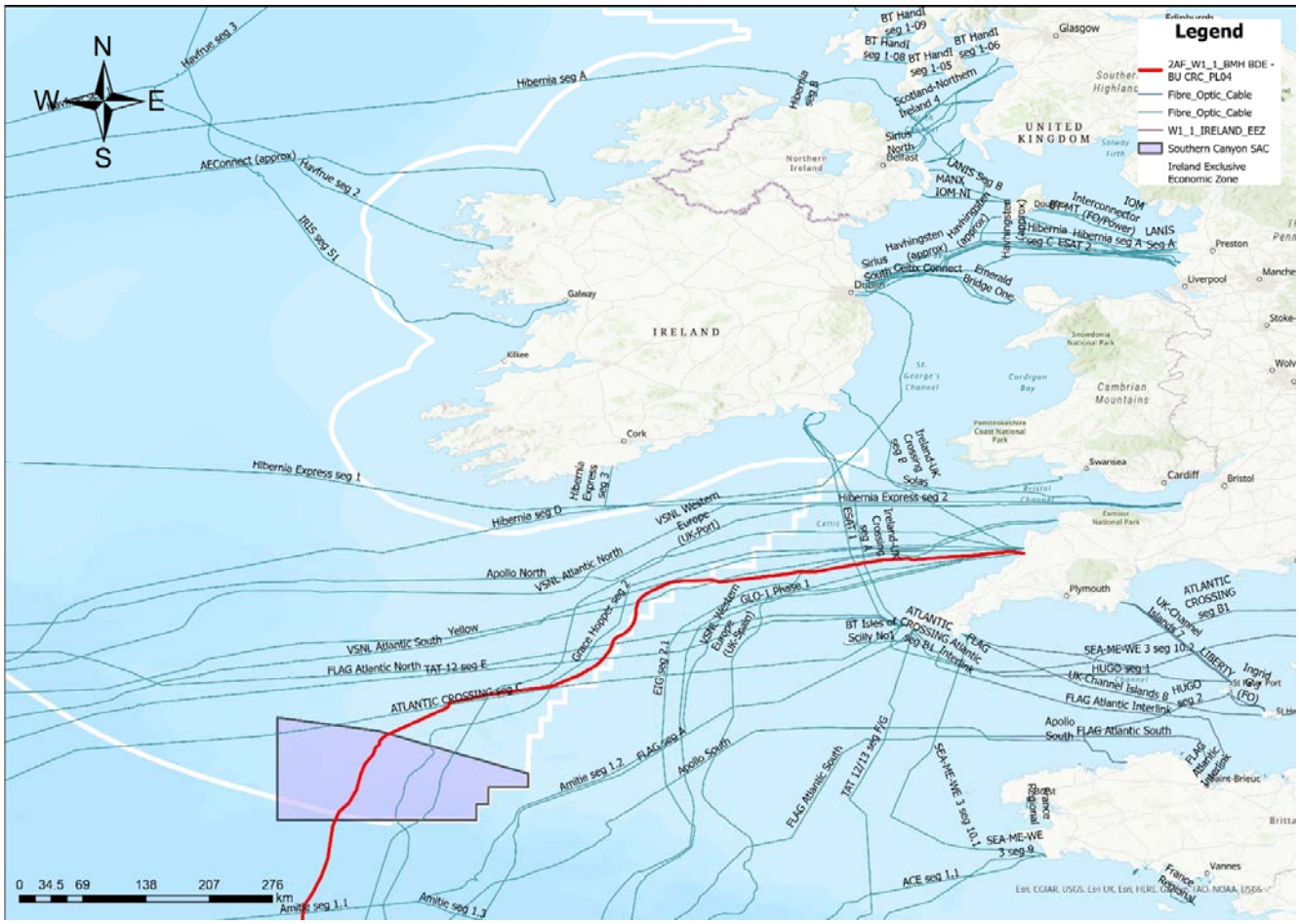


Figure 108.5. *2Africa cable route in relation to submarine cables (Alcatel and EMODnet data)*

18.5 Potential Future Developments

The potential future offshore developments in the marine environment off Southern Ireland are demonstrated in Table 18.1. No conflict is foreseen with planned or current projects.

Table 18.1. *Foreshore licence applications in southern Ireland of the 2Africa Cable*

Reference	Title	Year	Location	Activity	Status
FS007621	Péarla Offshore Wind Limited – Site Investigations for Export Cable Corridor for a proposed Offshore Wind Farm Project	2022	Off County Waterford	Site Investigations	Applied
FS007575	Kinsale Offshore Wind Limited Site Investigations for Export Cable Corridor for proposed Offshore Wind Farm	2022	Off County Cork	Site Investigations	Consultation
FS007488	Celtic Offshore Renewable Energy Site Investigations for proposed Offshore Wind Farm	2022	Off Counties Waterford and Wexford	Site Investigations	Applied
FS007471	Floating Cork Offshore Wind Limited Site Investigations for proposed Offshore Wind Farm	2022	Off County Cork	Site Investigations	Applied
FS007464	Bore Array Ltd., Site Investigations for Bore Array Offshore Wind Farm	2022	Off County Wexford	Site Investigations	Applied
FS007445	Blackwater Offshore Wind – Marine Surveys	2022	Wexford	Marine Surveys	Applied
FS007436	Voyage Offshore Array Limited Site Investigations for proposed Offshore Wind Farm	2022	Off Counties Waterford and Wexford	Site Investigations	Applied
FS007431	Tulca Offshore Array Limited Site Investigations for proposed Offshore Wind Farm	2022	Off County Cork	Site Investigations	Applied
FS007384	Celtic Horizon Offshore Wind Farm Limited Site Investigations for proposed Offshore Wind Farm	2021	Off Counties Wexford and Waterford	Site Investigations	Applied
FS007374	Mainstream Renewable Power Ltd.	2021	Off County Wexford	Site Investigations	Consultation
FS007361	Beaufort Sub-sea Fibre Optic Cable System	2022	Off Wexford Coast	Installation of Sub-sea Fibre Optic Cable	Consultation
FS007354	Kinsale Offshore Wind Ltd, Site Investigations for the proposed Kinsale Project offshore wind farm	2022	Off County Cork	Site Investigations	Consultation
FS007318	RWE Renewables Ireland East Celtic Ltd., Site Investigations for proposed East Celtic Offshore Wind Park	2021	Off Counties Wexford and Waterford	Site Investigations	Applied
FS007232	DP Energy – Latitude 52 Offshore Windfarm Ltd.	2021	Off Counties Wicklow and Wexford	Site Investigations	Applied
FS007135	ESB Wind Development Ltd. Site Investigations at Loch Garman Offshore Wind	2021	County Wexford	Site Investigations	Consultation
FS007050	Greenlink Interconnector	2020	County Wexford	Installation of Subsea Cable	Determination
FS006916	EirGrid Celtic Interconnector Electricity Cable	2021	Co. Cork	Installation of Subsea Cable	Determination

Greenlink Interconnector

Greenlink Interconnector Limited has been granted a Foreshore Licence (Reference FS 007050) for a cable route for an Electrical Interconnector to Wales. Works began in Pembrokeshire and Wexford in January 2022 and the project is expected to be commissioned at the end of 2024[6].

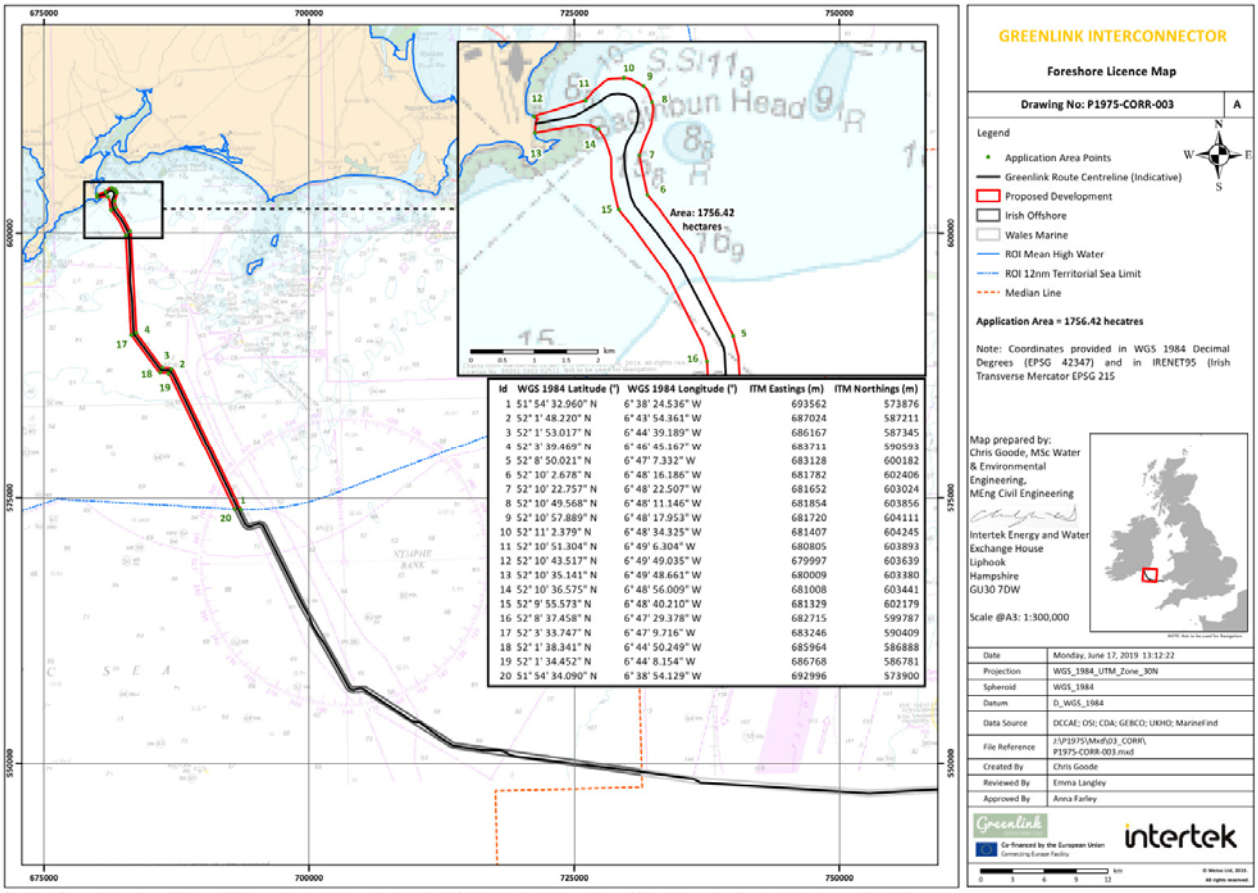


Figure 118.6. *Greenlink Interconnector Cable Route*

The planned route of the 2Africa Cable has taken the relative location of the Greenlink Cable into account. The proposed 2Africa Cable does not introduce any significant additional constraints which would inhibit the routing of the Greenlink Interconnector Cable.

[6] https://www.greenlink.ie/construction-summary

19 Interactions

As part of this Maritime Usage Licence application, Altemar liaised with Alcatel Submarine Networks to discuss the proposed route of the 2Africa cable. As outlined in the previous sections the potential for effects has been assessed. Specifically in relation to the proposed cable installation there potential interactions are seen in Table 19.1. Where these interactions are deemed to be significant appropriate mitigation has been implemented e.g noise and biodiversity.

Table 19.1. *Table of Interactions between Environmental Factors (X = Interaction)*

Interactions	Land & Soils	Water	Biodiversity	Fisheries & Aquaculture	Air Quality	Noise & Vibration	Landscape / Seascape	Traffic & Transport	Cultural Heritage	Population & Human Health	Major Accidents & Disasters	Climate	Waste	Material Assets
Land & Soils														
Water			X	X									X	
Biodiversity		X				X							X	
Fisheries & Aquaculture		X												
Air Quality														
Noise & Vibration			X											
Landscape / Seascape														
Traffic & Transport														
Cultural Heritage														X
Population & Human Health														
Major Accidents & Disasters														
Climate														
Waste		X	X											
Material Assets									X					

Trans-boundary effects

The potential impact footprint of the proposed cable lay is very small with localised temporary non-significant impacts only seen during main lay operations. No operational impacts are foreseen unless the cable is damaged and repair will involve localised disturbance of the cable and reburial of the cable with ROV. Removal of the cable if/when required will be subject to an additional licencing process. The cable is not expected to have any transboundary ecological or environmental impacts. The UK element of the project has been and approved under UK licencing in UK Territorial Seas.

20 Summary of Mitigations

20.1 Biodiversity

Minor short-term impacts may result as a consequence of the project, but these are believed not to be at the scale to impact on the integrity of the Natura 2000 sites, species or the Site Specific Conservation Objectives. However, following the precautionary principle, substantial mitigation measures have been developed to minimise the ecological impacts of the project, not only in relation to Natura 2000 Annex habitats and species, but also additional species and habitats of conservation importance that have been recorded in the area, including marine mammals offshore.

Mitigation measures are proposed including having an MMO present on the cable laying vessel to ensure marine mammals are not disturbed by the proposed works. The cable route would see invertebrate mortalities in the vicinity of the subtidal plough burial areas. However, during surface lay these effects would be expected to be extremely limited. These effects would be limited in nature and would be short term.

Pre cable laying mitigation

Route Planning

A strict route selection process was carried out to assess the optimal route within the Irish EEZ, taking into account the lowest environmental impact and highest resource efficiency on the basis of sound and comparable data. This included addressing engineering issues as well as environmental concerns which included assessing existing infrastructure.

The proposed cable route passes through an offshore Natura 2000 site of conservation significance (cSAC[1]). The conservation significance of the features of interest of the Natura 2000 sites was assessed. The route was deemed to be the optimal route of satisfying conservation significance (within the designated site) the optimal from an engineering perspective and for the stability and longevity of the cable. The cable route has been selected to avoid habitats of significant ecological interest since the routeing avoids areas of steep relief and harder substrates e.g. reef. This routeing of the cable is then strictly adhered to during the ploughing and surface lay processes. In the unlikely event that significant route alterations are required during the cable installation within the Southern Canyons SAC, the on-call marine biologist/project ecologist, will be consulted prior to any route amendments being made. It is important to note that burial within the cSAC is limited to between 550 metres water depth (mwd) and 1470mwd, across a mud plain, in additional to smaller area of between 156mwd and 264mwd. There will be no burial down the shelf between 264mwd and 550mwd and deeper than 1470mwd.

Construction phase mitigation measures

Subtidal

Mitigation impacts are primarily concerned with the cable laying as minimal impacts are foreseen during the operation phase, with the exception of human intervention in relation to a break or fault in the cable. Impacts in a decommissioning stage are similar to those of the cable laying phase. Repairing the cable may involve several scenarios, such as the use of a grapnel to lift the cable on board so that repairs can be carried out at sea. As a result, the following mitigation measures will be implemented:

1. During all cable operations within Irish waters, the cable lay vessel will be operating at idle /minimal wake speeds which reduces potential collision risk with marine mammals and turtle species. Surface lay operations will typically not exceed 7,500 meters/hour (~4 knots). Plough operations will typically not exceed 400 meters/ hour (~0.22kn) and PLIB / ROV activity will typically not exceed 200 meters / hour (0.1 kn) (note no PLIB / ROV activity anticipated with Irish waters).
2. A MMO will be onboard the vessel at all times in Irish waters to implement standard NPWS marine mammal mitigation measures. “Guidance to Manage the Risk to Marine Mammals from Man-made Sound Sources in Irish Waters” (NPWS, 2014) will be applied to ensure noise introduced into the marine environment have minimum effect. Plough launch, seabed ploughing and plough recoveries will be conducted in consultation with the MMO.

3. Mitigation measures will include the presence of a MMO onboard the vessel. The purpose of the MMO is to ensure that there is no disturbance of seal /cetacean or other Annex IV species e.g. marine turtles, to ensure that project anthropogenic noise is minimised.
4. Sufficient resources will be made immediately available on the vessel to deal with accidental oil spills, including hydraulic hoses bursting etc. and reported to the on board MMO and the onshore marine biologist.
5. Ballast water discharges from project vessels will be managed under the International Convention for the Control and Management of Ships' Ballast Water and Sediments standard (International Maritime Law: Ballast Water Management Convention).
6. The cable route along the continental slope traverses a primarily sedimentary habitat, that possibly contains minor reef e.g boulder areas. The cable route has been meticulously engineered, as outlined in the pre-lay mitigation, to avoid burial attempts in habitats such as steep relief and harder substrates, that may contain ecologically sensitive species. This route engineering is undertaken in accordance with the mitigation hierarchy and is to also ensure the security of the cable and avoid potential damage to laying equipment. It is also in the projects interest to ensure burial in sediment where possible, down to 1500m. The planned route will be strictly followed as to do otherwise could result not only in suboptimal cable burial but also result in impacts on sensitive habitats. Monitoring of vessel movements, via automatic identification system (AIS), will be carried out by the on-call marine biologist/project ecologist. It is important to note that no ploughing will occur in areas where the bedrock reef is at the surface, whether in large bedrock areas or where small bedrock outcrops emerge through the sediment. In such areas, the cable will be surface laid. Localised disturbance is anticipated in the slope area near the cable route. It's important to note that the plough is equipped with an underwater camera, aiding in obstacle avoidance. The proposed approach for surface laying over bedrock areas if encountered, involves lifting the plough off the seabed and continuing to lay the cable on the surface. Burial recommences once the bedrock is clear. However, based on the marine survey no bedrock was noted in the proposed ploughing area within the Southern Canyons SAC. In the unlikely event that significant route alterations are required during the cable installation within the Southern Canyons SAC, the on-call marine biologist/project ecologist, will be consulted prior to any route amendments being made.

Post-lay Monitoring

Given the location of the cable, buried in marine sediments or laid across reef areas, physical monitoring of the cable would pose an impact on the marine environment. Underwater cables by their nature are passive on/within the seabed. It is not expected that the cable will move, deteriorate or impact on marine habitats over time, unless impacted by anthropogenic /storm influence. As outlined by Carter et al. (2009) '*Unless a cable fault develops, the seabed may not be disturbed again within the system's design life.*' Problems, if they arise would be expected to result in a loss of signal and subsequent location of the break/damage and repair. The optical fibres and electrical supply in the cable are monitored 24hours a day from the terminal station, as this is a fundamental function of the cable.

Ecological supervision

In order to ensure the integrity of Annex habitats and additional habitats/species of importance are retained in the vicinity of the planned project, the following is recommended:

d. A MMO will be present during cable laying to minimise any impact on marine mammals.
e. A marine biologist/ecologist will be in daily contact with the lay vessel within the Southern Canyons SAC. An ecological clerk of works report will be prepared and submitted to NPWS within 2 month of the vessel leaving Irish waters.
f. Daily reports will be submitted to the project ecologist during works in the Southern Canyons SAC.

20.2 Fisheries

The proposed cable main lay would not be expected to result in the direct mortality of fish species due to the slow-moving nature of the main lay vessel. No significant impacts on fish nursery areas are predicted. A fishery liaison will be in place.

20.3 Noise & Vibration

The operations would comply with the NPWS (2014) "*Guidance to manage the risk to marine mammals from man-made sound sources in Irish waters*"[7]. These guidelines would be deemed adequate to mitigate the negative impacts of the proposed works. Cetaceans in the vicinity of the vessel during start up procedures would be given ample time to leave the site with the soft start procedures outlined in the guidelines. It should be noted that the vessel will be operating at a very slow speed on a 24 hour basis with a MMO on board. It is considered that due to the fact that the ship will be operating on this basis, a MMO will be onboard operating to MMO guidance procedures, it will be providing significant time for cetaceans to leave the area.

20.4 Traffic & Transportation

The following mitigation measures relating to navigation risk will be implemented:

- Vessel speed will be of the order of 0.3 knots during plough burial and 4 knots during surface lay.
- The Main Lay will be undertaken by a single, purpose-built vehicle.
- The vessel will be equipped with Automatic Identification Systems (AIS) and AIS monitoring.
- The vessel will install cable on a 24 hour per day basis and a full operational crew will be on duty at all times.
- The vessel will comply fully with all requirements of the International Regulations for Preventing Collisions at Sea.
- Arrangements will be made for the publication of a formal Marine Notice through the Department of Transport and the notice will provide vessel and contact details together with a general description of operations and approximate dates of commencement and completion.
- A Fisheries Liaison Officer will be employed to ensure co-operation between fishing operations and cable installation activities as the work proceeds.
- The project will comply with Convention on the International Regulations for Preventing Collisions at Sea (COLREGs).
- A Risk Control Log will be compiled for navigational risk.
- Prior to commencement of installation, the Dept. of the Environment, Climate, and Communications will be notified of the planned start and the estimated completion dates for the operation.

20.5 Cultural Heritage

An Archaeological Exclusion Zone (AEZ) of 100m will be imposed around each of the five identified cultural assets.

[7] http://www.npws.ie/sites/default/files/general/Underwater sound guidance_Jan 2014.pdf.

21 Consideration and Reasoned Conclusions

21.1 EIA Directive

EIAR Screening Methodology

The EIA Screening technical review and assessment has been undertaken having regard to relevant EU and national legislation and EPA guidance to include:

- EIA Directive 2011/92/EU, as amended by Directive 2014/52/EU.
- Foreshore Act 1933, as amended.
- Maritime Area Planning Act 2021.
- The Planning and Development, Maritime and Valuation Act 2022.
- Planning and Development Act 2000, as amended.
- Planning and Development Regulations 2001, as amended.
- Environmental Protection Agency (EPA) (2022) '*Guidelines on the Information to be Contained in Environmental Impact Assessment Reports*'.
- Office of the Planning Register (OPR) (2021) '*Environmental Assessments and Planning in Ireland'*.

Requirements of EIAR

The Guidelines for Planning Authorities and An Bord Pleanála on Environmental Impact Assessment, published in August 2018, specify that Environmental Impact Assessment is a process to be undertaken for specified classes of development listed in the Directive. The publication of the Guidelines coincided with the making of the European Union (Planning and Development) (Environmental Impact Assessment) Regulations 2018 (S.I. No. 296 of 2018) and the coming into operation of the Regulations on 1st September 2018 in order to transpose the Directive into Irish planning law. Section 72 of the EPA Act 1992, as amended, provides for the preparation by the Agency of 'guidelines on the information to be contained in environmental impact assessment reports'. The Guidelines on the information to be contained in Environmental Impact Assessment Reports (EPA,2022)

Under Article 2 of the 2018 Directive, for a project to require an Environmental Impact Assessment, it must come within one of the categories in Annex I or Annex II of the Directive.

Irish Context

EIA provisions in relation to planning development consents are contained in the Planning and Development Act 2000, as amended, and in the Planning and Development Regulations 2001, as amended.

The Foreshore Act 1933, as amended by S.I. No 544 of 2014, stipulates that in relation to a Foreshore Licence an EIA shall be carried out where the proposed development would be of a class specified in Schedule 5, Parts 1 or 2, of the Planning and Development Regulations 2001, as amended.

The Maritime Area Planning Acts 2021 and 2022 set out the requirements for EIAR under the new Maritime Area Regulatory Authority (MARA) state agency. The Maritime Area Planning Act 2021 provides the legislative framework for a new streamlined development consent process for activities in the maritime area including offshore renewable energy projects.

Status of the proposed project in an EIAR context

Examination of Annex I and Annex II the EIA Directive confirms that the project is not of a class or category that requires an Environmental Impact Assessment Report (EIAR) and does not come within the scope of the EIA Directive.

Examination of Annex I and Annex II of the EU Directive and Schedule 5 – Parts 1 and 2 of the Planning and Development Regulations shows that the project is not of a class or category the requires an EIAR.

Summary of Environmental Characteristics of the Project

Whereas an Environmental Impact Assessment Report is not required, a summary of relevant characteristics of the project, as described in the earlier chapters of this report demonstrate that the features and impacts of the project do not warrant an EIAR. A summary of relevant characteristics of the project is presented in Table 21.1. A Summary of Potential Effects is seen in Table 21.2.

21.2 WFD Directive

The Water Framework Directive requires Member States to use their River Basin Management Plans (RBMPs) and Programmes of Measures (PoMs) to protect and, where necessary, restore water bodies in order to reach good status, and to prevent deterioration. Good status means both good chemical and good ecological status. It applies to inland, transitional and coastal surface waters as well as groundwaters.[8]

The proposed 2Africa cable route is located 127km from the Irish shoreline (at its nearest point). No significant impacts on the water quality of watercourses, transitional waterbodies, and coastal waterbodies are foreseen. The project will not affect surface water, groundwater, or wastewater. The proposed project will not negatively impact on the environmental objectives of the Water Framework Directive (WFD). The cable itself is inert in nature and does not emit pollutants or chemicals to the marine environment or sediment.

21.3 MSFD Directive

The Marine Strategy Framework Directive (MSFD) is European legislation which aims to protect the marine environment. It requires the application of an ecosystem-based approach to the management of human activities, enabling a sustainable use of marine goods and services.[9] The aim of the MSFD is to achieve a "Good Environmental Status" of the EU's marine waters and sustainably protect the resource base upon which marine-related economic and social activities depend.[10]

As reported in the EPA Ireland's Environment: An Integrated Assessment 2020 Report (Chapter 8: The Marine Environment), Ireland's offshore waters are predominately clean, healthy, and biologically diverse. Out of an abundance of caution, it is considered that there is the potential for the proposed works to negatively impact on offshore water quality within the Irish EEZ. This is as a result of the potential for accidental small scale chemical, hydraulic and fuel spillages during main lay operations, which may negatively impact locally on the surrounding water quality. However, in the event of accidental spills, in the absence of on site mitigation these be would be expected to be minor in nature and would not impact on water quality status. The proposed project will not negatively impact on the environmental objectives of the Marine Strategy Framework Directive (MSFD).

[8] https://environment.ec.europa.eu/topics/water/water-framework-directive_en
[9] https://www.marine.ie/site-area/areas-activity/marine-environment/marine-strategy-framework-directive
[10] https://environment.ec.europa.eu/topics/marine-environment_en

Table 21.1. *Summary of Relevant Characteristics of the Project*

Questions to be Considered	Yes / No / ? Briefly Describe	Is this likely to result in a significant impact? Yes / No / ? – Why?
Brief Project Description: Installation of a subsea fibre-optic cable (2Africa) in the offshore marine subtidal of the Irish EEZ.		
1. Will construction, operation, decommissioning or demolition works of the Project involve actions that will cause physical changes in the locality (topography, land use, changes in waterbodies, etc.)?	No	The work relates to the installation of a cable in the seabed. The installation work is transient, of short duration and backfill is effective as work proceeds with reinstatement of the seabed completed naturally by tidal movements and currents. **No likely significant impact.**
2. Will construction or the operation of the Project use natural resources such as land, water, materials or energy, especially any resources which are non-renewable or are in short supply?	No	The cable is comprised of a fibre optic core with steel wire armour and the installation involves burial of the cable in the seabed. The cable is effectively inert. **No likely significant impact**
3. Will the Project involve the use, storage, transport, handling or production of substances or materials which could be harmful to human health, to the environment or raise concerns about actual or perceived risksto human health?	No	The project involves the cable and the optical equipment at the cable landing stations. The cable is effectively inert. Installation will be undertaken by custom designed vessels which comply with EU requirements in terms of operational controls and environmental standards. **No likely significant impact.**
4. Will the Project produce solid wastes during construction or operation or decommissioning?	No	The project involves the installation of a subsea fibre optic cable in the deep offshore marine environment of the Irish EEZ. No solid wastes will be produced by the proposed project. All vessels will comply with MARPOL and EU standards. **No likely significant impact.**
5. Will the Project release pollutants or any hazardous, toxic or noxious substancesto air or lead to exceeding Ambient Air Quality standards in Directives 2008/50/EC and 2004/107/EC)?	No	The project does not release pollutants or any hazardous toxic and noxious substances. Installation will be undertaken by custom designed vessels which comply with EU requirements in terms of operational controls and environmental standards. **No likely significant impact.**
6. Will the Project cause noise and vibration or the releasing of light, heat energy or electromagnetic radiation?	Yes	A SISAA report and NIS have been prepared. The proposed project will produce noise through the use of USBL equipment in the marine environment. Increased vibration will be localised to the cable route during plough burial works. Mitigation measures will be implemented. It should be noted that the subsea cable will not produce any light or significant heat energy or electromagnetic radiation. **No likely significant impact.**

Questions to be Considered	Yes / No / ? Briefly Describe	Is this likely to result in a significant impact? Yes / No / ? – Why?
7. Will the Project lead to risks of contamination of land or water from releases of pollutants onto the ground or into surface waters, groundwater, coastal wasters or the sea?	**Yes**	Pollution may arise from cable-laying vessels in the offshore marine environment. To minimise risk, installation will be undertaken by cable lay vessels which comply with EU requirements in terms of operational controls and environmental standards. **No likely significant impact.**
8. Will there be any risk of accidents during construction or operation of the Project that could affect human health or the environment?	**Yes**	The project involves the installation of an inert cable in the offshore subtidal. Procedures will be in place to identify, avoid and mitigate any risks of accidents which would affect human health or the environment. **This is not likely to result in a significant impact.**
9. Will the Project result in environmentally related social changes, for example, in demography, traditional lifestyles, employment?	No	The project will not result in any direct social changes such as demography, traditional lifestyles or employment. The project may increase quality of life and employment opportunities through the provision of efficient and effective telecommunications infrastructure. The main effects would be positive, outside of Ireland but indirect positive effects may be expected. **No likely significant impact.**
10. Are there any other factors that should be considered such as consequential development which could lead to environmental impacts or the potential for cumulative impacts with other existing or planned activities in the locality?	No	No cumulative impacts are foreseen as a result of the proposed project. **No likely significant impact.**
11. Is the project located within or close to any areas which are protected under international, EU, or national or local legislation for their ecological, landscape, cultural or other value, which could be affected by the Project?	**Yes**	A SISAA and stage 2 NIS have been completed as part of this application. The proposed 2Africa cable route traverses through the offshore Southern Canyons SAC. Mitigation measures will be implemented to prevent adverse effects on the integrity of this SAC. **No likely significant impact.**
12. Are there any other areas on or around the location that are important or sensitive for reasons of their ecology e.g. wetlands, watercourses or other waterbodies, the coastal zone, mountains, forests or woodlands, that could be affected by the Project?	No	A SISAA report and NIS have been prepared. The proposed cable route traverses through the offshore Southern Canyons SAC. The proposed cable route has been designed to avoid areas that may contain reef habitats (Qualifying Interest of this SAC). Mitigation measures will be implemented. **No likely significant impact.**

Questions to be Considered	Yes / No / ? Briefly Describe	Is this likely to result in a significant impact? Yes / No / ? – Why?
13. Are there any areas on or around the location that are used by protected, important or sensitive species of fauna or flora e.g. for breeding, nesting, foraging, resting, overwintering, migration, which could be affected by the Project?	**Yes**	A SISAA report and NIS have been prepared. There is the potential for benthic reef communities to exist on hard substrate on the seabed in the Southern Canyons SAC. The proposed 2Africa cable passes through this route. In areas where hard substrate has been noted, the cable will be surface laid. The cable route has been designed to avoid areas that potentially contain reef communities. There is the potential for marine mammals to be present during the proposed installation works. Mitigation measures are proposed to prevent potential impacts on reef and marine mammals. **No likely significant impact.**
14. Are there any inland, coastal, marine or underground waters (or features of the marine environment) on or around the location that could be affected by the Project?	No	The proposed cable route traverses through the subtidal canyons along the continental shelf. The proposed 2Africa route has been designed to prevent impacts on these areas. The subsea cable will be surface laid down the canyons (beyond depth of 1500m). No likely significant impact.
15. Are there any areas or features of high landscape or scenic value on or around the location which could be affected by the Project?	No	The proposed cable will be buried / surface laid on the seabed of the deep offshore marine subtidal. The proposed cable will not be visible from the Irish shore. The proposed cable will not negatively impact on any areas of high landscape or scenic value. **No likely significant impact.**
16. Are there any routes or facilities on or around the location which are used by the public for access to recreation or other facilities, which could be affected by the Project?	No	The proposed 2Africa cable route in the Irish EEZ is located within the deep offshore marine subtidal, at a minimum of 127km from the Irish coast. There are no areas of recreation or public facilities / access routes located proximate to the proposed cable route. **No likely significant impact.**
17. Are there any transport routes on or around the location that are susceptible to congestion or which cause environmental problems, which could be affected by the Project?	No	The proposed 2Africa cable route is located in an area that experiences relatively little vessel activity. The proposed cable in the Irish EEZ is not located proximate to any congested marine transport routes. **No likely significant impact.**
18. Is the Project in a location in which it is likely to be highly visible to many people?	No	The proposed 2Africa cable route in the Irish EEZ is located within the deep offshore marine subtidal, at a minimum of 127km from the Irish coast. The cable will be buried beneath / surface laid on the seabed. The cable will not be highly visible to many people. **No likely significant impact.**

Questions to be Considered	Yes / No / ? Briefly Describe	Is this likely to result in a significant impact? Yes / No / ? – Why?
19. Are there any areas or features of historic or cultural importance on or around the location that could be affected by the Project?	**Yes**	An "Underwater archaeology impact assessment for geophysical and geotechnical surveys in Irish waters" report had been prepared to inform the route selection of the proposed 2Africa cable (Appendix I). The cable route avoids areas of cultural or historical sensitivity in the offshore marine subtidal. **No likely significant impact.**
20. Is the Project located in a previously undeveloped area where there will be loss of greenfield land?	No	The project involves the installation of a subsea fibre optic cable in the deep offshore marine subtidal. There are no terrestrial elements of the project proposed on the island of Ireland. There will be no loss of greenfield land. **No likely significant impact.**
21. Are there existing land uses within or around the location e.g. homes, gardens, other private property, industry, commerce, recreation, public open space, community facilities, agriculture, forestry, tourism, mining or quarrying that could be affected by the Project?	No	There is no knowledge of existing land uses in the area of the proposed 2Africa cable route within the Irish EEZ. **No likely significant impact.**
22. Are there any plans for future land uses within or around the location that could be affected by the Project?	No	There is no indication of any plans for future land uses that could be affected by the project. **No likely significant impact.**
23. Are there areas within or around the location which are densely populated or built-up, that could be affected by the Project?	No	The project involves the installation of a subsea fibre optic cable in the deep offshore marine subtidal. There are no densely populated areas within or around the area of the proposed cable route. **No likely significant impact.**
24. Are there any areas within or around the location which are occupied by sensitive land uses e.g. hospitals, schools, places of worship, community facilities, that could be affected by the Project?	No	The project involves the installation of a subsea fibre optic cable in the deep offshore marine subtidal. There are no areas within or around the area of the proposed cable route occupied by sensitive land uses. **No likely significant impact.**
25. Are there any areas within or around the location which contain important, high quality or scarce resources e.g. groundwater,surface waters, forestry, agriculture, fisheries, tourism, minerals, that could be affected by the Project?	No	The location of the 2Africa cable in the deep offshore marine subtidal of the Irish EEZ does not impact on any high quality or scarce resources. The installation of the subsea cable will involve burial / surface lay of the cable which will cause only localised disturbance of the seabed and will not significantly affect aquaculture or sea fisheries. **No likely significant impact.**

Questions to be Considered	Yes / No / ? Briefly Describe	Is this likely to result in a significant impact? Yes / No / ? – Why?
26. Are there any areas within or around the location which are already subject to pollution or environmental damage e.g. where existing legal environmental standards are exceeded, that could be affected by the Project?	No	There is no knowledge of pollution or environmental Damage in the area of the proposed 2Africa cable route within the Irish EEZ. **No likely significant impact.**
27. Is the Project location susceptible to earthquakes, subsidence, landslides, erosion, flooding or extreme or adverse climatic conditions e.g. temperature inversions, fogs, severe winds, which could cause the Project to present environmental problems?	No	The project traverses an area with no history of physical conditions or occurrences which could cause the project to present environmental problems. **No likely significant impact.**

Table 12.2. *Summary of Potential Effects*

Land & Soils	Given the nature of the proposed works, and the limited range of potential disturbance impacts on seabed sedimentation, in the absence of mitigation measures, the project will have no significant impact on land or soils.
Water	No significant negative effects on water quality within offshore waters of the Irish EEZ are foreseen as a result of the proposed project following compliance with the MSFD and MARPOL.
Biodiversity	See SISAA Report, NIS (Appendix II), and Annex IV Report. The proposed works are located within the deep offshore subtidal of the Irish EEZ. There are no terrestrial elements of the proposed project located on the island of Ireland. The proposed 2Africa cable will traverse through the offshore Southern Canyons SAC. There is the potential for significant impacts on reef habitats (during main lay works) and marine mammals (via underwater noise from USBL equipment). Mitigation measures are proposed and will be implemented. Ecological supervision will be onsite. Following the implementation of mitigation measures, there will be no likely significant impacts on biodiversity.
Fisheries & Aquaculture	No significant adverse effects on aquaculture are foreseen. The proposed cable main lay should not result in the direct mortality of any fish species due to the slow-moving nature of the main lay vessel. No significant impacts on fish nursery areas are predicted. A fishery liaison officer will be in place.
Air Quality	The proposed project will comply with Ambient Air Quality standards in Directives 2008/50/EC and 2004/107/EC) and MARPOL. The project will have no significant impact on air quality.
Noise & Vibration	There is the potential for noise and vibration impacts on marine mammals during the proposed main lay works. Following the implementation of mitigation measures, no significant impacts via noise and vibration from the proposed project are likely.
Landscape / Seascape	No significant negative impacts on the Landscape / Seascape character are foreseen in the deep offshore areas of the Irish EEZ.
Traffic & Transport	The proposed cable route currently experiences relatively low marine traffic. No significant impacts on traffic and transport as a result of the proposed project are likely. Standard measures and a Fishery Liaison Officer will be in place.
Cultural Heritage	An “Underwater archaeology impact assessment for geophysical and geotechnical surveys in Irish waters” report had been prepared to inform the route selection of the proposed 2Africa cable. This report is included as Appendix I of this AIMU report. Following the implementation of mitigation measures, the project will have no significant impact on marine archaeology.
Population & Human Health	The proposed project will not have a direct impact on Population and Human Health within Ireland, but international communications capacity for Ireland will benefit indirectly via existing Ireland-UK network connections. The project would be seen to have a major positive impact on Population and Human Health through providing a catalyst for internet-based economy within countries that may currently have poor internet on the African continent.
Major Accidents & Disasters	Standard procedures will be in place to identify, avoid and mitigate risks of accidents which would affect human health or the environment.
Climate	The proposed project will comply with relevant EU Directives and MARPOL, in particular Annex VI – (Air Pollution). The project will have no significant impact on air quality. The operation of the cable would be expected to have a positive impact on the Climate as it would provide increased connectivity between and within both Europe and Africa.
Waste	The proposed project will comply with waste management and disposal standards outlined in the Waste Framework Directive 2008/98/EC and MARPOL. No significant environmental impacts are foreseen as a result of waste from the proposed project.
Material Assets	No significant negative impacts on the Material Assets are foreseen in the deep offshore areas of the Irish EEZ.

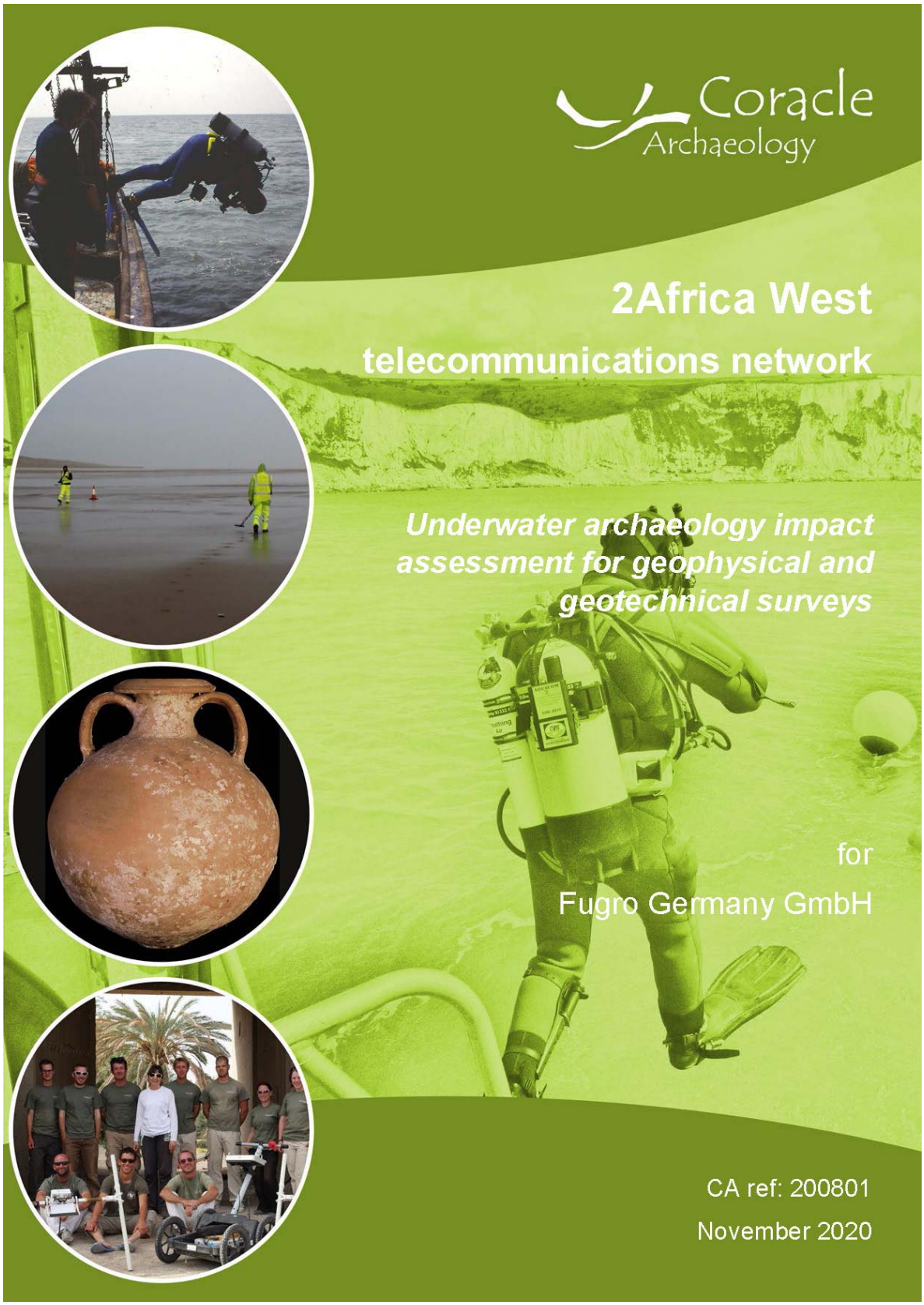
21.4 Conclusions

This Assessment of Impacts of the Maritime Uses (AIMU) report has been prepared to support the Maritime Usage Licence (MUL) application for the 2Africa Submarine Fibre-Optic Cable System. The MUL application relates to the proposed installation and operation of the 2Africa Submarine Cable System within the Irish Exclusive Economic Zone (EEZ). Where applicable, this assessment has considered the potential effects of the project on designated sites within the Irish EEZ.

The 2Africa cable will, in most areas, be buried beneath the seabed to a depth of 1500m using a plough burial installation method. In areas where cable burial is not possible, and at depths beyond 1500m, the proposed cable will be surface laid onto the seabed. Following an assessment of the proposed installation methods and cable route, it was determined that no significant impacts on the physical subsea environment are foreseen.

Following the implementation of the proposed mitigation measures outlined in this AIMU report and in the accompanying Natura Impact Statement (NIS), no significant impacts on the biological and human environment are foreseen. The NIS concludes that the proposed project will not adversely affect the integrity of the Southern Canyons SAC. No negative impacts on the conservation objectives of the WFD and MSFD are predicted as a result of the proposed project.

Appendix I Underwater archaeology impact assessment for geophysical and geotechnical surveys in Irish waters.



2Africa West telecommunications network

Underwater archaeology impact assessment for geophysical and geotechnical surveys in Irish waters

Coracle project no.: 200801

Coracle report no.: 200801.1

prepared by	[redacted] Senior Archaeologist
date	November 2020
checked and approved by	[redacted] Lead Marine Consultant
date	November 2020
issue	1

SUMMARY

Project name: 2Africa West telecommunications network

Coracle Archaeology was commissioned by Fugro Germany Marine GmbH to provide archaeological support services, including this underwater archaeology impact assessment, for survey works in Irish waters for the 2Africa West telecommunications network. This project plans to install a subsea telecommunications cable, originating at Widemouth Bay in the UK, and terminating in South Africa. The cable will pass through the southern sector of the Irish exclusive economic zone and will then link several west African countries along the route.

The planned surveys comprise marine geophysical and geotechnical investigations to assess the nature of the seabed within the 500-1,000m survey corridor, to assist in route-planning for the proposed cable. The marine geophysical survey will collect multi-beam echo-sounder, sidescan sonar, magnetometer and sub-bottom profiler data; geotechnical investigations will include gravity cores, grab samples and cone penetration tests.

This underwater archaeology impact assessment provides a baseline assessment of known sites and features within the proposed cable survey corridor. This will be used to assess potential impacts on the underwater cultural heritage resource, and to propose mitigation to reduce these impacts.

This assessment has highlighted potential impacts on five known cultural heritage assets along the planned survey corridor. Possible impacts will be mitigated through the imposition of archaeological exclusion zones around each asset.

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1. INTRODUCTION

Outline

1.1. Coracle Archaeology was commissioned in September 2020 by Fugro Germany Marine GmbH (FGMG) to provide archaeological support, including this underwater archaeology impact assessment (UAIA), for bathymetric, geophysical and geotechnical surveys in Irish waters for the 2Africa West telecommunications network (henceforth 'the proposed development').

1.2. 2Africa West is a proposed subsea telecommunications network cable, originating at Widemouth Bay in the UK, and terminating in South Africa. The network will pass through the southern sector of Irish exclusive economic zone (EEZ) and will then link several west African countries along the route.

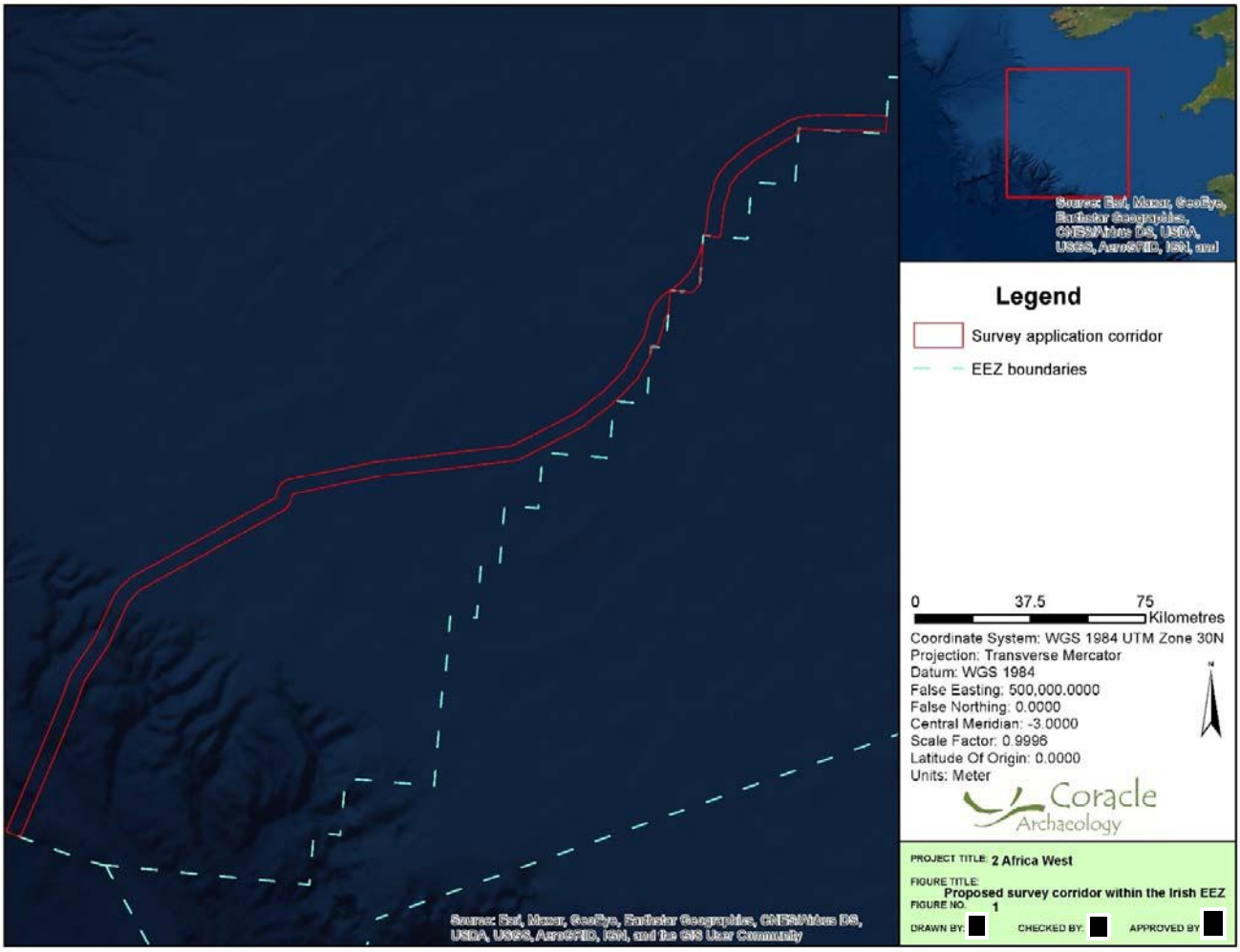
Location and context

1.3. The planned survey in Irish waters will be conducted over a period of approximately three weeks, commencing in late November 2020. The proposed cable route enters the Irish EEZ from UK waters (figure 1). It runs for c. 400km through the Irish EEZ, before exiting to the south. The marine survey corridor, centred on the proposed cable route, will be 500m wide in shallow water (<1,000m deep), or 1km wide in water depth exceeding 1,000m.

1.4. The survey aims to collect marine bathymetric, geophysical and geotechnical (benthic) data which will assist in the route design for the proposed development. The marine geophysical survey will collect sidescan sonar (SSS), magnetometer and sub-bottom profiler (SBP) data; bathymetric data will be collected using a multi-beam echo-sounder (MBES). Geotechnical (benthic) investigations will be undertaken using gravity cores (GC), grab samples (GS) and cone penetration tests (pCPT).

Aims and objectives

1.5. The aim of this impact assessment is to avoid impacts from the geotechnical survey on known archaeological sites and cultural heritage assets within the survey corridor. This will be achieved through the adoption of appropriate mitigation measures as set out below.


Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and
Legend
Survey application corridor
EEZ boundaries
0
37.5
75
Kilometres
Coordinate System: WGS 1984 UTM Zone 30N
Projection: Transverse Mercator
Datum: WGS 1984
False Easting: 500,000.0000
False Northing: 0.0000
Central Meridian: -3.0000
Scale Factor: 0.9996
Latitude Of Origin: 0.0000
Units: Meter
Coracle
Archaeology
PROJECT TITLE: 2 Africa West
FIGURE TITLE:
Proposed survey corridor within the Irish EEZ
FIGURE NO. 1
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APPROVED BY

2. LEGISLATIVE FRAMEWORK AND GUIDANCE

2.1. As this impact assessment is concerned only with the proposed survey corridor within Irish waters, it takes account of the following national legislation:

- Continental Shelf Act 1968; and
- National Heritage Act (Ireland) 1995.

2.2. This impact assessment follows appropriate national principles and guidance (Government of Ireland 1999).

3. METHODS AND DATA SOURCES

3.1. This impact assessment has been undertaken in the following stages:

- identification of known archaeological sites and cultural heritage assets within the survey corridor;
- assessment of potential development effects, including description of change to historic asset and the effect on the significance of the historic asset;
- identification of appropriate mitigation measures; and
- assessment of residual effects after proposed mitigation.

Data sources

3.2. This impact assessment includes a documentary and cartographic search to locate all known cultural heritage assets within the proposed survey corridor. Sources utilised include:

- The National Monuments Service (NMS) Wreck Viewer; and
- Wrecksite.eu

Scope of proposed geo-technical (benthic) works

3.3. The nature of the seabed along the survey corridor will be determined by geotechnical (benthic) investigations, including gravity cores, grab samples and cone penetration tests. Exact locations for the investigations have yet to be determined; these will be chosen following review of the marine geophysics.

3.4. A rapid assessment of marine geophysical survey data will be undertaken by Coracle Archaeology in conjunction with our colleagues at Coastal and Offshore Archaeological Research Services, University of Southampton, in areas where geotechnical investigations are planned. This will enable FGMG to use the same vessel for both the geophysical and geotechnical surveys, whilst ensuring the protection of potential cultural heritage assets.

Gravity cores

3.5. Gravity cores will be taken every c.10km along the survey corridor. A 3m gravity core will be deployed to obtain a 1m core sample. Each core will be split longitudinally, and digitally photographed to highlight the sub-bottom distribution of lithological units. Major units within the core will be tested to facilitate full geotechnical analysis of the recovered sediment. Log descriptions will show lithological distributions against depth, strength of cohesive units and a visual estimate of density of non-cohesive units. Once photographed and assessed, the samples will be returned to the seafloor.

Grab samples

3.6. If the first attempt to obtain a GC is unsuccessful, two further attempts will be undertaken. If a core sample is not obtained after the third attempt, a Van Veen grab will be deployed to obtain a sample from the top of the seabed.

Cone penetration

3.7. Cone penetration tests will be undertaken every c. 4km to ascertain the strength of the seabed sediments. The cone will penetrate the seafloor to a maximum depth of 2m. If the target depth is not attained at the first attempt, the pCPT will be repositioned before the second push is attempted. An ultra-short base-line (USBL) will be used to position the pCPT rig over the target location.

Potential impacts

3.8. Geo-technical investigations utilising GC, GS and pCPT techniques have the potential to impact known and as yet unidentified cultural heritage assets. Mitigation measures to avoid potential impacts are outlined below.

Assessment of potential effects

3.9. The methods used for the assessment of development effects begins with an assessment of the significance of each historic asset, assessed on a scale ranging from very high to very low. Significance can be defined as the sum of cultural heritage values, such as evidential, historical, aesthetic, and communal values. The following assessment of significance is based on the professional judgement of the assessor, informed by these values, and by the criteria presented in Table 1.

Table 1 Significance of the historic asset

Historic asset significance	Description / reason
Very high	• Historic assets of international importance
High	• Protected wrecks and scheduled monuments • Historic assets of national importance • Maritime losses where the position is known and has been positively identified • Targets of high archaeological potential identified in the geophysical survey
Medium	• Historic assets of regional importance • Targets identified in the geophysical survey of medium archaeological potential • Obstructions that could be indicative of wreckage or submerged features
Low	• Targets of low potential identified in the geophysical survey • Stray archaeological find spots
Very low	• Targets identified through the assessment of geophysical survey data as likely to represent natural features

Magnitude of change

3.10. Unlike terrestrial assessments, the method to determine the magnitude of impact in the context of marine archaeology is limited to the severity of impact. For the purpose of this assessment, severity is considered to be synonymous with magnitude.

3.11. The magnitude of change is a measure of the scale or extent of change in baseline conditions, irrespective of the value of the heritage assets affected. The criteria used to inform the assessment of the magnitude of change are set out in Table 2.

Table 2 Magnitude of impact

Magnitude	Definition
Very high	Total loss or major alteration of the historic asset removing the asset's value
High	Loss of one or more key elements of the historic asset substantially reducing the asset's value
Medium	Slight physical alteration of the historic asset not affecting key elements, slightly reducing the asset's value
Low	Very slight or negligible alteration of the historic asset
Very Low	Almost no alteration of the historic asset

Significance of effect

3.12. The assessment of the significance of an effect was undertaken using professional judgement, guided where necessary by the matrix shown in Table 3. The assessment of significance is influenced by the value of a receptor and the magnitude of the predicted change from the baseline condition.

Table 3 Significance of potential impacts

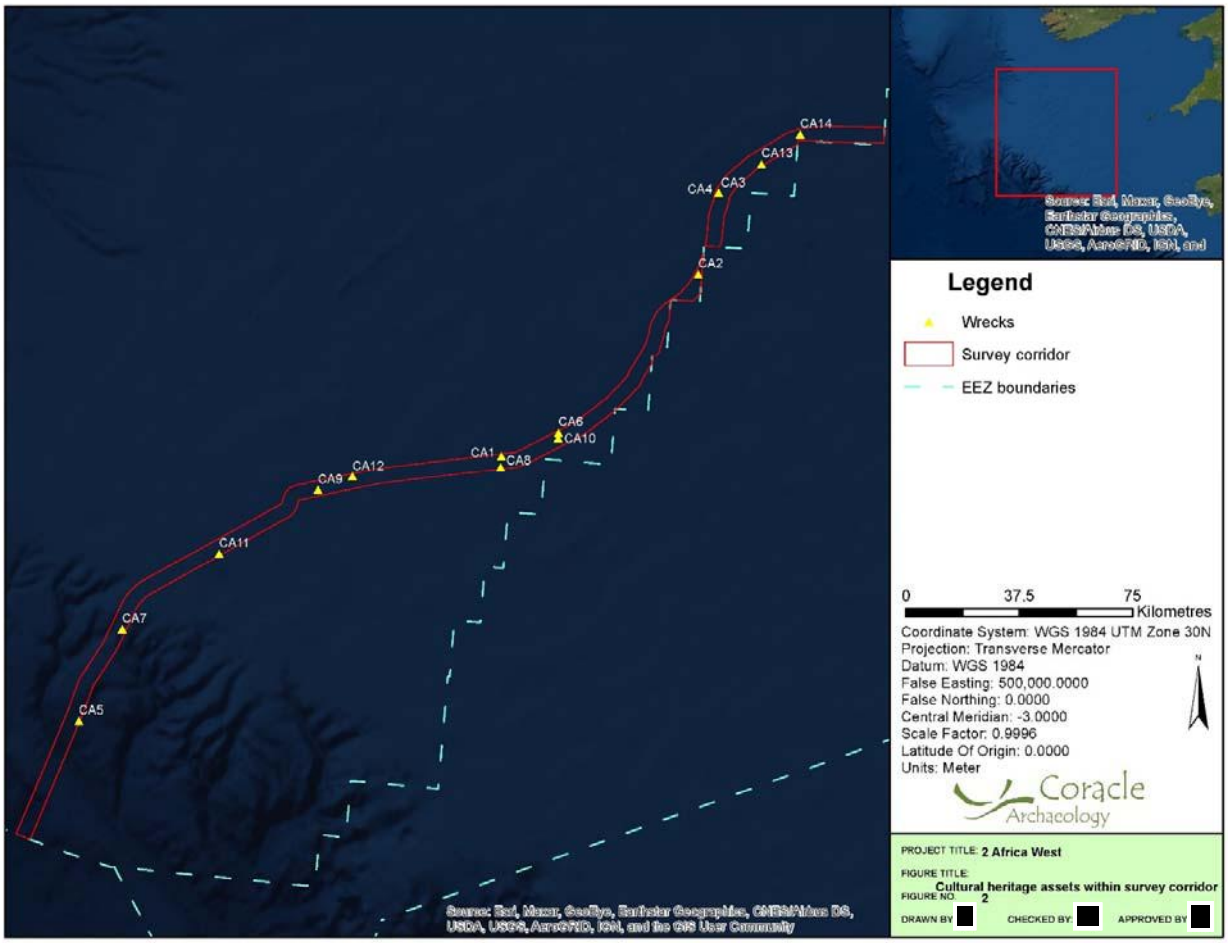
Receptor significance	Magnitude of impact					
		Very High	High	Medium	Low	Very Low
	Very High	Major	Major	Moderate	Minor	Minor
	High	Major	Moderate	Minor	Minor	Negligible
	Medium	Moderate	Minor	Minor	Negligible	Negligible
	Low	Minor	Minor	Negligible	Negligible	Negligible
	Very Low	Minor	Negligible	Negligible	Negligible	Negligible

Note: red-shaded cells are defined as significant impacts

4. EXISITING ENVIRONMENT

4.1. Assessment of the data held on the National Monuments Service of Ireland (NMS) wreck database has identified 14 cultural heritage assets within the survey corridor (see Table 4; figure 2), including five live wrecks. None of these wrecks are designated or protected assets. For ease of identification, records located along the survey route have been assigned a unique Coracle Archaeology number using the abbreviation (**CA**).

4.2. *SS Vapper* (**CA1**) was an Estonian registered steam ship of 4,543 gross registered tonnage (grt). Built in 1913 by Ropner Shibuilding & Co., Stockton-on-Tees, UK, the vessel was formerly known as the *Pilcot* and then the *Seapool* before it was purchased by the Tallin Shipping Co. On 6 July 1940 the *Vapper* was struck by a torpedo fired by German U-boat *U-34,* whilst en route from Cardiff to Buenos Aires with a cargo of coal. One crew member was lost. The wreck is considered live, and lies at a depth of c. 125m (wrecksite.eu).


CA14
CA13
CA4
CA3
CA2
CA6
CA10
CA1
CA8
CA12
CA9
CA11
CA7
CA5
Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and
Legend
Wrecks
Survey corridor
EEZ boundaries
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37.5
75
Kilometres
Coordinate System: WGS 1984 UTM Zone 30N
Projection: Transverse Mercator
Datum: WGS 1984
False Easting: 500,000.0000
False Northing: 0.0000
Central Meridian: -3.0000
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Latitude Of Origin: 0.0000
Units: Meter
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FIGURE TITLE:
Cultural heritage assets within survey corridor
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Table 4 Cultural heritage assets within the proposed survey corridor

CA number	Name	Status	Date	Latitude	Longitude	Source & ref
CA1	*SS Vapper*	Live	1940	49.5	-9.25	NMS 11658; WS*
CA2	*Kruguen*	Live	1976	50.08333	-8.41667	NMS 09798; WS
CA3	*San Julian*	Live	1992	50.32833	-8.35	NMS 10010; WS
CA4	*San Julian*	Live	1992	50.32883	-8.35067	NMS 10011; WS
CA5	*Sonia Nancy*	Live	2002	48.6	-11.03333	NMS 10049; WS
CA6	Unknown	Unknown	1902	49.58333	-9	NMS 16881
CA7	*SS Tronto*	Unknown	1915	48.88333	-10.88333	NMS 12479
CA8	*SS Parthenia*	Unknown	1917	49.46667	-9.25	NMS 09938; WS
CA9	*U-41*	Unknown	1940	49.35	-10.06667	NMS 10229; WS
CA10	Unknown	Unknown	1923	49.56667	-9	NMS 15557
CA11	Unknown	Unknown	1929	49.13333	-10.48333	NMS 15953
CA12	Unknown	Unknown	Unknown	49.4	-9.91667	NMS 10987; 10988
CA13	Unknown	Unknown	Unknown	50.42233	-8.1605	NMS 11071
CA14	Unknown	Unknown	Unknown	50.51767	-7.99033	NMS 11139

* WS = wrecksite.eu

4.3. The *Kruguen* (**CA2**) was a French fishing trawler reported missing on 12 March 1976. Despite an extensive search no trace was found of the trawler or her crew. The wreck is considered live, although the location is listed as unreliable by the UKHO (wrecksite.eu).

4.4. The *San Julian* (**CA3 & CA4**) was a French fishing trawler that foundered on the 27 July 1992 and was subsequently abandoned. The wreck is considered live, and lies at a depth of c.120m (wrecksite.eu). The wreck is recorded at two different locations c. 75m apart on the NMS wreck database (wreck numbers W10010 & W10011). There is no indication that the wreck is in two pieces, nor that these are different wrecks. In accordance with the National Monuments Service database, the *San Julian* has nevertheless been assigned two **CA** numbers, and is mapped at both of the suggested locations.

4.5. The *Sonia Nancy* (**CA5**) was a small Irish fishing vessel. On the 4 January 2002 it was abandoned after the engine failed in bad weather and later sank. The wreck is considered live (wrecksite.eu).

4.6. A number of wreck events are also recorded within the proposed survey corridor. It is important to emphasise that these are mostly reports of losses, and either do not have reliable locational information or should not be seen as indicative of the presence (or otherwise) of physical remains; the floating wreckage being a case in point. They are nevertheless included here to highlight the potential for encountering wrecks which have been reported in the past, but for which there is currently no material evidence to substantiate their existence. These include:

- An unknown wreck (**CA6**), reported as floating wreckage in 1902;
- The *SS Tronto* (**CA7**), lost in 1915;
- The *SS Parthenia* (**CA8**), a British steam ship of 5,160 grt, sunk by German U-boat *U-69* on 6 June 1917 with the loss of three lives (wrecksite.eu); and
- *U-41* (**CA9**), a German IX U-boat, sunk by depth charges from *HMS Antelope* on 5 February 1940 with the loss of all 49 crew members (wrecksite.eu).

4.7. A further five unknown wrecks (**CA10-14**) are reported within the proposed survey corridor. One of these (**CA12**) is recorded twice within the NMS (W10987 & W10988) at the same location. For the purpose of this assessment they have therefore been treated as the same wreck record.

4.8. Little or no information is available for these wrecks and it is likely that these too refer to reports of losses, rather than the physical location of wrecks themselves. The locations of wrecks (**CA6-14**) should therefore be considered tentative at best. Their approximate positions will nevertheless be shared with FGMG, ensuring that the survey company is aware of the potential to encounter cultural remains at or in the vicinity of these locations. These assets will be re-assessed following the rapid assessment of the marine geophysical survey data, and proposed mitigation measures updated or adapted accordingly. They will not, however, be considered further here.

Assessment of significance

4.9. Using the matrix outlined in Table 1 (above), the significance of the five remaining assets (**CA1-5**) has been assessed as **high** (Table 5).

Table 5 Assessment of significance and proposed mitigation

CA number	Name	Significance	Magnitude of impact	Significance of potential effect	Proposed mitigation	Residual effect
CA1	*Vapper (SS)*	High	High	Moderate	100m AEZ	Negligible
CA2	*Kruguen (MFV)*	High	High	Moderate	100m AEZ	Negligible
CA3	*San Julian*	High	High	Moderate	100m AEZ	Negligible
CA4	*San Julian*	High	High	Moderate	100m AEZ	Negligible
CA5	*Sonia Nancy*	High	High	Moderate	100m AEZ	Negligible

Assessment of magnitude and significance of effect

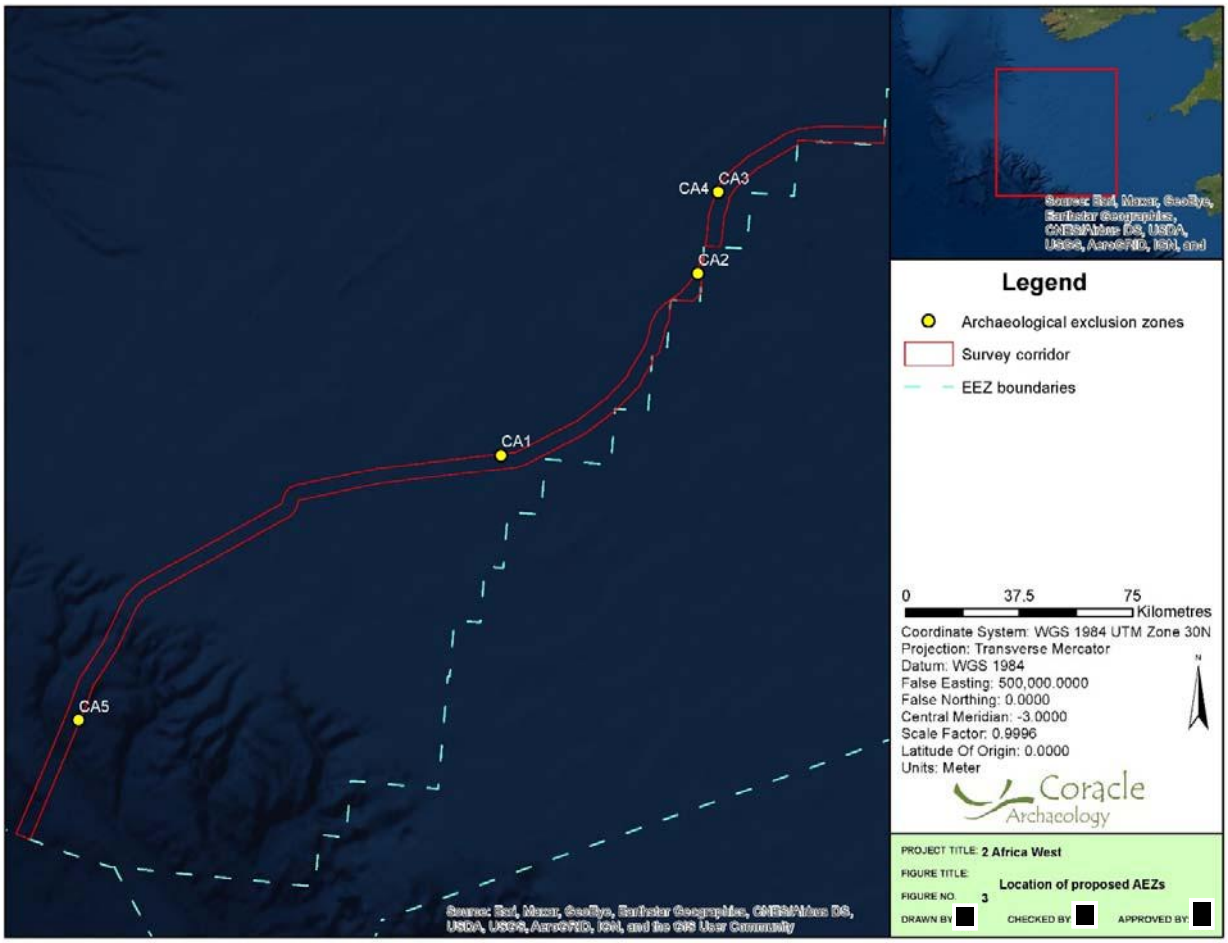
4.10. The assessment of magnitude and significance of effect are presented in Table 5, including proposed mitigation and assessment of the significance of residual effects.

4.11. The exact locations of the geo-technical investigations (GC, GS, pCPT) are yet to be determined. However, should they take place in the vicinity of any of the known wrecks listed in table 5 (**CA1-5**), they have the potential to result in the loss of one or more key elements of the historic assets, substantially reducing their value. The magnitude of impact on these historic assets is therefore considered to be **high**; the potential significance of effect is **moderate** and so mitigation is required.

5. PROPOSED MITIGATION

5.1. As stated, there is potential for impact on the five known live wrecks identified within the proposed survey corridor (**CA1-5**; table 5).

5.2. The potential impact is primarily from the invasive nature of the geotechnical investigations themselves. To mitigate this impact, an archaeological exclusion zone (AEZ) of 100m has been imposed around each of these assets (figure 3). After mitigation, the effect on these historic assets has been assessed to be **negligible**.


CA4
CA3
CA2
CA1
CA5
Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and
Legend
Archaeological exclusion zones
Survey corridor
EEZ boundaries
0
37.5
75
Kilometres
Coordinate System: WGS 1984 UTM Zone 30N
Projection: Transverse Mercator
Datum: WGS 1984
False Easting: 500,000.0000
False Northing: 0.0000
Central Meridian: -3.0000
Scale Factor: 0.9996
Latitude Of Origin: 0.0000
Units: Meter
N
Coracle
Archaeology
PROJECT TITLE: 2 Africa West
FIGURE TITLE: Location of proposed AEZs
FIGURE NO. 3
DRAWN BY
CHECKED BY
APPROVED BY

5.3. AEZs will apply to any activities that may disturb the seabed, within which all development-related activities will be prohibited. As no project-specific marine geophysical surveys have yet been conducted, the AEZs are of sufficient size to encompass potential reporting errors, scatter and debris. Each asset has been assigned an AEZ with a radius of 100m, which may be reassessed following the review of marine geophysical survey data.

5.4. AEZs have been defined following professional recommendations (Dix 2008) and converted into circular AEZs, with a defined centre point to encapsulate the required AEZ. The extent of the suggested circular AEZ is therefore sufficiently large to encompass the area that would be defined by a polygon, following the procedures outlined in Dix (2008). The use of a centre point and set radius has been deemed the most robust method when attempting to incorporate AEZs into different vessel navigation systems. This reduces the risk of accidental incursions into AEZs, and possible impacts on the potential asset within, during site works.

5.5. The implementation of a reporting protocol for archaeological discoveries is also recommended. The protocol would simply:

- outline what actions need to be undertaken in the event that any unexpected archaeology should be encountered;
- the likely nature of any potential discoveries;
- the roles and responsibilities of the survey teams; and
- contact details for the archaeological consultant (who would then liaise as necessary with the Underwater Archaeology Unit (UAU).

5.6. A reporting protocol is intended to mitigate risks to previously unidentified cultural heritage assets that may result from the geotechnical investigations. This would also entail the engagement of an archaeological consultant throughout the survey period, capable of providing advice and guidance to the survey teams. A reporting protocol has been prepared and submitted in conjunction with this impact assessment.

5.7. Coracle Archaeology will conduct a rapid assessment of marine geophysical survey data, prior to determining locations for geo-technical investigations. This will further mitigate the potential for these investigations to impact upon potentially unidentified cultural heritage assets.

5.8. The relative scarcity of known and, crucially, located historic assets within the proposed survey corridor, and the rapid archaeological assessment of geophysical survey data in the proposed geotechnical locations, suggests that the potential to encounter unexpected cultural remains during the geo-technical investigations is considered low. This will be reassessed following the archaeological review of marine geophysical survey data. Any encounters with previously unknown archaeological sites, features or assets will be mitigated through the implementation of the reporting protocol.

6. REFERENCES

Dix, J. 2008. Modelling Exclusion Zones for Marine Aggregate Dredging https://doi.org/10.5284/1000038

Government of Ireland. 1999. *Framework and Principles for the Protection of the Archaeological Heritage*. Dublin: DAHG Stationery Office

Online Resources

National Monuments Service Wreck Viewer [accessed November 2020]

https://www.archaeology.ie

Wreck Site [accessed November 2020]

https://www.wrecksite.eu

Appendix II NBDC data

Table A.II-1 provides a list of all species recorded in these areas that possess a specific designation, such as Invasive Species or Protected Species.

Table A.II-1. *NBDC Species Data*

Species Name	Date of Record	Designation
50km Square - T14.34.12.882		
Common Porpoise (Phocoena phocoena)	*23/05/2016*	*Protected Species: EU Habitats Directive || Protected Species: EU Habitats Directive >> Annex II || Protected Species: EU Habitats Directive >> Annex IV || Protected Species: Wildlife Acts || Threatened Species: OSPAR Convention*
Grey Seal (Halichoerus grypus)	*26/10/2009*	*Protected Species: EU Habitats Directive || Protected Species: EU Habitats Directive >> Annex II || Protected Species: EU Habitats Directive >> Annex V || Protected Species: Wildlife Acts*
Common Dolphin (Delphinus delphis)	*23/11/2015*	*Protected Species: EU Habitats Directive || Protected Species: EU Habitats Directive >> Annex IV || Protected Species: Wildlife Acts*
Cory's Shearwater (Calonectris diomedea)	*24/07/1980*	*Protected Species: Wildlife Acts || Protected Species: EU Birds Directive || Protected Species: EU Birds Directive >> Annex I Bird Species || Threatened Species: Birds of Conservation Concern || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List*
European Storm-petrel (Hydrobates pelagicus)	*23/07/1994*	*Protected Species: Wildlife Acts || Protected Species: EU Birds Directive || Protected Species: EU Birds Directive >> Annex I Bird Species || Threatened Species: Birds of Conservation Concern || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List*
Merlin (Falco columbarius)	*16/10/1980*	*Protected Species: Wildlife Acts || Protected Species: EU Birds Directive || Protected Species: EU Birds Directive >> Annex I Bird Species || Threatened Species: Birds of Conservation Concern || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List*
Black-legged Kittiwake (Rissa tridactyla)	*13/11/2016*	*Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List*
Common Guillemot (Uria aalge)	*16/12/1991*	*Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List*
Great Black-backed Gull (Larus marinus)	*16/10/1980*	*Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List*
Great Skua (Stercorarius skua)	*23/07/1994*	*Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List*
Lesser Black-backed Gull (Larus fuscus)	*23/07/1994*	*Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List*
Northern Gannet (Morus bassanus)	*23/07/1994*	*Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List*
Black-headed Gull (Larus ridibundus)	*16/10/1980*	*Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Red List*
Sooty Shearwater (Puffinus griseus)	*16/10/1980*	*Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Red List*
Skate (Dipturus batis)	*15/11/1997*	*Threatened Species: OSPAR Convention*
Spurdog (Squalus acanthias)	*02/12/2014*	*Threatened Species: OSPAR Convention*
50km Square - T14.32.35.206		
Bottle-nosed Dolphin (Tursiops truncatus)	*17/12/2016*	*Protected Species: EU Habitats Directive || Protected Species: EU Habitats Directive >> Annex II || Protected Species: EU Habitats Directive >> Annex IV || Protected Species: Wildlife Acts*

Common Porpoise (Phocoena phocoena)	*23/05/2016*	*Protected Species: EU Habitats Directive || Protected Species: EU Habitats Directive >> Annex II || Protected Species: EU Habitats Directive >> Annex IV || Protected Species: Wildlife Acts || Threatened Species: OSPAR Convention*
Common Dolphin (Delphinus delphis)	*27/02/2010*	*Protected Species: EU Habitats Directive || Protected Species: EU Habitats Directive >> Annex IV || Protected Species: Wildlife Acts*
Cory's Shearwater (Calonectris diomedea)	*30/08/1998*	*Protected Species: Wildlife Acts || Protected Species: EU Birds Directive || Protected Species: EU Birds Directive >> Annex I Bird Species || Threatened Species: Birds of Conservation Concern || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List*
European Storm-petrel (Hydrobates pelagicus)	*19/07/1994*	*Protected Species: Wildlife Acts || Protected Species: EU Birds Directive || Protected Species: EU Birds Directive >> Annex I Bird Species || Threatened Species: Birds of Conservation Concern || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List*
Atlantic Puffin (Fratercula arctica)	*05/11/1992*	*Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List*
Black-legged Kittiwake (Rissa tridactyla)	*16/01/2016*	*Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List*
Great Black-backed Gull (Larus marinus)	*13/05/1992*	*Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List*
Great Skua (Stercorarius skua)	*30/08/1998*	*Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List*
Lesser Black-backed Gull (Larus fuscus)	*30/08/1998*	*Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List*
Manx Shearwater (Puffinus puffinus)	*19/07/1994*	*Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List*
Northern Gannet (Morus bassanus)	*15/07/2015*	*Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List*
Herring Gull (Larus argentatus)	*13/05/1992*	*Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Red List*
50km Square - T14.30.59.854		
Bottle-nosed Dolphin (Tursiops truncatus)	*17/12/2016*	*Protected Species: EU Habitats Directive || Protected Species: EU Habitats Directive >> Annex II || Protected Species: EU Habitats Directive >> Annex IV || Protected Species: Wildlife Acts*
Common Porpoise (Phocoena phocoena)	*23/05/2016*	*Protected Species: EU Habitats Directive || Protected Species: EU Habitats Directive >> Annex II || Protected Species: EU Habitats Directive >> Annex IV || Protected Species: Wildlife Acts || Threatened Species: OSPAR Convention*
Common Dolphin (Delphinus delphis)	*09/04/2015*	*Protected Species: EU Habitats Directive || Protected Species: EU Habitats Directive >> Annex IV || Protected Species: Wildlife Acts*
Cory's Shearwater (Calonectris diomedea)	*03/07/1992*	*Protected Species: Wildlife Acts || Protected Species: EU Birds Directive || Protected Species: EU Birds Directive >> Annex I Bird Species || Threatened Species: Birds of Conservation Concern || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List*
European Storm-petrel (Hydrobates pelagicus)	*30/06/1994*	*Protected Species: Wildlife Acts || Protected Species: EU Birds Directive || Protected Species: EU Birds Directive >> Annex I Bird Species || Threatened Species: Birds of Conservation Concern || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List*
Atlantic Puffin (Fratercula arctica)	*04/11/1992*	*Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List*
Black-legged Kittiwake (Rissa tridactyla)	*17/12/2016*	*Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List*
Great Skua (Stercorarius skua)	*04/11/1992*	*Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List*
Lesser Black-backed Gull (Larus fuscus)	*05/09/1991*	*Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List*
Manx Shearwater (Puffinus puffinus)	*23/05/2016*	*Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List*

Northern Gannet (Morus bassanus)	*17/12/2016*	*Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List*
Sooty Shearwater (Puffinus griseus)	*04/09/1991*	*Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Red List*
Skate (Dipturus batis)	*13/11/2013*	*Threatened Species: OSPAR Convention*
50km Square - T14.30.23.899		
Bottle-nosed Dolphin (Tursiops truncatus)	*17/12/2016*	*Protected Species: EU Habitats Directive || Protected Species: EU Habitats Directive >> Annex II || Protected Species: EU Habitats Directive >> Annex IV || Protected Species: Wildlife Acts*
Common Dolphin (Delphinus delphis)	*27/02/2010*	*Protected Species: EU Habitats Directive || Protected Species: EU Habitats Directive >> Annex IV || Protected Species: Wildlife Acts*
Common Tern (Sterna hirundo)	*11/07/1989*	*Protected Species: Wildlife Acts || Protected Species: EU Birds Directive || Protected Species: EU Birds Directive >> Annex I Bird Species || Threatened Species: Birds of Conservation Concern || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List*
European Storm-petrel (Hydrobates pelagicus)	*11/07/1989*	*Protected Species: Wildlife Acts || Protected Species: EU Birds Directive || Protected Species: EU Birds Directive >> Annex I Bird Species || Threatened Species: Birds of Conservation Concern || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List*
Atlantic Puffin (Fratercula arctica)	*12/12/1991*	*Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List*
Black-legged Kittiwake (Rissa tridactyla)	*17/12/2016*	*Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List*
Common Guillemot (Uria aalge)	*25/03/1991*	*Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List*
Great Black-backed Gull (Larus marinus)	*04/04/1992*	*Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List*
Great Skua (Stercorarius skua)	*04/11/1992*	*Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List*
Lesser Black-backed Gull (Larus fuscus)	*04/04/1992*	*Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List*
Manx Shearwater (Puffinus puffinus)	*23/05/2016*	*Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List*
Northern Gannet (Morus bassanus)	*23/05/2016*	*Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List*
50km Square - T14.29.51.047		
Common Porpoise (Phocoena phocoena)	*22/06/2015*	*Protected Species: EU Habitats Directive || Protected Species: EU Habitats Directive >> Annex II || Protected Species: EU Habitats Directive >> Annex IV || Protected Species: Wildlife Acts || Threatened Species: OSPAR Convention*
Grey Seal (Halichoerus grypus)	*10/08/2012*	*Protected Species: EU Habitats Directive || Protected Species: EU Habitats Directive >> Annex II || Protected Species: EU Habitats Directive >> Annex V || Protected Species: Wildlife Acts*
Common Dolphin (Delphinus delphis)	*29/04/1995*	*Protected Species: EU Habitats Directive || Protected Species: EU Habitats Directive >> Annex IV || Protected Species: Wildlife Acts*
Long-finned Pilot Whale (Globicephala melas)	*07/06/1989*	*Protected Species: EU Habitats Directive || Protected Species: EU Habitats Directive >> Annex IV || Protected Species: Wildlife Acts*
European Storm-petrel (Hydrobates pelagicus)	*04/07/1995*	*Protected Species: Wildlife Acts || Protected Species: EU Birds Directive || Protected Species: EU Birds Directive >> Annex I Bird Species || Threatened Species: Birds of Conservation Concern || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List*
Atlantic Puffin (Fratercula arctica)	*07/11/1995*	*Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List*
Black-legged Kittiwake (Rissa tridactyla)	*16/01/2016*	*Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List*

Great Skua (Stercorarius skua)	*04/05/2001*	*Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List*
Manx Shearwater (Puffinus puffinus)	*29/04/1995*	*Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List*
Northern Gannet (Morus bassanus)	*23/06/2001*	*Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List*
Sooty Shearwater (Puffinus griseus)	*20/07/1994*	*Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Red List*
50km Square - T14.29.28.863		
Bottle-nosed Dolphin (Tursiops truncatus)	*15/03/2017*	*Protected Species: EU Habitats Directive || Protected Species: EU Habitats Directive >> Annex II || Protected Species: EU Habitats Directive >> Annex IV || Protected Species: Wildlife Acts*
Common Dolphin (Delphinus delphis)	*11/07/2005*	*Protected Species: EU Habitats Directive || Protected Species: EU Habitats Directive >> Annex IV || Protected Species: Wildlife Acts*
Minke Whale (Balaenoptera acutorostrata)	*11/07/2005*	*Protected Species: EU Habitats Directive || Protected Species: EU Habitats Directive >> Annex IV || Protected Species: Wildlife Acts*
Common Tern (Sterna hirundo)	*16/05/1996*	*Protected Species: Wildlife Acts || Protected Species: EU Birds Directive || Protected Species: EU Birds Directive >> Annex I Bird Species || Threatened Species: Birds of Conservation Concern || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List*
Cory's Shearwater (Calonectris diomedea)	*14/08/1998*	*Protected Species: Wildlife Acts || Protected Species: EU Birds Directive || Protected Species: EU Birds Directive >> Annex I Bird Species || Threatened Species: Birds of Conservation Concern || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List*
European Storm-petrel (Hydrobates pelagicus)	*16/05/1996*	*Protected Species: Wildlife Acts || Protected Species: EU Birds Directive || Protected Species: EU Birds Directive >> Annex I Bird Species || Threatened Species: Birds of Conservation Concern || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List*
Barn Swallow (Hirundo rustica)	*16/05/1996*	*Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List*
Black-legged Kittiwake (Rissa tridactyla)	*04/05/2001*	*Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List*
Great Skua (Stercorarius skua)	*04/05/2001*	*Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List*
Lesser Black-backed Gull (Larus fuscus)	*16/05/1996*	*Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List*
Manx Shearwater (Puffinus puffinus)	*29/04/1995*	*Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List*
Northern Gannet (Morus bassanus)	*04/05/2001*	*Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List*
Porbeagle (Lamna nasus)	*11/11/1997*	*Threatened Species: OSPAR Convention*
Skate (Dipturus batis)	*11/11/1997*	*Threatened Species: OSPAR Convention*
50km Square - T14.28.27.437		
Bottle-nosed Dolphin (Tursiops truncatus)	*15/03/2017*	*Protected Species: EU Habitats Directive || Protected Species: EU Habitats Directive >> Annex II || Protected Species: EU Habitats Directive >> Annex IV || Protected Species: Wildlife Acts*
Atlantic White-sided Dolphin (Lagenorhynchus acutus)	*02/06/2007*	*Protected Species: EU Habitats Directive || Protected Species: EU Habitats Directive >> Annex IV || Protected Species: Wildlife Acts*
Common Dolphin (Delphinus delphis)	*25/02/2010*	*Protected Species: EU Habitats Directive || Protected Species: EU Habitats Directive >> Annex IV || Protected Species: Wildlife Acts*
Long-finned Pilot Whale (Globicephala melas)	*15/03/2017*	*Protected Species: EU Habitats Directive || Protected Species: EU Habitats Directive >> Annex IV || Protected Species: Wildlife Acts*
Cory's Shearwater (Calonectris diomedea)	*14/08/1998*	*Protected Species: Wildlife Acts || Protected Species: EU Birds Directive || Protected Species: EU Birds Directive >> Annex I Bird Species || Threatened Species: Birds of Conservation Concern || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List*

European Storm-petrel (Hydrobates pelagicus)	*14/08/1998*	*Protected Species: Wildlife Acts || Protected Species: EU Birds Directive || Protected Species: EU Birds Directive >> Annex I Bird Species || Threatened Species: Birds of Conservation Concern || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List*
Atlantic Puffin (Fratercula arctica)	*16/05/1996*	*Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List*
Black-legged Kittiwake (Rissa tridactyla)	*04/05/2001*	*Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List*
Great Skua (Stercorarius skua)	*15/03/2017*	*Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List*
Lesser Black-backed Gull (Larus fuscus)	*04/05/2001*	*Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List*
Manx Shearwater (Puffinus puffinus)	*16/05/1996*	*Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List*
Northern Gannet (Morus bassanus)	*04/05/2001*	*Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List*
Skate (Dipturus batis)	*11/11/1997*	*Threatened Species: OSPAR Convention*
50km Square - T14.27.36.659		
Grey Seal (Halichoerus grypus)	*03/11/2009*	*Protected Species: EU Habitats Directive || Protected Species: EU Habitats Directive >> Annex II || Protected Species: EU Habitats Directive >> Annex V || Protected Species: Wildlife Acts*
Atlantic White-sided Dolphin (Lagenorhynchus acutus)	*05/06/2007*	*Protected Species: EU Habitats Directive || Protected Species: EU Habitats Directive >> Annex IV || Protected Species: Wildlife Acts*
Common Dolphin (Delphinus delphis)	*25/02/2010*	*Protected Species: EU Habitats Directive || Protected Species: EU Habitats Directive >> Annex IV || Protected Species: Wildlife Acts*
Fin Whale (Balaenoptera physalus)	*26/06/2011*	*Protected Species: EU Habitats Directive || Protected Species: EU Habitats Directive >> Annex IV || Protected Species: Wildlife Acts*
Long-finned Pilot Whale (Globicephala melas)	*25/02/2010*	*Protected Species: EU Habitats Directive || Protected Species: EU Habitats Directive >> Annex IV || Protected Species: Wildlife Acts*
Common Tern (Sterna hirundo)	*16/05/1996*	*Protected Species: Wildlife Acts || Protected Species: EU Birds Directive || Protected Species: EU Birds Directive >> Annex I Bird Species || Threatened Species: Birds of Conservation Concern || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List*
European Storm-petrel (Hydrobates pelagicus)	*16/05/1996*	*Protected Species: Wildlife Acts || Protected Species: EU Birds Directive || Protected Species: EU Birds Directive >> Annex I Bird Species || Threatened Species: Birds of Conservation Concern || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List*
Black-legged Kittiwake (Rissa tridactyla)	*03/04/2001*	*Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List*
Great Skua (Stercorarius skua)	*08/02/1995*	*Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List*
Lesser Black-backed Gull (Larus fuscus)	*16/05/1996*	*Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List*
Northern Gannet (Morus bassanus)	*03/04/2001*	*Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List*
Porbeagle (Lamna nasus)	*18/08/1993*	*Threatened Species: OSPAR Convention*
50km Square - T14.26.44.765		
Bottle-nosed Dolphin (Tursiops truncatus)	*18/08/1993*	*Protected Species: EU Habitats Directive || Protected Species: EU Habitats Directive >> Annex II || Protected Species: EU Habitats Directive >> Annex IV || Protected Species: Wildlife Acts*
Grey Seal (Halichoerus grypus)	*05/05/2011*	*Protected Species: EU Habitats Directive || Protected Species: EU Habitats Directive >> Annex II || Protected Species: EU Habitats Directive >> Annex V || Protected Species: Wildlife Acts*
Common Dolphin (Delphinus delphis)	*25/02/2010*	*Protected Species: EU Habitats Directive || Protected Species: EU Habitats Directive >> Annex IV || Protected Species: Wildlife Acts*

Striped Dolphin (Stenella coeruleoalba)	*18/08/1993*	*Protected Species: EU Habitats Directive || Protected Species: EU Habitats Directive >> Annex IV || Protected Species: Wildlife Acts*
Great Skua (Stercorarius skua)	*18/08/1993*	*Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List*
50km Square - T14.26.09.814		
None	*N/A*	*N/A*
50km Square - T14.23.25.628		
None	*N/A*	*N/A*
50km Square - T14.22.30.015		
None	*N/A*	*N/A*
50km Square - T14.22.01.676		
Grey Seal (Halichoerus grypus)	*09/03/2009*	*Protected Species: EU Habitats Directive || Protected Species: EU Habitats Directive >> Annex II || Protected Species: EU Habitats Directive >> Annex V || Protected Species: Wildlife Acts*

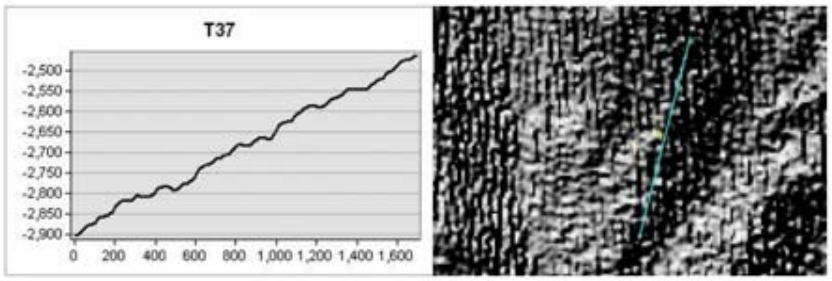
Appendix III – Vessel Specifications

Technical Specifications

DESCRIPTION / POSITIONING	Three state-of the art vessels, highly powerful for long stretch cable installation and burying in the harchest conditions. Duplex DP and Integrated Control System
OWNER	ALDA MARINE SERVICES S.A.S.
OPERATOR	LOUIS DREYFUS ARMATEURS S.A.S.
SHIP MANAGER	LOUIS DREYFUS ARMATEURS S.A.S.
FLAG	French
CONSTRUCTION YEAR	2002
LENGTH, OVERALL	140.36 m
BREADTH	23.40 m
DRAUGHT	8 m (summer draught)
DEADWEIGHT	9820 mt
ACCOMMODATION	Single cabins: 60, double cabins: 5
CABLE TANK CAPACITY	
main cable tank	2 x 2500 tonnes (max cap each tank: 3500 tonnes), 2 x 1500 m^3
spare cable tank	2 x 250 tonnes, 2 x 150 m^3
REPEATER STORAGE	2 x 100
CABLE MACHINERY	1 Linear Cable Engine – DOWTY 21 Wheels pair, 1 Drum Engine – DOWTY 6T DOHB / 28T Drum, 2 Transporter – DOWTY 2 Wheels Pairs, 1 Stern Hauler – DOWTY 2 Wheels Pairs
TYPE OF PLOUGH	1 SMD HD3 Plough – burial in all soils (including fractured rocks). Max burial: 3 m
CABLE LAYING SOFTWARE	MakaiLay
DYNAMIC POSITIONING	DP2 BV PDY MATAR Alstom
TRANSIT SPEED	15 knots
BOLLARD PULL	100 tonnes
POWER GENERATION	4 x 4320 kW MAK + 1 x 1360 kW MAK
THRUSTERS	2 x Lips 1500 kW Bow Thrusters 1 x Lips 720 rpm - 1500 kW AZ Fore Thruster 2 x Lips 1500 kW Aft Thrusters
PROPULSION	2 electrically driven fixed pitch propellers. Output 4000 kW each. Propeller diameter: 3700 mm. Max propeller speed: 146 rpm

Appendix IV Sea Rover Dives and cetacean distributions

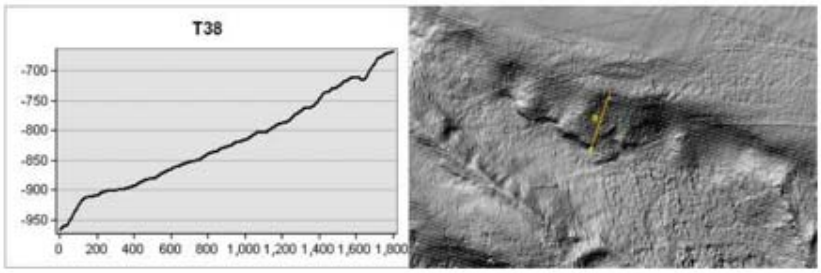
Transect 37 – Dive 648



P1. Water Depth: 2924m. **Feature:** Slope with occasional terraces and cliffs

'*Seafloor is of soft sediment on a steep slope with occasional terraces and cliffs. Conspicuous fauna is sparse and includes small tubes, foraminiferans, occasional ophiuroids and echinoids. Burrows are also noted. Further upslope the sea pen Distichoptilum is common along with the soft coral Anthomastus. Burrows are present, with some containing galatheid crabs*.'

Transect 38 – Dive 649

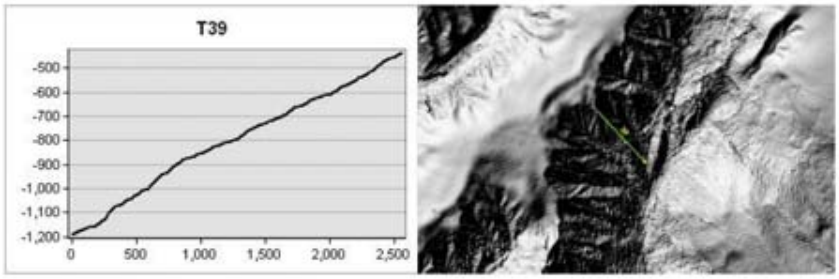


P2. Water Depth: 950m. **Feature:** Slope

Of note: Corals *Desmophyllum*, occasionally *Madrepora* and monofilament fishing line.

'*The bottom current is very strong and the seafloor is subject to scour, with development of wave forms throughout. Initially the substrate is pebbly, moving into ground dominated by coral rubble. Towards the top of the slope the substrate is sand. Fauna consists of clumps of live Desmophyllum and occasionally Madrepora. There are a lot of Clavulariidae octocorals and a single Acanthogorgia. The echinoid Cidaris is abundant, some anemones and hermit crabs also observed. The crinoid Koehlermetra porrecta is dense in places. Monofilament fishing line was observed towards the end of the dive*.'

Transect 39 – Dive 650

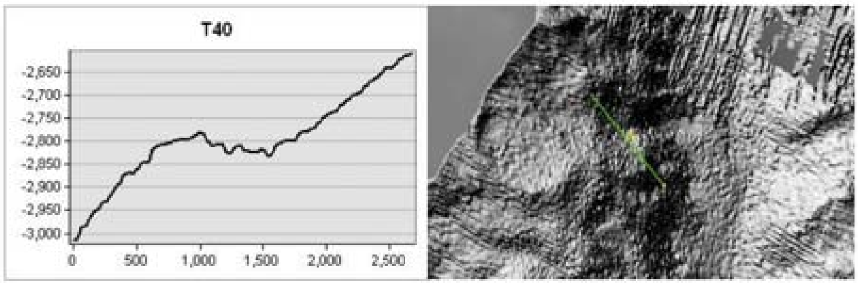


P1. Water Depth: 1184m. **Feature:** Slope with escarpment

Of note: Escarpments with coral (*Lepidisis* and *Madrepora*)

'*Unusual geology here in the form of large rounded pillars. The substrate is largely an overlay of fine sediment on carbonate rock. Larger outcrops, both carbonate and igneous, are also present. About midway through the dive a series of escarpments occur, first as small ridges then as very large vertical escarpments. Along the escarpments the biodiversity is rich and include the corals Lepidisis and Madrepora, crinoids and anemones. Orange roughy and octopuses are observed*.'

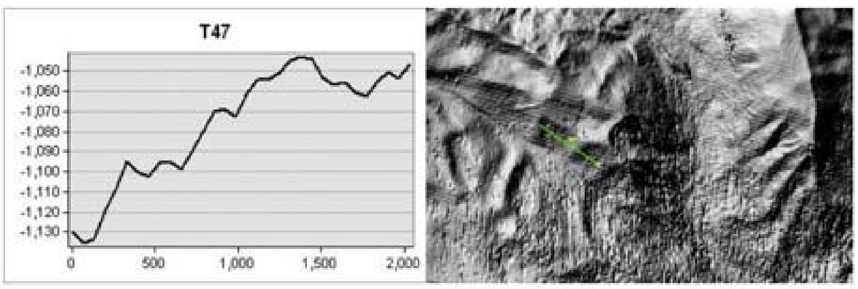
Transect 40 – Dive 651



P1. Water Depth: 3000m. **Feature:** Slope, depth

‘*Soft sediment throughout the dive. Numerous burrows and occasional pteropod shells are present. The main faunal components are worm tubes and holothurians. Occasional sea pens, echinothuiroids and elpidiids occur. The soft coral Anthomastus is observed as are some decapods and fish including grenadiers and scabbards. One or two cup corals observed; attempts made to collect one failed. No cores taken for technical reasons*.’

Transect 41 – Dive 652 (nearest to the proposed cable route in Canyon to the east)

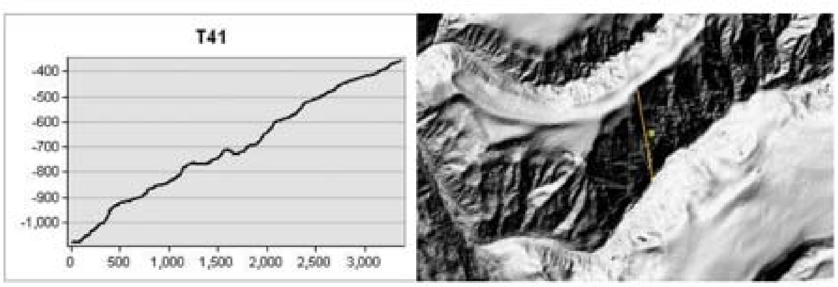


P1. Water Depth: 1115 m. **Feature:** Unknown area

Of note: Corals *Desmophyllum pertussum* and *Madrepora oculata*

‘*The seafloor is mainly soft sediment with some boulders. An area of coral reef is present with intermittent coral rubble followed by more soft sediment. The main faunal components are anemones and foraminifera. Sea pens, eels and fish are observed on the soft sediment. Glass sponges, the corals Desmophyllum pertussum and Madrepora occulata and crinoids are observed on boulders. An unknown anthozoan was collected. On the biogenic reef some gorgonian corals are observed which could not be identified*.’

Transect 42 – Dive 653

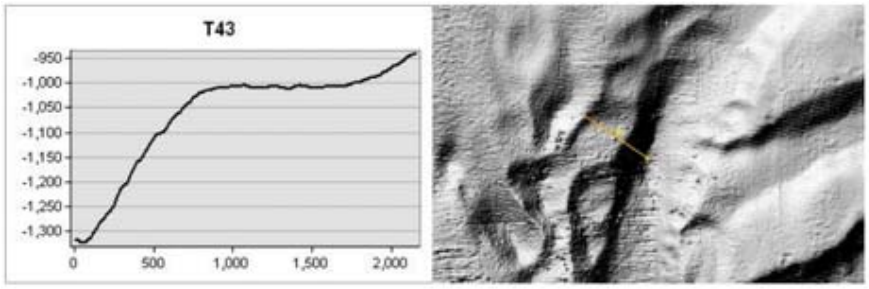


P2. Water Depth: 1074m**. Feature:** Unknown area

Of note: Fishing nets, rubbish

‘*The seafloor consists of ridges covered in coarse sand and sediment waves with occasional rocks. Towards the end of the dive, the topology becomes quite mountainous with towering shoulders of sediment containing many burrows. The fauna includes large barnacles, Swiftia, Desmophyllum, a variety of sea pens including Kophobelemnon and Pennatula are noted as are some ophiuroids. Numerous fish include Lepidion eques and eels. Much fishing gear is observed, entangled on rocks and much rubbish is also observed. Visibility is very poor due to suspended sediment in the water, possibly as a result of nearby trawling activity which was apparent on the radar*.’

Transect 43 – Dive 654

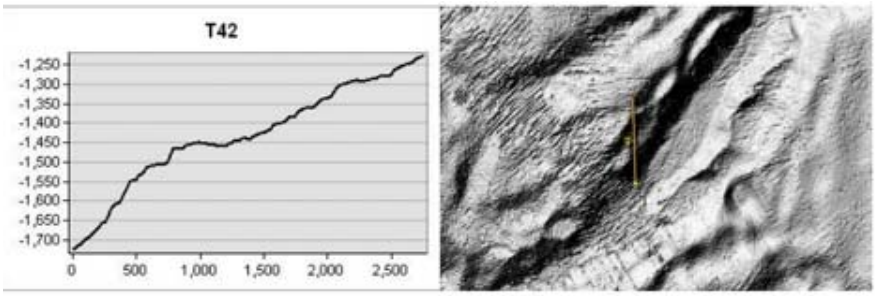


P2. Water Depth: 1328m**. Feature:** Slope

Of note: Sea pen field, fishing gear, plastic rubbish

'*An initial gentle incline with mixed sediment becomes more steep and meets vertical carbonate cliffs. The cliffs host only sparse epifauna. At the top of the cliffs there is a gentle to moderate slope with fine sediment containing some burrows. Occasional sparse cobbles and boulders are observed throughout the area. An extensive field of sea pens including Pennatula sp. and Kophobelemnon sp. occur, and the bamboo coral Acanella (both fir tree and bush-like forms) are recorded amongst the sea pens. Some fishing gear as well as plastic rubbish is observed on this dive. Dolphins (possibly common dolphins) were observed on the surface as the ROV was being deployed*.'

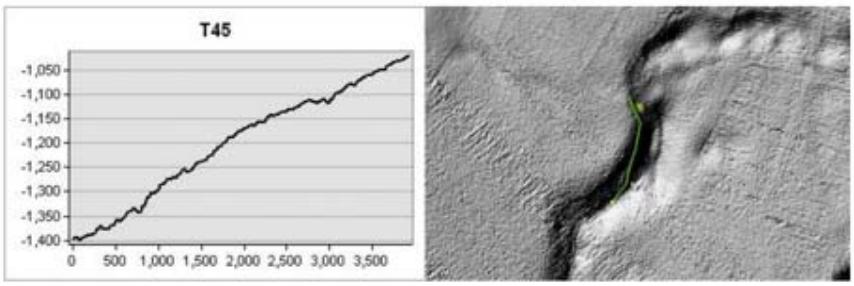
Transect 42 – Dive 655



P2. Water depth: 1735m. **Features:** Slope

'*A lot of marine snow over a very muddy, steep slope. Two Hyalonema sponges are observed, and one was sampled for zooanthids. Fauna are generally scarce and include seapens, cerianthids and occasional small sea stars. Fish (also scarce) include eels, grenadiers, some orange roughly and a cartilaginous fish*.'

Transect 45 – Dive 656

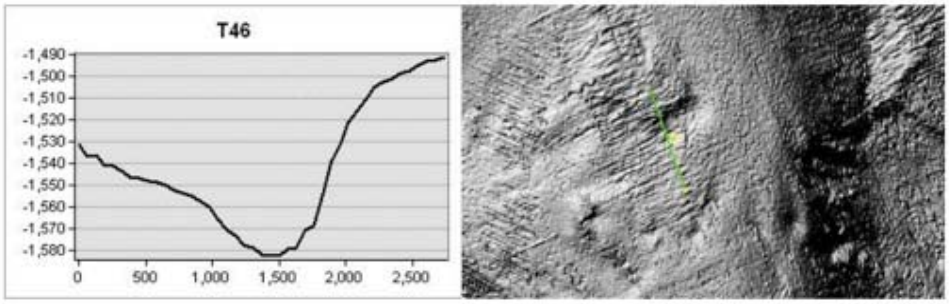


P1. Water depth: 1393m. **Features:** Ridge

Of note: Bamboo coral stalks, marine litter, fishing line and net

'*Seafloor is initially soft, sandy sediment. Boulders, large basalt rocks and carbonate terraces are present towards the end of the dive. Bare stalks of bamboo corals are present on these rocks. Sea pens and cerianthids are abundant with evidence of coral rubble. Occasional Hyalonema sponges, stalked crinoids and the octocoral Umbellula sp. are observed. A Hyalonema specimen (with zooanthids on its stalk) and a large Anthomastus sp. were sampled*.'

Transect 46 – Dive 657

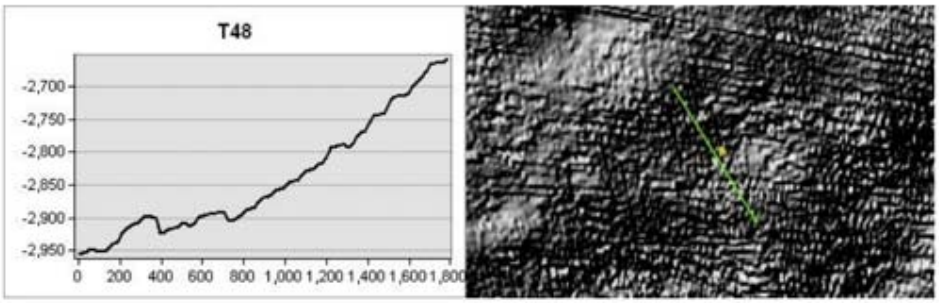


P1. Water depth: 1516m – 1537m. **Feature:** Downhill slope.

Of note: Abundant and diverse fish species

'*The seafloor consists of soft muddy bottom with many burrows and varying morphology, on a gentle slope. There is very little marine snow and limited current. Epifauna is scarce and consists mainly of cerianthids and very small sea pens (possibly Anthoptilium). Fish species included eels, grenadiers, a Bathypterios sp. and a chimerid. An enormous stalked hexactinellid (Hyalonema – like), the head of which was at least 30 cm across was observed*.'

Transect 48 – Dive 658



P1. Water depth: 2900m. **Feature:** Gentle, muddy slope

'*The seafloor is a soft muddy bottom on a gentle slope with frequent burrows. Epifauna is sparse and includes a variety of holothurians and the octocoral Radicipes sp.. Flocculent material, most likely marine snow is observed. Litter identified included plastic and metal*.'

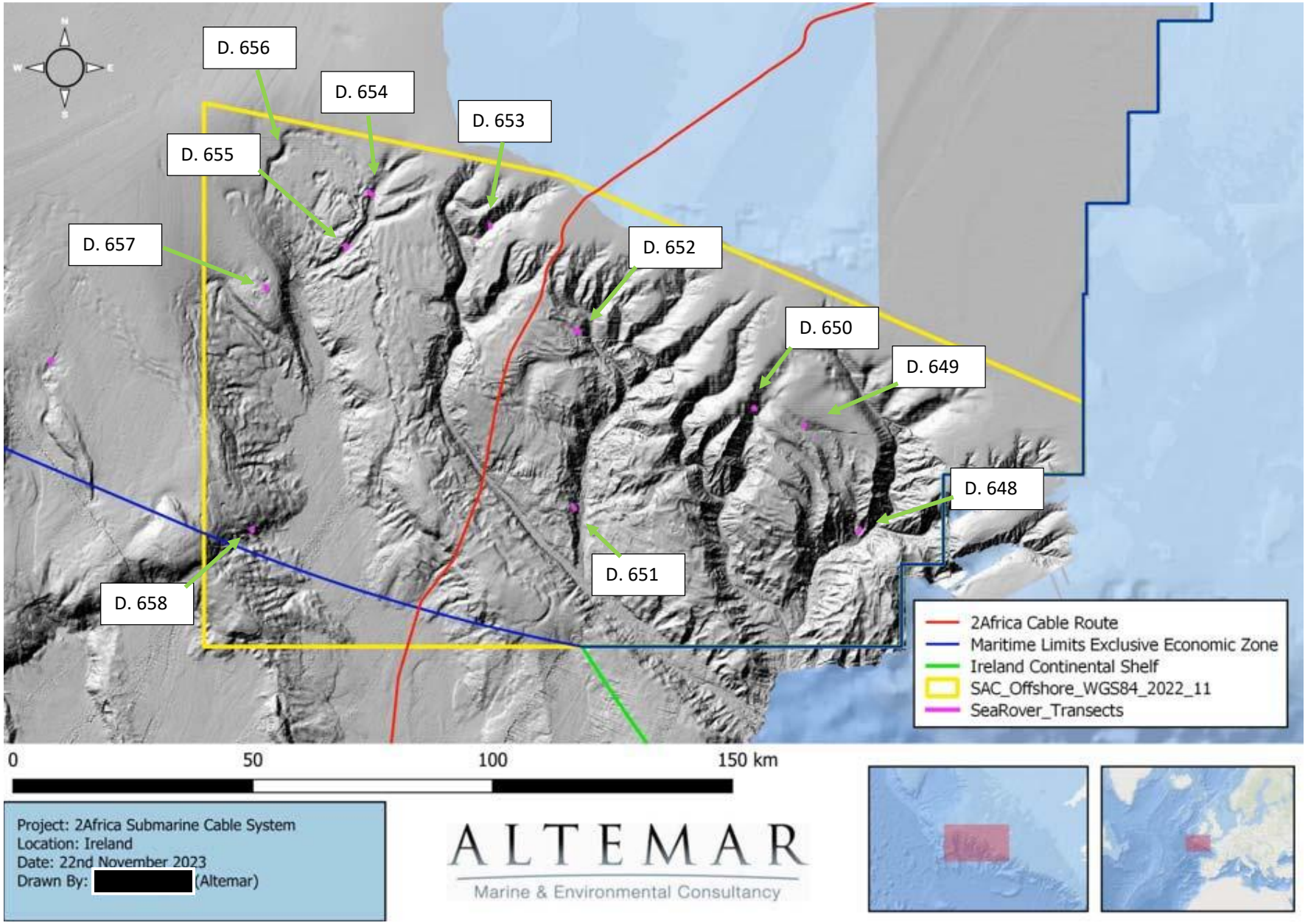


Figure APIV-1: Position of offshore fibre optic route in relation to the Irish EEZ, Designated Irish Continental shelf, Offshore SAC's, SeaRover 2019 Dives (Infomar Shaded Relief)

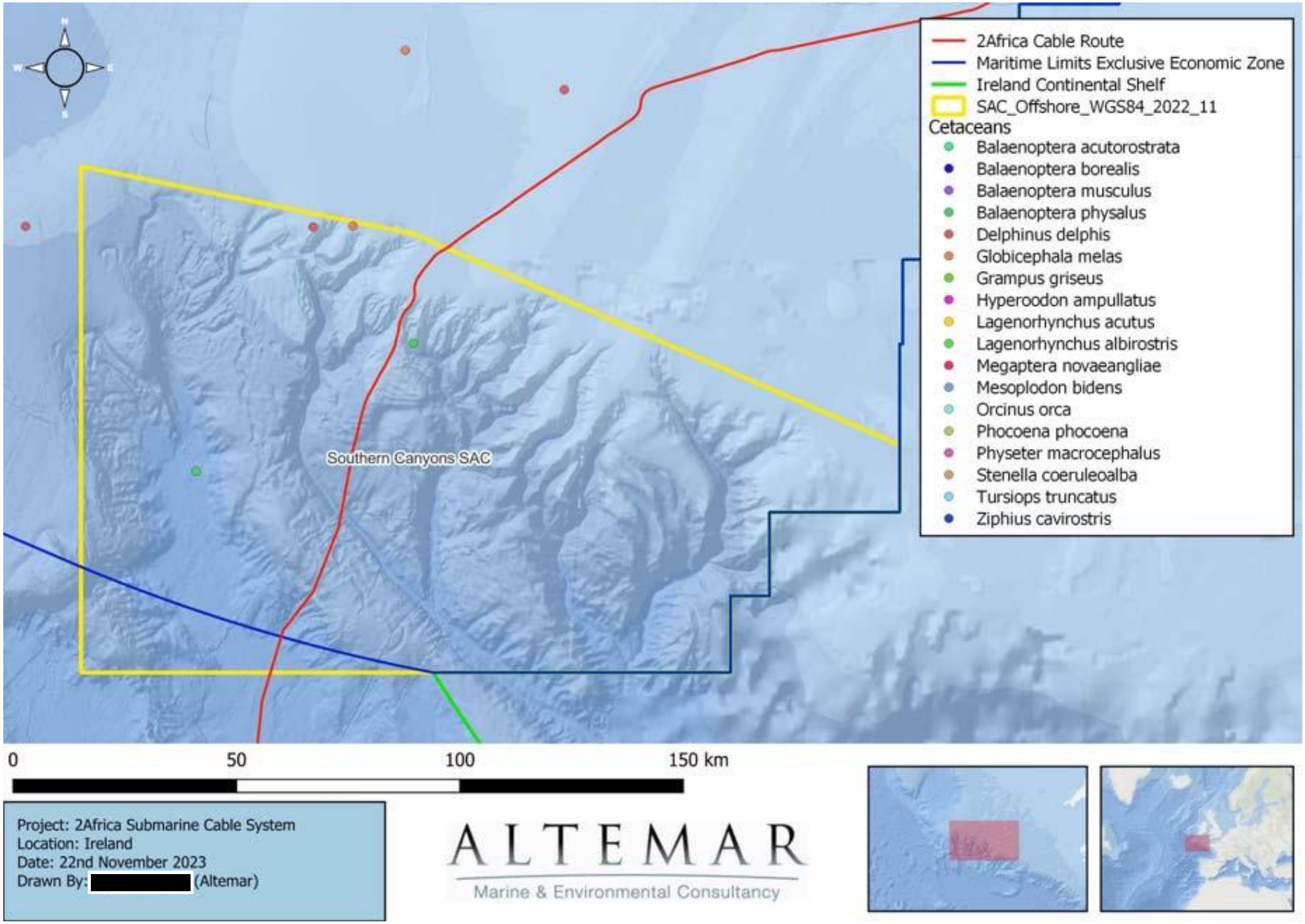


Figure APIV-2. Recorded Cetacean sightings in Southern Canyons SAC

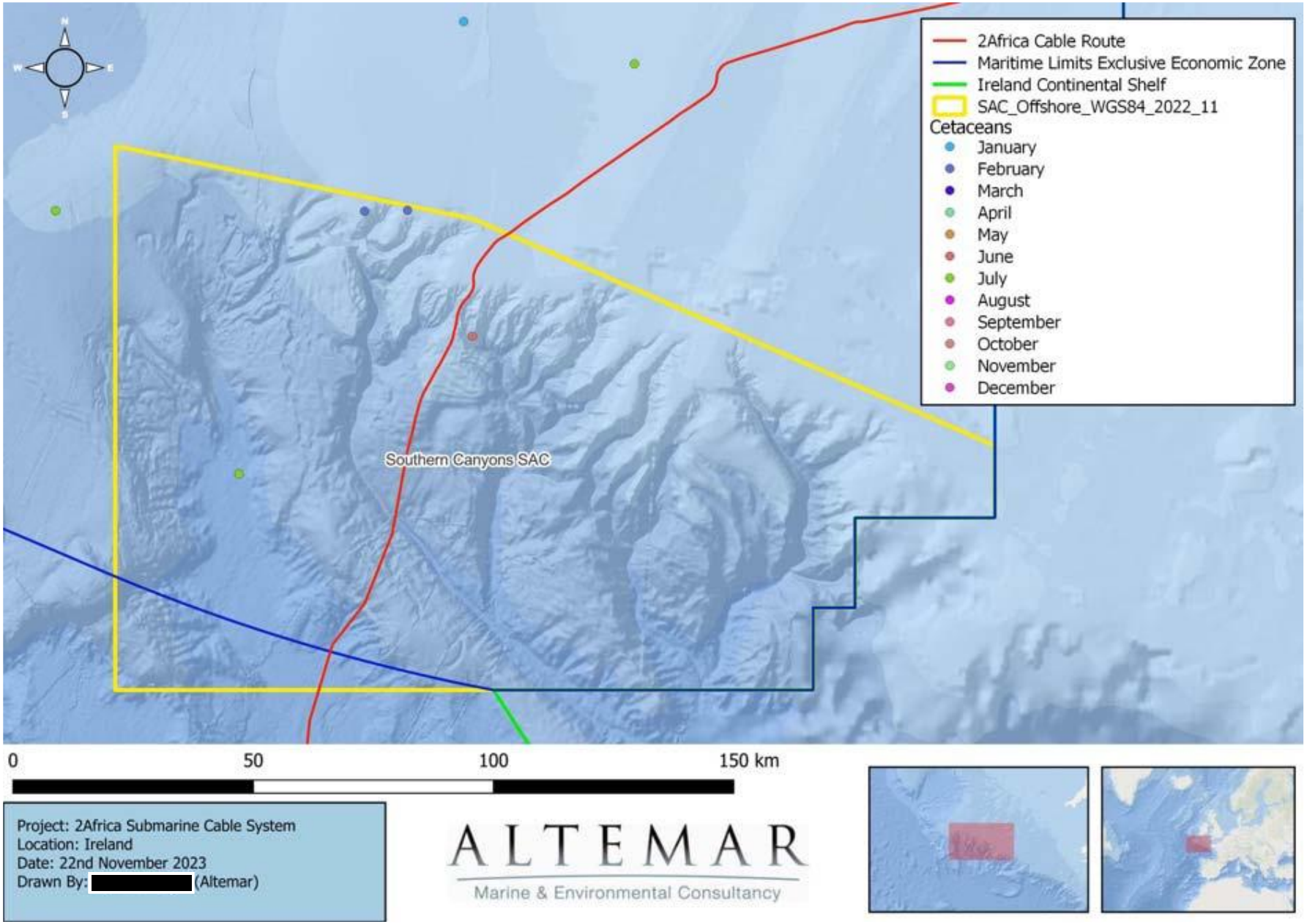
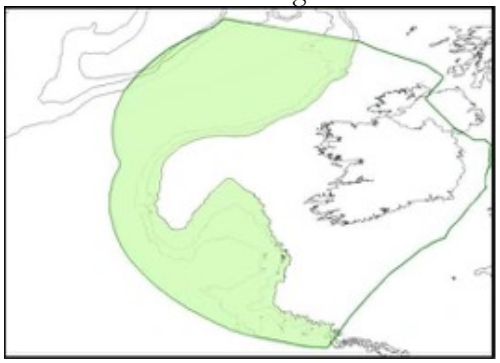
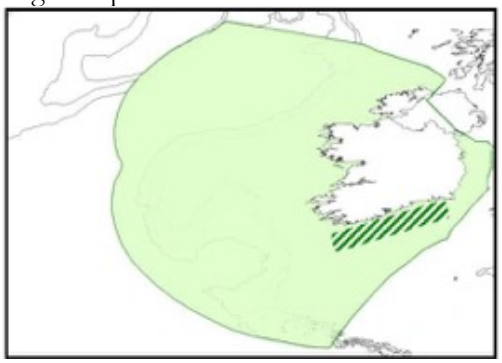


Figure APIV-3. Recorded Cetacean sightings (Month) in Southern Canyons SAC.

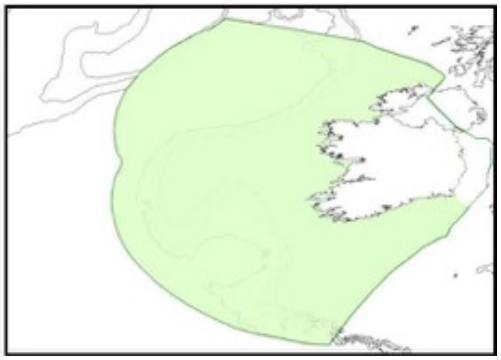
= Cetacean habitat = High number of records v) = Vagrant species



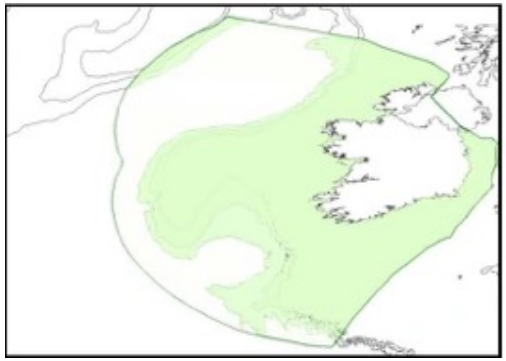
Blue whale



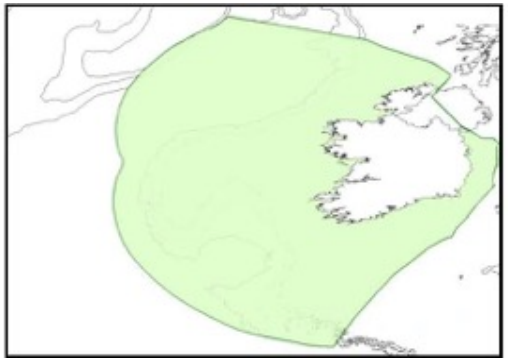
Fin whale



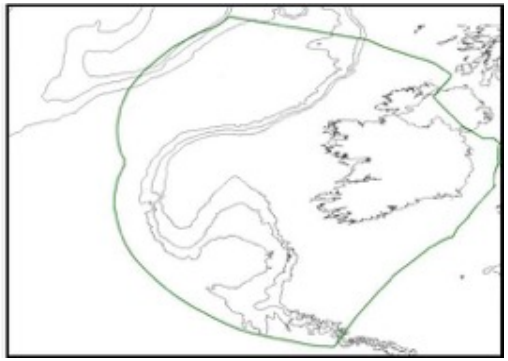
Sei whale



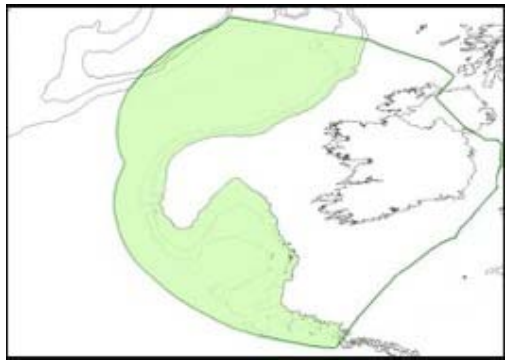
Minke whale



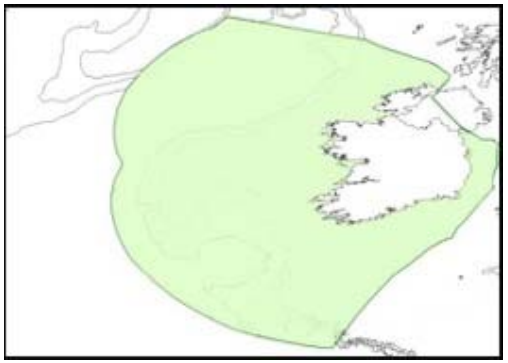
Humpback whale



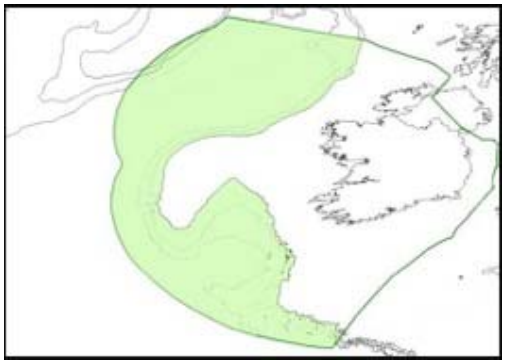
Northern right whale (v)



Sperm whale

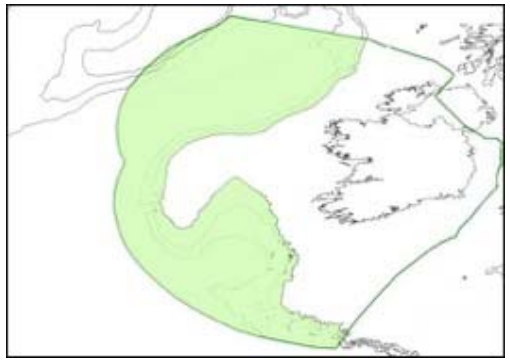


Northern bottlenose whale

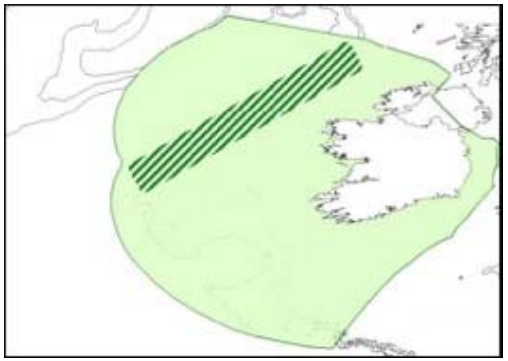


Sowerby's beaked whale

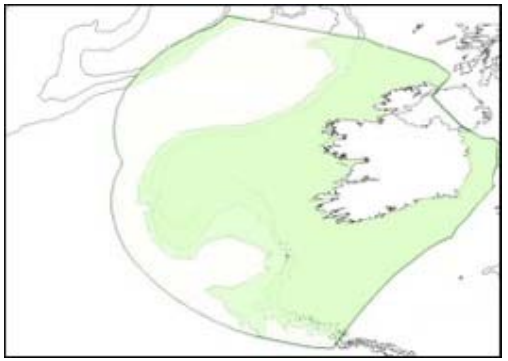
Figure APII-10. Distribution of Cetacean species in the Irish EEZ (Source NPWS).



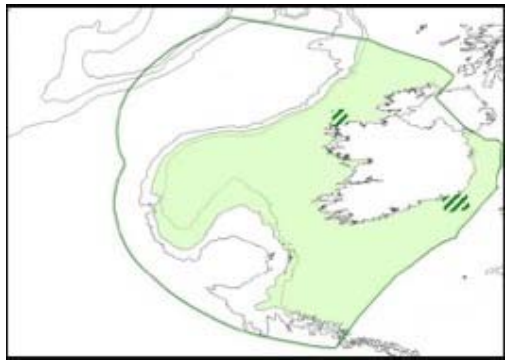
Cuvier's beaked whale



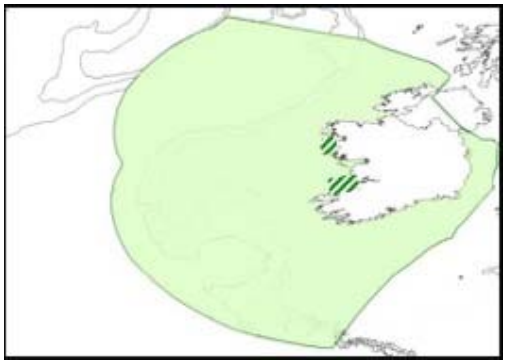
Long-finned pilot whale



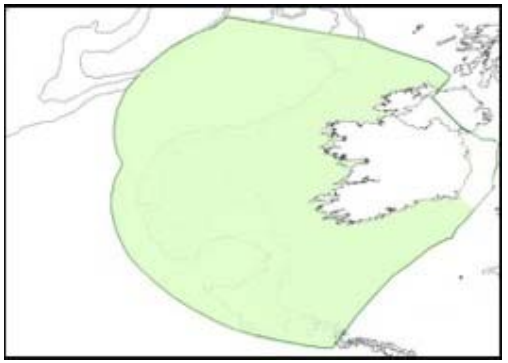
Killer whale



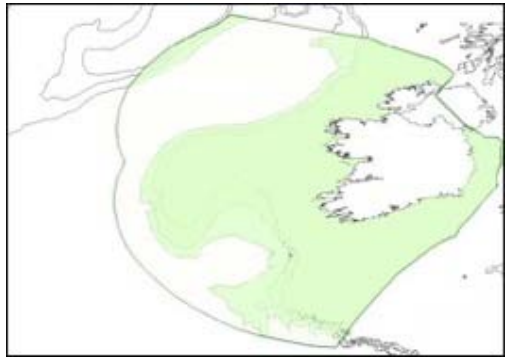
Risso's dolphin



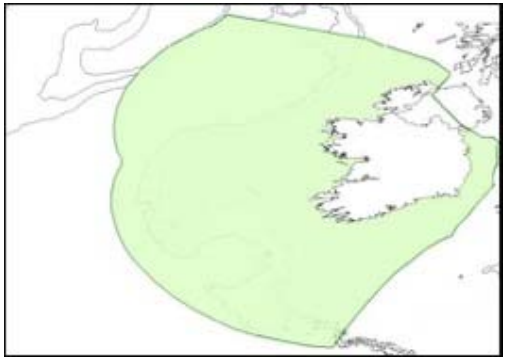
Bottlenose dolphin



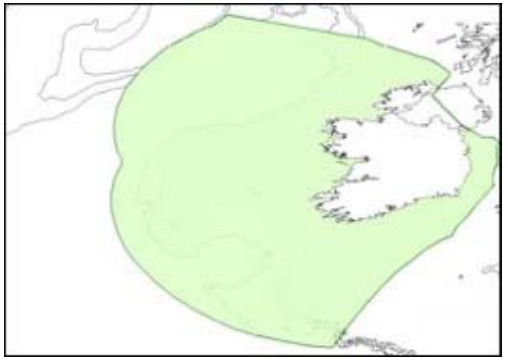
Atlantic white-sided dolphin



White-beaked dolphin

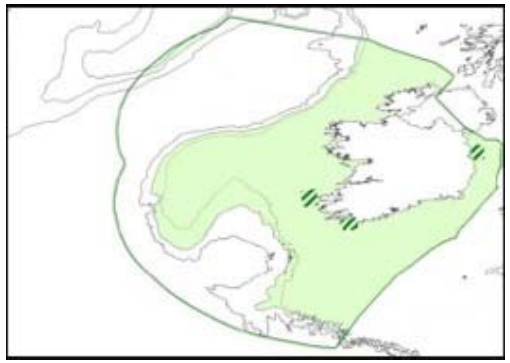


Striped dolphin

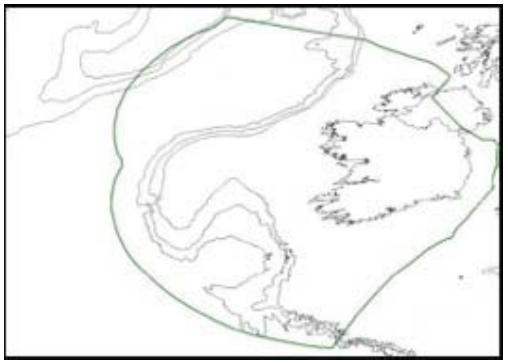


Short-beaked common dolphin

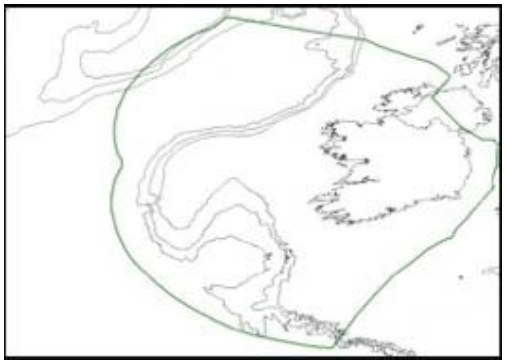
Figure APII-10. Distribution of Cetacean species in the Irish EEZ (Source NPWS) (contd.).



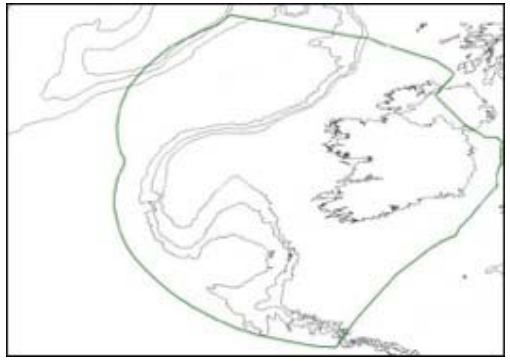
Harbour porpoise



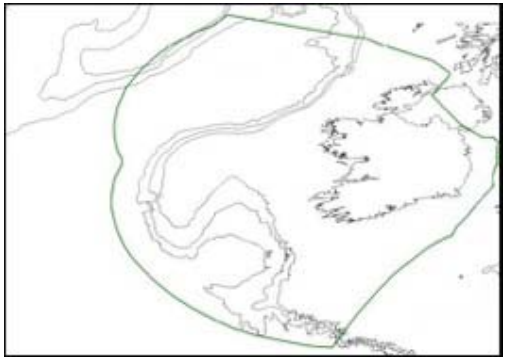
False killer whale (v)



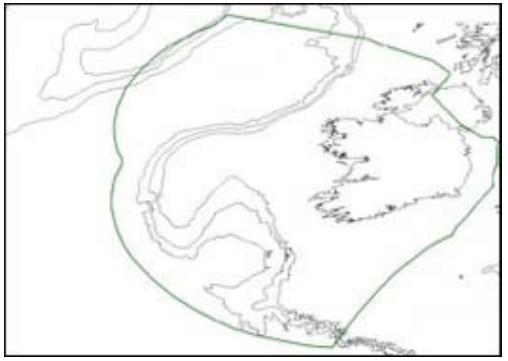
Gervais' beaked whale (v)



True's beaked whale (v)



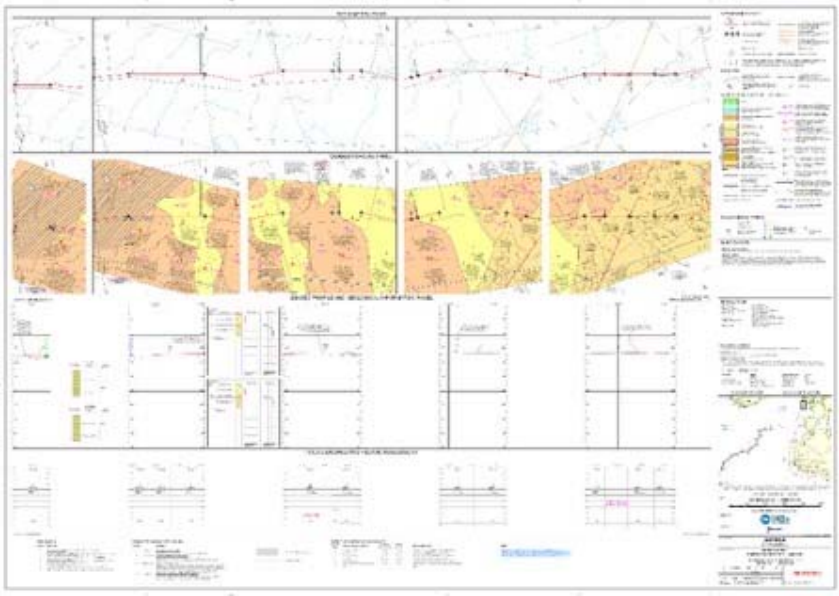
White whale (v)

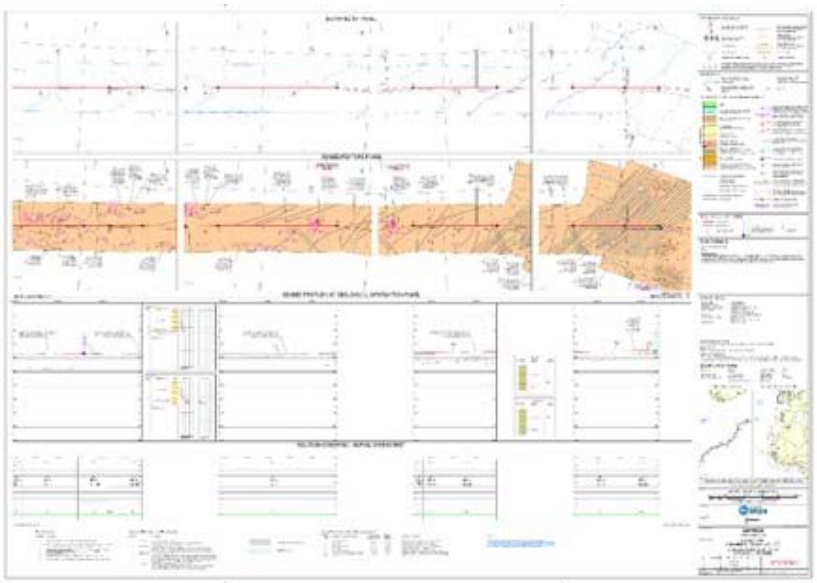


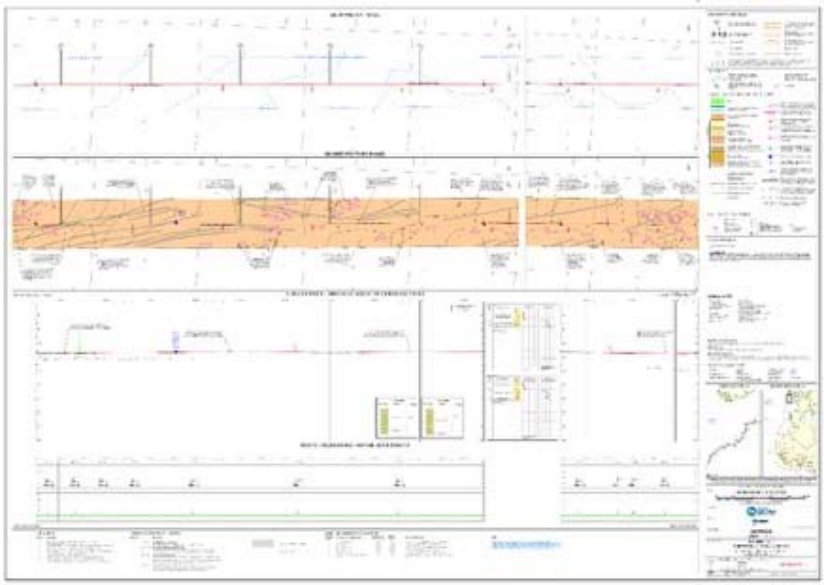
Pygmy sperm whale (v)

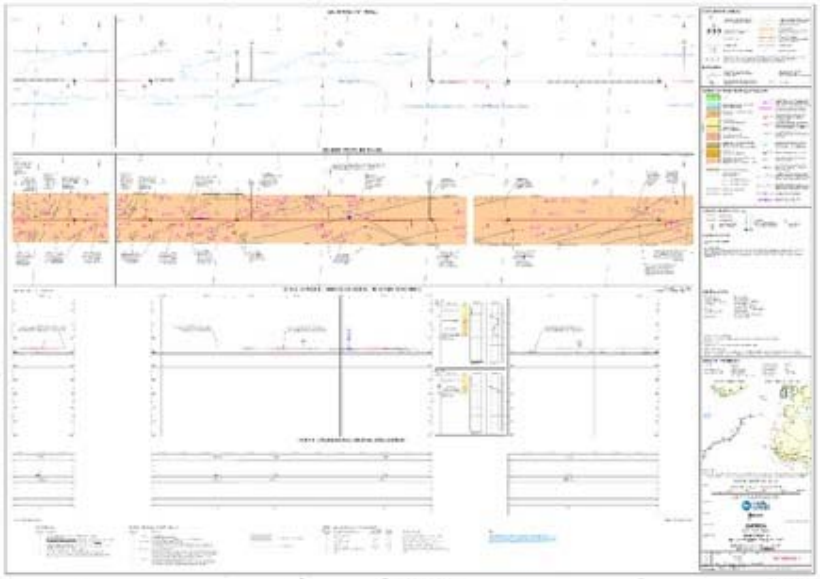
Figure APII-10. Distribution of Cetacean species in the Irish EEZ (Source NPWS) (contd.).

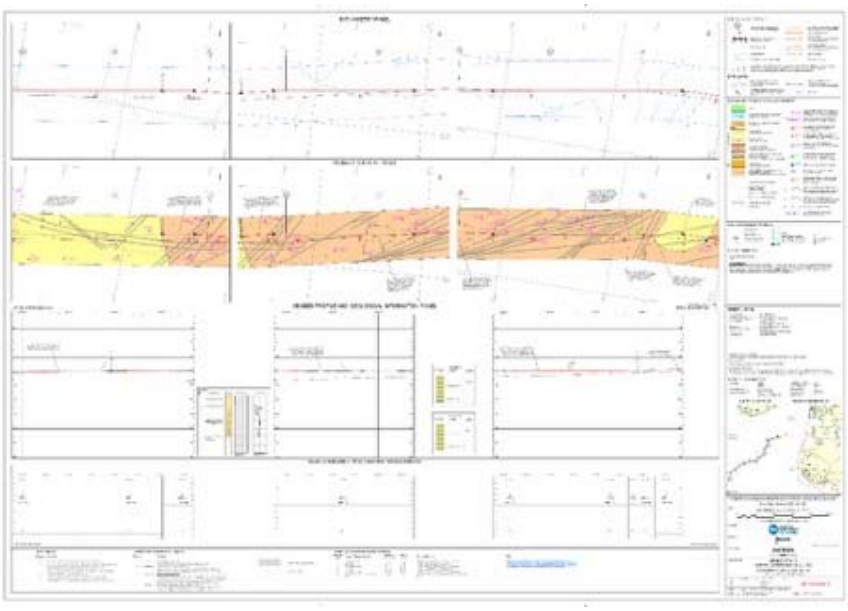
Appendix V Detailed imagery of 2 Africa survey data within Irish EEZ.

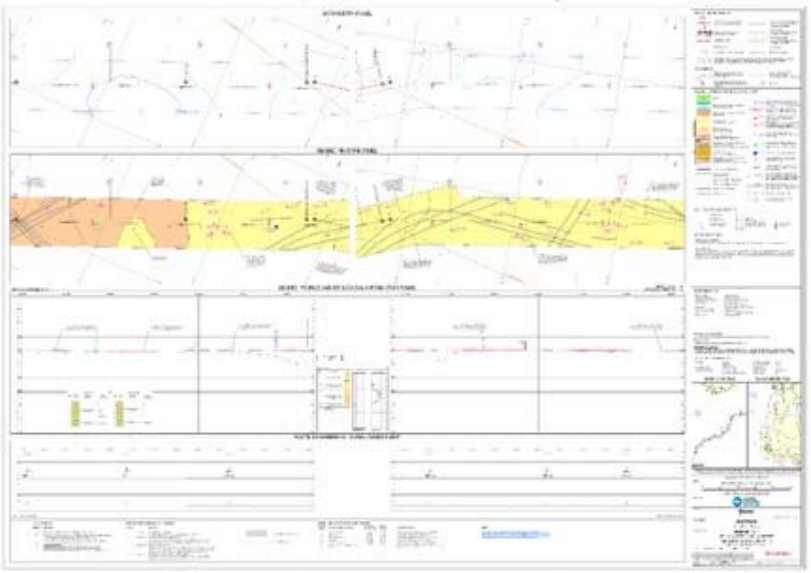


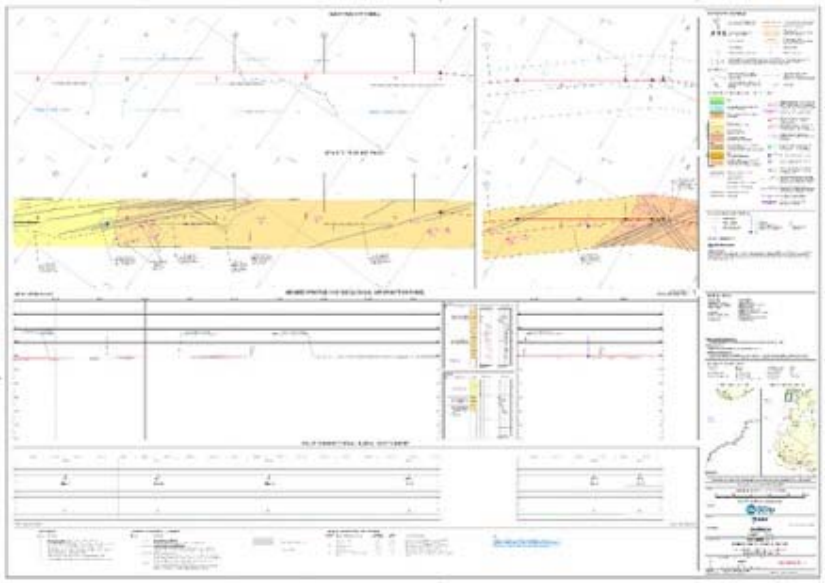


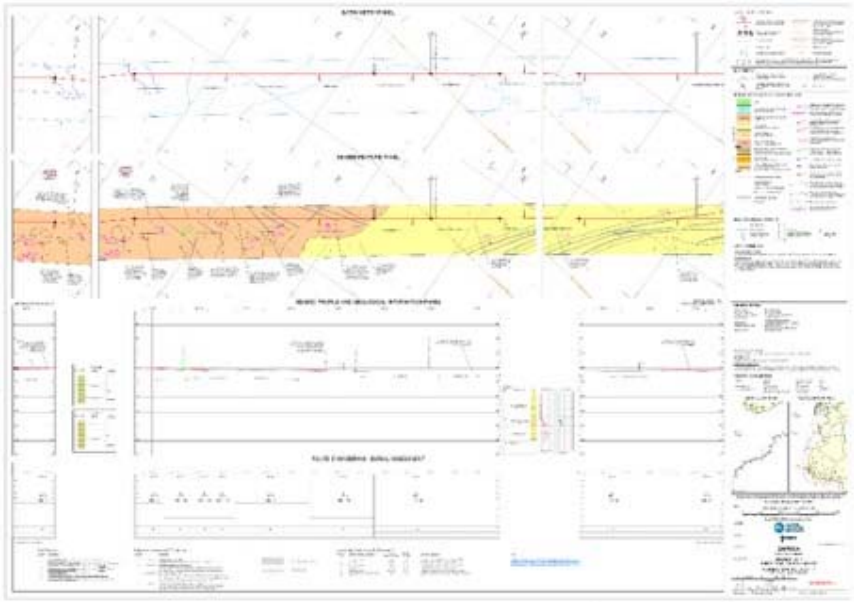


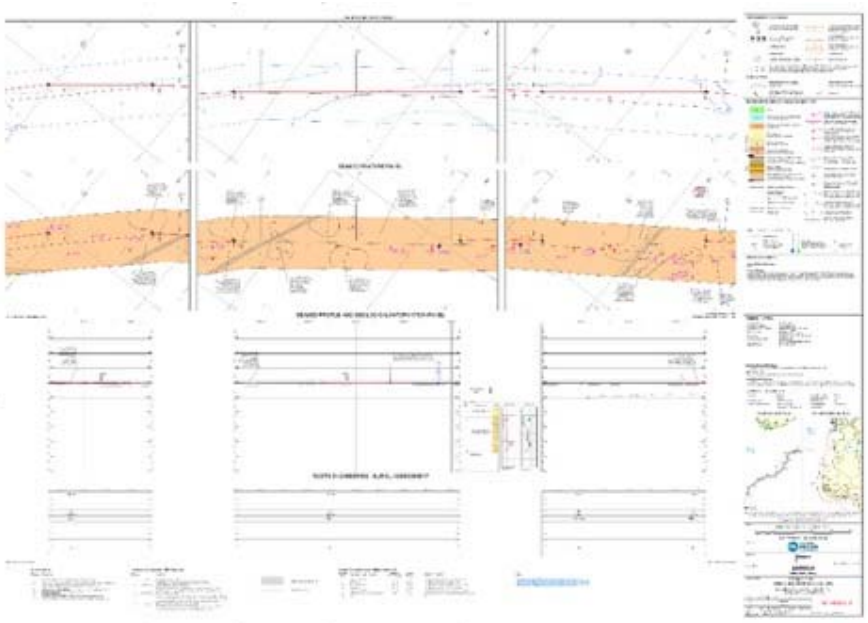


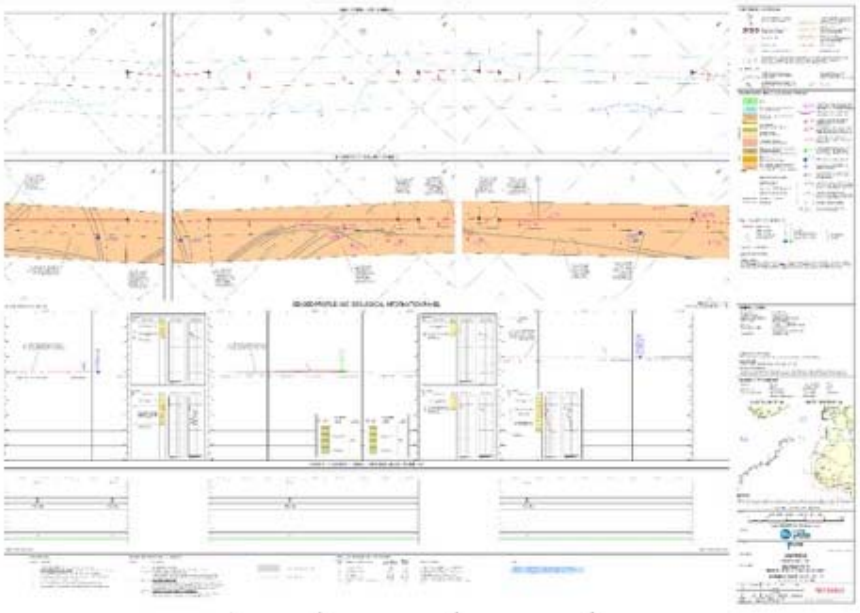


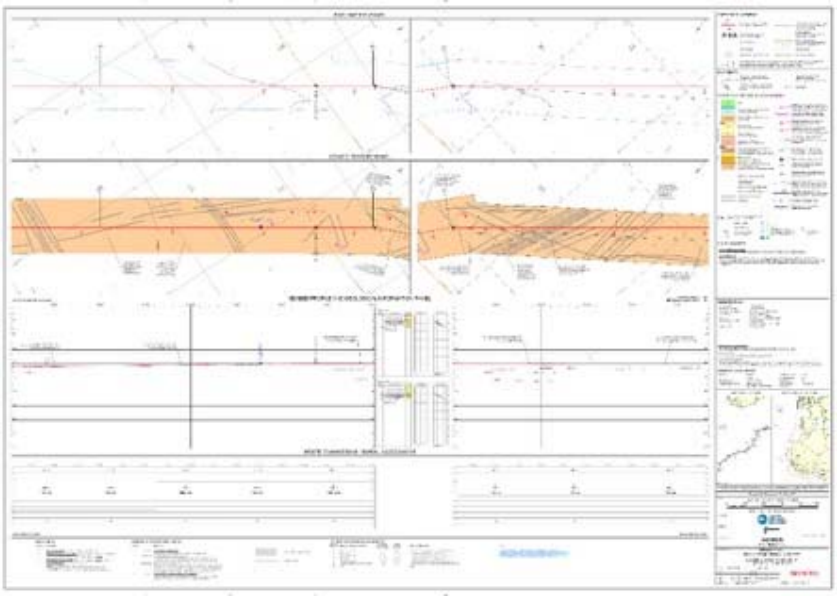


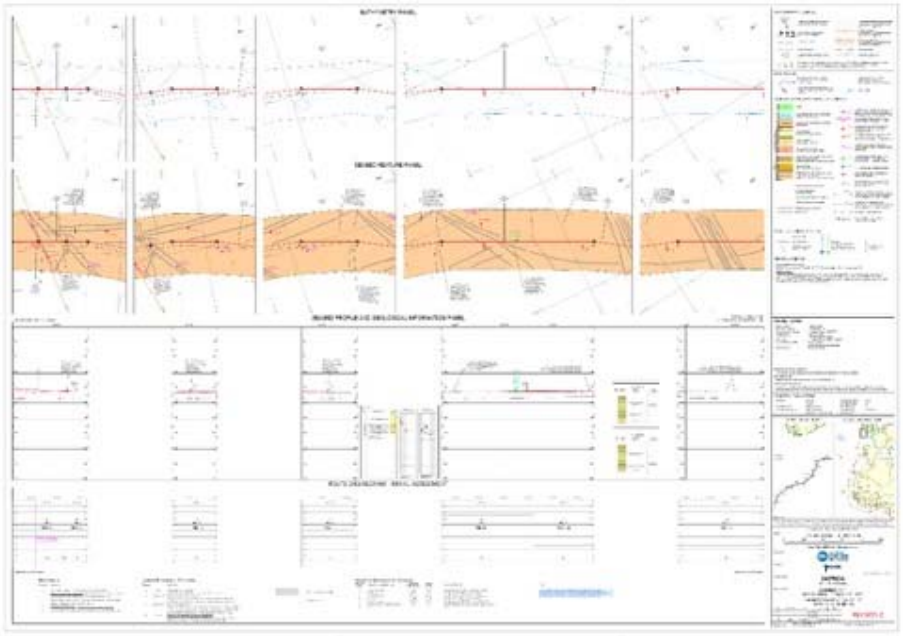


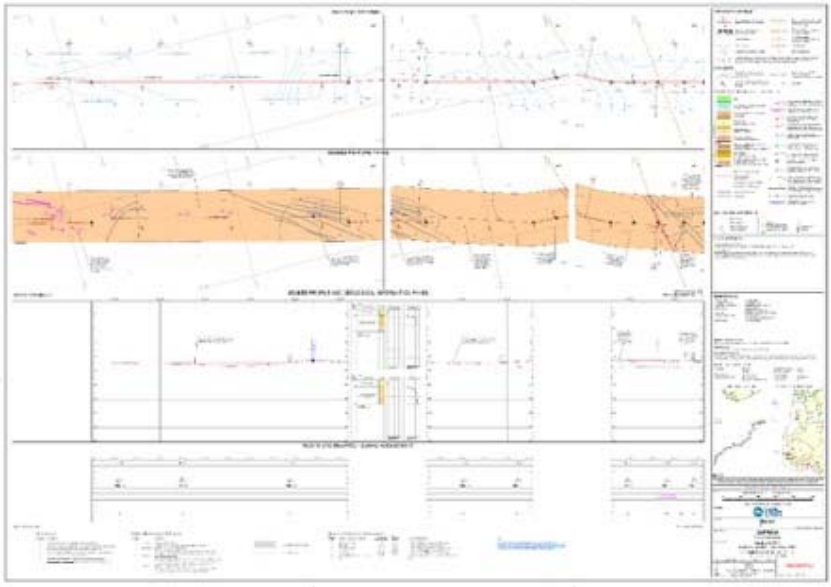


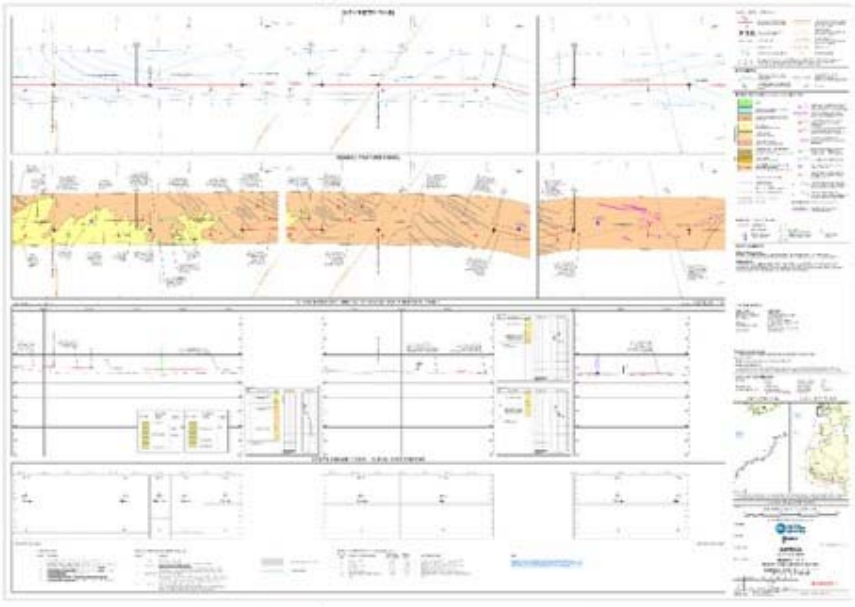


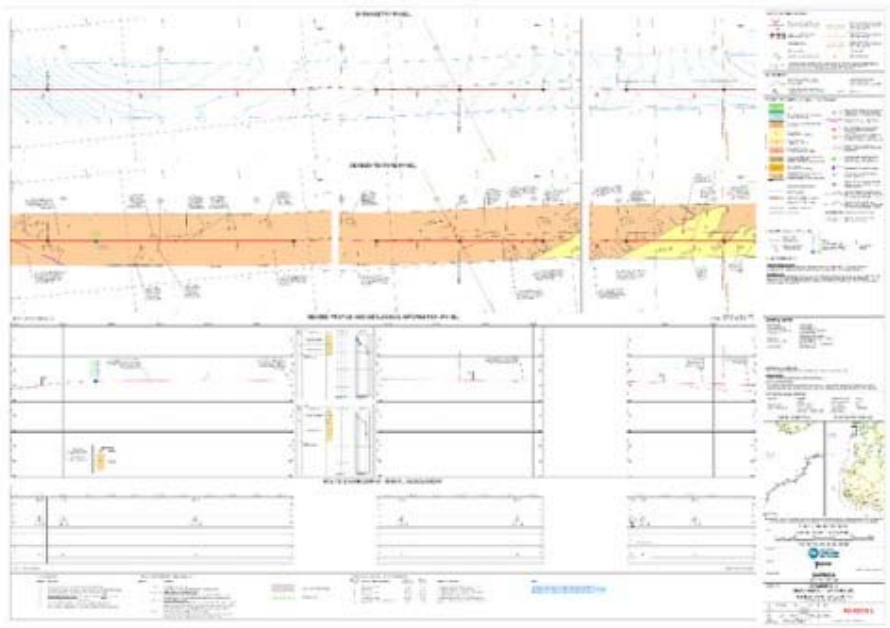


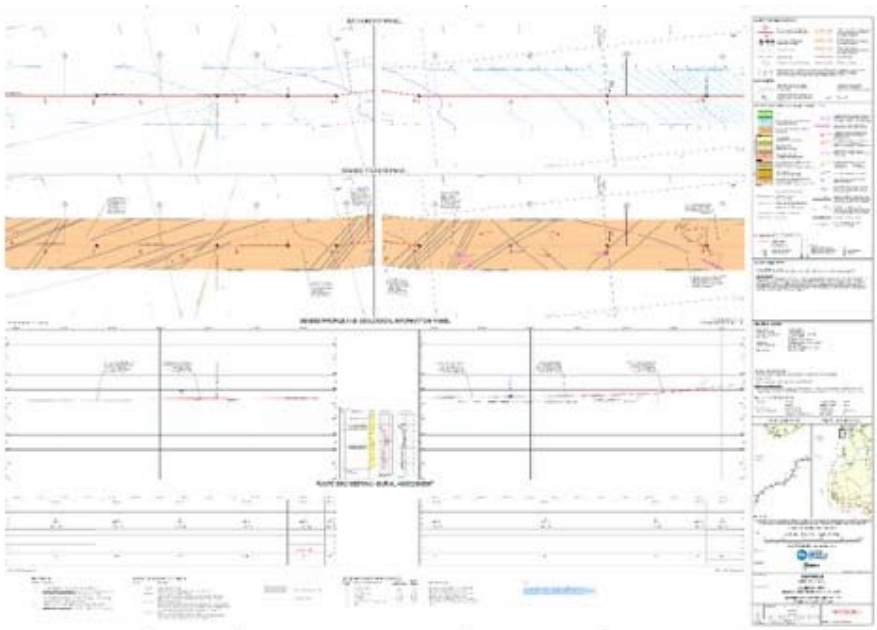


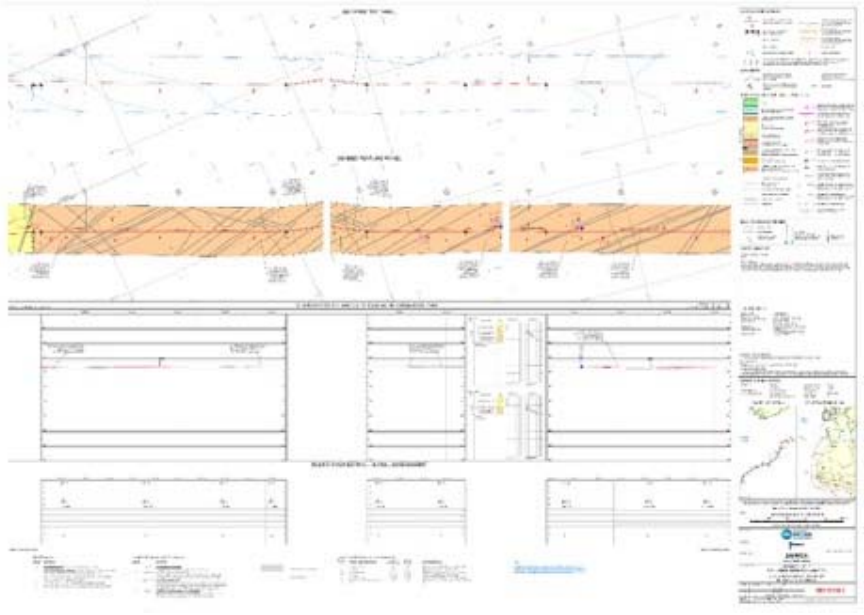


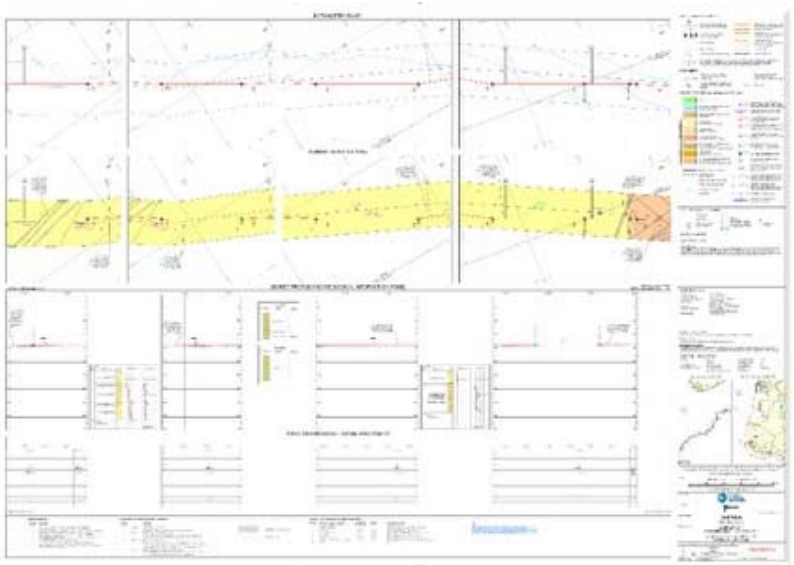


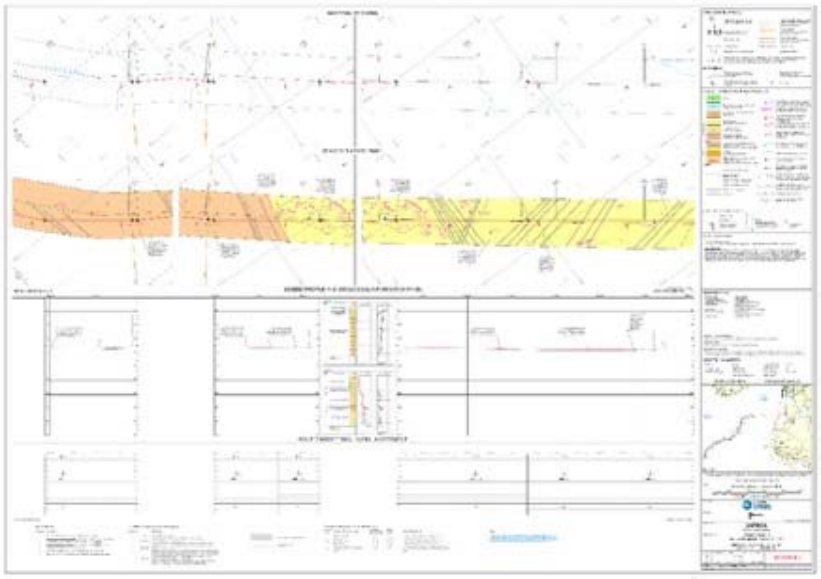


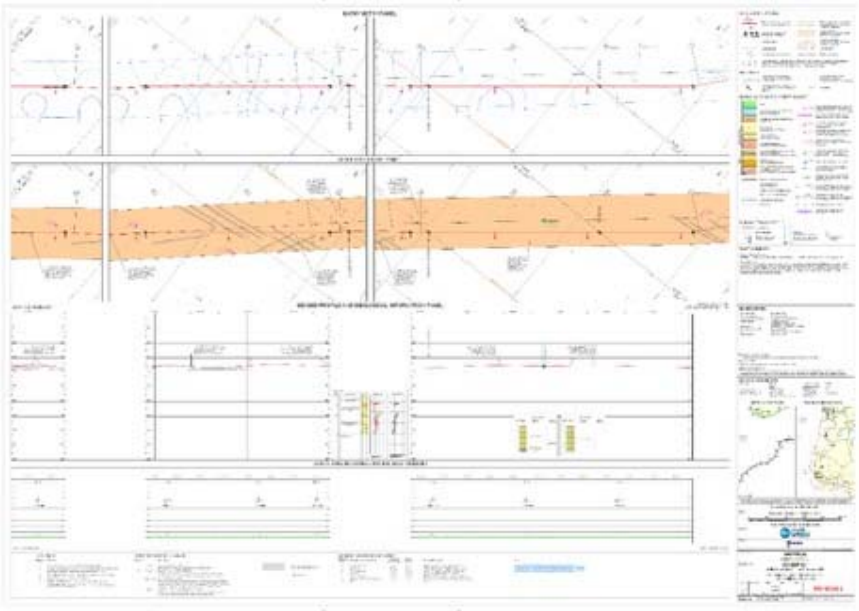


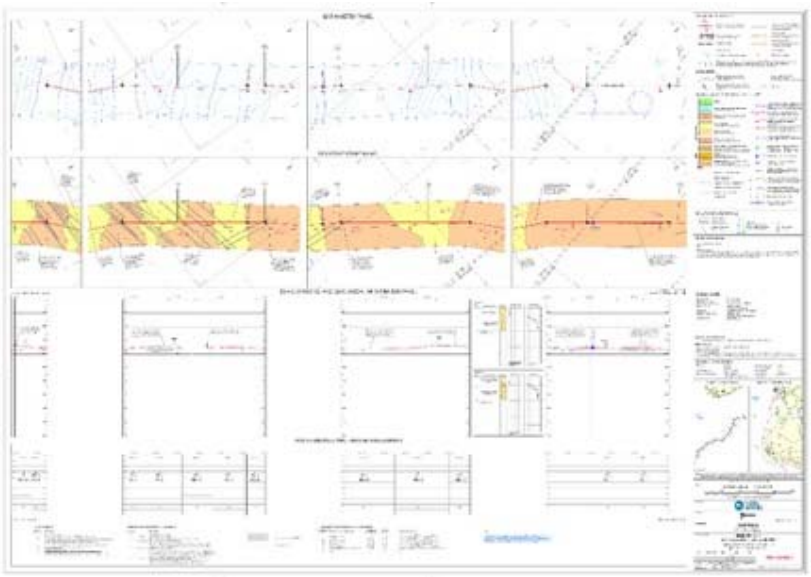


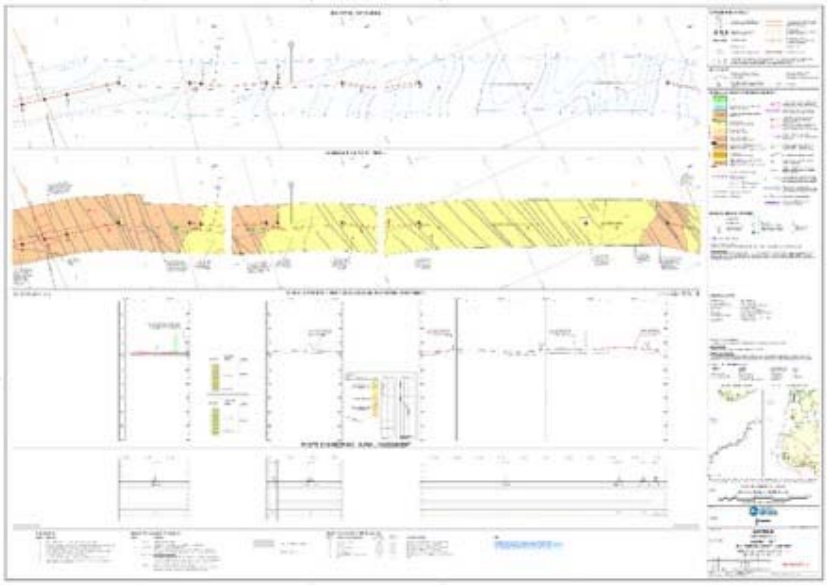


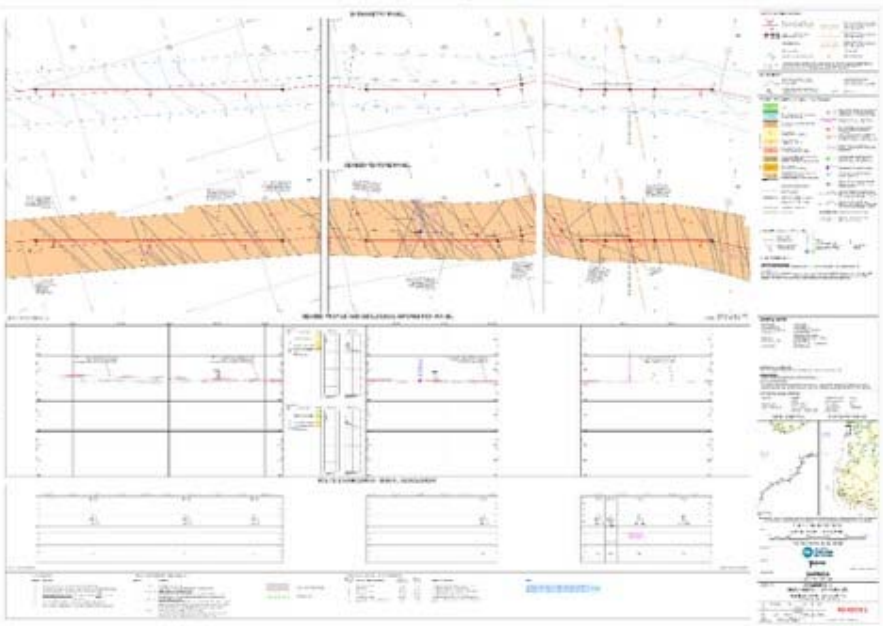


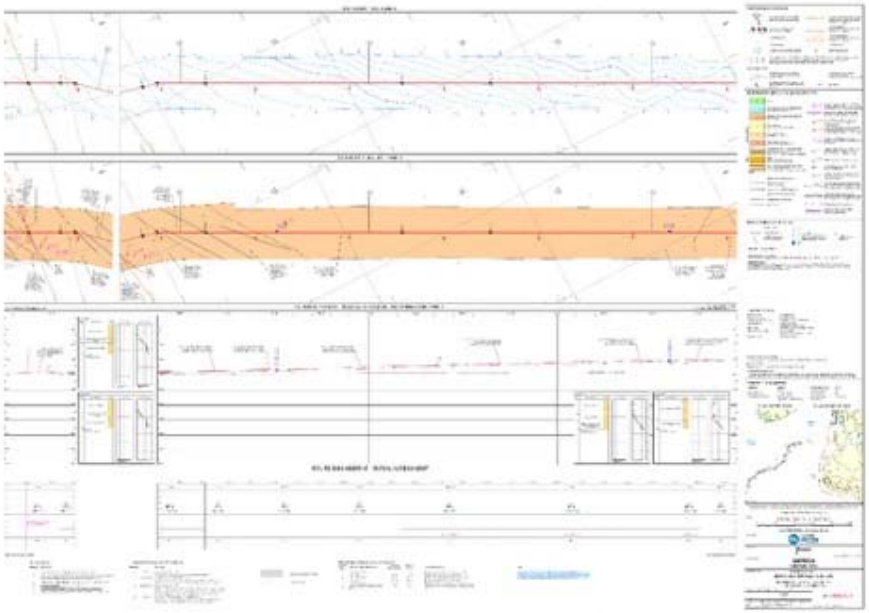


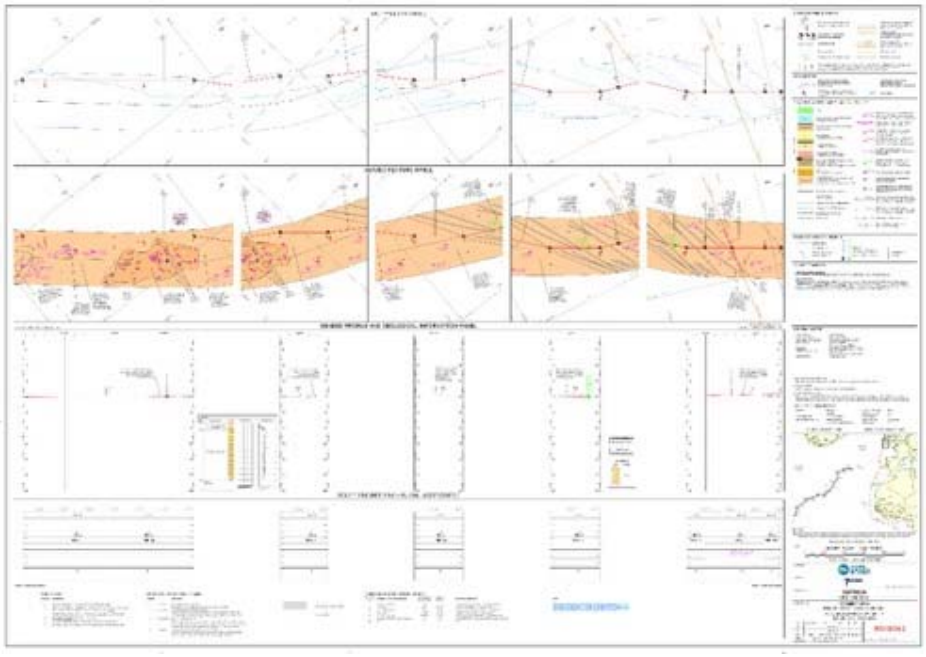


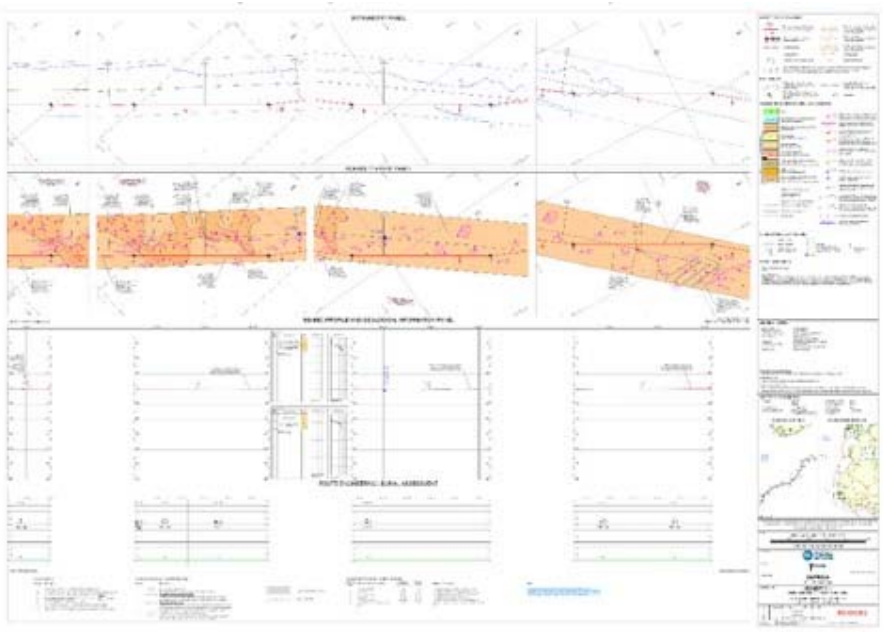


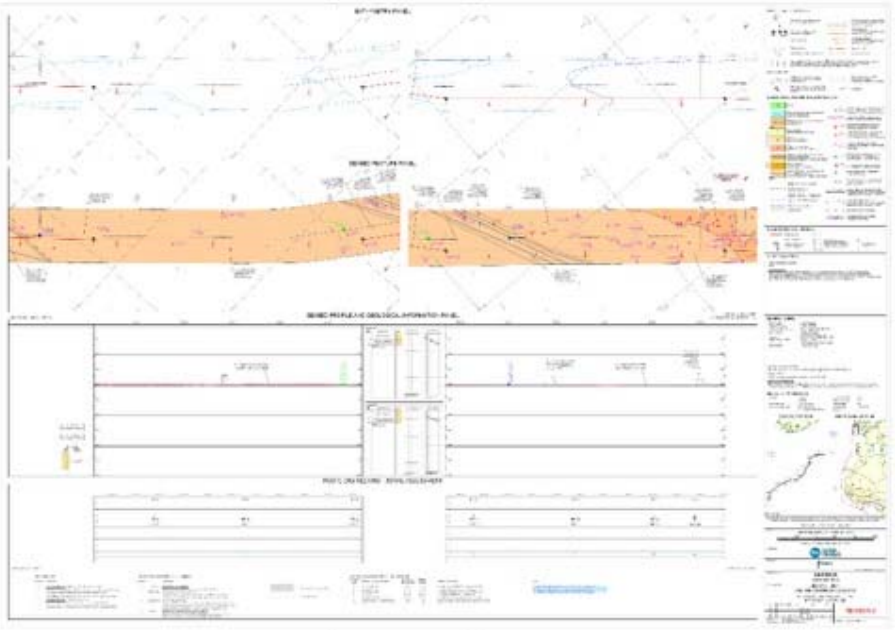


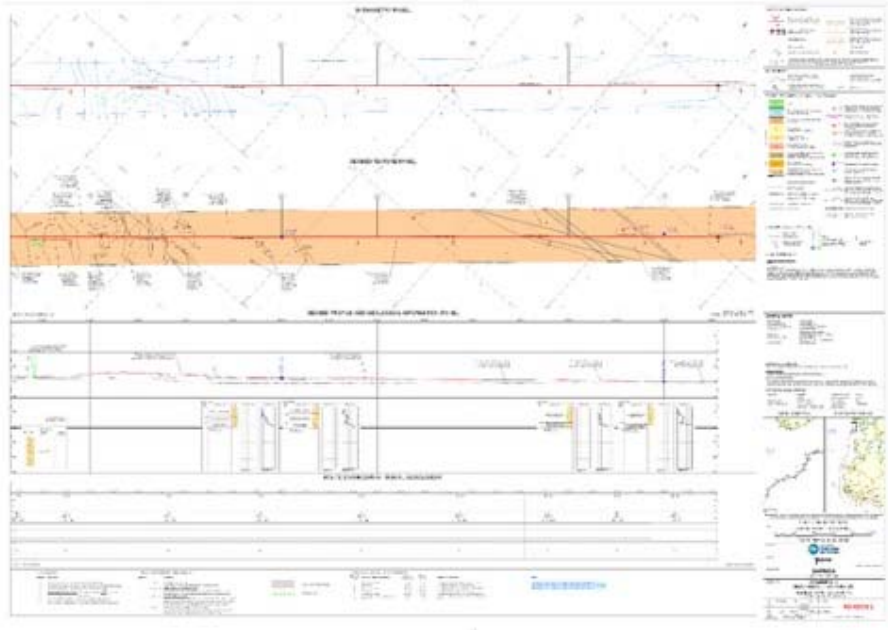


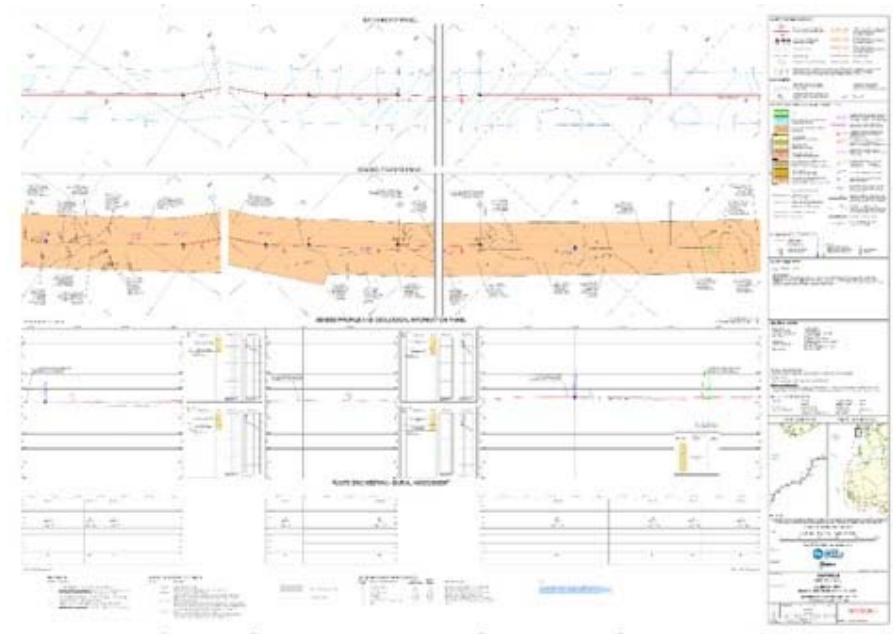


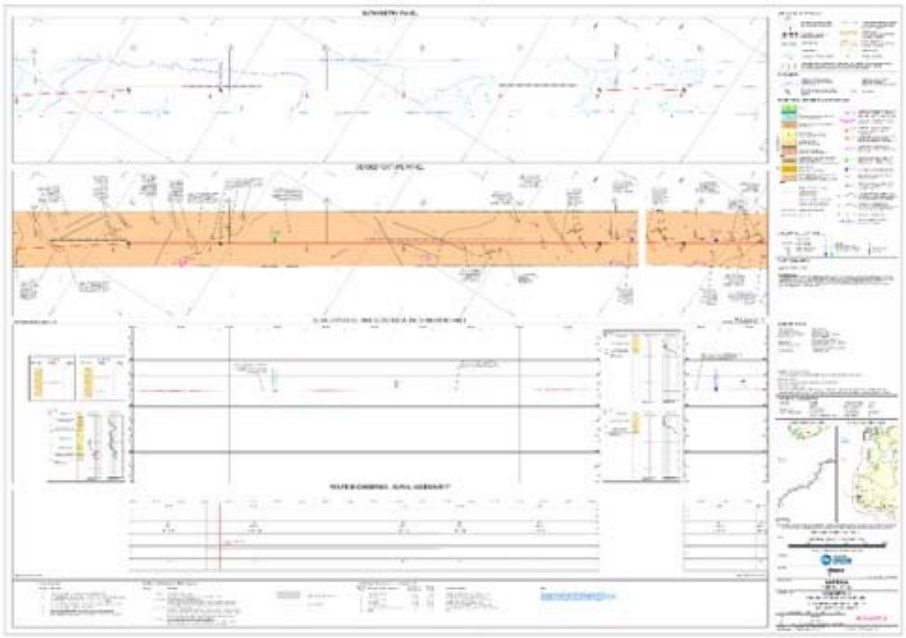


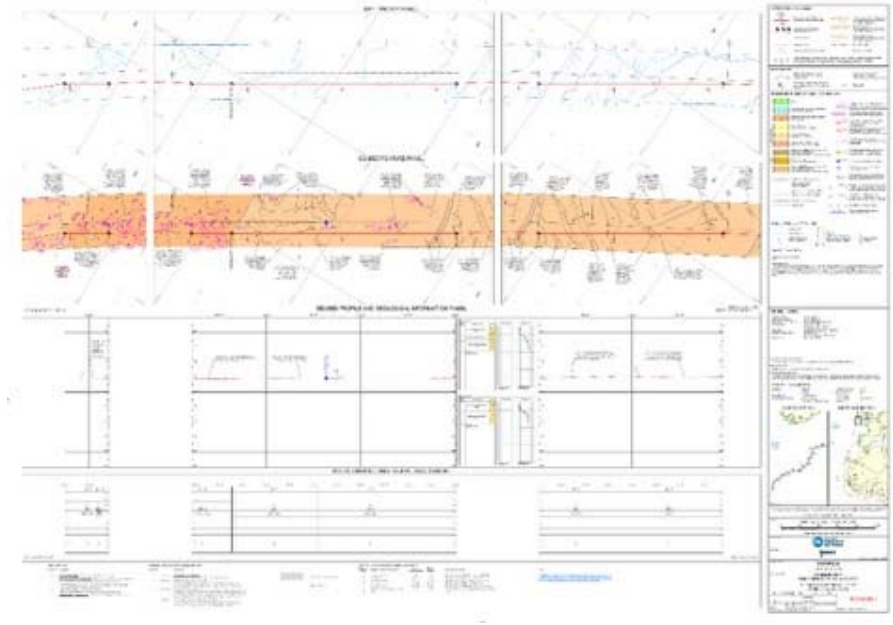


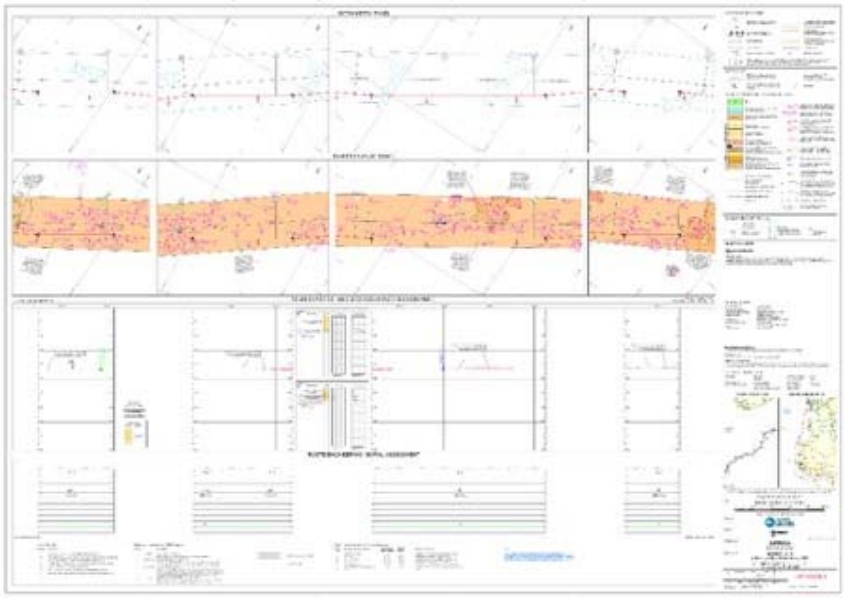


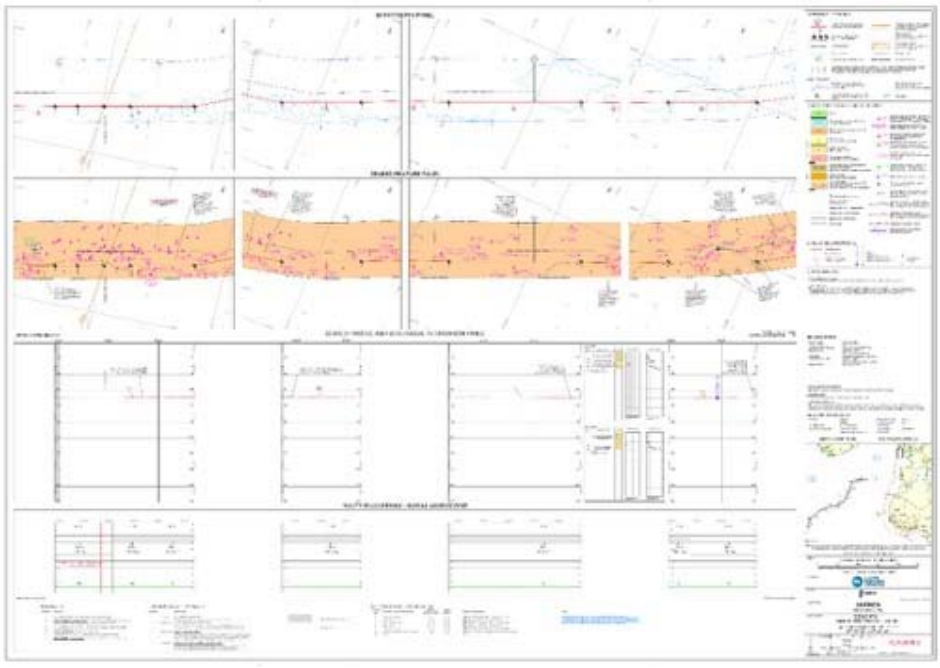


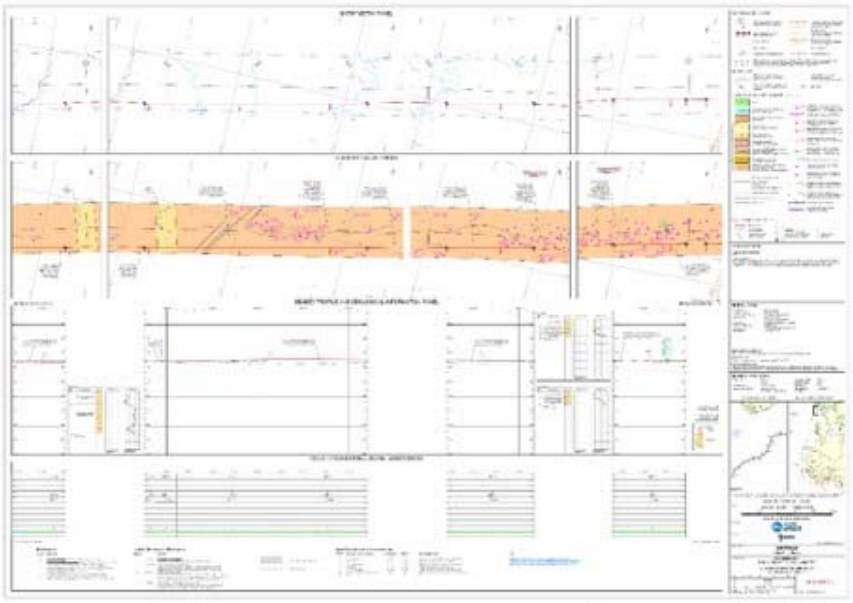


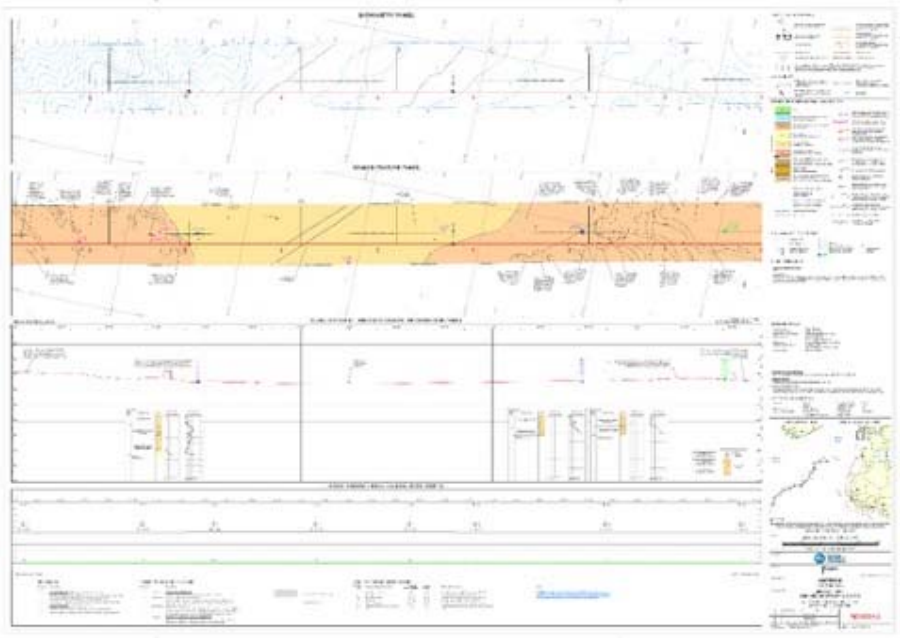


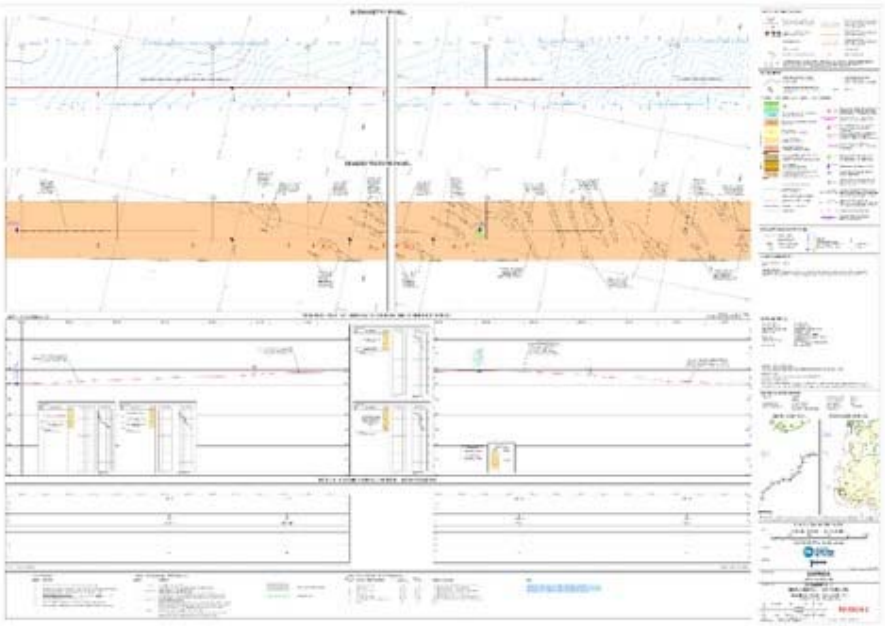


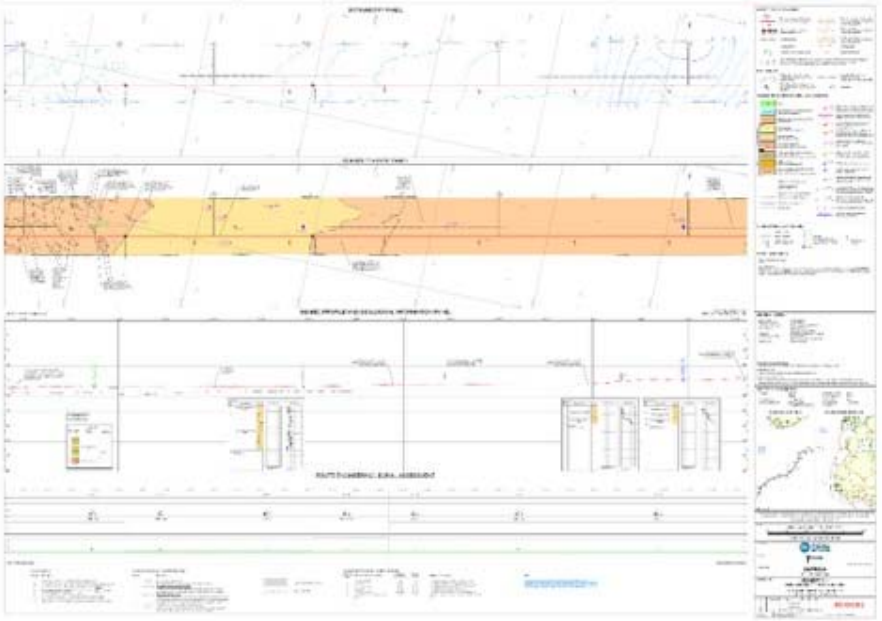


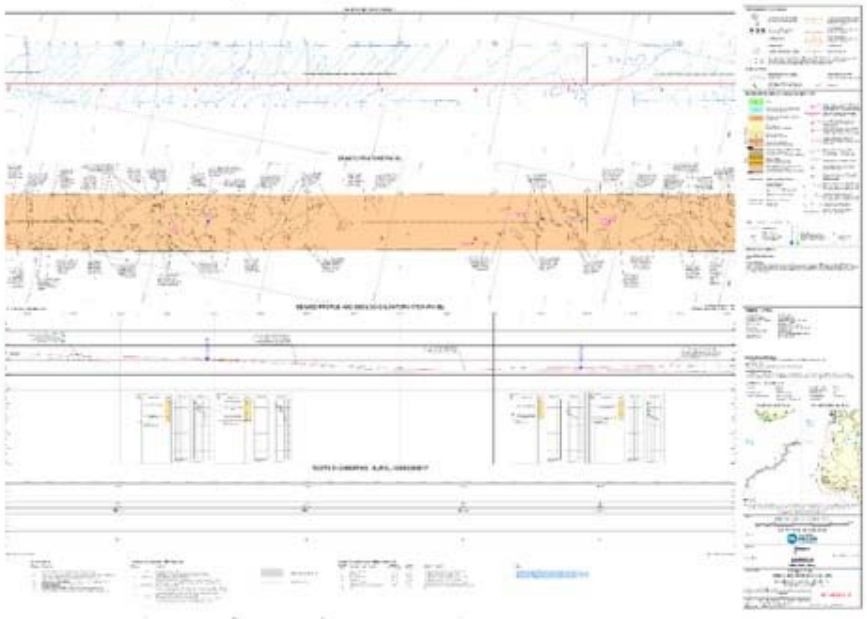


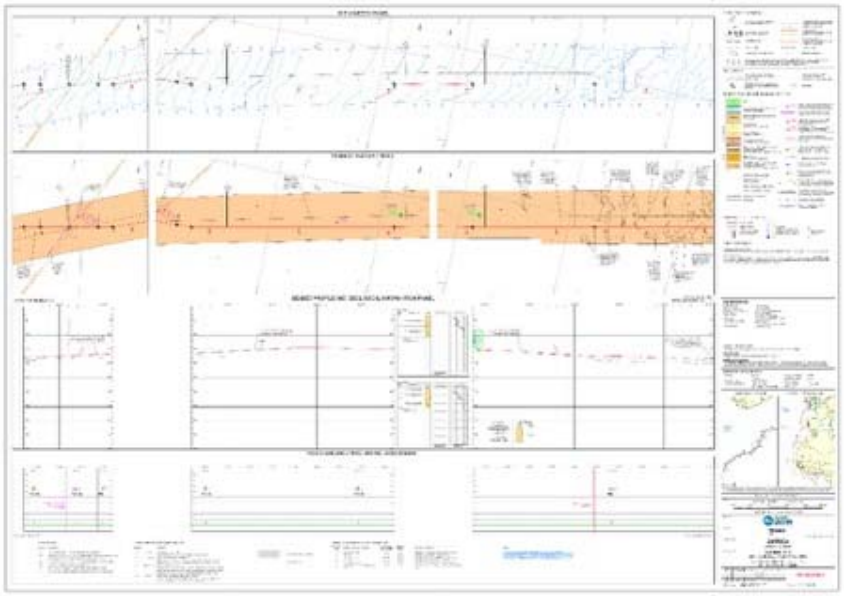


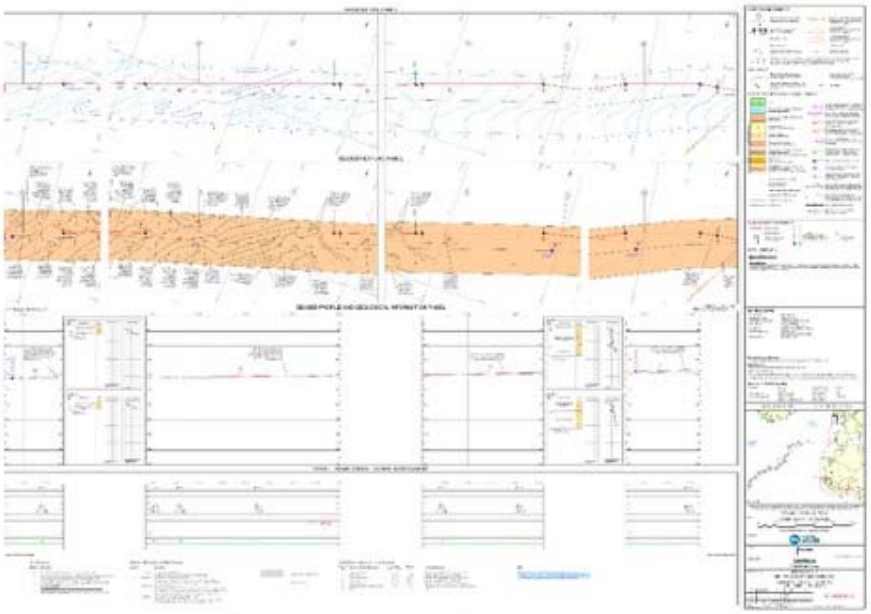


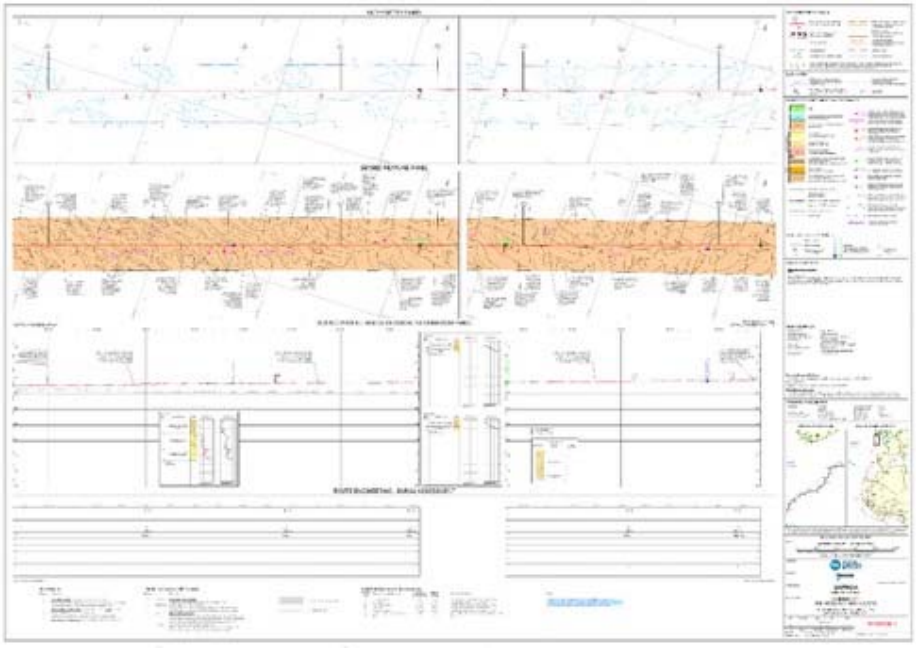


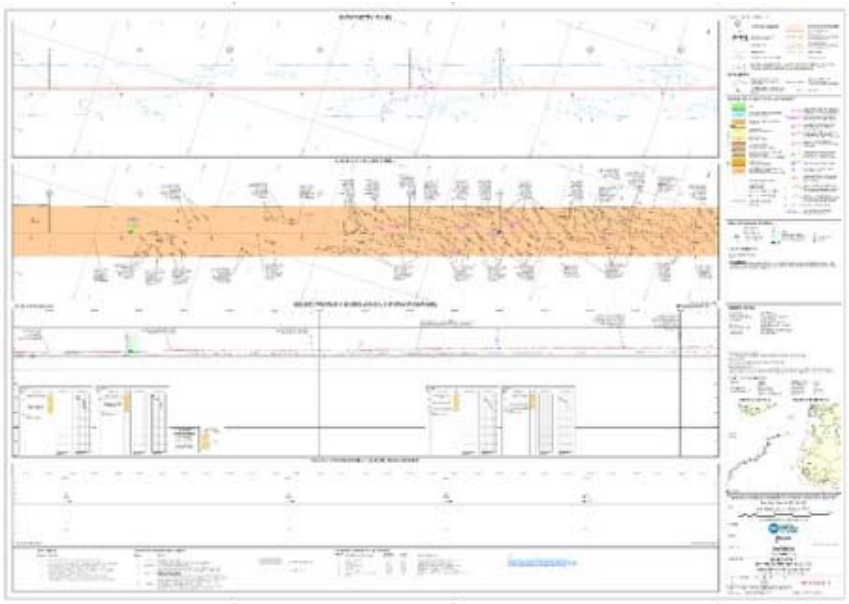


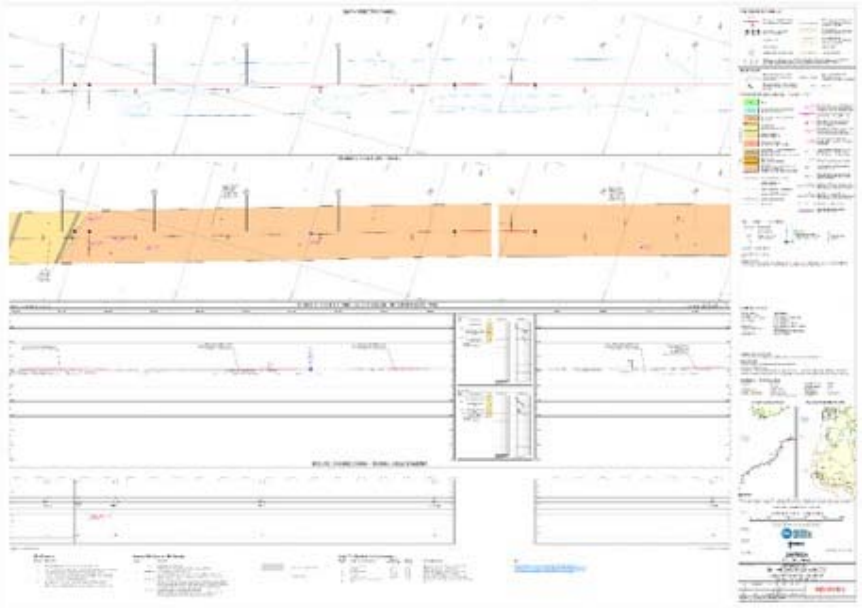


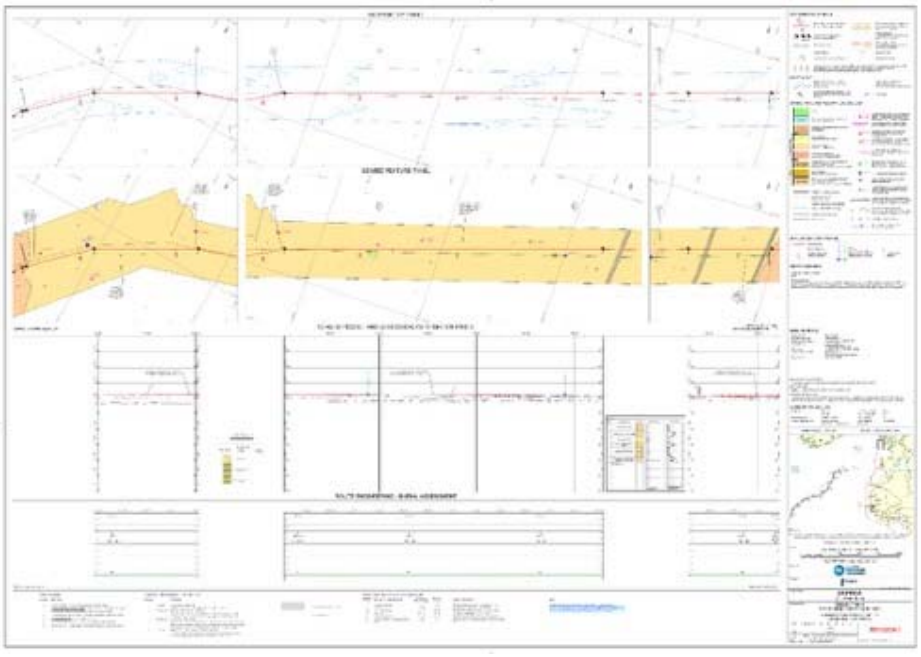


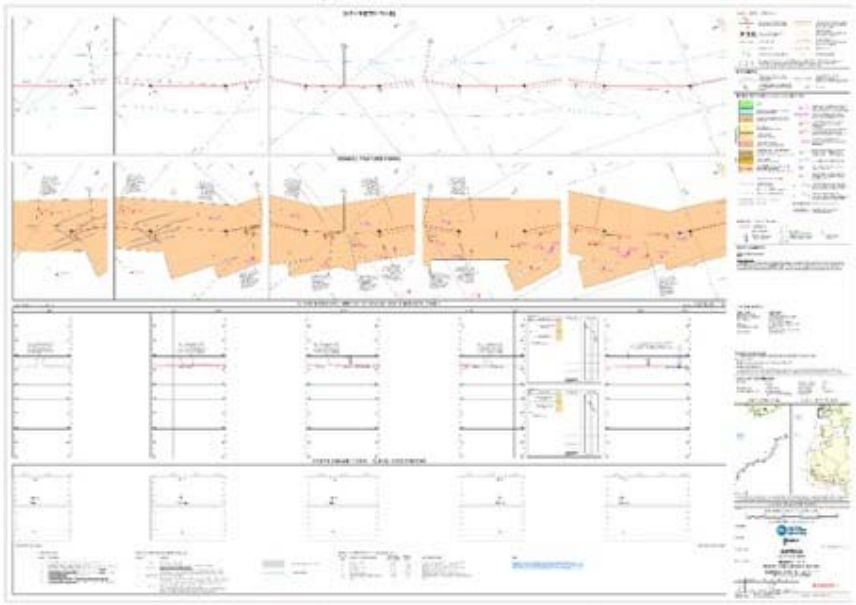


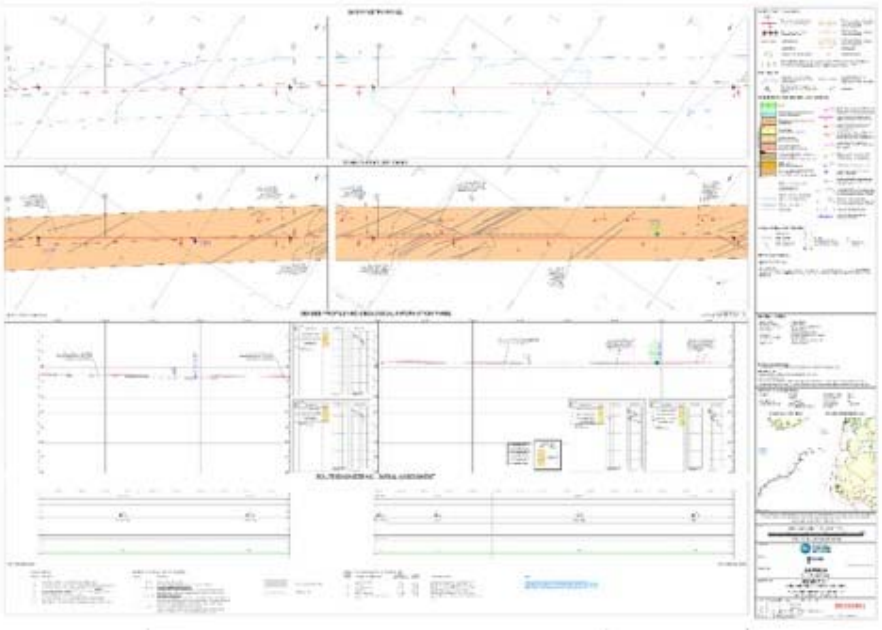


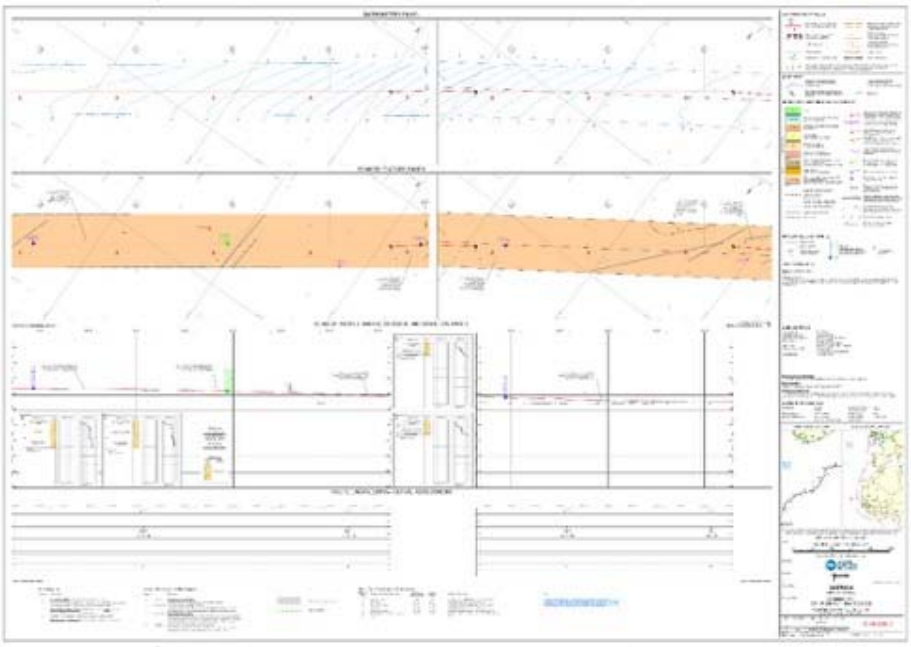


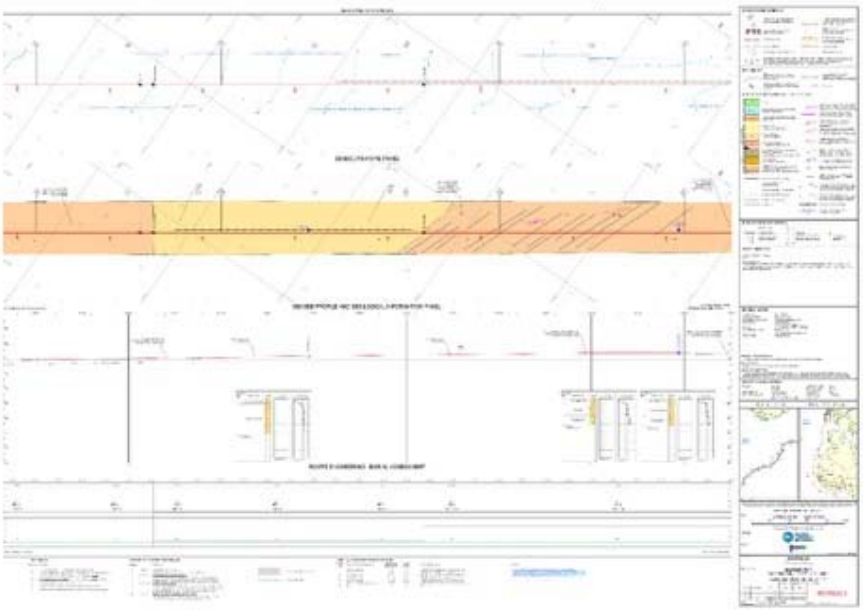


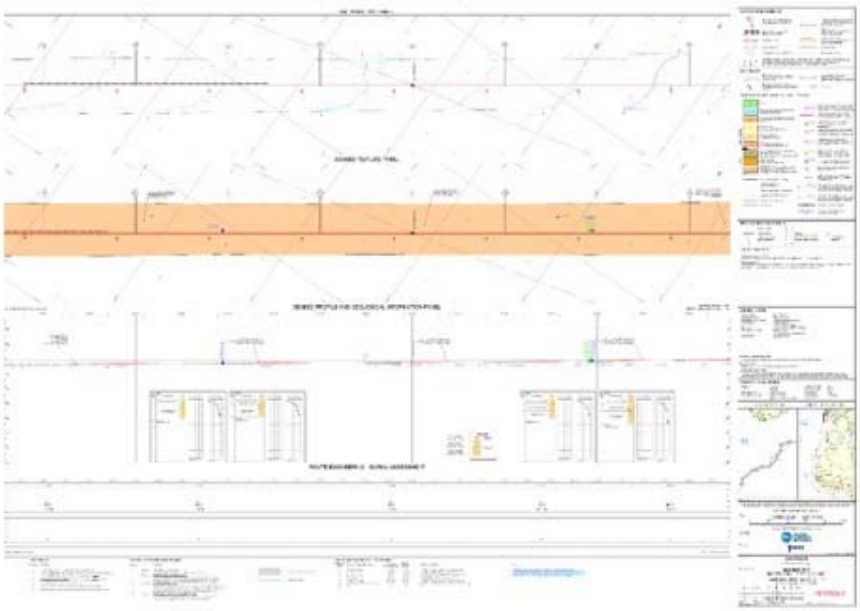


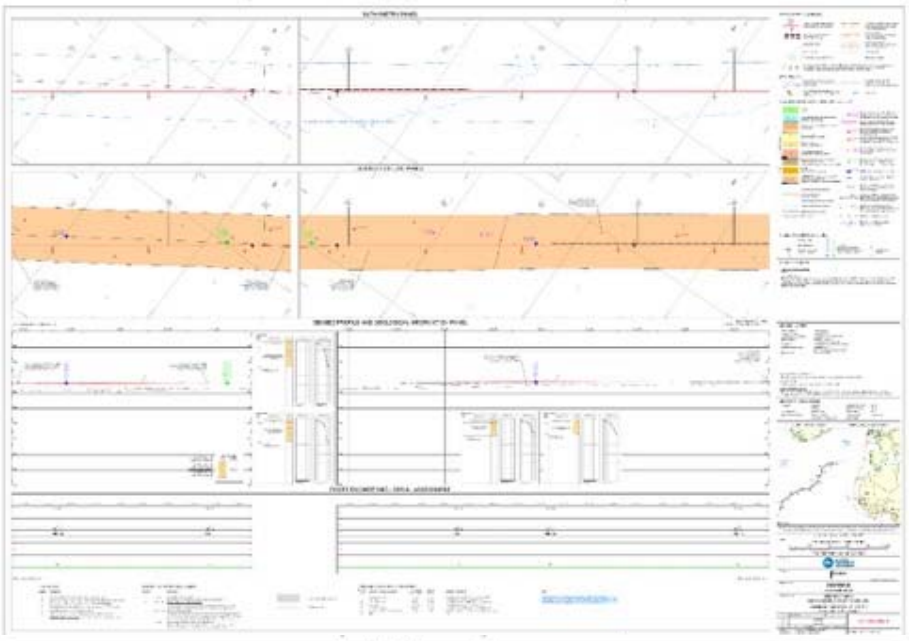


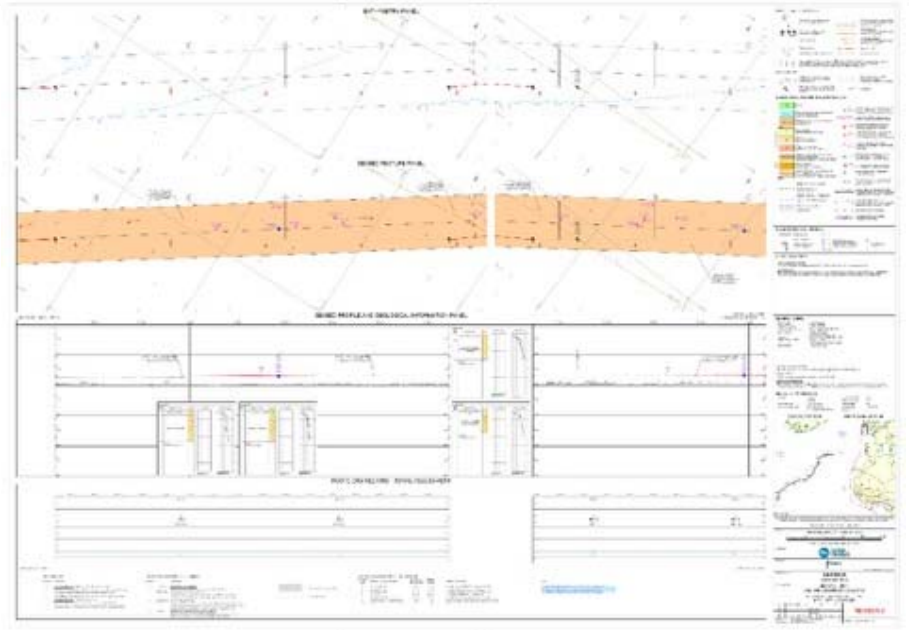


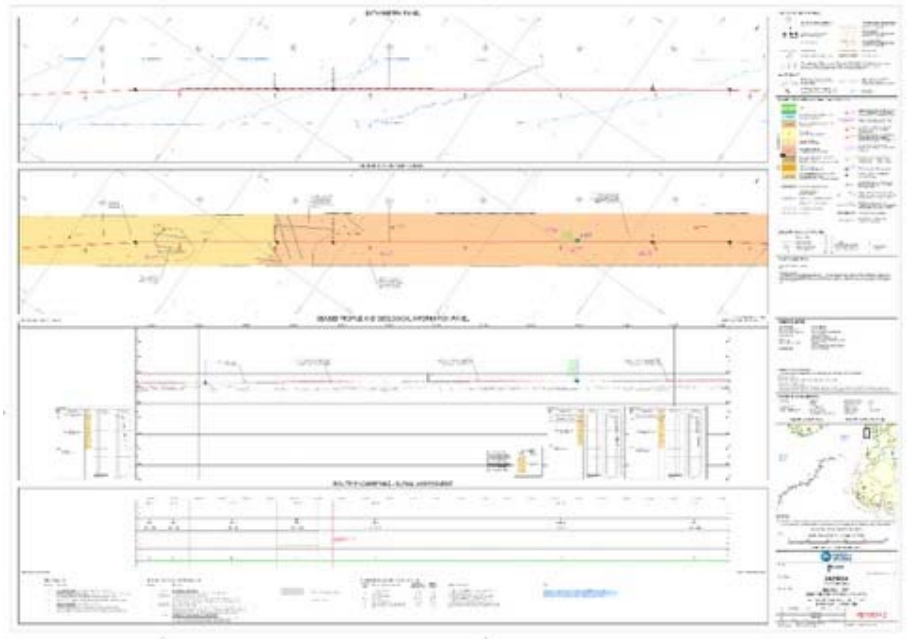


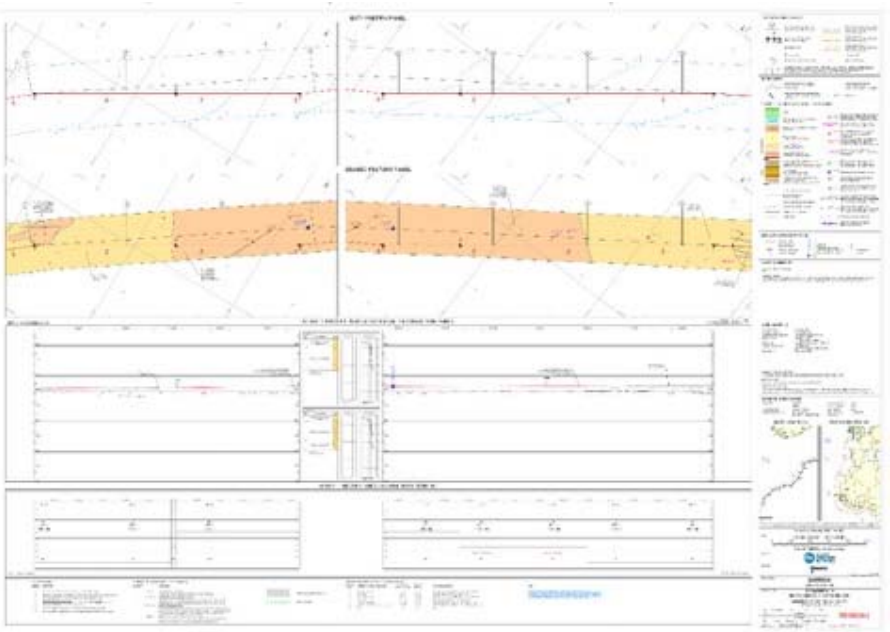


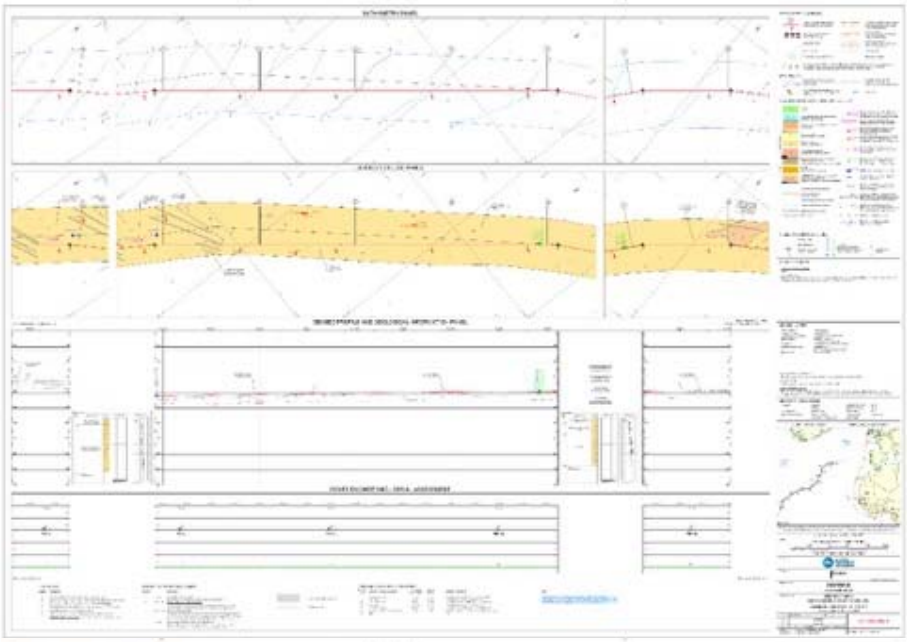


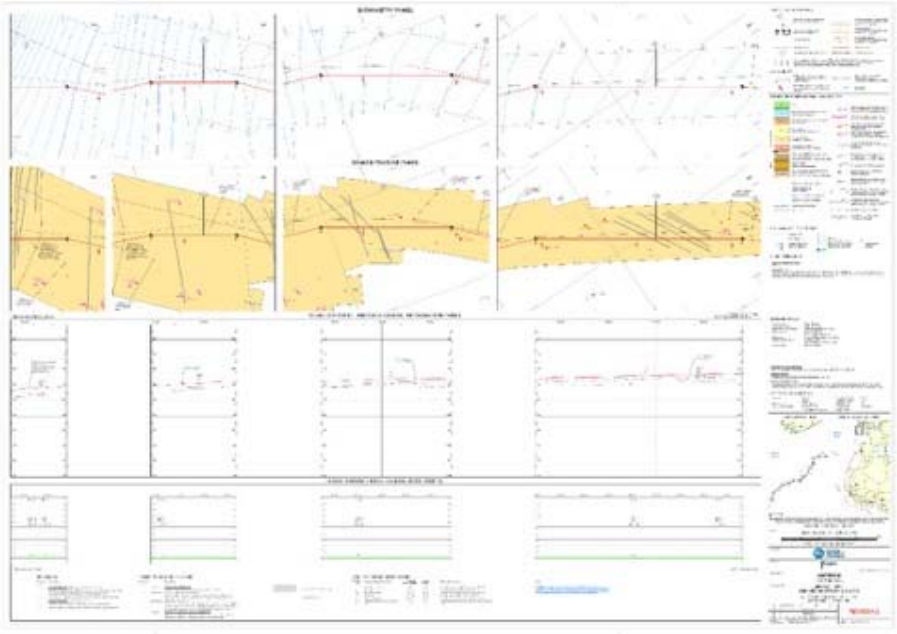


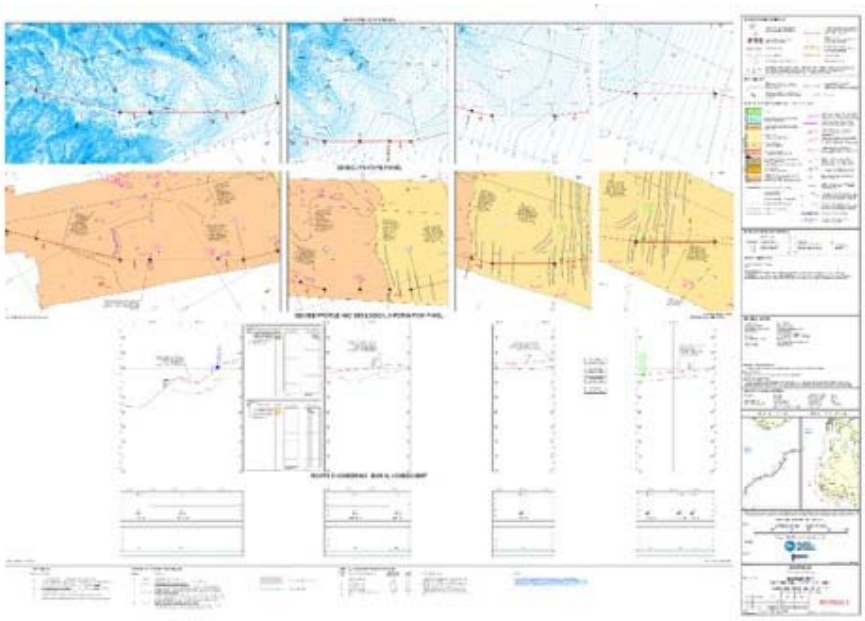


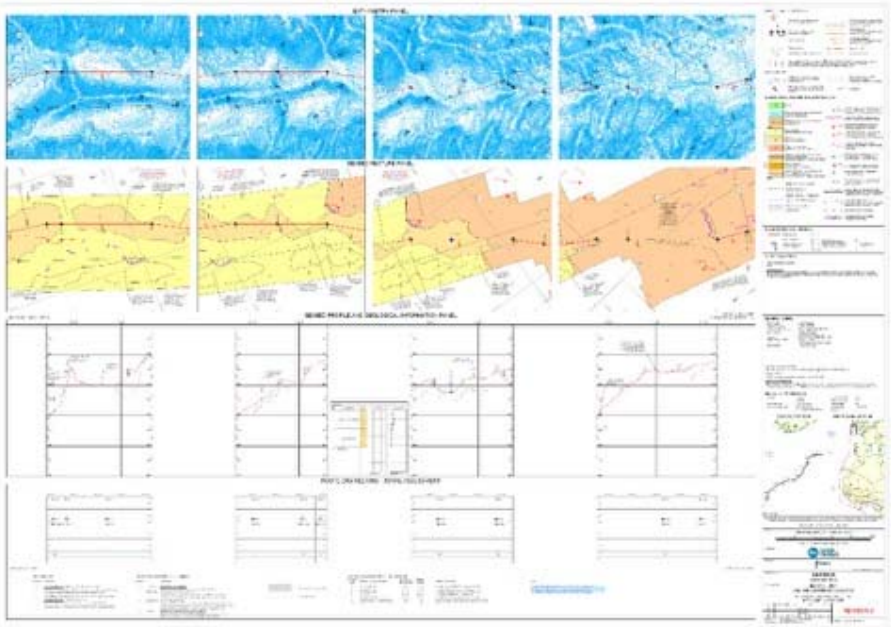


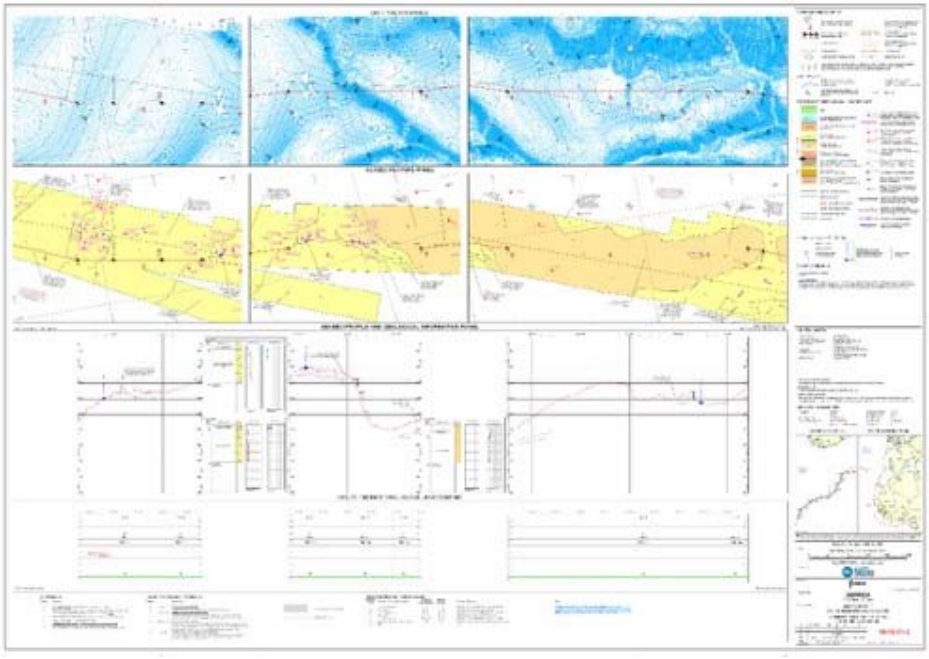


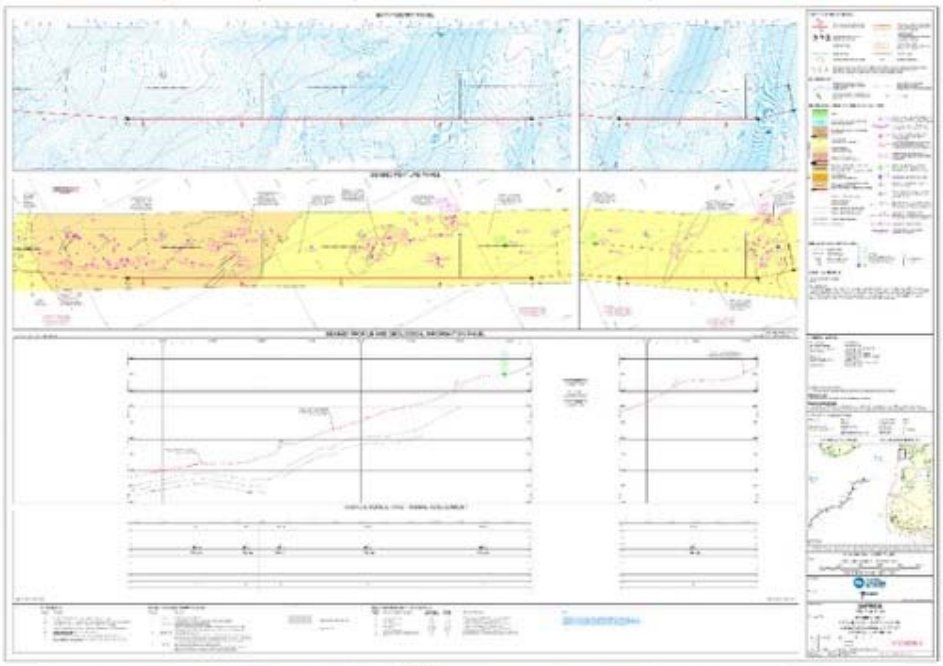


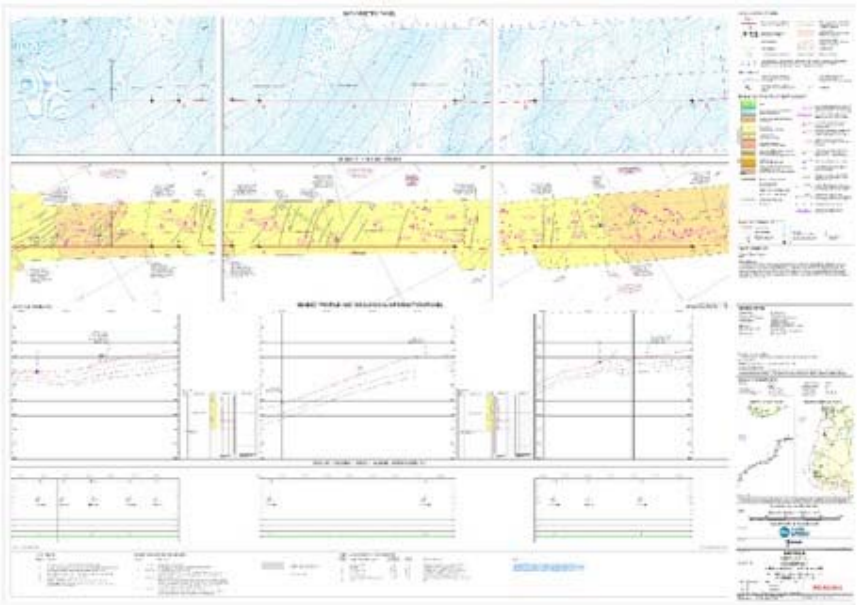


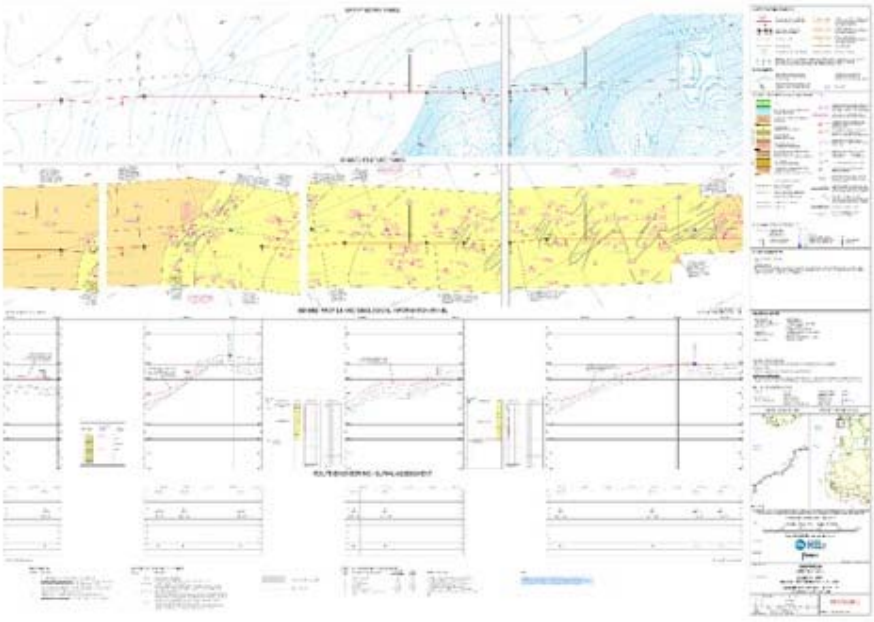


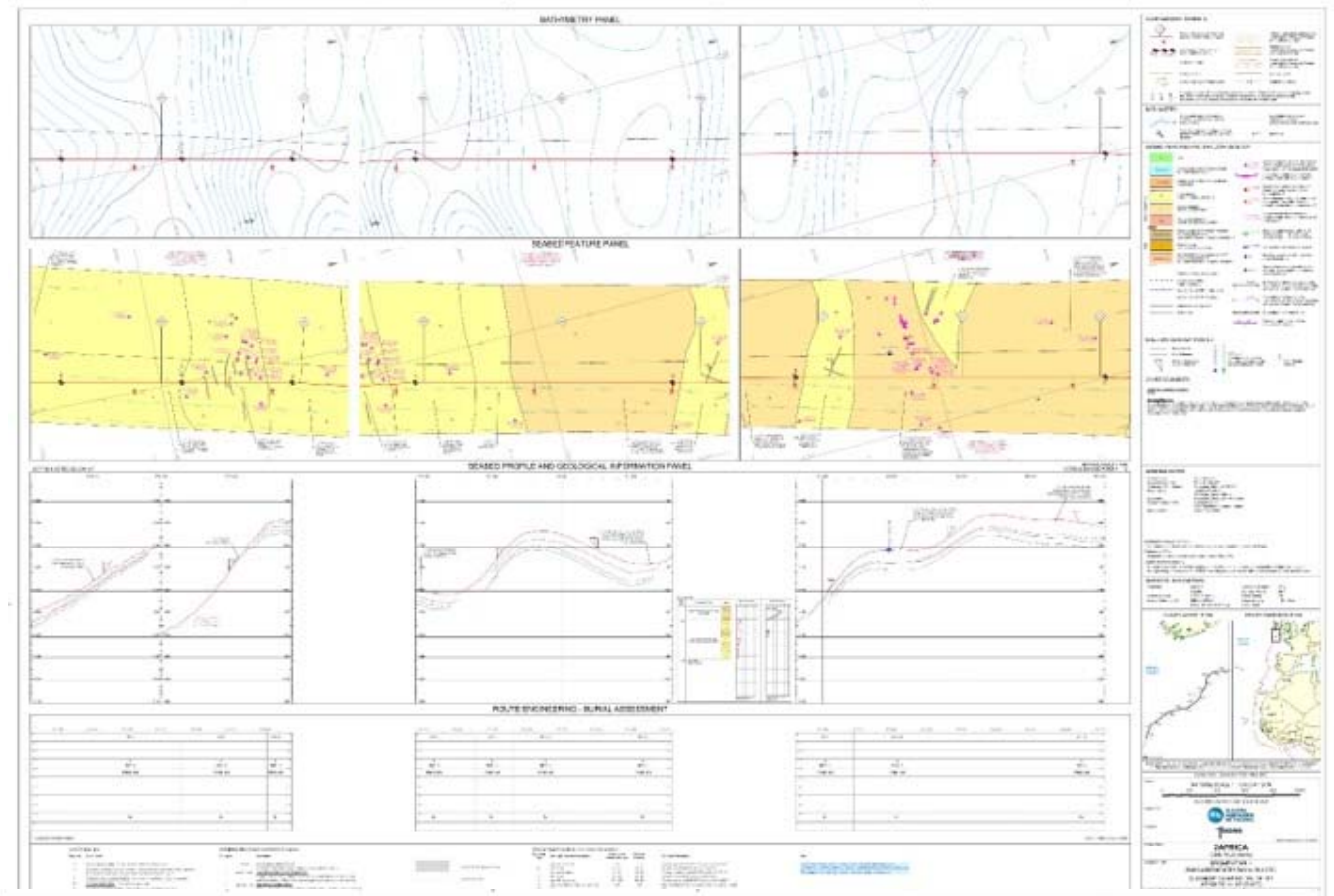








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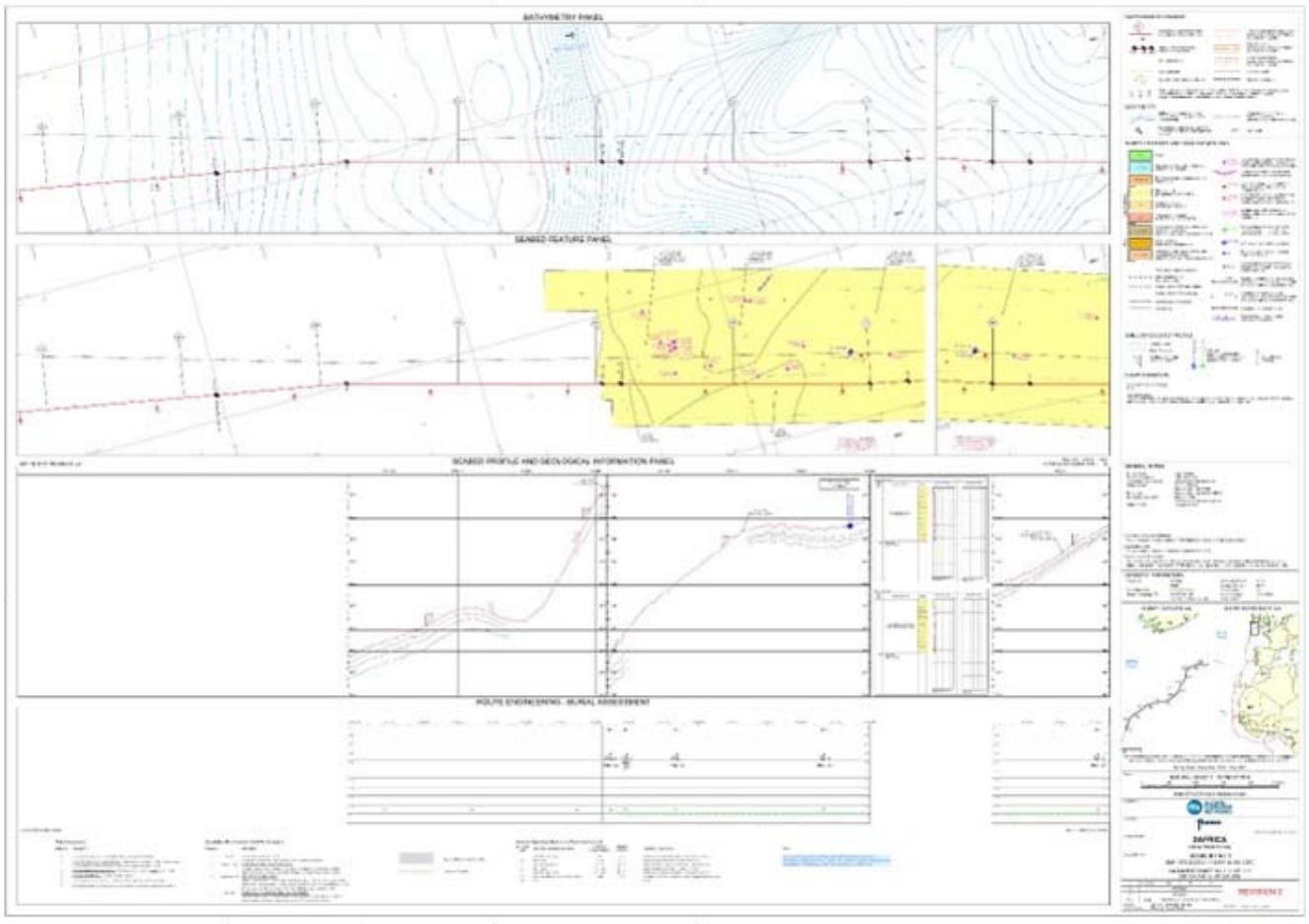
SEABED PROFILE AND GEOLOGICAL INFORMATION PANEL
ROUTE ENGINEERING - BURIAL ASSESSMENT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SEABED PROFILE AND GEOLOGICAL INFORMATION PANEL
ROUTE ENGINEERING - BURIAL ASSESSMENT

Appendix VI. Modelled Bottom currents within the Southern Canyons cSAC

ALCATEL SUBMARINE NETWORKS

Bottom Currents in Southern Canyon Special Area of Conservation

Introduction

To investigate potential sediment movement and smothering risk during the installation of the 2Africa cable system, Metocean Analytics tool was used to determine and analyse bottom currents. As shown in Figure 1, 3 points were investigated along the 2 Africa West route as it passes through the Southern Canyon SPAC. The results of the study are presented below.

Figure 1 - Overview of the study area showing the 5 points investigated.

Average Annual Bottom Currents

The average annual bottom currents of all 3 points were determined and results are presented in Table 1. Results show that on average, bottom currents across all 3 points are 0m/s.

Point No.	Average Bottom Current (m/s)
1	0
2	0
3	0

Table 1 - Table showing annual average bottom currents (m/s) at all 5 points.

Probability Distribution of Current Speeds

The probability distribution of current speeds at each point was also investigated using Met Ocean Analytics. Results are shown in the below figures.

Point 1:

As shown in Figure 2, at the beginning of the Irish shelf break, bottom currents between 0.05m/s and 0.1m/s are most likely to be present, with a predicted occurrence of 49.77% annually. The highest predicted current at Point 1 is between 0.2m/s and 0.25m/s, however probability of these speeds occurring are insignificant and only predicted to be seen 0.58% across the year.

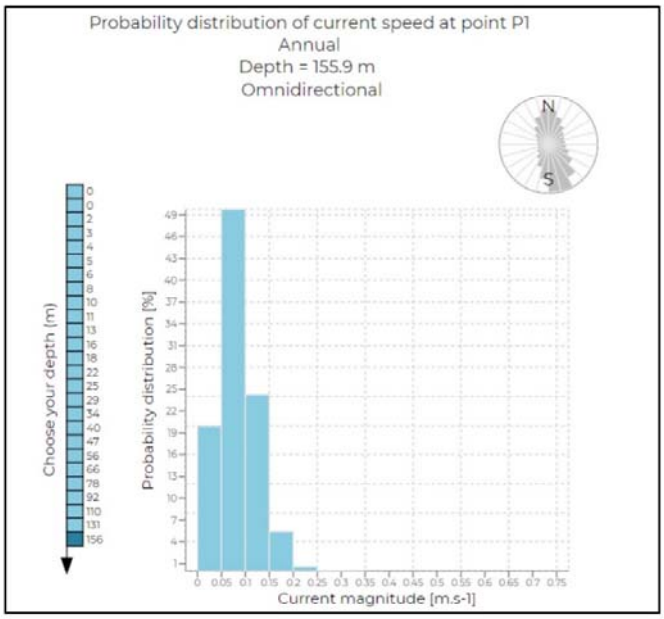

Figure 2 - Probability Distribution of Bottom Currents at Point 1

Point 2

As the 2Africa route drops off the shelf break and begins to enter the Southern Canyon, bottom currents drop further. As seen in Figure 3, currents between 0.00m/s and 0.05m/s are most prominent current speed present and are predicted to occur 44.6% of the year. Following this, speeds between 0.05m/s and 0.1m/s make up another 36.83%, resulting in currents below 0.1m/s accounting for 81.43% of the annual distribution. The highest speed predicted is between 0.25m/s and 0.3m/s, however this only accounts for 0.19% of the distribution and therefore poses insignificant risk.

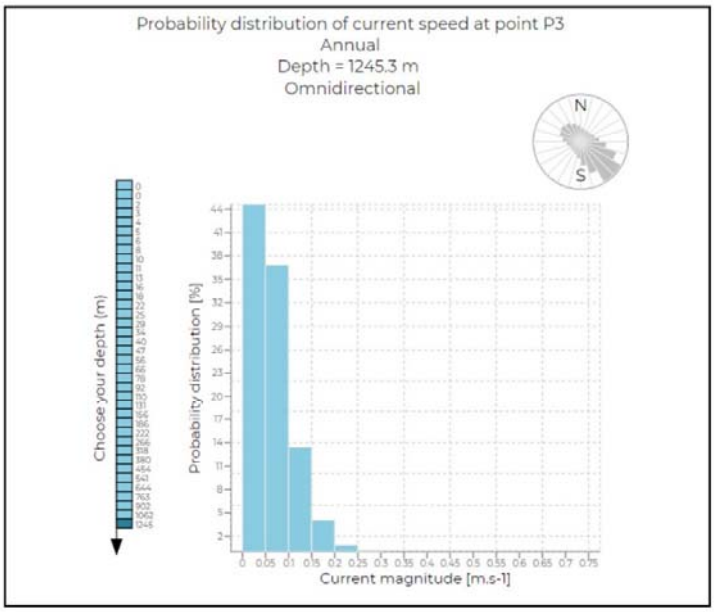

Figure 3 - Probability Distribution of Bottom Currents at Point 2

Point 3

Towards the bottom of the shelf, as represented by Figure 3, the distribution of bottom currents moves even further to the left, whereby 93.27% of bottom currents are predicted to be between 0m/s and 0.05m/s. The remaining 6.37% are predicted to be between 0.05m/s and 0.1m/s.

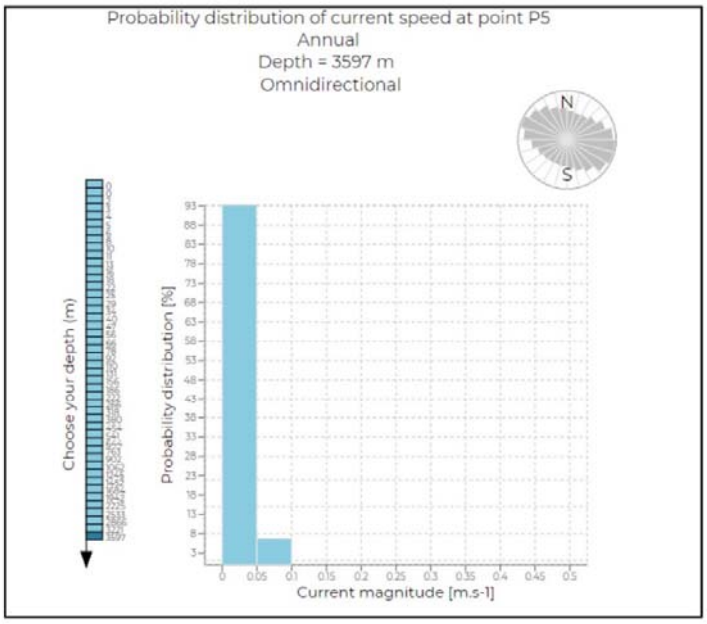

Figure 4 - Probability Distribution of Bottom Currents at Point 3

Conclusion

The results from the analysis conclude that bottom currents throughout the Southern Canyon Special Areas of Conservation pose minimal if any risk of significant sediment movement or smothering during the installation of the 2 Africa cable system.