Appendix 15-3: Marine Geophysical Surveys 2022 - Archaeological Interpretation Report

ORIEL WINDFARM
OFFSHORE RENEWABLE ENERGY

rps
A TETRA TECH COMPANY

JERA NEX BP

ESB Energy for generations

ORIEL WIND FARM PROJECT

Environmental Impact Assessment Report - Addendum
Appendix 15-3: Marine Geophysical Surveys 2022 - Archaeological Interpretation

MDR1520C
EIAR - Appendix 15-3
A1 C01
December 2025

rpsgroup.com

Oriel Offshore Windfarm

Marine Geophysical Surveys 2022

Archaeological Interpretation

22R0220

Oriel Offshore Windfarm

Marine Geophysical Surveys 2022

Archaeological Interpretation

22R0220

Issued	18/12/2025
Client	**Oriel Windfarm Ltd**
Project Director	**Niall Brady**
Report Author	**Niall Brady**
Beverley Studios, Church Terrace, Bray, Co. Wicklow	www.adco-ie.com

Table of Contents

Abbreviations

OOW -	Oriel Offshore Windfarm
ADCO -	Archaeological Diving Company Ltd
AEZ -	Archaeological Exclusion Zone
AIA -	Archaeological Impact Assessment
AMP -	Archaeology Management Plan
DD -	Decimal Degrees
DHLGH -	Department of Housing, Local Government and Heritage
E -	Easting
ECC -	Export Cable Corridor
ECR -	Export Cable Route
EIAR -	Environmental Impact Assessment Report
GI -	Geotechnical Investigations
ITM -	Irish Transverse Mercator
LAT -	Lowest Astronomical Tide
NMI -	National Museum of Ireland
NMS -	National Monuments Service
MHW -	Mean High Water
N -	Northing
NGR -	National Grid Reference
NIAH -	National Inventory of Architectural Heritage
OD -	Ordnance Datum
SI -	Site Investigations
SMR -	Sites and Monuments Record
TBT -	Toolbox Talk
UAIA -	Underwater Archaeological Impact Assessment
UTM -	Universal Transverse Mercator

List of Figures

List of Plates

Executive Summary

Subject: Oriel Offshore Windfarm – Marine Geophysical Surveys 2022
Location: North Irish Sea
UTM 29N: 692684E 5978718N
Status: Archaeological seascape

Introduction

Archaeological interpretation has been carried out on marine geophysical survey data acquired for Oriel Offshore Windfarm in 2022, completed under archaeological licence 22R0220.

The surveys were carried out by GTec in the concession area, and by XOcean using Uncrewed Surface Vessels (USV) X20 and X22 across both the concession area and the export cable corridor.

The survey data build on those acquired in 2006 and 2019.

Observations

Marine geophysical survey in 2006 and 2019 was completed along a series of defined survey lines. The 2022 survey is far more comprehensive and fully covers the concession area and the export cable corridor area.

The survey data reaffirms the nature of the surface deposits that extend offshore from Dunany Head, Co. Louth, recording expanses of boulder fields associated with morainic deposits, and expanses of soft mud/sands.

There was no indication of submerged landscape.

The survey supports the presence of wreckage at W11435.

The data provides fresh coverage of the known shipwreck site, W00248, SS *Topaz*.

The data did not record a feature at the charted location of W00276.

The 2006 survey recorded a series of features considered to be boulders. These features were subsequently considered as potential wreck sites. The 2022 survey did not record any features other than boulders at these locations.

The survey did not record a target feature at the location SS0087, recorded in 2019 as a piece of debris.

The 2022 survey recorded a series of boulder clusters. The absence of more definitive features suggests these are not ballast mounds associated with wreckage.

A series of small-scale features were identified as debris across the wider survey area. In one instance, two targets (E022 and E023) located close together and occupying a small depression are of interest and suggest the potential for being associated with a previously unrecorded feature indicative of wreckage.

The 2026 GI campaign will conduct boreholes at each proposed turbine location and OSS location. The proposed GI locations will avoid all AEZs, charted sites and contact positions.

Recommendations

Reference	Name	Easting	Northing	AEZ & size / action
W11435, UKHO5787	unidentified	694658	5978484	AEZ 100m radius from centrepoint
W00248, GSI295, UKHO5867	SS *Topaz*	694658	5978484	AEZ 150m radius from centrepoint
W00276	unidentified	685780	5972449	AEZ not required
W11145	unidentified	693621	5980341	Delist from Historic Shipwreck Inventory (HSI)
W11146	unidentified	690308	5978709	Delist from HSI
W11148	unidentified	692424	5976582	Delist from HSI

Reference	Name	Easting	Northing	AEZ & size / action
W11149	unidentified	692573	5981435	Delist from HSI
W11150	unidentified	692007	5981426	Delist from HSI
W11151	unidentified	694497	5979620	Delist from HSI
W11152	unidentified	691827	5980475	Delist from HSI
W11153	unidentified	692404	5976569	Delist from HSI
W11155	unidentified	693671	5980517	Delist from HSI
W11157	unidentified	690272	5978758	Delist from HSI
2019 survey, ss087	debris, site of	693154	5974937	AEZ not required
2022 survey, E_022, E_023	Debris, snag point	686496	5974400	AEZ 50m radius from centrepoint

Table summarising recommended actions in relation to recorded features.

An Archaeological Exclusion Zone is recommended around the location of W11435.

An Archaeological Exclusion Zone is recommended around the location of W00248.

An Archaeological Exclusion Zone is recommended around the location of E_022, E023.

The current report will serve as a baseline on which the Oriel Windfarm project may develop its proposed programme of marine geotechnical investigations (GI) in 2026.

GI locations should avoid all known archaeological features by respecting the presence of AEZs.

A protocol will be required to allow for geoarchaeological assessment of borehole cores.

The observations and recommendations made in this report will be absorbed into the Archaeological Management Plan that establishes archaeological protocols to be followed in the course of the project's development. The Archaeology Management Plan outlined in the 2024 EIAR will be amended to absorb the observations of the Department of Housing, Local Government and Heritage set out in their letter of 29/07/2024, reference Plan03577/2024.

The recommendations contained in this report are subject to the approval of the National Monuments Service at the Department of Housing, Local Government and Heritage.

1.0 Introduction

The Archaeological Diving Company Ltd (ADCO) was appointed by Oriel Windfarm Ltd to carry out an archaeological interpretation report on marine geophysical survey data acquired for Oriel Offshore Windfarm in 2022, and processed under archaeological licence 22R0220.

The development area is located at the mouth of Dundalk Bay, some 22km southeast of Dundalk and 10km northeast of Dunany Point, Co. Louth (Figure 1).

2.0 Background

Archaeological assessment for Oriel Offshore Windfarm has taken place since 2007. Marine geophysical surveys carried out in 2006 and 2019 have been the subject of archaeological interpretation, and a further report of 2021 includes an assessment of geotechnical investigations completed in 2019.[1] Terrestrial archaeological study was carried out as well.[2] The results of land and marine work achieved to 2022 are incorporated into a project Environmental Impact Assessment Report (EIAR) of 2024, chapters 6 and 15 respectively.[3] Subsequent to the EIAR, an intertidal archaeology survey was completed.[4]

The marine geophysical survey of 2022 represents a more comprehensive survey of the seabed compared to those of 2006 and 2019, which were based on a select series of survey lines. In 2022, the full extent of both the windfarm concession area (that zone where it is proposed to construct wind turbines) and the export cable corridor were surveyed. The current report presents an up-to-date interpretation of the accumulated data sets since 2007, and informs the proposed marine geotechnical investigations planned for 2026.

[1] On the marine, see Niall Brady, 'Archaeological assessment for Oriel Offshore Windfarm development North-western Irish Sea. 06R118', Archaeological Diving Company 2007; Niall Brady, 'Archaeological Impact Assessment Oriel Offshore Windfarm, Dundalk Bay and Dunany, Co. Louth', Archaeological Diving Company 2019; Niall Brady, Underwater Archaeological Impact Assessment, Oriel Wind Farm, off Dunany, Co. Louth, Wind Farm area and cable routes', Archaeological Diving Company, 2021.

[2] The terrestrial archaeology was carried out by Courtney Deery Heritage Consultancy.

[3] The Oriel Wind Farm Project EIAR was compiled by RPS, 2024: https://orielwindfarm-marineplanning.ie/environmental-documents/eiar/

[4] Niall Brady, 'Intertidal Archaeology Survey, Oriel Wind Farm project, Dunany, Co. Louth, 24D0267, 24R0575', Archaeological Diving Company, 2025.

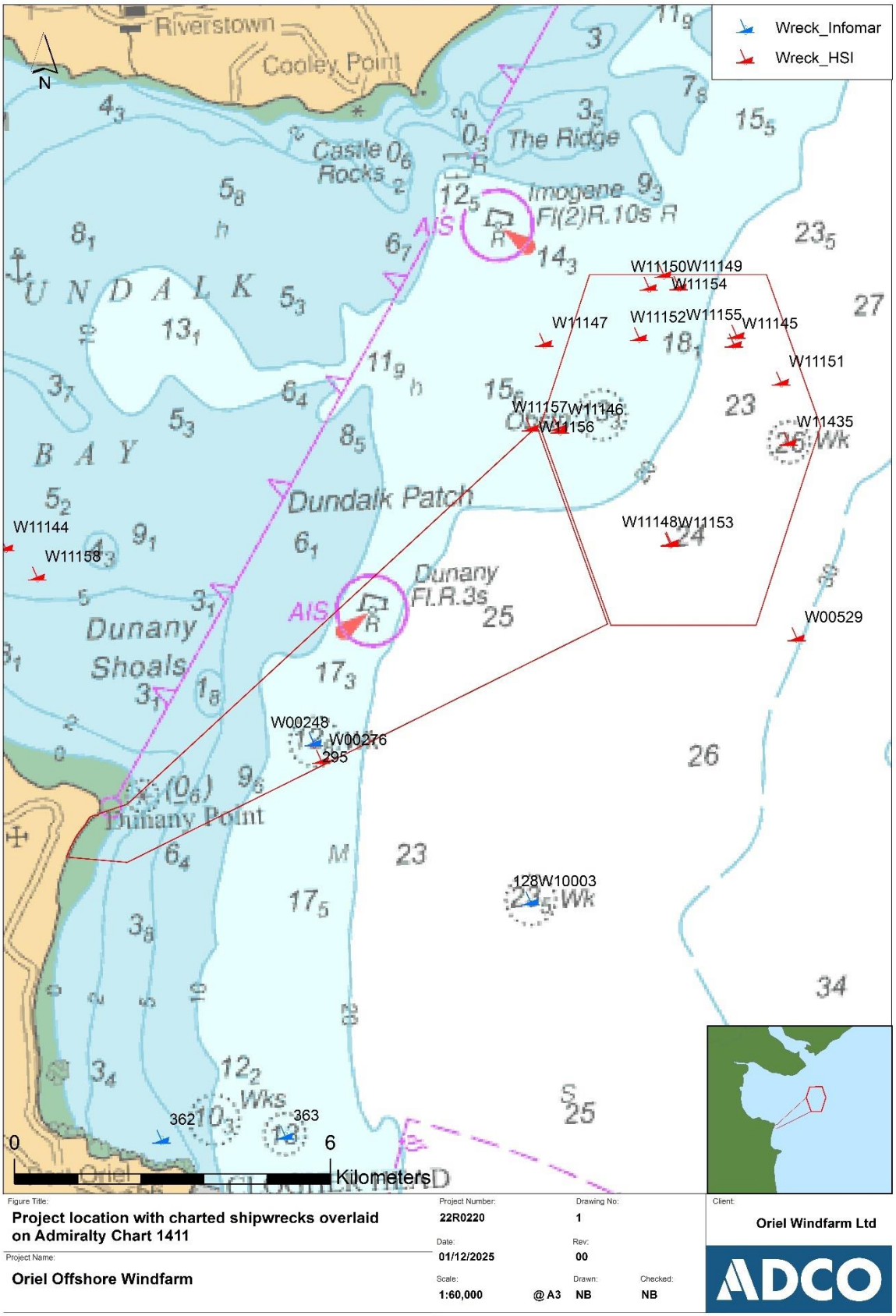


Figure 1: Project location.

3.0 Scope

The survey data was acquired in two parts; by G-Tec and XOcean respectively. G-Tec's scope was particular to the concession area, where the following was required:

- Ultra-High Resolution Survey (UHRS) seismic.
- Spatial extent to focus on 80m x 80m survey boxes around proposed turbine and Offshore Service Station (OSS) locations.

XOcean's brief was to deploy a full suite of marine geophysical survey devices across both the concession area and the export cable corridor. The scope was for:

- Multibeam Echosounder;
- Magnetometer;
- Sub-bottom Profile;
- Side scan sonar; and
- Line-spacing to be at 40m and 80m, depending on water depth.

The desired outcomes of the survey were:

- Identification and mapping of potential geohazards.
- Identification and mapping of potential archaeological sites and features.
- Facilitate development of a ground model in support of the offshore windfarm design.
- Provide data and information to support Environmental Impact Assessment.

4.0 Data Review

The following data sets were made available for archaeological review.

4.1 G-Tec

- Location packages, .sgd files
- Operations report[5]

4.2 XOcean

- Multibeam outputs, geotiffs
- Backscatter, geotiffs
- Side scan sonar, mosaic geotiffs; 3,217 xtf files, made up of 1,105 files covering the concession area, and 2,112 files covering the export cable corridor.
- Magnetometer, magnetic intensity geotiffs
- Sub Bottom Profile SGY files; 609 files, made up of 137 files covering the concession area, and 472 files covering the export cable corridor

[5] G-Tec, 'Geophysical investigation – Oriel Offshore Wind Farm, interpretative report' 6006 Version 3.0, 2023. Reference document: ORIGT-GTS-REP-2015-01_Interpretation_Report_v3.

- Operations reports[6]
- Picked contacts, Shape files
- Vessel and device trackplots, Shape files

5.0 Observations

5.1 G-Tec Data Quality

The G-Tec survey was very robust and the imaging employed in the operations report is comprehensive and informative. The detailed consideration of survey data acquired is robust and detailed. The report synthesises a wider understanding of the substrate across the concession area, and provides a succinct basis on which to appreciate the potential for submerged landscape remains.

5.2 XOcean Data Quality

The XOcean survey was completed using Uncrewed Surface Vessels (USV) X20 and X22 across both the concession area and the export cable corridor. The survey was very comprehensive, providing full coverage across both the concession area and the export cable corridor. The seabed was imaged in multiple parameters, and it is possible to cross-reference locations recorded by one instrument with those of another.

The integration of the primary survey instruments within the USVs resulted in the simultaneous acquisition of multibeam, side scan sonar, magnetometer and sub-bottom profile data on identical survey lines.

Line-spacing varied to ensure data capture. The survey lines within the concession area were run north-northeast-south-southwest to align with the long axis of the area, and were set 65m apart on average. The side scan sonar range was set at 60m, which ensured overlap of side scan sonar data between survey lines of the central zone between survey lines. Within the export cable corridor, survey lines were acquired on a different axis, and were for the most part run parallel with the corridor's northeast-southwest alignment. Line spacing varied according to depth, with lines spaced more closely together in shallow water. This resulted in nearshore line-spacing being 25-30m apart with side scan sonar range set at 40m, ensuring ample overlap between survey lines. Close inshore, for a distance of 1.75km, the survey lines changed direction to north-northeast-south-southwest to follow the coastline. For the most inshore component, which measured some 350m wide from land to sea, the survey lines were set 10m apart with side scan sonar range at 9m. This also ensured adequate coverage of the seabed.

The processing of the data sets has delivered a very crisp georeferenced multibeam chart of the seabed that shows clearly the natural variations in the seabed surface as well as indications of human intervention. The presence of trawl scars is particularly evident across the soft sediment surfaces that

[6] Jordan Corrick, '00442-PAR-IRE-WIND Parkwind –Concession Area. Project execution and results report', XOcean report, 2023; Jordan Corrick, '00442-PAR-IRE-WIND Parkwind –ECR Survey. Project execution and results report', XOcean report, 2023.

occupy the southeastern quadrant of the concession area and the adjoining northeast quadrant of the export cable corridor (Figure 2).

This resulted in clear overlap with the intertidal archaeology survey, and two examples of such overlap are presented in Plate 1. For the Oriel Windfarm project, it is concluded that there was no data gap in the survey coverage.

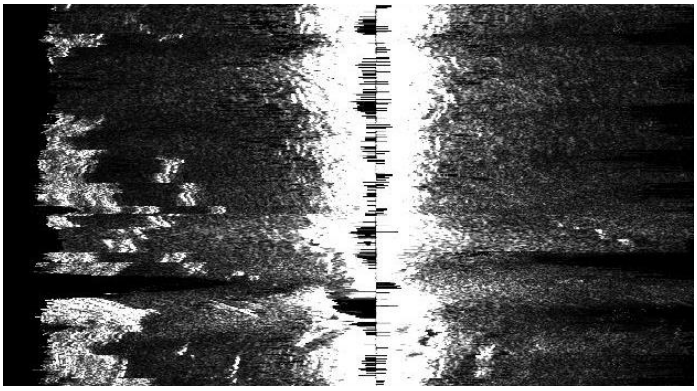


Plate 1: Side scan sonar trace at 681425E 597106N, proceeding from south to north on left, with photograph on right showing the same section of foreshore in January 2025 during the intertidal archaeology survey.

The eastern edge boulder field extruded in the photograph (looking west) is recorded along the left side of the sonar trace.

From an archaeological perspective, the multiple deployment lays the basis for a robust interrogation of the seabed. The quality of the data recovered overall is good, although the side scan sonar data sometimes did not provide as crisp an imaging of the seabed as desired. In the case of the known shipwreck site, W00276 (SS *Topaz*), for example, the wreck was recorded in the side scan sonar but the imaging was unclear, and details of the vessel's interior structure were not returned. In this case, the simultaneous deployment of multibeam was able to capture the relevant details, and has provided an up-to-date survey detail of the wreck site (presented in section 5.6 below).

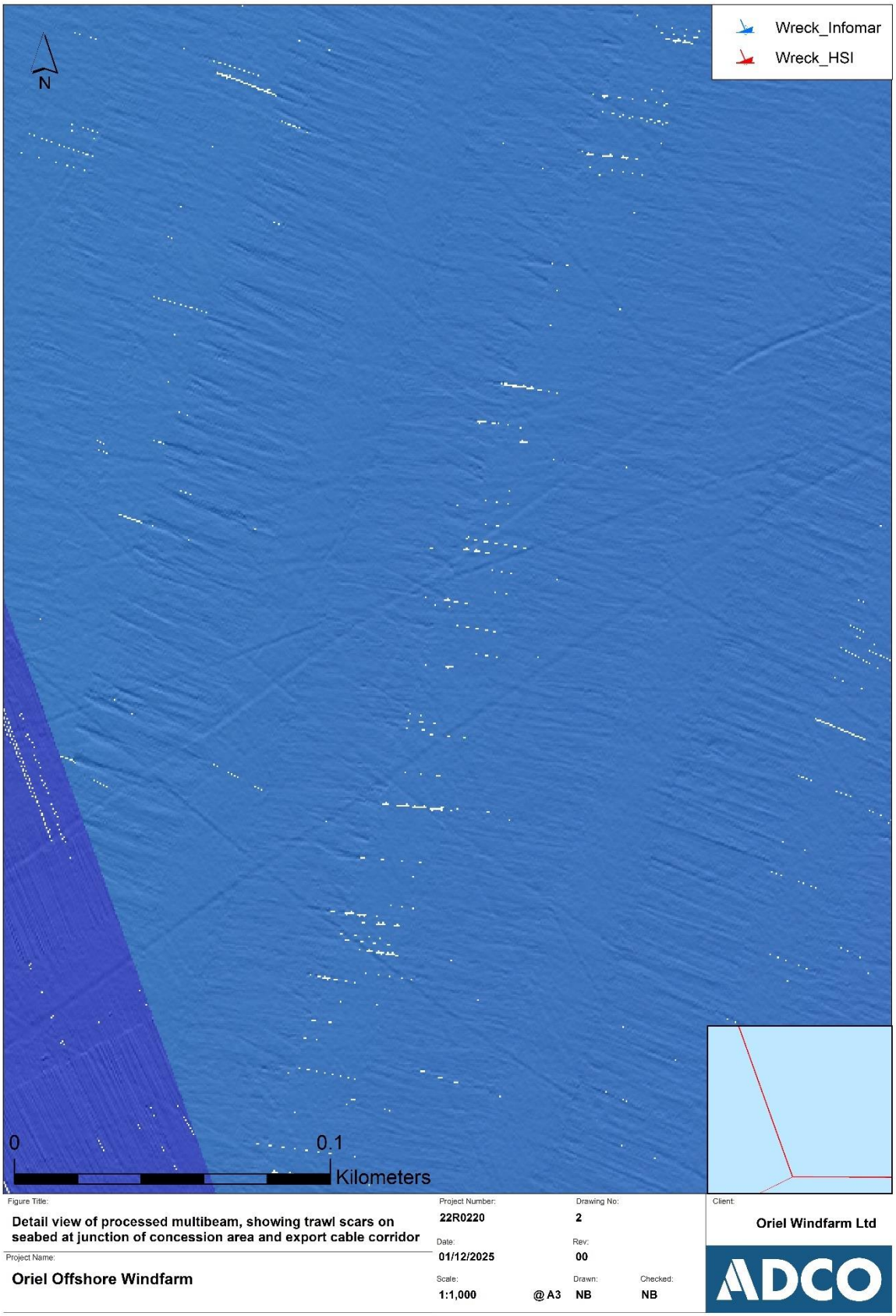


Figure 2: Detail showing multibeam image of seabed in area of soft sediment, showing trawl scars clearly cutting across the surface sediments. The survey extended across the Low Water Mark by up to 100m (Figure 3).

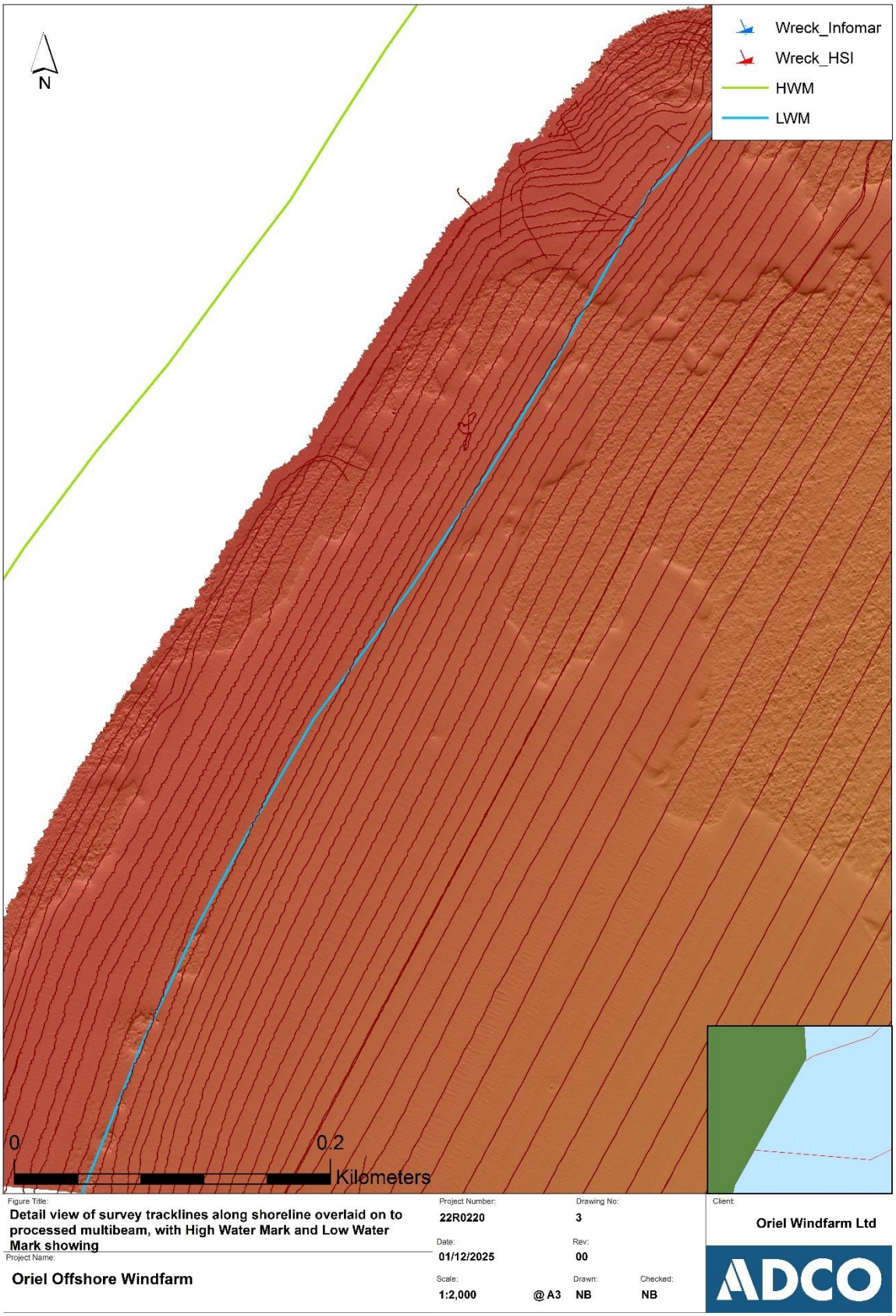


Figure 3: Detail of the shoreline area, showing the extent survey achieved across the Low Water Mark, and survey tracklines as acquired in this shallow-water zone.

5.3 Geological history

Located to the east of Dunany Point and Dundalk Bay, Co. Louth, Oriel Offshore Windfarm is situated within the Western Irish Sea, whose geological history is well studied and has been informed by the project's 2019 geotechnical investigations.[7] Two of the main geological elements of the region that shape its subsurface characteristics above bedrock are glaciation and sedimentation. During the Quaternary period, which started 2.6 million years ago, the Irish Sea experienced three major glaciation events, with the last glaciation leaving the most lasting effect on seabed deposits. In addition, tidal currents have affected sedimentation, remobilizing sediments northwards along the Irish Sea from Cahore Point, Co. Wexford.

The surface sedimentary layer is made up of Holocene deposits (*c.* 11,700 year Before Present (BP))[8] of muddy sand marine sediments that represent the inter-glacial period and overlie Pleistocene deposits (*c.* 2.58m to 11,700 BP) of glacial till boulder clay. The windfarm is located within a sedimentary basin that is filled with Holocene sediments which have accumulated since the last glaciation, and reach up to 40m in depth, effectively burying the glacial stratigraphy.

The stratigraphic framework for the region identifies four deposit units:

- Unit 1: Holocene muds lie on the surface and reach up to 27m deep, representing a relatively undisturbed, homogenous body of sediments.
- Unit 2: Glacio-marine ice-proximal sand and sandy muds, representing a coarser marine sediment that can include boulders.
- Unit 3: Glacio-marine to glacio-lacustrine ice-proximal outwash deposited during the ice retreat phase, and representing heterogenous and coarser grained materials, dominated by gravels, muds, sand, cobble and boulders.
- Unit 4: Basal subglacial till comprising still or hard clay with boulders, overlying bedrock (limestone), and representing glacial advance, with sediments deposited at the base of the ice sheet.

The deposit sequence reflects glacial movement, both as advancing glaciation and glacial retreat. A series of sub-units are associated, and result from sub-glacial meltwater channels, moraines and iceberg scars.

In addition, the stratigraphic sequence is not lying entirely horizontal. Unit 4 (subglacial till) is exposed on the seabed surface near Dundalk Bay, and is interpreted as the offshore segment of the Dundalk Bay moraine complex. The concession area lies to the east of this exposure, but the export cable corridor appears to cross it.

[7] What follows is summarised from G-Tec's report, pp 45–68.
[8] Before Present is a technical calendrical baseline date set at 1950 AD, to mark the point in time after which the nature of the compound Carbon 14 in the atmosphere is considered to have been irrevocably changed because of nuclear testing. Carbon 14 is the principal element analysed when dating ancient matter by the radiocarbon dating technique.

Grab-sampling indicates that the surface deposits within the windfarm site, for the most part, are muddy sands and slightly gravelly muds.

G-Tec's analysis of the UHRS acquired within the concession area supported these observations, and condensed the four stratigraphic units into three units that better reflect the local picture, which nevertheless echoes the wider observations.[9]

5.4 Topography

The northwest quadrant of the concession area extends across a lobe, or terrace, of shallower seabed that forms the south side of an outflow channel issuing eastwards from Dundalk Bay (Figure 4). The seabed across the lobe lies at a depth of approximately 14m Lowest Astronomical Tide (LAT), after which it falls away to 33.22m LAT seawards. Deeper water is also experienced within the export cable corridor close to the concession area, at 28.6m LAT, but this shallows inshore to 1.88m LAT. Despite the differences in depth between east and west across the windfarm area, the topography across both the concession area and the export cable corridor may be described overall as sloping gently seawards.

As noted in section 5.3, extrusions of Unit 4 (boulder clay) deposits within the concession area lie alongside the soft muds and sands of Unit 1 deposits, presenting a varied seascape within this gently sloping area, with the coarser sediments lying either side of a central zone characterised by sands and muds. Similar coarse sediment adjoining soft sediment is true for the export cable corridor. G-Tec's analysis of the seismic data acquired within the concession area mapped the different surface deposits, which vary between expanses of finer grained homogenous sediments, interpreted as sand dunes, and expanses of coarser deposits, interpreted as outcropping glacial deposits. This element corresponds with the side-scan sonar record acquired by XOcean, which records the finer sediments as sands and muds, with the coarser deposits populated with boulders (Figures 5–6) (Plates 2–3).

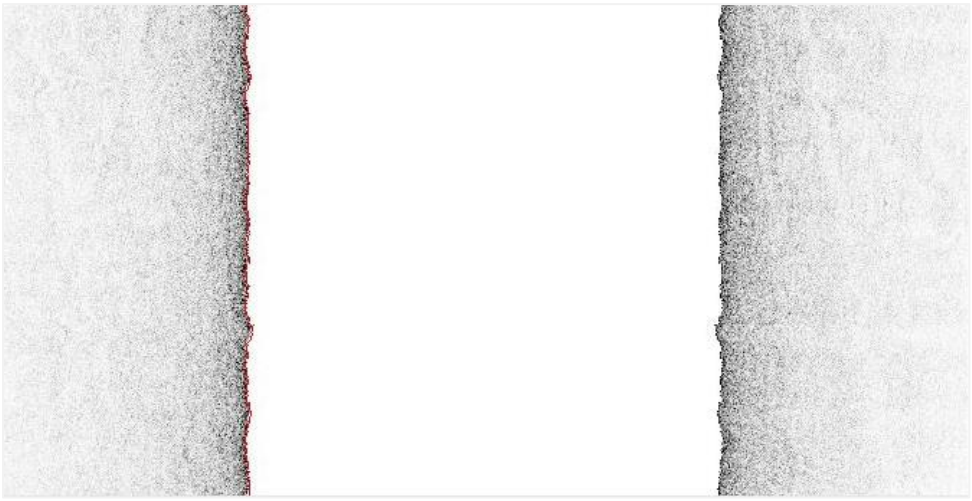


Plate 2: Example of soft sediment as recorded with side scan sonar. The linear lines crossing the surface are trawl scars. Range set at 58m either side of centreline.

[9] G-Tec report, page 72.

Source line: XOcean, ECR/0007_20221116_132153.0005. Location : Export cable corridor, 689021E 5975352N.

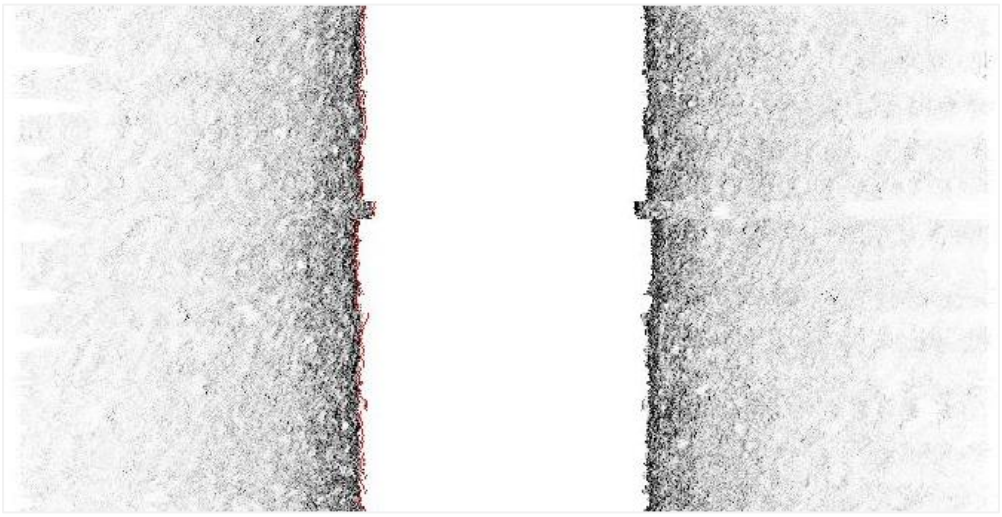


Plate 3: Example of coarse sediment as recorded with side scan sonar. The many boulders in such a boulder field are clearly visible. Range set at 24m either side of centreline.

Source line: XOcean, 0372_x22_20221118_204136.0002. Location : Export cable corridor, 683233E 5972163N

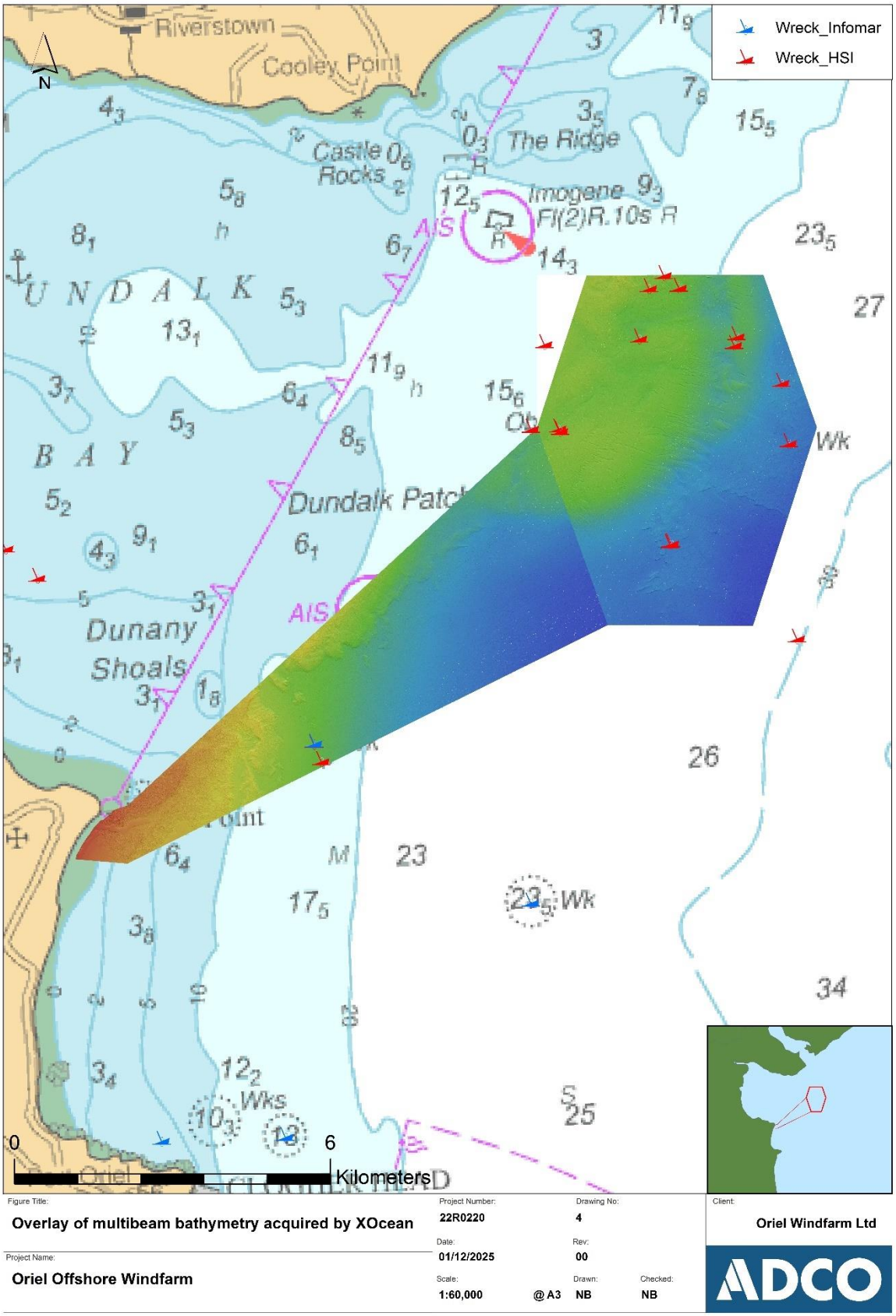


Figure 4: Overview showing the detail of bathymetry data acquired in 2022 across the project area.

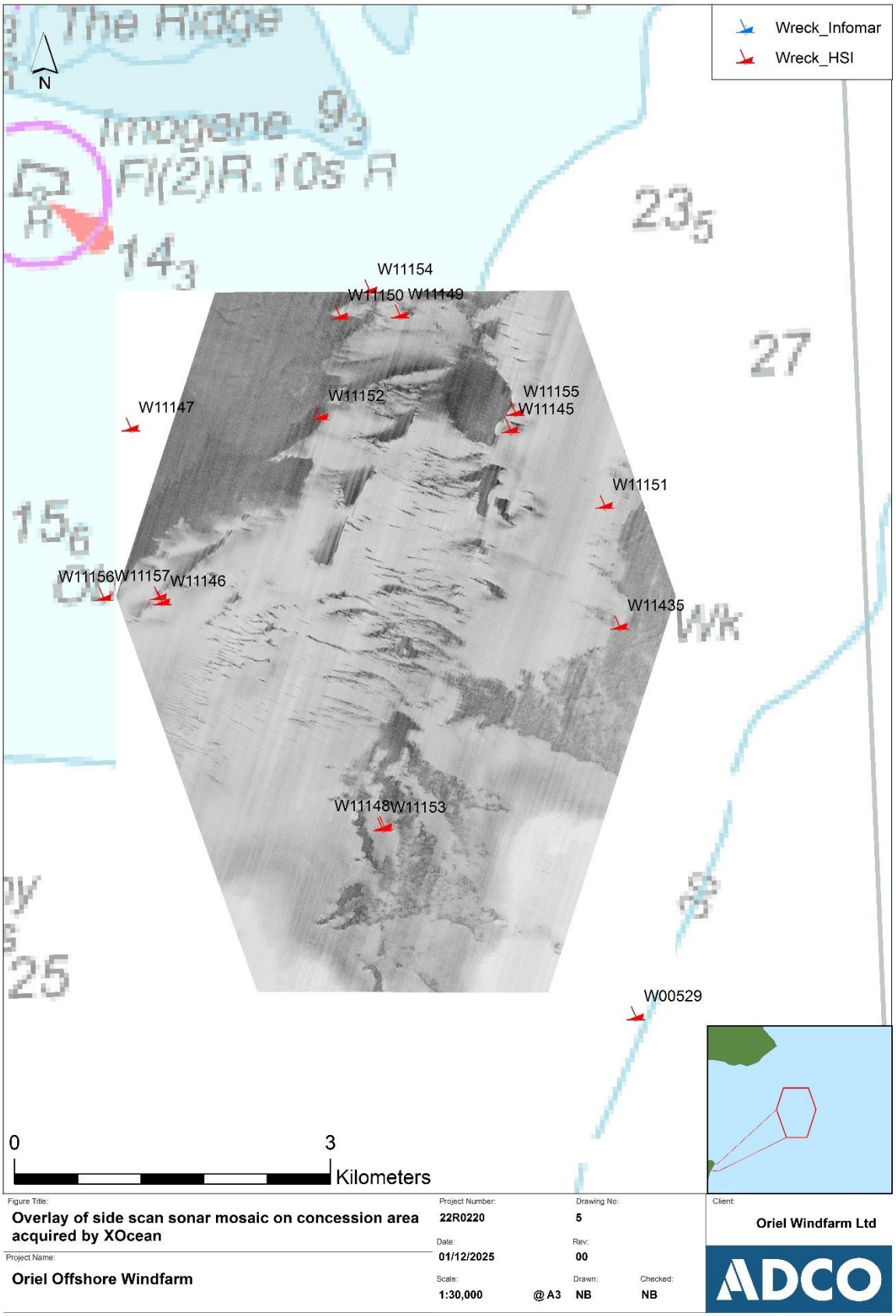


Figure 5: Side scan sonar mosaic image of the concession area, highlighting the different expanses of soft and coarse sediments.

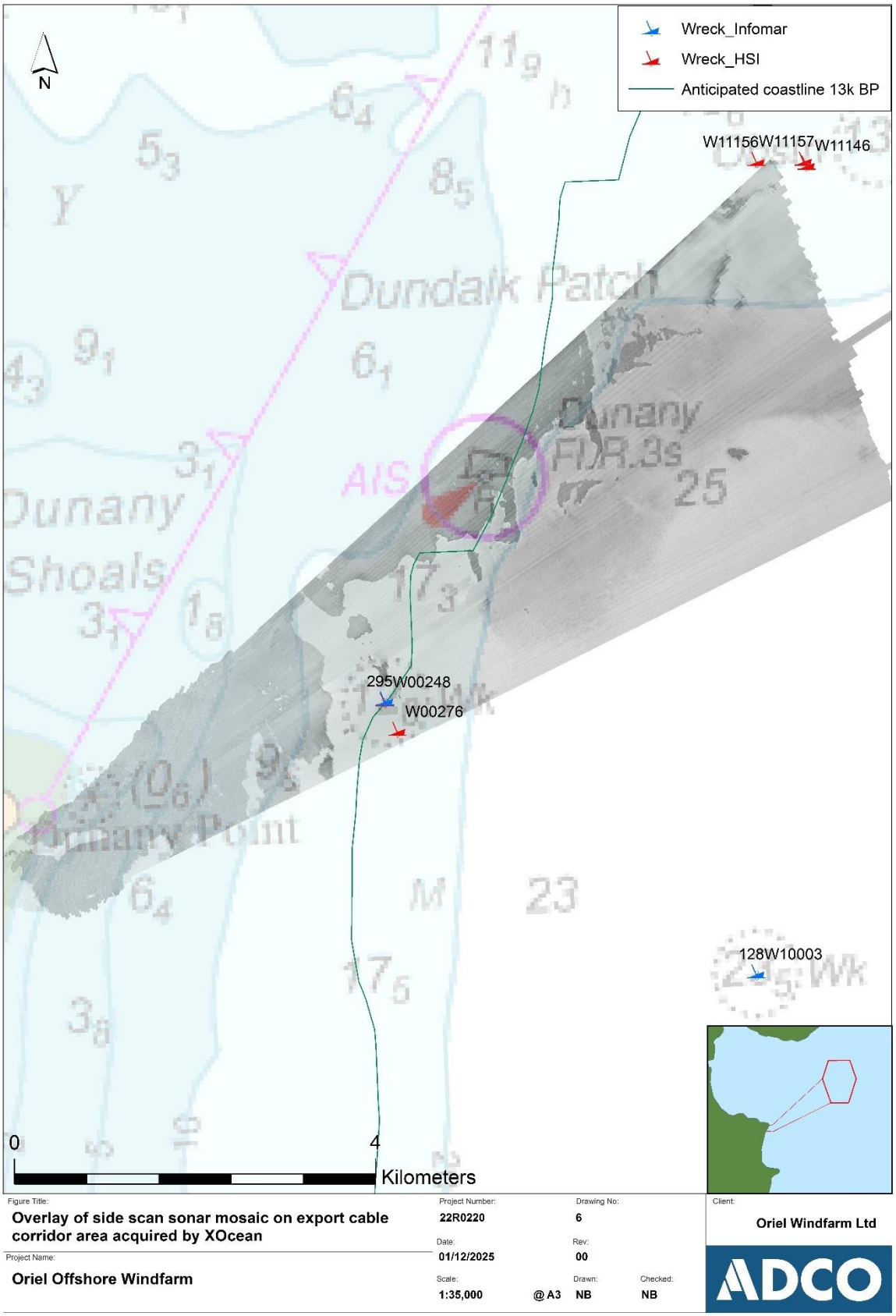


Figure 6: Side scan sonar mosaic image of the export cable corridor, highlighting the different expanses of soft and coarse sediments.

5.5 Submerged landscape potential

As noted in the EIAR chapter, during the Pleistocene the Irish Sea most likely either formed dry land (inter-glacial) as part of the land mass that connected Ireland with Britain and mainland Europe or was covered in an ice sheet (glaciation).[10] The Irish Sea area would have been uninhabitable during glacial periods, but during inter-glacial periods there is a potential for periglacial occupation when the seabed would have formed dry land. The impacts of repeated glaciations, marine transgressions and associated fluvial activity suggest that the potential for the survival of archaeological remains from this period within the Oriel Windfarm area is low.

The anticipated lines of palaeocoastlines that may have existed from the earliest presence of people in Ireland cross over the export cable corridor area, and the anticipated coastline of 13,000 BP also intersects with the northwest corner of the concession area (Figure 6).

Seismic data can suggest the potential for submerged layers indicative of former coastline and coastal habitats, such as estuarine areas and organic deposits indicative of former woodland and/or peat. However, there is no such indicators in the data recovered to date.

More tangible evidence can be anticipated in data recovered from geotechnical investigations (GI). The borehole data recovered from the 2019 GI campaign was acquired from a string of boreholes that extended along the centreline of the export cable corridor and from within the concession area (see Appendix 1 for summary of observations). The core depths reached varied from between 1.55m and 37.55m, and averaged between a shallow group of 3m depth, and a deeper group of 20m depth. Silts, sands, and clays were the recurring observations, with no substantial evidence for organic remains, and no reference to peat layers or burned material, such as charcoal.

It is useful to consider the terrestrial landscape in this regard. As reported in Chapter 26 of the EIAR for Oriel Offshore Windfarm, stone tools (lithics) were observed in the plough soil in fields at Dunany Point and Dunany Demesne.[11] The evidence indicates a definite horizon of prehistoric activity on the headland that lies just north of the proposed landfall, which is supported by the somewhat later site of *Dún Áine* promontory fort (recorded monument LH019-002). The intertidal archaeology survey noted the eroding nature of the headland, which stands 8-10m above the foreshore and is considered to be a moraine.[12] It is likely that the moraine continued seawards, as the Dundalk Bay Moraine Complex. No stone tools or other tangible indicators of activity zones were observed on the foreshore. It is reasonable to conclude in this instance that the potential for revealing previously unrecorded evidence for submerged landscape remains low.

[10] EIAR, Volume 2, Chapter 15, p. 10.
[11]
[12] Brady, 'Intertidal Archaeology Survey, 24D0267 24R0575', page 5 note 1.

5.6 Shipwreck

The previous archaeological reports for the project record the navigation perspective of Dundalk Bay as foul and shallow with an irregular bottom.[13] Dunany Point and the adjacent Dunany reefs ('Dunany Shoals' on current Admiralty Charts) present irregular depths in the order 5.5m that extend north-northeast for 2.5 nautical miles, where depths shallow to 4.6m, with even shallower water between it and the shore. The presence of a meteorological mast (Met Mast) within the concession area, 11.9km offshore, speaks to the shallow nature of the seabed in this location. There are a significant number of recorded shipwrecking events associated with Dundalk Bay, with some 172 events noted in records since systematic recording of shipwreck began in Ireland from *c.* 1750 AD. It is a significant number for a bay that measures only 14km long (between Cooley Point in the North and Dunany Point in the South) and 11km wide. This includes 163 recorded wrecking events whose specific locations are not known and nine charted wreck-site locations, one of which occurs within the concession area and two within the proposed export cable corridor. There are also 15 locations where features observed in marine geophysical survey have been registered by the National Monuments Service as potential wreck sites, ten of which occur within the concession area.

The potential for new discovery exists and the opportunity provided by fresh marine geophysical survey presents an occasion for renewed observation. Within the context of the 2022 survey, the survey data provided the opportunity to update the baseline information on the charted sites.

W11435, UKHO5787. 53.91814 Latitude, -6.03577 Longitude; UTM29N 694658E 5978484N

Wreck site W11435 is located within the concession area and is marked on Admiralty Charts as a shipwreck location, which is believed to measure 5m in length. The 2022 survey did not record a feature directly at the charted location but a feature was recorded on the X22 survey line 0102, which was acquired 40m west of the charted location, and corresponds with a localised magnetic fluctuation (Plate 4). While the imaging is not clear, the sum of the evidence suggests some level of confidence in vessel wreckage existing at the location.

[13] Brady, 2021, pp 7-8.

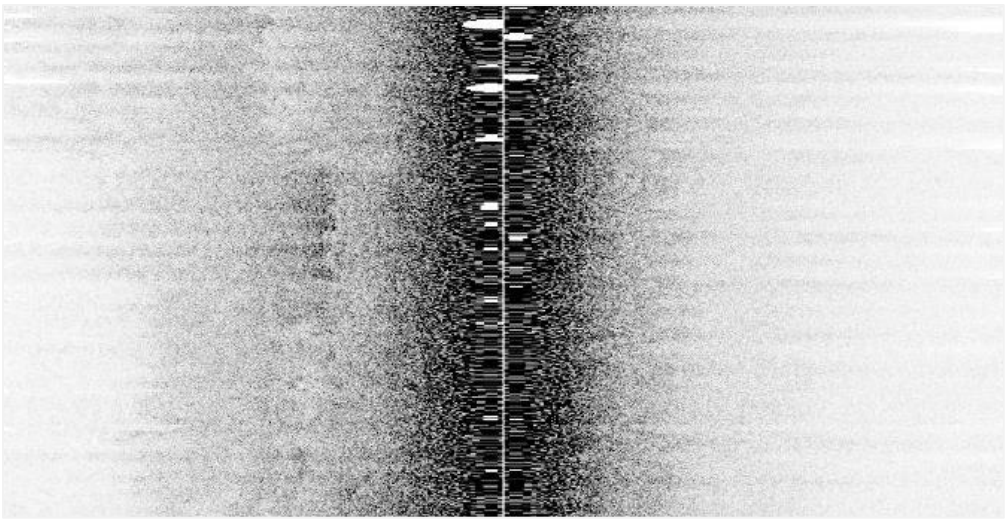


Plate 4: Side scan sonar data trace showing faint shadow on left side, indicating the presence of W11435.

Source line: XOcean, X22_0102_20221101_064201.0008.

W00248, GSI295, UKHO5867. 53.8702 Latitude -6.1764 Longitude, UTM29N 685638E 5972776N

Located within the export cable corridor, the SS *Topaz* was a Glasgow registered iron steamship built in 1883 and lost in 1891. The ship weighed 168/353 tons and measured 161 feet long and was *en route* from Workington to Dundalk, carrying a cargo of steel rails, with a crew of nine when it was lost in a west-southwest Force 4 wind. The record reports that she struck a reef, drifted into deeper water and sank. The reef was likely Dunany reef. The crew took to their lifeboat and landed at Greenore, Co. Louth. The ship and cargo were insured, so Lloyds employed a diver called Rigden/Rizdon to salvage the steel rails during 1892–1893. The rails, engines and working gear were removed. The vessel's masts were also removed, and the area was buoyed. In 1977 the hull was still almost intact. When surveyed by INFOMAR, the vessel was recorded as standing partly exposed on the seabed in 14m of water, measuring 49m long, with the boiler and stern standing almost 3m high off the seabed (Plate 5). The vessel today is exposed over a length of 51m and measures 7.5m wide. The raw side scan sonar imaging acquired by XOcean was poor (Plate 6), but the processed side scan sonar mosaic presents a clearer image, while multibeam image clearly shows the wreck and its context, lying in an expanse of soft sediment (Plate 7). The magnetic intensity imaging, in turn, indicates a zone of magnetism that is larger than the visible remains of the wrecked vessel, reaching up to 30m from it, suggesting that buried elements of wreckage may lie in the surrounding silts (Plate 8). The sub-bottom profile survey also records the vessel and clearly shows its hull extending to depth, penetrating the surface marine silts by more than 2m depth (Plate 9).

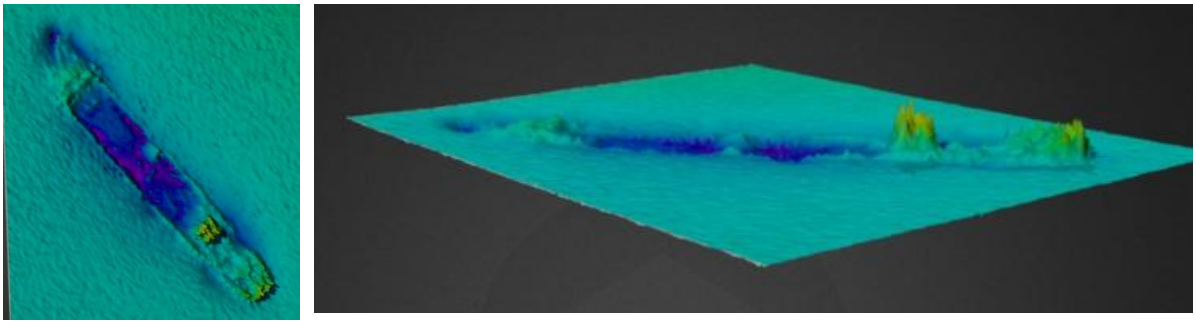


Plate 5: Plan view and isometric view of the Topaz as acquired by INFOMAR, 2011.

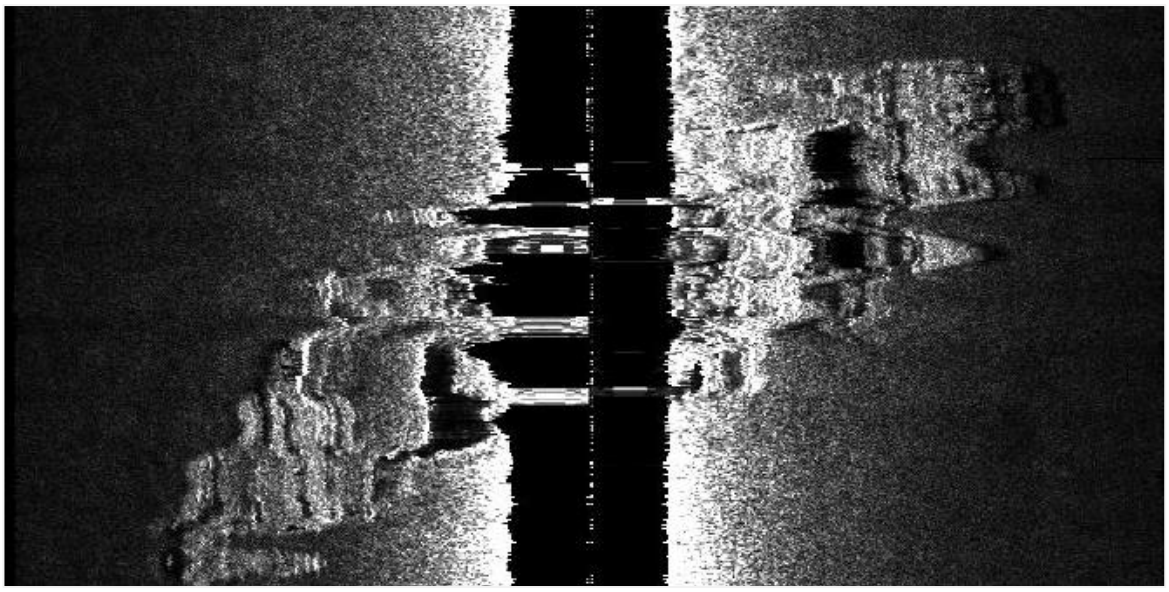


Plate 6: Side scan sonar data trace of the Topaz, as recorded in 2022.

Source file: XOcean Line 0067_20221118_050612.0002. Range set at 39m either side of centreline.

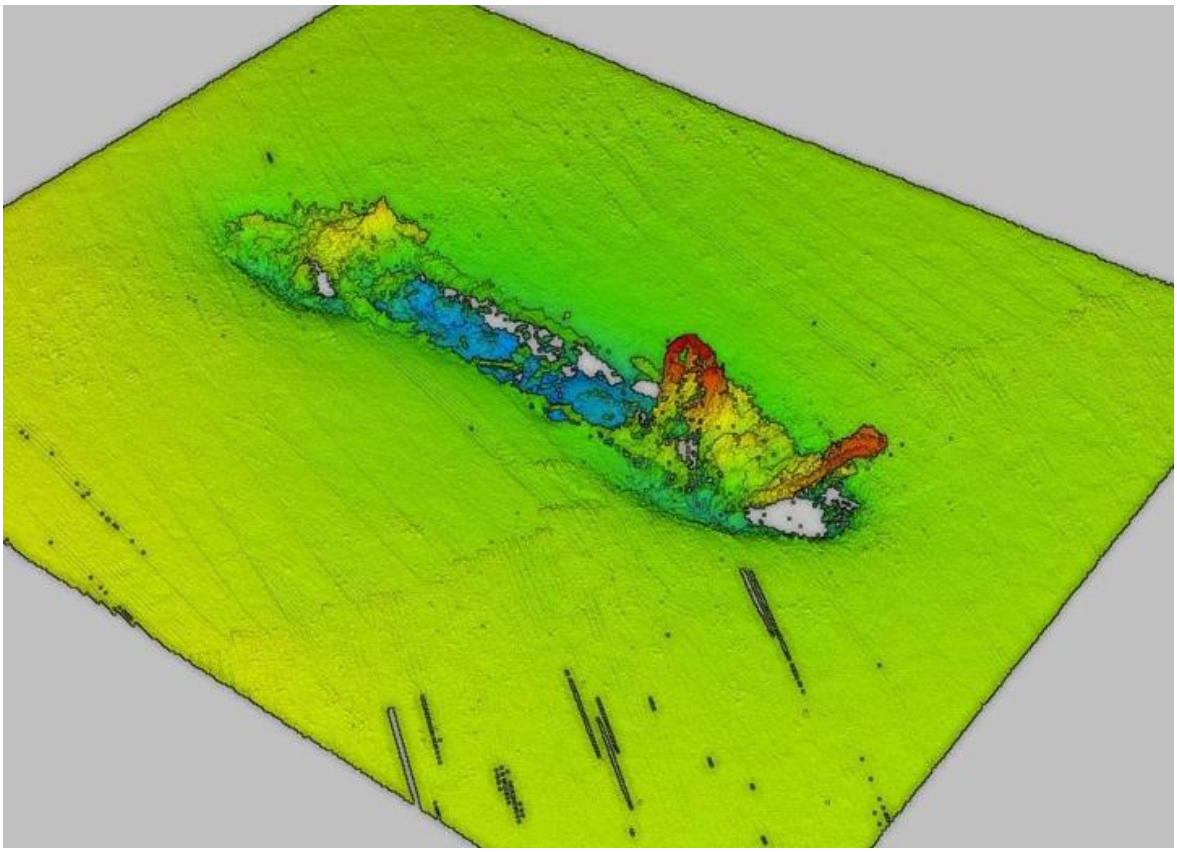


Plate 7: Isometric view of the Topaz as recorded by XOcean, 2022.

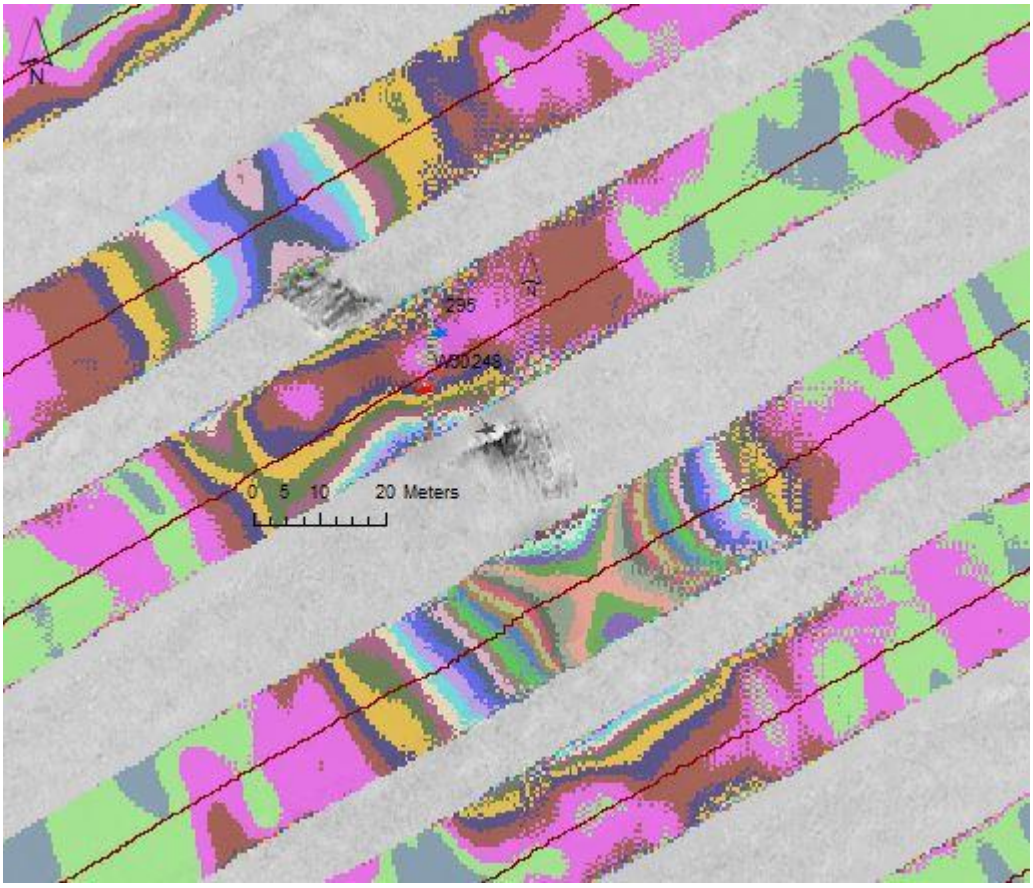


Plate 8: Detail showing the Topaz from side scan sonar mosaic underlaid beneath the magnetometer intensity mapping, where the accentuated colours reveal the intense reading generated from the metal hull.

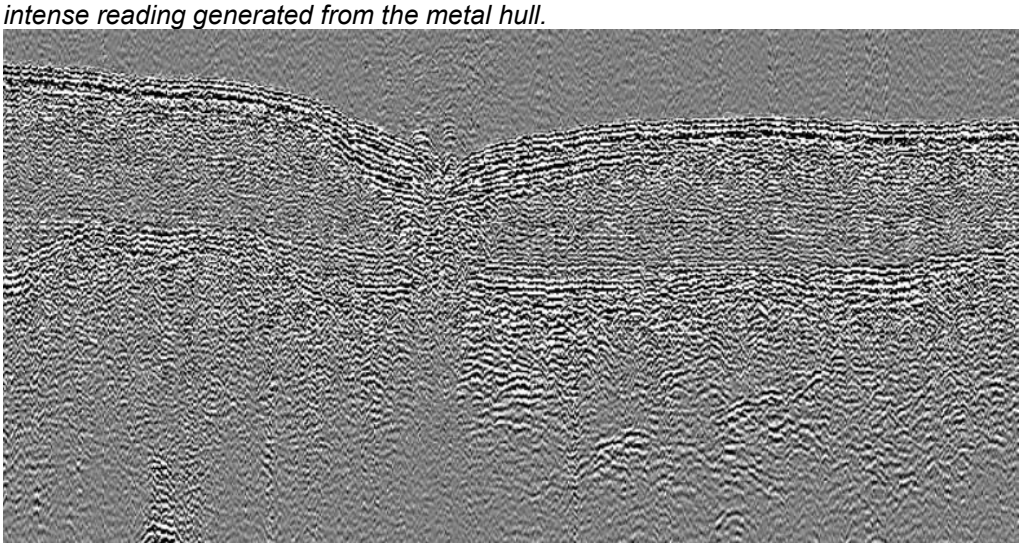


Plate 9: Detail from sub bottom profile data trace, across the Topaz, showing the extent to which it is partially buried in the surface sediment.

Source file: XOcean SBP_X20_00442LSA2_44_20221118_050606

W00276. 53.86722 Latitude -6.17444 Longitude, UTM29N 685780E 5972449N

W00276 is recorded simply as an unidentified wreck located within the export cable corridor beside the wreck that of the *Topaz.* The record is included in the published *Shipwreck Inventory Ireland*, citing a digital source.[14] The charted position locates W00276 350m south-southeast of the *Topaz*. However, there is nothing recorded in the 2022 data at this location that would indicate the presence of wreckage, and the data only recorded soft sediment (Plate 10).

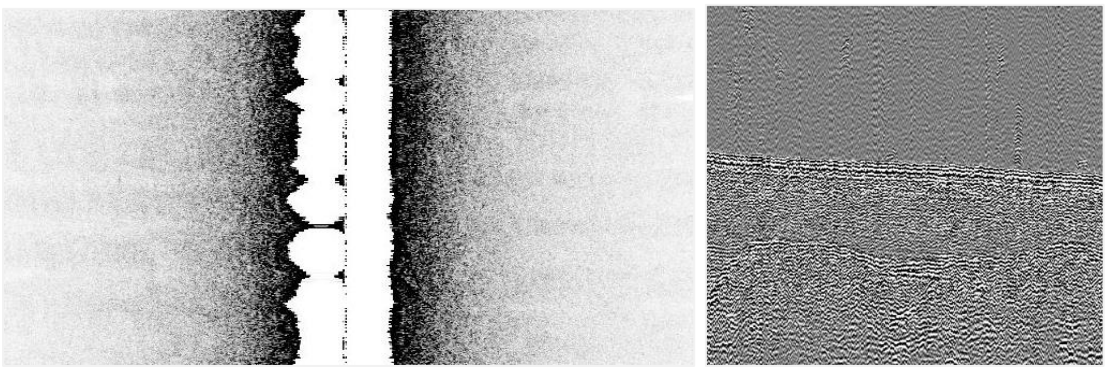


Plate 10: Side scan sonar trace and sub bottom profile trace showing seabed at charted location of W00276.

Source files: XOcean Line 007720221118_084615.0004 and SBP_X2000442LSA2_54_20221118_084609.

Other potential wreck sites, 2006 Survey

The features recorded as likely boulder features in the 2006, which were subsequently absorbed as possible wreck sites by the National Monuments Service, did not present grounds for consideration as wreck sites in the 2022 survey, and the results of observations are summarised in Table 1. The features were invariably not observed in the 2022 data sets, and nor were they highlighted in the more limited 2019 survey where that survey intersected with 2006 data. The 2006 features occurred generally in areas of soft sediment. The fact that they were not visible in 2022 suggests the dynamic nature of the sands/silts, and how items that may at one time be exposed can subsequently be buried. The absence of localised magnetometer readings at these locations indicates the absence of ferrous metal, and leads to the conclusion that the 2006 features are in all likelihood natural boulders.

Reference	2006 observation	2022 observation
W11145	Interpreted as a localized anomaly creating gravel ripples to one side in larger area of gravel/soft sediment. Feature lies 40m from centreline but scour area crosses survey window	Side scan sonar indicates presence of sand/silt occupying a hollow next to an extruded expanse of coarse material. Nothing in magnetometer or sub-bottom profile data

[14] Karl Brady, *Shipwreck inventory of Ireland. Louth, Meath, Dublin and Wicklow* (Dublin, 2008), p. 90, citing R. Stokes and L. Dowling, *Irish Wrecks*, 2003. CD Compuwreck, Arklow.

Reference	2006 observation	2022 observation
W11146	Geophysical anomaly identified during the 2006 survey and since entered into the NMS Wreck Inventory. Interpreted as an oblong feature at centreline creating scour filled with ripples to one side.	Nothing apparent in any the data sets
W11148	Interpreted as cobbles 30m north of centreline	Side scan sonar indicates presence of sand/silt over a large expanse of slightly rolling seabed. Nothing in magnetometer or sub-bottom profile data
W11149	Interpreted as outlying rocks adjacent to boulder field, either side of centreline	Side scan sonar indicates presence of sand/silt next to an extruded ridge of coarse material. Nothing in magnetometer or sub-bottom profile data
W11150	Interpreted as isolated rocks with acoustic shadows on rippled gravel bed	Side scan sonar indicates presence of sand/silt. Nothing in magnetometer or sub-bottom profile data
W11151	Interpreted as outlying rock adjacent to cobbled area, approximately 25m south of centreline	Side scan sonar indicates presence of sand/silt over a large expanse of flat seabed. 2022 multibeam survey identified a series of targets interpreted as boulders in thew wider area, the nearest being 29m north-northwest. Nothing in magnetometer or sub-bottom profile data
W11152	Interpreted as irregularity, unclear image, but perhaps a boulder within a sand/silt hollow, 30-40 m south of centreline.	Side scan sonar indicates presence of coarse ground. Nothing in magnetometer or sub-bottom profile data
W11153	Interpreted as a concentration of cobbles in gravel area, suggesting a localized area of entrapment, 40m from centreline	Side scan sonar indicates presence of sand/silt over a large expanse of slightly rolling seabed. Nothing in magnetometer or sub-bottom profile data
W11154	Interpreted as a series of irregular features, probable rocks//boulders.	Not surveyed as the location lies outside the concession area
W11155	Interpreted as a feature creating localized irregularity at break of slope	Side scan sonar indicates presence of sand/silt next to an extruded expanse of coarse material. Nothing in magnetometer or sub-bottom profile data
W11156	Interpreted as a single well defined isolated boulder 15 m north of centreline in sandy area.	Not surveyed as the location lies outside concession area and export cable corridor area
W11157	Interpreted as a feature 40m north of centreline, causing localized entrapment.	Side scan sonar indicates presence of ridge likely exposed boulder clay. Nothing in magnetometer or sub-bottom profile data

Table 1: Geophysical Survey 2006 target features that were subsequently absorbed by the National Monument Service and considered as potential wreck sites

Other potential archaeological features, 2019 Survey

A piece of debris was recorded in the 2019 survey, along the southern edge of the concession area. The location of contact sss087 was reviewed in the 2022 data sets (UTM29N 693154E 5974937N), but there is no indication of the feature in those data, where the side scan sonar image files show only soft sediment/sand (Plate 11). Nor is there any magnetic fluctuation indicating the presence of ferrous metal. The location in 2022 had witnessed significant trawl scars. It is likely that such impactful fishing would have removed any such small object.

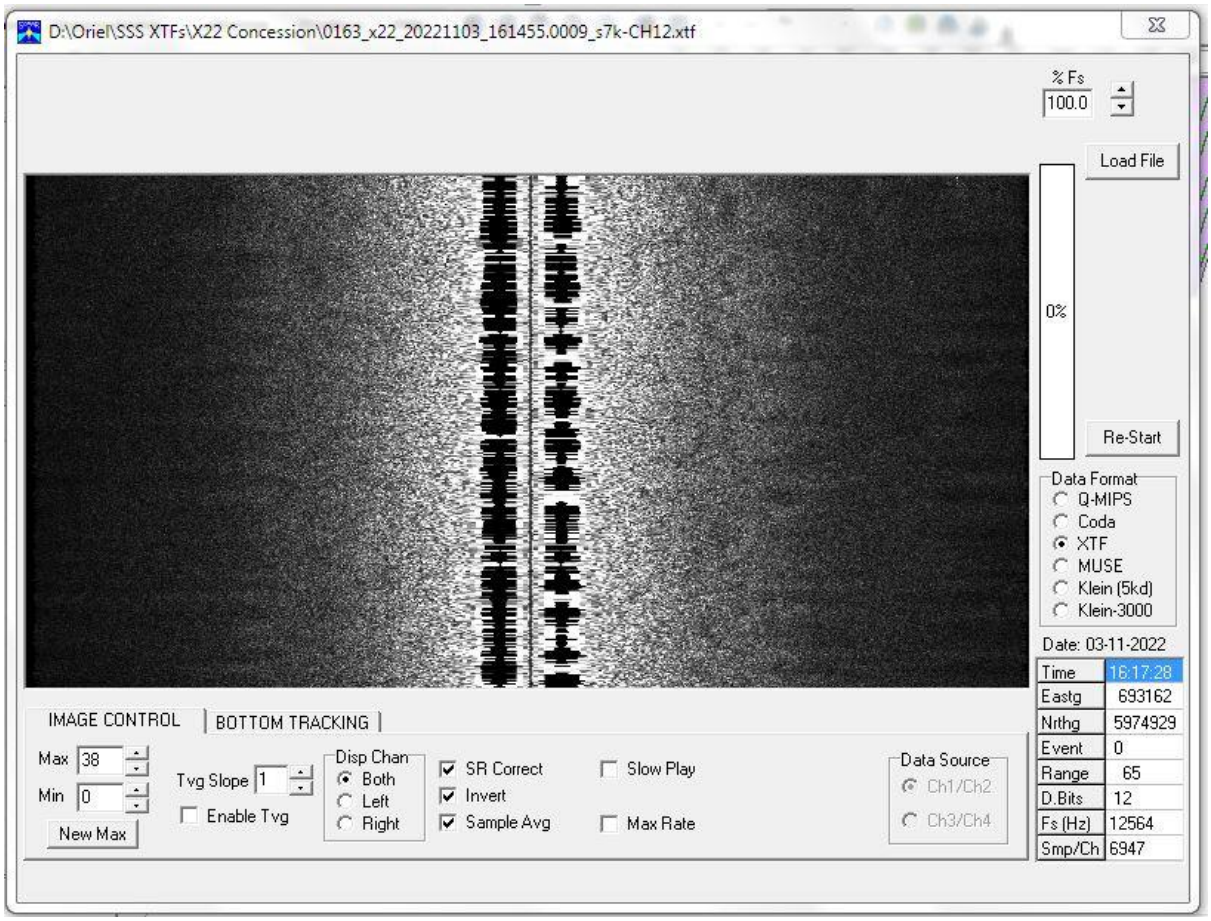


Plate 11: Side scan sonar trace showing location in 2022 of the where a piece of debris (ss0087) was recorded in 2019.

Source file: XOcean X22 Concession area Line 0163_20221103_161455.0009.

5.7 2022 Survey results, concession area

The 2022 survey recorded its own set of features (see Appendices 2 and 3 for listings). Within the concession area, 198 contacts were recorded, and they are distributed across the site, with only the central zone and the southwest being relatively free of contacts (Figure 7). The vast majority of the targets are considered to be boulders, and only two targets are clearly not boulders; these are the meteorological mast (contact C_185), located in the central west sector, and a contact that is considered to be a piece of debris with a trailing scar (contact C_164, Plate 12). Despite the USV crossing within 10m of the contact, and crossing directly over the trailing element, no magnetometer

variation was determined that would otherwise be indicative of ferrous metal. The feature may be a length of rope attached to a heavier component.

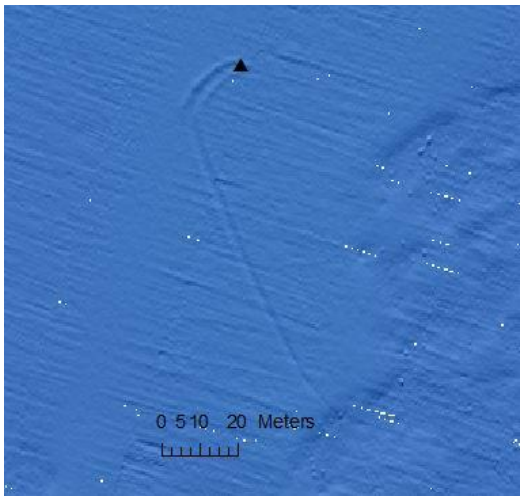


Plate 12: Contact C_164, showing trailing feature as recorded on multibeam data set.

The presence of so many boulders is not surprising, given their relative ubiquity on the expanses of boulder clay till throughout the project area. The fact that none of the contacts returned a magnetic fluctuation supports their identification as boulders. It is apparent that many of the boulders observed in the 2019 survey were not recorded in the 2022 survey. On reviewing the various data sets, the 2019 contacts were not visible in 2022, indicating that where these locations lie on areas of sands and silts, it is likely that the sands have shifted and buried those from 2019, while revealing previously unrecorded boulders in 2022. Natural processes may lie behind the shifting sands. Processes associated with seabed impacts may also be a factor, given the presence of trawl scars across much of the softer sands (see Figure 2).

In four instances, the contact refers to a cluster of boulders (contacts C_110, C_143, C_144, C_146). From an archaeological perspective, the record of boulder clusters brings to mind the potential for shipwreck as the remains of ballast mounds, where stone was used to help load a vessel's weight correctly. One would anticipate a ballast mound to be a significantly-sized feature, and to have a magnetic signature from associated metal elements and/or metal-working debris/slag that was also used as ballast. In the four instances recorded, C_143 measures 12.9m long, and C_144 9.1m long, while C_146 is 7.2m long and C_110 measures 4.9m long. These are not insignificant in size but lack any metallic signature. Given the prevalence of boulders across the concession area associated with naturally deposited boulder clay till, it is likely that the origin of the boulder clusters is natural.

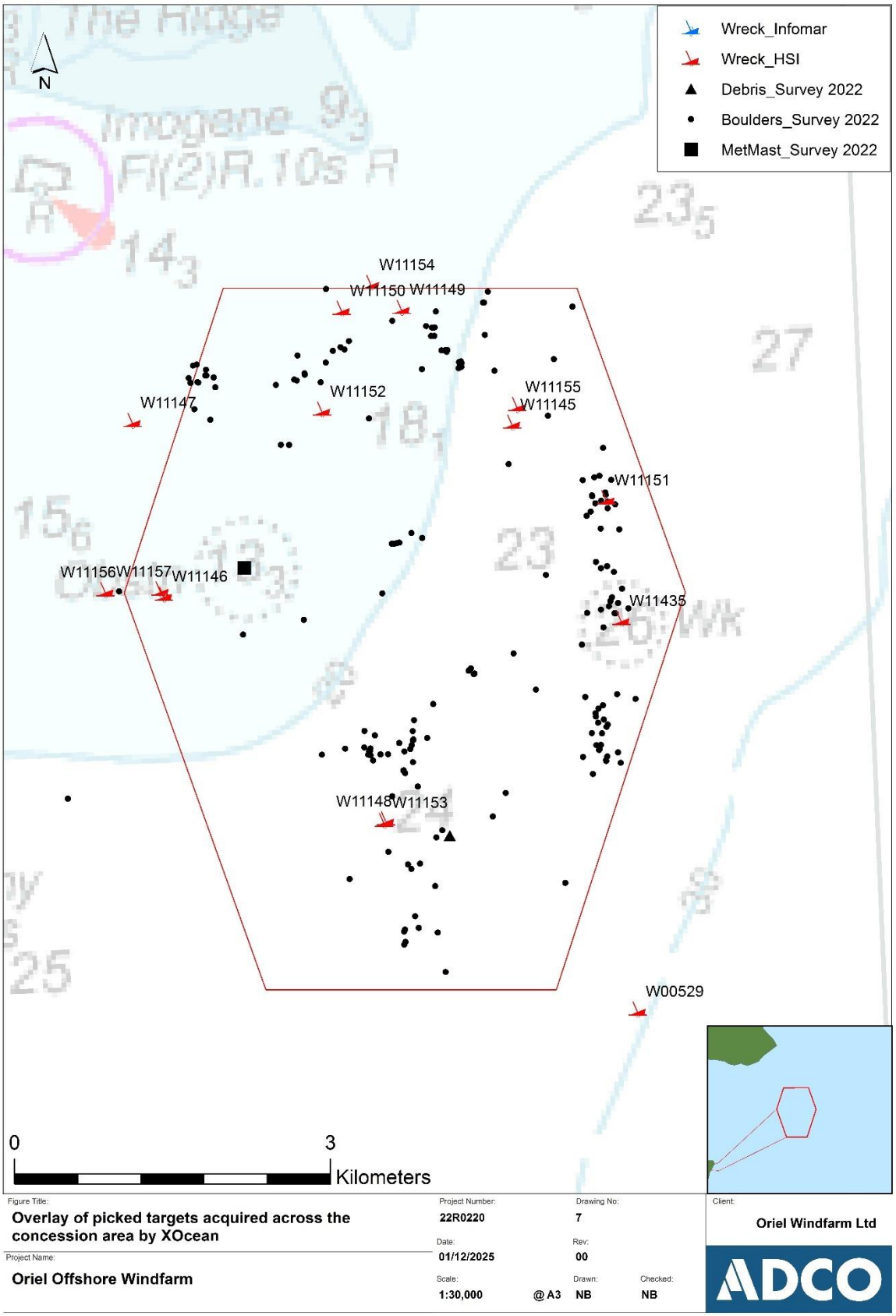


Figure 7: Distribution of contact features arising from the 2022 survey in the concession area.

5.8 2022 Survey results, export cable corridor

The 2022 survey recorded fewer contacts in the export cable corridor, and the majority of contacts were determined to be boulders (Appendix 3) (Figure 8). Among these, contact E_003 is the only cluster of boulders recorded in this area, and the cluster extends over an area measuring 19.3m long by 15.6m wide, standing 1.6m high (Plate 13). There is no magnetic signature here, in an area of coarse sediment/till, with no other upstanding features close by.

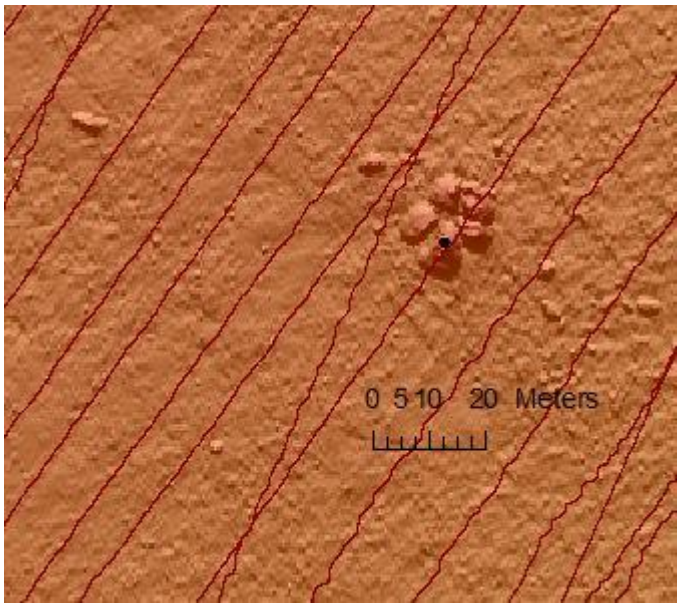


Plate 13: Contact E_003, showing mass of boulders.

There are eleven instances of debris (E005, E012, E_014, E_018, E_022, E_023, E_025, E_027, E_029, E_031, E_034). For the most part, these occur as isolated features that measures in the order of 3m long and are less than 2m in size, with the largest piece measuring 5m long (E_029). None of the contacts register a significant magnetometer reading, suggesting that if they are ferrous metal in origin they are small in scale and are not associated with large debris that may be buried under adjacent sediment. One location, however, stands out as offering potential for wreckage, and that is the location where E_022 and E_023 are found next to each other, occupying a small snag point that measures 9m long by 5m wide, orientated north-south (Plate 14). While no magnetic anomaly was recorded, the survey line passed 6m to the south/east.

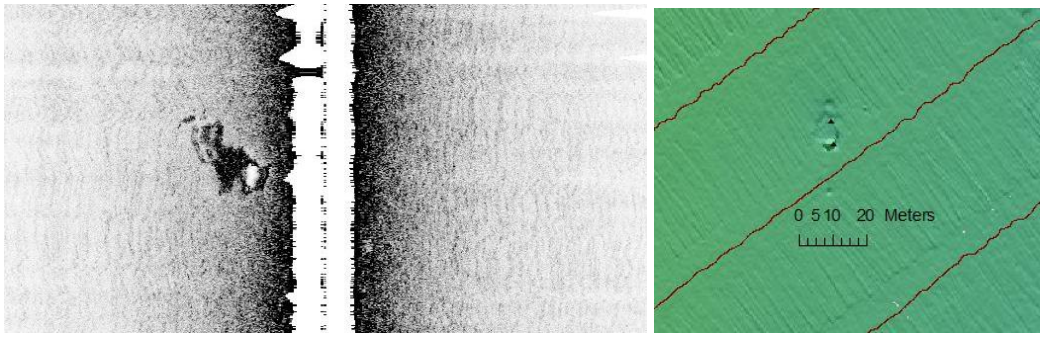


Plate 14: Side scan sonar trace and processed multibeam imaging, showing the feature highlighted by contacts E_022 and E023. Source file: XOcean Line 0139_20221119_220149.00013.

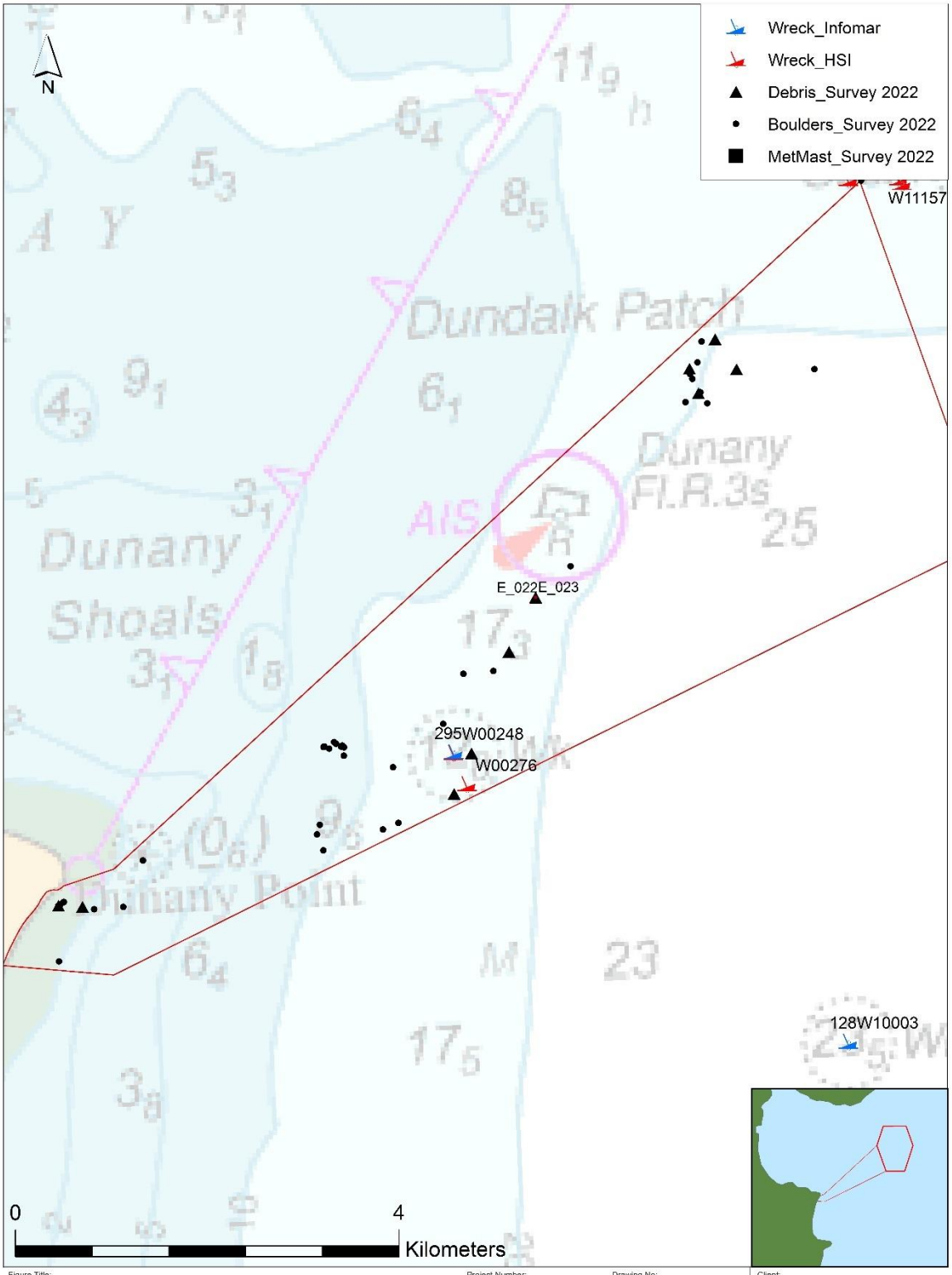


Figure 8: Distribution of contact features arising from the 2022 survey in the export cable corridor area.

5.9 Conclusions

The 2022 survey data represents a comprehensive addition to the baseline knowledge of the Oriel Offshore Windfarm concession area and export cable corridor.

The survey amounts to a complete survey of the project area, employing a suite of instruments that are typically employed in prospecting for marine archaeological features, be they indicators for submerged landscape, or the remains of features that lie for the most part on or close to the surface of the seabed, such as shipwreck.

The survey supports the presence of wreckage at W11435.

The survey confirms the presence of the known shipwreck SS *Topaz*, and provides supporting evidence to be confident that wreckage survives at the location of W00248.

The survey did not record any feature at the charted location of W00276.

The survey did not find evidence supporting the consideration of a series of contact features recorded in the 2006 survey as shipwreck, and consequently would suggest that the following are not shipwreck sites: W11145–W11153, W11155 and W11157.

The survey did not record a target feature at the location SS0087, recorded in 2019 as a piece of debris.

The 2022 survey recorded a series of boulder clusters. The absence of more definitive features suggests these are not ballast mounds associated with wreckage.

A series of small-scale features were identified as debris across the wider survey area. In one instance, two targets (E022 and E023) located close together and occupying a small depression are of interest and suggest the potential for being associated with a previously unrecorded feature indicative of wreckage.

In no other instance were the pieces of debris close to or evidently part of a cluster of features that would otherwise suggest an association of objects indicating the potential presence of something more substantial. Such pieces of debris should be considered isolated instances, and are not unexpected observations across the seabed surface.

6.0 GI 2026 campaign

The current report serves as a baseline on which the Oriel Windfarm project will develop its proposed programme of marine geotechnical investigations (GI) in 2026.

The 2026 GI programme will conduct boreholes in the concession area, at each of the proposed turbine locations and the OSS location (Figure 9).

The GI vessel will be dynamically positioned, limiting impacts on the seabed to the boreholes themselves.

GI locations will avoid all known archaeological features by respecting the presence of AEZs.

GI locations will avoid all Historic Shipwreck Inventory locations. For the most part, the GI locations will be in excess of 250m distant from charted positions.

GI locations will also avoid all picked contact locations. The zone of avoidance is generally greater than 100m from a contact location. In only two instances is the GI location less than 100m distant:

> At Turbine C01 positioned in the south-central part of the concession area, a boulder measuring 1.97m long is located 90m south of the proposed GI, and a second boulder is located 85m southwest of the GI. There are several boulder contacts in the wider area, spread over a *c.* 600m wide by 400m area.
>
> At Turbine B05, in the very northeast of the concession area, a boulder measuring 2.1m long is recorded 96m east-southeast of the proposed turbine and GI location.

In neither case are there pieces of debris or charted shipwreck in proximity to these locations.

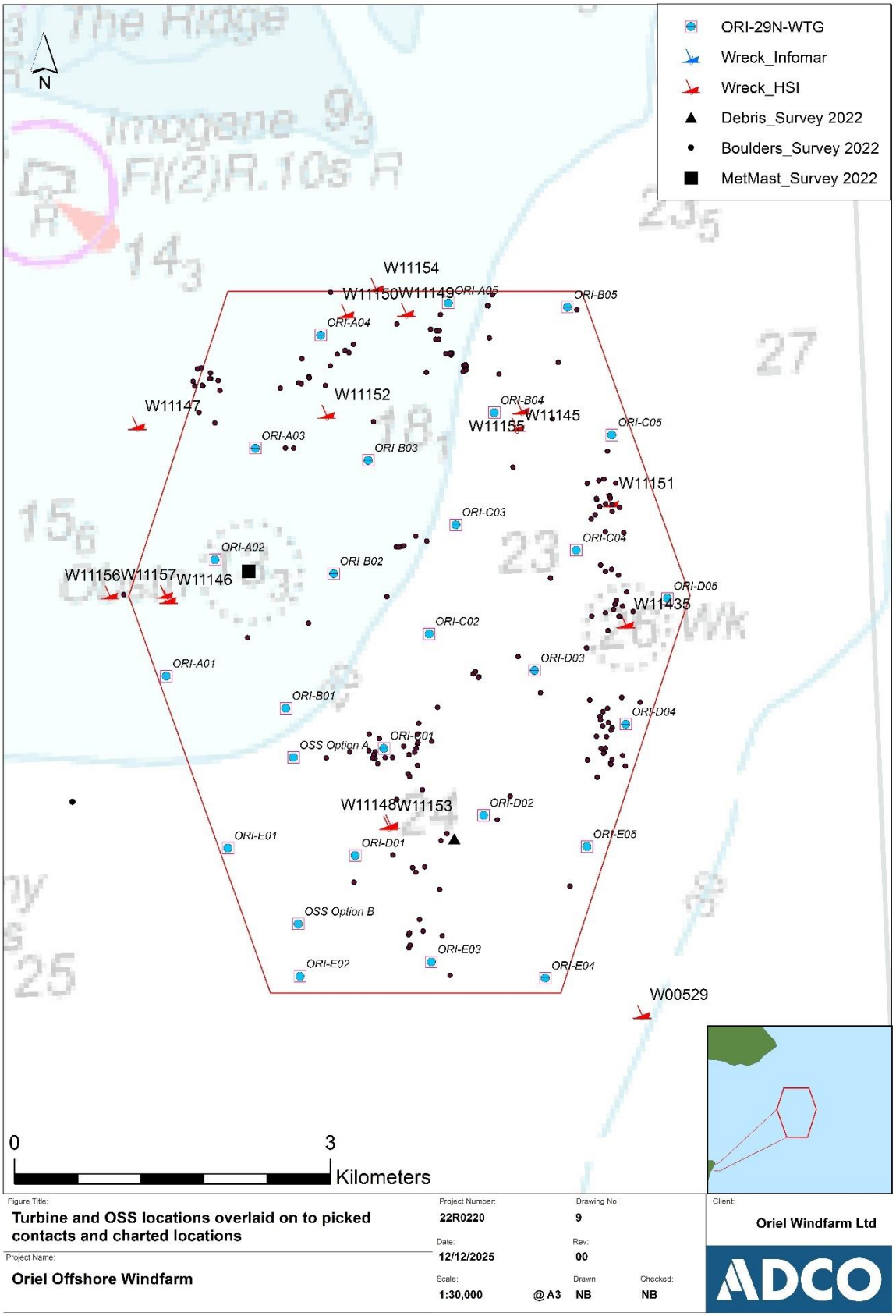


Figure 9: 2026 GI locations (Turbine and OSS locations) overlaid on to picked contacts and charted features.

7.0 Recommendations

7.1 Archaeological Exclusion Zones

It is recommended that Archaeological Exclusion Zones (AEZ) are applied around the wreck of the SS *Topaz* (W00248), that of the unnamed charted wreck, W11435, and the location recorded in 2022 as retaining two pieces of debris, E022 and E023. The recommendations are summarised in Table 2.

Reference	Name	Easting	Northing	AEZ & size / action
W11435, UKHO5787	unidentified	694658	5978484	AEZ 100m radius from centrepoint
W00248, GSI295, UKHO5867	SS *Topaz*	694658	5978484	AEZ 150m radius from centrepoint
W00276	unidentified	685780	5972449	AEZ not required
W11145	unidentified	693621	5980341	Delist from Historic Shipwreck Inventory (HSI)
W11146	unidentified	690308	5978709	Delist from HSI
W11148	unidentified	692424	5976582	Delist from HSI
W11149	unidentified	692573	5981435	Delist from HSI
W11150	unidentified	692007	5981426	Delist from HSI
W11151	unidentified	694497	5979620	Delist from HSI
W11152	unidentified	691827	5980475	Delist from HSI
W11153	unidentified	692404	5976569	Delist from HSI
W11155	unidentified	693671	5980517	Delist from HSI
W11157	unidentified	690272	5978758	Delist from HSI
2019 survey, ss087	debris, site of	693154	5974937	AEZ not required
2022 survey, E-22, E023	Debris, snag point	686496	5974400	AEZ 50m radius from centrepoint

Table 2: Recommended actions

The purpose of an AEZ is to provide protection to the archaeological site from impacts that may occur during construction works. Such works include anchor-laying as well as grapnel runs and other intrusive works that disturb the seabed surface. No works should take place within an AEZ unless expressly permitted by the National Monuments Service (NMS) and subject to further requirements of the NMS.

The AEZ around W11435 should extend 100m from the charted centrepoint.

The recommended size of the AEZ around the *Topaz* should extend 150m in radius from the midships; this will extend to include the extent of the magnetic signature indicative of ferrous metal elements that may lie concealed in the ambient soft sediments.

The AEZ around E022 and E023 should extend 100m from the charted centrepoint.

The absence of features supporting the suggestion that the targets recorded in 2006 are other than boulders, leads to the recommendation that these features be delisted from the Historic Shipwreck Inventory maintained by the National Monuments Service, as indicated in Table 2.

6.2 Marine GI programme, 2026

The requirement for a monitoring archaeologist aboard the GI vessel is not considered necessary because the proposed GI locations avoid all AEZs, charted sites and contact positions.

A Toolbox Talk (TBT) will be prepared by the marine archaeologist who will present the TBT to the GI crews prior to works commencing.

A protocol will be required to allow for geoarchaeological assessment of borehole cores prior to the laboratory analysis of the cores, with the express purpose of investigating further the potential for submerged landscape remains to survive at depth.

The results of the GI operations and analysis will be assessed archaeologically, and will be subject of an archaeological interpretation report that will be submitted to the NMS following completion of the 2026 programme.

6.3 Archaeology Management Plan

The observations and recommendations made in this report will be absorbed into the Archaeological Management Plan that establishes archaeological protocols to be followed during the project's development.

In the absence of published guidelines for Marine Archaeology in Irish waters, the Archaeology Management Plan outlined in the 2024 EIAR will be amended to absorb the observations of the Department of Housing, Local Government and Heritage set out in their letter of 29/07/2024, reference Plan03577/2024 and any further recommendations that the Department may have identified in relation to Offshore Renewables projects.

The recommendations contained in this report are subject to the approval of the National Monuments Service at the Department of Housing, Local Government and Heritage.

8.0 References

Brady, Karl, *Shipwreck inventory of Ireland. Louth, Meath, Dublin and Wicklow* (Dublin, 2008).

Brady, Niall, 'Archaeological assessment for Oriel Offshore Windfarm development North-western Irish Sea. 06R118', Archaeological Diving Company 2007.

Brady, Niall, 'Archaeological Impact Assessment Oriel Offshore Windfarm, Dundalk Bay and Dunany, Co. Louth', Archaeological Diving Company 2019.

Brady, Niall, 'Intertidal Archaeology Survey, Oriel Wind Farm project, Dunany, Co. Louth, 24D0267, 24R0575', Archaeological Diving Company, 2025.

Brady, Niall, Underwater Archaeological Impact Assessment, Oriel Wind Farm, off Dunany, Co. Louth, Wind Farm area and cable routes', Archaeological Diving Company, 2021.

Corrick, Jordan, '00442-PAR-IRE-WIND Parkwind –Concession Area. Project execution and results report', XOcean report, 2023.

Corrick, Jordan, '00442-PAR-IRE-WIND Parkwind –ECR Survey. Project execution and results report', XOcean report, 2023.

G-Tec, 'Geophysical investigation – Oriel Offshore Wind Farm, interpretative report' 6006 Version 3.0, 2023. Reference document: ORIGT-GTS-REP-2015-01_Interpretation_Report_v3.

Oriel Wind Farm Project EIAR was compiled by RPS, 2024: https://orielwindfarm-marineplanning.ie/environmental-documents/eiar/

Appendix 1: Tabulated Borehole Log Sheet information collected from the study area of Oriel Offshore Windfarm in 2019

Source: G-Tec, 'Geophysical investigation – Oriel Offshore Wind Farm, interpretative report', pp 56-59, Table 11.

Core ID	UTM29N Easting	UTM29N Northing	Water Depth (m)	Core Length (m)	Core Description
BH_001	690626	5980066	17.3	20.5	0-0.9m: Medium dense dark grey gravel of mixed lithologies. 0.9-2.3m: Very dense dark grey fine to medium sand. 2.3-4m: Dark greenish gray fine to medium calcareous sand. 4-5.5m: Low to medium strength dark grey, intermediate plasticity clay. 5.5-6.5m: Becoming interbedded with fine sand. 6.5-10.5m: Low to medium strength dark grey slightly gravelly/sandy intermediate plasticity calcareous clay. 10.5-13.5m: Becoming high plasticity. 13.5-16m: Loose to medium dense non-calcareous gravel of sandstone. 16-17.5m: Very weak to medium strong greyish black calcareous muddy limestone with organic material (5%) and pyrite minerals (5%) and occasional white fragments of crinoids. 17.5-20.5m: Medium strong dark grey calcareous muddy fossiliferous limestone with organic material (10-20%) and pyrite minerals (4%) and occasional white fragments of crinoids.
BH_002	692608	5978541	20.7	20.9	0-0.3m: Medium dense dark grey slightly gravelly slightly silty fine to coarse calcareous sand with frequent shell fragments. 0.3-4.1m: Dense to very dense dark grey, silty fine to medium calcareous sand. 4.1-6.5m: High to extremely high strength very dark greyish brown slightly gravelly slightly sandy intermediate plasticity calcareous clay. 6.5-9.5m: Becoming sandy and low plasticity. 9.5-14.5m: Very dense gravel and cobbles of mixed lithologies (limestone, sandstone, basalt). 14.5-18m: Extremely weak to weak dark grey highly calcareous fossiliferous intra-sparite limestone with organic material (10-15%) and pyrite (5-8%) and frequent fine to coarse bioclasts and intra-clasts. 18-20m: Becoming impure organic-rich limestone with organic material (15-20%) pyrite minerals (5-8%). 20-20.9m: Weak dark grey limestone. Fractures are subhorizontal/locally subvertical/closely spaced planar.
BH_002A	692601	5978541	20.7	20.9	

Core ID	UTM29N Easting	UTM29N Northing	Water Depth (m)	Core Length (m)	Core Description
BHZ_003	693742	5976731	29.8	13.6	0-1.5m: Very loose slightly clayey sand 1.5-1.8m: Low to medium strength dark grey slightly gravelly slightly sandy intermediate plasticity calcareous clay with rare pockets of fine sand. 1.8-2m: Medium bed of sand. 4.3-8.5m: Medium strong to strong coarse subrounded to subangular gravel and cobbles of dark grey limestone/greywacke. 8.5-12m: Weak to medium strong dark greyish black altered basalt. 12-13.6m: Fractures becoming subhorizontal to inclined (4570º) closely to medium spaced locally very closely spaced.
BHZ_003A	693736	5976731	30		
BH_003	694192	5977320	26.4	1.55	0-1.55m: Dark grey fine to coarse angular to sub-angular gravel and cobbles of mixed limestone/sandstone lithologies.
BH_004	691139	5976518	26	37.65	0-1m: Medium dense dark olive grey silty clayey fine to medium calcareous sand with frequent shell fragments. 1-2.9m: Very loose to loose silty sand. 2.9-6.4m: low to medium strength dark grey slightly gravelly thinly laminated intermediate plasticity calcareous clay with occasional pockets of silt and fine sand.
					6.4-12m: Low to medium strength dark grey slightly gravelly slightly sandy low plasticity calcareous clay. 12-16.85m: Dense dark grey fine to coarse subangular calcareous gravel and cobbles of mixed lithologies. 16.85-19.5m: Medium strong dark grey highly calcareous fossiliferous limestone with occasional fragments of white crinoids. 19.5-20.5m: Fractures locally inclined (60º). 20.5-24.5m: Thin bed of moderately weak greyish black carbonaceous limestone. 24.5-32m: Fractures are sub-horizontal to inclined (10-25º). 32-37.65m: Weak to medium strong dark grey impure limestone with organic content (4-5%), pyrite minerals (34%), and occasional white fragments of crinoids.
BH_005	693177	5975988	28.1	22	0-0.47m: Extremely low to very low strength slightly gravelly/sandy low plasticity calcareous clay. 0.47-1.35m: Possible cobble. 1.35-1.9m: Becoming soft and gravelly. 1.9-6.8m: Very high to extremely high strength slightly gravelly sand sandy highly calcareous low plasticity clay. 6.8-7m: Sand is fine to medium. 7-7.45m: Extremely high strength dark grey slightly gravelly sandy low plasticity calcareous clay. 7.45-11m: Possible cobble 11-11.5m: With rare shell fragments 11.5-12m: Possible cobble

Core ID	UTM29N Easting	UTM29N Northing	Water Depth (m)	Core Length (m)	Core Description
					12-14m: Fine to medium angular highly calcareous gravel of sandstone/limestone/ psammite/granite mixed lithologies. 14-18.6m: Medium strong to strong medium grey highly calcareous fossiliferous limestone with organic material (45%) and pyrite minerals (1-2%). 18.6-21.5m: becoming weak to medium strong, dark grey. 21.5-22m: Becoming fossiliferous dolomitic limestone with dolomite (20-25%), organic material (5-10%) and pyrite minerals (3-5%).
BH_005-A	693174	5975994	30.6	22	
BH_005-B	693170	5975989	28.9	22	
BH_006	694123	5980530	23.7	25.3	0-1m: Medium dense dark grey slightly silty/clayey fine to medium calcareous sand with occasional shell/its fragments. 1-1.5m: Becoming loose 1.5-2.75m: Becoming fine to medium with rare thin laminations of silty sand 2.75-4.2m: Medium dense to dense dark grey silty slightly clayey fine to medium calcareous sand with thin beds of clay and occasional shells and shell fragments. 4.2 to 4.6-5m: Very dense 5-5.7m: Becoming very dense 5.7-7.6m: With rare thin laminations of coarse sand. 7.6-10.58m: Very dense dark grey and very dark grey fine to coarse angular to subrounded calcareous gravel of mixed sandstone/greywacke/limestone lithologies. 10.58-11.1m: Becoming greenish black 11.1-13m: Cobble of strong medium dark grey graywacke. 13-16m: Medium strong to strong locally thinly laminated dark grey highly calcareous limestone. 16-19.75m: Medium strong to strong dark grey calcareous sandstone locally with pyrite inclusions. 19.75-20.78m: Possible fault zone. Very weak to medium strong greenish grey locally dark grey highly calcareous breccia with medium strong to strong dark grey limestone. 20.78-23.4m: Strong to locally very strong dark grey locally medium dark grey argillaceous calcareous limestone. 23.4-25.3m: Very weak to medium strong dark grey argillaceous calcareous limestone.
BH_006-A	694118	5980533	22.6	25.3	
BH_007	694781	5978116	28.2	15	0-2.1m: Very high to extremely strength dark grey slightly gravelly slightly sandy low plasticity calcareous clay. 2.1-9.1m: Possible cobble. 9.1-11m: Medium strong to strong dark grey to dark greyish back highly calcareous impure fossiliferous limestone to fossiliferous

Core ID	UTM29N Easting	UTM29N Northing	Water Depth (m)	Core Length (m)	Core Description
					limestone with organic material (20-25%), pyrite minerals (5-10%), quartz (1-3%), iron oxide (1-2%). 11-13.5m: Probable weathered and naturally fractured interval. 14.5-15m: Fractures becoming horizontal and locally inclined to vertical fractures (60-90º) with infill of calcite.
BH_007-A	694774	5978116	27.8	15	
BH_007-B	694787	5978117	28.1	15	
BH_010	690498	5975478	27.5	3.32	0-1.2m: Extremely low to very low strength dark grey sandy silty clay. 1.2-1.8m: Very loose very dark grey very gravelly clayey fine to medium sand. 1.8-3.2m: Low to medium strength dark grey slightly sandy intermediate plasticity clay. Thin bed of sand at 3.2m.
BH_010-A	690503	5975480	27.6	3.32	
BH_013	689701	5975144	26.2	3.32	0-1.1m: Extremely low to very low strength slightly gravelly slightly sandy intermediate plasticity calcareous clay. 1.1-1.75m: Very loose sand 1.75-2.3m: Medium strength grey slightly sandy slightly gravelly clay. 2.3-3.3m: Becoming high to very high strength. 3.3m: Very thin bed of sand.
BH_016	688488	5974635	24.1	3.42	0-0.9m: Extremely low to low strength very dark grey slightly gravelly sandy silty calcareous clay with occasional shells. 0.9-3.42m: Medium dense gravelly sand.
BH_018	687697	5974158	22.1	2.5	0-0.4m: Extremely low to very low strength dark grey sandy low plasticity calcareous silt with occasional shell fragments. 0.4-0.9m: Dense to very dense gravelly sand. • 0.9-2.5m: Very dense dark grey gravel/cobbles of sandstone.
BH_019	686230	5973986	18.1	3.36	0-2.8m: Very loose dark grey very silty clayey fine to medium sand with frequent shell fragments. • 2.8-3.36m: Medium strength clay with thin beds of sand.
BH_020	685167	5973471	14.7	3.38	0-1.9m: Very loose clayey sand. 1.9-3.38m: Medium dense grey silty slightly clayey fine to medium sand.

Appendix 2: Target List acquired by XOcean for the Oriel Offshore Windfarm concession area in 2022

Source: Corrick, '00442-PAR-IRE-WIND Parkwind –Concession Area. Project execution and results report', Appendix 1.

Non-boulder targets are highlighted in blue for ease of reference.

MBES Target ID	SSS Target ID	MAG Target ID	Easting	Northing	Dimensions (m) L x W x H	Comment
C_001	C_SSS_001		691423.75	5980137.62	2.63 x 1.5 x 0.32	Boulder
C_002	Not Found in SSS		691503.23	5980135.30	1.86 x 1.54 x 0.23	Boulder
C_003	C_SSS_002		691642.47	5978475.56	2.57 x 2.23 x 0.51	Boulder
C_004	Not Found in SSS		691065.25	5978336.60	1.02 x 0.81 x 0.34	Boulder
C_005	C_SSS_003		692896.67	5981402.74	2.58 x 3.42 x 0.33	Boulder
C_006	C_SSS_004		692949.06	5981032.77	3.08 x 1.98 x 0.57	Boulder
C_007	C_SSS_005		693389.40	5981589.82	3.07 x 2.84 x 0.26	Boulder
C_008	C_SSS_006		693436.95	5976610.22	10.11 x 9.43 x 0.22	Boulder
C_009	C_SSS_007		692988.43	5975133.52	1.69 x 1.72 x 0.14	Boulder - Matches UHL19008-Oriel_SSS_260
C_010	C_SSS_008		693353.92	5981486.23	2.53 x 2.36 x 0.23	Boulder
C_011	C_SSS_009		693343.34	5981485.83	1.74 x 1.61 x 0.11	Boulder
C_012	C_SSS_010		694016.15	5980950.18	3.65 x 3.15 x 0.19	Boulder
C_013	Not Found in SSS		694192.62	5981447.97	2.14 x 2.07 x 0.4	Boulder
C_014	C_SSS_011		692803.31	5981263.91	1.76 x 1.86 x 0.08	Boulder
C_015	C_SSS_012		690548.21	5980769.87	1.73 x 1.58 x 0.58	Boulder
C_016	C_SSS_013		690640.76	5980727.33	2.49 x 2.48 x 1.14	Boulder
C_017	C_SSS_014		690632.33	5980731.03	1.37 x 1.02 x 0.3	Boulder
C_018	C_SSS_015		690603.92	5980474.50	0.98 x 0.65 x 0.36	Boulder
C_019	Not Found in SSS		692914.04	5975508.65	1.52 x 0.86 x 0.1	Boulder
C_020	C_SSS_016		692889.52	5975949.15	2.11 x 0.62 x 0.72	Boulder
C_021	Not Found in SSS		692733.20	5975553.44	1.59 x 1.57 x 0.07	Boulder
C_022	C_SSS_017		692850.42	5981170.38	1.62 x 1.29 x 0.74	Boulder
C_023	Not Found in SSS		692679.15	5977125.30	1.5 x 0.92 x 0.17	Boulder
C_024	C_SSS_018		692997.84	5981018.55	3.11 x 2.55 x 0.32	Boulder
C_025	C_SSS_019		693005.58	5981037.02	2.46 x 2.16 x 0.44	Boulder
C_026	C_SSS_020		692989.28	5981036.67	0.97 x 0.93 x 0.07	Boulder
C_027	C_SSS_021		693127.80	5980925.19	2.66 x 1.65 x 0.37	Boulder
C_028	C_SSS_022		693116.22	5980922.08	2.35 x 1.37 x 0.11	Boulder

MBES Target ID	SSS Target ID	MAG Target ID	Easting	Northing	Dimensions (m) L x W x H	Comment
C_029	C_SSS_023		693141.84	5980912.38	2.19 x 1.13 x 0.09	Boulder
C_030	Not Found in SSS		692589.78	5977047.35	1.35 x 1.28 x 0.09	Boulder
C_031	C_SSS_024		693125.16	5980896.18	1.14 x 1.05 x 0.35	Boulder
C_032	Not Found in SSS		693131.19	5980885.63	1.38 x 1.02 x 0.12	Boulder
C_033	C_SSS_025		693138.52	5980876.77	1.24 x 1.05 x 0.07	Boulder
C_034	C_SSS_026		693112.08	5980863.50	0.77 x 0.52 x 0.29	Boulder
C_035	C_SSS_027		692482.06	5981313.77	2.02 x 1.67 x 0.21	Boulder
C_036	C_SSS_028		692070.33	5981121.36	1.24 x 1.17 x 0.12	Boulder
C_037	Not Found in SSS		691990.67	5981062.77	1.65 x 1.53 x 0.1	Boulder
C_038	C_SSS_029		692028.16	5981041.90	1.42 x 1.53 x 0.2	Boulder
C_039	C_SSS_030		691918.56	5981028.88	1.47 x 1.01 x 0.07	Boulder
C_040	C_SSS_031		693361.06	5981179.64	3.3 x 2.5 x 0.4	Boulder
C_041	C_SSS_032		693215.01	5977998.98	1.16 x 1.08 x 0.13	Boulder
C_042	C_SSS_033		693207.78	5977992.60	1 x 0.38 x 0.1	Boulder
C_043	C_SSS_034		692596.17	5975393.51	3.26 x 1.97 x 0.36	Boulder - Matches UHL19008-Oriel_SSS_197
C_044	C_SSS_035		692663.86	5976111.65	3 x 2.96 x 0.64	Boulder
C_045	C_SSS_036		692631.95	5976154.77	3.01 x 3.02 x 0.61	Boulder
C_046	C_SSS_037		694365.15	5979503.78	2.51 x 1.39 x 0.45	Boulder
C_047	C_SSS_038		694327.82	5979462.08	1.9 x 2.47 x 0.36	Boulder
C_048	C_SSS_039		691850.26	5980917.34	1.52 x 1.05 x 0.18	Boulder
C_049	C_SSS_040		693228.98	5978014.68	0.95 x 0.45 x 0.74	Boulder
C_050	Not Found in SSS		692594.55	5975518.32	1.52 x 0.65 x 0.1	Boulder
C_051	Not Found in SSS		691582.14	5980984.91	1.32 x 0.82 x 0.35	Boulder
C_052	C_SSS_041		691853.17	5981615.26	1.73 x 1.21 x 0.47	Boulder
C_053	Not Found in SSS		690801.57	5980683.62	1.47 x 0.77 x 0.11	Boulder
C_054	C_SSS_042		693559.5	5976833.53	2.80 x 2.00 x 0.73	Boulder
C_055	C_SSS_043		690785.83	5980776.20	1.79 x 1.43 x 0.31	Boulder
C_056	C_SSS_044		694386.8	5977013.63	2.10 x 1.87 x 0.48	Boulder
C_057	Not Found in SSS		694125.9	5975979.68	3.71 x 3.17 x 0.57	Boulder
C_058	Not Found in SSS		690717.18	5980794.80	1.51 x 1.1 x 0.13	Boulder
C_059	C_SSS_045		690705.80	5980795.75	0.7 x 0.58 x 0.22	Boulder
C_060	C_SSS_046		690712.23	5980849.60	0.53 x 0.39 x 0.28	Boulder
C_061	Not Found in SSS		690625.33	5980898.05	0.97 x 0.77 x 0.14	Boulder
C_062	C_SSS_047		690590.16	5980889.04	0.98 x 0.68 x 0.26	Boulder

MBES Target ID	SSS Target ID	MAG Target ID	Easting	Northing	Dimensions (m) L x W x H	Comment
C_063	C_SSS_048		690566.14	5980723.51	0.65 x 1 x 0.3	Boulder
C_064	C_SSS_049		691376.26	5980705.18	0.9 x 0.57 x 0.26	Boulder
C_065	C_SSS_050		691551.15	5980755.88	1.75 x 0.84 x 0.67	Boulder
C_066	Not Found in SSS		691574.94	5980746.55	0.72 x 0.64 x 0.34	Boulder
C_067	C_SSS_051		691648.35	5980815.36	1.05 x 0.94 x 0.18	Boulder
C_068	Not Found in SSS		691651.50	5980802.83	1.14 x 1.06 x 0.16	Boulder
C_069	C_SSS_052		691802.23	5980730.24	4.5 x 2.6 x 0.23	Boulder
C_070	Not Found in SSS		692260.85	5980387.72	1.1 x 0.94 x 0.28	Boulder
C_071	C_SSS_053		692763.38	5980855.06	1.53 x 0.98 x 0.15	Boulder
C_072	C_SSS_054		693452.54	5980839.04	2.8 x 2.45 x 0.36	Boulder
C_073	C_SSS_055		693959.91	5980412.77	1.52 x 1.1 x 0.97	Boulder
C_074	C_SSS_056		694483.24	5980108.54	2.56 x 2.35 x 0.53	Boulder
C_075	C_SSS_057		692663.33	5979299.88	5.31 x 4.96 x 0.44	Boulder
C_076	Not Found in SSS		692766.80	5979252.81	2.56 x 2.4 x 0.22	Boulder
C_077	C_SSS_058		692865.243	5981249.72	4.62 x 3.50 x 0.06	Boulder
C_078	Not Found in SSS		692587.56	5977046.45	1.31 x 1.02 x 0.11	Boulder
C_079	Not Found in SSS		693262.55	5977966.15	0.98 x 0.59 x 0.08	Boulder
C_080	C_SSS_059		693257.08	5977959.89	0.98 x 0.55 x 0.79	Boulder
C_081	C_SSS_060		693586.64	5979954.68	1.46 x 0.45 x 0.13	Boulder
C_082	Not Found in SSS		693941.54	5978902.98	1.33 x 0.7 x 0.24	Boulder
C_083	C_SSS_061		693634.26	5978157.08	1.85 x 1.66 x 0.2	Boulder
C_084	C_SSS_062		694283.02	5978240.12	1.47 x 1.32 x 0.13	Boulder
C_085	C_SSS_063		694553.63	5978653.87	2.05 x 2 x 0.39	Boulder
C_086	C_SSS_064		694568.83	5978690.30	1.67 x 1.33 x 0.11	Boulder
C_087	C_SSS_065		694463.36	5978966.56	3.07 x 1.76 x 0.53	Boulder
C_088	C_SSS_066		694522.10	5978985.35	2.41 x 1.42 x 0.25	Boulder
C_089	C_SSS_067		694416.80	5979026.19	1.06 x 0.85 x 0.11	Boulder
C_090	C_SSS_068		694637.11	5979334.76	1.34 x 1.09 x 0.23	Boulder
C_091	C_SSS_069		694528.03	5979598.38	2.07 x 2.03 x 0.29	Boulder
C_092	C_SSS_070		694465.56	5979605.74	2.93 x 2 x 0.29	Boulder
C_093	C_SSS_071		694504.85	5979685.03	1.76 x 1.59 x 0.13	Boulder
C_094	C_SSS_072		694526.44	5979534.91	1.58 x 1.44 x 0.98	Boulder
C_095	Not Found in SSS		694597.77	5979572.38	1.29 x 1.09 x 0.1	Boulder
C_096	Not Found in SSS		694509.88	5979661.71	1.25 x 0.01 x 0.07	Boulder

MBES Target ID	SSS Target ID	MAG Target ID	Easting	Northing	Dimensions (m) L x W x H	Comment
C_097	C_SSS_073		694400.16	5979828.73	2.33 x 2.14 x 0.14	Boulder
C_098	C_SSS_074		694449.06	5979842.56	2.25 x 1.95 x 0.46	Boulder
C_099	C_SSS_075		690754.82	5980374.09	1.42 x 1.33 x 0.43	Boulder
C_100	C_SSS_076		689888.48	5978745.94	1.68 x 1.27 x 0.35	Boulder
C_101	C_SSS_077		692476.58	5979198.41	1.42 x 1.7 x 0.2	Boulder
C_102	C_SSS_078		692524.39	5979202.70	1.03 x 0.3 x 0.26	Boulder
C_103	C_SSS_079		692548.71	5979209.01	2.4 x 2.54 x 0.24	Boulder
C_104	C_SSS_080		692500.11	5979196.88	2.19 x 0.81 x 0.2	Boulder
C_105	C_SSS_081		692387.19	5978726.74	2.29 x 1.82 x 0.19	Boulder
C_106	C_SSS_082		692603.69	5977021.30	1.37 x 1.01 x 0.17	Boulder
C_107	C_SSS_083		692881.30	5981169.86	1.15 x 0.79 x 0.13	Boulder - Matches with UHL19008-Oriel_SSS_243
C_108	C_SSS_084		694561.38	5979804.42	1.21 x 1.15 x 0.9	Boulder
C_109	C_SSS_085		694290.95	5979801.99	1.07 x 0.72 x 0.07	Boulder
C_110	C_SSS_086		694381.59	5979648.70	4.9 x 1.2 x 0.16	Cluster of boulders
C_111	Not Found in SSS		694377.95	5979657.02	1.56 x 1.49 x 0.12	Boulder
C_112	C_SSS_087		694409.57	5979581.65	0.62 x 0.56 x 0.06	Boulder
C_113	Not Found in SSS		694460.92	5979342.48	1.13 x 0.4 x 0.09	Boulder
C_114	Not Found in SSS		694586.58	5978930.92	1.23 x 1.04 x 0.07	Boulder
C_115	Not Found in SSS		694664.20	5978772.17	1 x 0.92 x 0.13	Boulder
C_116	C_SSS_088		694626.50	5978635.42	1.61 x 1.51 x 0.1	Boulder
C_117	C_SSS_089		694725.46	5978585.36	2.72 x 2.44 x 0.21	Boulder
C_118	C_SSS_090		694603.00	5978537.82	1.88 x 1.75 x 0.11	Boulder
C_119	Not Found in SSS		694593.61	5978539.25	1.57 x 1.17 x 0.12	Boulder
C_120	C_SSS_091		694464.12	5978573.04	1.42 x 1.13 x 0.17	Boulder
C_121	Not Found in SSS		694539.62	5978605.17	2.33 x 1.62 x 0.11	Boulder
C_122	C_SSS_092		694333.25	5978541.47	1.3 x 1.04 x 0.08	Boulder
C_123	C_SSS_093		694487.19	5978404.78	1.16 x 0.66 x 0.14	Boulder
C_124	Not Found in SSS		693846.37	5977813.89	1.18 x 0.61 x 0.19	Boulder
C_125	C_SSS_094		694792.65	5977726.06	1.14 x 0.96 x 0.77	Boulder
C_126	C_SSS_095		694617.73	5977770.19	1.37 x 0.75 x 0.15	Boulder
C_127	C_SSS_096		694314.53	5977743.89	1.6 x 1.19 x 0.09	Boulder
C_128	C_SSS_097		692481.88	5976801.09	1.77 x 0.72 x 0.32	Boulder
C_129	Not Found in SSS		694440.43	5977635.37	2.05 x 1.78 x 0.36	Boulder

MBES Target ID	SSS Target ID	MAG Target ID	Easting	Northing	Dimensions (m) L x W x H	Comment
C_130	Not Found in SSS		694482.68	5977665.01	1.37 x 1.06 x 0.16	Boulder - Matches UHL19008-Oriel_SSS_375
C_131	C_SSS_098		694411.22	5977590.68	1.7 x 0.75 x 0.31	Boulder
C_132	C_SSS_099		692445.72	5976274.38	1.16 x 1.09 x 0.08	Boulder
C_133	C_SSS_100		694415.76	5977558.36	2.9 x 1.4 x 0.1	Boulder
C_134	C_SSS_101		694491.49	5977530.87	1.14 x 1.06 x 0.22	Boulder
C_135	C_SSS_102		694474.23	5977399.04	2.01 x 0.92 x 0.18	Boulder
C_136	C_SSS_103		694527.81	5977481.99	2.24 x 0.34 x 0.16	Boulder
C_137	C_SSS_104		694516.85	5977460.69	1.94 x 0.91 x 0.07	Boulder
C_138	Not Found in SSS		694437.23	5977500.69	1.23 x 1.2 x 0.13	Boulder
C_139	C_SSS_105		694377.14	5977401.06	2.58 x 1.43 x 0.22	Boulder
C_140	C_SSS_106		694625.98	5977217.85	2.01 x 1.56 x 0.24	Boulder
C_141	C_SSS_107		694651.99	5977119.00	2.13 x 1.16 x 0.22	Boulder
C_142	C_SSS_108		694512.05	5977146.08	2.62 x 1.67 x 0.68	Boulder
C_143	C_SSS_109		694514.63	5977137.21	12.96 x 3.79 x 0.15	Cluster of boulders
C_144	C_SSS_110		694525.04	5977180.23	9.16 x 7.37 x 0.18	Cluster of boulders
C_145	C_SSS_111		694420.22	5977286.22	1.67 x 1.35 x 0.37	Boulder
C_146	C_SSS_112		694464.09	5977289.30	7.26 x 1.7 x 0.43	Cluster of boulders
C_147	C_SSS_113		692859.663	5981249.73	2.67 x 1.92 x 0.07	Boulder
C_148	Not Found in SSS		694450.22	5977247.12	5.23 x 5.22 x 0.18	Boulder
C_149	C_SSS_114		694446.08	5977241.46	1.41 x 1.35 x 0.15	Boulder
C_150	Not Found in SSS		694292.94	5977175.02	1.37 x 1.08 x 0.11	Boulder
C_151	C_SSS_115		692870.24	5977677.04	1.67 x 1.1 x 0.33	Boulder
C_152	C_SSS_116		692676.31	5977420.56	1.3 x 0.7 x 0.95	Boulder
C_153	Not Found in SSS		692682.17	5977334.78	1.29 x 0.72 x 0.07	Boulder
C_154	Not Found in SSS		692677.41	5977332.71	1.14 x 0.8 x 0.1	Boulder
C_155	C_SSS_117		692689.00	5977524.67	1.77 x 1.36 x 0.37	Boulder
C_156	C_SSS_118		692814.07	5977354.90	1.66 x 1.63 x 0.32	Boulder
C_157	C_SSS_119		692698.91	5975662.88	2.22 x 1.4 x 0.5	Boulder
C_158	C_SSS_120		692683.23	5977340.87	1.9 x 1.63 x 0.13	Boulder
C_159	Not Found in SSS		692667.01	5977287.05	1.51 x 1.26 x 0.1	Boulder
C_160	C_SSS_121		692651.73	5977249.54	1.3 x 0.92 x 0.14	Boulder
C_161	Not Found in SSS		692724.69	5976894.24	1.51 x 0.95 x 0.15	Boulder
C_162	Not Found in SSS		692602.24	5975536.40	1.93 x 0.86 x 0.12	Boulder
C_163	C_SSS_122		692957.58	5976479.50	2.1 x 1.71 x 0.09	Boulder

MBES Target ID	SSS Target ID	MAG Target ID	Easting	Northing	Dimensions (m) L x W x H	Comment
C_164	C_SSS_123		693028.56	5976429.08	2.09 x 1.15 x 0.25	Debris with 132.16m-long trailing scar
C_165	C_SSS_124		692901.74	5976411.59	1.62 x 0.95 x 0.14	Boulder
C_166	Not Found in SSS		692746.78	5976162.21	1.09 x 0.38 x 0.08	Boulder
C_167	C_SSS_125		691813.35	5977196.92	1.29 x 1.29 x 0.13	Boulder
C_168	C_SSS_126		692034.86	5977253.78	1.97 x 1.12 x 0.14	Boulder
C_169	C_SSS_127		692217.82	5977421.04	2.92 x 2.43 x 0.32	Boulder
C_170	Not Found in SSS		692316.48	5977379.54	1.92 x 2.22 x 0.07	Boulder
C_171	C_SSS_128		692370.81	5977199.30	1.97 x 1.43 x 0.25	Boulder
C_172	C_SSS_129		692275.90	5977190.56	2.76 x 1.47 x 0.2	Boulder
C_173	Not Found in SSS		692274.83	5977255.45	2.13 x 1.46 x 0.13	Boulder
C_174	Not Found in SSS		692265.01	5977229.14	2.21 x 1.83 x 0.09	Boulder
C_175	Not Found in SSS		692270.20	5977228.85	1.68 x 0.98 x 0.13	Boulder
C_176	Not Found in SSS		692262.42	5977226.57	1.18 x 0.82 x 0.8	Boulder
C_177	Not Found in SSS		692216.59	5977265.28	1.41 x 0.79 x 0.76	Boulder
C_178	Not Found in SSS		692300.69	5977141.63	0.89 x 0.58 x 0.12	Boulder
C_179	C_SSS_130		692252.83	5977196.00	1.83 x 1.16 x 0.1	Boulder
C_180	C_SSS_131		692597.99	5977226.52	0.45 x 0.29 x 0.32	Boulder
C_181	C_SSS_132		692442.16	5977200.66	1.17 x 1.53 x 0.09	Boulder
C_182	C_SSS_133		692547.66	5977306.79	1.68 x 0.92 x 0.25	Boulder
C_183	C_SSS_134		692076.28	5976016.51	1.87 x 1.52 x 0.09	Boulder - Matches UHL19008-Oriel_SSS_142
C_184	C_SSS_135		692607.81	5975419.96	1.71 x 1.25 x 0.13	Boulder
C_185	C_SSS_136	C_Mag_009	691077.01	5978966.68	37.1 x 21.6 x 2.3	Met Mast
C_186	C_SSS_137		693133.84	5980928.19	1.61 x 1.14 x 0.35	Boulder
C_187	C_SSS_138		692884.76	5981251.54	3.10 x 1.80 x 0.08	Boulder
	C_SSS_139		692960.60	5975152.00	5.17 x 1.15 x 0.90	Not present in MBES
	C_SSS_140		692407.70	5976944.00	1.39 x 0.39 x 2.66	Not present in MBES
	C_SSS_141		692659.00	5977373.00	1.03 x 0.97 x 1.47	Not present in MBES
	C_SSS_142		692505.90	5975958.00	0.45 x 0.24 x 0.66	Not present in MBES
	C_SSS_143		692900.60	5981179.00	0.43 x 0.38 x 0.55	Not present in MBES
	C_SSS_144		693294.10	5981617.00	1.25 x 0.61 x 1.81	Not present in MBES
	C_SSS_145		692671.30	5979296.00	3.91 x 1.45 x 2.44	Not present in MBES
	C_SSS_146		691968.70	5980913.00	0.47x 0.24 x 1.04	Not present in MBES
	C_SSS_147		692077.00	5981169.00	1.18 x 0.36 x 1.31	Not present in MBES

MBES Target ID	SSS Target ID	MAG Target ID	Easting	Northing	Dimensions (m) L x W x H	Comment
	C_SSS_148		692336.60	5980549.00	1.36 x 0.18 x 0.63	Not present in MBES
	C_SSS_149		691600.20	5980983.00	2.00 x 0.35 x 1.39	Not present in MBES

Appendix 3: Target List acquired by XOcean for the Oriel Offshore Windfarm export cable corridor area in 2022

Source: Corrick, '00442-PAR-IRE-WIND Parkwind –ECR Survey. Project execution and results report', Appendix 1.

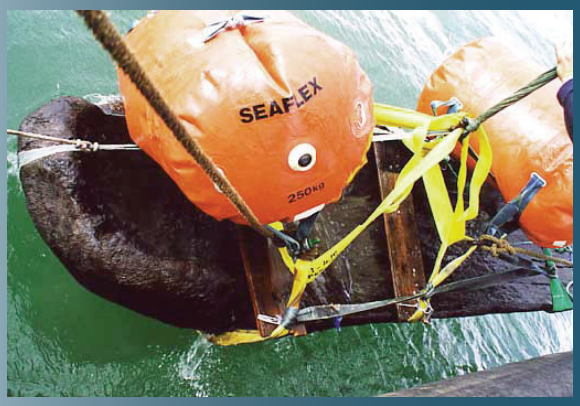
Non-boulder targets are highlighted in blue for ease of reference

MBES Target ID	SSS Target ID	MAG Target ID	Easting	Northing	Dimensions (m) L x W x H	Comment
E_001	E_SSS_001	Not Found	681569.15	5971221.45	0.86 x 0.68 x 0.40	Boulder
E_002	E_SSS_002	Not Found	681576.49	5971225.38	1.37 x 1.21 x 0.31	Boulder
E_003	E_SSS_003	Not Found	682401.11	5971658.98	19.38 x 15.63 x 1.61	Large collection of boulders within defined boulder area
E_004	E_SSS_004	Not Found	684341.35	5972824.35	1.31 x 0.99 x 0.30	Boulder
E_005	E_SSS_005	Not Found	688590.16	5976779.93	3.12 x 3.02 x 0.60	Debris
E_006	E_SSS_006	Not Found	684291.21	5972846.75	1.01 x 0.71 x 0.37	Boulder
E_007	E_SSS_007	Not Found	685065.25	5972050.31	2.40 x 1.56 x 1.07	Boulder
E_008	E_SSS_008	Not Found	684903.98	5971981.29	0.95 x 0.58 x 0.29	Boulder
E_009	Not Found	Not Found	685009.44	5972630.66	2.33 x 1.81 x 0.56	Boulder
E_010	Not Found	Not Found	684394.04	5972892.7	0.99 x 0.86 x 0.26	Boulder
E_011	Not Found	Not Found	688226.63	5977069.29	0.91 x 0.91 x 0.47	Boulder
E_012	E_SSS_009	Not Found	688367.49	5977092.9	1.71 x 0.60 x 0.38	Debris
E_013	E_SSS_010	Not Found	688183.05	5976850.62	1.65 x 1.22 x 0.52	Boulder
E_014	E_SSS_011	Not Found	688099.79	5976785.63	1.18 x 1.10 x 0.26	Debris
E_015	Not Found	Not Found	689402.21	5976779.3	1.62 x 1.50 x0.69	Boulder
E_016	E_SSS_012	Not Found	688130.01	5976679.2	1.75 x 1.20 x 0.45	Boulder
E_017	E_SSS_013	Not Found	688105.51	5976729.56	1.33 x 1.22 x 0.59	Boulder
E_018	E_SSS_014	Not Found	688192.99	5976529.46	2.04 x 1.68 x 0.48	Debris
E_019	Not Found	Not Found	688059.32	5976436.58	2.06 x 1.37 x 0.40	Boulder
E_020	Not Found	Not Found	688285.17	5976423.99	1.77 x 0.97 x 0.51	Boulder
E_021	Not Found	Not Found	686859.56	5974725.55	3.60 x 2.97 x 0.75	Boulder
E_022	E_SSS_015	Not Found	686496.12	5974394.16	2.60 x 2.42 x 0.69	Debris
E_023	E_SSS_016	Not Found	686495.56	5974400.82	1.09 x 1.07 x 0.37	Debris

MBES Target ID	SSS Target ID	MAG Target ID	Easting	Northing	Dimensions (m) L x W x H	Comment
E_024	E_SSS_017	E_MAG_018	685650.08	5972769.93	50.60 x 8.94 x 2.26	TOPAZ, steam ship, wreck ID: 6954, dangerous wreck
E_025	Not Found	Not Found	685646.79	5972353.04	3.08 x 1.56 x 0.32	Debris
E_026	Not Found	Not Found	685742.63	5973603.78	0.89 x 0.83 x 0.24	Boulder
E_027	E_SSS_018	Not Found	685826.5	5972775.41	1.72 x 1.20 x 0.68	Debris
E_028	Not Found	Not Found	686055.23	5973633.47	2.82 x 1.65 x 0.43	Boulder
E_029	Not Found	Not Found	686217.49	5973834.21	5.06 x 4.43 x 0.16	Debris
E_030	E_SSS_019	Not Found	681526.7	5970606.06	1.30 x 1.06 x 0.24	Boulder
E_031	E_SSS_020	Not Found	681520.19	5971187.58	1.45 x 1.17 x 0.30	Debris
E_032	E_SSS_021	Not Found	681517.73	5971186.43	0.86 x 0.69 x 0.34	Boulder
E_033	E_SSS_022	Not Found	681539.76	5971199.53	1.17 x 0.86 x 0.24	Boulder
E_034	E_SSS_023	Not Found	681770.26	5971175.82	2.28 x 1.26 x 0.32	Debris
E_035	E_SSS_024	Not Found	681891.82	5971150.71	1.56 x 0.59 x 0.23	Boulder
E_036	Not Found	Not Found	682195.92	5971173.35	1.52 x 1.26 x 0.52	Boulder
E_037	Not Found	Not Found	684282.9	5971763.94	0.92 x 0.82 x 0.31	Boulder
E_038	E_SSS_025	Not Found	684215.63	5971929.08	1.61 x 1.26 x 0.28	Boulder
E_039	E_SSS_026	Not Found	684245.52	5972029.86	1.39 x 1.36 x 0.27	Boulder
E_040	Not Found	Not Found	685531.46	5973082.87	1.59 x 1.36 x 0.33	Boulder
E_041	Not Found	Not Found	684283.96	5972841.681	1.01 x 0.57 x 0.35	Boulder
E_042	Not Found	Not Found	684415.15	5972874.685	0.52 x 0.27 x 0.15	Boulder
E_043	Not Found	Not Found	684466.371	5972847.422	1.36 x 0.87 x 0.39	Boulder
E_044	Not Found	Not Found	684497.973	5972838.441	1.12 x 1.01 x 0.30	Boulder
E_045	Not Found	Not Found	684477.654	5972856.134	1.58 x 0.98 x 0.33	Boulder
E_046	Not Found	Not Found	684495.71	5972751.305	0.82 x 0.44 x 0.14	Boulder
E_047	Not Found	Not Found	688214.889	5976538.793	0.85 x 0.82 x 0.11	Boulder

ADCO

Professional Diving Solutions
Leading Maritime Archaeology



Providing effective underwater and land-based archaeological solutions since 1999.

Conducting intelligent diving and underwater/marine inspections and NDT for the civils and scientific sectors.

Specialised in marine geophysical data interpretation.

Precision survey using latest equipment, including 3D Laser-scanning services.

ADCO works closely with clients from project inception, through EIS, to full construction stages, delivering the highest quality effectively.

ADCO Ltd.
Church Terrace, Bray
Co.Wicklow, A98 P3V2
Ireland

www.adco-ie.com
info@adco-ie.com
+353 (0) 1 908 1541

Achilles
Supply-Line
SILVER PLUS

SAFETY MANAGEMENT
SAFECERT
CONSTRUCTION SECTOR
CERTIFIED SYSTEM

Celebrating 25 years at the forefront of Underwater Archaeology in Ireland