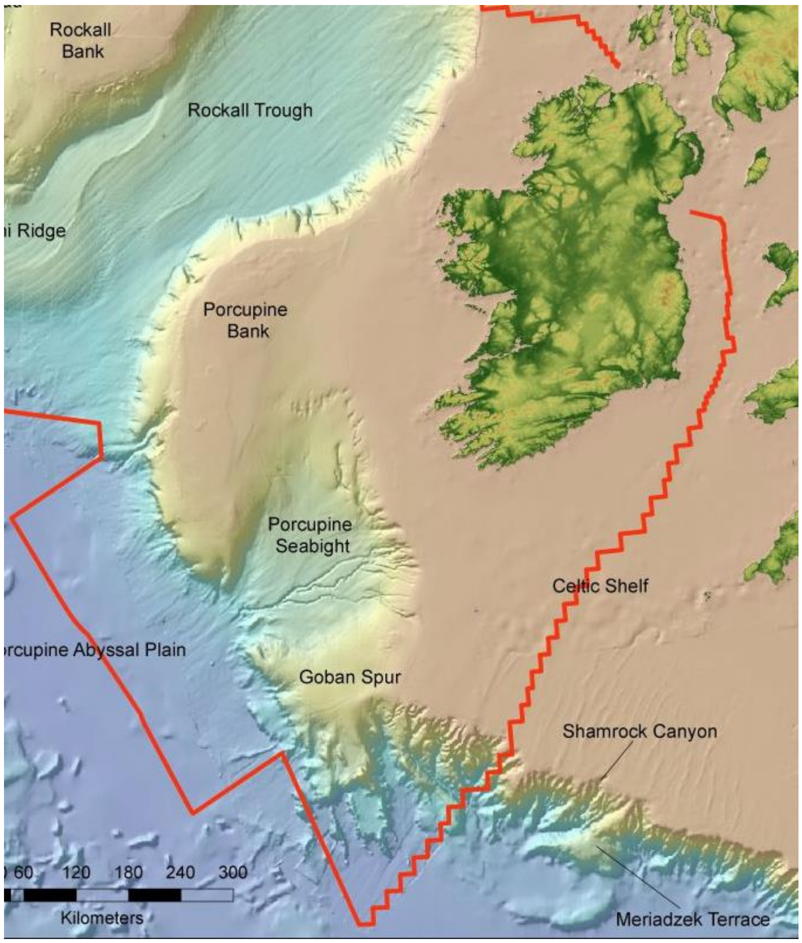
DEEPSEA Fibre Networks Ltd
Specialists in Sub-Sea Cable Systems

WINS
Western Ireland Northern Spain



PLANNING REPORT

Ref: FS006838

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1.0 INTRODUCTION

1.1 DeepSea Fibre Networks Ltd. is planning to construct a new sub-sea telecoms cable system linking Galway, on the west coast of Ireland to Bilbao on the north coast of Spain. This is referred to as the WINS System (Western Ireland Northern Spain) and the general line of the route is presented in Figure 1.

Figure 1. The general line of the WINS Cable System.

1.2 The high-level programme for the project is as follows:

Pre-submission Consultation and Application Preparation: March 2018

Submit Main-Lay Application: July 2018

Contracts for Main-Lay & Cable: October 2018

Site Investigations: April 2019

Shore-end Installation: June 2019

Main-Lay: June – August 2019

This is the proposed overall programme but may be subject to change arising from the Licensing/Permitting process.

1.3 This report covers the landfall at Ballyloughane Strand at Renmore in Galway and the overall planned route which extends south west from Galway towards the deep waters of the Porcupine Seabight and then towards the Bay of Biscay and landfall at Bilbao, Spain. The overall system is 1774 km in length with the majority of the system routed in deep water off the continental shelf.

1.4 This report presents a Route Position List indicating the centre line for the cable route corridor, an outline of the seabed conditions to be traversed, the findings of an Archaeological Assessment Report, a Natura 2000 Impact Assessment and an Ecological Assessment Report.

2.0 BACKGROUND

2.1 The planned Route Corridor is based on the following:

- Offshore Seabed Geomorphology Study
- Bathymetry, Multi-Beam Backscatter and Sub-Bottom Profile data available under licence via the Marine Institute
- Sea-bed Sediment and Bed form data for Galway Bay.
- Landfall Features.
- Galway Port Development Plan.
- Admiralty Chart Data
- Inventory of Wrecks.
- Inventory of existing cables.
- Inventory of marine installations and licence blocks
- Archaeological Assessment Report
- Natura 2000 Impact Statement
- Ecological Impact Assessment
- Other data in the public domain.

2.2 There are currently no subsea telecommunications cables providing Ireland with direction connection to Continental Europe.

Type of Cable

2.3 The cable is to be an industry-standard cable with the capability to transmit high-speed data and voice via light wave through the optical fibres contained within the core Unit Fibre Structure (UFS). A cut-away section of the Double Armour Cable is shown in Figure 2. The cable will be double armoured in Irish waters.

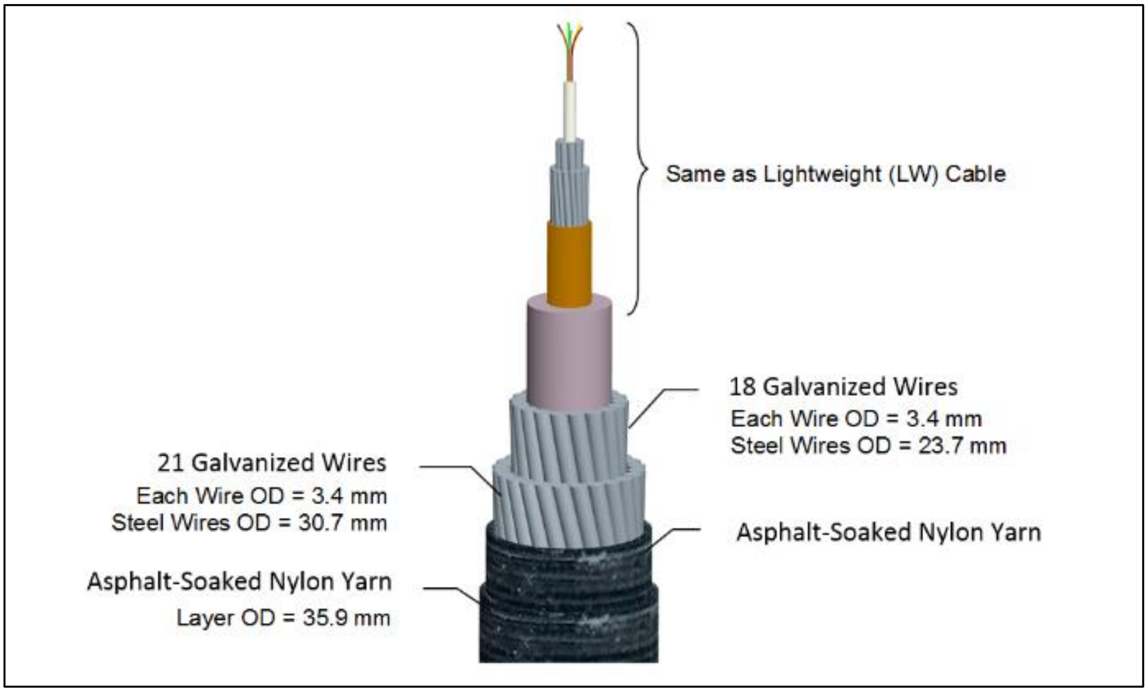

Figure 2. Typical Double Armour Cable Section.

2.4 The UFS is the innermost element of the cable and consists of optical fibres embedded in a buffer gel material inside a Polybutylene Terephthalate plastic tube. The buffer gel is a thixotropic material that protects the optical fibres from shear stresses associated with movement inside the tube. Ultra-high strength steel wires are helically wrapped around the UFS and together they act as a pressure vessel that protects the UFS from stresses up to and in excess of 100 MPa. The interstices between the steel wires are filled with a hydrophobic elastomeric water-blocking material which resists longitudinal water ingress. The SL design includes a conductor to carry both system power and the cable monitoring and maintenance signal. The power conductor is constructed by seam welding a copper tape around the high-strength wires. A thin layer of ethylene-acrylic and copolymer plastic resin and a thick layer of polyethylene insulating jacket are coextruded over the copper sheath. The polyethylene jacket provides insulation, abrasion resistance and corrosion protection.

2.5 The double armour, consisting of two layers of galvanised wire wrapped around the cable, is coated with hot-blown petroleum asphalt and wound with asphalt-soaked yarn. The finished DA Cable has an outer diameter of 35.9mm.

2.6 The cable will have Repeaters approximately 120km apart. These are “Optical Amplifiers” whose primary purpose is to boost the optical signal along the route. The copper conductors inside the cable power these Repeaters. The system line current will be of the order of 1 amp.

3.0 THE PLANNED ROUTE

3.1 The WINS cable system is 1774 km in length with the majority of the system routed in deep water off the continental shelf. The objective of this routing is to minimize installation difficulties and maximizing security of the system during its life. Of the 1774 km overall length only 325 km of the system is in water depth of less than 1500m. The line of the proposed route is presented in Figure 3. It is also presented in Appendix 1: 1317-A-108 Overall Route.

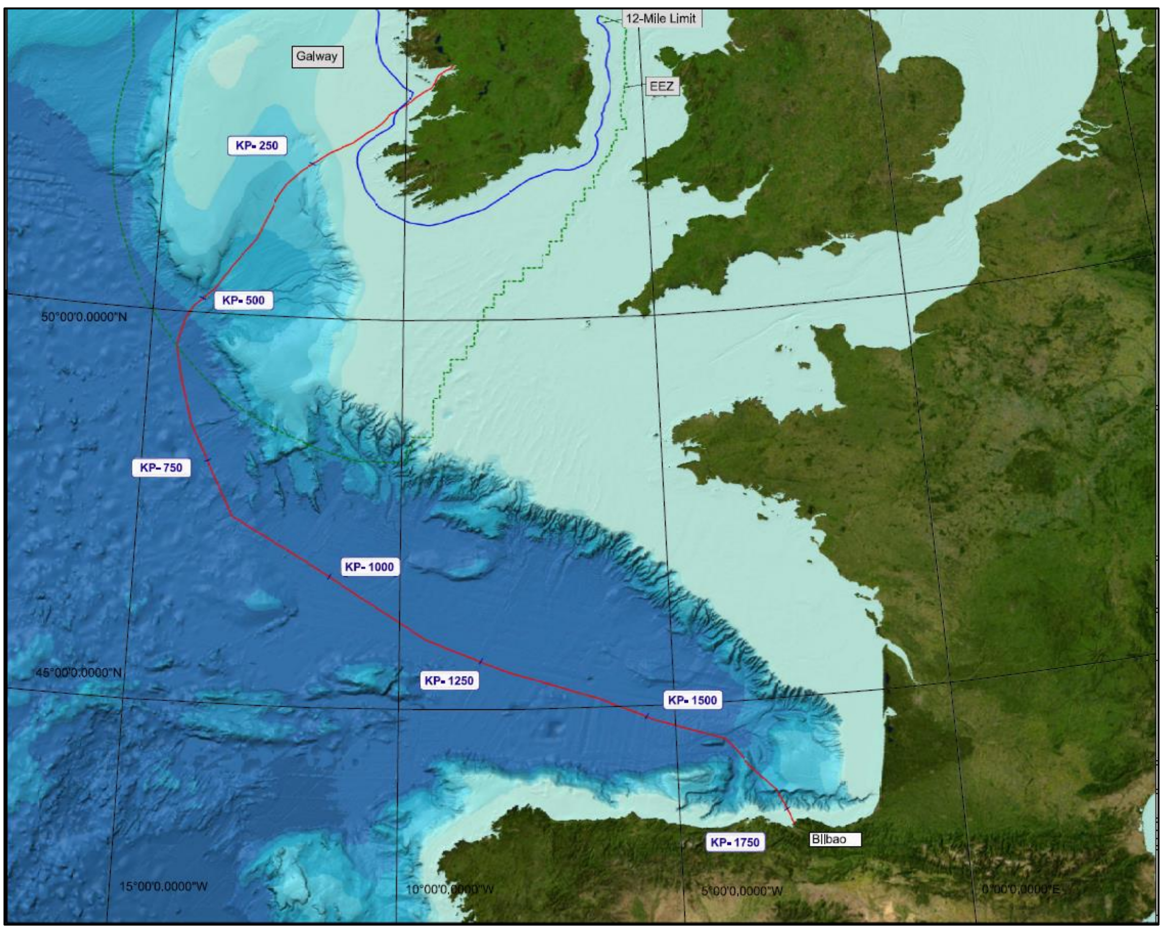

Figure 3. The Overall Route.

3.2 At Galway the WINS system will be tied-in to existing fibre optic cable networks which will provide resilient backhaul throughout Ireland and will connect with a selected PoP location in Dublin. In Bilbao, Spain the WINS system will be tied-in to existing fibre optic cable networks at Sopelana and then connect with a selected POP location at Basauri.

3.1 The route position list was issued in draft form to Geomara and to Altemar so as to facilitate a Marine Archaeology Assessment together with Environmental and Ecological Reports. Based on the findings of these reports, the proposed route was locally modified and a route which meets the requirements of these studies has been defined. This final Route Position List from H.W.M. to EEZ is presented in Table 2.

3.4 Key sections of the route from Galway Bay to the EEZ off the south-west coast are as follows (Figures 4-7);

- Landfall (KP0) at:

  53° 16' 14.7719" N 9° 01' 6.7752" W

- From Landfall (KP0) to the 12-mile territorial limit (KP102.5) at:

  52° 42' 21.8201" N 10° 09' 44.5417" W

- From the 12 mile territorial limit (KP102.5) to the edge of the Porcupine Sea Bight (KP240.1) at:

  52° 01' 17.1002" N 11° 49' 5.2609" W

- From the edge of the Porcupine Sea Bight (KP240.1) to the EEZ (KP579.4) at:

  49° 33' 16.8914" N 14° 27' 51.9009" W

TP	Latitude	Longitude	Length	Total Length	Heading
00	53° 16' 14.7719" N	9° 01' 6.7752" W	739.96 m	---	217.6°
01	53° 15' 55.8108" N	9° 01' 31.1369" W	411.59 m	739.96 m	201.9°
02	53° 15' 43.4545" N	9° 01' 39.4069" W	231.39 m	1.152 km	209.4°
03	53° 15' 36.9345" N	9° 01' 45.5372" W	333.68 m	1.383 km	210.7°
04	53° 15' 27.6553" N	9° 01' 54.7320" W	214.81 m	1.717 km	213.9°
05	53° 15' 21.8868" N	9° 02' 1.1921" W	154.12 m	1.931 km	217.3°
06	53° 15' 17.9220" N	9° 02' 6.2322" W	89.993 m	2.086 km	202.4°
07	53° 15' 15.2298" N	9° 02' 8.0788" W	285.8 m	2.176 km	195.6°
08	53° 15' 6.3256" N	9° 02' 12.2252" W	34.804 m	2.461 km	197.2°
09	53° 15' 5.2501" N	9° 02' 12.7799" W	63.902 m	2.496 km	188.4°
10	53° 15' 3.2052" N	9° 02' 13.2832" W	306.39 m	2.56 km	179.9°
11	53° 14' 53.2941" N	9° 02' 13.2585" W	243.43 m	2.866 km	210.7°
12	53° 14' 46.5248" N	9° 02' 19.9647" W	153.6 m	3.11 km	222.5°
13	53° 14' 42.8606" N	9° 02' 25.5594" W	121.84 m	3.263 km	231.9°
14	53° 14' 40.4273" N	9° 02' 30.7280" W	204.84 m	3.385 km	243.2°
15	53° 14' 37.4347" N	9° 02' 40.5835" W	154.9 m	3.59 km	246.1°
16	53° 14' 35.4035" N	9° 02' 48.2194" W	115.5 m	3.745 km	247.2°
17	53° 14' 33.9532" N	9° 02' 53.9592" W	356.37 m	3.861 km	252.4°
18	53° 14' 30.4683" N	9° 03' 12.2767" W	338.22 m	4.217 km	253.6°
19	53° 14' 27.3822" N	9° 03' 29.7736" W	68.214 m	4.555 km	237.0°
20	53° 14' 26.1793" N	9° 03' 32.8572" W	67.356 m	4.623 km	229.5°
21	53° 14' 24.7635" N	9° 03' 35.6178" W	75.401 m	4.691 km	213.0°
22	53° 14' 22.7173" N	9° 03' 37.8305" W	78.018 m	4.766 km	210.9°
23	53° 14' 20.5513" N	9° 03' 39.9896" W	58.068 m	4.844 km	204.3°
24	53° 14' 18.8400" N	9° 03' 41.2804" W	40.916 m	4.902 km	212.4°
25	53° 14' 17.7221" N	9° 03' 42.4612" W	50.147 m	4.943 km	223.8°
26	53° 14' 16.5509" N	9° 03' 44.3320" W	105.79 m	4.993 km	223.9°
27	53° 14' 14.0855" N	9° 03' 48.2881" W	220.98 m	5.099 km	217.6°
28	53° 14' 8.4253" N	9° 03' 55.5648" W	265.61 m	5.32 km	229.3°
29	53° 14' 2.8213" N	9° 04' 6.4195" W	444.42 m	5.586 km	230.0°
30	53° 13' 53.5773" N	9° 04' 24.7687" W	1.021 km	6.03 km	228.4°
31	53° 13' 31.6514" N	9° 05' 5.9283" W	892.13 m	7.051 km	239.4°
32	53° 13' 16.9381" N	9° 05' 47.2953" W	4.353 km	7.943 km	251.7°
33	53° 12' 32.7357" N	9° 09' 30.0232" W	6.025 km	12.296 km	239.6°
34	53° 10' 53.8776" N	9° 14' 9.7084" W	6.621 km	18.321 km	242.5°
35	53° 09' 14.8560" N	9° 19' 25.7645" W	2.8 km	24.943 km	206.9°
36	53° 07' 54.0896" N	9° 20' 33.9263" W	1.749 km	27.742 km	206.9°
37	53° 07' 3.6364" N	9° 21' 16.4712" W	1.974 km	29.491 km	206.9°

TP	Latitude	Longitude	Length	Total Length	Heading
38	53° 06' 6.6886" N	9° 22' 4.4479" W	1.236 km	31.465 km	206.9°
39	53° 05' 31.0196" N	9° 22' 34.4752" W	1.244 km	32.701 km	210.6°
40	53° 04' 56.4059" N	9° 23' 8.5214" W	1.249 km	33.945 km	195.0°
41	53° 04' 17.3738" N	9° 23' 25.9196" W	2.153 km	35.194 km	200.3°
42	53° 03' 12.0617" N	9° 24' 6.0699" W	3.129 km	37.347 km	207.6°
43	53° 01' 42.3411" N	9° 25' 23.8636" W	1.019 km	40.476 km	215.3°
44	53° 01' 15.4245" N	9° 25' 55.4197" W	956.53 m	41.495 km	221.9°
45	53° 00' 52.3766" N	9° 26' 29.6562" W	776.05 m	42.452 km	197.5°
46	53° 00' 28.4392" N	9° 26' 42.1988" W	884.89 m	43.228 km	205.3°
47	53° 00' 2.5522" N	9° 27' 2.4525" W	675.81 m	44.113 km	214.2°
48	52° 59' 44.4795" N	9° 27' 22.8413" W	834.71 m	44.789 km	219.0°
49	52° 59' 23.4868" N	9° 27' 50.9873" W	442.06 m	45.623 km	237.0°
50	52° 59' 15.6904" N	9° 28' 10.8535" W	1.035 km	46.065 km	231.2°
51	52° 58' 54.7370" N	9° 28' 54.1056" W	573.88 m	47.1 km	226.5°
52	52° 58' 41.9488" N	9° 29' 16.4026" W	10.702 km	47.674 km	239.9°
53	52° 55' 48.1468" N	9° 37' 32.1538" W	14.659 km	58.376 km	235.5°
54	52° 51' 18.9084" N	9° 48' 17.6415" W	8.553 km	73.035 km	228.7°
55	52° 48' 16.0042" N	9° 54' 0.4490" W	3.327 km	81.588 km	237.7°
56	52° 47' 18.4911" N	9° 56' 30.5581" W	2.536 km	84.916 km	231.0°
57	52° 46' 26.8429" N	9° 58' 15.6922" W	5.629 km	87.452 km	244.2°
58	52° 45' 7.4767" N	10° 02' 45.8711" W	2.863 km	93.081 km	233.8°
59	52° 44' 12.8115" N	10° 04' 49.0398" W	3.763 km	95.943 km	234.2°
60	52° 43' 1.5561" N	10° 07' 31.6473" W	2.781 km	99.707 km	243.8°
61	52° 42' 21.8201" N	10° 09' 44.5417" W	3.113 km	102.49 km	241.1°
62	52° 41' 33.1625" N	10° 12' 9.6861" W	4.346 km	105.6 km	230.5°
63	52° 40' 3.6310" N	10° 15' 8.0378" W	3.499 km	109.95 km	250.7°
64	52° 39' 26.1316" N	10° 18' 3.6926" W	3.463 km	113.45 km	235.7°
65	52° 38' 22.9120" N	10° 20' 35.7854" W	7.298 km	116.91 km	214.6°
66	52° 35' 8.4153" N	10° 24' 15.6278" W	3.73 km	124.21 km	221.5°
67	52° 33' 37.9695" N	10° 26' 26.6999" W	7.507 km	127.94 km	223.4°
68	52° 30' 41.5668" N	10° 31' 0.4436" W	9.874 km	135.44 km	234.8°
69	52° 27' 37.0804" N	10° 38' 7.6040" W	13.587 km	145.32 km	240.0°
70	52° 23' 56.9054" N	10° 48' 29.9808" W	26.249 km	158.9 km	233.5°
71	52° 15' 30.1852" N	11° 07' 2.2840" W	21.238 km	185.15 km	245.0°
72	52° 10' 38.3990" N	11° 23' 55.0947" W	14.62 km	206.39 km	245.0°
73	52° 07' 17.6160" N	11° 35' 31.3200" W	19.092 km	221.01 km	234.4°
74	52° 01' 17.1002" N	11° 49' 5.2609" W	25.566 km	240.1 km	237.2°
75	51° 53' 48.0062" N	12° 07' 49.6728" W	30.535 km	265.67 km	226.5°

TP	Latitude	Longitude	Length	Total Length	Heading
76	51° 42' 26.3708" N	12° 27' 3.2258" W	18.982 km	296.2 km	213.3°
77	51° 33' 52.5865" N	12° 36' 4.0425" W	71.437 km	315.18 km	203.8°
78	50° 58' 35.6669" N	13° 00' 44.3021" W	43.548 km	386.62 km	219.6°
79	50° 40' 28.1215" N	13° 24' 19.2888" W	48.56 km	430.17 km	214.6°
80	50° 18' 52.3970" N	13° 47' 33.3947" W	36.637 km	478.73 km	228.0°
81	50° 05' 37.4061" N	14° 10' 24.1343" W	12.274 km	515.37 km	210.6°
82	49° 59' 55.4309" N	14° 15' 38.0134" W	12.625 km	527.64 km	206.5°
83	49° 53' 49.5388" N	14° 20' 19.8886" W	39.144 km	540.26 km	193.4°
84	49° 33' 16.8914" N	14° 27' 51.9009" W	-----	579.41 km	-----

Table 1. Route Position List to Irish EEZ limits.

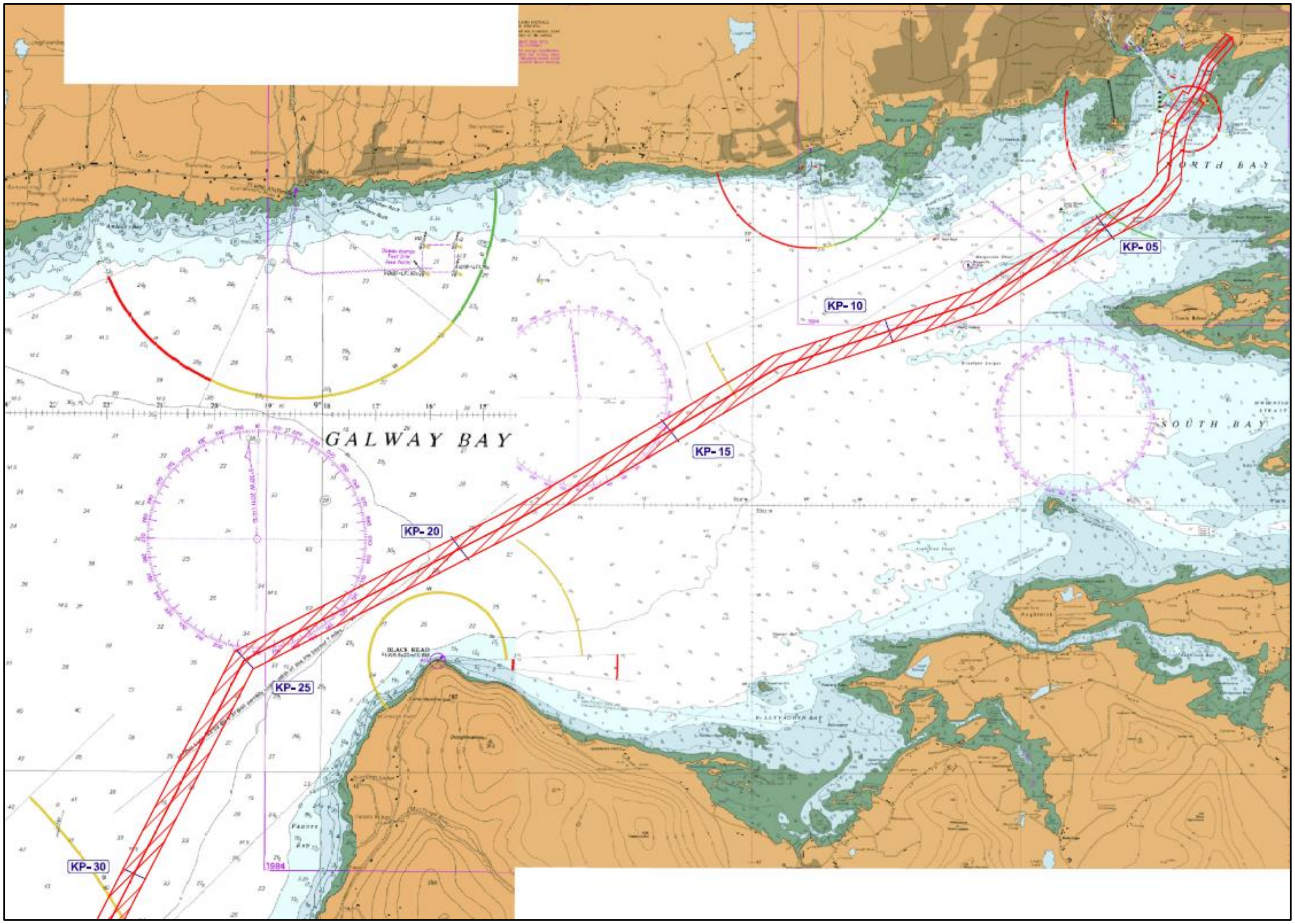

Figure 4. Galway Bay.

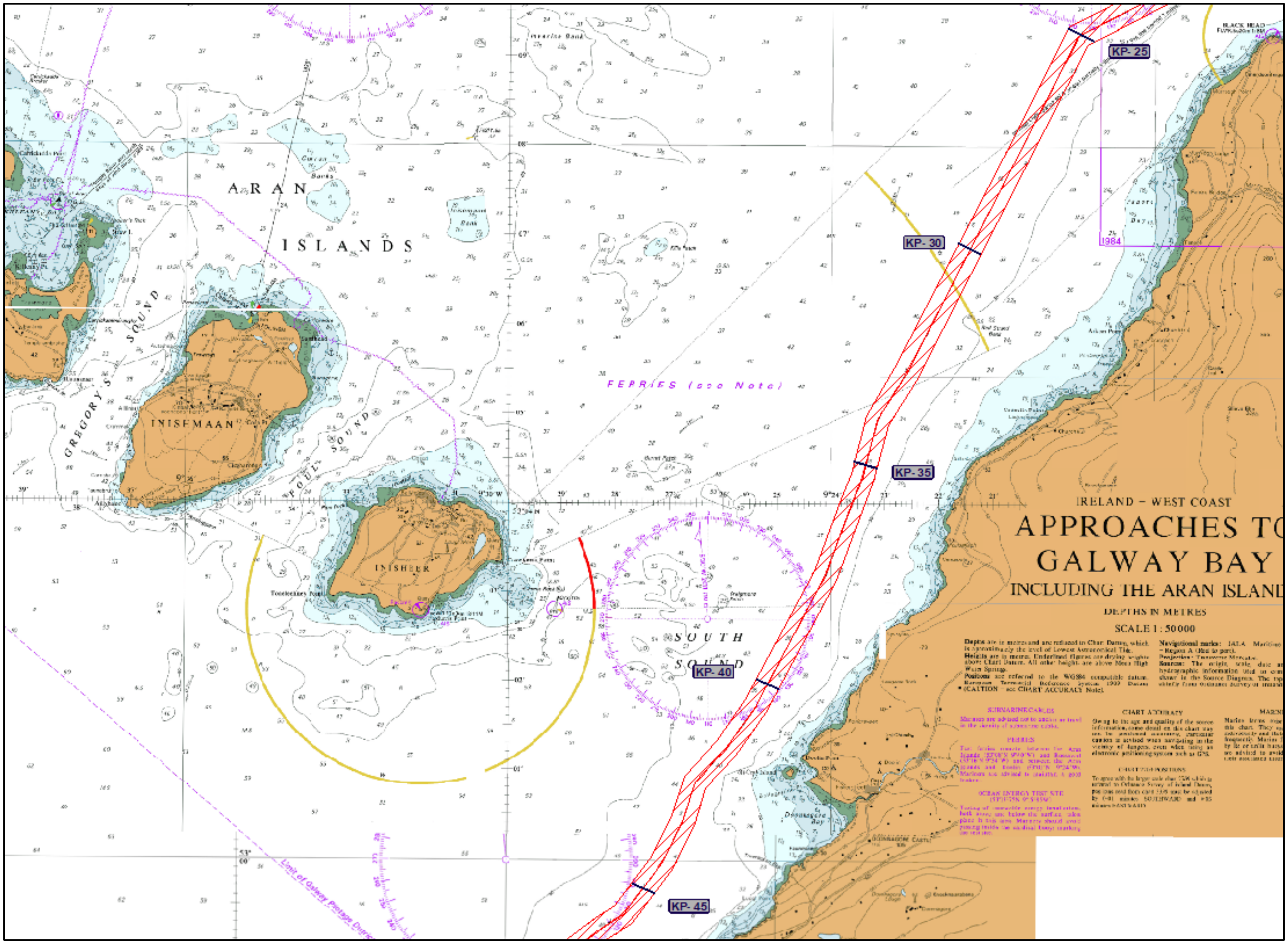

Figure 5. South Sound.

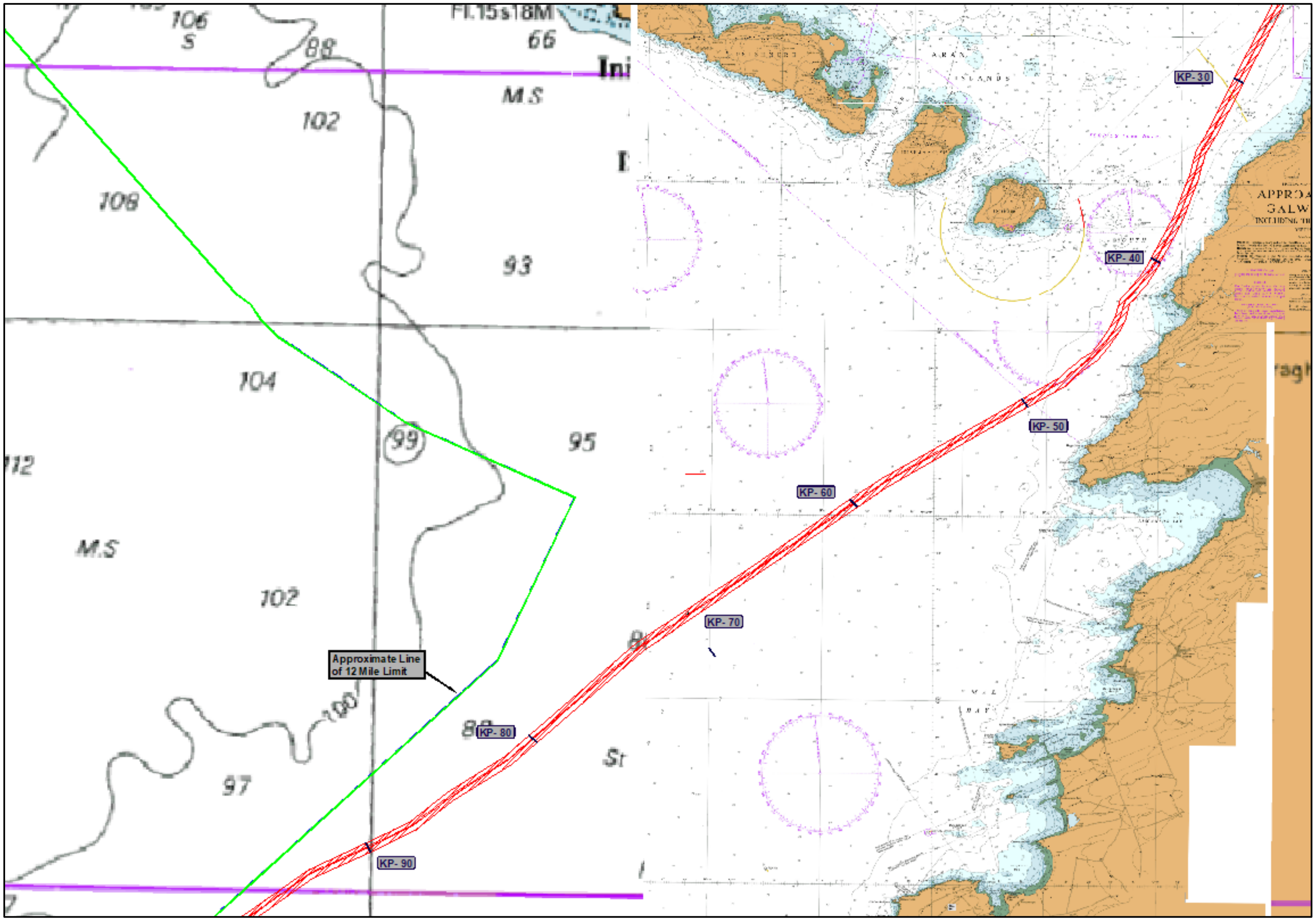

Figure 6. Offshore Section - South West Coast.

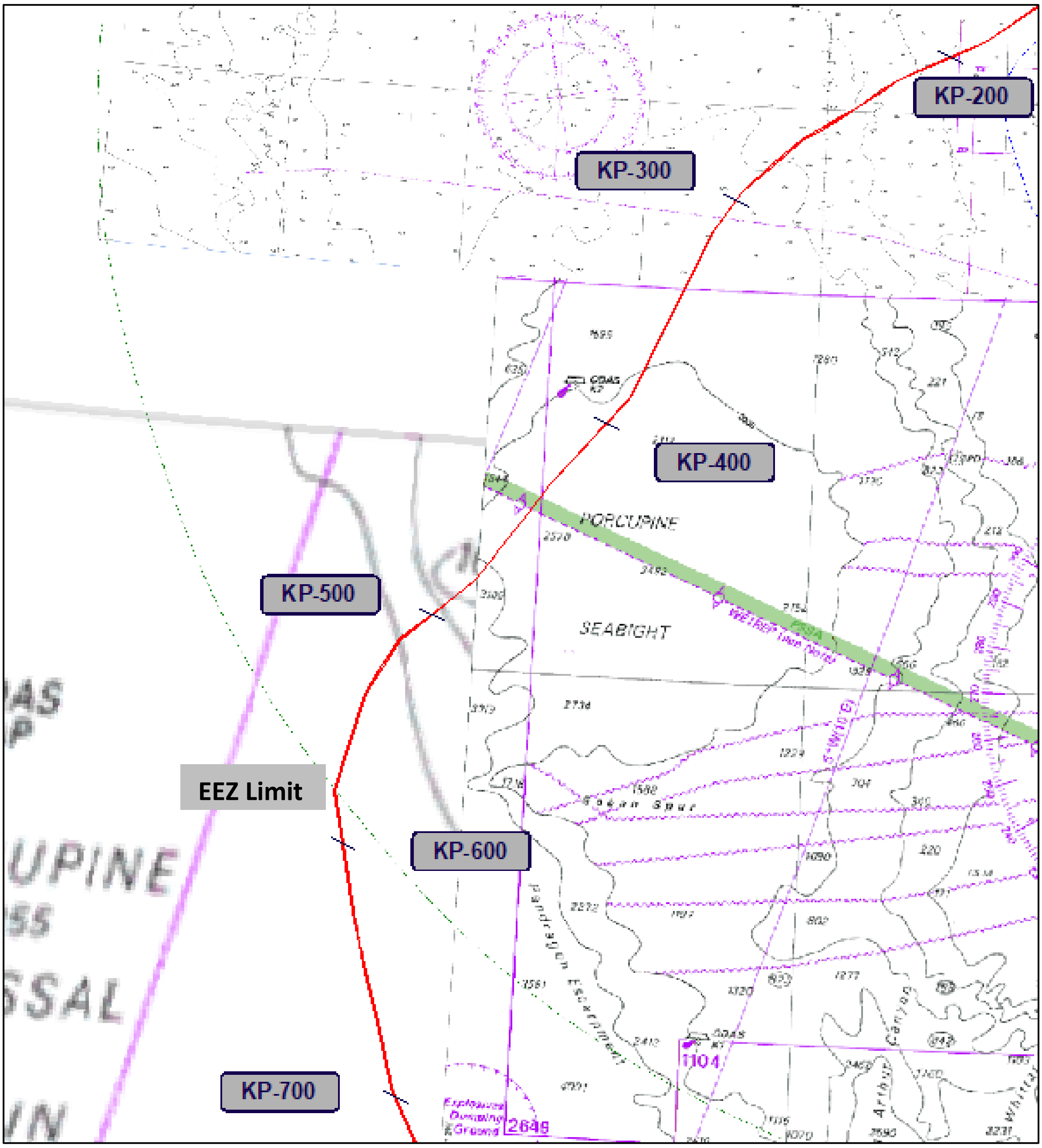

Figure 7. Offshore Section - Porcupine Sea Bight.

Water Depths and Distances

3.5 The water depths in the offshore Ireland section are shown in Figure 8 and range from 40 metres in the South Sound as the route leaves Galway Bay to 250 metres along the Continental Shelf over a distance of 221 kilometres. As the route descends into the Porcupine Sea Bight the water depth increases rapidly and reaches 3,800 metres at the base of the slope. The route then travels along the sea-floor of the Porcupine Sea Bight for a distance of 358 kilometres before it enters the Abyssal Plain.

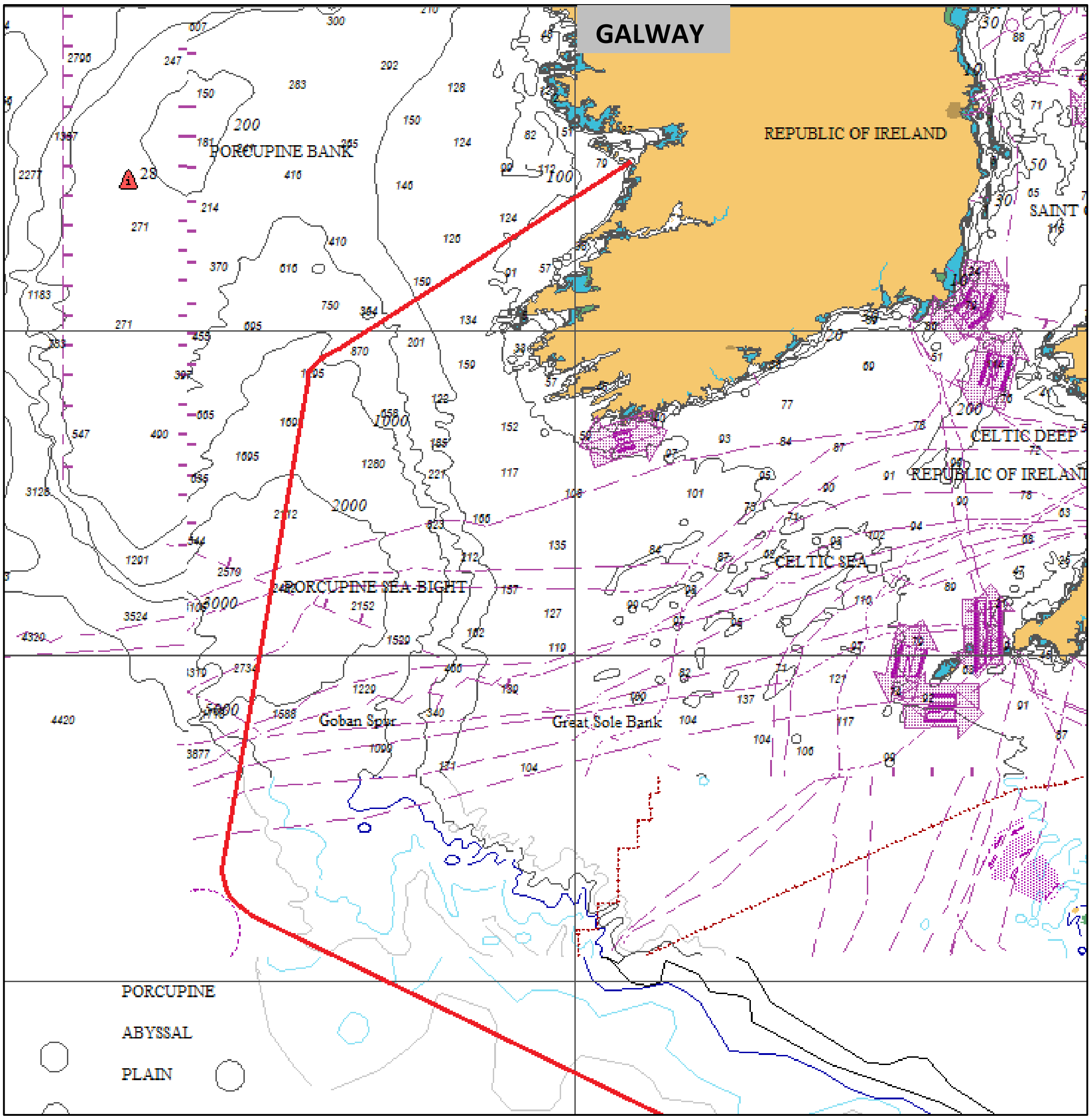

Figure 8. Offshore Ireland - Water Depths.

3.6 The transect of the Abyssal Plain to the base of the slope off northern Spain is shown in Figure 9. It is 1,085 kilometres in length and has a general water depth of 4,000 metres. As it approaches the Spanish coast, the route swings south to ascend the slope and on to the landfall at Bilbao.

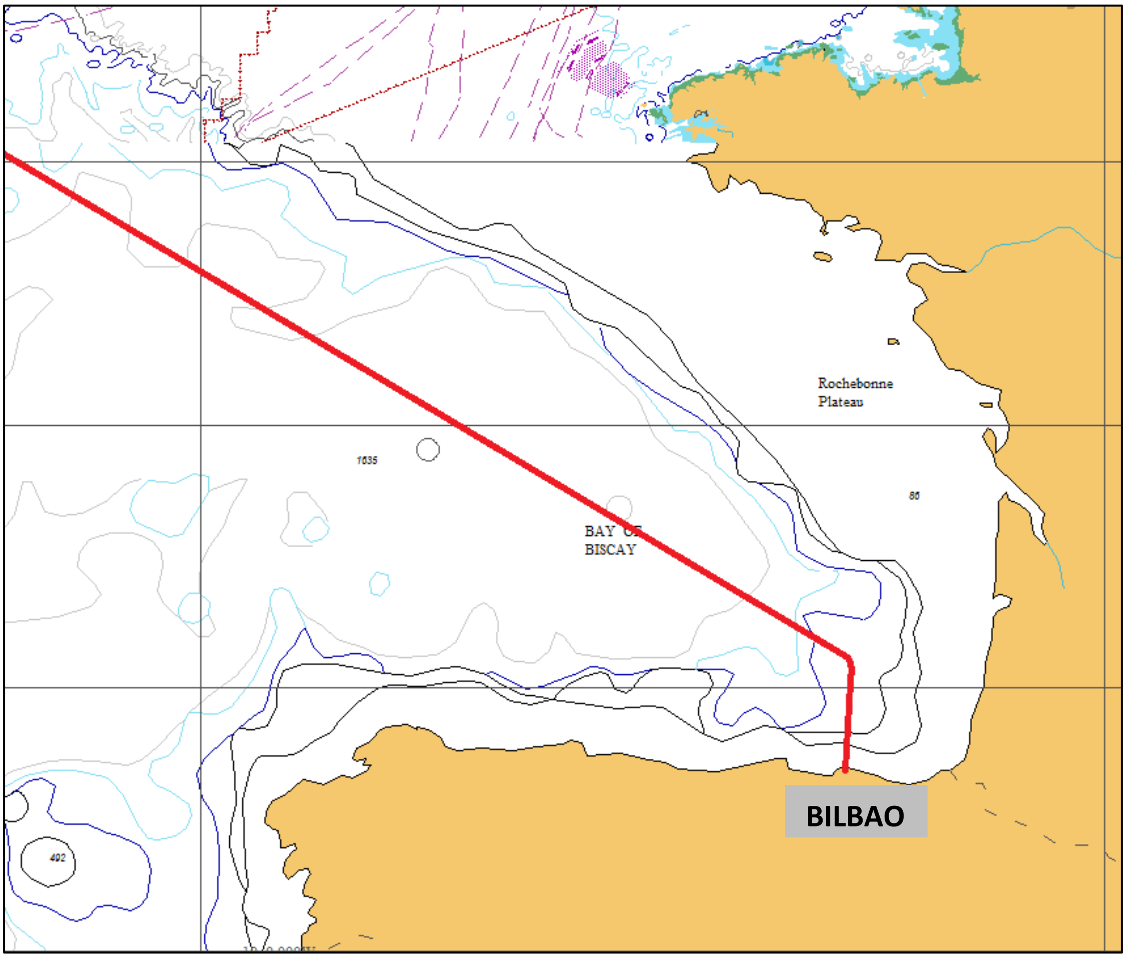

Figure 9. Spanish Offshore - Water Depths.

3.7 An analysis showing water depths and distances is presented in Table 2 where it can be seen that 1370 km of the planned route involves water-depths in excess of 3,800 metres. This equates to 80% of the overall route.

Sector	Water Depth	Distance
Irish Continental Shelf	40 – 250 m	221 km
Porcupine Sea Bight	3,800 m	358 km
Abyssal Plain	4,000 m	1085 km
Spanish Continental Shelf	40 – 250 m	110 km
	Total	1774 km

Table 2. Route Sectors by Water Depth and Distance.

3.8 The general criteria for secure sub-sea cable installation are that the cable needs to be trenched to a depth of 500mm to 600mm up to the 1500 metre water-depth. Beyond the 1500 metre water-depth the cable can be surface laid on the sea-floor.

3.9 Even in the case of the shallower sections, the water depths are of the order of 200 to 250 metres except at the approaches to the landfalls where sea bed conditions are expected to facilitate secure cable trenching with adequate depth of cover.

OFFSHORE SEABED GEOMORPHOLOGY STUDY

3.10 An Offshore Seabed Geomorphology Study was specially commissioned so as to be informed of the conditions which would be encountered throughout the route and the findings of this study are presented in the following paragraphs (3.11 to 3.23).

3.11 As shown in Figure 3 the cable exits Galway Bay through the South Sound (to the south of the Aran Islands) before proceeding in a south westerly direction along the Continental Shelf towards the Porcupine Sea Bight, off the south west coast of Ireland. The route then descends the slope of the Continental Shelf and runs along the sea-floor of the Porcupine Sea Bight. It then swings southwards before it turns to the south east towards the Bay of Biscay and on to Bilbao.

Cable Installation Considerations

3.12 The general criteria for secure sub-sea cable installation are that the cable needs to be trenched to a depth of 500mm to 600mm up to the 1500 metre water-depth. Beyond the 1500 metre water-depth, where the risk of impact from fishing and shipping activities is low, the cable can be surface laid on the sea-floor. With this in mind a number of considerations need to be taken into account and these are as follows;

- The seafloor sediments down to the 1500 metres water depth should ideally be ploughable to about 500mm-600mm below the seafloor
- The seafloor conditions beyond that water-depth need to be favourable for the laying of the cable so that it does not get damaged. That includes the avoidance of hard rock outcrops on the seafloor and also hydrodynamic conditions, including submarine landslides and sediment flows that reach the deep sea.

3.13 The Irish offshore and the NW European margin have had a long geological history and they include a number of features that need to be taken into account. The continental slope off northern Spain is morphologically complex as it is dissected by canyons, the largest of which, Cap Breton Canyon, is parallel to the coastline, and emanates from the southern slope of France.

Sea-Floor Conditions:

- **Galway Bay to Edge of Continental Shelf**

3.14 The proposed route out of Galway Bay through the South Sound follows a relatively narrow seafaring route with a tidal range up to 5 metres. Mud to fine sand seems to be the dominant lithology in the South Sound with a few metres thickness but in a narrow strait as for a radius of 4 kilometres around Inish Oírr there are limestone outcrops (Figure 10). Similarly, for a zone of up to 10 kilometres from the Loop Head peninsula coast and the Kerry coast there are rocky outcrops that will need to be avoided.

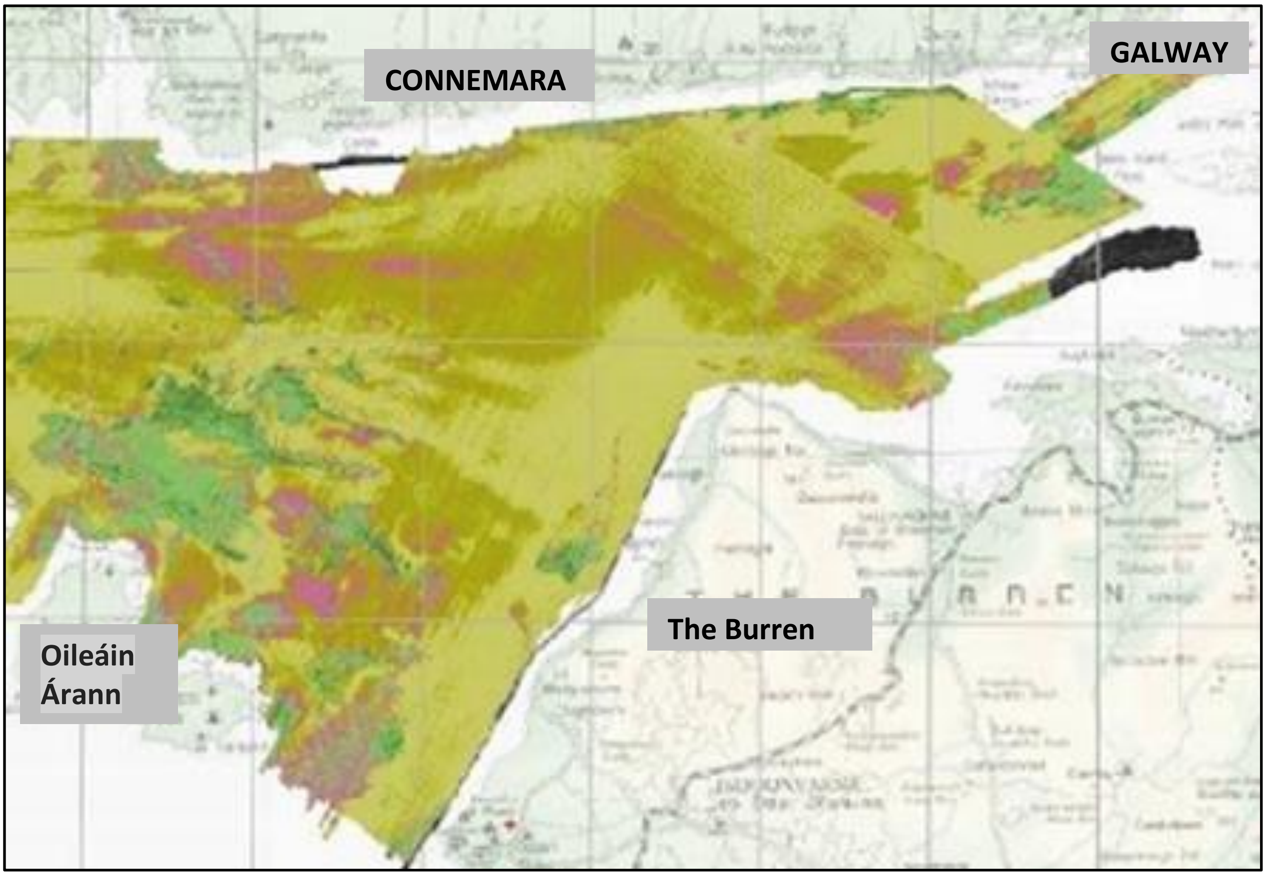

Figure 10. Galway Bay Seabed Classification Map.

3.15 Off the Kerry coast, the sea floor of the Continental Shelf is comprised of a widespread presence of glacial sediments consisting of compacted muds, open framework gravels and gravelly sand of at least 1 metre thickness (based on sediment cores retrieved in this area). Finding ploughable seafloor between the South Sound and the 1500 metres water depth contour on the Porcupine Sea Bight should not be a problem.

3.16 The continental slope from at least 300 metres water depth has thick sediments (several tens of metres) ranging from hemipelagic mud to well-sorted loosely packed sand and some patches of gravel and coral rubble around the coral mounds. There is evidence that the seafloor sediments are fairly mobile due to currents and the hydrodynamic regime the mounds create, but this is restricted to the areas around the coral mounds. Outside these provinces the sediments are not as mobile. There, lithologically the area is dominated by thick piles of hemipelagic mud.

- **The Porcupine Sea Bight**

3.17 The Porcupine Sea Bight is world renowned for its carbonate mounds, the Hovland Mound Province (HMP) and the Belgica Mound Province (BMP) (Figure 12). These are coral reefs, but unlike their popular cousins that feature in documentaries, these are found at greater water depths and in cold water, which is why they are called cold-water corals (Figure 11).

3.18 Their growth is associated with the presence of bottom water currents that carry the nutrients that the corals need to feed on. Both provinces are designated Special Areas of Conservation. The route is designed to traverse between them and so it would not disrupt the reefs. The seafloor between the coral reefs seems to have been affected by submarine landslides. Several small scarps can be seen but the landslides do not seem to have moved very far. The route can readily avoid these features and pass through an undisturbed part of the seafloor between the scarps.

Figure 11. Examples of Cold water corals from Porcupine Area.

3.19 Another feature of the Porcupine Sea Bight (Figure 12) which can be readily avoided is the Gollum Channel (Named after the much loved Tolkien Channel as are many other features on the Porcupine Seabight; (the Arwen, Elrond and Galadriel channels are also named after characters from the Lord of the Rings books).

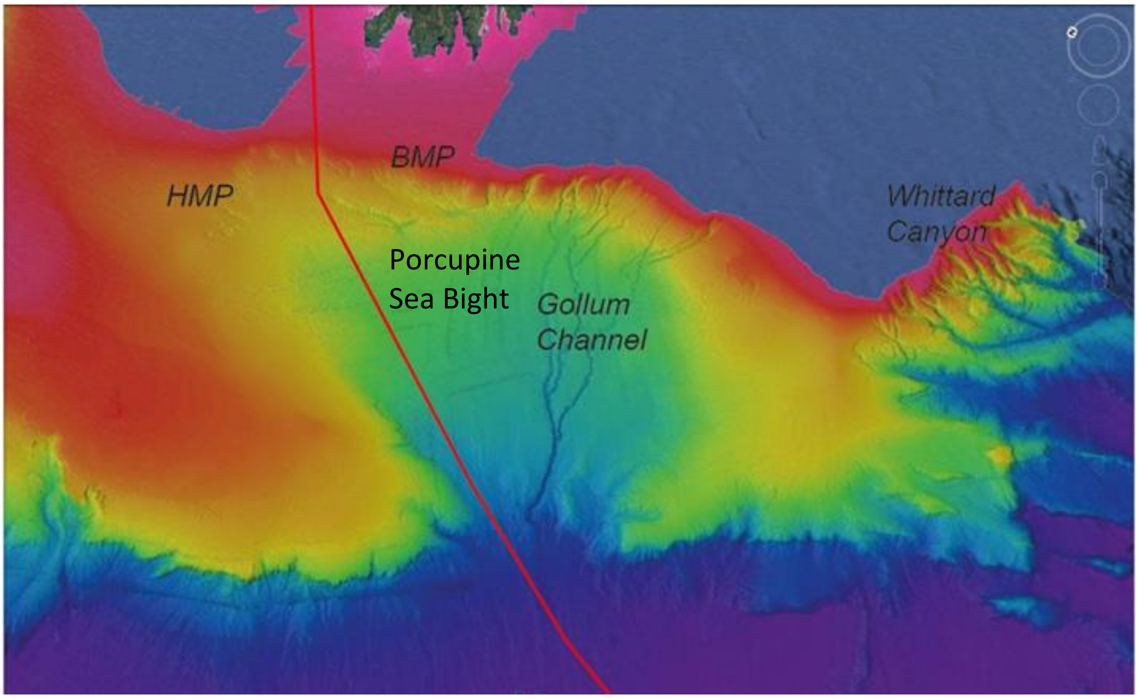

Figure 12. Porcupine Sea Bight and proposed cable route.

3.20 The Gollum Channel was very active and fed by the glacial outlets of the British Irish Ice Sheet that extended across the British Isles and the continental shelf all the way to the shelf edge during the last glaciation. Surveys in the Gollum Channel have shown that activity in the channel, in the form of downslope transfer of sediment-laden flows, did not seize with the end of the glaciation and, although infrequent, there are sediment flows through the channel. Submarine canyons and channels have steep morphologies and variable current speeds. To that effect the route follows the slope some distance to the north of the channel.

- **The Abyssal Plain to Cap Breton Canyon**

3.21 The Abyssal Plain hosts three large deep-sea submarine fans, the Celtic deep-sea fan, the Armorican deep-sea fan and the Cap Ferret deep-sea fan. The fans have been fed with sediments through numerous channels and canyons (the most prominent of which is the Whittard Canyon) that dissect the Celtic margin that forms the western end of the English Channel continental shelf and the Armorican and Aquitaine margins offshore western France. The last phase of energetic activity was the last glaciation. Even though the last glaciation was their most active phase, deep-sea scours have been found at the mouths of the canyons suggesting that active flows still come through these canyons. Accordingly, the route is designed to avoid the mouths of the canyons and will be laid through the outer edges of the fans where only the largest flows may reach, and even those at this point are very slow and infrequent (in the range of hundreds to thousands of years).

3.22 There are also a number of seamounts peppering the sea-floor. These are structural highs, remnants of the tectonic processes that took place during the Palaeocene-Oligocene (65-23 million years ago). These seamounts, unlike the volcanic seamounts that are found in the World's oceans, are not associated with geothermal activity and therefore not associated with the hot, corrosive fluid seepages which are characteristic of volcanic seamounts.

- **The Cap Breton Canyon**

3.23 The cable will make landfall at Bilbao in the Basque Country of northern Spain. To make it to Bilbao, the cable traverses an area that is topographically complex, as it is dissected by the Cap Breton Canyon (Figure 13). The canyon incises the south west French continental shelf and runs westward, parallel to the northern Spanish coastline.

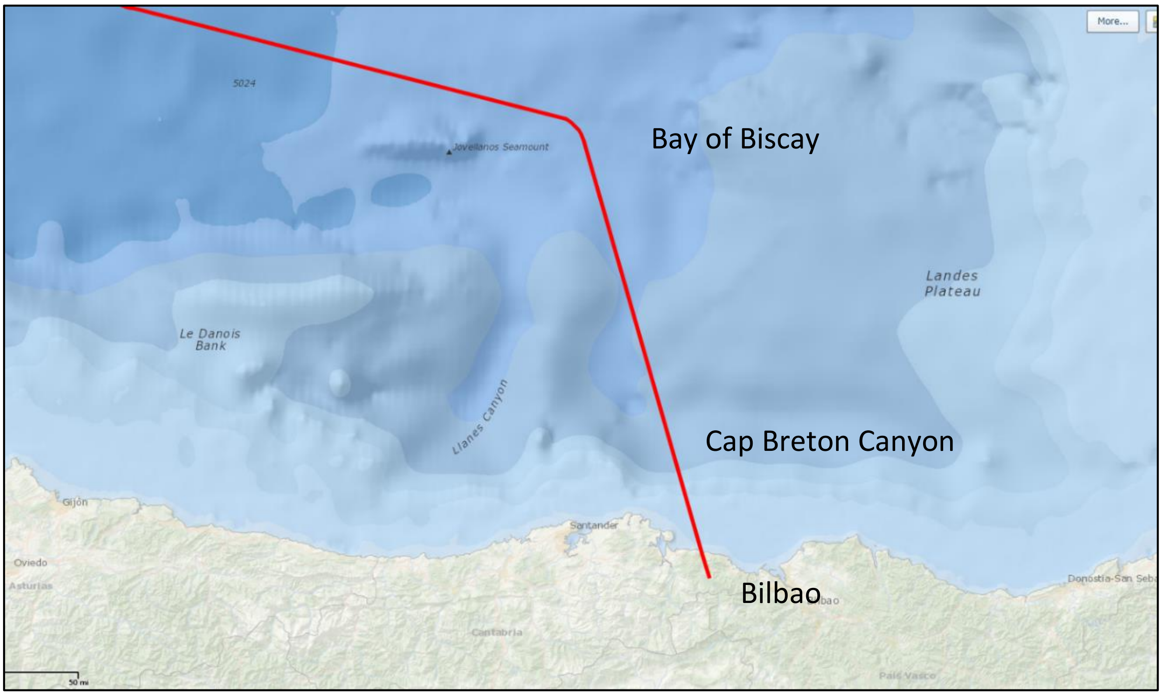

Figure 13. North Spanish Margin showing Cap Breton Canyon.

3.24 The findings relating to the sea bed conditions are consistent with cable installation experience on the Irish Continental Shelf. In the case of the Abyssal Plain, where water depths are in excess of 4,000 metres, there are numerous cables (Figure 14) and their presence is indicative of non-aggressive sea bed conditions and appropriate routing potential for the proposed cable. It can be noted that this also demonstrates that there are currently no direct subsea communication links from Ireland to continental Europe.

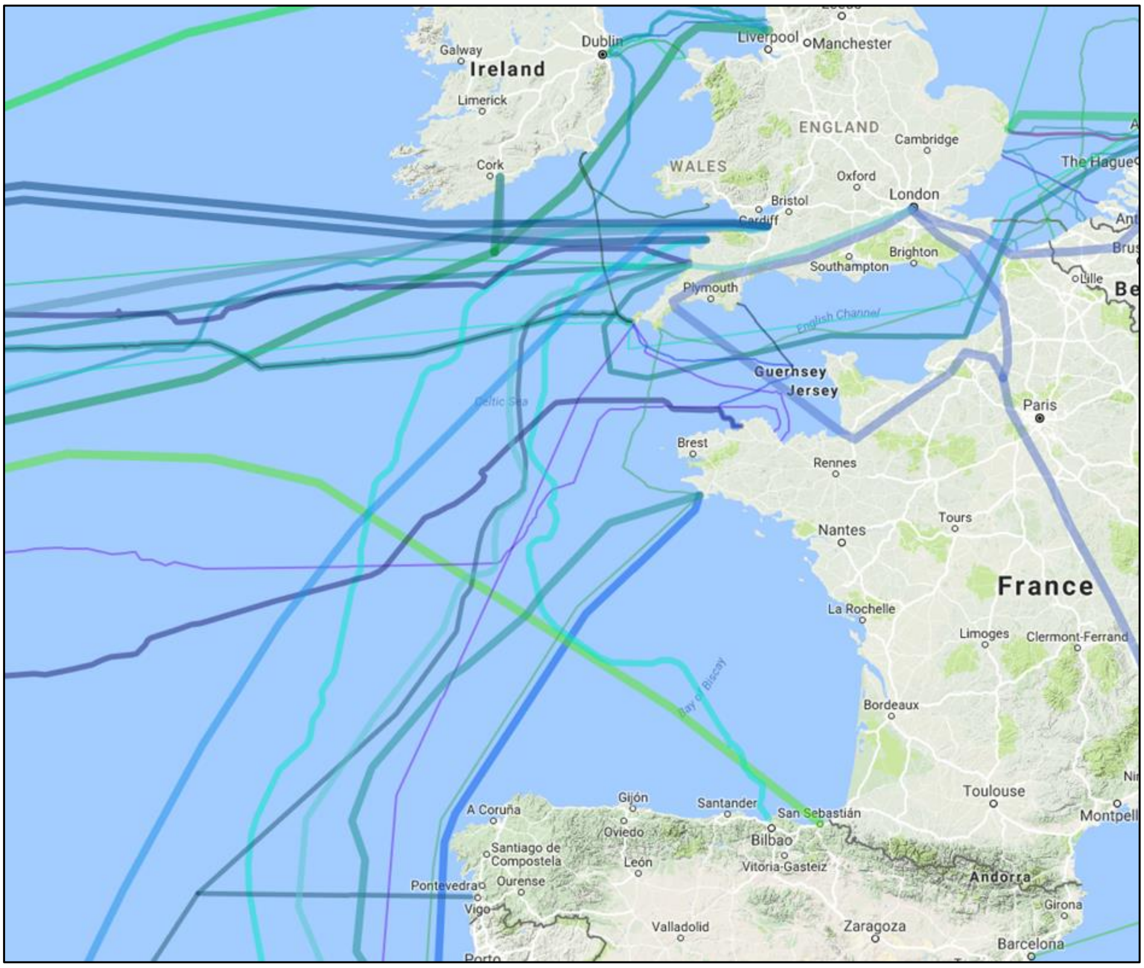

Figure 14. Overview of existing international subsea cables (indicative only).

Subsea Crossings

3.25 Along the planned route, there are no subsea crossings of existing in-service cables or pipelines within the Irish foreshore between the High Water Mark and the 12 nautical mile limit.

3.26 All crossings of in-service subsea cables are in deep water (>2000m) negating the need for plough up / plough down activities, guard vessels, post lay inspection and burial and associated weather delays and potential for cable damage during installation. ICPC Recommendations for cable crossings of this type will apply.

Hydrocarbon Licence Blocks

3.27 There is a number of Hydrocarbon Licence Blocks off the west and southwest coast of Ireland. These are shown in Figure 15 and 16 with the planned cable route overlaid. The Planned Route unavoidably traverses a number of these blocks and, to some extent the cable is routed to keep to the edges of blocks.

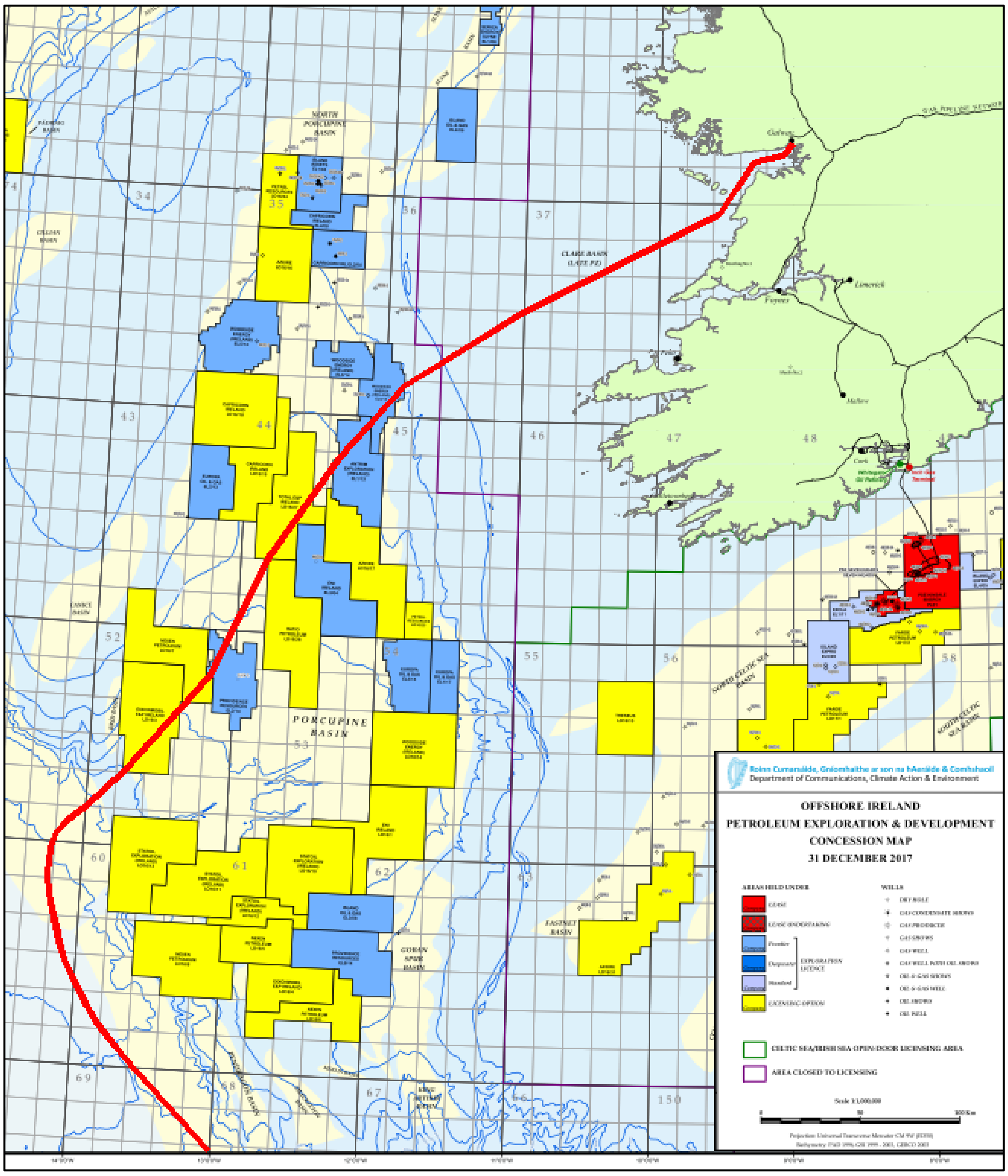

Figure 15. Hydrocarbon Licence Blocks.

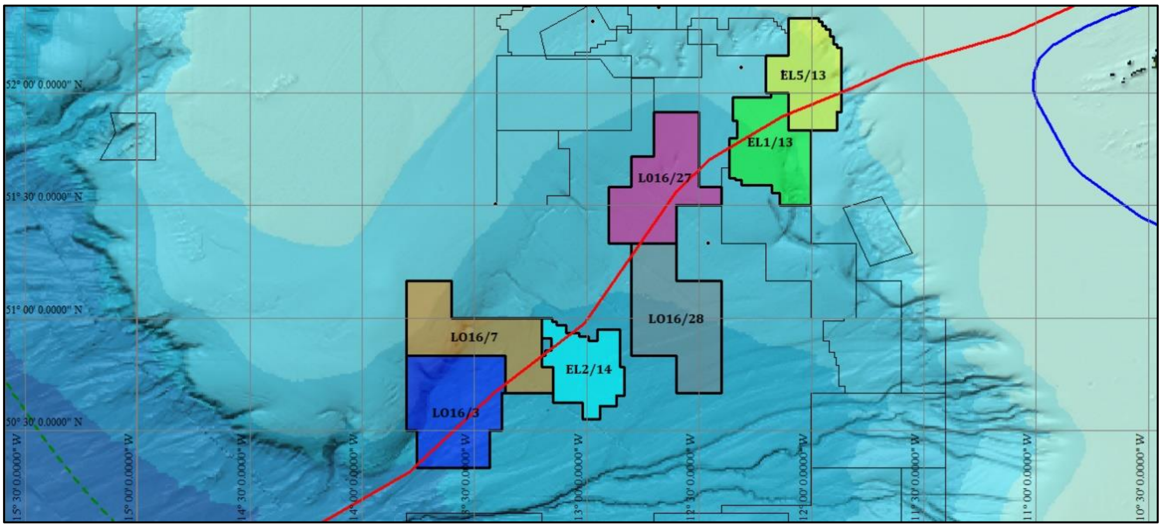

Figure 16. Licence Blocks traversed by planned cable route.

3.28 The Licence Blocks traversed by the cable route are as follows;

- EL2/14 – Providence Resources – Exploration Licence Frontier
- EL1/13 – Antrim Exploration (Ireland) - Exploration Licence Frontier
- EL5/13 – Woodside Energy (Ireland) - Exploration Licence Frontier
- LO16/27 – Providence Resources – Licensing Option
- LO16/28 - Ratio Petroleum - Licensing Option
- LO16/3 – Exxon Mobil E+P Ireland - Licensing Option
- LO16/7 – Nexen Petroleum - Licensing Option

3.29 It should be noted that the footprint of the cable is approximately 36mm in width and the installation will have no significant impact on activities within the Licence Blocks. Consultation with affected License Block concessionaires will be undertaken prior to cable installation.

4.0 INSHORE SECTION (IRELAND)

4.1 The Irish inshore section is defined as the section of cable from the High Water Mark at Ballyloughane Strand out to the 12-mile limit which is at KP 102.5, i.e. approximately 103 Kilometres from landfall and 35 km West of Kilkee. The Irish inshore section is presented in Figures 17 & 18.

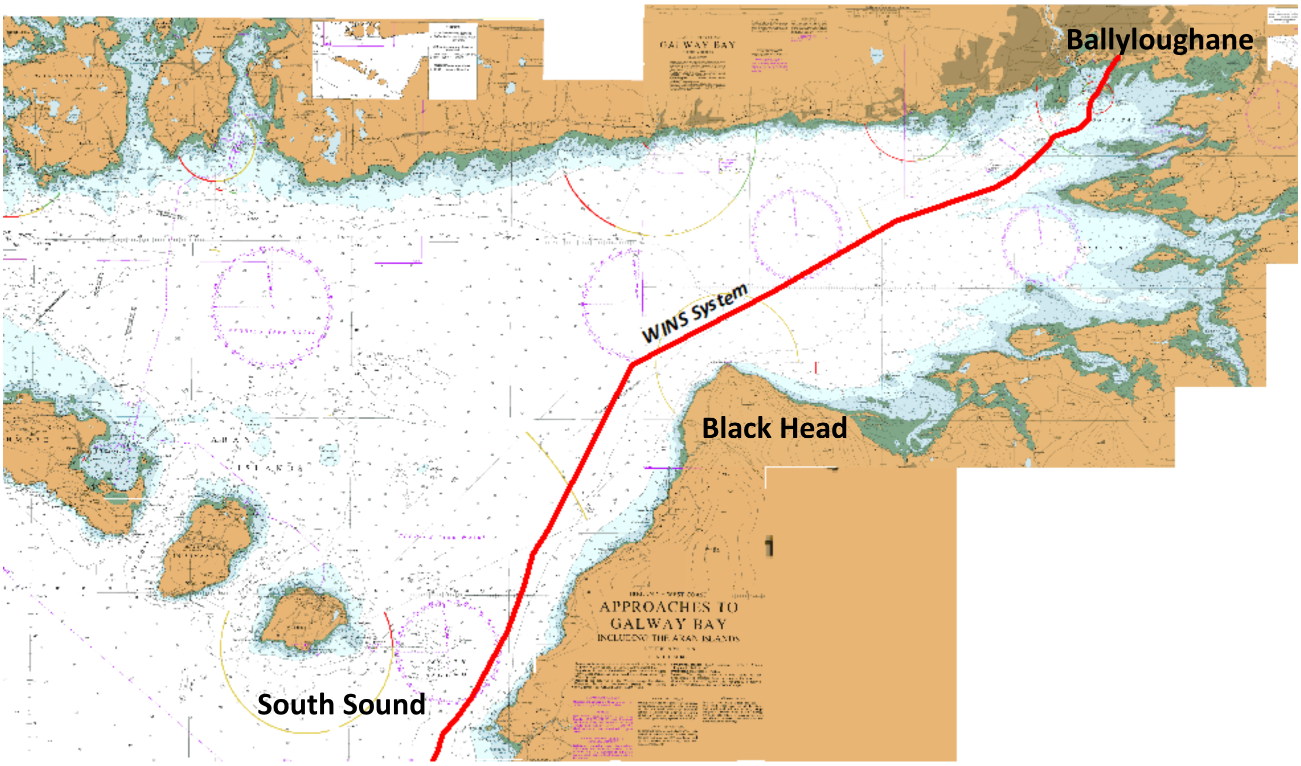

Figure 17. Inshore Section Ireland - Ballyloughane to South Sound.

4.2 It can be seen from Figure 17 that from Ballyloughane, the route of the WINS cable proceeds to the west of Hare Island, avoiding traversing the existing and proposed future navigation channels of Galway Port. The route continues in a general south west heading, carefully diverting around zones of ecological importance and navigation hazards such as the shallows of the Tawin and Margaretta shoals and the Henry ledges.

4.3 Once past the Margaretta shoals, the WINS cable route traverses the Bay in a south westerly direction, then turning at KP 24.9 near Black Head to proceed southwards through the South Sound. The seabed in the inner bay is predominantly unconsolidated sedimentary layers.

4.4 From Black Head, WINS proceeds parallel to the coast and the transit through the South Sound was chosen to avoid the limestone bedrock outcrops surrounding Inis Oírr, following lenses of sandy sediment where possible for optimum burial conditions.

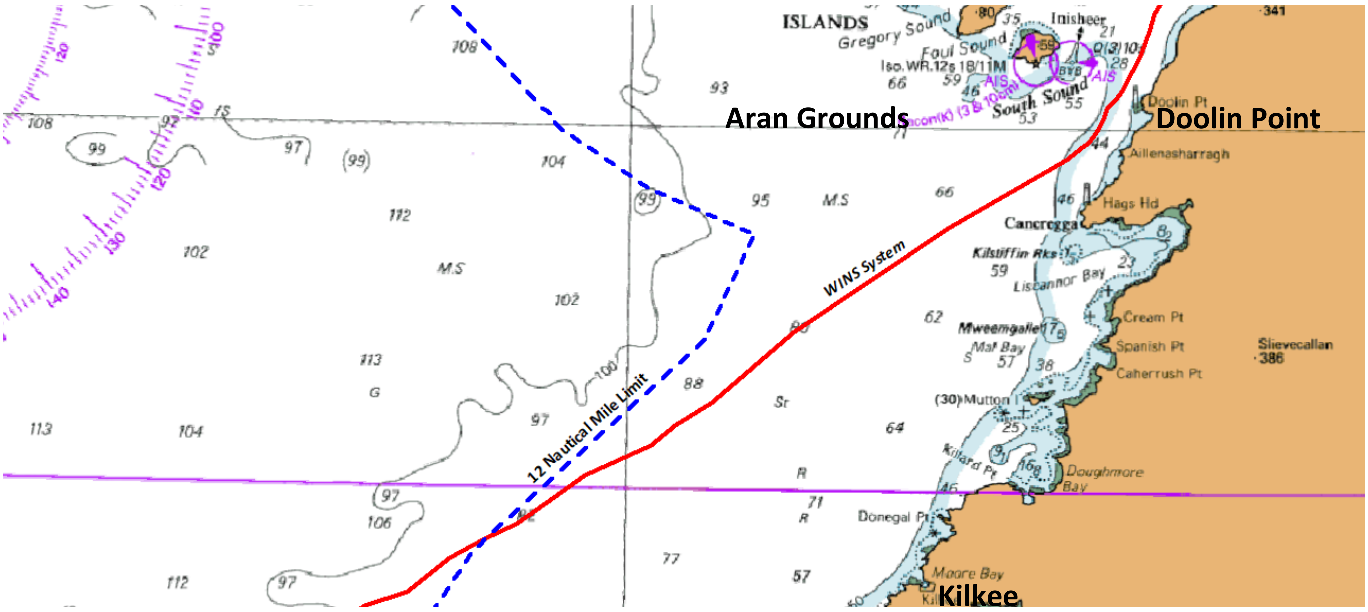

Figure 18. Inshore Section Ireland - South Sound to 12NM Territorial Limit.

4.5 Figure 18 illustrates the path of the WINS cable after exiting the South Sound at Doolin Point, proceeding south westerly, avoiding the Aran Grounds. This is a medium density nephrops fishery of national importance. The seabed changes from mud and sandy sediments upon exiting the South Sound at Doolin Point with a transition to variable seabed substrates such as consolidated glacial till and compacted mud.

4.4 The WINS cable route intersects with the Irish 12NM Foreshore Limit at KP 102.5 approximately 35km West of Kilkee at:

Latitude: 52° 42' 21.8201" N Longitude: 10° 09' 44.5417" W.

5.0 SUBSEA CABLE INSTALLATION

5.1 The Cable Installation is comprised of a number of elements which include;

- Pre-installation Survey and Site Investigations
- The Landfall at Galway (Ballyloughane Strand)
- Cable Installation on the Beach
- Subsea Cable Installation

Pre-Installation Survey and Site Investigations

5.2 The existing Infomar and INSS survey data has been obtained under licence from the Marine Institute provides a reliable base for route corridor planning for the subsea cable. The Irish National Seabed Survey (INSS) was conducted in the period from 2000 to 2006 and focused on mapping the Irish designated seabed from the 200 metre contour to the 4500 metre contour. The Integrated Mapping for the Sustainable Development of Irelands Marine Resource (INFOMAR) is the successor to the INSS and has been systematically surveying the remaining shallower areas. Galway Bay and the West Coast has been extensively surveyed by INFOMAR and INSS with the most recent campaign in 2014. The data collected and published by INFOMAR includes bathymetry (multibeam echo sonar and LIDAR), seabed classification (multibeam backscatter and ground truthing) and shallow geology (sub bottom profile traces).

5.3 Prior to mobilisation of the Main Lay Vessel a detailed marine survey will be undertaken over the full width of the selected route corridor for the entire route from Galway to Bilbao. The basis of the survey is to ground-truth the sea-bed conditions and check for any anomalies in terms of marine archaeology, submerged landscapes and any subsea environmental features. The survey will include Bathymetry, Side Scan Sonar, Sub-Bottom Profiling and Magnetometer.

5.4 The Survey Operations will be broken down into separate but overlapping areas, with boundaries defined by water depth as specified in the technical requirements outlined below and in Appendix 2. The water depth boundaries may be adjusted due to suitability of the survey vessel(s) and survey gear. The surveys will ensure that there are no gaps or unsurveyed areas between all of the different survey operations. For the marine route survey, the sidescan ranges will be limited to those providing the greatest resolution possible (able to resolve a 0.5m object or better), while following the requisite line spacing and overlap. The maximum speeds outlined will be used as guidelines. Bathymetry data collection will, at minimum, comply with the requirements in this document or with International Hydrographic Office standards (S44).

5.5 Survey line spacing is to be designed to ensure adequate coverage and overlap of geophysical measurements. For swathe bathymetry, "20% overlap" signifies that adjacent acquisition swathes within the survey corridor overlap by 20%. For side scan sonar (SSS), 100% overlap requires two passes of complete coverage over a given area of sea-floor, with the two passes each ensonifying the sea-floor from opposite directions to ensure targets are adequately imaged.

5.6 Site investigations for the landfall section will include the following,

- 3 Trial Pits at 50m centres on the upper section of the beach at Ballyloughane. (2.5 metres target depth, excavated and immediately reinstated by JCB)
- Bar probes at 25m centres from the seaward Trial Pit to the Low Water Line. (effectively non-intrusive investigation)
- Bar probes at 25m centres from the Low Water Line to the 3m water depth contour. (effectively non-intrusive investigation)

5.7 The basic survey equipment is to comply with the requirements of the Underwater Archaeology Unit.

5.8 The Method Statement and the Specification for the Pre-Installation Survey is presented in Appendix 2.

The survey data will be reviewed by an accredited Marine Archaeologist as survey operations proceed and will be the subject matter of a formal monitoring report. The data and the report will be made available to the Underwater Archaeology Unit and any specific measures which may be required will be incorporated prior to commencement of cable main-lay operations.

6.0 CABLE LANDFALL AT GALWAY (BALLYLOUGHANE STRAND)

6.1 The proposed landfall is located at Ballyloughane Strand at Renmore in Galway City. Ballyloughane is sheltered from sea conditions generated by westerly winds by Mutton Island and causeway (Figure 19). It is sheltered from the south by Hare Island and the reef connecting it to the shoreline. The beach is exposed to sea conditions generated by south westerly winds but the fetch is quite short and the water depths are quite shallow.

Figure 19. Approach to landfall at Ballyloughane Strand.

Landfall

6.2 The proposed landfall is located approximately mid-way along Ballyloughane Strand. The shoreline (Figures 20 & 21) is in the form of a stable sandy beach with a low stub wall protecting a footway which defines the sea-land boundary. Inland of the footway there is a grass strip which separates the footway from end-on parking bays and a local road.

Figure 20. Ballyloughane Shoreline.

Figure 21. Ballyloughane Shoreline.

Seaward Approach

6.3 The seaward approach to the landfall is shown in Figure 22 on an Admiralty Chart base. The beach is gently sloping and extends over a distance of 560 metres to the Low Water Line (Mean Springs).

6.4 Seaward of the Low Water Line the sea bed continues its gentle slope to cross the 5 metre water depth line at 1431 metres from the shore-line. The gently sloping sea-be extends for a further 4.3 kilometres before it reaches the 10m water depth line.

6.5 The line of the Planned Route on the approach to the landfall has been developed and agreed in consultation with the Harbour Master at Galway Port with respect to navigation and future expansion of the port.

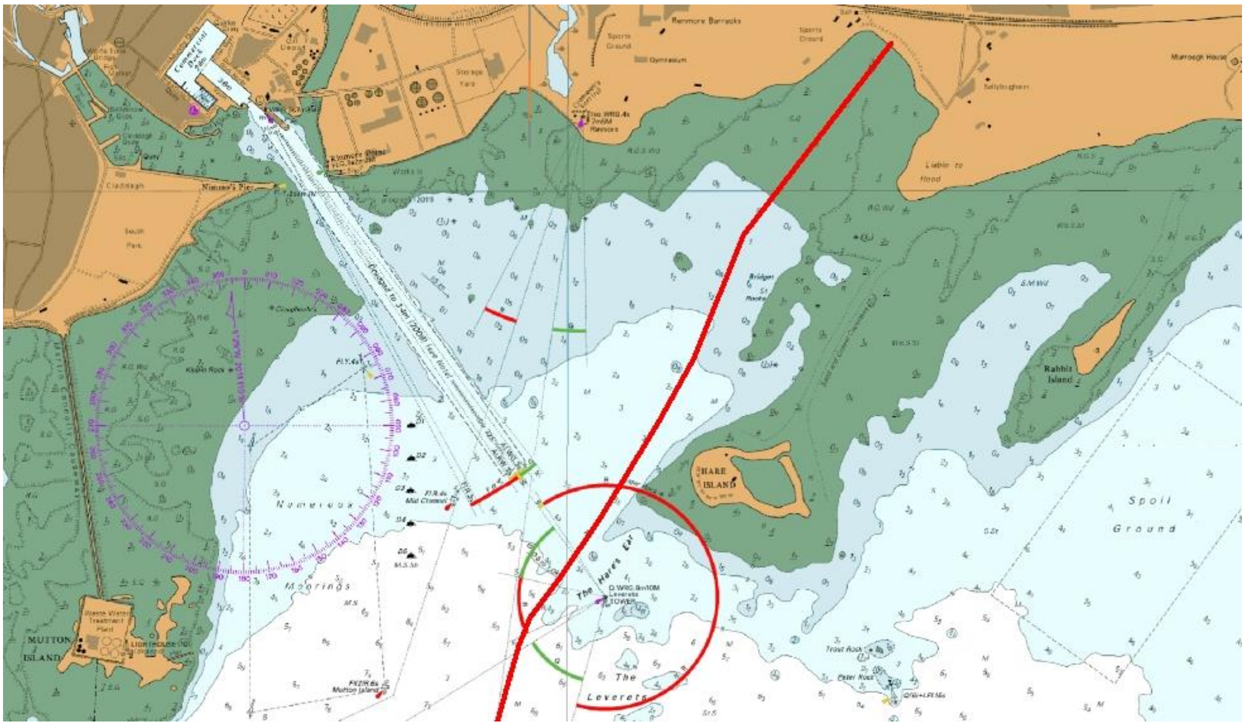

Figure 22. Seaward Approach.

Ordnance Survey Maps

6.6 An OS Map to a scale of 6” to 1 wide (1/10,560) is presented in Figure 23. This is the current published edition but was last revised in 1945. The route corridor is shaded and has a width of 250 metres at the approach to the landfall. The route corridor then widens to 500 metres for the offshore section.

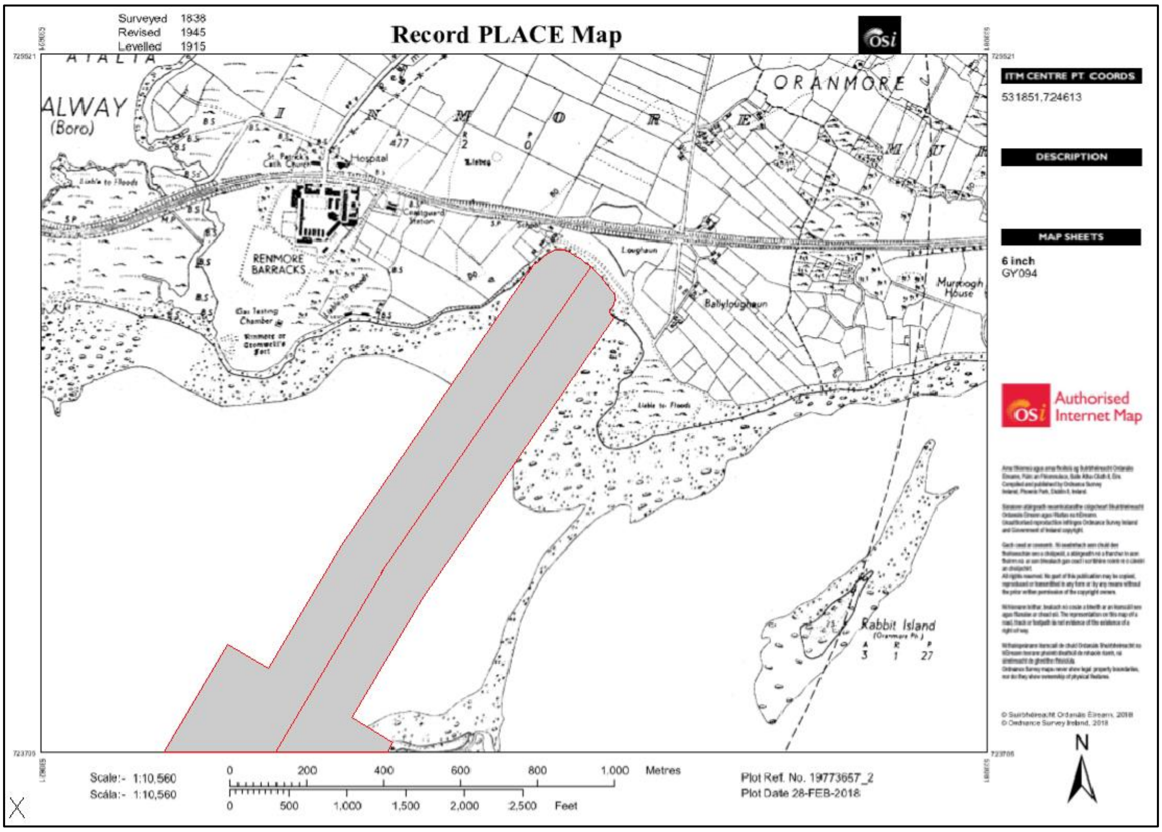

Figure 23. Ordnance Survey Map: Scale 6" to 1 mile.

6.7 An OS Map to a scale of 1/1000 is presented in Figure 24. This is the current published edition and was last revised in 2016. The route corridor is shaded and the planned cable route is denoted by the central red line.

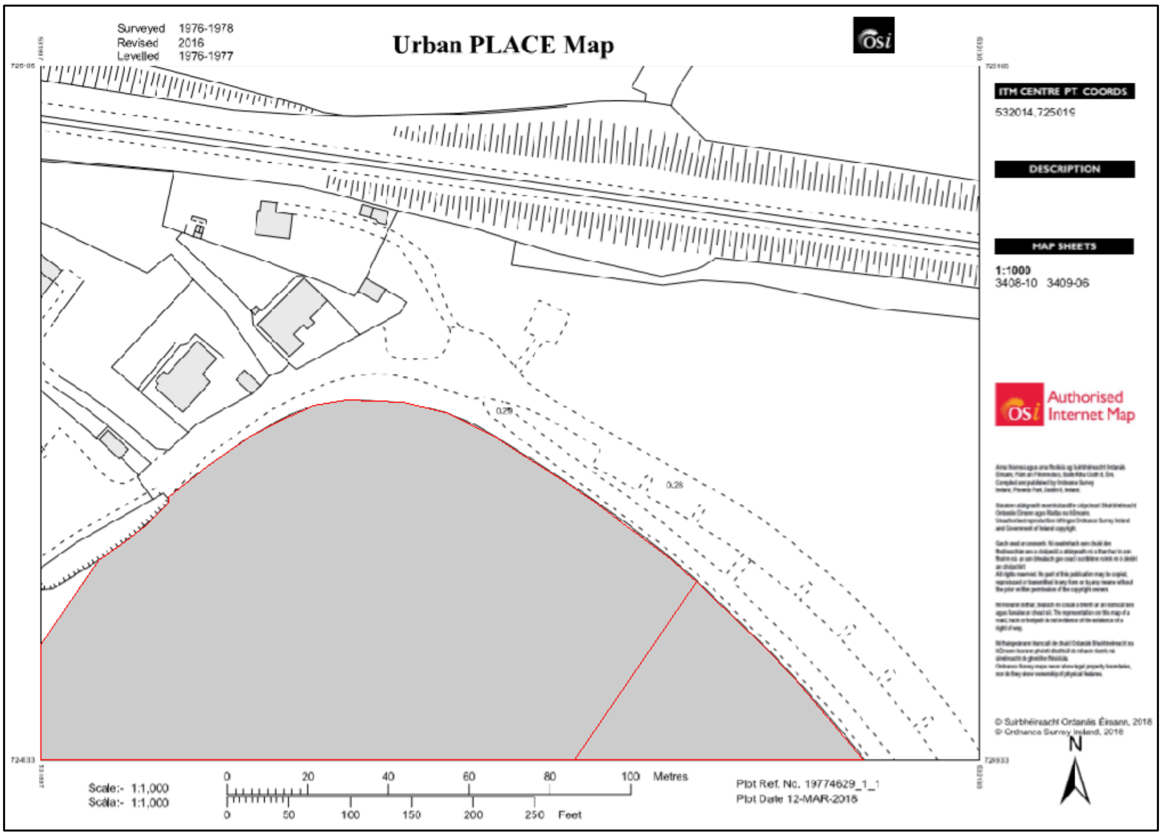

Figure 24. Ordnance Survey Map: Scale 1/1000.

Horizontal Directional Drill

6.8 Taking the features of the shoreline into account it is planned that the shore-end will be installed by means of a Horizontal Directional Drill which will be carried out in advance of the cable lay. It is planned that the drilling will be located in the “green” immediately east of the public road. The drill-casing will commence in a pit 1.5m below ground level and this will enable it to cross at 2.5m depth below the road and well below the existing beach level at the shoreline. This form of installation will avoid any excavation or damage to the shoreline and will ensure that nothing is done which would exacerbate the stability of the shoreline.

6.9 The drill-casing will extend 170 metres beyond the shore-line and the shelving beach adjacent to it and will terminate in the flat sandy foreshore at a depth of 1.5m below beach level. Drilling seaward to that extent will ensure that there will be no impairment of use of the upper section of the beach.

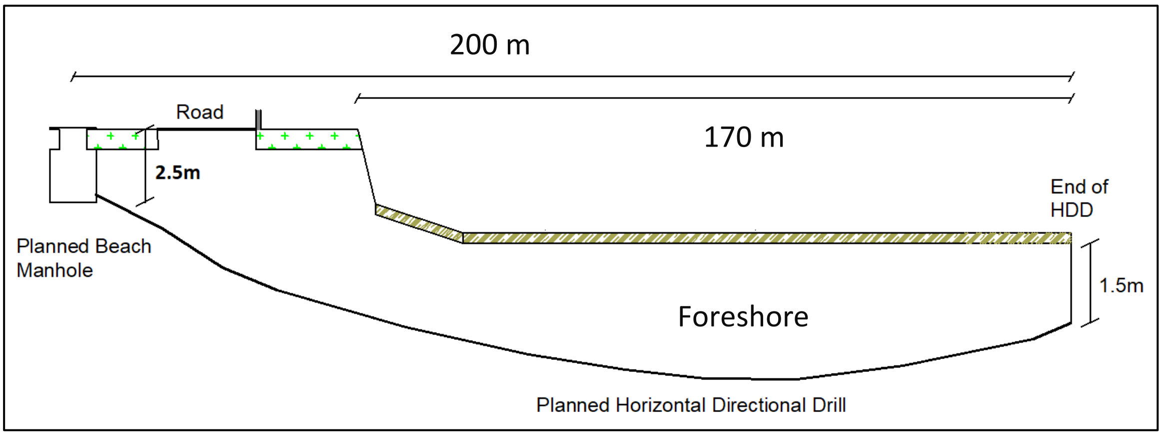

Figure 25. General Schematic of Horizontal Directional Drill.

6.10 Data pertaining to the Horizontal Directional Drill is as follows;

- Length of Horizontal Directional Drill –Approximately 200m
- Internal diameter of Drill-Casing – 109mm.
- Drill-Casing Material S-135 High Strength Steel.
- Length of individual Drill-Casing Pipes – 6.1m.
- Entry Angle – Less than 10°.
- Descent Angle – Less than 15°
- Ascent Angle – Less than 15°.
- Exit Angle – Less than 10°.
- Composition of drilling fluid – 60 to 70kg Bentonite per 1m^3 of water.
- Max volume of drilling fluid in HDD 1.9 m^3.
- Expected drilling rate – Approx. 100m/day.
- Planned working hours – 12 hours/day.

Site Preparation & HDD Rig Set Up

6.11 The procedure to be followed consists of three stages.

1. A perimeter fence will be set up and the drill pit site will be clearly signposted informing the general public of the work in progress while limiting access to the site.
2. The minimum area necessary will be utilised to reduce the impact of the works.
3. All the equipment necessary for the drill pit and drill rig installation will be transported to the site pending the excavation of the pit and the final positioning of all necessary tools and equipment.
4. The pits will be dug and lined with geotextile and polyethylene sheet to prevent any seepage of drilling fluids into the surrounding soil.

HDD Operations

6.12 The drilling process will be closely monitored and logs will be kept over the entire duration of the operations. The drill design will be followed so that the achievable drill will be within acceptable tolerances. The bore alignment will follow the reference alignment shown on the plans and will be accurate to within the following tolerances:

- Installation of the horizontal directional drill will be within 1 m of the centreline of bore indicated on the drawings at the bore entry.
- Installation of the horizontal directional drill will be within 3 m of the centreline of bore indicated on the drawings for the entire length of the bore.
- The bore exit angle will be maintained at ten (10) degrees or flatter.

Drill Head Tracking System

6.13 The method employed to monitor the progress of the HDD necessitates the use of a wire-line connected transmitter system in order to provide sufficient data so that the drill bit's relative position is real-time recorded throughout the entire drilling operation. A non-magnetic sonde will be installed on an adaptor casing following the mud motor attachment in the bore and wire-lined back to the HDD Rig. This sonde is responsible for transmitting a signal to provide real-time information regarding the drill bit's azimuth, vertical distance from the receiver (which is translated as depth) as well as its coordinates (latitude – longitude). All information transmitted is constantly displayed in a remote monitor mounted on the HDD machine so that the operator is always aware of the precision of the bore's progress.

Drilling Mud/Bentonite

6.14 Bentonite is commonly used as drilling mud to lubricate and cool cutting tools, to remove cuttings and help prevent blowouts. Bentonite is a ground naturally occurring clay. It is inorganic, non-toxic and non-irritating. It has a specific gravity of approximately 2.4 and comes in the form of a grey powder. It expands when wet and, when mixed with water at a concentration of the order of 60-70kg of bentonite powder per m^3 of water, it takes on the characteristics of a gel. Bentonite is widely used in the construction industry as a drilling fluid, as a lining for the base of landfills and for the construction of curtain walls to waterproof below-grade excavations.

Drilling Mud Containment

6.15 It is planned to use a "drill & leave" scenario using steel drill casing pipes and then leaving them in place. When the HDD reaches its target length it is proposed to excavate a reception pit on the beach. It is planned to clean out and flush the steel drill casing with water when it reaches its target length. Whilst it is anticipated that no bentonite will escape from the HDD bore which will be 1.5 m below the sand surface, any residue which may escape will be very little and will be contained in the reception pit. All necessary precautions shall be put in place to protect other foreshore users in accordance with relevant Health and Safety Legislation with temporary fencing, barriers and signage in place around the location of the reception pit. The minimum area necessary will be utilised to reduce the impact of the works. Excavation and Backfill of the reception pit will involve the use of a tracked excavator or JCB on the beach for a short period.

On-Shore Sludge Removal

6.16 The volume of fluids and cuttings produced during the HDD process will be removed from the on-shore drilling pit at regular intervals by way of sludge pumps and sent to the recycling unit positioned alongside the drilling pit. Solids can be optically assessed with accuracy after the fluid turbidity clears and the volume of fluids can be also calculated. All residue will be disposed of in accordance with the requirements of Galway City Council.

Proving of the HDD Pipe Bore

6.17 Once the HDD pipe is installed, it will be tested through its entire length to prove the minimum internal diameter required and to ensure that no abnormalities, which may affect the future cable landing, are existent. After the pipe inspection, a messenger line (3/8" wire rope) will be installed and a cap will be fitted to prevent the ingress of any sediment and/or debris.

Completion of Advance Works

6.18 The installation of the messenger line marks the completion of the Advance Works seaward of the High-Water Line. The reception pit on the beach will be backfilled carefully using the excavated material.

Site Restoration

6.19 On completion of the drilling operations, a Beach Manhole will be constructed in the vicinity of the drilling pit and the site will be restored to its prior condition. All materials and equipment will be removed and the site area will be cleaned and reinstated to its original condition. This will include the following:

- Remove all debris and project related material from the site at the completion of the work.
- Remove all evidence of machinery presence and reinstate the ground to its original condition.
- Replant any and all vegetation damaged during the drilling operations.
- Repair any damage to structures such as kerbs, fences, walls, gates, etc.

This is a general Method Statement. When a Contractor is appointed a specific Method Statement will be prepared and this will be discussed with the Underwater Archaeology Unit, Natural Parks and Wildlife Service and Galway City Council, prior to commencement. It is planned to carry out the work in early Summer of 2019.

Beach Manhole

6.20 The beach manhole is to be constructed in the grassed area east of the road at Ballyloughane, above the High Water Mark and outside the Foreshore Limits. The Beach Manhole will be 3m long x 2m wide x 2m deep and is to be constructed in reinforced concrete. Only the manhole cover will be visible at the surface once the construction is complete.

7.0 CABLE INSTALLATION ON THE BEACH AND INSHORE

7.1 The cable installation from the end of the HDD out to the low water line will be installed by a cable plough at low tide. The cable will be floated ashore from a Shallow Draft Lay Vessel (Figure 27) using rigid inflatable boats (ribs) and buoys at high tide. Once the tide ebbs, the end of the HDD duct will be exposed and the cable will be inserted in the HDD duct and pulled into the Beach Manhole where it will be secured. A cable plough (Figure 26) will then be pulled by a low-pressure dozer from the end of the HDD duct out to the Low Water Line with the cable being inserted and buried as the plough moves seaward. Target burial depth is 1.5 metres. At the Low Water Line the dozer will be uncoupled from the cable plough and will then reverse towards the shoreline in the same track and will backfill the plough trench by back-blading towards the shore in advance of the flood tide. Beach disturbance will be minimal and the surface will be naturally reinstated by wave action as the tide comes in.

Figure 27. Typical Plough Installation.

Figure 26. Typical Shallow Draft Cable Lay Vessel.

7.2 The cable plough will then be attached to the Shallow Draft Lay Vessel and the deployment and burial of the subsea cable will continue to the 15 metre depth contour where the Main Lay Vessel will take over. This method has previously been used for the installation of the ESAT 2 cable at Sandymount, Dublin and for Hibernia – Segment D at Sutton, Dublin and proved to be quite successful and to have minimal impact.

Beach / Foreshore Access

7.3 There will be a requirement for equipment access to the beach / foreshore for;

- Excavation and backfill of the 3 Trial Pits.
- Excavation and backfill of a reception pit at the end of the Horizontal Directional Drill.
- Pulling the cable ashore.
- Pulling the plough to trench the cable from the end of the Horizontal Directional Drill out to the Low Water Line.

The equipment will involve;

- A small tracked excavator or JCB for the Trial Pits, for the pit at the end of the Horizontal Directional Drill and for pulling the cable ashore.
- A tracked low-pressure dozer for pulling the cable plough.

It is proposed that these will gain access to the beach via the existing concrete slipway approximately 130 metres southeast of the line of the cable, adjacent to the car parking area (Figures 20 and 28). Existing public access arrangements to the general foreshore area shall not be impeded by plant or materials used in connection with the works and all necessary precautions shall be put in place to protect foreshore users and the public in accordance with relevant Health and Safety Legislation.

Figure 28. Foreshore Access Slipway.

8.0 OFFSHORE CABLE INSTALLATION

Pre-Lay Grapnel Run (PLGR)

8.1 A Pre-Lay Grapnel Run will be undertaken prior to commencement of Main-Lay. This activity is to ensure that the planned line of the cable is clear of seabed debris which may include chains, steel cables, anchors nets etc. The swathe of the grapnel is less than 1 metre wide and there will be minimal disturbance of the sea-bed during the debris clearance operation. All debris recovered from the sea-bed will be hauled on board and subsequently disposed of onshore in a safe and environmentally approved manner. The PLGR vessel will use a DGPS positioning system. The route followed by the PLGR will be as close as practicable to the selected Route Position List and always within the swathe of the route survey.

Cable Installation on the Continental Shelf

8.2 The Main Lay vessel will pick up the end of the cable for the Inshore Section and this will then be jointed to the main cable on board the Main Lay Vessel. The jointing process takes approximately 18-24 hours to complete including tests of the cable system. The Main Lay Vessel will then proceed to deploy and bury the cable in the seabed using a sea-plough. The sea-plough is towed by the Main Lay Vessel and is designed to bury the cable at a depth which will be secure from fishing activities.

8.3 The plough uses a minimally invasive plough-share to create a furrow in the seabed approximately 750mm in width. As the plough moves forward the cable is placed in the bottom of the furrow which backfills with the natural movement of sediment on the seafloor.

8.4 Typical ploughing speed is less than 1 knot and is dependent on the stiffness of the seabed sediment. There is no significant noise generation during ploughing operations. Cable installation by plough produces only a minor plume of suspension of seabed sediments in the water column and this is transient and localised due to the nature of the ploughing and natural backfill activities.

8.5 A sketch which illustrates the Main Lay cable installation is presented in Figure 29.

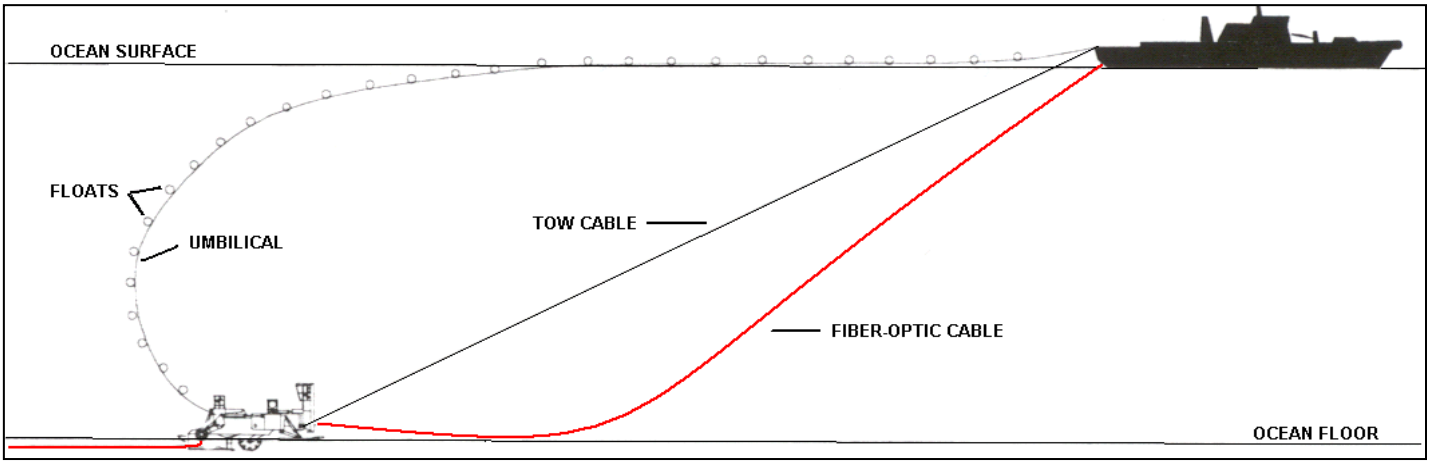

Figure 29. Offshore Cable Installation and Plough Burial.

8.6 The target burial depth for the WINS cable systems is 1.5 metres. In areas of stiff soil, the actual burial depth may be reduced but is planned to be still at a depth which will be protect the cable from fishing operations and generally not less than 0.4 to 0.6 metres. Over areas of sensitive reef, the cable will be surface laid.

Deep Sea Cable Surface Lay

8.7 The general criteria for secure sub-sea cable installation are that the cable needs to be trenched to a depth of 500mm to 600mm up to the 1500 metre water-depth. Beyond the 1500 metre water-depth the cable will be surface laid on the sea-floor whilst taking care to avoid hard rock outcrops and hydrodynamic conditions such as submarine landslides and sediment flows.

8.8 Surface laying is where the submarine cable is laid onto the surface of the seabed. This procedure is carried out in water where the cable cannot, or is not required to, be buried (e.g. in areas where the seabed is too hard for the burial tool, or at a water depth greater than 1500 metres off the Continental Shelf)

8.9 While surface laying, the cable is deployed according to the seabed profile, cable type, and bottom characteristics with the intention that the cable moulds itself to the bottom contours and avoiding cable free spans. Real-time cable slack calculations will be used to monitor and control the cable deployment by onboard Cable Engineers during the installation. By utilizing cable slack management techniques during the surface laying operations, the onboard cable engineers will ensure that there is enough cable to allow for the conforming of the system to the various undulations and features on the seabed.

Post Lay Operations

8.10 Following main lay operations, post lay inspection and burial may be carried out in certain areas to inspect the proper laying and burial of the cable in the seabed.

A post-lay burial operation may be performed in order to supplement the burial operations in the following instances:

- Planned recoveries of the burial tool, e.g. ploughshare change locations
- Initial and final splice positions within the buried sections – Post-Lay Inspection and Burial is planned for the initial splice location between the Pre-Lay Shore End and main lay section of the cable to 1.5 metre target burial depth
- Unplanned recoveries due to burial tool breakdown, weather delay, etc.
- Surface-laid sections due to sea-plough malfunction where the plough is not brought back on board.
- Water depths or seabed types that exceed the operational limits of the sea-plough

ROV Operations

8.11 In limited areas requiring Post-Lay burial, a separate Remotely Operated Vehicle (ROV) is utilized. The ROV typically uses a jetting burial tool to bury the cable to the required depth. The seabed is emulsified in the localised region of the burial and a narrow trench is formed. The ROV burial system slowly moves along the seabed on the required cable track cutting a trench into which the cable is placed. The seabed sediment is displaced temporarily to form the trench during the burial operation and then naturally allowed to re-form and 'backfill' the trench after the passage of the ROV's burial tool. It should be noted that the surrounding seawater is used for the jetting system, i.e. nothing alien is introduced into the environment. The burial tool does not remove any seabed materials from the area. The ROV burial operation is controlled from the main vessel and monitored in real time using high definition video cameras mounted on the ROV.

8.12 The General Specification for Cable Installation is presented in Appendix 6.

9.0 NAVIGATIONAL SAFETY CONSIDERATIONS

9.1 There are a number of commercial ports on the west coast of Ireland and in the context of the WINS Cable System, the key centres are;

Port of Galway

Rossaveal

Foynes Port

Fenit Harbour

9.2 There are also fishing ports at Rossaveal and Dingle and a local ferry port at Doolin. The fishing port at Casteltownbere is on the south coast and a significant distance from the planned route of the WINS cable.

9.3 The fishing grounds and concentrations of fishing activity off the west and south west coasts are shown in Figure 31 and it can be seen that the 'West of Blaskets' and 'Slope' are traversed by the planned route across a relatively short section, south west of the Kerry coast. Commercial Shipping traffic concentrations along the West and South West coast are shown in Figure 30 below.

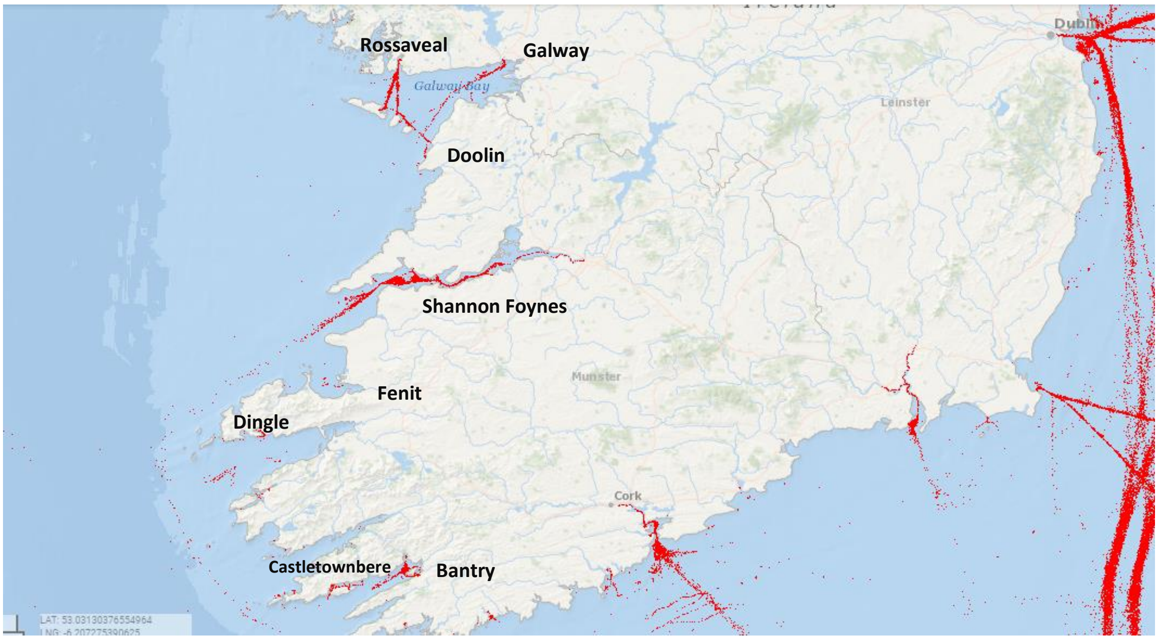

Figure 30. Commercial Shipping Traffic.

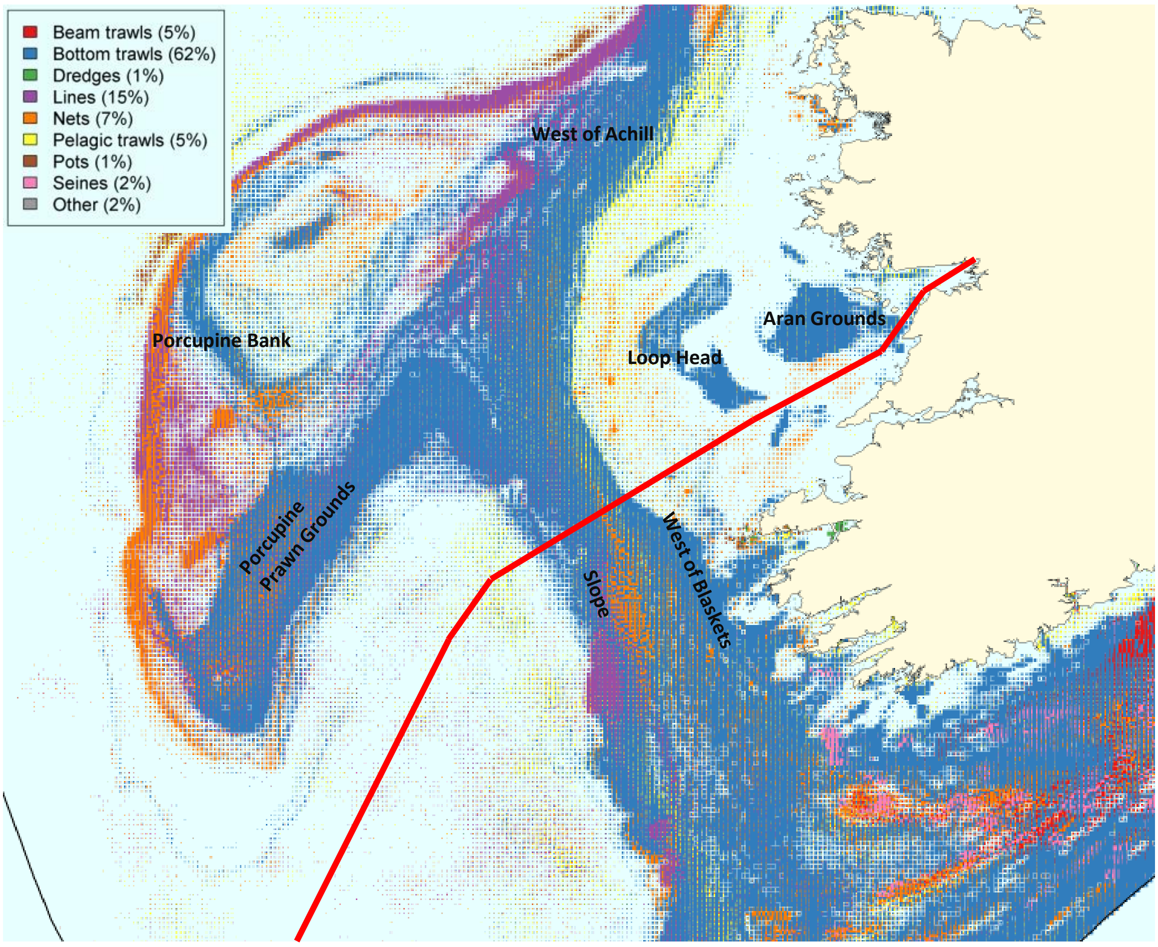

Figure 31. Fishing Activity and Fishing Grounds - West and South West Coast.

MITIGATION OF NAVIGATION RISK

9.4 Key points relating to mitigation of Navigational Risk associated with the installation of the WINS subsea cable system inside the 12-mile limit are as follows:

- Subsea cable installation will be performed by a single, purpose-built lay vessel and will comply fully with all requirements of the International Regulations for Preventing Collisions at Sea.
- The vessel will lay cable on a 24 hour per day basis and a full operational crew will be on duty at all times.
- The plan is that the cable will be laid and plough-buried in a single operation.
- Vessel speed during cable laying will be of the order of 1 knot.

- Prior to commencement of cable installation, the Dept. of the Environment Community and Local Government will be notified of the planned start and the estimated completion dates for the operation.
- The Galway Port Harbourmaster will be informed of the Plan of Work and of the planned start and estimated completion dates for the operation.
- The Coastguard will be notified of the Plan of Work and of the planned start and estimated completion dates for the operation.
- Representatives of the local fishing fleets will be contacted and made aware of planned operations. Arrangements will be put in place to provide next-day position forecast throughout the survey and cable-installation period.
- Arrangements will be made for the publication of a formal Marine Notice through the Department of Transport, Tourism and Sport and the notice will provide vessel and contact details together with a general description of operations and approximate dates of commencement and completion.
- A local marine notice giving vessel details together with a general description of operations and approximate dates of commencement and completion will be published.

10.0 MARINE ARCHAEOLOGY

10.1 There is a significant library of data available from various surveys in the selected route corridor. These include the Shipwreck Inventory of Ireland, the Irish National Seabed Survey (INSS) and the Infomar Survey. These are supplemented with knowledge gained from marine surveys from other subsea projects in the general area and adjacent to the corridor.

10.2 The data available from this material has formed the basis for a Marine Archaeology Report which has been prepared by Geomara Ltd. A copy of the report is presented in Appendix 3.

10.3 The non-Technical Summary of the Marine Archaeology Report is as follows;

DeepSea Fibre Network Systems have commissioned Geomara Ltd. to undertake a maritime archaeological assessment in connection with a proposed new sub-sea telecoms cable system linking Galway, on the west coast of Ireland to Bilbao on the north coast of Spain. This report addresses the section within the Irish jurisdiction.

The assessment comprises an introduction to the study area and the identification of cultural heritage sites, features and deposits located along the proposed cable route corridor. In order to provide a comprehensive assessment, an extensive desk-based study of the route corridor was undertaken. The potential impact of the proposed scheme on the receiving environment is addressed and mitigation measures to ameliorate these impacts are presented.

Seven sites were identified during the Galway City Council Storm damage mitigation report at or around Ballyloughane beach including a possible old quay and some ships timbers. All the sites are on the shore side of the planned Horizontal Directional Drilling.

One potential known wreck site **(W09510)** *including some additional ones nearby are located in close proximity to the cable corridor. Three archaeological monuments located in the vicinity of the cable landfall in Ballyloughane Strand; a Ringfort (**GA-094-059**), located in the townland of Rinmore c. 430m directly North of the where the cable makes landfall, c. 1.1km to west of where the cable makes landfall a Fulacht Fia (**GA-094-115**) can be found in the townland of Rinmore and in the townland of Ballybaan Beg, c. 1* *km directly north of the manhole, a church and graveyard (**GA-094-10 & GA-094-10-001)** are present. Given the close proximity to these known sites and wrecks, the likelihood of additional unknown archaeological features or wrecks associated with the surrounding historical landscape needs to be taken into consideration before and during the proposed project.*

Consequently, given the results of the impact assessment the mitigation strategies outlined here detail the measures to be adopted in order to ameliorate any unforeseen direct, indirect and secondary impacts that the proposed cable may have on features of maritime cultural heritage interest. If these measures are employed it is envisaged that the proposed cable installation will have no impact on features of maritime cultural heritage interest.

The following mitigation recommendations are presented in connection with the proposed cable:

1. It is recommended that all sites of cultural heritage interest included in this report are avoided.
2. In light of the seven sites identified at or around Ballyloughane beach, including a possible old quay and some ship timbers, the cable installation from the end of the HDD out to the low water line should be subject to archaeological monitoring
3. Archaeological analysis of the geophysical and bathymetric pre-installation surveys should be undertaken to both confirm the locations of the wreck sites within the survey corridor and also to identify any potential unrecorded seabed and sub-seabed maritime archaeological features. Where the location of the one wreck **(W09510)** site directly on the cable route is confirmed the cable should be re-routed to avoid it or additional unforeseen wrecks.
4. Archaeological monitoring of the pre-lay grapnel run should be undertaken in order to identify any previously unrecorded features.
5. It is recommended that procedures should be put in place to ensure that any previously unrecorded cultural heritage assets encountered during the project should be assessed by a suitably qualified archaeologist and avoided by the cable laying operations

6. Should the proposed cable route be subject to further revision, details of these revisions should be forwarded to the project archaeologist for assessment
7. On completion of the cable installation a report will be produced summarising all archaeological aspects of the project and submitted to DAHG and the National Museum of Ireland

11.0 NATURA 2000 IMPACT STATEMENT

11.1 A Natura 2000 Impact Statement was prepared for the pre-installation survey and main lay activities. The assessment was carried out by Altemar Ltd and a copy of the Statement is presented in full in Appendix 4.

11.2 The conclusion of the Natura 2000 Impact Statement is as follows;

"In conclusion, no significant impacts are likely on the features of interest or the site specific conservation objectives of Natura 2000 sites within 15km of the proposed survey and cable laying operations associated with the proposed fibre optic cable routing within Irish waters and at the landfall at Ballyloughane Beach, individually or in combination with other plans or projects. However, mitigation measures and construction phase controls are required and should be carried out in consultation with an ecologist."

"No Significant Effects on Natura 2000 sites are Likely."

12.0 ECOLOGICAL IMPACT ASSESSMENT

12.1 An Ecological Impact Assessment was also carried out for the pre-installation survey and main lay activities. The assessment was prepared by Altemar Ltd and a copy of the Assessment Report is presented in full in Appendix 5.

12.2 The conclusion of the assessment are as follows;

"Residual impacts are impacts that remain once mitigation has been implemented, or impacts that cannot be mitigated against. As previously outlined from the early stage of this project use of Best Available Techniques (BAT) have been used in the planning and implementation of the project as they "represent a key measure for avoiding environmental impacts" (OSPAR, 2012). This has included optimal site selection, methodologies of cable laying and phasing of the project outside key ecological times such as the over-wintering bird season in order to reduce the ecological impact of the project on, not only the designated sites at the landfall location, but also the additional habitats out to, and beyond the 12nm limit out to the Irish EEZ. The use of BAT will also help to ensure the longevity and stability of this important piece of infrastructure.

Surveying and cable laying will be outside over-wintering bird season and will not be close to tern nesting sites, for which this site is designated as an SPA. Works will be carried out during harbour seal breeding season. The nearest breeding site is 1.2km from the cable survey route and an MMO will be present for all surveys and the cable laying. Works are not proposed in the majority of the sensitive habitats listed as features of interest of the Galway Bay Complex SAC. However, the cable does pass through mudflat/sandflat in the intertidal and the impacts in these areas are deemed to be minor adverse short-term.

In the subtidal areas classed as Large Shallow Inlets and Bays, considerable lengths have been taken to avoid undocumented sensitive communities that were encountered during a video survey for the project, specifically carried out to assess habitats in the subtidal within the SAC. Impacts to these habitats are deemed at worst to be minor adverse short-term. However, mitigation measures as discussed with NPWS are proposed and include further video surveys and refining the route in this area in consultation with NPWS.

However, despite the use of BAT in addition to the outlined mitigation measures, residual impacts will remain. The laying, operation and subsequent decommissioning of the cable, if required, will have no significant impact on the integrity of a conservation site or its site specific conservation objectives. Impacts are primarily related to short-term minor adverse impacts due to disturbance over the period of the HDD, 1 day cable burial on the beach and the ploughing by the vessel in the shallow subtidal (1-2 days in the SAC).

Mitigation measures have been proposed to minimise/eliminate negative impacts on species or habitats of conservation importance."

Appendices

Appendix 1 – Drawings.

FORESHORE LICENCE MAPS:

- 1317-A-108 Overall Route
- 1317-A-101 Site Location Map
- 1317-A-109 Site Location Map 2
- 1317-A-102 Foreshore Licence Map 1 Inshore
- 1317-A-103 Foreshore Licence Map 2 Galway Bay
- 1317-A-104 Foreshore Licence Map 3 South Sound
- 1317-A-105 Foreshore Licence Map 2 Offshore

ADDITIONAL INFORMATION:

- 1317-WINS-AL-01 Route Corridor Survey Data Alignment Sheet KP00 – KP15
- 1317-WINS-AL-02 Route Corridor Survey Data Alignment Sheet KP15 – KP30
- 1317-WINS-AL-03 Route Corridor Survey Data Alignment Sheet KP30 – KP45
- 1317-WINS-AL-04 Route Corridor Survey Data Alignment Sheet KP45 – KP60
- 1317-WINS-AL-05 Route Corridor Survey Data Alignment Sheet KP60 – KP76
- 1317-WINS-AL-06 Route Corridor Survey Data Alignment Sheet KP76 – KP92
- 1317-WINS-AL-07 Route Corridor Survey Data Alignment Sheet KP92 – KP104

Appendix 2 – Specifications for Pre-installation Survey.

Appendix 3 – Marine Archaeology Assessment Report.

Appendix 4– Natura 2000 Impact Statement.

Appendix 5 – Ecological Impact Assessment Report.

Appendix 6 – Specifications for Cable Installation.

Appendix 7 – Pre-application Consultation, Correspondence & Consents.