ALCATEL SUBMARINE NETWORK

Havhingsten Fibre Optic Telecommunication Cable

Foreshore License Appliction for Cable Installation - Planning Report

P2228_R4693_Rev 5 | December 2019

Intertek Energy & Water Consultancy Services
Prospect Business Centre, Dundee Technology Park, Dundee DD2 1TY, United Kingdom

DOCUMENT RELEASE FORM

Alcatel Submarine Network

P2228_R4693_Rev 5

Havhingsten Fibre Optic Telecommunication Cable

Foreshore License Appliction for Cable Installation - Planning Report

Author/s

Paula Daglish & Charlie Cameron

Project Manager

Patricia Adams

Authoriser

Beth Monkman

Rev No	Date	Reason	Author	Checker	Authoriser
Rev 0	24/06/2019	Draft	PLD	PAD	-
Rev 1	05/07/2019	Final	PLD / CC	PAD	ALF
Rev 2	18/07/2019	Update corridor coordinates	PLD	PAD	ALF
Rev 3	14/08/2019	Update corridor coordinates	PLD	PAD	ALF
Rev 4	28/11/2019	Response to consultation comments	CC	JEH	BHM
Rev 5	05/12/2019	Response to a Foreshore unit comments	AN	PLD	ALF

CONTENTS

	DOCUMENT RELEASE FORM	**I**
	GLOSSARY	**VI**
1.	**INTRODUCTION**	**1**
1.1	Overview of the project	1
1.2	The developer	1
1.3	Project need	5
1.4	Scope and objectives of the planning report	5
1.5	Structure of the planning report	6
2.	**PROJECT DESCRIPTION**	**7**
2.1	Installation overview	7
2.2	The cable	7
2.3	Route development and landfall alternatives	8
2.4	The planned route	12
2.5	Pre-installation operations	15
2.6	Installation operations	16
2.7	Indicative installation programme	25
2.8	Operation and emissions	25
2.9	Cable maintenance and repair	25
2.10	Decommissioning	26
2.11	Embedded mitigation	26
3.	**SHIPPING AND NAVIGATION SAFETY CONSIDERATIONS**	**28**
3.1	Shipping and navigation	28
3.2	Commercial fisheries	31
4.	**MARINE ARCHAEOLOGY**	**38**
5.	**SUMMARY OF APPROPRIATE ASSESSMENT SCREENING ASSESSMENT**	**39**
6.	**PROJECT SPECIFIC MITIGATION**	**44**
7.	**CONCLUSIONS**	**45**

	REFERENCES	46
APPENDIX A	Environmental Assessment Methodology	A-1
APPENDIX B	Application Corridor Coordinates	B-1
APPENDIX C	Cable Burial Assessment	C-1
APPENDIX D	Fisheries Activity Study	D-1
APPENDIX E	Marine Archaeological Technical Reports (E1-3)	E-1
APPENDIX F	Stage 1 Screening for Appropriate Assessment	F-1
APPENDIX G	Underwater Noise Assessment	G-1
APPENDIX H	Sediment Suspension and Dispersion	H-1
APPENDIX I	Marine Survey Reports	I-1
APPENDIX J	Pre-application communication	J-1

LIST OF TABLES AND FIGURES

Tables

Table 1-1	Structure of this planning report	6
Table 2-1	Landfall sites	9
Table 2-2	Consultation in Ireland	11
Table 2-3	Crossing in Ireland	13
Table 2-4	Cable installation techniques in Ireland	16
Table 2-5	Post – lay rock protection at cable crossings	21
Table 2-7	Embedded Mitigation inherent to the Project's design	26
Table 3-1	Shipping information	29
Table 3-2	Impact assessment summary for installation and maintenance activities – shipping & navigation	31
Table 3-3	Impact assessment summary for installation and maintenance activities – commercial fishing	37
Table 4-1	Impact assessment summary for installation and maintenance activities – marine archaeology	38
Table 5-1	Natura 2000 sites crossed by the marine cable corridor	39
Table 5-2	Summary of the assessment of likely significant effects	40
Table 5-3	Impact assessment summary for installation and maintenance activities – protected sites	42
Table 6-1	Project specific measures	44
Table 7-1	Conclusion of the environmental assessment	45

Figures

Figure 1-1	Havhingsten telecommunication cable	2
Figure 1-2	Havhingsten fibre optic telecommunication cable – Ireland route (DWG P2228 – CORR-002B	3
Figure 1-3	Foreshore Licence application area (DWG P2228 – CORR-006)	4
Figure 2-1	Example of double armour fibre optic cable	8
Figure 2-2	Loughshinny landing site	10
Figure 2-3	Donabate landing site	11
Figure 2-4	Havhingsten route and Irish Sea bathymetry (DWG P2228-BATH-002)	14
Figure 2-5	Example of grapnel equipment used to grip cut and recover debris	15
Figure 2-8	Cable lay vessel example	19

Figure 2-10	Crossing design	21
Figure 2-11	Uraduct type product for cable protection	21
Figure 2-12	Typical BMH	22
Figure 2-13	Overview image of Loughshinny landing site showing the location of the BMH in the beach car park, and the relative mean tide lines	23
Figure 2-14	Typical shore-end landing utilising floatation buoys	23
Figure 2-15	Articulated pipe example	24
Figure 2-16	Articulated pipe being fitted onto cable example	24
Figure 2-17	Typical excavators	24
Figure 3-1	Shipping density in the Irish sea	29
Figure 3-2	Shipping density in approaches to Loughshinny	30
Figure 3-3	Fish Spawning and Nursery Areas 1 (DWG P2228-FISH-007)	34
Figure 3-4	Fish Spawning and Nursery Areas 2 (DWG P2228-FISH-008	35
Figure 3-5	Fishing density (July to December 2017)	36
Figure 5-2	Protected sites near to the marine cable corridor	43

GLOSSARY

AIS
Automatic Identification System

ASN
Alcatel Submarine Networks

BMH
Beach Manhole

CLB
Cable Lay Barge

CLV
Cable Lay Vessel

DK
Denmark

DWG
Drawing

EEZ
Exclusive Economic Zone

EU
European Union

HDD
Horizontal Directional Drilling

IoM
Isle of Man

IRL
Ireland

IHO
Irish Hydrographic Office

IMO
International Maritime Organisation

LWM
Low Water Mark

MARPOL
The International Convention for the Prevention of Pollution from Ships, 1973

MHWS
Mean High Water Springs

MBES
Multibeam Echosounder

MMO
Marine Management Organisation

NPWS
National Parks and Wildlife Service

NM
Nautical Mile

PLB
Post Lay Burial

PLGR
Pre-lay Grapnel Run

RNLI
Royal National Lifeboat Institute

ROV
Remotely Operated Vehicle

SAC
Special Area of Conservation

SOPEPS
Shipboard Oil Pollution Emergency Plans

SPA
Special Protection Area

TAC
Total Allowable Catch

TW
Territorial Waters

UK
United Kingdom

UKHO
United Kingdom Hydrographic Office

1. INTRODUCTION

1.1 Overview of the project

Alcatel Submarine Networks (ASN) has been selected as the Supplier of the Havhingsten fibre optic telecommunication cable system ('Havhingsten cable'). Aqua Comms is the Developer and Landing Party for the Havhingsten project. Intertek has been selected by ASN as the Environmental Consultant to manage the permit consultation and application process for the offshore part of the cable installation in Ireland (IRL), Isle of Man (IoM), United Kingdom (UK) and Denmark (DK). It will span more than 940km and deliver a boost to bandwidth (the maximum rate of data transfer) between the respective countries.

The marine segments of the Havhingsten cable are proposed to cross:

- The Irish Sea from Loughshinny (north of Dublin in Ireland) to Squires Gate Lane (south of Blackpool on the west coast of the UK);
  - This section will also include two branches onto the IoM; and
- The North Sea from the Seaton Sluice (on the east coast of the UK, north of Newcastle), to Houstrup (on the west coast of the Jutland peninsular in Denmark);
  - This section will also include two stubbed cable routes from Whitley Bay (on the east coast of the UK) and Houstrup (in Denmark), both to be installed out to the respective territorial water boundaries (12nm).

The offshore cable route spanning across the Irish Sea and North Sea segments is presented in Figure 1-1 (DWG P2228-LOC-007); the Irish cable route is presented in Figure 1-2 (DWG P2228-LOC-003).

The Havhingsten marine cable corridor, the subject of the Foreshore Licence application, is approximately 500m wide from mean high water springs (MHWS) at Loughshinny, Co. Dublin to the 12nm limit, a distance of approximately 29.8km. It is presented in Figure 1-3 (DWG P2228-CORR-006). As a worst case the assessment assumes that the cable could be laid anywhere within this area.

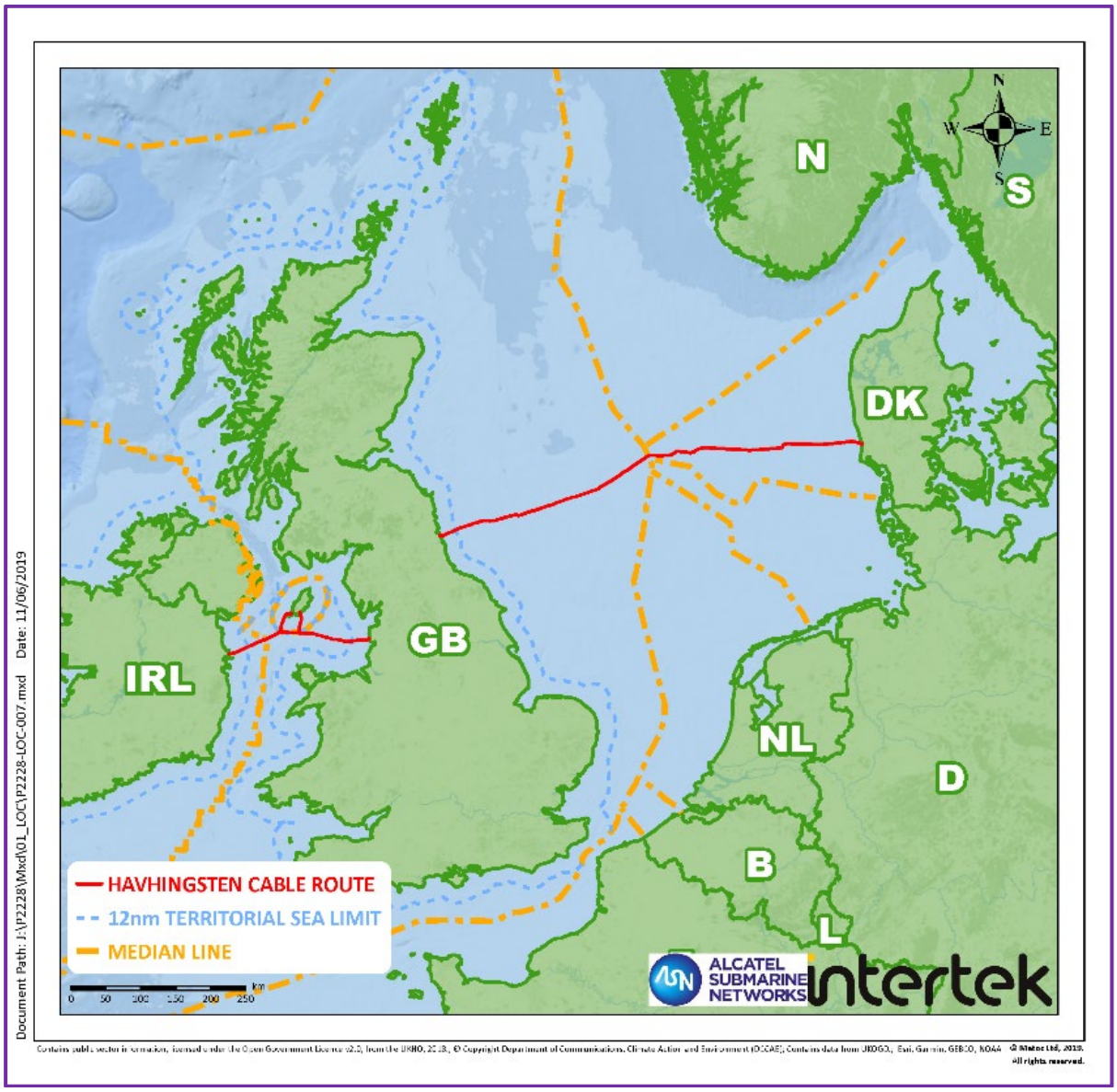
1.2 The developer

Founded in 2014, Aqua Comms has established a reputation for excellence in the field of subsea cabling. Aqua Comms DAC is an Irish Carrier which specialises in the building and operating of submarine cable systems. Aqua Comms facilitate telecommunications through planning, implementation and supply of fibre pairs, spectrum and capacity services to the global media, content and carrier markets.

Aqua Comms is the owner and operator of the existing America Europe Connect-1 (AEConnect-1) and CeltixConnect-1 cable systems and continues to build on its vision of efficient submarine infrastructure ownership with the development of the ACConnect-2 and Havhingsten projects, connecting the United States (US) and Northern Europe.

ASN, as part of Nokia, is a fully integrated provider of turnkey submarine network solutions. For the Havhingsten project ASN are providing services to Aqua Comms including feasibility, route engineering, system design, manufacturing and installation.

Figure 1-1 Havhingsten telecommunication cable



HAVHINGSTEN TELECOMMUNICATIONS CABLE

INSTALLATION CORRIDOR

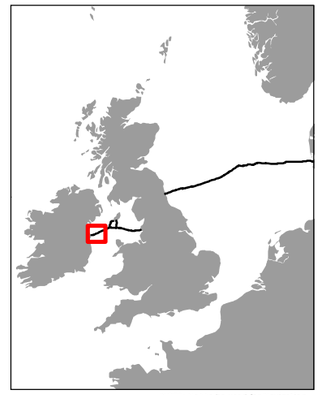
Republic of Ireland Route

Drawing No: P2228-CORR-002	B

Legend

- Crossing Location
- Survey Corridor
- 12nm Territorial Sea Limit
- Median Line

N
W E
S



NOTE: Not to be used for Navigation

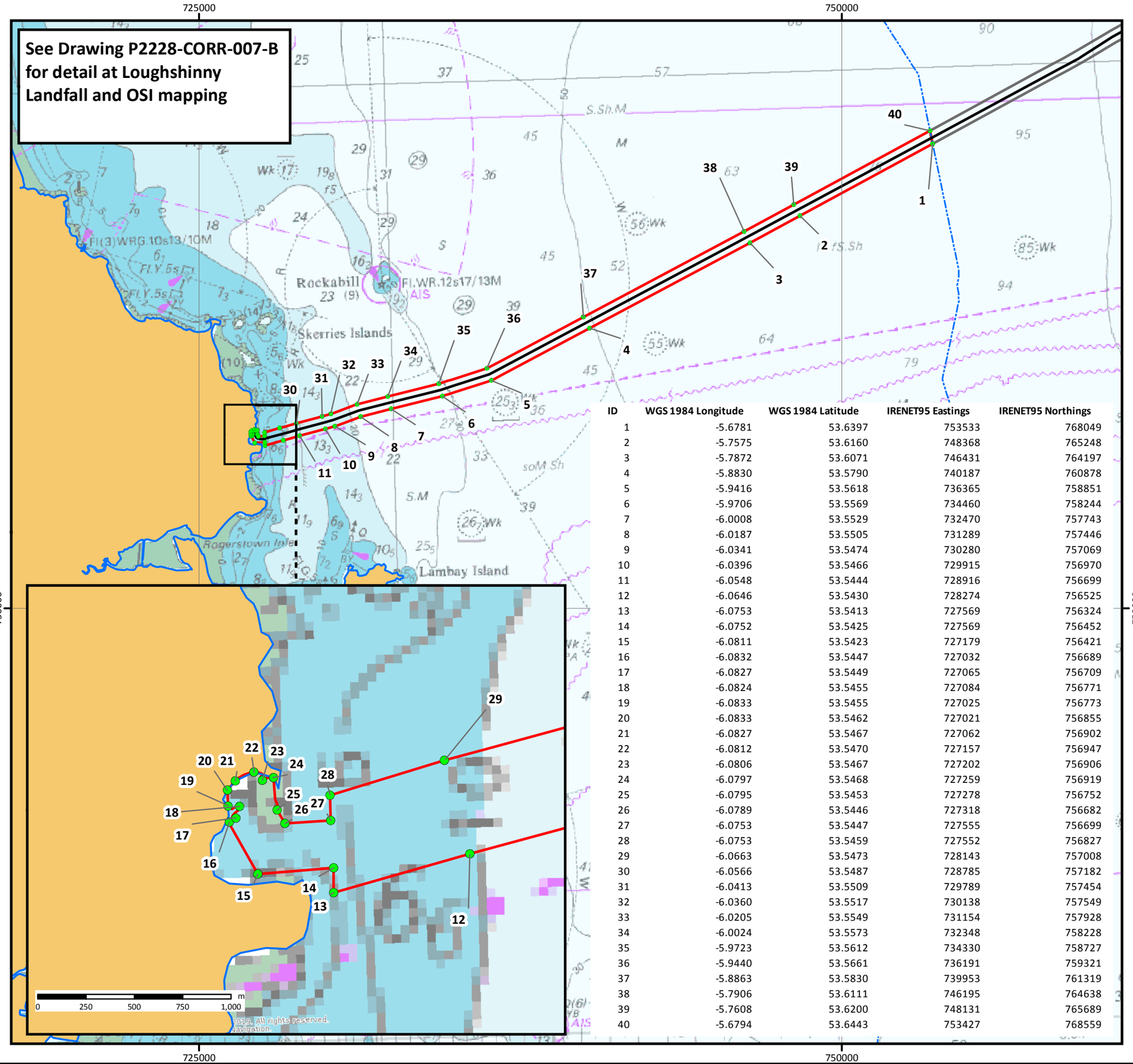
Date	Monday, July 29, 2019 13:15:04
Projection	WGS_1984_UTM_Zone_30N
Spheroid	WGS_1984
Datum	D_WGS_1984
Data Source	GEBCO; DCCAE; CDA; MarineFind; ASN
File Reference	J:\P2228\Mxd\02_CORR\ P2228-CORR-002.mxd
Created By	Chris Goode
Reviewed By	Emma Langley
Approved By	Paula Daglish

km
0 2.5 5 7.5 10

300000 325000 350000

5975000 5950000 5925000

km
0 0.5 1 1.5 2



ID	WGS 1984 Longitude	WGS 1984 Latitude	IRENET95 Eastings	IRENET95 Northings
1	-5.6781	53.6397	753533	768049
2	-5.7575	53.6160	748368	765248
3	-5.7872	53.6071	746431	764197
4	-5.8830	53.5790	740187	760878
5	-5.9416	53.5618	736365	758851
6	-5.9706	53.5569	734460	758244
7	-6.0008	53.5529	732470	757743
8	-6.0187	53.5505	731289	757446
9	-6.0341	53.5474	730280	757069
10	-6.0396	53.5466	729915	756970
11	-6.0548	53.5444	728916	756699
12	-6.0646	53.5430	728274	756525
13	-6.0753	53.5413	727569	756324
14	-6.0752	53.5425	727569	756452
15	-6.0811	53.5423	727179	756421
16	-6.0832	53.5447	727032	756689
17	-6.0827	53.5449	727065	756709
18	-6.0824	53.5455	727084	756771
19	-6.0833	53.5455	727025	756773
20	-6.0833	53.5462	727021	756855
21	-6.0827	53.5467	727062	756902
22	-6.0812	53.5470	727157	756947
23	-6.0806	53.5467	727202	756906
24	-6.0797	53.5468	727259	756919
25	-6.0795	53.5453	727278	756752
26	-6.0789	53.5446	727318	756682
27	-6.0753	53.5447	727555	756699
28	-6.0753	53.5459	727552	756827
29	-6.0663	53.5473	728143	757008
30	-6.0566	53.5487	728785	757182
31	-6.0413	53.5509	729789	757454
32	-6.0360	53.5517	730138	757549
33	-6.0205	53.5549	731154	757928
34	-6.0024	53.5573	732348	758228
35	-5.9723	53.5612	734330	758727
36	-5.9440	53.5661	736191	759321
37	-5.8863	53.5830	739953	761319
38	-5.7906	53.6111	746195	764638
39	-5.7608	53.6200	748131	765689
40	-5.6794	53.6443	753427	768559

HAVHINGSTEN TELECOMMUNICATIONS CABLE

FORESHORE LICENCE MAP

Drawing No: P2228-CORR-006 | **B**

Legend

- Proposed Corridor Vertices
- Havhingsten Cable Route
- Proposed Development
- Irish Offshore
- 12nm Territorial Sea Limit
- ROI Mean High Water

N W E S

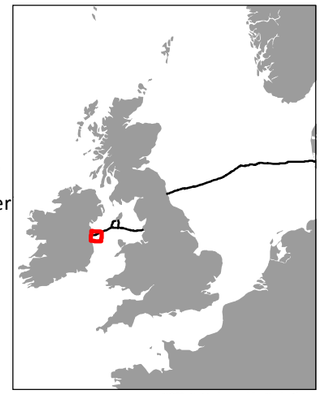
Application Area = 1446 hectares (14.46 km²)

Note: Coordinates provided in WGS 1984 Decimal Degrees (EPSG 42347) and in IRENET95 (Irish Transverse Mercator EPSG 2157)

Map prepared by:
Chris Goode, MSc Water & Environmental Engineering, MEng Civil Engineering

Intertek Energy and Water
Exchange House
Liphook
Hampshire
GU30 7DW

Scale @A3: 1:150,000



NOTE: Not to be used for Navigation

Date	Monday, July 29, 2019 12:59:05
Projection	WGS_1984_UTM_Zone_30N
Spheroid	WGS_1984
Datum	D_WGS_1984
Data Source	GEBCO; DCCAE; CDA; MarineFind; ASN
File Reference	J:\P2228\Mxd\02_CORR\ P2228-CORR-006.mxd
Created By	Chris Goode
Reviewed By	Emma Langley
Approved By	Paula Daglish

ALCATEL SUBMARINE NETWORKS

intertek

0 2.5 5 7.5 10 km

1.3 Project need

The Havhingsten project aligns with the Europe 2020 Strategy and the Digital Agenda for Europe (lower prices for electronic communication, better internet connectivity for all and better protection of consumers in telecommunications).

The project is to form part of a resilient dual path network between Dublin and the UK, Denmark and the USA complementing the existing Aqua Comms infrastructure AEC1 and CeltixConnect-1 cables, along with additional new connections under construction between the USA, Denmark and western Ireland. The project will provide a 'carrier neutral' access to north-western Europe and associated networks, which allow interconnection between multiple telecommunication carriers and providers bringing competitive service into regions from the telecoms industry.

The Havhingsten project will support the needs of the web-scale providers that underpin today's international cloud industry. The route will enable connectivity for global carriers, cloud-based networks, data centres, information technology companies, Internet Service Providers and the global media. The provision of fast and reliable internet connection will support Information and Communication Technologies to foster innovation, economic growth and progress.

There is increasing demand for high capacity connectivity linking USA, Ireland and Northern Europe. The Havhingsten project will facilitate this in combination with existing fibre optic routes. Havhingsten will deliver a reliable and resilient connection to support the rise of the European digital economy. It therefore will benefit the socio-economy of Ireland and the North European states.

1.4 Scope and objectives of the planning report

This report forms part of a Foreshore Licence Application to the Department of Housing, Planning and Local Government – Foreshore Unit under the Foreshore Acts 1933 to 2011, seeking permission for the installation of the cable in Irish waters from the landing site out to the 12nm limit. The Act requires permission to be granted for installation of cables within foreshore belonging to Saorstát Eireann.

The Foreshore application provides supporting information for the Foreshore Unit to identify if the project may be granted permission for development.

The objective of this report is to present an overview of the scope of the project, to highlight the proposed plan for the laying of the telecommunication cable, establish the shipping and navigation, archaeological and environmental baseline and assessment (including Appropriate Assessment Screening of protected sites) in the vicinity of the cable corridor. The consents for the onshore elements of the cable installation are being sought separately by M and M consultants from Fingal County Council. Fingal County Council has granted three T2 road opening licences for the terrestrial works for the fronthaul route (licence reference numbers: 2019DF0451, 2019DF0674, 2019DF0676).

The Electricity Supply Board (ESB) has applied separately for Planning Permission from Fingal County Council for the development of a single storey cable landing station at ESB Loughshinny 38kV Substation, Featherbed Lane, Loughshinny (application reference number: F19A/0169).

1.5 Structure of the planning report

This planning report is set out in the following sections as listed in Table 1-1. The assessment methodology used to identify the potential effects of the proposed installation and maintenance activities is included in Appendix A.

Table 1-1 Structure of this planning report

Section	Section title and description
Section 2	**Project description** – this section provides an overview of the cable design, the planned route in Irish waters as well as the installation operations.
Section 3	**Shipping and navigation safety considerations** – this section provides an overview of the shipping and fisheries in the vicinity of the Project. The Project is not located within an area of high shipping of fisheries activity.
Section 4	**Marine archaeology** – this section summarises the findings of the marine archaeological survey conducted along the proposed Havhingsten cable route.
Section 5	**Summary of Screening of Appropriate Assessment** – this section summarises the findings of the Appropriate Assessment Screening assessment
Appendix A	**Environmental Assessment Methodology** - assessment methodology used in this planning report
Appendix B	**Application Corridor Coordinates –** area applied for under this Foreshore licence application
Appendix C	**Cable Burial Assessment** – review of seabed sediment conditions and cable burial depth using proposed installation tools.
Appendix D	**Fishing Activity Study** – a review of the commercial fishing activity within the region.
Appendix E	**Marine Archaeology Technical Report** – Report that combines a desk-based assessment, results of the foreshore survey and review of geophysical survey data into one assessment.
Appendix F	**Stage 1 Screening for Appropriate Assessment** – screening assessment for effects to Natura 2000 sites
Appendix G	**Underwater noise assessment** – review of the noise created by installation and maintenance activities and how this will affect marine species
Appendix H	**Sediment Suspension and Dispersion** – supporting information for benthic habitat assessment including calculations
Appendix I	**Survey Reports** - Geophysical and geotechnical survey reports; environmental survey reports; intertidal survey reports
Appendix J	**Pre-Application Consultation** - evidence of all consultation undertaken to date for the project

2. PROJECT DESCRIPTION

2.1 Installation overview

The Havhingsten submarine cable has a total length in Irish waters (territorial and exclusion economic zone) of approximately 55.7km of which 29.8km is within the Irish territorial waters. The proposed installation corridor coordinates are included in Appendix B.

From the MHWS seaward the 35mm diameter cable will be buried to a target depth of 1.5m – 2m below the seabed. The cable will be buried using various industry standard burial tools including water jetting and ploughing. The cable lay will be performed by an installation vessel with a dynamic positioning system, anchors are unlikely to be used due to current speeds, however where divers are deployed, anchors may be a requirement for safety reasons. The fibre optic cable will occupy up to 40mm width of the seabed following installation.

Marine survey including side scan sonar, multibeam echosounder, sub-bottom profiler and geotechnical sampling were carried out in autumn 2018 under Foreshore Licence FS006746. The objective of the marine survey campaign was to acquire all appropriate data for the confirmation of a preferred offshore route. This included:

- detailed mapping of nearshore shallow geological and seabed character;
- reconnaissance level mapping of seabed relief and features along offshore sections; and
- baseline environmental mapping along the entire route corridor.

The data has been used to support this cable installation application and associated environmental assessment.

The survey data was also used to inform a cable burial assessment. Provided as Appendix C, this identified that the cable laying area was predominately composed of sands and clay, there were no obvious areas where cable burial may be significantly less than the target depth of 1.5m. The requirements for cable burial, the installation tools to be used and potential cable protection were established during the cable burial assessment. These methods are described in Section 2.6.

Other information to support the application include:

- Fishing Activity Study;
- Marine Archaeology Technical Report; including a desk-based assessment; and results from the foreshore survey and review of geophysical survey data.
- Stage 1 Screening for Appropriate Assessment; and
- Underwater noise assessment for marine mammals and fish.

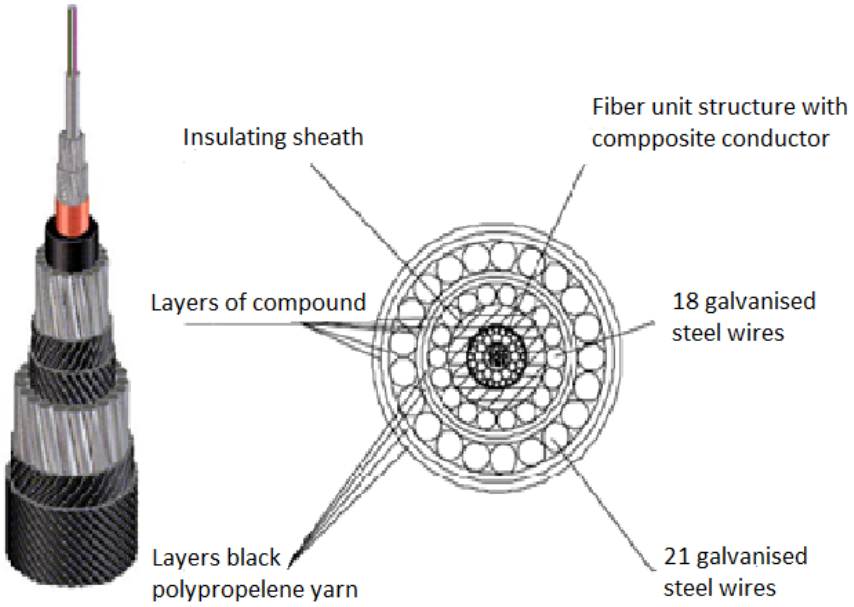
Following installation, the cable is expected to be operational for at least 25 years. During operation there may be a potential requirement for maintenance work such as cable repair at fault locations due to unexpected damage. These works will be similar in nature to cable installation works described below but shorter in duration. Further detail on the project is included in Sections 2.2 to 2.10.

2.2 The cable

The main design function of the cable is to protect the optical fibre transmission path over the entire service life of the system, including laying, burial, and recovery operations. Integrity will be assured by using armoured cable. The fibre optic elements in this cable are contained within a gel filled 2.3mm diameter steel tube cased within a composite (steel wire and copper) conductor and a 17mm diameter polyethylene insulating sheath. The construction of this core provides protection against water

penetration and hydrogen. The core is further protected by layers of steel wire, polypropylene yarn and proofing compound, giving a final cable diameter of 40mm (Figure 2-1). The conductor allows for monitoring of the cable performance and break location in the event of damage.

Figure 2-1 Example of double armour fibre optic cable



2.3 Route development and landfall alternatives

2.3.1 Offshore route development

The marine cable route and project design have been developed and refined through two main stages:

- Cable route study – detailed review of all factors affecting the routing of the cable, including physical, environmental, socioeconomic, and regulatory aspects; and
- Marine cable route survey – surveys of the inshore and offshore sections of the route.

A key driver in the Havhingsten cable routing has been to ensure design of an optimal transmission route, enabling reasonable transmission bandwidth with a consideration to minimise signal latency in the system, while taking into consideration environmental sensitivities and stakeholder constraints.

A cable route study was produced to inform pre-survey route planning and marine cable route survey. It provides comprehensive and accurate information for cable engineering, system installation and identification of constraints that may lead to increased maintenance during the 25-year design life of the Havhingsten system.

As part of the cable route study, site visits to possible landing points (listed in Table 2-1) were undertaken to gather information and meet with local stakeholders. Factors considered during route development include archaeology, seabed sediments, gradients, coastal erosion, currents and tides, fishing intensity and other marine users, restrictions and artificial hazards, territories, environmental designations and security of the jurisdictions through which the cable was to be routed.

Survey data acquired across the 500m wide survey corridor, was positioned around a centreline developed by the cable route study. The marine cable route survey comprised of the use of multibeam echosounder (MBES), side scan sonar, sub bottom profiling, magnetometer, cone penetrometer tests and core sampling. The extent of the 500m wide survey corridor has been taken forward as the proposed marine cable corridor, the subject of the Foreshore Licence application.

The marine cable route survey identified areas within the marine cable corridor, where the pre-survey centreline is obstructed by seabed features and the pre-survey route has been refined to avoid constraints. One wreck was identified within the cable route corridor during survey (Fugro 2019a) at KP35.01 (53° 39.9508'N, 005° 36.1172'W). This is approximately 140m to the northwest of the proposed installation route. No other wrecks have been located within proximity to the cable route corridor.

The marine cable route within the marine cable corridor has been engineered where appropriate to avoid potential hazards, reduce impact to sensitive seabed habitats and users such as disruption to marine resources and operations, and secure long-term protection of the cable. The finalisation of the route follows consultation with key stakeholders and the results of detailed marine surveys carried out in Q3-4 of 2018.

Following the cable route study and marine cable route survey, the proposed route was developed to the current position. The final installed route will be subject to change but will be within the marine cable corridor applied for in this foreshore application.

2.3.2 Selecting landfalls

Three preselected landfalls were initially considered for the east coast of Ireland: Loughshinny, Portrane and Donabate (illustrated in Figure 1-2; co-ordinates presented in Table 2-1). Landfall visits were undertaken between Monday 18th and Friday 22nd June 2018. Prior to arriving at the landfall visits in Ireland, the Portrane landfall had been discounted by ASN and was not visited due to this landing site having been already selected for another cable system. The other two landing sites were considered and studied to maintain diversity for the Havhingsten cable. The landfalls visited are reviewed below. Following the site visits, ASN selected Loughshinny as the preferred landing point.

Table 2-1 Landfall sites

Landfall Site	Location	Latitude	Longitude
Loughshinny	BMH	53° 32.827’ N	06° 04.841’ W
	LP	53° 32.723’ N	06° 04.844’ W
Donabate	BMH	53° 28.706’ N	6° 60.931' W
	LP	53° 28.588’ N	6° 06.846’ W

A description of the landfall sites is provided below. This is based on the landfall visits undertaken in 2018 and outlines the project rationale for selecting the landfall site, Loughshinny.

2.3.2.1 Loughshinny

Loughshinny is a small cove on the east coast of Ireland, on the north coast of Co. Dublin, situated 2.4km north of Rush Point. At high tide, the cove consists of a gently sloping narrow sandy bay based on grey limestone and black shale. The south of the cove has steep slightly eroding cliffs with chevron folds (Loughshinny formation) of geological interest. Some rock protection has been placed at the foot of the lower lying cliff areas. The north side of the cove has a concrete breakwater/harbour wall providing mooring opportunities and protection for small vessels. The cove and harbour area completely dry at low tide, providing a wide expanse of sandy beach littered with lugworm casts. The fishing pier is actively used by local small fishing vessels mainly fishing for razor shellfish in the surrounding area.

The beach is an ‘identified bathing beach’, currently with excellent water quality status under the European Union (EU) standards (Fingal County Council 2018). The beach is seasonally popular with visitors and Fingal County Council provide a lifeguard service June – August. The Drumanagh headland to the south of the cove is the site of a Martello tower (No. 4) and has also been found to contain the

remains of a major Iron Age fort, where important Roman artefacts have been found. The headland is currently being excavated by archaeologists.

The Loughshinny landfall does not pass through a designated site within the intertidal area; however, offshore the route crosses the Rockabill Special Protection Area (SPA) and the Lambay Island Special Area of Conservation (SAC).

Loughshinny has been selected by ASN as the preferred landing site, as it presents relatively few marine constraints in comparison to the other sites investigated.

Figure 2-2 Loughshinny landing site

Note: These images were taken during site visits and highlight the beach looking towards the breakwater/harbour and looking towards the proposed landing from harbour area

2.3.2.2 Donabate

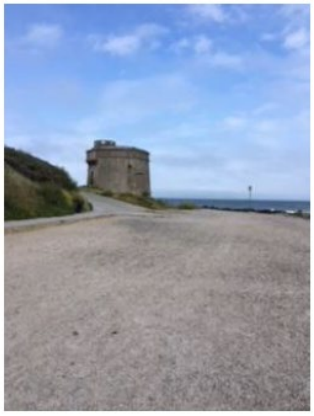
The Donabate landfall is located on a peninsula between the Rogerstown Estuary to the north and Broadmeadow Estuary to the south. Both estuaries surrounding the Donabate peninsula are partially closed by large sand spits stretching north to south. The northern spit contains Portrane beach. A stretch of low limestone cliffs to the south of Portrane beach leads to Donabate Beach which is the east face of the southern spit. The Waterside House Hotel and carpark are the only vehicular access to Donabate beach.

The wide sandy beach at Donabate consists of mixed coarse grain sand with rounded pebbles backed by an extensive sand dune system (and golf course). A Martello tower (No.2) is located on the rocky outcrop at the headland below the access track to the beach. Donabate is a popular recreational beach, with activities such as kite surfing, recreational fishing, kayaking and dog walking. However, the beach lost its blue flags status in 2017 and did not regain it again in 2018, due to failing water quality status under EU standards.

Two routes have been considered from the Donabate landing point. The route to the north of Lambay Island was granted a Foreshore Licence for survey until April 2019. However, this route was discounted as the route went through an area of strong tidal currents and the substrate was not suitable for burial.

The Donabate landfall was considered likely to present the most consenting challenges from the fishing community, archaeological potential (Martello tower) and engineering constraints with regards to potential rocky outcrops offshore. These potential constraints were identified by the marine surveys and initial environmental assessment. As such, the Donabate landfall was not selected as the preferred landing point.

Figure 2-3 Donabate landing site



Note: These images were taken during site visits and highlight Donabate beach looking towards the landfall location and the Martello tower adjacent to cable landing route

2.3.3 Consultation

Table 2-2 lists the meetings and discussions held with primary advisors and consultees prior to submission of this Foreshore Licence application.

Table 2-2 Consultation in Ireland

Stakeholder	Date	Objective
Marine Institute	19/06/2018	Meeting – to introduce the project and identify constraints
Geological Survey of Ireland	19/06/2018	Meeting – to introduce the project and identify constraints
Howth Harbour Master	20/06/2018	Meeting – to introduce the project and identify constraints
Department of Culture, Heritage and the Gaeltacht	20/06/2018	Contact to arrange a meeting with Foreshore Unit to introduce the project while on site visits.
Department of Culture, Heritage and the Gaeltacht	24/08/2018	Submission of pre-application information
National Parks and Wildlife Service (NPWS)	13/09/2018	Response to introduction of the project – advised NPWS will respond to main application
Department of Culture, Heritage and the Gaeltacht	12/09/2018	Foreshore Unit confirmed that the project can proceed to Application Stage
Fingal County Council	13/09/2018, 01/11/2018, 20/11/2018	Introduction to scope of project and enquiry for need for planning permission
Irish Fish Producers Organisation	03/02/2019	Contacted to introduce the project
Bird Watch Ireland	14/02/2019	Contacted regarding availability of Loughshinny and surrounding area Bird Count data
Fingal County Council	13/05/2019	Provide shore end connection information for information
Mr Faulkner (Fisherman)	11/06/2019	Introduce the project to Loughshinny fishermen and provide point of contact & response
Bord Iascaigh Mhara (BIM)	11/06/2019	Introduce the project to Loughshinny fishermen and provide point of contact.

Stakeholder	Date	Objective
Mr Hickey (Fisherman)	11/06/2019	Introduce the project to Loughshinny fishermen and provide point of contact.
Irish South & East Fish Producers Organisation (ISEFPO)	12/06/2019	Introduce the project to Loughshinny fishermen and provide point of contact & response.
Mr Flanning (Fisherman)	13/06/2019	Introduce the project to Loughshinny fishermen and provide point of contact and response.

Details of the above consultation are included in Appendix J.

2.4 The planned route

The marine cable corridor crosses the Irish median line and reaches the Irish coast at Loughshinny. The corridor is presented in Figure 1-3 (DWG P2228 – CORR-006). The cable route within the marine cable corridor has been assigned kilometre point (KP) markers to help delineate individual sections. KP0 is at the Port Erin Branching Unit within UK offshore waters. The marine cable corridor crosses the Ireland / UK median line at KP25.058 and enters Irish territorial waters (12nm limit) at KP51.351. The Loughshinny landing site is at KP80.621.

The marine cable corridor is approximately 500m wide (it aligns with the extent of the marine cable route survey). This is to allow flexibility during installation. The final installed cable will only occupy a small part (40mm wide) of this corridor. A corridor is sought to allow for optimisation of the final route to minimise engineering and environmental challenges such as avoidance of boulders, any debris not removed prior to installation, sub-cropping rock or hard ground or other magnetic anomalies.

Offshore from the median line towards the landing site, the route comprises fine silt sediments that form part of the Irish Sea Mudbelt. Through the mud belt area, the seafloor gently slopes with trawl scars present.

With proximity to the Irish coast the seabed sediments become coarser from very soft clay to clayey silt with shell fragments and patches of sub-cropping hard ground until the western limit of the western mud belt (approximately around KP70), after which the sediment becomes hardground sub-crops covered with a layer of coarse gravel at KP 70.048. Between this location and the Irish nearshore there are no trawl scars identified. From the nearshore to the coast the seabed sediments transition gradually from coarse gravelly sand to fine to medium sand. Shoreward, the dominant sediment comprises littoral mixed sediments and barren amphipod dominated littoral medium to fine sands at the landing site.

Seabed sediment sampling undertaken during the marine cable route survey confirmed offshore sediments were predominantly sandy mud and mud with faunal burrows in the deeper sites from the median line (Fugro 2019a). According to the European Nature Information System (EUNIS) the habitat classification from the median line to within the 12nm limit is A5.26 ‘circalittoral muddy sand’ (Fugro 2019b). Within the 12nm limit sediments are increasingly sandy. From approximately KP64.407 the seabed transitions to A5.351’Amphiura Filiformis, Kurtiella bidentate and Abra Nitida in circalittoral sandy mud’. The nearshore area from KP 78.082 to the landing site is classified as A5.261 ‘Abra alba and Nucula Nitdosa in circalittoral muddy sand or slightly mixed sediment (Figure 2-4 (DWG P2228-HAB-008))

Loughshinny is a predominantly sandy bay enclosed to the west by layered limestone and shale bedrock extending directly from coastal cliffs, and to the east by a concrete pier used by creel fishermen. Some emergent boulders were present to the east of the sandy bay and near the low water mark. The lower shore to the east of the bay was comprised of mixed sediment (sand, pebbles, cobbles and boulders). The upper shore featured boulder sea defences upon which small white sand dunes

have formed. A small area of gabion sea defence was present in the north-west of the bay. Several outflows were observed along the upper shore, through the boulder sea defences. To the north-east of the bay, a small area of bedrock was emergent, with cobbles and boulders to the west and boulder sea defences to the north.

Water depths at the Ireland-UK median line are approximately 80m. They increase to 120m approximately 10km west of the median line (between KP 34 and 35), and then decrease to shallower depths in the nearshore towards the Irish coastline (Figure 2-4, DWG P2228-BATH-002).

There is a limited number of existing infrastructures in the vicinity of the marine cable corridor. The Havhingsten project crosses one existing pipeline, the 'Interconnector 1' within the Irish Exclusive Economic Zone (EEZ) close to the Irish / UK median line.

A firing practice area has also been identified on Admiralty Charts approximately 3.3km north of the marine cable corridor and 10km offshore from the proposed landing point at Loughshinny (ASN 2018).

2.4.1 Third-party infrastructure crossing

The marine cable corridor within Irish territorial waters does not cross any existing infrastructure. However, further offshore in the Irish EEZ (beyond the Foreshore licencing jurisdiction) the Havhingsten cable will cross the Interconnector 1 gas pipeline (shown on Figure 2-4, DWG P2228-BATH-002). The location of the proposed crossing has been provided for information in Table 2-4. This cable crossing could include the use of cable protection measures.

The crossing angle will be dependent on the operational constraints and will be between 60-90 degrees from the existing asset, with the angle being as large as possible to minimise the potential impact of any future maintenance operations for either assets.

The crossing of third-party infrastructure is made with agreement of the owner following a negotiated formal Crossing Agreement (CA). The CA describes the rights and responsibilities of the parties and the detailed physical design of the crossing. The design addresses the need to protect both the Havhingsten cable and the third-party infrastructure and other aspects such as crossing angle and vertical separation (approximately 25mm is required). In some cases, the crossing location, relative to sensitive structures, e.g. subsea valves or cable repeaters, is specified.

Table 2-3 Crossing in Ireland

Crossing type	Crossing name	Latitude *	Longitude *	Water depth, m
Pipeline	Interconnector 1	53° 44.6268'N	5° 19.5120'W	78

Note: * Expressed in WSG84

Further details on the installation method selected for the cable crossing is provided in Section 2.6.3.

HAVHINGSTEN TELECOMMUNICATIONS CABLE

BATHYMETRY

Republic of Ireland Route

Drawing No: P2228-BATH-002	A

Legend

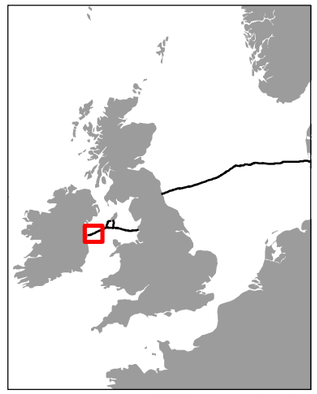
- Crossing Location
- Proposed Development
- Irish Offshore
- 12nm Territorial Sea Limit
- Median Line
- 10m Contour Interval

Bathymetry

Depth Below LAT (m)

High : 150

Low : 0



NOTE: Not to be used for Navigation

Date	Tuesday, August 13, 2019 15:18:14
Projection	WGS_1984_UTM_Zone_30N
Spheroid	WGS_1984
Datum	D_WGS_1984
Data Source	UKHO; DCCAE; CDA; EMODNET; MarineFind; ASN
File Reference	J:\P2228\Mxd\03_BATH\ P2228-BATH-002.mxd
Created By	Chris Goode
Reviewed By	Emma Langley
Approved By	Paula Daglish

ALCATEL SUBMARINE NETWORKS

intertek

0 2.5 5 7.5 10 km

2.5 Pre-installation operations

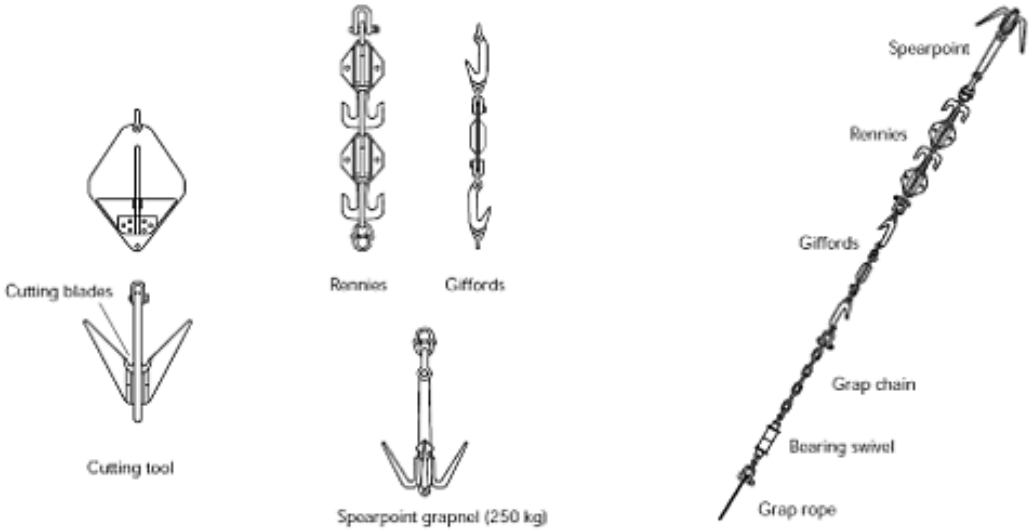
2.5.1 Seabed preparation

In general, little or no preparation of the seabed is required prior to laying telecommunication cables. The route centreline has been optimised to avoid large boulders, hard cropping rock and gravel deposits where possible. Any smaller boulders will be removed during pre-installation ploughing. In the nearshore approach to Loughshinny the route crosses a boulder field of fine to medium sand with numerous small boulders. In addition, the route crosses sub-cropping rock covered by fine to medium sand for approximately 100m from approximately KP80.04. During the marine cable route survey 38 of the 42 sonar contacts identified by the shallow water survey; and 36 of the 40 contacts in the inshore surveys were boulders. The remainder of contacts were debris and one wreck (Fugro 2019a) One linear magnetic contact was observed at KP72.47, no potential unexploded ordnance were identified (Fugro 2019a).

2.5.2 Pre-lay grapnel

Prior to the start of marine cable installation, it is essential to ensure the marine cable route is clear of obstructions that may hinder the installation works. This will be achieved by towing a heavy grapnel with a series of specially designed hooks, or grapnels (see Figure 2-5), approximately 1m width and 0.5m – 1m penetration depth along the centre line of the cable route by either a work boat or the cable lay vessel. The purpose of the pre-lay grapnel run is to clear any surface debris that could impact on the cable burial operations, such as lost fishing gear, from the cable route. Debris retained by the grapnel will be collected on board and disposed of appropriately through licensed onshore facilities. The pre-lay grapnel run will be conducted over the length of the proposed cable route prior to installation commencing.

Figure 2-5 Example of grapnel equipment used to grip cut and recover debris



2.6 Installation operations

2.6.1 Cable burial and protection

ASN will be installing the Havhingsten cable. It is planned to bury all the cable in all Irish waters. The target depth for burial is 1.5m to 2m below the seabed. The exception to achieving target burial depth may be where there are stiff or resistant seabed conditions or at the cable crossing location in the EEZ.

Different cable installation and burial techniques will be used depending on geological seabed conditions, water depth and environmental considerations along the cable route, in particular the suitability of seabed soil types (granulometry, cohesiveness, density) and maximum operational soil shear strength. Table 2-4 provides the expected installation technique for each section of the cable route. The cable burial assessment (Appendix C) estimates that 95.21% of the cable route in Irish waters can be installed using a plough. The remaining 4.79% will be subject to post-lay burial.

Table 2-4 Cable installation techniques in Ireland

Segment of cable	Method	Description of method
Beach manhole (BMH) to end of seaward duct	Trenching	Trenching of cable to target 2m depth in seaward duct (HDPE pipe) to MHWS line. Duct will be installed from BMH to the edge of the beach using diggers and handheld trenching tools.
End of Seaward duct to Low Water Mark (LWM)	Trenching	Trenching of cable across the beach to target 2m depth. Articulated Pipe (600m) will be applied to the cable across the beach for additional protection. Trench will be excavated using diggers and manual trenching. The excavated sand will be used to backfill the trench.
LWM to 15m water depth	Diver jet burial	Burial of cable using handheld jet burial tools operated by divers, supported by dive support vessel in the inshore area. Target depth of burial is 1.5m.
15m water depth to EEZ boundary	Plough burial	Burial of cable using ASN HD3 plough from the main lay cable ship. The cable is passed over the back of the vessel and through the plough which is pulled along the seabed via a tow wire. The tension on the tow wire is controlled from the vessel. The target depth of burial is 1.5m, the ASN HD3 plough provides continuous depth of burial verification during the installation operation.

Where the cable crosses the Interconnector 1 (within the Irish EEZ) the cable will have Uraduct fitted unless other extra separation / cable protection stabilisation is agreed between the pipeline owner and Havhingsten cable owner. If external cable protection is not required at cable crossings, ASN will use remotely operated vehicle / post-lay burial to bury and stabilise the cable up to the crossing point. Additional cable protection requirements at crossings will be investigated once formal crossing agreements are in place.

Offshore cable installation will commence from the Irish/UK median line and run toward the Loughshinny landing site. Onshore the installation of the BMH and horizontal directional drilling will be completed before the marine cable reaches shore.

Cable installation techniques may include trenching before cable installation (pre-lay), simultaneously with the cable installation or after cable installation (post-lay). Divers will also route the cable around larger boulders in the near-shore zone to ensure cable is on the seabed with a minimum of suspension. Jetting may be employed nearshore, in areas of mobile sediments such as sand waves. The technique allows the control of burial depth and offers more resistance to sand wave mobility. A description of the likely process and equipment to be used for cable installation is included below:

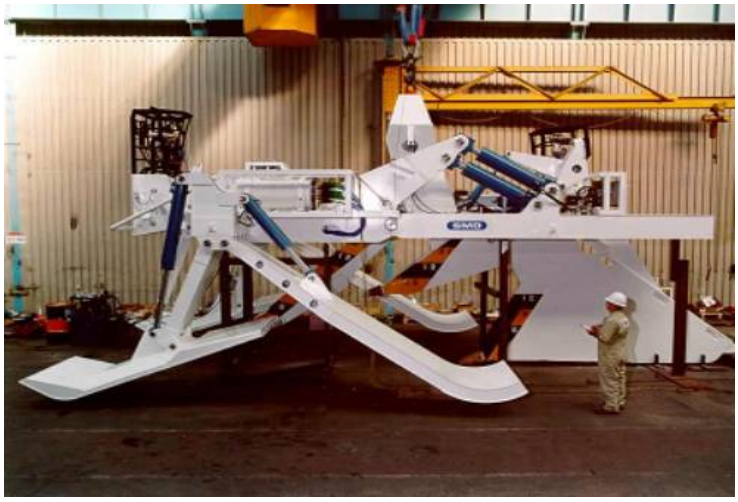
2.6.1.2 Plough

A subsea plough is a relatively simple tool that enters a narrow blade (the plough 'share') below the surface of the seabed as it is pulled along (Figure 2-6). Use of the plough is limited to the cable lay vessel, in water depths deeper than 15m. The cable feeds into a bell-mouth at the front of the plough and is guided down through the share to emerge in the trench it leaves as it passes through the soil. The soil displaced by the plough share may be gathered into the wake of the plough to close the trench over the cable. Hydraulically adjustable skids are used to control the depth of protrusion of the share, and therefore the depth of burial of the cable. The plough will be towed behind the cable lay vessel for simultaneous lay and burial. Some tools may feature a mechanical cutting tool or be assisted by water jets, but the distinctive feature of the plough is that it does not propel itself. The plough provides relatively high progress rates in suitable soils, such as clays.

The plough is designed to backfill the cable burial trench during operation. The hydraulic adjustable skids will indicate the footprint of the installation on the seabed and have the dimensions 11m x 5m x 6m (L x H x W) with a submerged weight of 25 tonnes. Burial by plough will be carried out at a rate of 17km/day (depending on the number of crossings and plough recoveries required).

Simultaneous cable installation with plough burial is the planned method for the majority of the offshore route. Alternative methods will be applied where target burial cannot be achieved with this method or within 250m distance of crossings.

Figure 2-6 Typical plough machine



2.6.1.3 Water jetting

Most jetting trenchers are a self-propelling ROV which is powered and controlled from the CLV or another support vessel (Figure 2-7). Some are towed rather than self-propelled. Jetting trenchers sit on the seabed and follow the cable whilst employing high powered pumps to inject seawater either side of the cable which fluidises the seabed. The cable naturally sinks between the jetting "swords". Jetting machines can achieve burial depths more than 2m in soft clays and sands and can be used to pass several times if required to achieve target burial depths.

The trench left behind back-fills from the natural movement of sediment on the seabed. A specialised jetting trencher may be used to cover the intertidal and shallow water sections of the route. A typical system designed for such an application is shown below, a high-pressure shallow water jetting system, powered and controlled from a shallow water pumping barge. It is fitted with 2.5m jet swords and can trench in sand, silts and gravels.

Figure 2-7 Typical water jetting machines

The expected maximum width of the seabed fluidised by the jet burial is approximately 105mm either side of the centre line of the proposed marine cable route (i.e. 210mm width) and the cable is buried to a target depth of 2m. It should be noted that the seabed can be expected to naturally reinstate to before-work level and condition shortly after completion of the works.

2.6.1.4 Cable protection

The main form of cable protection proposed for the Havhingsten cable is articulated pipe. Articulated pipes are required where the cable is at risk of exposure or damage from external forces. Articulated pipe will be applied to the cable on the beach from the end of seaward duct for approximately 600m. The cable protected with articulated pipe will be buried to target 2m depth on the beach down to the low water mark (LWM) and target 1.5m depth in the inshore area.

No additional cable protection is required within the Irish territorial waters. Additional rock protection will be required at the Interconnector 1 crossing which is outside of the Foreshore licencing area. This will consist of Uraduct for the pipeline crossing and post lay rock protection, as agreed with asset owners in formal Crossing Agreement.

2.6.2 Installation vessels

The cable lay will be performed on a 24-hour basis to ensure minimal navigational impact on other users and to maximise efficient use of suitable weather conditions and vessel and equipment time. The progress speed is relatively slow, normally between 0.5 – 1.0 km/hour (17-20km per average day), with speed depending on soil conditions, target plough burial depth and weather (ASN 2018). Notice to mariners (NM) will be issued in accordance with Regulation 19.2.1.4 of the revised Chapter V of the Safety of Life at Sea (SOLAS) Convention, and the Merchant Shipping (Safety of Navigation) Regulations to ensure navigational and operational safety. In addition to the installation vessel, additional vessels (i.e. guard vessels) will be involved with the operation. Although exact details may change, it is likely that the vessels to be used will consist of:

2.6.2.1 Cable lay vessel (CLV)

The CLV is a specialist ship equipped with dynamic positioning systems, designed specifically to carry and handle long lengths of up to 8000km of deep-sea fibre-optic cable or 2500km of armoured fibre-optic cable (Figure 2-8). The cable is loaded onto the ship at the cable factory. The CLV's have powered turntables to allow cables to be wound on without coiling which may lead to damage to the integrity of the cable prior to installation. The factory is also equipped with a turntable as well as a purpose-built dock with rollers and guides so the transfer of cable to the vessel is smooth and safe for the integrity of the cable. Once loaded the vessel transits to a port, close to the worksite for final mobilisation of cable handling crew. Installation vessels will operate in dynamic positioning mode during cable installation operations. Anchors are unlikely to be used except where divers are deployed; anchors may be a requirement for safety reasons.

The CLV will be equipped with a ROV and supporting camera equipment.

The CLV is restricted to working within water depth greater than 15m and therefore depending on the distance from CLV to shore may require support from a cable lay barge (CLB).

Figure 2-8 Cable lay vessel example

2.6.2.2 Ancillary support vessel

Dedicated vessel for all ancillary operations, including Route Clearance, Pre-Lay Grapnel Run (PLGR) and Post-Lay Inspection & Burial (PLIB) operations. The vessel will be equipped with a remotely operated vehicle (ROV) to bury sections of cable which cannot be buried by the plough (i.e. at cable crossing). The vessel will follow the installation of the CLV.

2.6.2.3 Shore end support vessel

For the shore end operation, small inshore vessels will be used to support the cable landing on the beach at Loughshinny. These vessels will include small diver support vessels to support the placement and burial of the shore end cable in waters depths less than 15m. Anchors are unlikely to be used except where divers are deployed, where anchors may be a requirement for safety reasons.

2.6.2.4 Rock-dumping vessel

If rock is required at the crossing within the EEZ section of the marine cable corridor, a rock-dumping vessel will be deployed. This will be equipped to carry sufficient rock material to provide the necessary protection at the crossing and will comprise of a fall pipe, from which the rock can be deposited from the vessel to the seabed in a controlled manner.

2.6.2.5 Guard vessel

If necessary, a guard vessel will accompany the CLV to maintain surveillance around the worksite ensuring other vessels are kept clear, reducing the risk of collision and to protect the cable prior to burial. The guard vessel will often be a local vessel employed for their knowledge of the installation area and other vessels operating in the region.

2.6.3 Cable laying (offshore)

When the CLV arrives on site the cable is transported via cable engines to the over-boarding point of the ship (usually the aft end). Under a hold back tension, it is guided over into the water (and into a plough, if burial is simultaneous with lay). It is either laid onto the seabed for later burial or emerges from the plough at a point below the seabed consistent with the specified burial depth.

Operations can continue in heavy weather, up to force 7 winds and the vessel can stay on station typically in force 8 or 9 winds (ASN 2018). In the most severe weather, the vessel may have to cut and

cap the cable and leave the worksite. In this case the vessel will return when the weather has subsided, recover the end of the cable, make a joint and continue the laying operations.

The only interruptions to the marine installation may be for any joints that need to be made, the cable crossing or at the landfall. In selected areas, such as at the cable crossing, the ROV will be used to check the cable touch down position.

Cable jointing

The CLV has sufficient capacity to carry enough cable for the installation without joints. However, there is also the possibility that for operational reasons it is necessary to introduce an interim joint in the system between two already laid sections of cable e.g. operation encounters severe weather. Joints are made on board the vessel before the cable laying operation continues.

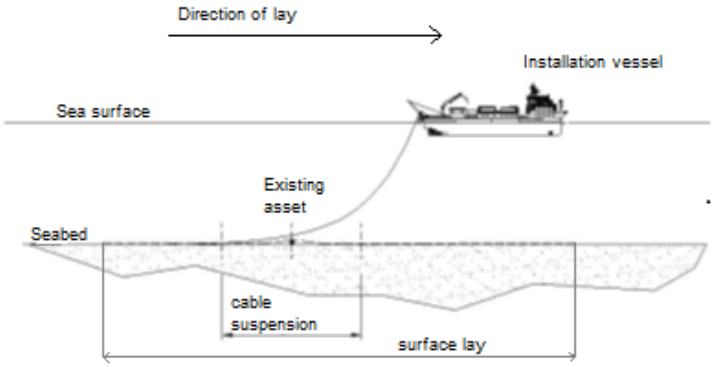
Where cable joints are required, the cable-lay vessel may remain stationary for up to 2 days to create one joint. If joints are required, as far as possible, joints will not be located in sensitive areas, e.g. shipping channels, anchoring grounds, where the prolonged location of the installation spread on the seabed is not desirable. Exact joint locations can only be determined following cable manufacturer and installation contractor design.

Cable crossing

Prior to constructing the crossing, the location will be surveyed in detail to establish the exact position of the existing infrastructure and its condition including the depth to which it is buried.

Where the cable crosses the Interconnector 1 pipeline (in the Irish EEZ), ploughing installation will stop at a minimum distance of 250m before Interconnector 1 and be resumed at minimum distance of 250m on the other side (Figure 2-9).

Figure 2-9 Crossing design installation example



The plough will be recovered on deck, and the cable unloaded from the plough to fit the cable protection product (URADUCT or similar) on to the cable. Uraduct (or similar) will be applied onboard the vessel. It will be applied to cable to be laid at approximately 100-250m distance from the crossing and will continue for a distance of 100-250m beyond the crossing (depending on the terms of the crossing agreement) (Figure 2-10). This will provide a protective barrier ensuring no direct metallic contact between the cable armour and Interconnector 1. The Uraduct half shells will be bound together with a “band-it” tool system (Figure 2-11), using bands of 19mm stainless steel/titanium or similar sea water resistant banding material (ASN 2018). Cable burial will be undertaken by jetting as soon as practicable to a depth of approximately 2m up to the crossing location where cable suspension will start/end over the existing asset.

Crossing agreements for the Havhingsten cable are currently in negotiation. Rock protection and/or concrete mattressing will only be used if specified by the existing asset owner. As a worst case it is

assumed that rock will be deposited at all cable crossings. If vertical separation is required, a bridging layer (rock or concrete mattresses) will be deposited on the existing infrastructure by a support vessel approximately two days before the approaching cable lay spread. The cable will then be surface laid from the CLV. Once the CLV has progressed beyond the crossing site the rock-dumping vessel will re-locate onsite to deposit the covering rock protection material. Table 2-5 provides indicative details of the rock protection requirements.

Table 2-5 Post – lay rock protection at cable crossings

Crossing type	Crossing name	Asset owner	Post rock berm length (m)	Estimated Rock m^3	Estimated Rock ton	Estimated footprint (m^2)
Pipeline	Interconnector 1	Gas Networks Ireland	75	234	491	687.5

The completed crossing will be surveyed visually (where visibility allows) to ensure that the installation has been successful. Further burial depth survey using acoustic devices to ensure the crossing design has been achieved may also be undertaken.

Figure 2-10 Crossing design

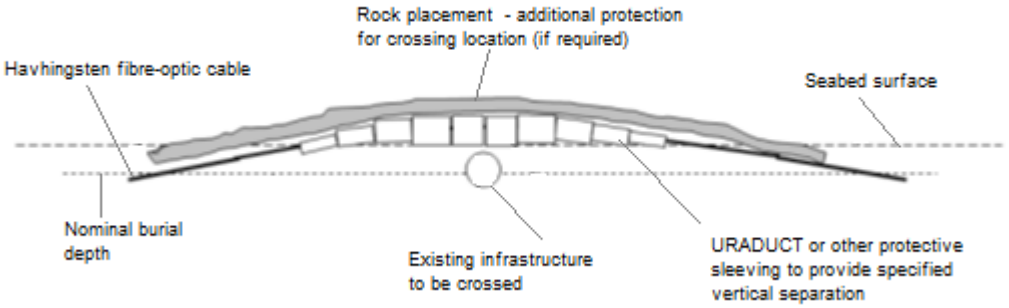


Figure 2-11 Uraduct type product for cable protection

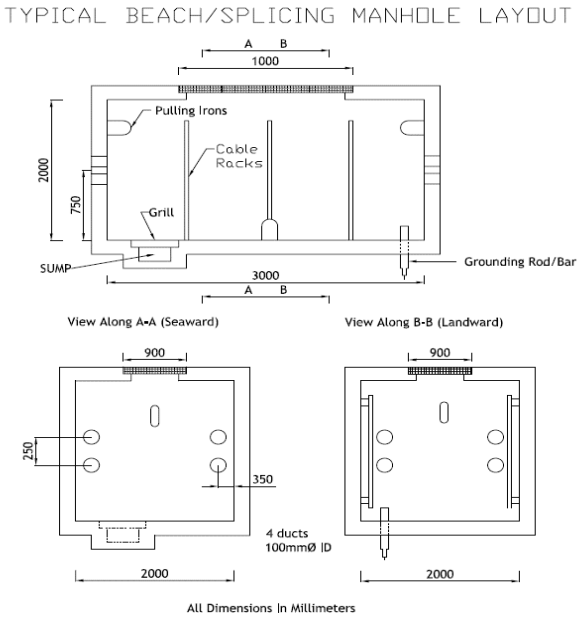
2.6.4 Cable landing and nearshore installation

2.6.4.1 Beach manhole (BMH)

The BMH is where the interface, the beach joint, between the marine cable and the terrestrial cable will be permanently housed. It will be constructed above MHWS (see Figure 2-13) in the car park at Loughshinny ahead of the marine installation. As it is above MHWS it is outside the scope of the Foreshore Licence, but details have been included to provide context for the cable landing works.

The BMH will be constructed ahead of the marine installation and will consist of an underground chamber with internal dimensions as shown below (Figure 2-12).

Figure 2-12 Typical BMH

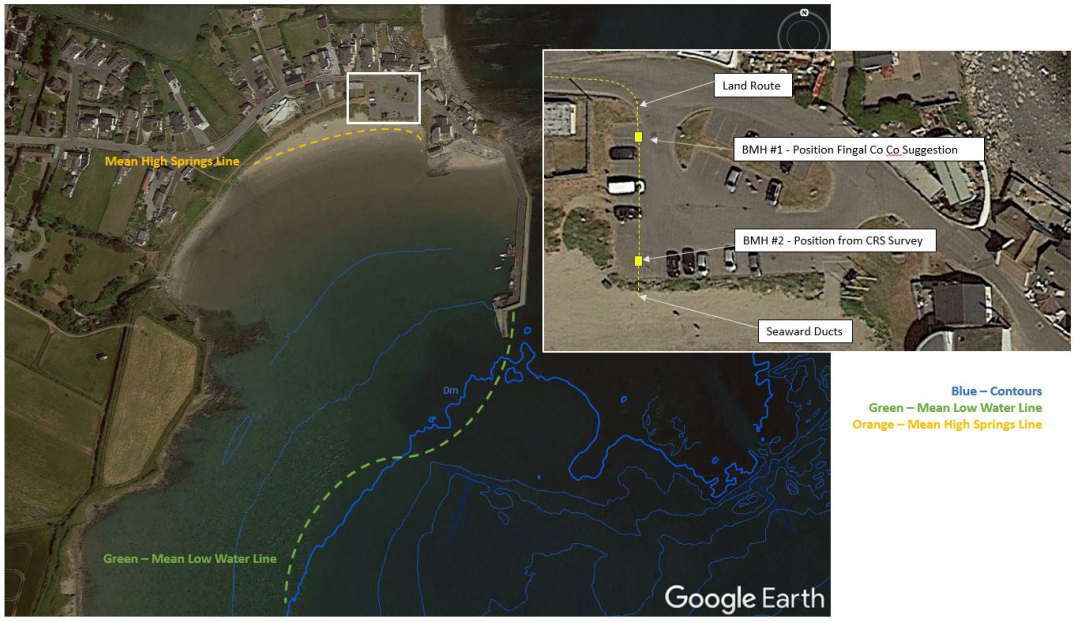


From the BMH a duct will be installed beneath the car park to a point at the back of the beach (seaward of MHWS). The position of the BMH will dictate the length of the seaward duct, which will be installed in a trench of 27 metres in length. The seaward duct will be constructed in advance of the shore-end installation (expected to be completed in July 2019. The BMH#1 position in Figure 2-13 has been selected in agreement with Fingal County Council). The duct consists of a 100mm diameter PVC or HDPE pipe buried to a depth of approximately 1.25m on leaving the BMH increasing to a depth of 1.5m at the beach end.

Past the edge of the car park, it is better to have the cable protected by articulated pipes which have some flexibility, rather than extend a PVC/HDPE conduit.

The estimated work area for the construction of the BMH is approximately 12 metres by 12 metres. The work area will be secured using Heras type fencing barriers for public safety. The duration of the work is anticipated to be 12-14 days. This is mainly to allow curing time for the bentonite cement which will be poured in four separate stages.

Figure 2-13 Overview image of Loughshinny landing site showing the location of the BMH in the beach car park, and the relative mean tide lines



2.6.4.2 Nearshore installation (BMH - 15m water depths)

The duct will emerge at the edge of the carpark. Anticipated duct end co-ordinates are 53 32.8221 N; 006 04.8430 W. Bentonite cement will be used at the end of the duct on the beach to provide stability. It is planned to stop the duct at a point from where the remainder of the cable on the beach can be easily trenched. The cable will be installed within beach sediments which will be re-instated soon after the cable landing operations.

The shore-end landing operations will occur when the CLV approaches the shore to a point where the water depth is approximately 15m. A line will be taken ashore using a small boat and this line will be used to pull the cable ashore. The cable is suspended above the sea floor using flotation buoys which are removed by a team of divers after the cable is drawn up the beach. Onshore, the end of the seaward duct is exposed by excavation and the cable is then passed into the BMH via the duct, leaving sufficient slack for jointing to the terrestrial cable. Once the cable is in position the remaining buoys are removed and the cable sinks to the sea floor (Figure 2-14).

Figure 2-14 Typical shore-end landing utilising floatation buoys

The cable will be post-lay buried to a target depth of 1.5m up to LWM, using divers and water jet burial tools. On the beach, the cable will be buried in a trench using excavators to a target depth of 2m.

To provide additional protection, the cable on the beach, intertidal area and surf zone will be installed within articulated pipe which has a maximum external diameter of 150mm (Figure 2-15). The articulated pipe is supplied in 0.5m sections, split longitudinally with a distinct top and bottom. The sections are designed to lock together and are typically bolted every 5m for additional security (Figure 2.16). At this landing point it is planned to use articulated pipe for a length of 600m.

Figure 2-15 Articulated pipe example

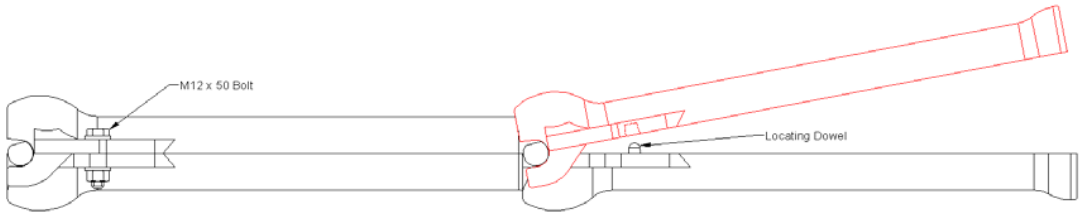


Figure 2-16 Articulated pipe being fitted onto cable example

The articulated pipes will be buried on the beach to a target depth of 2m below the ground surface or until bedrock to mean low water (MLW). The beach excavation will typically be carried out using small tracked diggers (Figure 2-17). A backhoe machine and hand tools will be used to form a trench of approximate dimension 0.5m (width) x 1.5m (target depth) within the intertidal area. The trench will be backfilled with excavated material following installation and the beach profile will be restored.

Figure 2-17 Typical excavators

2.7 Indicative installation programme

Subject to the award of installation consents, the cable installation is scheduled to begin in the fourth quarter of 2019 and is expected to be operational by the end of 2019. Following installation, the cable is expected to be operational for at least 25-years.

The exact timing of the landfall works will be dependent upon the offshore works and any license conditions. Cable landing and use of divers will require relatively good weather to proceed. The current planned cable installation schedule is listed in Table 2-6 below.

Table 2-6 Current planned cable installation schedule for Irish marine route

Installation activity	Estimated timescale	Comments
Pre-installation works (seabed preparation, route clearance and pre-lay grapnel run)	1 day in Territorial Waters	TW: RC/PLGR operation after PiP received and prior to main lay operations EEZ: RC/PLGR operation completed in June 2019
Offshore installation, ploughing and cable lay	Approximately 15 hours within Territorial Waters 3 days within all Irish waters	Simultaneous cable lay and burial, including crossing of Interconnector 1 pipeline
Offshore installation, post-lay inspection and burial (PLIB)	3 days	Cable crossing location and final splice locations where plough burial was not performed.
Rock protection material at crossing	Post-lay rock dump 1 day/site	Optional post-lay rock dumping for Interconnector 1 pipeline crossing; protection to be agreed in final Crossing Agreement
Shore-end tie-in	2-3 days and up to 7 days post burial nearshore	To follow completion of the offshore cable installation.
Seaward duct installation at Loughshinny	2-3 days	To be carried out just ahead of the shore-end landing.
Beach Man-Hole (BMH) construction – above MHWS and included for information only	12-14 days (curing time is up to 4 weeks after casting)	To be completed outside of the peak tourist season (01 July to 31 August, inclusive)

2.8 Operation and emissions

The proposed cable installation is 'un-repeated' meaning that there is no power supply to the cable. Therefore, operation of the cable is not expected to emit any electric induced, magnetic fields or heat to the surrounding sediment or seabed and there are no anticipated effect of cable operation on the environment.

2.9 Cable maintenance and repair

Post burial surveys using an ROV will be carried out at the pipeline crossing to establish the as-built situation. This information is especially important should the local environmental conditions change or in areas of high tidal or wave energy. ASN will be responsible for cable repairs and maintenance during the warranty phase (5-years). If required, cable intervention activities will have a similar effect to the installation activities, however they will be on a smaller extremely localised scale, and as such are not expected to have any significant effect. Any effects will be less than those identified for installation operations.

2.10 Decommissioning

The least environmentally damaging option and the usual approach for submarine telecommunication cables is to leave the cable in-situ and this is the expected approach for the Havhingsten cable. Should decommissioning be undertaken, the operation will be conducted according to the standard industry protocol at the time.

2.11 Embedded mitigation

Mitigation measures are the actions or systems proposed to manage or reduce the potential negative environmental effects. The Institute of Environmental Management & Assessment (IEMA) defines three types of mitigation; primary (inherent design), secondary (foreseeable) and tertiary (inexorable) (IEMA 2016).

The Havhingsten cable installation includes a range of primary mitigation measures that have been 'designed' into (or 'embedded' in) the project to reduce or prevent significant adverse effects arising. Tertiary measures such as legislative compliance and best practice are also included in the embedded mitigation. The assessment of effects has therefore considered all embedded mitigation that form part of the project which ASN is committed to implementing. The embedded mitigation is detailed within each assessment Section (where relevant to the topic) and gathered together in Table 2-7 below.

Table 2-7 Embedded Mitigation inherent to the Project's design

ID	Aspect	Embedded mitigation
E1	Vessel safety	The cable will be buried to a target depth of 1.5m below seabed to ensure cable safety and protect fishing vessels from snagging effects. Notice to Mariners will be issued before works commence and after completion of the installation activities. The cable will include URADUCT protection at the Interconnector-1 crossing. If additional cable protection measures are used, they will be over-trawlable. The as-laid position and route of the cable will be provided to the IHO and UKHO for inclusion on all marine charts in the region so fishing vessels can take care along the cable route.
E2	Prevention of damage to an external asset	The crossing design will be agreed Gas Networks Ireland prior to installation and will be based around the principles of 25mm vertical separation, no metallic contact; 60-90 degrees crossing angle where possible. Cable protection measures for both the existing external asset and Havhingsten cable will be agreed prior to installation. Direct notice to external asset owner will be issued before works commence and after completion of the installation activities.
E3	Prevention of damage to an external asset e.g. cable, through anchor dragging	Cable installation methods will stop at a minimum distance of 250m before existing infrastructure. Cable burial within 250m of existing infrastructure will be by jetting tool ROV, and if required rock dumping.
E4	Prevention of deterioration to water quality	Project vessels will be equipped with waste disposal facilities (sewage treatment or waste storage) to IMO MARPOL Annex IV Prevention of Pollution from Ships standards.
E5	Prevention of hydrocarbon or chemical spill	Control measures and shipboard oil pollution emergency plans (SOPEPs) will be in place and adhered to under MARPOL Annex I requirements for all project vessels. Chemicals and hydrocarbons will be stored in a secure, designated area in line with appropriate regulations and guidelines. A Chemical Risk Assessment will be prepared for the use of chemicals. A chemical inventory will be kept of all chemicals and oils used.

ID	Aspect	Embedded mitigation
E6	Prevention of shipping accident / collision	Vessels to comply with the International Regulations for Preventing Collisions at Sea, 1972 (COLREGs) – as amended, particularly with respect to the display of lights, shapes and signals; Project vessels will exhibit signals in accordance with the Irish requirements for marking and identification of offshore installations as specified in the Safety, Health and Welfare (Offshore Installations) Act, 1987. A local marine notice giving vessel details together with a general description of operations and approximate dates of commencement and completion will be published. Identify the collision risk during installation and repair prior to commencement of activities; Implement a 500m safety zone surrounding the cable installation and /or repair vessels; Installation vessels will have passage planning procedures, holding positions (e.g. if waiting on weather), traffic monitoring (radar, AIS and visual), means of communications with third party vessels and emergency response in the event of a vessel approaching on a collision course; Notifications will be issued in accordance with statutory procedures to ensure navigational and operational safety. ASN will Ensure other operators in the area are aware of proposals and installation operations via Kingfisher, notice to mariners, NAVTEX and NAVAREA warnings. Ensure that cable burial depths are sufficient; Ensure cable protection at crossing locations will not be greater than 5% water depth reduction; ASN will employ the use us a guard vessel as necessary (during installation at cable crossings and where surface lay, and installation will be performed). Navigational warnings will be broadcast by the installation and guard vessels to warn approaching vessels of the position and course of the spread and inform fishing vessels of the presence of the cable. ASN will liaise with the relevant port's authorities regarding the risk of anchor dragging. A method statement and risk assessment will be prepared by ASN A Fisheries Liaison Officer (FLO) will be appointed and fisheries liaison will be undertaken prior to and during cable installation operations. Cable protection measures (Uraduct type product, rock dumping) will only be deployed at the Interconnector 1 pipeline crossing. Project vessels will travel at speeds of 14knots or less.
E7	Prevention of the introduction of non-native invasive species; and Prevention of hydrocarbon or chemical spill	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. The vessel proposed for installation underwent hull cleaning on 13th February 2019 and has since been working exclusively in the UKCS prior to installation within Irish waters.
E8	Minimisation of disturbance to seabed sediments, habitats and species	Deployment of anchors/anchor chains on the seabed will be kept to a minimum in order to reduce disturbance to seabed. Dynamic Positioning systems on the main installation vessel allow the vessel to hold its position even in bad weather conditions, meaning use of anchors can be kept to a minimum. Trenches will be backfilled with excavated sediments the beach profile restored.
E9	Minimisation of disturbance to sediments, habitats and species	Construction vehicle movement on beaches will be kept to a minimum and within a defined work area.
E10	Minimisation of disturbance to sediments, habitats and species	An ASN crew member is a fully trained MMO and will operate to minimise the risk of collision or disturbance to marine mammals.

3. SHIPPING AND NAVIGATION SAFETY CONSIDERATIONS

Marine navigational safety issues must be considered when preparing a Foreshore Licence application. Shipping activity can have a significant effect on cable installation operations (ASN 2018) and in turn cable installation can cause disruption and present a hazard to shipping, navigation and fishing activities. The following Section provides an overview of the shipping, navigation and fishing activities in the vicinity of the marine cable corridor; the potential effects the proposed installation and maintenance activities will have on the activity; and if necessary, proposes mitigation to reduce the significance of effects.

The assessment methodology used in this Section is provided in Appendix A. The embedded mitigation appropriate to this topic is listed in Section 2-11.

3.1 Shipping and navigation

3.1.1 Baseline

The Loughshinny landing site is located close to two ports on the Irish coast: Dublin Port, approximately 30km south; and Drogheda Port, approximately 30km north (EMODnet 2019). Dublin Port is the largest freight and passenger port in Ireland. The Port is also an important hub for transport of goods and deals with 50% of the trade in Ireland (Dublin Port 2019). Drogheda Port is a commercial state port, handling cargos, goods and passengers. This port also has a hydrocarbon facility and a liquid petroleum gas terminal (Drogheda Port 2019). Navigational features in the area include:

- Rockabill lighthouse is marked as an Aid to Navigation and is situated approximately 4km north of the marine cable corridor (at the closest point);
- The closest designated anchorage area is approximately 5km north west of the marine cable corridor, located off the entrance to Drogheda; and
- The closest Royal National Lifeboat Institute (RNLI) stations are at Skerries and Clogher Head.

The cable route corridor in the landfall approach falls partially within the Loughshinny harbour area. The north side of the Loughshinny cove has a concrete breakwater / harbour wall providing mooring opportunities and protection for small vessels predominantly used by a number of small fishing vessels and occasional pleasure craft. The mooring completely dries at low tide. The proposed installation footprint is not within the Loughshinny harbour area, however some temporary disturbance to access of the breakwater area may occur during shore end installation.

Shipping density information for the region were obtained for 2017 in the Irish Sea (Figure 3-1) and in proximity to Loughshinny landing site (Figure 3-2). High shipping densities are represented in red in these Figures, while lower densities are in blue.

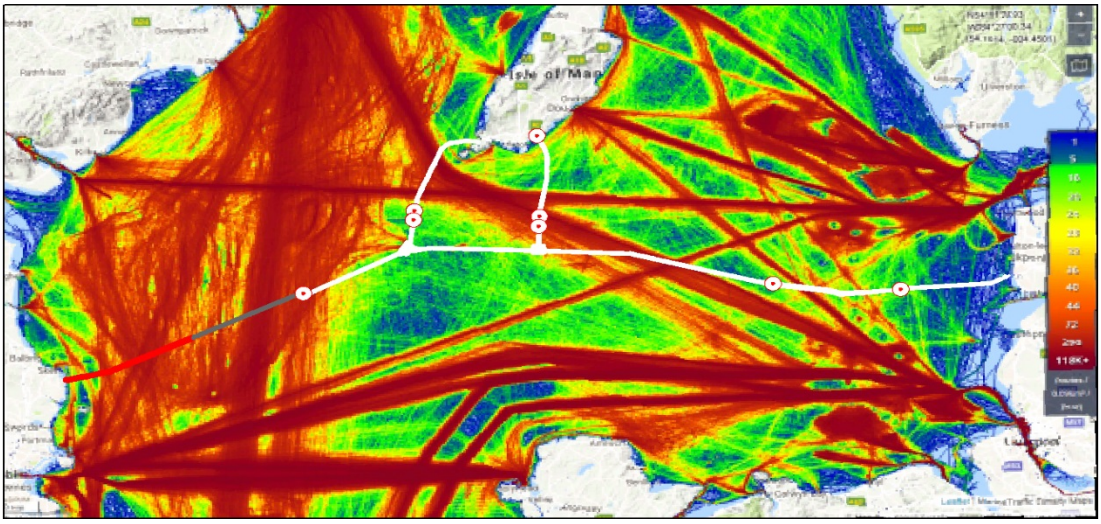
The Irish Sea is an area of generally high shipping density (Figure 3-1). Shipping routes are composed of North-South routes along the western Irish Sea and routes connecting UK ports with those in Northern Ireland and the Republic of Ireland (MMO 2014). The shipping routes in the vicinity of the marine cable corridor with the greatest traffic are between Dublin and Liverpool or Holyhead, based on AIS data (MMO 2014). Average weekly vessel density in 2012 was 10 to 25 vessels per week (MMO 2014). Information on scheduled ferry crossings in the vicinity of the proposed marine cable corridor is included in table 3-1. The MMO data is represented in Figures 3-1 and 3-2 taken from the ASN Cable Route Study (ASN 2018).

Table 3-1 Shipping information

Ferry Operator	Route	Crossings per day
ICG	Dublin – Holyhead	6 per day
	Dublin – Cherbourg	4 per week
Seatruck	Dublin – Liverpool	4 per day
	Dublin – Heysham	1 per day
P+O	Dublin – Liverpool	4 per day
Cobel Fret	Dublin – Rotterdam	1 per day
	Dublin – Zeebrugge	2 per week
Stena	Dublin – Holyhead	4 per day
Isla of Man Steampacket	Dublin – Douglas	1 weekly

Note: The shipping information has been taken from various ferry schedules.

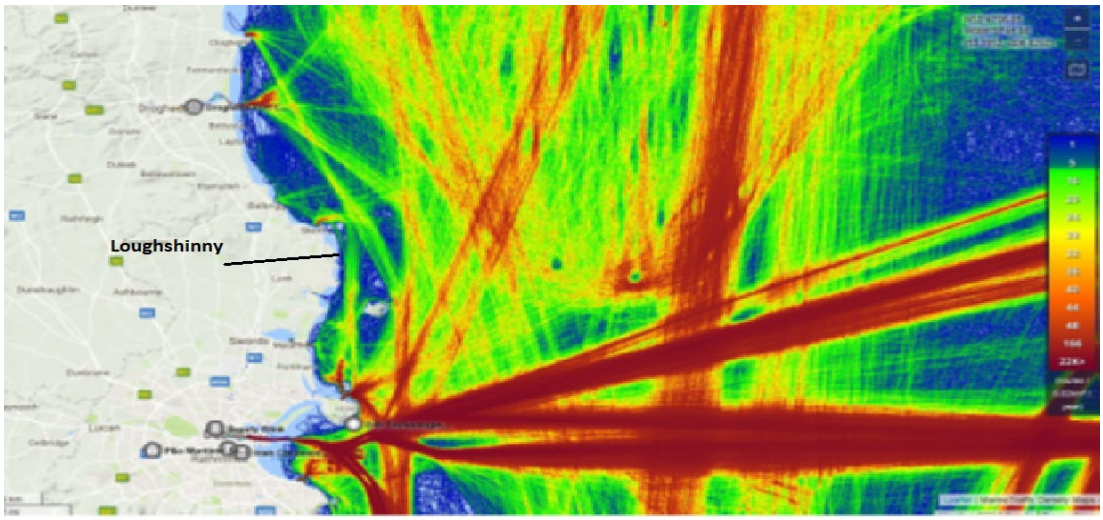
Figure 3-1 Shipping density in the Irish sea



Source: ASN (2018)

Figure 3-2 below displays the shipping density in the approaches to the selected landing site, Loughshinny. This shows that the majority of the traffic in the vicinity of the Havhingsten project is towards the Dublin Port, with some North-South traffic in the nearshore area. A limited number of vessels are travelling towards the Drogheda Port, located 30km north of Loughshinny.

Figure 3-2 Shipping density in approaches to Loughshinny



Source: ASN (2019)

Based on information displayed in Figures 3-1 and 3-2 above, it is necessary for the Havhingsten route to pass through some high-density traffic shipping lanes (ASN 2019). The cable crossing with the Interconnector 1 pipeline is located within an area of busy shipping traffic (Figure 3.1). During any maintenance activities, vessels may be stationary at a site for up to 3 days. Mitigation of navigational risks is therefore essential. Notice to Mariners is to be issued prior to installation and maintenance operations and other sea users known to be operating in the area will be contacted prior to installation or repair operations commencing. Subsea cable installation will be performed by a purpose-built cable lay vessel and will comply fully with all requirements of the International Regulations for Preventing Collisions at Sea (COLREGS). A local marine notice giving vessel details together with a general description of operations and approximate dates of commencement and completion will be published.

3.1.2 Effects and proposed mitigation

The cable installation activities will have an effect that has been assessed as Not Significant on commercial shipping. The significance of the effect increases to Slight for activities associated with the crossing installation and any maintenance activities as these works typically involve stationary vessels, remaining in position for a number of days.

During installation vessels will be progressing at a speed of between 0.5 – 1.5km/hr. Other shipping in the region will be requested to remain at least 500m (radial distance) from the cable lay vessels for safety reasons. This will cause temporary displacement as vessels will have to make minor alterations to passages to avoid the works. However, all ASN vessels will adhere to the Collision Regulations and Notice to Mariners will be issued. There is sufficient space available for shipping to make minor alterations to routes to avoid the cable lay works.

The proposed crossing location with the Interconnector 1 pipeline is within an area of busy shipping traffic. Due to increased shipping in this area, there is a higher probability of ship collisions. However, ASN best practice measures will be implemented to minimise the potential for collision. The cable lay operation will be performed on a 24-hour basis to ensure minimal time that vessels will be stationary and reduce navigational impact on other users (in addition to maximise efficient use of suitable weather conditions) and vessel and equipment time. Notifications will be issued in accordance with statutory procedures to ensure navigational and operational safety (and will include notification via Kingfisher and notice to mariners / NAVTEX, with confirmation of crossing position, cable type, depth and crossing angle are sent 1 week, 48 and 24 hours in advance, as well as on completion of the crossing and use of appropriate marking and lighting). The crossing is within water depths of over 70m, therefore no reduction to water depth will occur that may be of concern for navigational safety.

During maintenance activities, the implementation of a temporary exclusion zone around the works will again cause temporary small scale disturbance to shipping traffic while repairs are carried out. However, as for installation, there will be sufficient sea room surrounding the exclusion area for manoeuvring and vessels will be able to make minor alterations to passages. The effects identified are not significant and will be controlled by compliance with embedded mitigation as summarised in Table 3-2.

Table 3-2 Impact assessment summary for installation and maintenance activities – shipping & navigation

Determination of potential effect				Impact Assessment				
Activity	**Embedded Mitigation ID***	**Potential pressure**	**Receptor**	**Magnitude**	**Sensitivity**	**Significance**	**Project Specific Mitigation**	**Residual Significance**
PLGR, cable lay	E6	Displacement of vessels	Commercial shipping and other sea users **	Medium	Low	Slight	-	Slight
Crossing installation and maintenance activities	E6	Collision of vessels	Commercial shipping and other sea users	Medium	Low	Slight	-	Slight
		Changes to water depth from installation of cable protection		Negligible	Low	Not significant	-	Not significance

* Embedded mitigation is listed by ID code in Table 2-7

** commercial fishing considered in section 3.2

3.2 Commercial fisheries

A fishing activity study was conducted to review fisheries activities in the Irish Sea along the proposed marine cable corridor. This is provided as Appendix D and summarised below.

The seas around Ireland are among the most productive and biologically sensitive areas in EU waters. The overall 2016 fishing opportunities for stocks to which the Irish fleet has access to, were 1.1 million tonnes of fish, with an estimated landed value of €1.26 billion. Ireland's total share of these Total Allowable Catches (TAC) in 2016 amounted to 216,261 tonnes with a value of € 201 million (Marine Institute 2016).

Fish communities present within coastal areas include juvenile flatfish and sandeel (*Ammodytes sp.*) over sandy sediments, with seasonal influxes of sprat (*Sprattus sprattus*), herring (*Clupea harengus*), juvenile gadoids (*Gadidae*) and mullet (*Mugilidae*). Razor clam (*Siliqua patula*) are caught between 5 – 10m water depth and rocky shore fish assemblages are caught around the headlands and islands. The fish ecology at the landing site is diverse and dominated by small species such as wrasses (*Labridae*), gobies (*Gobiidae*) and blennies (*Blenniiformes*), as well as juvenile pollock (*Pollachius*) and saithe (*Pollachius virens*) (DCCAE 2015).

The marine cable corridor is within the spawning and nursery grounds for eighteen species of marine fish (Figure 3-3 DWG P2228-FISH-007 and Figure 3-4 DWG P2228-FISH-008).

Pelagic species such as Atlantic mackerel (*Scomber scombrus*), horse mackerel (*Trachurus japonicus*) and Atlantic herring (*Clupea harengus*) are present within Irish waters largely on a seasonal basis, migrating between spawning and feeding grounds. Herring typically spawn in Irish waters from August to September (with a peak in May and June (DCCAE 2015)) over coarse sands and gravels or shell/maerl beds (Ellis *et al*, 2012; Boyle & New, 2018). Due to the soft sediments identified by the cable route survey, no Atlantic herring spawning is expected within the marine cable corridor. Atlantic mackerel spawning occurs across the Irish Sea from January through to June with no particular sediment preference.

An overview of fishing activity within the Irish Sea from July to December 2017 is shown in Figure 3-5 below. Fishing activity is concentrated along the eastern deeper water section of the marine cable corridor (i.e. towards the 12nm limit and across the Irish EEZ). According to the Ireland's Marine Atlas (2016), fishing using all type of gears is of high density offshore the landing site. Gears identified include mobile gears, seine and other passive methods.

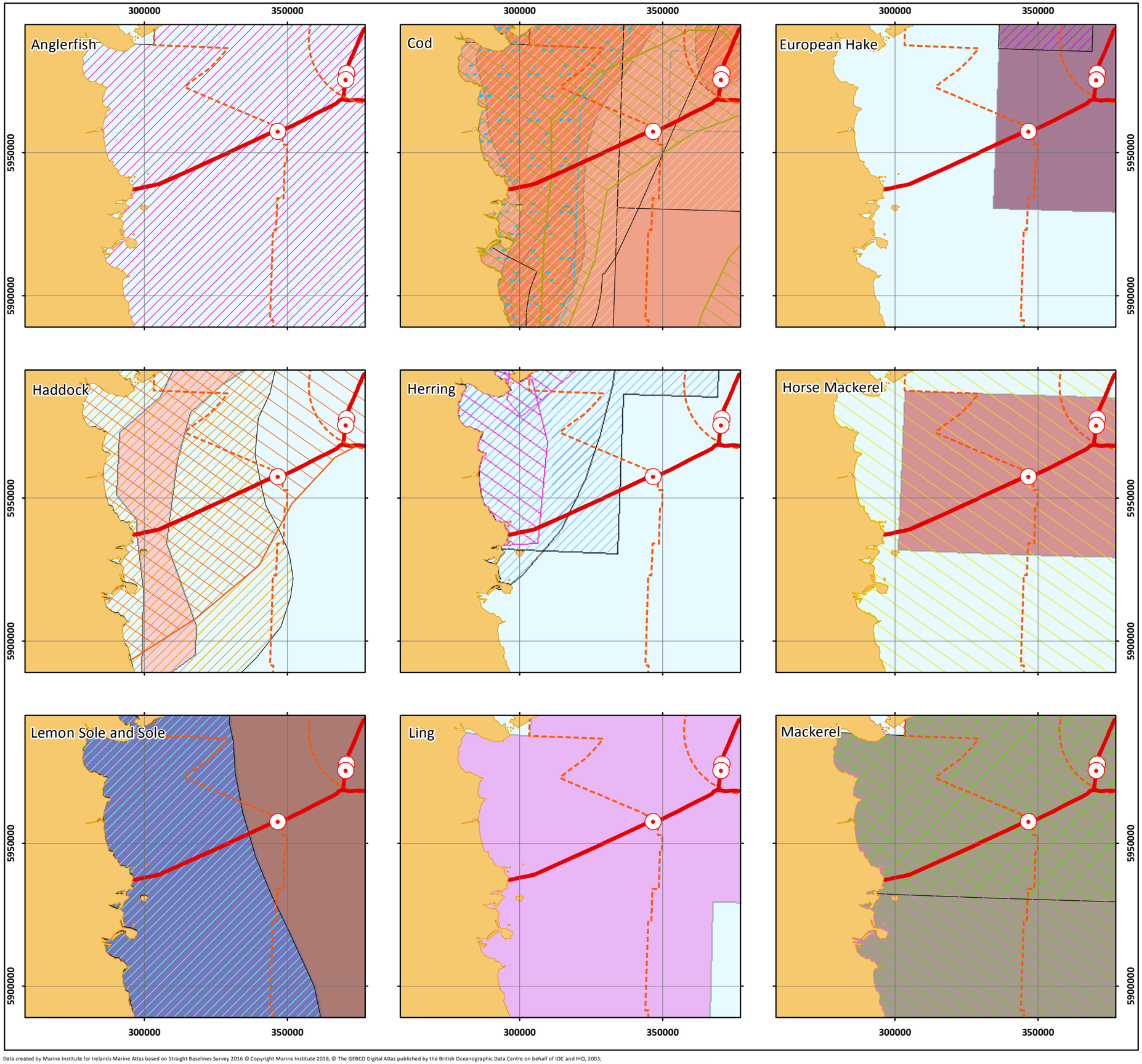
In the nearshore area, dredge and net fishing occurs along the coast, from the north of Dublin to the south of Dundalk (Ireland's Marine Atlas 2016). Pot fishing, primarily targeting prawns and shellfish, is also present along the coast and in the vicinity of the landing site. Most of the seabed near Ireland is trawled at least once per year and some regions are trawled more than 10 times per year. The greatest threat to cables from fishing activity result from dredging and trawling activities. Trawl scars are visible on the seabed within the marine cable corridor, indicating historical trawling activity (Fugro 2019).

East coast and offshore of the coast of Ireland is important commercially for lobster, crabs, whelk and scallops. According to Tully (2017), the following conclusions can be made about each fishery:

- Lobster - Baited traps, all year but mainly March to October. By-catch in set nets. Annual landings may be up to 800 tonnes (2004). Total activity estimated in 2013 was 765 vessels fishing 214,000 pots. Although the fishery for lobster is targeted there is a significant by-catch of brown and velvet crab in the fishery. Lobster becomes less abundant and brown crab are more abundant with increasing depth. Velvet crab are a common by-catch in the fishery close to shore;
- Crabs - Distribution of fishery similar to that of lobster but usually in shallow waters less than 20m depth. Landings mainly into ports on the east coast including Howth. Annual landings up to 400 tonnes. The crab fishery may be in decline due to increasing effort and in season stock depletion (MI & BIM 2018);
- Whelks - Baited traps. Brown crab is the main bait. Fishery all year. Landings historically up to 10,000 tonnes per annum. Between 2005-2015 landings 2,000-4,000 tonnes;
- Scallops - Irish offshore vessels fish in Irish Sea. Landings up to 3,000 tonnes per year; and
- Razor Clam – The commercial fishery operates year-round on the east coast of Ireland in water depths of 4m to 10m which is limited by current fishing methods. Landings for the North Irish Sea during 2018 were 500 tonnes which was a decline on the previous two years (MI & BIM 2018). The fishery is closed during June for the spawning season.
- Nephrops – The nephrops fishery is located within the Irish Sea mud belt West and South West of the Isle of Man. Nephrops is the main demersal species landed within the Irish Sea and are primarily targeted using otter trawls (ICES 2018).

The proposed crossing with the Interconnector 1 cable will require the installation of rock protection utilise up to 75m long within a footprint of up to 687.5m^2. This installation will change the habitat type

from fine soft sediments to harder substrate. However, the profile of the rock berm will be over trawlable for the protection of the cable and fishing vessels.



HAVHINGSTEN TELECOMMUNICATIONS CABLE

FISH SPAWNING AND NURSEY AREAS

Republic of Ireland Route - Sheet 1 of 2

Drawing No: P2228-FISH-007	A

Legend

- Crossing Location
- Survey Corridor
- Median Line

CEFAS Spawning Grounds

- Cod
- Lemon Sole
- Sole
- Horse Mackerel
- Ling
- European Hake
- Mackerel

FEAS Spawning Grounds

- Cod
- Haddock

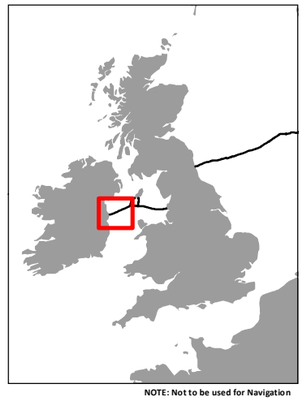
CEFAS Nursery Grounds

- Haddock
- Lemon Sole
- Anglerfish
- Cod
- European Hake
- Herring
- Mackerel

FEAS Nursery Grounds

- Cod
- Haddock
- Herring
- Horse Mackerel
- Mackerel

N W E S



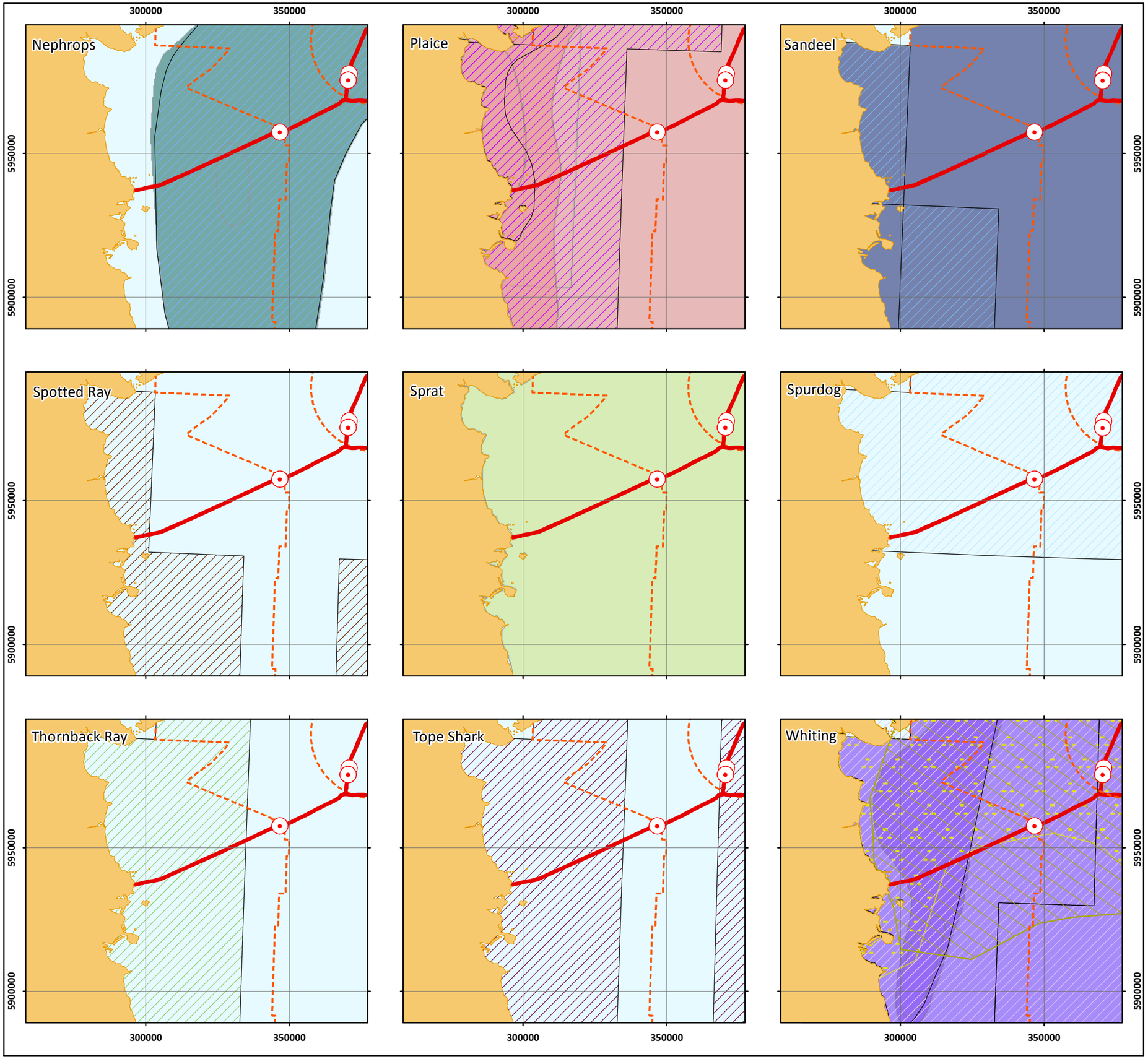
NOTE: Not to be used for Navigation

Date	Thursday, April 11, 2019 09:04:01
Projection	WGS_1984_UTM_Zone_30N
Spheroid	WGS_1984
Datum	D_WGS_1984
Data Source	CDA; GEBCO; CEFAS; FEAS
File Reference	J:\P2228\Mxd\06_FISH\ P2228-FISH-007.mxd
Created By	Emma Langley
Reviewed By	Chris Goode
Approved By	Paula Daglish

ALCATEL SUBMARINE NETWORKS

intertek

0 10 20 30 40 km



HAVHINGSTEN TELECOMMUNICATIONS CABLE

FISH SPAWNING AND NURSEY AREAS

Republic of Ireland Route - Sheet 2 of 2

Drawing No: P2228-FISH-008	A

Legend

- Crossing Location
- Survey Corridor
- Median Line

CEFAS Spawning Grounds

- Mackerel
- Nephrops
- Norway Pout
- Plaice
- Saithe
- Sandeel
- Spotted Ray
- Sprat
- Spurdog
- Thornback Ray
- Tope Shark
- Undulate ray
- Sandeel
- Whiting

FEAS Spawning Grounds

- Whiting

FEAS Nursery Grounds

- Whiting

CEFAS Nursery Grounds

- Nephrops
- Norway Pout
- Plaice
- Saithe
- Sandeel
- Sole
- Spotted Ray
- Sprat
- Spurdog
- Thornback Ray
- Tope Shark
- Undulate ray
- Whiting
- Nephrops

NOTE: Not to be used for Navigation

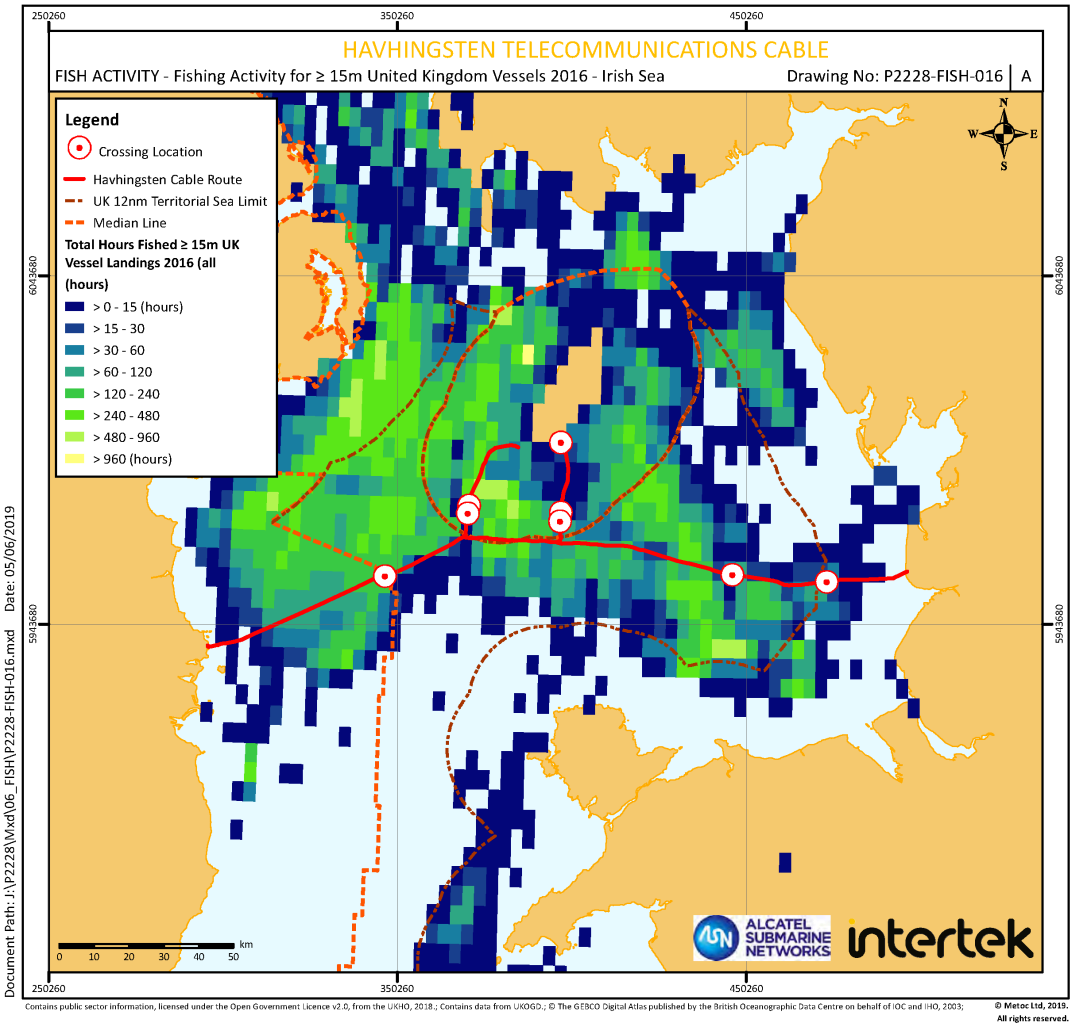
Date	Thursday, April 11, 2019 09:15:47
Projection	WGS_1984_UTM_Zone_30N
Spheroid	WGS_1984
Datum	D_WGS_1984
Data Source	CDA; GEBCO; CEFAS; FEAS
File Reference	J:\P2228\Mxd\06_FISH\ P2228-FISH-008.mxd
Created By	Emma Langley
Reviewed By	Chris Goode
Approved By	Paula Daglish

ALCATEL SUBMARINE NETWORKS

intertek

0 10 20 30 40 km

Figure 3-5 Fishing density (July to December 2017)



Source: ASN 2018

3.2.2 Effects and proposed mitigation

During installation vessels will be progressing at a speed of between 0.5 – 1.5km/hr. Fishing vessels will be requested to remain at least 500m (radial distance) from the cable lay vessels for safety reasons. Fishermen deploying static gear will be asked to move pots out of the marine cable corridor until the cable installation has passed through. Fishermen with mobile gear will be briefly displaced from a very small portion of the available fishing ground. All ASN vessels will adhere to the Collision Regulations and Notice to Mariners will be issued.

Installation of rock protection at the cable crossing location with Interconnector 1 pipeline is within an area that experienced total fishing hours of between 120 – 240hrs for vessels >15m during 2016. The location is moderately important as a commercial fishing ground. However, the works associated with the crossing installation are temporary and will take approximately three days to complete. The implementation of a temporary exclusion zone around the crossing installation or in future any maintenance activities will cause temporary displacement to commercial fishing vessels operating in the area.

The introduction of rock berm as cable protection at this location will introduce a change to the seabed habitat. Rock protection berms are designed to protect the cable and have a smooth over-trawlable profile so that they do not present an obstruction to fishing activity while enabling the cable to be buried beneath the area penetrated by heavy fishing gear (up to 0.4m).

The potential pressure of displacement of vessels offshore and substrate change at the proposed cable crossing within the EEZ are not significant and will be controlled by compliance with embedded mitigation as summarised in Table 3-3.

Installation at the Loughshinny landing site will temporarily restrict movements to small fishing vessels potentially accessing the harbour area for up to 3 days.

The effects of displacement to fishing vessel movements at Loughshinny breakwater during landing installation are moderate given the potential restricted movement for normal activities for these vessels. The effects are manageable based on good communication via the ASN appointed FLO for the project, who will discuss the project activities with the local fishing industry prior to and throughout cable installation. It is anticipated that a satisfactory outcome will be achieved, therefore the impact to vessels with moorings at Loughshinny breakwater are considered to be tolerable.

Table 3-3 Impact assessment summary for installation and maintenance activities – commercial fishing

Determination of potential effect				Impact Assessment				
Activity	**Embedded Mitigation ID***	**Potential pressure**	**Receptor**	**Magnitude**	**Sensitivity**	**Significance**	**Project Specific Mitigation**	**Residual Significance**
Route clearance, PLGR, cable lay	E1, E6	Displacement of vessels	Commercial shipping and other sea users **	Negligible	Low	Not significant	-	Not significant
Crossing installation, Maintenance activities	E1, E6	Substrate change due to the presence of installed cable protection	Fishing vessels	Low	Low	Slight	M1	Slight
PLGR, cable lay at cable landing site	E6	Displacement of vessels – Loghshinny breakwater	Localised fishing vessels	Medium	Medium	Moderate	-	Moderate

* Embedded mitigation is listed by ID code in Table 2-7; project specific mitigation is listed by ID code in Table 6-1.

4. MARINE ARCHAEOLOGY

To determine marine archaeological sensitivities along the cable corridor a desk-based assessment was undertaken to establish the archaeological baseline. This has been updated with the results of a foreshore survey undertaken at Loughshinny, and a review of the geophysical data (out to 12nm limit) collected by the cable route survey. The Marine Archaeology Technical Report, provided as Appendix E, presents the resultant study which collates the findings of these activities. The section below summarises the results.

The desk-based assessment comprises an introduction to the project area and the different assessment techniques used to conduct the foreshore archaeological survey at the landing site.

The assessment concluded that there are no known potential cultural heritage assets or wrecks directly affected by the landing site in Loughshinny (Appendix E).

Complimentary in-phase (magnetic susceptibility) and quadrature (conductivity) geophysical datasets collected at Loughshinny recorded a clear contrast between high conductivity/ high magnetic susceptibility in the harbour area adjacent to the wharf in the east and lower values generally in the west of the survey area.

This variation is assumed to have resulted from the accumulation of marine deposits behind the harbour wall where the silts are sheltered from the Irish sea. Clearly interpretable metallic responses were identified in the in-phase dataset as discrete anomalies with extreme values, mostly occurring towards the high-water mark at the head of the beach and within the harbour area in the east. This observation was reflected in the results from the metal-detection survey.

The concentration of metal detection locations higher up the beach, to the north-west probably represents casual losses indicative of the area of the beach that is most likely favoured by visitors and users of the beach and is unlikely to be an indication of archaeological interest.

The marine cable corridor route within Ireland has not required any changes following the evaluation of the data by marine archaeologists. The Marine Archaeology Technical Report has not recommended that Archaeological Exclusion Zones are implemented within the marine cable corridor.

4.1.1 Effects and proposed mitigation

There cable installation and maintenance activities will have No Significant effect on marine archaeology, as summarised in Table 4-1. No wrecks or archaeological assets have been identified within 140m of the installation route (Fugro 2019a). The closest wreck is 140m to the northwest of the marine cable route and will not be disturbed by the installation tool. Review of the geophysical survey data has not indicated any potential for cultural heritage assets within the installation corridor.

Table 4-1 Impact assessment summary for installation and maintenance activities – marine archaeology

Determination of potential effect				Impact Assessment				
Activity	**Embedded Mitigation ID***	**Potential pressure**	**Receptor**	**Magnitude**	**Sensitivity**	**Significance**	**Project Specific Mitigation**	**Residual Significance**
Route clearance, PLGR, cable lay, crossing installation, maintenance activities	-	Disturbance or removal of archaeology	Archaeological asset	Negligible	Low	Not significant	-	Not significant

5. SUMMARY OF APPROPRIATE ASSESSMENT SCREENING ASSESSMENT

The marine cable corridor crosses two Natura 2000 sites; Rockabill to Dalkey Island Special Area of Conservation (SAC), and Rockabill Special Protection Area (SPA). A summary of the sites are provided below. Sites are identified in Figure 5-1 (DWG P2228-PROT- 002). The Stage 1 Screening for Appropriate Assessment is presented in Appendix F.

Rockabill to Dalkey Island SAC

This SAC represents a key habitat for the EC Habitats Directive Annex II listed species - harbour porpoise (*Phocoena phocoena)*, within the Irish Sea. Harbour porpoise occur year-round within the site and comparatively high group sizes have been recorded and regularly sighted. Porpoises with young (i.e. calves) are observed during the summer months. The site also provides reef habitat areas fringing the offshore islands along the Dublin coast occurring at Dalkey Island, Maiden Rock and Muglins in the southern portion, off Howth Head, Ireland's Eye and Lambay Island in the central portion, and Rockabill in North Dublin. The reefs which cover approximately 1.82km^2 are subject to strong tides and currents which are believed to provide important habitat for harbour porpoise (NPWS 2009).

Rockabill SPA

The marine cable corridor crosses approximately 0.69km^2 of this site. The actual installation route is not within the SPA. The site is designated to maintain nationally important numbers of overwintering Purple Sandpiper (48 individuals) and breeding populations of Roseate tern (1207 nests recorded in 2012), common tern (2,031 nests recorded in 2012) and Arctic ten (165 nests recorded in 2012) (NPWS 2015). The Rockabill SPA is co-located with the Rockabill to Dalkey Island SAC.

Table 5-1 Natura 2000 sites crossed by the marine cable corridor

Site Name & Code	Reason for Designation
Rockabill to Dalkey Island SAC [IE003000]	**Annex I habitat:** Reefs ▪ intertidal reef complex; and subtidal reef complex
	Annex II species: ▪ Harbour porpoise (*Phocoena phocoena*)
Rockabill SPA [IE004014]	**Annex I species (breeding):** ▪ Roseate tern (*Sterna dougallii*) ▪ Common tern (*Sterna hirundo*) ▪ Arctic tern (*Sterna paradisaea*)
	All-Ireland Importance overwinter: Purple Sandpiper (*Calidris maritima*)

As the proposed installation and maintenance activities are not directly connected with or necessary to the management of these Natura 2000 sites it is regarded as necessary that the proposed installation and maintenance activities should be subject to the Appropriate Assessment (AA) process.

A Stage 1 Screening for Appropriate Assessment has been undertaken for the Havhingsten cable and is provided as Appendix F.

The screening for AA was completed in compliance with the relevant European Commission and National guidelines. The potential effects during the installation and maintenance activities have been

considered in the context of the Natura 2000 sites potentially affected, their Qualifying Interests and conservation objectives.

The screening assessed 17 Natura 2000 sites that were either within the direct zone of influence of the proposed activities or contain mobile Annex II species which could potentially travel into the area. Figure 5-1 shows the locations of protected sites near to the marine cable corridor.

A review of the proposed installation and maintenance activities identified four pressures that could be exerted on Qualifying Interest during installation and maintenance. These were:

- Penetration and/or disturbance of the substrate below the surface of the seabed, including abrasion;
- Siltation rate changes, including smothering (depth of vertical sediment overburden);
- Visual Disturbance; and
- Underwater noise changes.

Sites were assessed to determine if there was a potential pressure-receptor pathway between the proposed activities and the Qualifying Interest(s).

To inform the Stage 1 Screening a number of studies and data have been collected to identify the baseline conditions and predict the significance of effects to the species and habitats within the Natura 2000 sites. The additional studies include:

- Appendix G - Underwater noise assessment – identified the potential effects of installation activities on marine mammals and fish;
- Appendix H - Sediment Suspension and Dispersion – supporting information for benthic habitat assessment including calculations;
- Appendix I - Survey Reports - Geophysical and geotechnical survey reports; environmental survey reports; intertidal survey reports

Initial screening concluded, that it is considered possible that there exists a pressure-receptor pathway between the proposed installation and maintenance activities and the Qualifying Interests of 12 of the 17 sites reviewed (Appendix H, Table 5-3). Further analysis of the likely significant effects taking into consideration the sites conservation objectives concluded that the proposed installation and maintenance activities will not have a likely significant effect on any of the Natura 2000 sites screened. Table 5-2 summarises the conclusions of the assessment of likely significant effects.

Table 5-2 Summary of the assessment of likely significant effects

Site Name & Code	Applicable Qualifying Interest	Potential Pressure on site from proposed activities	Conclusion
Rockabill to Dalkey Island SAC [IE003000]	Harbour porpoise	Underwater noise changes	No potential for significant effects / AA is not required
Rockabill SPA [IE004014]	Breeding tern species	Visual disturbance to foraging seabirds	No potential for significant effects / AA is not required
Skerries Islands SPA [IE004122]	Breeding seabird species	Visual disturbance to foraging seabirds	No potential for significant effects / AA is not required
Baldoyle Bay SPA [IE 004016]	Overwintering seabird species	Visual disturbance	No potential for significant effects / AA is not required
Malahide Estuary SPA [IE004025]	Overwintering seabird species	Visual disturbance	No potential for significant effects / AA is not required

Lambay Island SAC [IE000204]	Pinniped species	Underwater noise changes	No potential for significant effects / AA is not required
North Anglesey Marine SAC [UK0030398]	Harbour porpoise	Underwater noise changes	No potential for significant effects / AA is not required
West Wales Marine SAC [UK0030397]	Harbour porpoise	Underwater noise changes	No potential for significant effects / AA is not required
Lleyn Peninsula and the Sarnau SAC [UK0013117]	Bottlenose dolphin	Underwater noise changes	No potential for significant effects / AA is not required
North Channel SAC [UK0030399]	Harbour porpoise	Underwater noise changes	No potential for significant effects / AA is not required
Cardigan Bay SAC [UK0012712]	Bottlenose dolphin	Underwater noise changes	No potential for significant effects / AA is not required
Bristol Channel SAC [UK0030396]	Harbour porpoise	Underwater noise changes	No potential for significant effects / AA is not required

Overall there is no evidence to indicate that the works in combination with any plan or project will produce a significant adverse effect on the habitats of the qualifying species and on species of special conservation interest, ensuring the integrity of the sites are maintained. No significant cumulative effect is envisaged.

The proposed project does not have the potential to give rise to significant adverse effects on the overall integrity of the Natura 2000 sites considered. Therefore, AA process has stopped at Stage 1 screening and there is no further requirement for Stage 2 AA.

5.1.2 Impact Assessment – protected habitats and species

No reef areas were identified within the marine cable corridor within the Rockabill to Dalkey Island SAC (Fugro 2019a & c). Sediment disturbance and deposition caused by installation e.g. ploughing and jetting, will be within the levels of natural variability experienced during storm events and no effects to the reef areas is expected. Low level noise disturbance to cetacean species within 130m (conservative) of the installation vessels may occur but this will be brief (less than 24 hours), transient and set against the background of moderate shipping levels in the area. Birds from the Rockabill SPA and Skerries islands SPA may be foraging or loafing in the marine cable corridor, however any disturbance will be set against the background shipping activities in the area and will not act as a barrier to feeding and foraging birds from protected sites or associated coastal sites.

The impact assessment has concluded that effects will be Slight or Not Significant. The Stage 1 Screening concluded that there is no potential for significant effects and an AA is not required.

Table 5-3 Impact assessment summary for installation and maintenance activities – protected sites

Determination of potential effect				Impact Assessment				
Activity	**Embedded Mitigation ID***	**Potential pressure**	**Receptor**	**Magnitude**	**Sensitivity**	**Significance**	**Project Specific Mitigation**	**Residual Significance**
Plough / Cable Crossing Installation / Jetting and maintenance activities	E6 E10	Underwater noise changes	Marine Mammals	Low	Low	Slight	-	Slight
		Visual disturbance		Negligible	Low	Not significant		Not significant
	E6	Visual disturbance	Birds	Low	Low	Slight		Slight
		Penetration and/or disturbance including abrasion	Benthic Communities	Negligible	Low	Not significant	-	Not significant

* Embedded mitigation is listed by ID code in Table 2-7.

HAVHINGSTEN TELECOMMUNICATIONS CABLE

PROTECTED SITES

Republic of Ireland Route

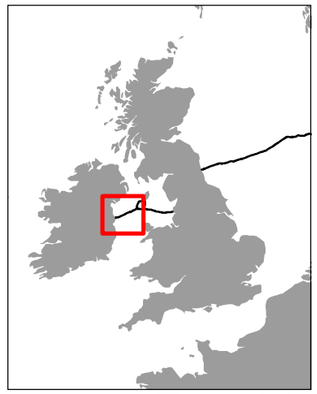
Drawing No: P2228-PROT-002	A

Legend

- Crossing Location
- Proposed Development
- Irish Offshore
- Median Line

Environmental Designations

- SAC
- SPA



NOTE: Not to be used for Navigation

Date	Tuesday, August 13, 2019 15:22:19
Projection	WGS_1984_UTM_Zone_30N
Spheroid	WGS_1984
Datum	D_WGS_1984
Data Source	NPWS; DAERA; CDA; MarineFind; ASN
File Reference	J:\P2228\Mxd\07_PROT\ P2228-PROT-002.mxd
Created By	Chris Goode
Reviewed By	Emma Langley
Approved By	Paula Daglish

ALCATEL SUBMARINE NETWORKS

intertek

0 5 10 15 20 km

6. PROJECT SPECIFIC MITIGATION

Where possible, measures to avoid or mitigate environmental effects are included in the project design (termed embedded mitigation). The embedded mitigation measures are set out in Table 2-7 of the Project Description Chapter (section 2.11).

Project specific mitigation measures are additional to embedded mitigation and are direct measures applied to the project to minimise impacts. Often these mitigation measures are identified and defined through the consultation and environmental assessment process (Table 6-1).

Table 6-1 Project specific measures

ID	Receptor	Project Specific mitigation measure
M1	Commercial fisheries, benthic and intertidal habitats,	Cable protection measures (Uraduct type product, rock armouring or rock and mattresses) will only be deployed at the crossing with Interconnector 1 where adequate burial cannot be achieved.

7. CONCLUSIONS

The sensitive receptors, the potential pressures the project could exert, the likely effects of these pressures, and the significance levels, are summarised in Table 7-1. During assessment the worst case has been considered. Therefore, effects are likely to be as summarised below in Table 7-1, or less.

These effects are generally considered as being insignificant and adequately controlled by project design, best practice and legal controls. Displacement of vessels from the proposed landing site during installation has a moderate effect. Effects in this category are considered tolerable given the onward activities of the FLO consultation throughout the project. This will reduce effects to as low as reasonably practicable (ALARP) and that no further measures are feasible. During potential maintenance activities the effects of the activities will be similar to installation, on a smaller scale (dependant on the location of the maintenance activities.

Table 7-1 Conclusion of the environmental assessment

Receptor	Potential Pressure	Potential Effect	Significance Level
Shipping and navigation	Displacement of Vessels	Disruption to shipping routes surrounding installation vessels	**Slight**
	Increased vessel traffic	Collision of vessels	**Slight**
	Reduction to water depth	Installation of cable protection	**Not Significant**
Commercial fisheries	Displacement of vessels	Temporary reduction in fishing area	**Not significant**
	Displacement of vessels	Disruption to vessel movements at cable landing site	**Moderate**
	Substrate change due to the presence of installed cable protection	Permanent loss of fishing habitat	**Slight**
Marine Archaeology	Penetration and/or disturbance including abrasion	Disturbance or removal of archaeology	**Not significant**
Protected Sites	Underwater noise changes	Disturbance to marine mammals	**Slight**
	Visual disturbance – marine mammals	Disturbance to marine mammals	**Slight**
	Visual disturbance - Birds	Disturbance to foraging seabirds	**Slight**
	Penetration and/or disturbance including abrasion		**Not significant**

REFERENCES

1 ASN (2018). Havhingsten Submarine Fibre Optic Cable System Cable Route Study. Master Document. Doc. Ref. INST.13684. Issue 1

2 Boyle, G. and New, P. (2018) ORJIP Impacts from Piling on Fish at Offshore Wind Farm Sites: Collating Population Information, Gap Analysis and Appraisal of Mitigation Options. Final Report – June 2018. The Carbon Trust, UK. 247pp

3 Cotswold Archaeology (2019), Archaeological Reports to support Havhingsten Telecommunication Cable Application.

4 Drogheda Port (2019). About us [online] Available at: http://www.droghedaport.ie/ (Accessed March 2019)

5 Dublin Port (2019). About Dublin Port [online] Available at: https://www.dublinport.ie/about-dublin-port/about-us-2/ (Accessed March 2019)

6 EMODnet (2019). Human Activities [online] Available at: http://www.emodnet-humanactivities.eu/view-data.php (Accessed March 2019)

7 Fingal County Council (2018), signage in carpark at landing site.

8 Fugro (2019a), Havhingsten Subsea Cable Network Volume – Segment 1-1 BU Port Erin to BMH Loughshinny - Book 01 Survey Report. Final Issue

9 Fugro (2019b), Intertidal Habitat Report - Havingsten Cable Route Survey - Loughshinny, Ireland. Fugro Document No.: 181275-R-016(02) 28 June 2019

10 Fugro (2019c), Benthic Characterisation Report - Havhingsten Cable Route – Ireland. Fugro Document No.: 181275-R-015(01) 23 May 2019

11 IEMA (2016). Environmental Impact Assessment Guide to: Delivering Quality Development.

12 Marine Institute (2016). Ireland's Marine Atlas [online] Available at: https://atlas.marine.ie/#?c=53.8063:-6.1880:9 (Accessed March 2019)

13 MarineSpace (2018), Havhingsten Fibre Optic Submarine Cable: Fisheries Activity Study 2018.

14 Marine Institute and Bord Iascigh Mhara (BIM) (2018), Shellfish Stocks and Fisheries Review 2018 – An assessment of selected stocks. Available at: https://oar.marine.ie/bitstream/handle/10793/1392/Shellfish%20Stocks%20and%20Fisheries%20Review%202018.pdf?sequence=1&isAllowed=y (Accessed June 2019)

15 MMO (2014). Mapping UK Shipping Density and Routes from AIS. MMO Project No: 1066.

16 NPWS (2009), Natura 2000 – standard Data Form. Available at: https://www.npws.ie/sites/default/files/protected-sites/natura2000/NF003000.pdf

17 NPWS (2015), Site Synopsis – Rockabill SPA. Available at: https://www.npws.ie/sites/default/files/protected-sites/synopsis/SY004014.pdf

18 Marine Institute (2019) Irelands Marine Atlas. Available at: https://www.marine.ie/Home/site-area/data-services/interactive-maps/irelands-marine-atlas. (Accessed May 2019)

19 Tully, O. (2017). Atlas of commercial fisheries for shellfish around Ireland, Marine Institute, March 2017. ISBN 9781902895611 58 pp.