APPENDIX 17-1

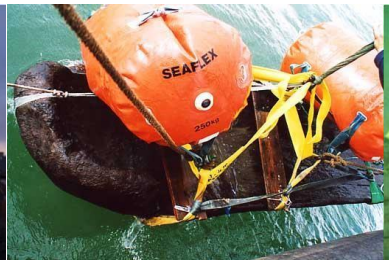
SCEIRDE ROCKS OFFSHORE WIND FARM MARINE GEOPHYSICAL SURVEY ARCHAEOLOGICAL INTERPRETATION 2022 (ADCO, 2023).

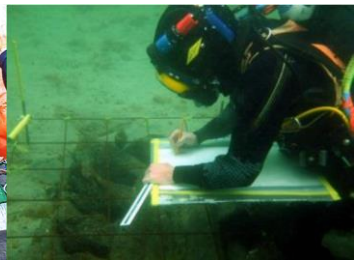
Sceirde Rocks Offshore Wind Farm

Marine Geophysical Survey

Archaeological Interpretation

22R0105





Sceirde Rocks Offshore Wind Farm

Marine Geophysical Survey

Archaeological Interpretation

22R0105

Final	28/06/2023
Client	**GDG for** Fuinneamh Sceirde Teoranta**.**
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Contents

Abbreviations

ADCO -	Archaeological Diving Company Ltd
AIA -	Archaeological Impact Assessment
DHLGH -	Department of Housing, Local Government and Heritage
E -	Easting
ECC -	Export Cable Corridor
EIS -	Environmental Impact Statement
GDG -	Gavin & Doherty Geosolutions Ltd
GI -	Geotechnical Investigations
ITM -	Irish Transverse Mercator
INFOMAR -	Integrated Mapping for the Sustainable Development of Ireland's Marine Resource
LAT -	Lowest Astronomical Tide
MAG -	Magnetometer
MHW -	Mean High Water
N -	Northing
NGR -	National Grid Reference
NMS -	National Monuments Service
OD -	Ordnance Datum
RMP -	Register of Monuments and Places
SBCPT -	Sub-bottom cone penetration test
SBP -	Sub-bottom Profile
SI -	Site Investigations
SSS -	Side-Scan Sonar
UAIA -	Underwater Archaeological Impact Assessment
UAU -	Underwater Archaeology Unit
UTM -	Universal Transverse Mercator

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Executive Summary

Project: Sceirde Rocks OWF
Location: 5km off the West Coast, northwest of the Aran Islands
UTM 29N: 435941E 5902437N (Array central point)
Consent 22R0105
Subject: Archaeological review of marine geophysical survey data acquired across project area

Introduction

A Marine Geophysical Survey has been carried out within the proposed Export Cable Corridor (ECC) area and the Array area for the Sceirde Rocks Offshore Wind Farm under consent 22R0105 acquired for the project.

The purpose of the current report is to provide sufficient information to understand the nature and extent of the archaeological risk associated with the survey area by describing and discussing the existing baseline information established from desk studies and from the 2022 site-specific survey. Existing details relating to specific known sites and features are presented in Appendix 1. Details relating to observations as a result of the 2022 site-specific survey are presented in Appendix 2.

The report also sets out at a high level the likely archaeological strategy and requirements expected to ensure that the integrity of the maritime cultural heritage is maintained and that any new discoveries which may come to light in the course of project works are observed, recorded and resolved where necessary. It is anticipated that the observations, assessment and recommendations will continue to be refined as the project develops.

Receiving environment

The underlying geology of the area indicates a thin substrate of sand with large exposures of bedrock.

The potential exists for prehistoric material to be associated with submerged palaeocoastlines that are indicated across the array area.

There is one known shipwreck within the survey area, W09419, and only a small number of other known wreck sites in proximity to the surveyed area . W09419 records the loss of the fishing vessel *Arosa* in 2000. The location recorded in the Historic Shipwreck Inventory differs from that recorded in the Marine Accident Investigation Report.

Marine geophysical survey 2022

The Marine geophysical survey completed in 2022 for the project under consent 22R0105 included multibeam bathymetry, side-scan sonar, magnetometry and sub-bottom profile survey.

The present report focuses on a review and interpretation of the data sets acquired.

The extent of survey completed is robust and comprehensive.

The data shows confirms the shallow sand and extensive exposure of bedrock.

The survey did not record features at the charted location of W09419.

No new wreck sites were observed in the course of the survey.

This report concludes that the location for W09419 recorded in the Historic Shipwreck Inventory appears to be incorrect. It is likely that the location given in the Marine Accident Investigation report is correct, and that location is outside the surveyed area.

The 2022 survey was able to reach 600 m of the shoreline with multibeam and 1200 m of the shoreline with side scan sonar, magnetometry and sub bottom profile survey. This leaves a gap in coverage that has not been surveyed.

Recommendations

The principal of avoidance with known archaeological sites and sites of archaeological potential is recommended. No Archaeological Exclusion Zones (AEZ) apply to the areas surveyed in 2022.

Further Marine geophysical surveys, and geotechnical investigations will take place in advance of construction to ensure that any new sites and features are identified and avoided.

Further archaeological assessment of the data gap at the landfall location should be considered.

Intertidal Archaeology Survey licensed by the Department of Housing, Local Government and Heritage (DHLGH) may be required once the landfall location is confirmed.

An Archaeological Management Plan (AMP) will be prepared to inform the project throughout its lifetime, including construction, operation and decommissioning phases, and will be reviewed and updated at regular intervals.

The recommendations contained in this report are subject to the approval of the National Monuments Service (NMS) at the DHLGH.

1.0 Introduction

The Archaeological Diving Company Ltd (ADCO) was appointed by Gavin and Doherty Geosolutions (GDG) for Fuinneamh Sceirde Teoranta to carry out an archaeological review of marine geophysical survey data acquired in 2022 for the Sceirde Rocks Offshore Wind Farm, under archaeological consent 22R0105 (Figure 1). The Relevant Site Area (RSA) is located 5 to 12 km from the nearest inhabited land at Muinis, Co. Galway, and extends around the small archipelago known as Skerd Rocks. A wider area around the RSA, referred to as the Extended Survey Area (ESA) was also surveyed. For the purposes of the present report, both the RSA and the ESA are referred to simply as the Array area. The Export Cable Corridor (ECC) runs approximately 60 km southwest from the array passing west of the Aran Islands to make landfall in the vicinity of Killard townland adjacent to Doonbeg, Co. Clare.

The principal aim of the report is to provide sufficient information to understand the nature and extent of the archaeological risk associated with the survey area by presenting and discussing the existing baseline information established from desk studies and from the 2022 site-specific survey. Existing details relating to specific known sites and features are presented in Appendix 1. Details relating to observations as a result of the 2022 site-specific survey are presented in Appendix 2.

The report also sets out at a high level the likely archaeological strategy and requirements expected to ensure that the integrity of the maritime cultural heritage is maintained and that any new discoveries identified in the course of the project works are observed, recorded, and resolved where necessary. It is anticipated that the observations, assessment and recommendations will continue to be refined as the project develops.

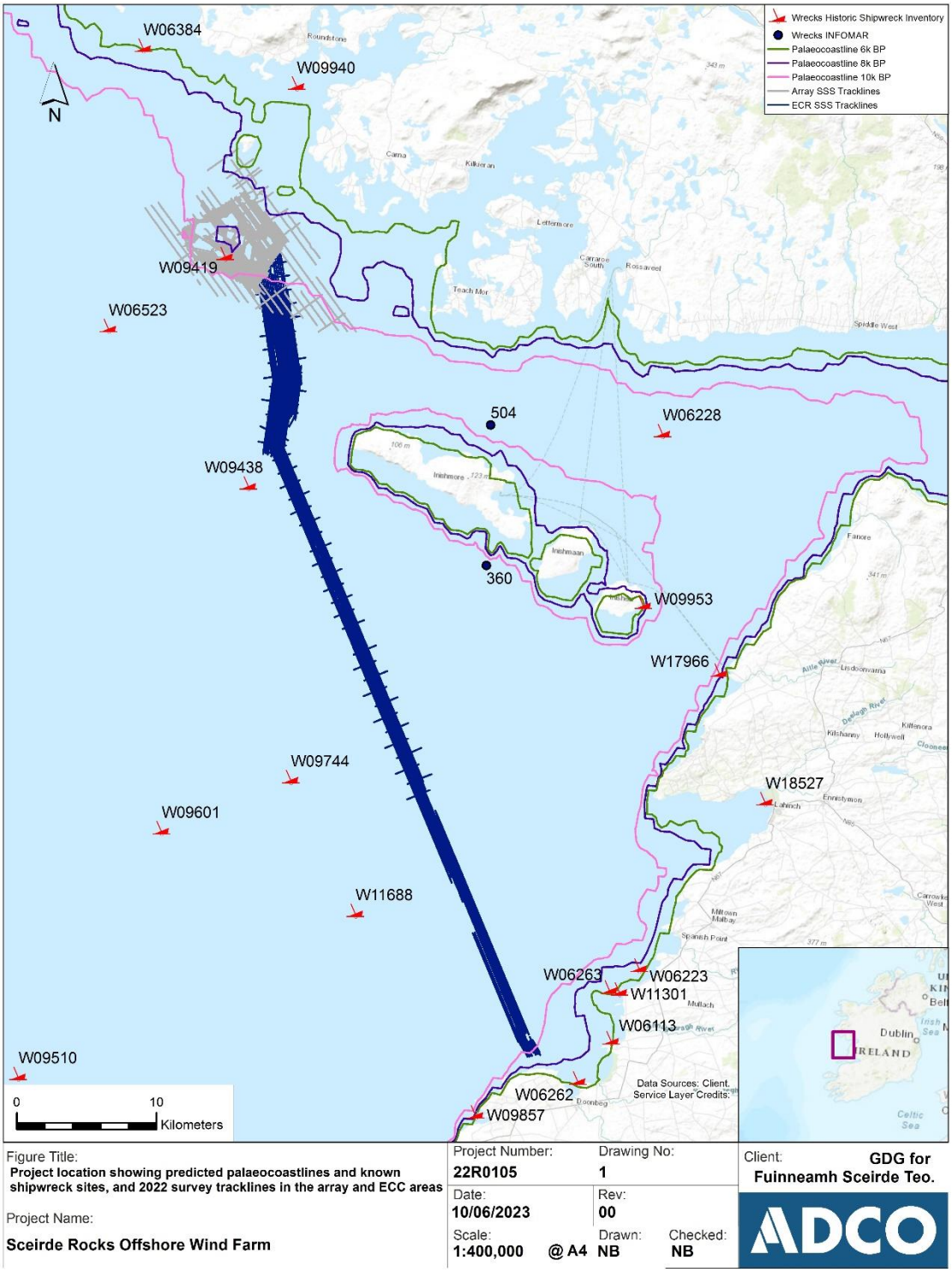


Figure 1: Project area, showing predicted palaeocoastlines and known shipwreck sites, and the 2022 survey tracklines with the Array and ECC areas.

2.0 Receiving environment

2.1 Topography

The Skerd Rocks is an archipelago of rocky outcrops that include a series of named islets, including Doolick in the east; Kelly Rock to the south; Carrickbricks in the centre, and Skerdmore to the west, which is the most prominent of the islets rising 18m above sea level. Below the water's surface lies more rock, some of which lies close to the surface, such as Fool's Shoal to the southeast and present navigation hazards. The seabed also drops precipitously in places to depths in the order of -60 m CD. The exposed bedrock defines the seabed within the project array area, as mapped by the INFOMAR seabed survey.[1] The low-lying bedrock extends south in the ECC area until the Aran Islands, at which point a covering layer of sands and silt is evident and seabed contours are in the range of -80 m, dropping further to -100 m CD as the ECC continues south. Where the ECC approaches landfall in Co. Clare, the underwater topography changes again; the water shallows to -60 m CD some 7 km offshore and exposed bedrock reappears. The ECC follows what appears to be a silt channel that reaches further inshore, while bedrock lies close against the shore where the seabed slopes steeply from depths of -20 m to land.

2.2 Submerged landscapes and palaeocoastlines

Marine transgression and regression is a feature of the post-glacial period when the interplay between rising sea levels due to melting ice sheets and ground level rise due to the rebound effect of land mass formerly buried by ice – isostatic response – occurred. The changes in relative sea level (RSL) differ spatially across Ireland, with isostatic response greatest in the northeast. This had led to raised beaches above the present-day sea level in Antrim and Down, and drowned landscapes along the south coast. The process, while continuous, fluctuated, resulting in changes that are not so much incremental as they are episodic.

The EMODnet Geology project has collated sources that allow for the mapping of coastline change.[2] Three predicted palaeocoastlines have been recorded that would have existed as Ireland was being occupied by people in early prehistoric times, and, therefore, present the possibility that physical remains of the earliest inhabitants may survive in areas associated with ancient shorelines (Figure 1).

The first of these relates to *c.* 10,000 years BP (Before Present, 1950 AD), when the shoreline is considered to have been 11 km west of the present-day shoreline, corresponding broadly with the -20 m CD contour. In this context, the Skerd Rocks would have been dry land and presenting

[1] www.infomar.ie/maps/interactive-maps/dynamic-bathymetric-viewer
[2] EMODnet draws on the following paper to map this information: Anthony Brook, Sarah Bradley, Robin, Edwards and Nicola Goodwyn, 'The palaeogeography of Northwest Europe during the last 20,000 years', *Journal of Maps* 7.1 (2012), pp 573–587.

an indented shoreline populated with many fissures that follow the bedrock's ridges and troughs. In contrast, because of the much deeper depths closer inshore, the same shoreline in the southern part of the project area lay approximately 1.5 km offshore of the current shoreline at Killard, Co. Clare. While Britain had human activity much earlier during the Palaeolithic period (0.78–0.99 million years ago), it was not until after 10,000 BP that full settlement of Ireland is considered to have occurred, as witnessed by the type-site at Mount Sandel, Co. Derry (*c.* 9,800 BP).[3] At this time in Ireland (the Mesolithic period), hunter-fisher-gatherers were actively exploiting the coastlines. The predicted extension of landmass west of the current shoreline to include Skerd Rocks is tantalising but there re are no reported finds from the Skerd Rocks of this time period, or indeed of later periods. A possible flint core was recovered in a lobster pot off Renvyle to the north, and a collection of stone tools of Mesolithic type recovered from the River Corrib establish the presence of human activity in the wider area at this early time.[4]

By *c.* 8,000 BP, the coastline close to the array area lay 5 km west of the present-day shore offshore, while it appears to have reached with 1.5 km of the shoreline by *c.* 6,000 BP, at the start of the Neolithic period. The Neolithic is associated with the transition to settled agriculture. Peat deposits retaining pine stumps located in the present-day intertidal foreshore off Galway have been dated to *c.* 3000 BC, suggesting that RSL in this part of the Atlantic coast was probably 2-4 m lower than at present, and that the present-day coastline may have been established in the historic period at *c.* 500 AD, or the Early Medieval period.[5]

The known archaeological sites associated with submerged landscape across Ireland are located along the present-day shoreline and inshore.[6] There are no known sites within the project area. The absence of such sites, however, indicates the absence of archaeological research rather than the known absence of evidence. Consequently, the acquisition of new data associated with the current project offers the opportunity for fresh insight. Seismic data acquired as part of marine geophysical survey may yield some insight, but borehole data derived from geotechnical investigations presents better opportunities to identify strata indicative of submerged landscapes, such as peat layers in the shallower depths. Intertidal archaeological survey also presents the opportunity to record exposed strata where they exist.

[3] Kieran Westley and Peter Woodman, 'Ireland: submerged prehistoric sites and landscapes', in G. Bailey, N Galanidou, H. Peeters, H. Jöns, M Mennenga (eds), *The archaeology of Europe's drowned landscapes*. Coastal Research Library, 35 (Springer, 2020), pp 221-248, at pp 227–228. https://doi.org/10.1007/978-3-030-37367-2_11pp. 222, 240.
[4] Westley and Woodman, 'Ireland: submerged prehistoric sites and landscapes', pp 227–228.
[5] Michael O'Connell and Karen Molloy, 'Mid- and late-Holocene environmental change in western Ireland: New evidence from coastal peats and fossil timbers with particular reference to relative sea-level change', *The Holocene* 27.12 (2017), 1825-1845. https://doi.org/10.1177/0959683617708447
[6] Kieran Westley and Peter Woodman, 'Ireland: submerged prehistoric sites and landscapes', in G. Bailey, N Galanidou, H. Peeters, H. Jöns, M Mennenga (eds), *The archaeology of Europe's drowned landscapes*. Coastal Research Library, 35 (Springer, 2020), pp 221-248, at p. 227 Fig. 11.3. https://doi.org/10.1007/978-3-030-37367-2_11

2.2 Shipwreck

The Historic Shipwreck Inventory (HSI) maintained by the National Monuments Service (NMS) at the Department of Housing, Local Government and Heritage (DHLGH) is the principal resource for understanding the history of shipwreck and related marine losses off Ireland's coastline.

The inventory includes recorded shipwreck events as well as the locations of known shipwreck sites. Reports of shipwreck events in Ireland begin to be written down systematically from the mid-1700s and this body of information is a source for understanding the pattern of historic wrecking from the eighteenth century through to the modern period. The history of shipwreck before the eighteenth century is not well documented.

A shipwrecking event and other marine loss would be made by those watchers and reporters who might be positioned on the shore and who saw and recorded a ship in distress, or have been part of rescue parties dispatched to save crews and passengers and recover cargo. Their records will typically position the ship in relation to the nearest topographic reference point.

One can expect the Atlantic seaboard to retain extensive numbers of shipwrecking events but those that occurred any distance offshore may not have been recorded. Perhaps the most infamous sequence of historic maritime tragedy along this coastline is associated with the retreat of the Spanish Armada in 1588, when the remaining elements of the fleet of 130 ships assembled by King Philip II of Spain to invade England battled extreme weather as they limped back to Spain. Only 67 ships returned, and it is thought that 33 of the 63 vessels lost were wrecked along the Irish coast.[7] Between Carna, Co. Galway and Doonbeg, Co. Clare, there are four Armada wrecks noted: the *Concepcíon de Juan de Cano* was an 18-gun vessel built in 1585 that wrecked off Carna, but its precise location is not known. Similarly, an unnamed Armada vessel is believed to have wrecked in Galway Bay but its location is not known. In contrast, the remaining two wrecks are known sites. The wreck of the 790-tonne Portuguese built galleon, the *San Marcos* (Historic Shipwreck Inventory reference W06263), is located off Tromore, Co. Clare, 7 km east of the ECC survey area. The wreck of the *San Estaban* (W06262) lies much closer to the project area and is 3m inshore from the southern element of the surveyed ECC. The vessel is positioned just north of McGrath's Point on the east side of Doonbeg Bay. The ship was built in Cantabria in 1586, weighed 936 tonnes and was armed with a complement of 20 guns.

If these four vessels of the Spanish Armada serve to highlight the potential for new discovery of shipwreck, the remaining records of wreck, if less spectacular, are no less important. One vessel whose name is not known was identified at the base of Skerd Mór, based on the report of a

[7] John Miles, 'Spanish Armada wrecks on the Irish coast', *History Ireland* 29.5 (2021).

large anchor, and the Historic Shipwreck Inventory archives record a series of seventeen other vessels lost between Mweenish Bay, Roundstone and Mutton Island to the south.

In addition to the *San Marcos* and the *San Estaban*, there are several other known shipwreck sites in the wider area, as presented on Figure 1 but there is only a single known shipwreck charted within the surveyed area. Wreck W09419 reports the loss of MFV *Arosa* on 3rd October 2000, off Skerd Mór (Table 1; Appendix 1). As the vessel is less than one hundred years of age, it does not retain statutory protection as an archaeological site. However, twelve of the thirteen crew died in the wrecking of the *Arosa*, and the event has been the subject of a Marine Accident Investigation, as summarised in Appendix 1. As will be discussed in section 3.6, the coordinate recorded in the HSI appears to be inaccurate, and the more accurate location places the wreck site against the toe of the rocky islet. It is in a location that is outside the area surveyed in 2022 and is outside any impact zone associated with the proposed offshore wind farm.

Reference	Name	Date of Loss	UTM 29N Easting	UTM 29N Northing
W09419	MFV *Arosa*	03/10/2000	433599	5900911

Table 1: Known Shipwreck locations within the surveyed area. See Appendix 1 for further information.

2.3 Modern infrastructure

The IRIS communications cable crosses the ECC, and its installation coincided with the time the marine geophysical survey was being carried out. There are two Ocean Energy facilities in the wider area, but neither is within the project surveyed area.[8] These are: Western Star Wave / Project *Saoirse*, located to the east of the surveyed area and lying 5 km off Hags Head, Co. Clare; and the West Wave Demonstration project, located west of the surveyed area and lying 6.6 km off Killard, Co. Clare.

3.0 Marine geophysical survey 2022

3.1 Extent

Marine geophysical survey completed in 2022 for the project under consent 22R0105 has conducted multibeam bathymetry, side-scan sonar, magnetometry and sub-bottom profile survey. The survey extent is indicated on Figure 1, which shows the extent of the side scan sonar tracklines.

[8] https://emodnet.ec.europa.eu/geoviewer/

The survey was carried out by EGS International Ltd and was conducted in two stages, with the ECC and the array areas being surveyed separately. The two survey areas overlapped in terms of coverage, and an inshore vessel, *Ocean Navigator*, was used to survey across the shallower areas within the array area, while it and an offshore survey vessel, *EGS Ventus*, were deployed for the larger survey areas. The 2022 survey was able to reach within *c.* 1200 m of the shore off Killard townland, Co. Clare with side scan sonar, magnetometry and sub bottom profile survey, and *c.* 600 m of the shore with multibeam. This leaves a potential gap in coverage that has not been surveyed to the ultimate landfall location, the location of which is still under review.

The area surveyed included the location of only one known wrecksite namely, W09419.

The survey was completed between 16 June and 1 September, with work commencing on the ECC area.

The present report focuses on an archaeological review and interpretation of the data sets acquired over the survey area.

3.2 Data

The following data received was reviewed:

Reference	Source File	Type
Bathymetry	.tiff	Processed georeferenced image files
Side Scan Sonar	.xtf files, High Frequency: 190 files for Array area; 206 files for ECC area	Primary data files, per survey line
Magnetometer	.xlsx Target Listing	Excel file
Sub Bottom Profile	.sgy Processed; 172 for Array area; 220 for ECC area	Processed primary data files, per survey line
Tracklines	.shp	Shape Files for each device deployment
EGS Survey Reports	.pdf	EGS Preliminary Geophysical Survey 2022 Interpretative reports for array area and for ECC area. Reference files DOC. 6173_FST_PGS2022_INT_RSA-ESA_REV and DOC. 6173_FST_PGS2022_INT_ECR_REV1
EGS Survey Report Charts	.pdf and CAD	Detailed project mapping showing bathymetry; interpreted features; side scan sonar mosaic and interpreted seismic of the same seabed area on the same charted page

Table 2: Data made available for archaeological review.

3.3 Survey grid

The multibeam bathymetry achieved 100% coverage of the survey area. Primary survey lines were deployed for the most part in a NW-SE alignment. Side-scan sonar, magnetometer and sub-bottom profile were deployed along the same grid. The survey lines within the ECC were acquired mostly at 70 m intervals and crosslines at 1000 m intervals. but Survey lines within the Array area were deployed at 125 m intervals within the RSA and 500m within the ESA. Overlap of up to 3 km occurred between the ECC and the Array areas, ensuring good data overlap at this point (Figure 2).

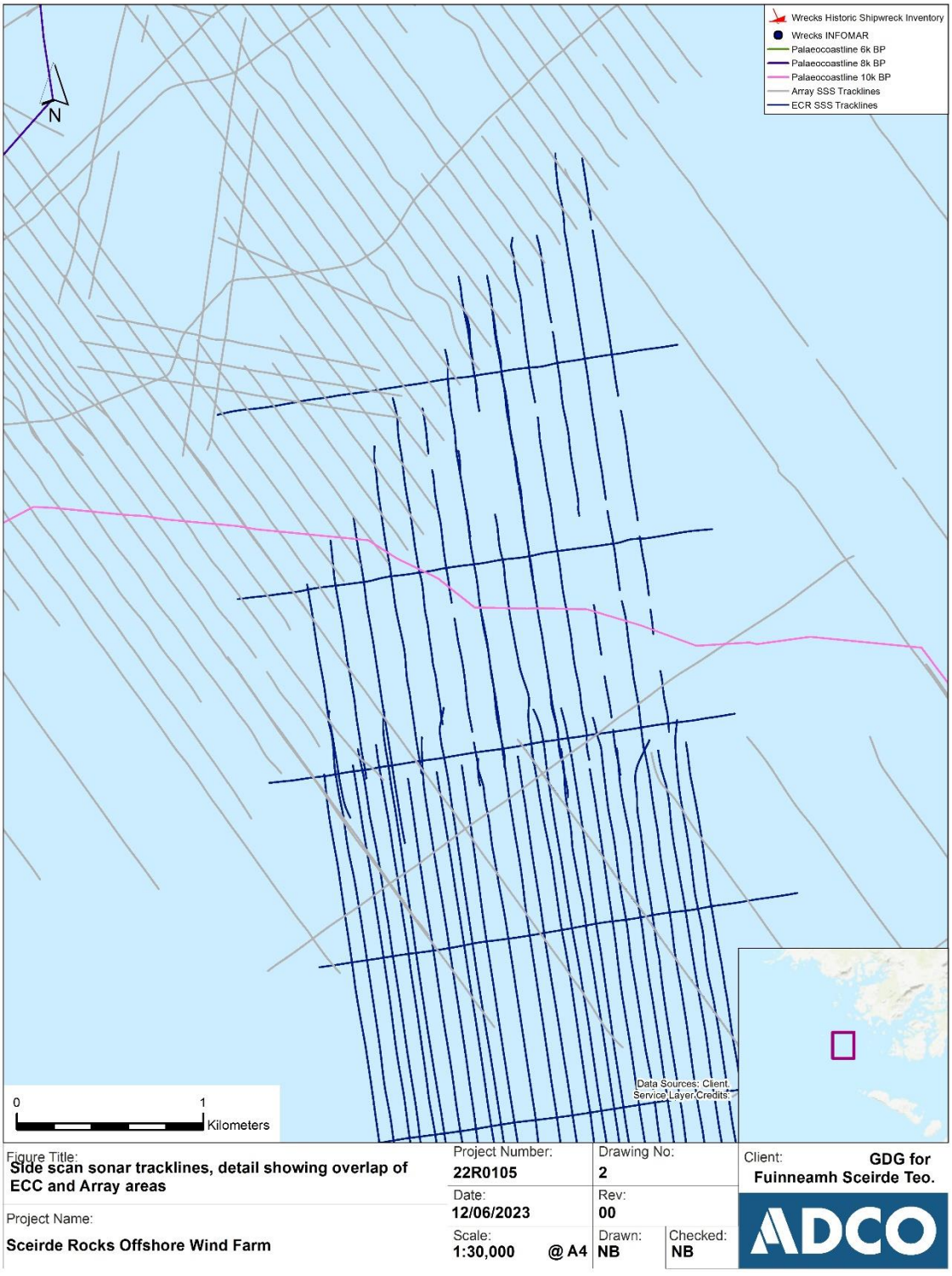


Figure 2: Side Scan Sonar survey tracklines, detail showing overlap of ECC and Array areas.

3.4 Multibeam: Topography

The multibeam data supports the INFOMAR survey and provides a high level of image resolution. The bedrock formations present vivid imaging and contrasts with the relatively

featureless and relatively flat nature of the ECC corridor south the Aran Islands (Figure 3). The survey terminated where the bedrock resurfaces off Killard, Co. Clare (Figure 4).

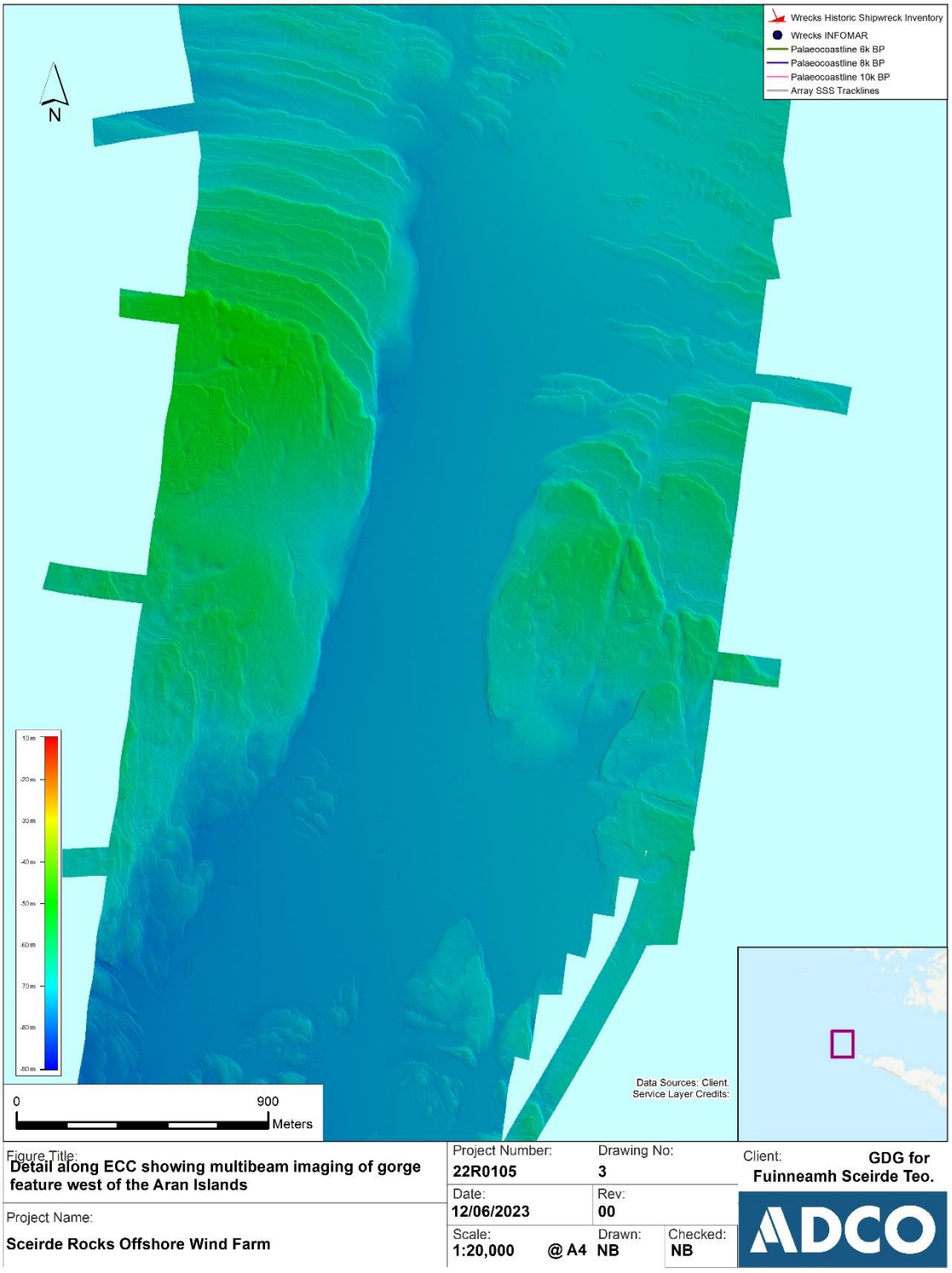


Figure 3: Detail along ECC showing multibeam imaging of gorge feature west of the Aran Islands.

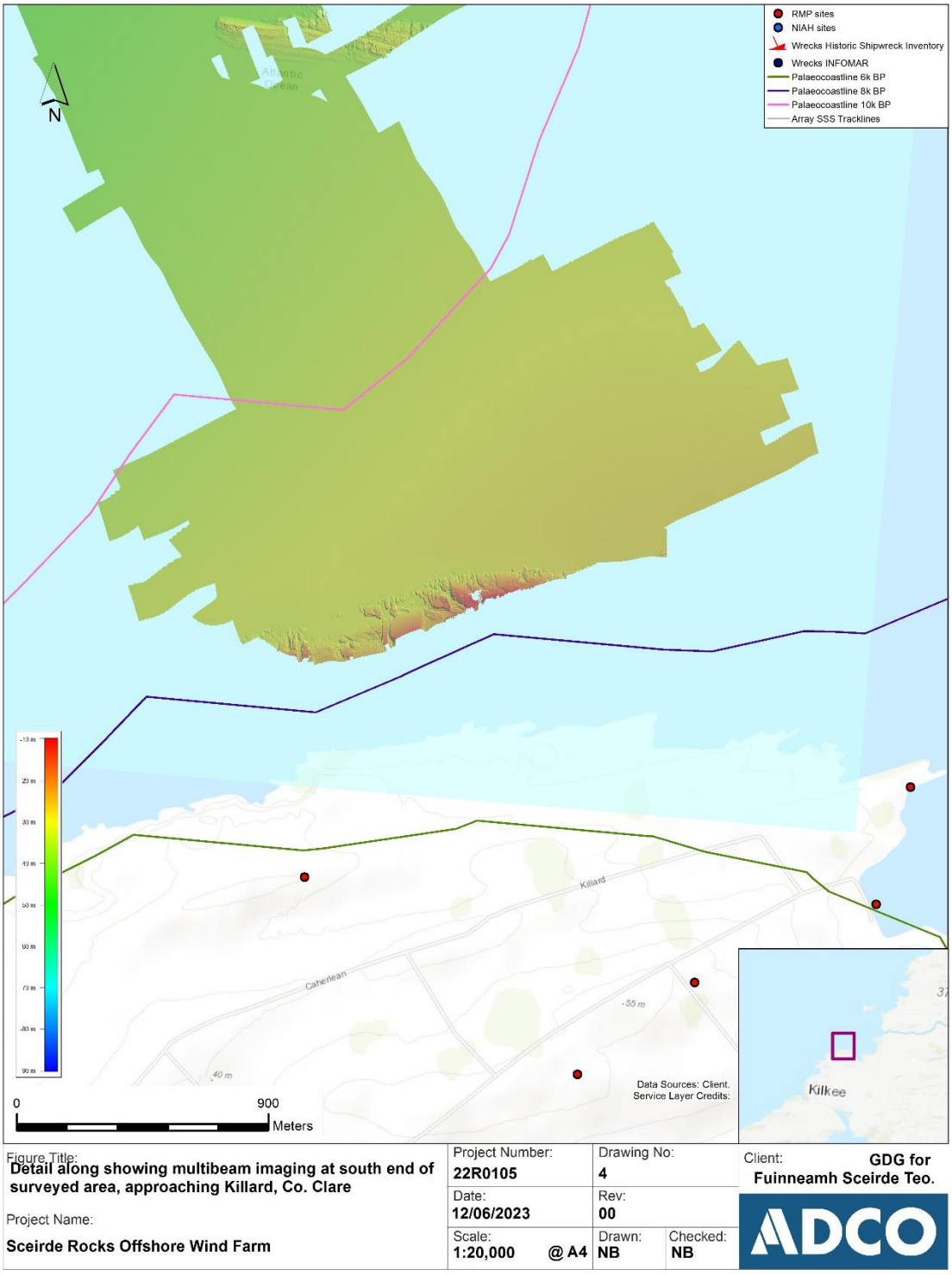


Figure 4: Detail from multibeam imaging at south end of surveyed area, approaching Killard, Co. Clare. Known archaeological sites on land (RMP) and sites of architectural heritage (NIAH) along shoreline included.

The multibeam survey did not reveal any indication of contact features at the charted location of W09419 and, while the charted location was captured in the side scan sonar, the data traces showed only sand (see Appendix 1). The deployments of magnetometry and sub-bottom profile, in turn, did not extend directly over the charted location of the wrecksite, yet there was nothing in either data set in adjacent survey lines to indicate a feature at this location.

3.5 Side-scan Sonar and Magnetometer

The side-scan sonar data was presented in: 190 .xtf High Frequency data files for the Array area and 206 files for the ECC area, and as geo-referenced mosaic files. The primary data files were imported into CODA Octopus Survey Engine and examined in playback mode.

The magnetometer data was examined in target listing and the distribution presented in a Shape file.

The sub-bottom profile data was presented as 172 individual .sgy files for the Array area and 220 files for the ECC area. The primary data files were imported into CODA Octopus Survey Engine and examined in playback mode.

All three device deployments followed the same survey grid, and tracklines for each deployment were presented.

The side-scan sonar range setting for much of the survey was at 130 m. With 70 m line-spacing in the ECC, this allowed for a 90% overlap between the survey lines. Closer range setting within the Array area's RSA of 90 m was able to ensure a *c.* 50% overlap between survey lines with 125 m separation. In the Array area's ESA where lines were spaced 500 m apart, range was set at 130 m but this would leave a data gap of *c*. 130 m between such survey lines. The different line spacings were in part a feature of surveying within the archipelago of Skerd Rocks. Nevertheless, the combined survey allowed for a comprehensive coverage of the seabed areas, and the possibility to view the same section of seabed on more than one occasion and from opposing angles. This ensured that the recording of the seabed surface was robust and comprehensive.

In terms of both the magnetometer and the sub-bottom profile, the data gathering does not benefit from swath capture and is effectively only recording data from directly beneath the survey device, resulting in a smaller sample coverage over the survey area.

The side-scan sonar data confirms the topography recorded in the multibeam data sets. It shows a featureless flat sand/silt surface within the central and southern extent of the ECC, while the exposed bedrock in the northern section and across the Array area is very striking and, in many ways, is even more vivid in the side scan sonar data traces than on the multibeam. A series of images presented as Plates 1–5 capture the essence of the seabed, and the image locations are shown on Figure 5.

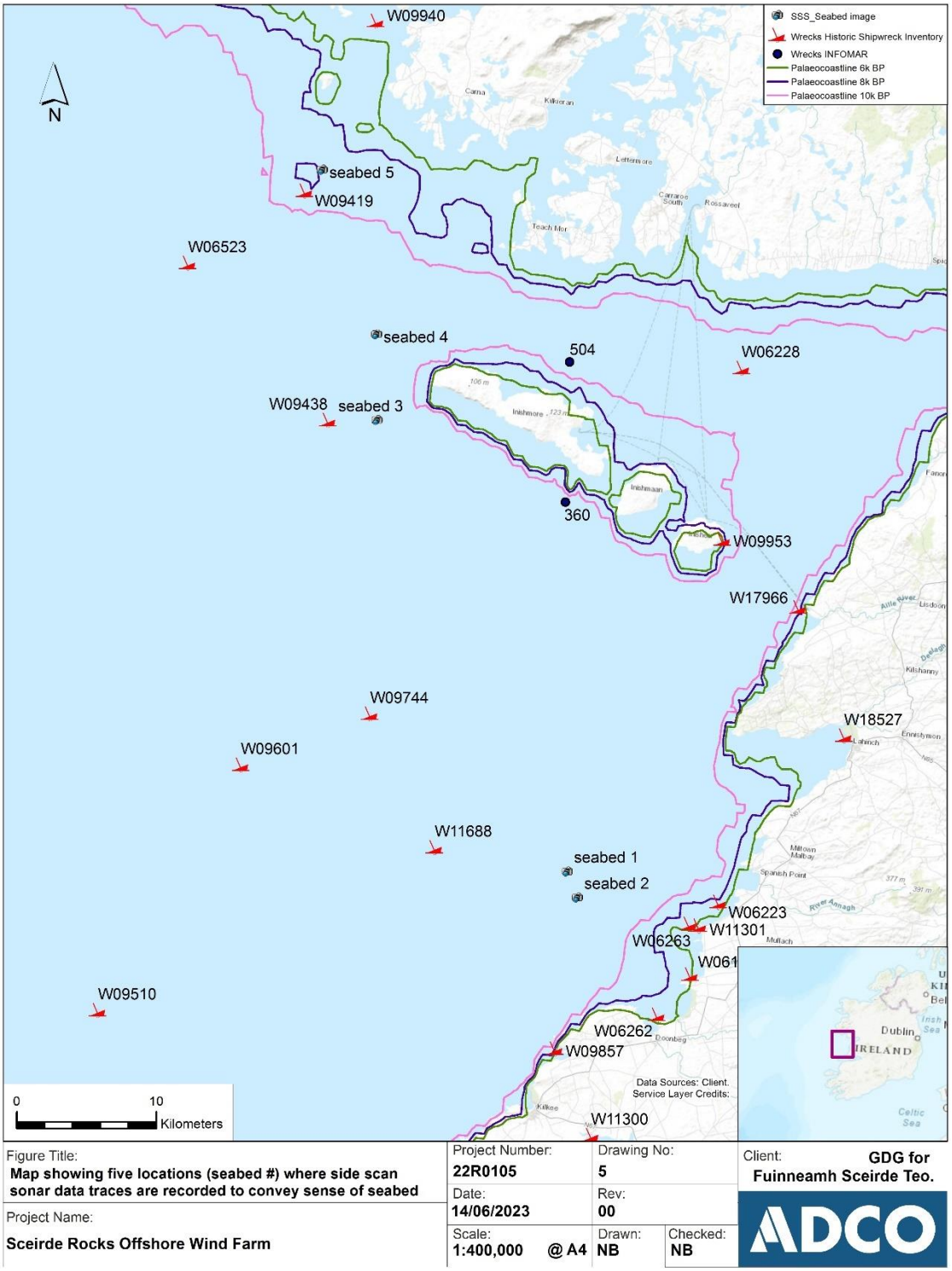


Figure 5: Map showing five locations (seabed #) where side scan sonar data traces are recorded (Plates 1–5) to convey a sense of the seabed.

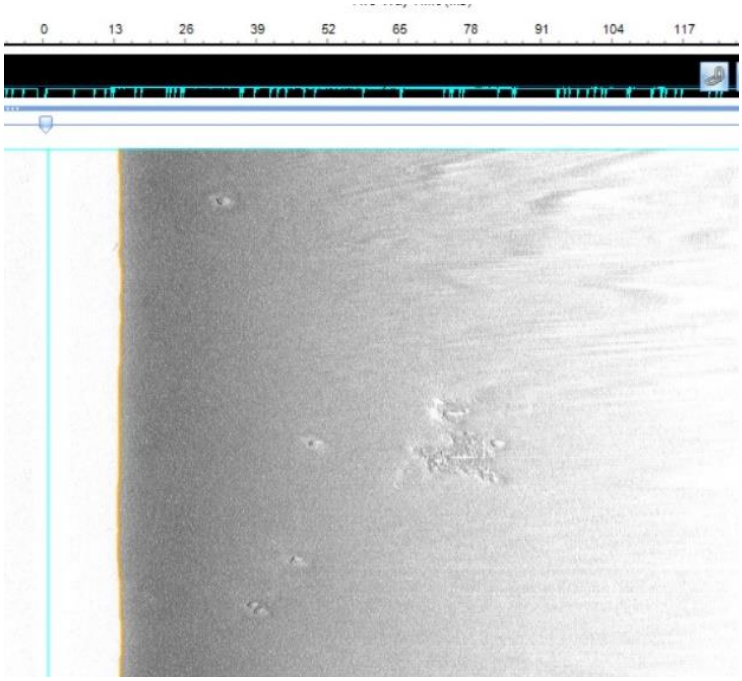


Plate 1: Seabed image 1, Side scan sonar data trace showing nature of sandy seabed surface recorded 9 km from south end of ECC. The small contacts are interpreted by EGS as debris, and did not return magnetic anomalies. Source file: WP4B10001.

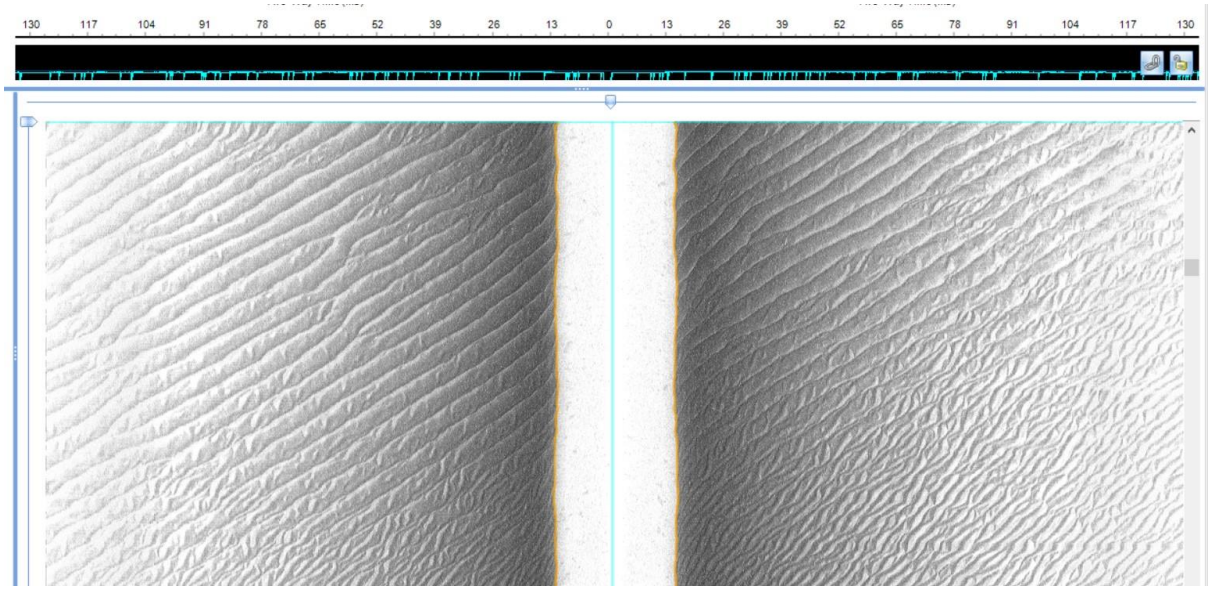


Plate 2: Seabed image 2, Side scan sonar data trace showing nature of seabed surface recorded 7.5 km from south end of ECC, showing sand ripples. Source file: WP4B10001_rev1.

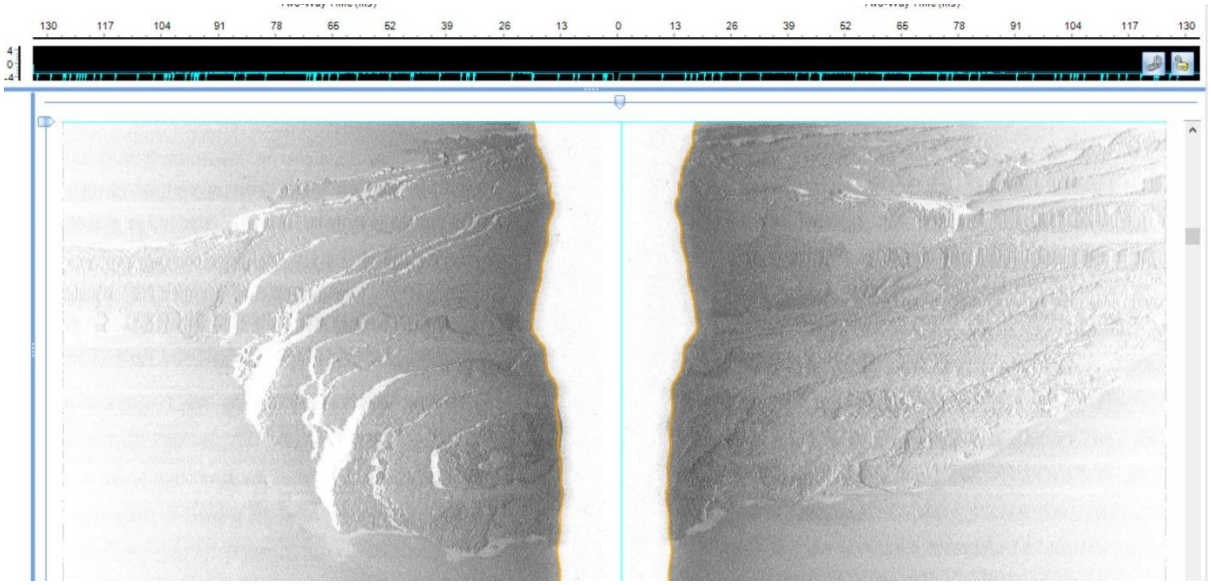


Plate 3: Seabed image 3, Side scan sonar data trace showing nature of seabed surface recorded 5 km west of the Aran Islands, showing exposed bedrock strata rising to small plateau on lower left side. Source file: WP4B30001.

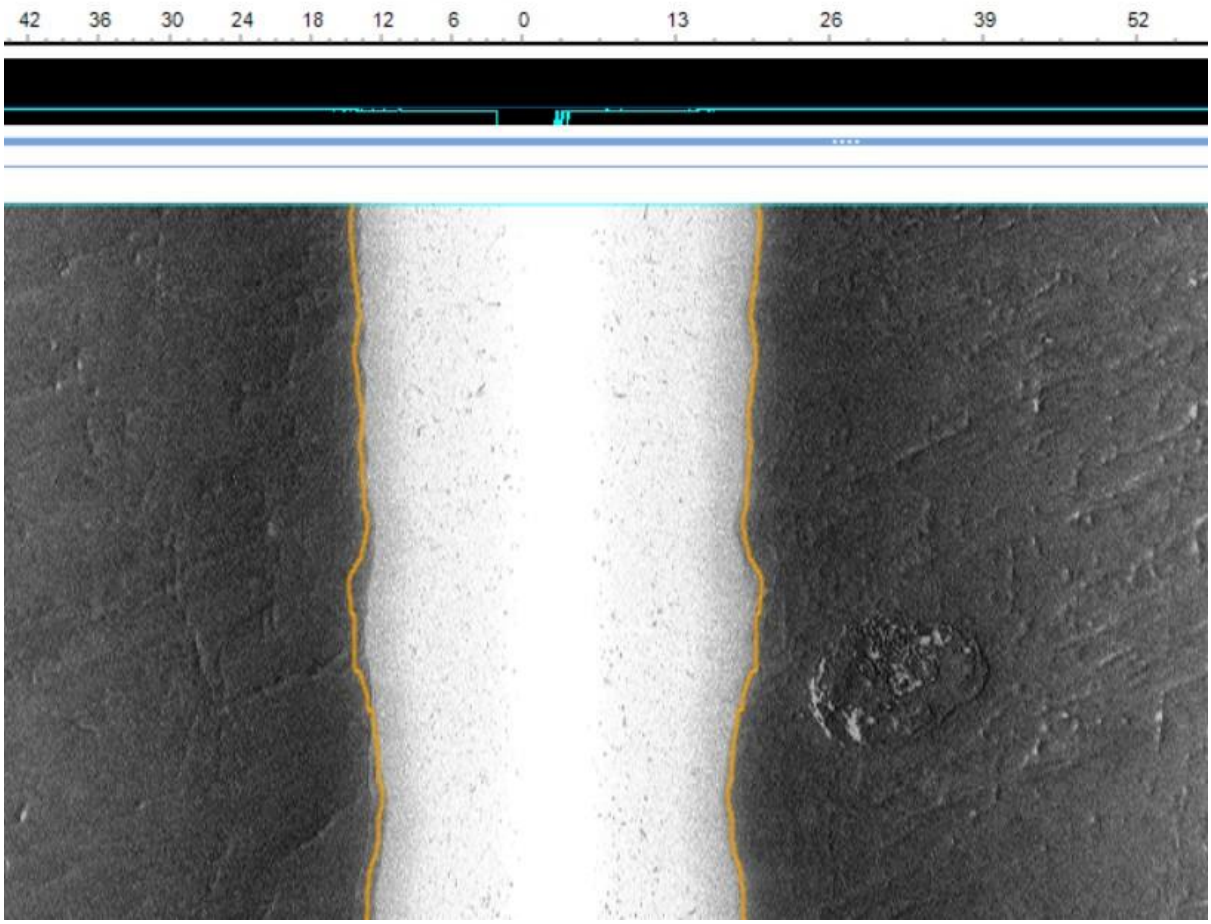


Plate 4: Seabed image 4, Side scan sonar data trace showing nature of seabed surface recorded 4.6 km northwest of the Aran Islands, showing exposed bedrock strata. The rock reveals curious formations that are nevertheless natural in origin. Source file: WP4B40001_rev01.

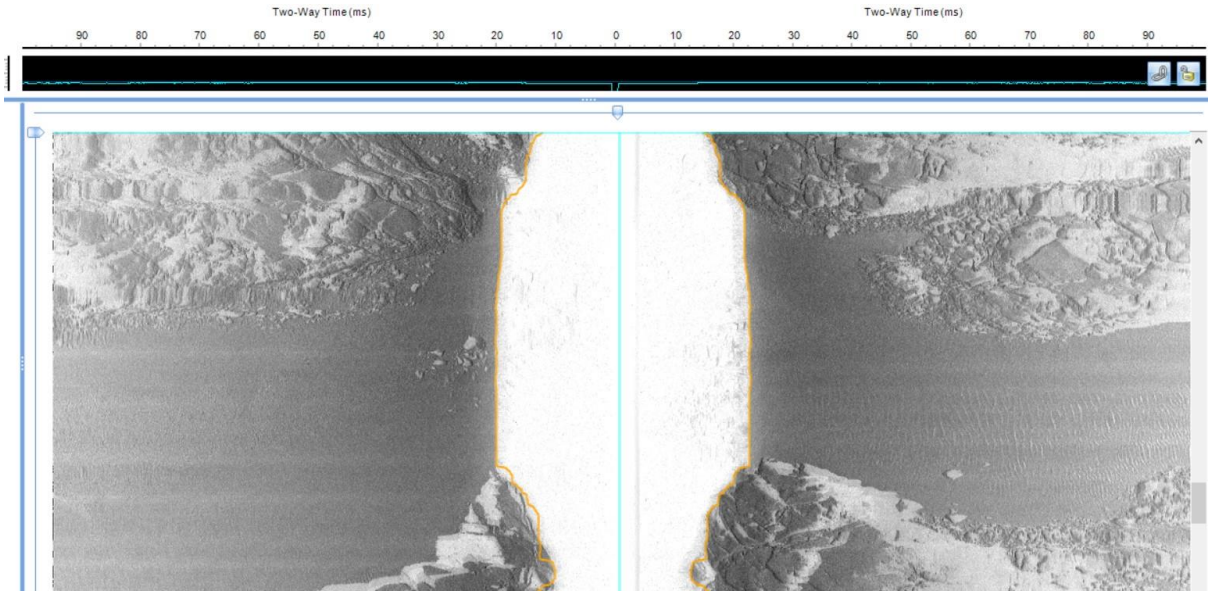


Plate 5: Seabed image 5, Side scan sonar data trace showing seabed image of boulder cluster on sand patch between two outcrops; the boulder area measures 10m by 8m. Source file: WP3I0030.

The side scan sonar did not record any shipwreck features and, as noted above in section 2.2 and described in Appendix 1, the one known wreck site (W09419) whose location is recorded in the HSI as being within the surveyed array area appears to be mislocated.

The geophysical survey contractor (EGS) presented a review of the geophysical data acquired. The review identified a small number of side scan sonar and magnetometer contacts, as presented in Table 3 and on Figures 6–9. The majority of the side scan sonar contacts are considered to be boulders, with a smaller number of bedrock outcrop being recorded. There was no shipwreck identified and thirty-one items were recorded as debris. Examination of the data sets agrees with these principal findings and adds further observations.

N-Sea Classification	**Number of targets**
Shipwreck	0
Fishing Gear	0
Debris	31
Cable trench	1
Boulder	369
Rock Outcrop	22
Magnetometer contacts	69
Total	*492*

Table 3: Summary of side-scan sonar and magnetometer contacts identified by EGS.

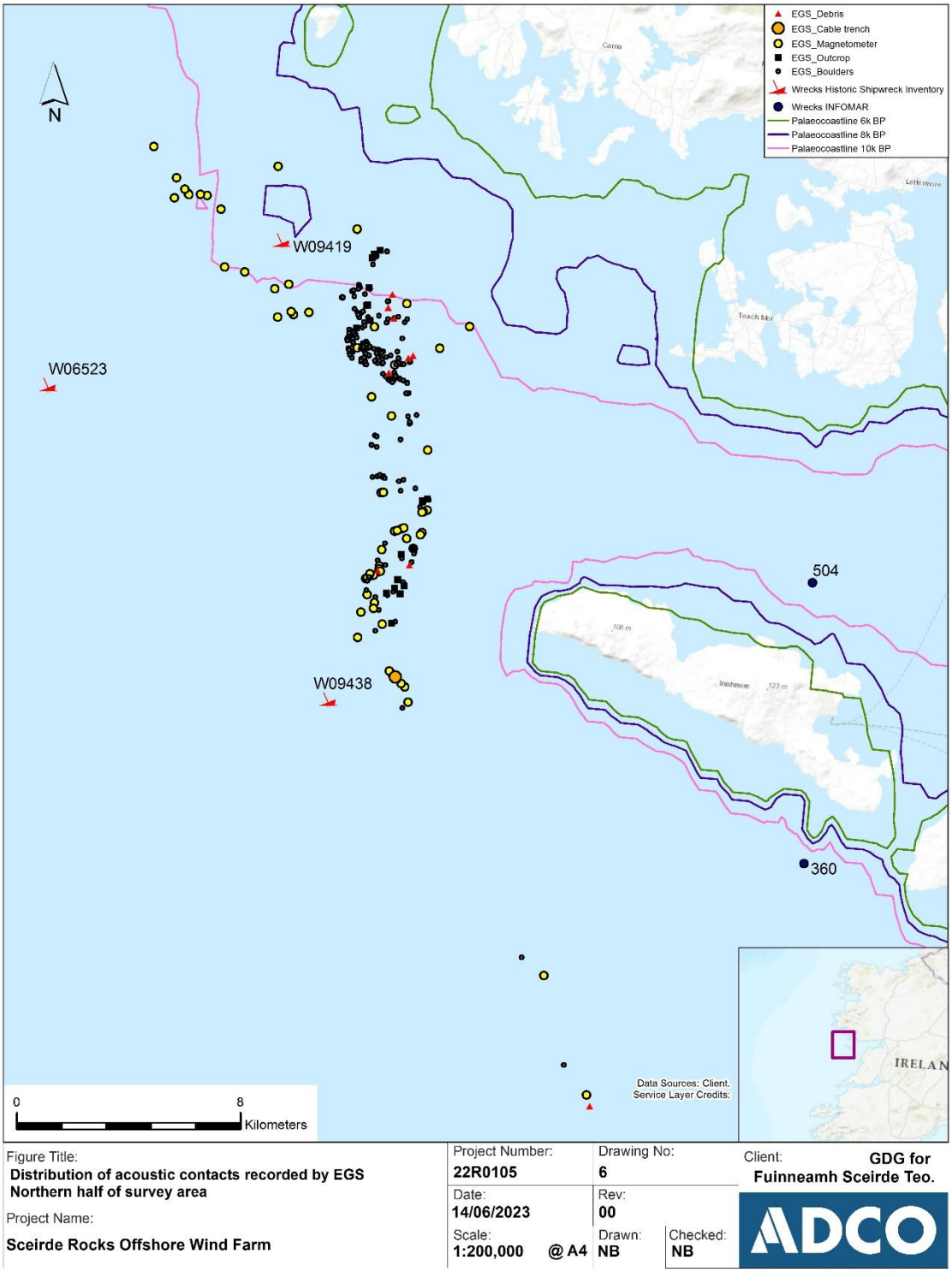


Figure 6: Distribution of acoustic contacts recorded by EGS, in the northern half of the survey area.

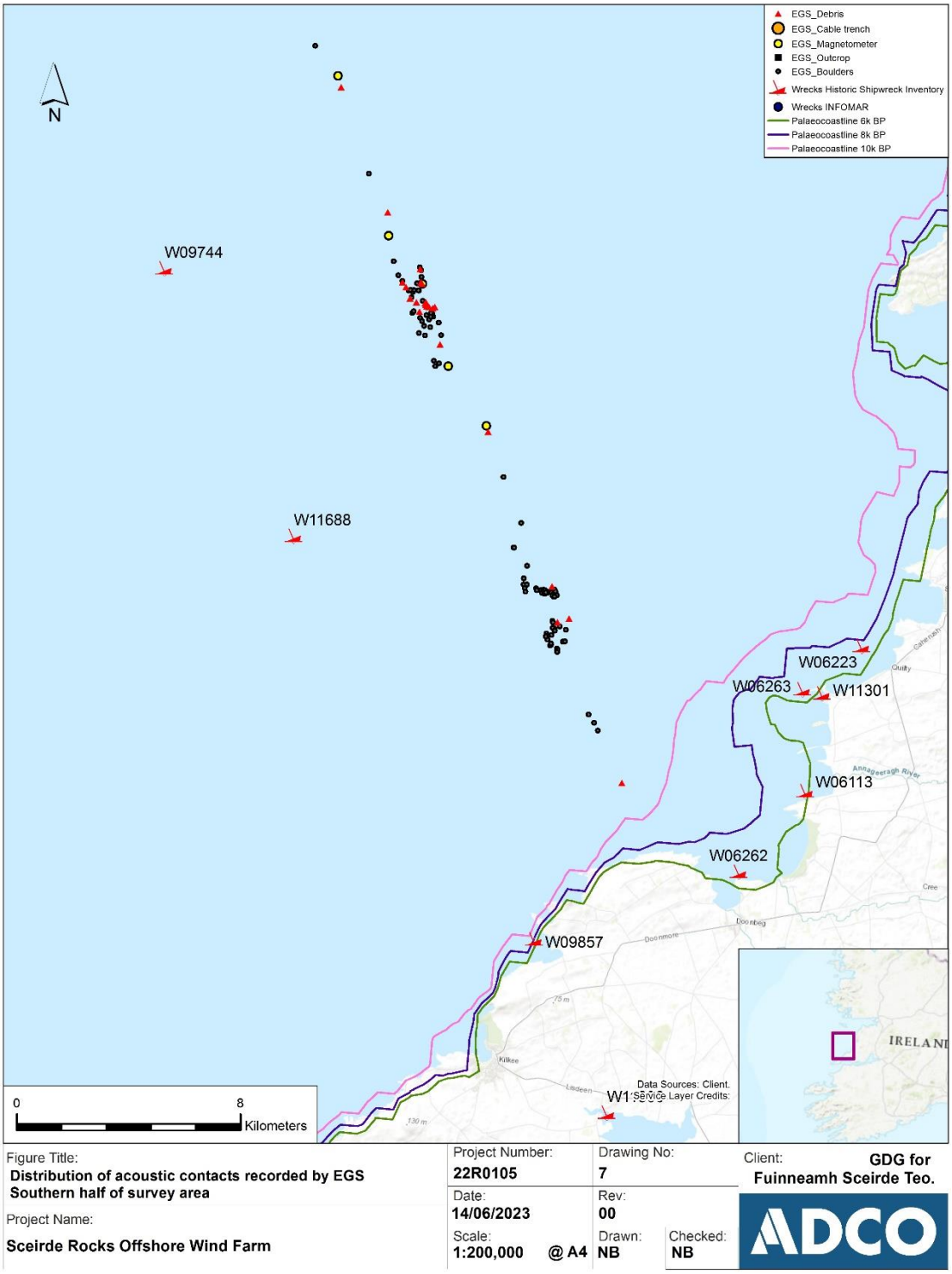


Figure 7: Distribution of acoustic contacts recorded by EGS, in the southern half of the survey area.

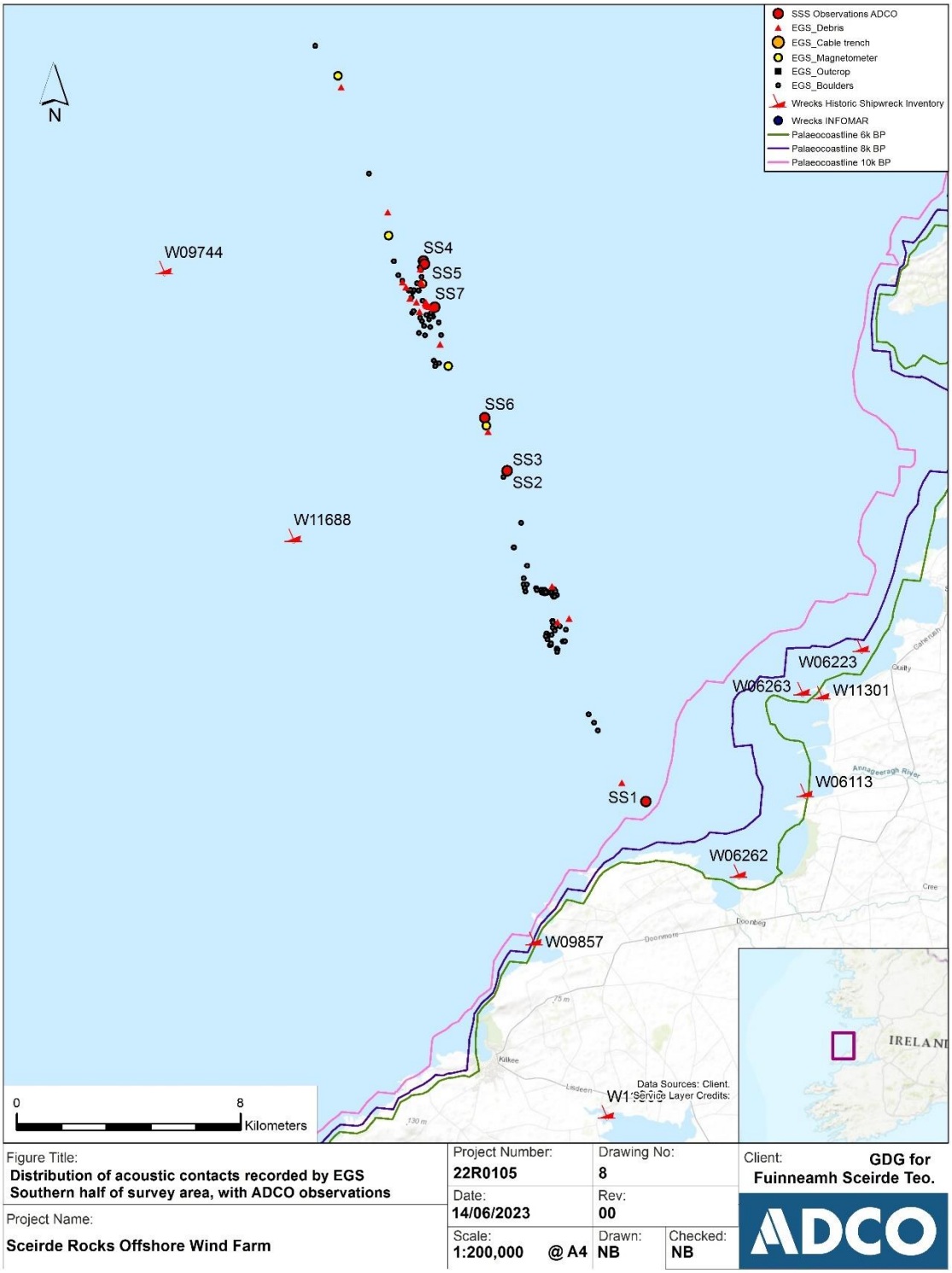


Figure 8: Distribution of acoustic contacts recorded by EGS in the southern half of the survey area, with ADCO observations.

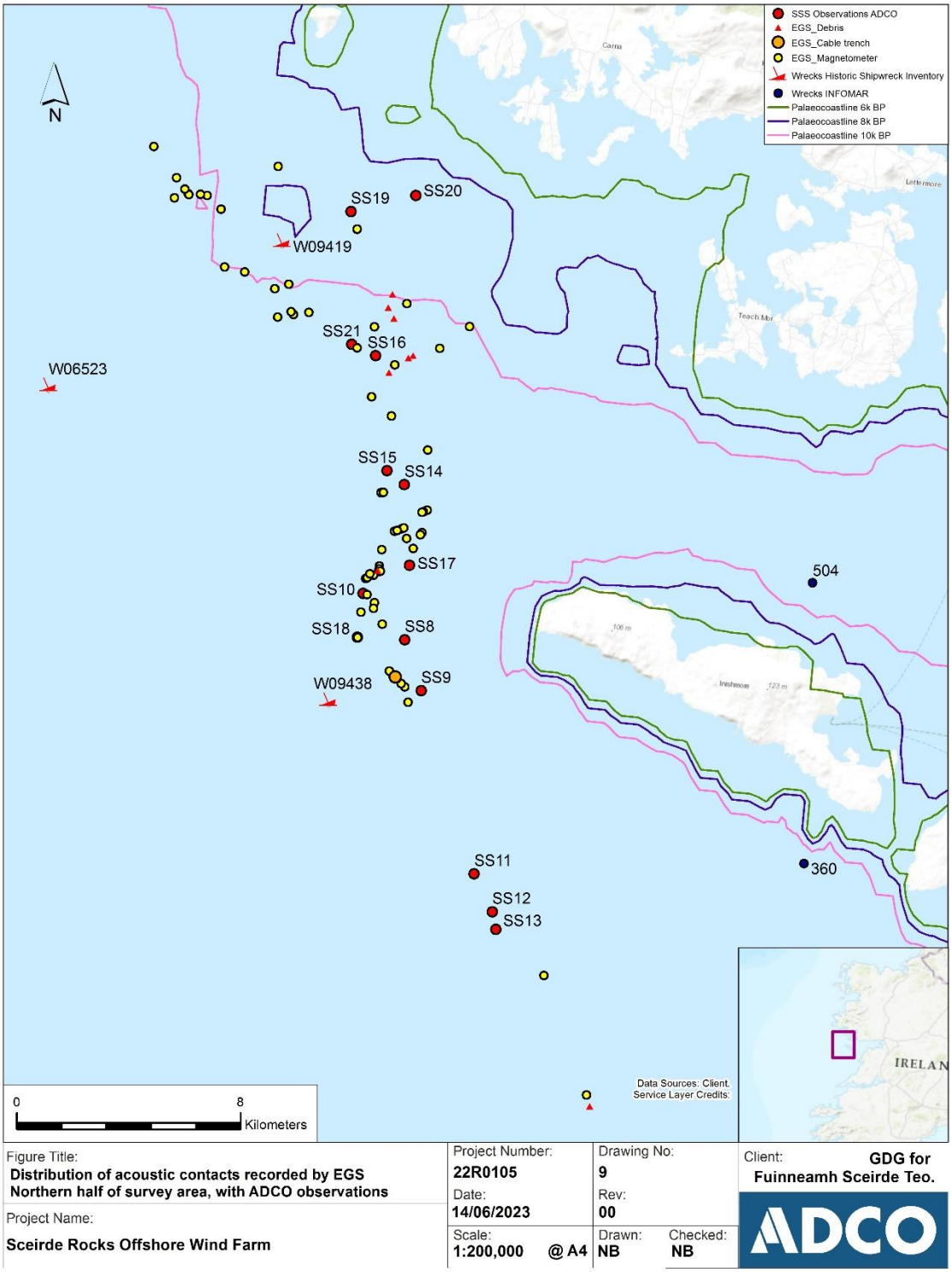


Figure 9: Distribution of acoustic contacts recorded by EGS in the northern half of the survey area with ADCO observations.

The contact targets are distributed widely across the survey area. There is a density of contacts in the northern section that is directly associated with the outcropping bedrock, and this is also where the majority of magnetometer contacts lie. Many of the magnetometer contacts are not

associated with other acoustic contacts; and where these occur on exposed bedrock, it suggests the source may be a natural variation in the background magnetism. However, if the contact results from anthropogenic factors it is likely that they represent small-scale objects that are caught in the rocky fissures.

The distribution of debris contacts is also seen right along the survey area and there is little to suggest focused concentration. There are relatively few instances where there is a close correlation between debris contacts and magnetometer contacts. Where there is correlation, it indicates that the source of the possible debris has a ferrous metal content but where the debris occurs directly under a magnetometer survey line that does not record a magnetic anomaly, it suggests the debris lacks a ferrous metal content. There is a clustering of features in the southern half of the ECC, some 21 km from the proposed landfall, in a region of the seabed that is otherwise featureless (Figures 8, 10). Debris and boulders are recorded here over a 3 km-long extent, and ADCO's interpretation of the contact features is that they include possible tyres (Appendix 2, SS4, SS5) as well as small pieces of debris (SS7). The debris represented by SS7 extends over a 400 m-long area. The seabed surface is sand but the presence of boulders here may suggest the extended area is a snag point for fishing activities, although there is no obvious indication of trawl marks on the seabed.

3.6 Wrecks

The survey did not record features at the charted location of W09419. As described in Appendix 1 and section 2.2, it appears that the charted location in the HSI is incorrect and the actual location is 410m to the west, as reported in the Marine Accident Report, and outside the surveyed area.

No indication of shipwreck was recorded in the survey data.

3.7 Sub-bottom profile

The sub-bottom profile data suggests only a shallow deposit of sediment below the sand surface of the seabed where it exists (Plates 6–8). In contrast, the data shows the extruded nature of the outcropping bedrock very clearly. From an archaeological perspective, the data sets did not reveal additional insight and suggest that where sediment has accumulated the deposits are shallow

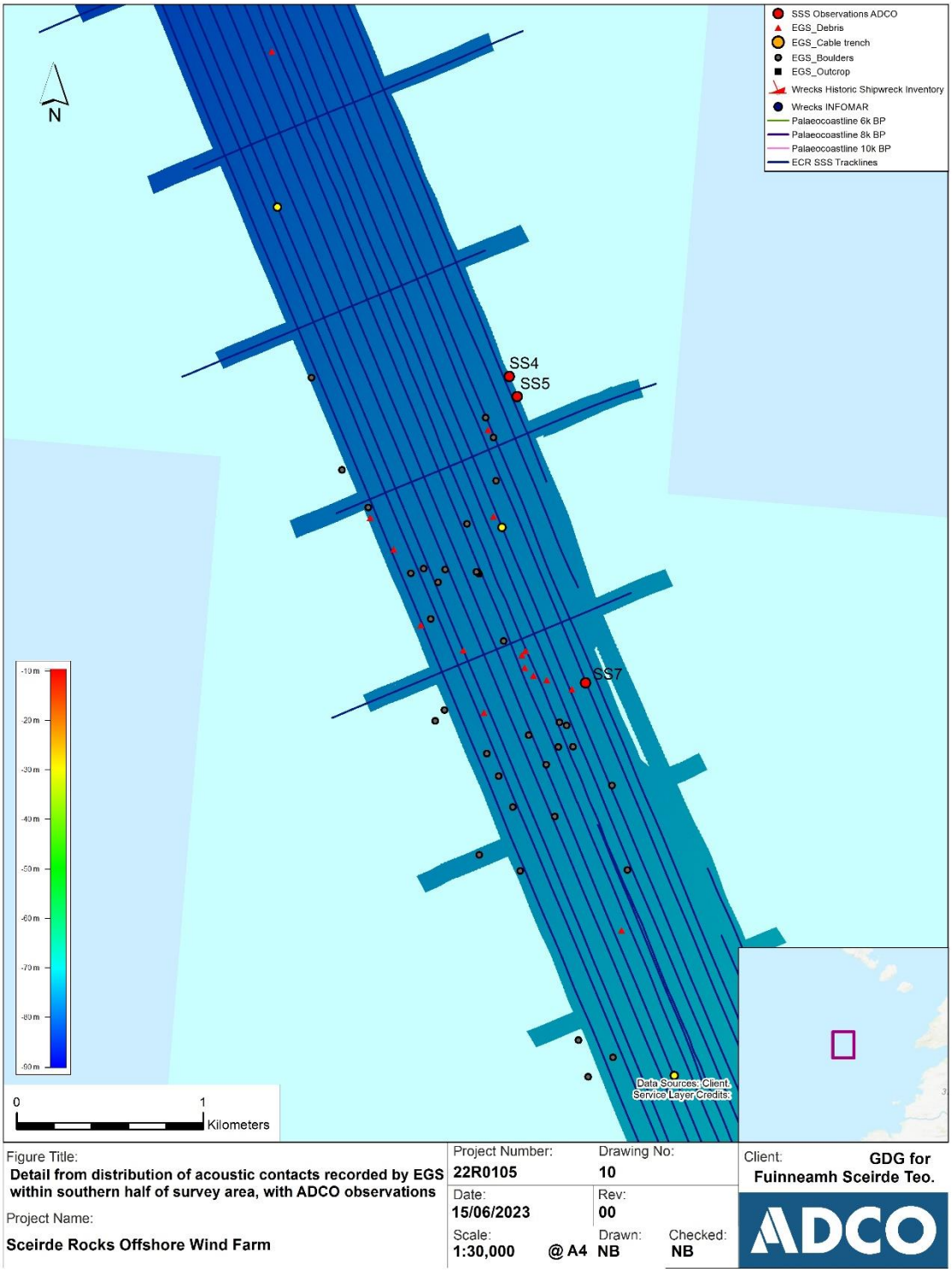


Figure 10: Detail from distribution of acoustic contacts recorded by EGS within the southern half of the survey area, with ADCO observations.

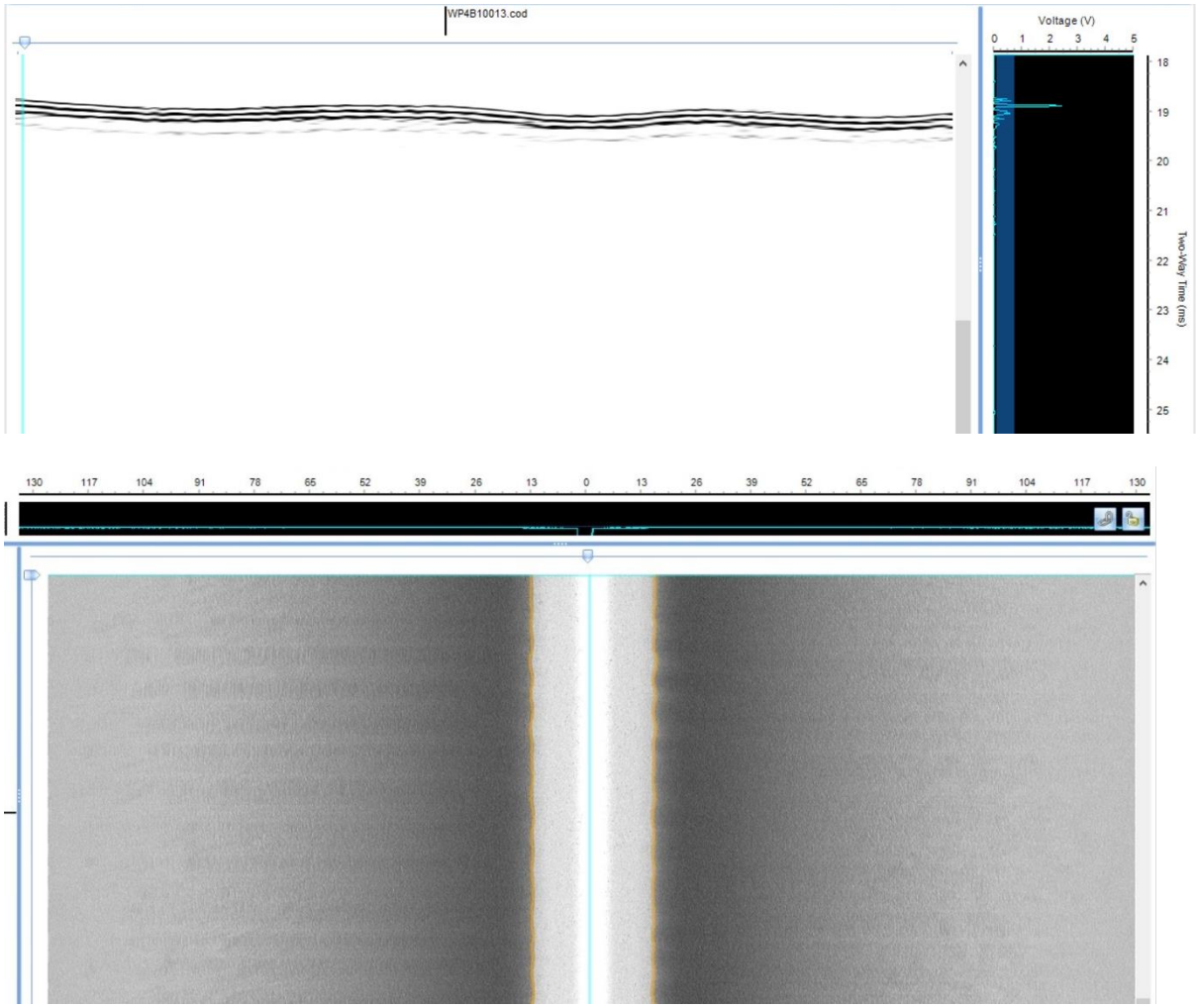
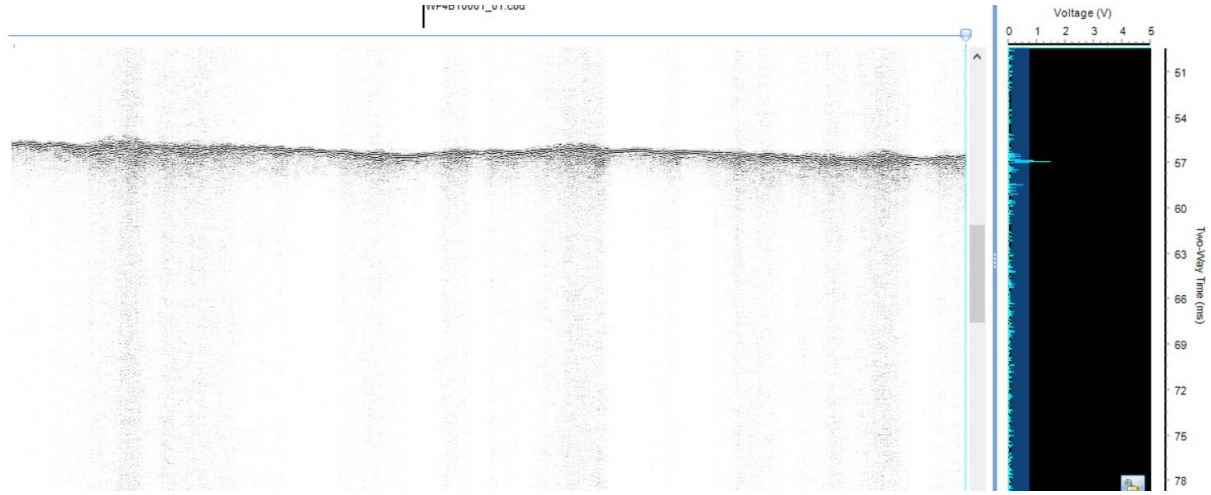


Plate 6: Detail from Sub-bottom profile WP4ADD0013 and side scan sonar data trace WP4B1003 at UTM29N 459752E 5846936N, located in the southern section of the ECC.



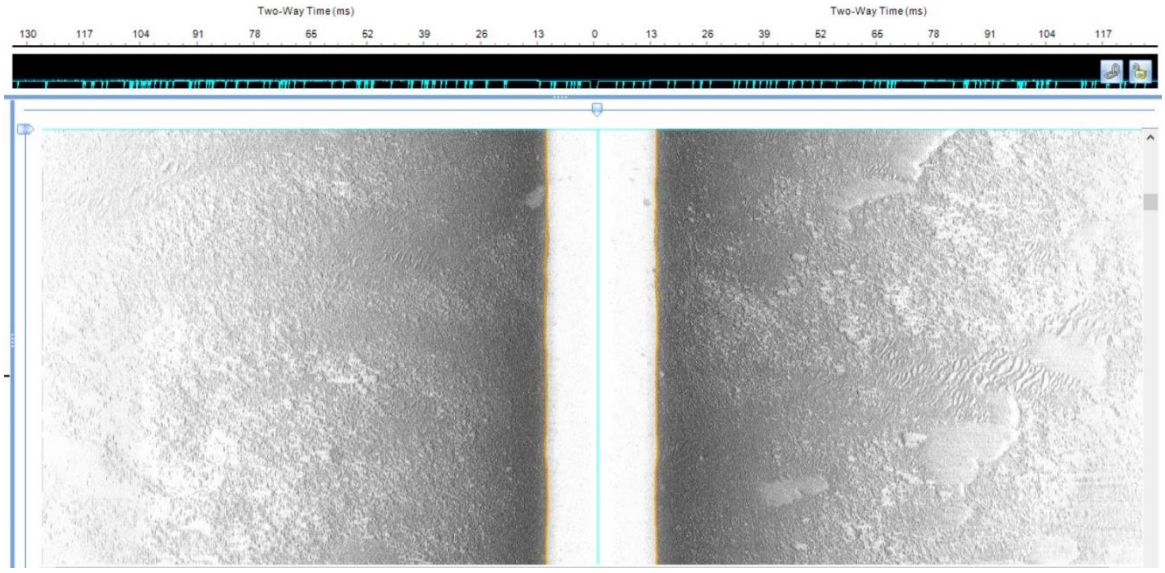


Plate 7: Detail from Sub-bottom profile WP4B10001and side scan sonar data trace WP4B10001 at UTM29N 457547E 5853143N, located in the southern section of the ECC.

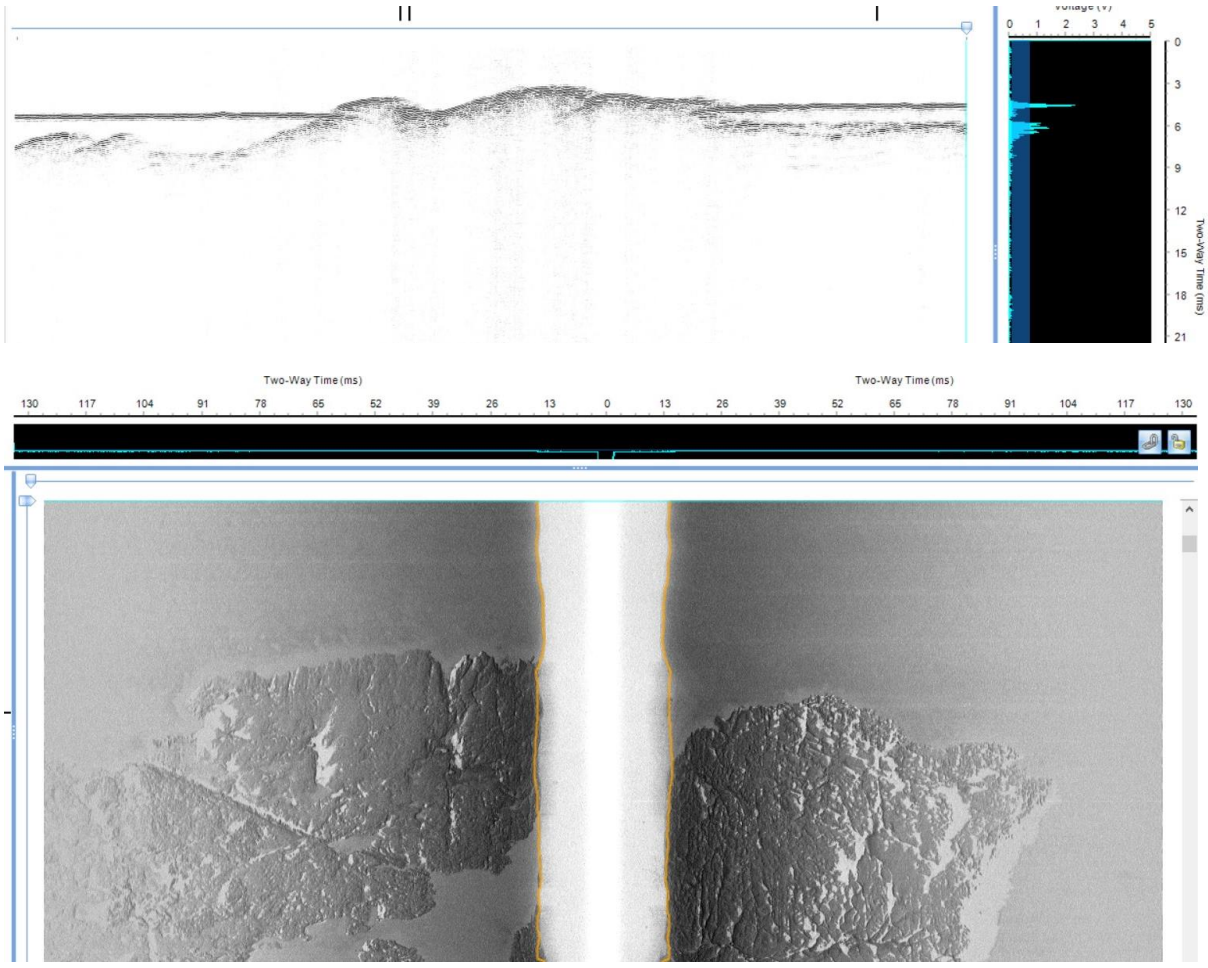


Plate 8: Detail from Sub-bottom profile WP4B30001 and side scan sonar data trace WP4B40008 at UTM29N 439712E 5887473N located in the Array area, showing transect across extruded bedrock and the shallow sediment deposit above the underlying bedrock.

4.0 Conclusions

The 2022 marine geophysical survey data sets are robust and provide comprehensive insight to the nature of the seabed and its underlying strata within the surveyed area of the ECC and Array areas.

The data confirms the striking nature of the exposed bedrock seascape in the Array area and the northern part of the ECC, and the contrasting featureless sandy bed of the southern part of the ECC.

While a series of contact features was recorded throughout the survey area, the majority of the features appear to be boulders, and while there is some debris items there are no clear signs of *in situ* wreckage on the seabed.

The location of W09419 as charted by the HSI appears to be incorrect, and the correct location of the MFV *Arosa* lies on the exposed shoreline of Skerd Rocks outside the surveyed area.

The potential for identifying palaeocoastlines and submerged landscapes is perhaps better anticipated in the present instance from borehole data that would be subject to future geotechnical investigation work.

The 2022 survey was able to reach within 600 m of the shoreline approaching the landfall area at the southern part of the ECC. This leaves a potential gap in coverage that has not been surveyed to the ultimate landfall location, the location of which is still under review.

5.0 Recommendations

The principal of avoidance will inform the design process, whereby impacts on known archaeological sites will be avoided wherever possible. Such a measure ensures that known archaeological sites are protected from direct impacts associated with the proposed development.

Archaeological Exclusion Zones (AEZ) will be established around known and potential archaeological sites and features to ensure the protection of such sites, and within which no impacts are to take place. Such a measure ensures that known and potential archaeological sites are protected from direct impacts associated with the proposed development. Based on the information to hand, no AEZs apply to the area surveyed in 2022.

Further Marine geophysical surveys, and geotechnical investigations will take place in advance of construction to ensure that any new sites and features are identified and avoided.

Further archaeological assessment of the data gap that exists inshore will be considered once the landfall location is confirmed.

Intertidal Archaeology Survey licensed by the Department of Housing, Local Government and Heritage will be considered once the landfall location is confirmed.

An Archaeological Management Plan (AMP) will be prepared to inform the project throughout its lifetime, including construction, operation and decommissioning phases, and will be reviewed and updated at regular intervals. The AMP will facilitate recording and reporting procedures and will establish archaeological protocols in the event of archaeological discovery during works. Preservation by record is the last resort once all other options have been considered.

Archaeological monitoring licensed by the Department of Housing, Local Government and Heritage (DHLGH) will take place during ground and seabed disturbance activities that take place during construction.

Project maritime archaeologists operating under licence from the DHLGH will be engaged by the Sceirde Rocks OWF project sponsor as part of the design team and to monitor construction activities and resolve archaeological features that may be exposed in the course of works.

Archaeological inputs are licensed by the DHLGH and consent is granted through its NMS.

The recommendations contained in this report are subject to the approval of the NMS at the DHLGH.

6.0 References

Brook, Anthony, Bradley, Sarah, Edwards, Robin and Goodwyn, Nicola, 'The palaeogeography of Northwest Europe during the last 20,000 years', *Journal of Maps* 7.1 (2012), pp 573–587.

Hayes, Stephen, 'Fuinneamh Sceirde Teoranta, Sceirde Rocks OWF Preliminary Geophysical Survey 2022, interpretive report (Export Cable Route), EGS Doc.6173_PGS2022_Int_ECR_Rev1 (2023).

Hayes, Stephen, 'Fuinneamh Sceirde Teoranta, Sceirde Rocks OWF Preliminary Geophysical Survey 2022, interpretive report RSA & ESA EGS Doc.6173_PGS2022_Int_RSA-ESA_Rev3 (2023).

Marine Accident Investigation, 'Report on the investigation of the grounding and total loss of the United Kingdom-registered fishing vessel *Arosa* (M321) on Doonguddle Rock off the west coast of Ireland with loss of 12 crew members, 3 October 2020'. Marine Accident Investigation Branch report No. 41/2001.

O'Connell, Michael and Molloy, Karen, 'Mid- and late-Holocene environmental change in western Ireland: New evidence from coastal peats and fossil timbers with particular reference to relative sea-level change', *The Holocene* 27.12 (2017), 1825-1845. https://doi.org/10.1177/0959683617708447

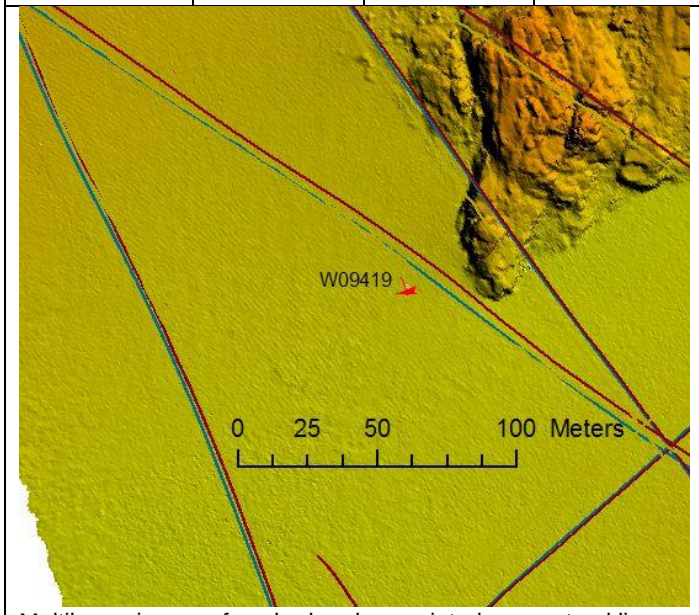
Online resources:

Historic Environment Viewer:	https://maps.archaeology.ie/HistoricEnvironment/
Historic Shipwreck Inventory:	https://dahg.maps.arcgis.com/apps/webappviewer/index.html?id=89e50518e5f4437abfa6284ff39fd640
Irish National Seabed Survey:	www.infomar.ie

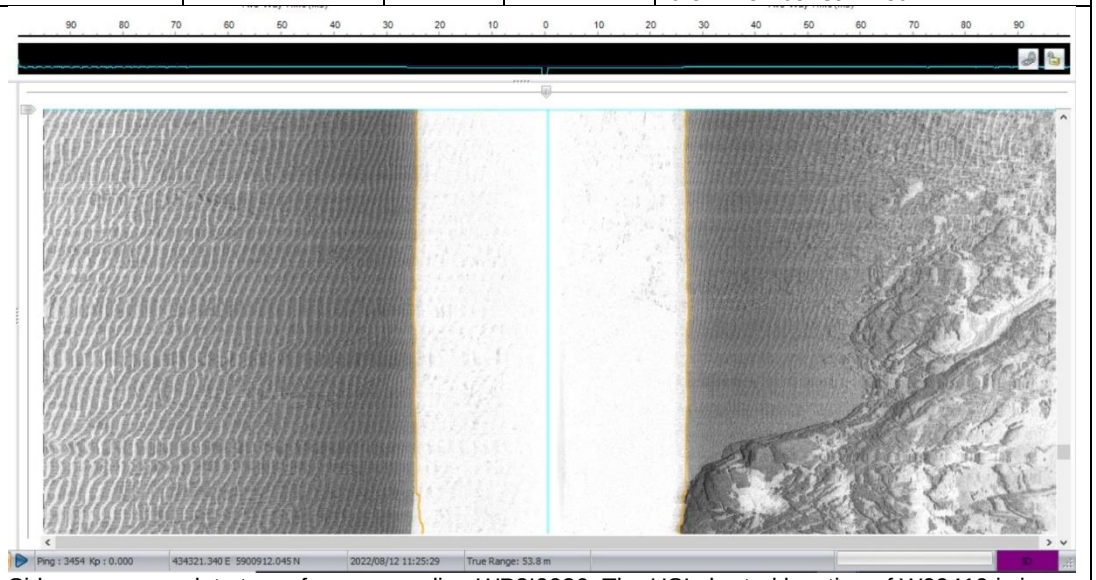
7.0 Appendix 1: Known shipwreck events within the Sceirde Rocks Offshore Wind Farm 2022 survey area

Source: https://dahg.maps.arcgis.com/apps/webappviewer/index.html?id=89e50518e5f4437abfa6284ff39fd640;

Reference	Date of Loss	UTM29N_E	UTM29N_N	DD_Latitude	DD_Longitude	Within Array / ECC	Vessel Name	Description
W09419	03/10/2000	433599	5900911	53.253434	-9.983372	Array	MFV *Arosa*	UK-registered, Spanish-owned and operated 248-tonne 32.61m-long steel side trawler, built 1974 in Santander, Spain. Went aground during storm and was a total loss, with the loss of 12 crew. Only one crew member survived.



Multibeam image of seabed and associated survey tracklines of HSI charted location of MFV *Arosa*

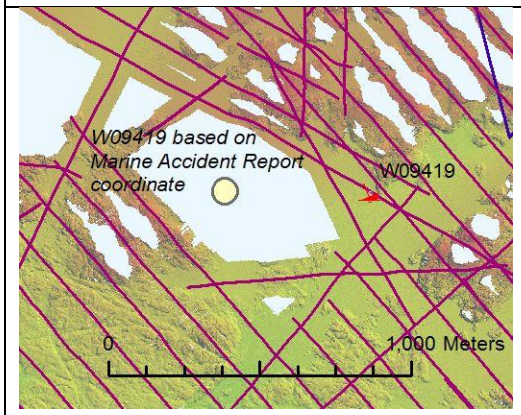

Side scan sonar data trace from survey line WP3I0036. The HSI charted location of W09419 is in the rippled sand area on the upper left side. There is no indication of the trawler.

Source: 'Report on the investigation of the grounding and total loss of the United Kingdom-registered fishing vessel *Arosa* (M321) on Doonguddle Rock off the west coast of Ireland with loss of 12 crew members, 3 October 2020'. Marine Accident Investigation Branch report No. 41/2001.

Reference	Date of Loss	UTM29N_E	UTM29N_N	DM_Latitude	DM_Longitude	Within Array / ECC	Vessel Name	Description
W09419	03/10/2000	433929	5900928	53º 15.21	-9º 59.42	Array	MFV *Arosa*	The Marine Accident Report noted a different location, *c.* 500 m west of the HSI reference, which is at a location that was not surveyed in 2022, presumably because it was inaccessible. The Marine Accident Report includes photographs (to left) that show the vessel aground on rock, rather than some distance from the rockhead as indicated in the HSI record. One may conclude that the HSI coordinate is incorrect and that the actual wrecksite is outside the area surveyed in 2022.

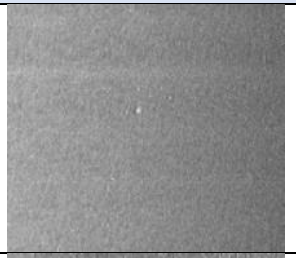
Photograph of the *Arosa* early in her service.

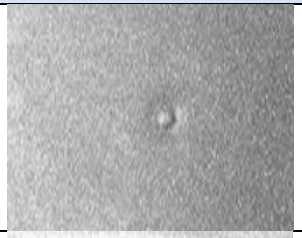
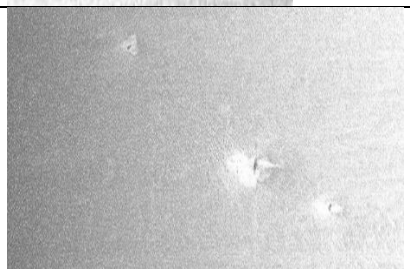
Photograph of the *Arosa* aground and wrecked. The image clearly shows the vessel should be lying close in on rock head.

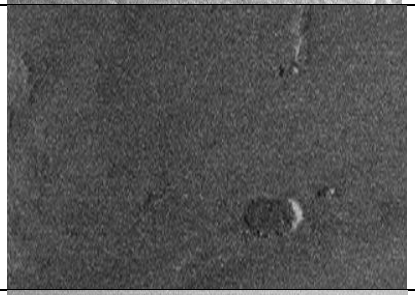


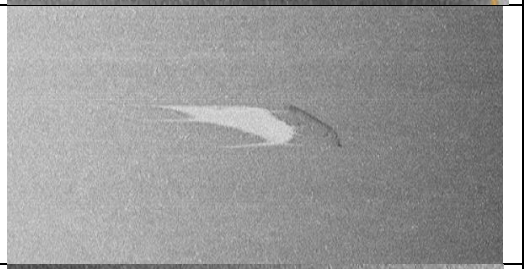
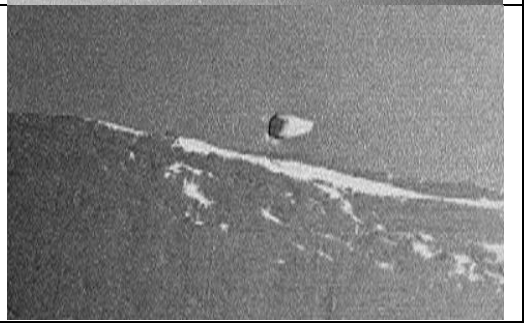
Detail from multibeam survey with the two location of the *Arosa* plotted. The Marine Accident Report location, showing as white refers to unsurveyed area that lies above the seabed and is the more accurate of the two locations. A LiDAR or Drone survey could readily confirm that the *Arosa* remains wrecked here if necessary.

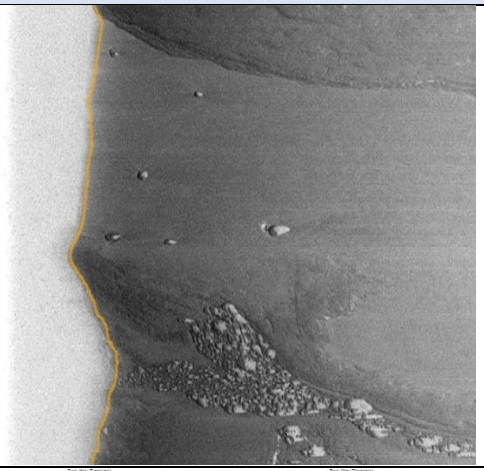
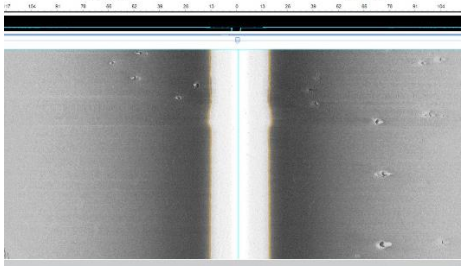
8.0 Appendix 2: Side scan sonar contacts, based on information from 2022 survey

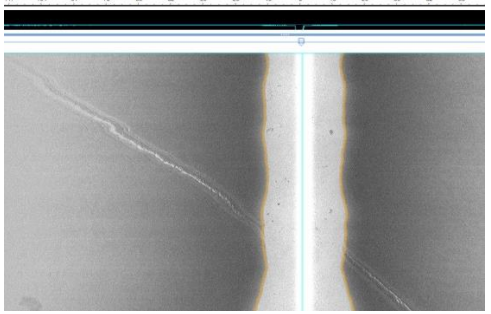
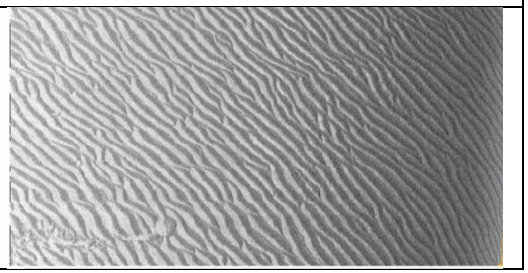
ADCO Reference	EGS Reference	Survey Line	UTM 29N Easting	UTM 29N Northing	DMS Lat	DMS Long	Description	Image
SS1	none	WP4ADD00003	460900	5846558	52º 46' 2.781"	-9º 34' 46.257"	Boulder, 1m diam. in sandy bed, example of periodic observation	
SS2	none	WPB10002_rev01	454977	5857898	52º 52' 8.091"	-9º 40' 7.896"	Possible rock in sandy area, or debris3.8m by 5m flat rectangular-shaped feature with scour 10m x 9m indicated in flat seabed area	
SS3	none	WPB10003_rev01	454977	5857904	52º 52' 8.285"	-9º 40' 7.899"	7m by 5m isolated large feature on seabed. Same as SS2	
SS4	none	WP4B20001_rev1	451377	5865109	52º 56' 0.311"	-9º 43' 24.296"	Boulder or debris, tyre? Isolated feature on sandy bed. 2m in diameter circular in shape, perhaps a tyre?	

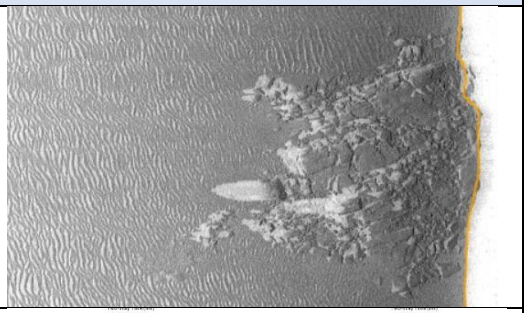
ADCO Reference	EGS Reference	Survey Line	UTM 29N Easting	UTM 29N Northing	DMS Lat	DMS Long	Description	Image
SS5	none	WP4B20001_rev1	451428	5865006	5º 2 55' 56.994"	-9º 43' 21.509"	boulder or debris, tyre? Isolated feature on sandy bed. 2m in diameter circular in shape, perhaps a tyre?	
SS6	none	WP4B20003_rev1	454023	5859725	52 º 53' 6.923"	-9 º 40' 59.842"	Boulder or debris Isolated feature 3m x 2m not clearly defined. Possible boulder or debris.	
SS7	SSS_2_11	WP4B20003_SPL000_SPL000_rev1	451921	5863508	52º 55' 8.679"	-9º 42' 54.308"	Three contacts extended over 45m with separation of 30m and 15m.. Small in scale, 0.3m, 2m and 1.5m in length. Corresponds with line of seven interpreted debris recorded by EGS that did not register any magnetometer contacts	

ADCO Reference	EGS Reference	Survey Line	UTM 29N Easting	UTM 29N Northing	DMS Lat	DMS Long	Description	Image
SS8	none	WP4B30001_rev02	439955	5887098	53º 07' 47.665"	-9º 53' 50.734"	Contact lying at right angles to natural bedrock and reaching on to sand to the south. Aligned NW-SE, slightly curved in profile, possible acoustic shadow. 11m x 3m long x wide.	
SS9	none	WP4BB30003_rev 02	440701	5885331	53º 06' 50.791"	-9º 53' 9.425"	Contact lying at right angles to natural bedrock and reaching on to sand to the north. Aligned NW-SE, 3m x 1m. Possible debris.	
SS10	none	WP4B30010_rev02	438339	5888618	53º 08' 36.184"	-9º 55' 18.724"	Curved contact on bedrock with acoustic shadow. 3m diameter, probable debris.	
SS11	none	WP4B30012_rev02	443127	5878978	53º 03' 26.172"	-9º 50' 54.911"	Two poorly defined linear features with possible acoustic shadow indicative of fishing gear. 6.7m and 7m long, with possible netting 5m away in a 5m-long heap.	

ADCO Reference	EGS Reference	Survey Line	UTM 29N Easting	UTM 29N Northing	DMS Lat	DMS Long	Description	Image
SS12	none	WP4B30012_rev02	443886	5877679	53º 02' 44.427"	-9º 50' 13.332"	Short feature with acoustic shadow. 5m long by 1.5m wide. Debris.	
SS13	none	WP4B30013_rev02	444064	5877064	53º 02' 24.527"	-9º 50' 12.946"	Short linear feature with acoustic shadow. Very similar to SS12 in dimensions and image but 600 m south of it.	
SS14	none	WP4B40015A_rev 01	439480	5892612	53º 10' 45.889"	-9º 54' 20.040"	3m x 2m contact with acoustic shadow on sand beside rock outcrop, possible boulder, ; other contacts in vicinity interpreted as boulders by EGS	

ADCO Reference	EGS Reference	Survey Line	UTM 29N Easting	UTM 29N Northing	DMS Lat	DMS Long	Description	Image
SS15	none	WP4B0023_rev01	438823	5893059	53º 11' 0.082"	-9º 54' 55.734"	Line of three contacts with three outliers, each c. 1m diameter, occurring on narrow sand channel between two bedrock exposures, possible fishing pots. Aligned over 31m with separation of 12m to centre and 19m to next. Coordinate to centre contact.	
SS16	SSS_5_493	WP4B50018_rev01	438075	5897114	53 º 13' 10.977"	-9º 55' 38.856"	Series of c. 30 individual contacts distributed over c. 150 x 250m area in zone of flat sandy seabed, with sand ripples to the north and bedrock to the south. Each contact measures 1m-2m in size. Interpreted by EGS as boulders. Although they do not lie in neat lines, consideration that some are fishing pots may be considered. Also captured on lines WP4B50019_rev01, WP4B50020_rev01,	

ADCO Reference	EGS Reference	Survey Line	UTM 29N Easting	UTM 29N Northing	DMS Lat	DMS Long	Description	Image
							WP4B50021a_rev 01	
SS17	SSS_4_46	WP4B40008	439905	5889764	53º 09' 13.909"	-9º 53' 55.224"	Two short linears 3m and 1.9m long perhaps forming two sides of a buried box feature. On sand/mud. Debris.	
SS18	MAG_4_103	WP4B40027	438262	5887045	53º 07' 45.254"	-9º 55' 21.777"	Irregular but continuous cut into sand crossing survey data window and in excess of 150m long. Explained by EGS as trench cut for IRIS cable, which was being laid while survey was being conducted.	
SS19	none	WP3M0009_001	436760	5902172	53º 15' 54.077"	-9º 56' 53.363"	Linear feature (in lower left) cutting across rippled sand and terminating at circular feature. 18m long linear, 3x5m termination. Mooring?	

ADCO Reference	EGS Reference	Survey Line	UTM 29N Easting	UTM 29N Northing	DMS Lat	DMS Long	Description	Image
SS20	none	WP5AM001-SPL000	439021	5902941	53º 16' 19.912"	-9º 54' 51.874"	5m long linear feature with acoustic shadow on edge of rock outcrop. Probably a piece of the bedrock exposure or perhaps debris lodged on it.	
SS21	none	WP5AX0004	437186	5897448	53 º 13' 21.408"	-9º 56' 27.019"	Spread of defined point contacts less than 1m in diameter, extended over area more than 100m by 60m and separated 10-20m apart. Possible lobster pots.