Deep Green Project – Holyhead Deep

Project and Export Cable Route – Offshore Survey

Volume 2 – Results Report

Bibby HydroMap Project No. 2015-021

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Report Revisions

Revision Number	Date of Issue	Comments
00	July 2015	For comment
01	September 2015	Client comments addressed
02	December 2015	Final (added CMACS Benthic reports)

Contents

Figures

Tables

Appendices

Appendix 1: Listings

Appendix 2: Charting

Appendix 3: Benthic Technical Report

Appendix 4: Habitat Assessment Report

1. Introduction

1.1 Project Overview

Bibby HydroMap were commissioned by Xodus Group in June 2015 to carry out a geophysical and environmental survey at Holyhead Deep, Holyhead, Wales. CMACS Ltd were subcontracted by Bibby HydroMap to assist on the environmental study.

The survey was required to investigate the seabed and sub-surface conditions in order to plan any subsequent geotechnical investigations and assist with the design and placement of tidal generation units and associated foundation structures including an export subsea cable linked to a land based substation facility and a transformer positioned on the seabed.

The survey was carried out between 9 June and 5 July 2015. A site location plan is presented below.

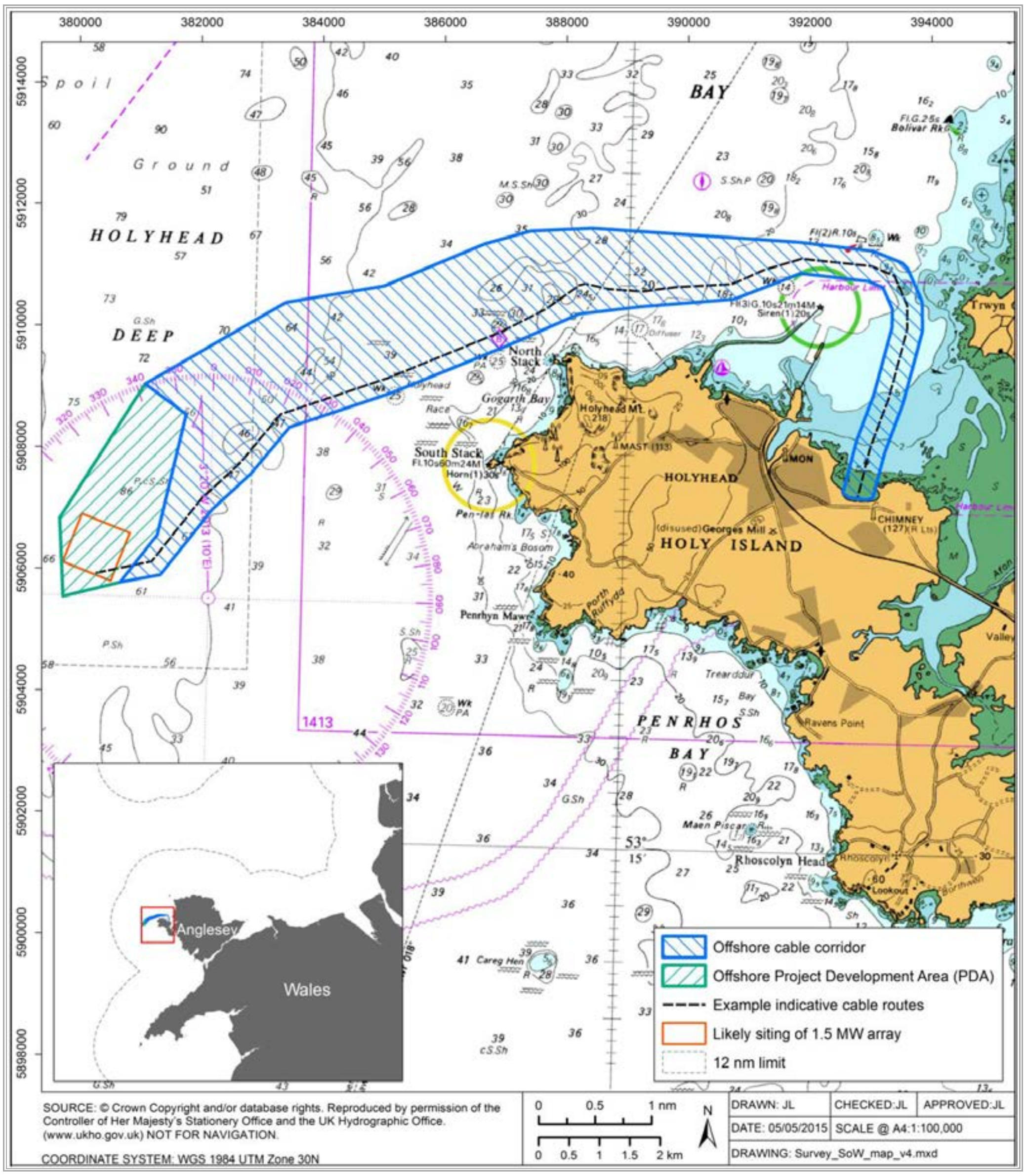


Figure 1: Site Location Plan

The main objectives of the surveys were as follows:

Geophysical Survey:

- To provide detail of the seabed conditions and bathymetry of the area;
- To identify any debris, potential hazards and obstructions;
- To identify any cable/ pipeline crossings as well as the presence of any existing subsea structures within the survey area;
- To identify the presence of any points of archaeological and cultural heritage interest;
- To produce laterally continuous interpretation of subsoil conditions where possible within the uppermost 5m below seabed; and
- Integrate the above data to optimise the installation of the subsea structures, cable route layout and planning of future geotechnical investigations.

Environmental Survey:

- To document the seabed environment, habitats and species of conservational interest; and
- To ensure that all potential seabed biotopes and their distribution are sufficiently sampled in order to produce final habitat and biotope maps.

In order to meet these objectives, multibeam bathymetry, side scan sonar, sub-bottom profiling and magnetometer data were acquired on site.

During the latter stages of the survey, an additional 'Route Development Area' survey was requested by the Client. This was undertaken within the inner section of the route bend between KP2.500 and KP4.500, across an area of approximately 0.58 km^2. Bathymetry and backscatter data were acquired at this location, with the backscatter data used for seabed features interpretation.

Volume 1 is the Operations Report, which details the operational parameters, locations, times and techniques utilised during the survey carried out by MV Chartwell and MV Eagle. This volume, Volume 2, presents the preliminary results of the survey undertaken within the PDA and proposed export cable route. The preliminary Results Report encompasses the geophysical survey; the Environmental survey, provided by CMACS, will be included in the final report.

1.2 Project Summary

The survey covered a corridor of approximately 19.5km long by 2.3km wide at its wider section, with the planned layout comprising two main sections:

1. The Project Development Area where a total of three tidal generation units will be placed. This is located to the western extents of the site, approximately 5.4km to the west of Holy Island and covers an area of approximately 3.6km long by 1.5km wide. Survey lines were orientated north-east to south-west at 50-60m separation. Seven cross lines were run in a north-west to south-east orientation at 500m centres.
2. The proposed export cable route on the coast of Penrhos Beach, approximately 2.5 km south-east of Holyhead Harbour. It extends to the north-north-east initially until KP3.250 where it veers to the south-west along the north coast of Holy Island, ending at the PDA. Survey lines were run every 50-60m in a north-east to south-west orientation over the

majority of the survey corridor. At the inshore end lines were run parallel with the direction of the corridor resulting on a line centred on the cable route and three wing lines on either side of the centre line.

The bathymetric survey achieved full coverage from the start of the offshore area to approximately KP2.060, and then partial coverage to approximately KP1.500, at the proposed landfall. The side scan sonar achieved full coverage along the survey extents down to KP0.227, with the exception of a 557m long by 59m wide triangular shaped area at the south-eastern boundary of the export cable route (between KP15.084 and KP15.567). This was caused by logging off slightly too early during acquisition, however bathymetry data was acquired over the small data gap and after further analysis of the seabed levels it was possible to extrapolate the seabed features, as no relevant seabed changes were noted in the area. This was raised with the client once found and no further re-acquisition was deemed necessary.

Data acquisition was not undertaken at the most inshore end of the survey corridor, from the KP values mentioned above down to KP0.000, given the shallow depths and tidal constraints encountered at the time of the survey.

The main marine scope was completed using the survey vessel MV Chartwell which operated on a 24 hour basis from the Port of Holyhead. MV Eagle operated from Holyhead Marina on a 12 hour basis and was utilised for the shallower sections of the survey.

MV Chartwell was equipped with high resolution multibeam echo sounder, side scan sonar, high and low frequency surface-towed sub-bottom profiler, towed hydrophone array and a high performance marine magnetometer. MV Eagle was equipped with a side scan sonar system and a high performance marine magnetometer.

2. Results and Interpretation

Side scan sonar and residual magnetic data are presented as seabed features with residual magnetic and sonar contacts on charts 2015-021-PL-001a to -001e at a scale of 1:5000.

Processed bathymetry data are presented as coloured shaded relief charts 2015-021-PL-002a to -002e at a scale of 1:5000. The data are contoured at a vertical interval of 1.0m, relative to VORF Low Astronomical Tide (LAT).

The sub-bottom profiling data are presented as isopachytes and sub-bottom profiles on charts 2015-021-PL-003a to -003e and 2015-021-PL-004 respectively.

Datasets were reduced to VORF LAT, which involved applying the UKHO Vertical Offshore Reference Frame (VORF) Geoid model to the data during post processing.

In this report volume, the results of the bathymetry, side scan sonar data, sub-bottom and magnetometer features are discussed in the PDA and along the export cable route.

Listings for all sonar, magnetometer and sub-bottom contacts across the site are presented in Appendix 1 to this report. This report is designed to be a summary of the information contained within the charts and should therefore be read in conjunction with these, and the following information:

- Side scan sonar contacts within the site boundary have been picked and listed. Given the high quantity of boulders identified on the sonar data with dimensions greater than 0.3m, a boulder density calculation was carried out with representative boulders being listed and plotted. Their ID's have not been included on the charts due to cluttering. However, these are provided on the listings, in Appendix 1 to this report. Sonar targets identified as possible debris and large boulders have all been presented on the charts along with ID and included on the listings. The location of linear targets provided on the listings is of their centre point.
- Sub-bottom targets are characterised by the presence of hyperbolae and the strength of these is dependent on variations such as surface sediments, vessel speed and the object itself. It is not possible to provide any dimensions for these features, other than depth to top of the target. The sub-bottom targets have been presented on the seabed features and sub-bottom profiles charts. A full list is presented in Appendix 1 to this report.
- Magnetic anomalies that are considered to relate to a side scan sonar contact (these generally lie within a 10m radius of each other) have been identified on the sonar contacts listings. Significant anomalies (over 10nT) are presented within the report. A complete magnetic anomaly listing is provided in Appendix 1 to this report.

In addition, the following data were provided as digital deliverables:

- Vessel COG and sensor track plots as shape files for multibeam, side scan sonar, boomer, pinger and magnetometer;
- Bathymetry reduced water depths reduced to VORF LAT as XYZ points file;
- Side scan sonar raw data in XTF format;

- Boomer and pinger sub-bottom raw data in SEG-Y format; and
- Raw total magnetic field and processed total and residual magnetic field readings in TXT format.

2.1 Project Development Area (PDA)

2.1.1 Bathymetry

Seabed levels across the PDA range from a minimum of 65.0m below LAT, on an irregular rocky outcrop near the north-eastern edge of the site, to a maximum of 88.0m below LAT in a localised depression within a broad, deep channel feature, which runs approximately north-northeast to south-southwest across the central section of the PDA.

Several localised depressions are present within the deep channel, where seabed levels are up to 3.0m deeper than the surrounding seabed. Maximum seabed gradients of up to 6.0° were noted around the edges of the deep channel, with localised gradients of up to 8.0° noted around the patches of outcropping rock near the north-western edge of the PDA.

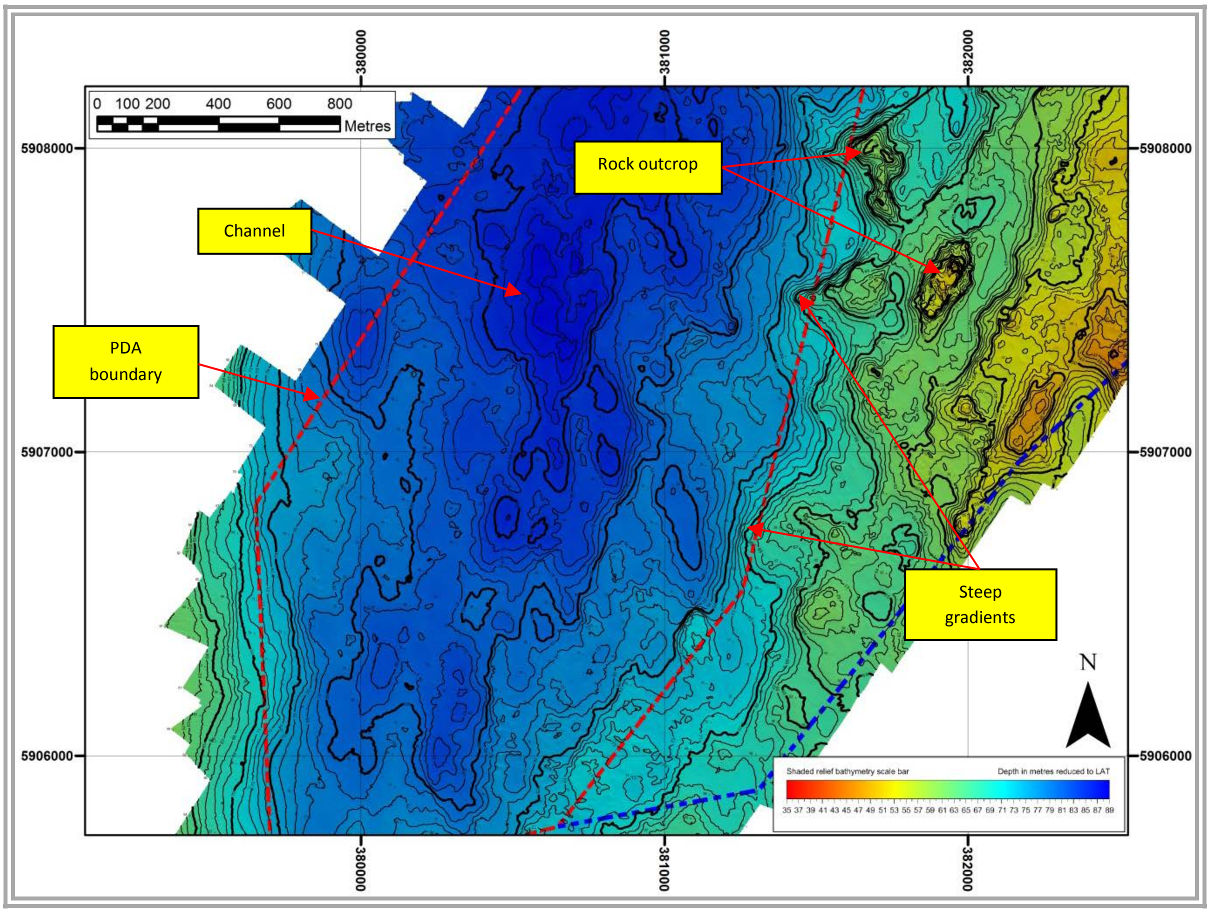


Figure 2: Shaded-relief image showing seabed channel orientated north-northeast to south-southwest

2.1.2 Seabed Features

The seabed characterisation is based on the relative reflectivity of different grain sized materials present on the seabed, including the presence of boulders, and on the geological knowledge of the area.

The seabed across the PDA comprises mainly sand and gravel, with several small, irregular patches of megarippled sand and gravel, including boulders (Figure 3, below). The term boulder is utilised for any single item of granular sediment with a minimum dimension of 200mm or greater.

The megaripples are generally orientated north-east to south-west, with the exception of a patchy area near the southern extents of the PDA, where an east-west orientation was noted. The megaripples stand up to 0.5m high, with wavelengths varying between 3m-5m and 15m-20m.

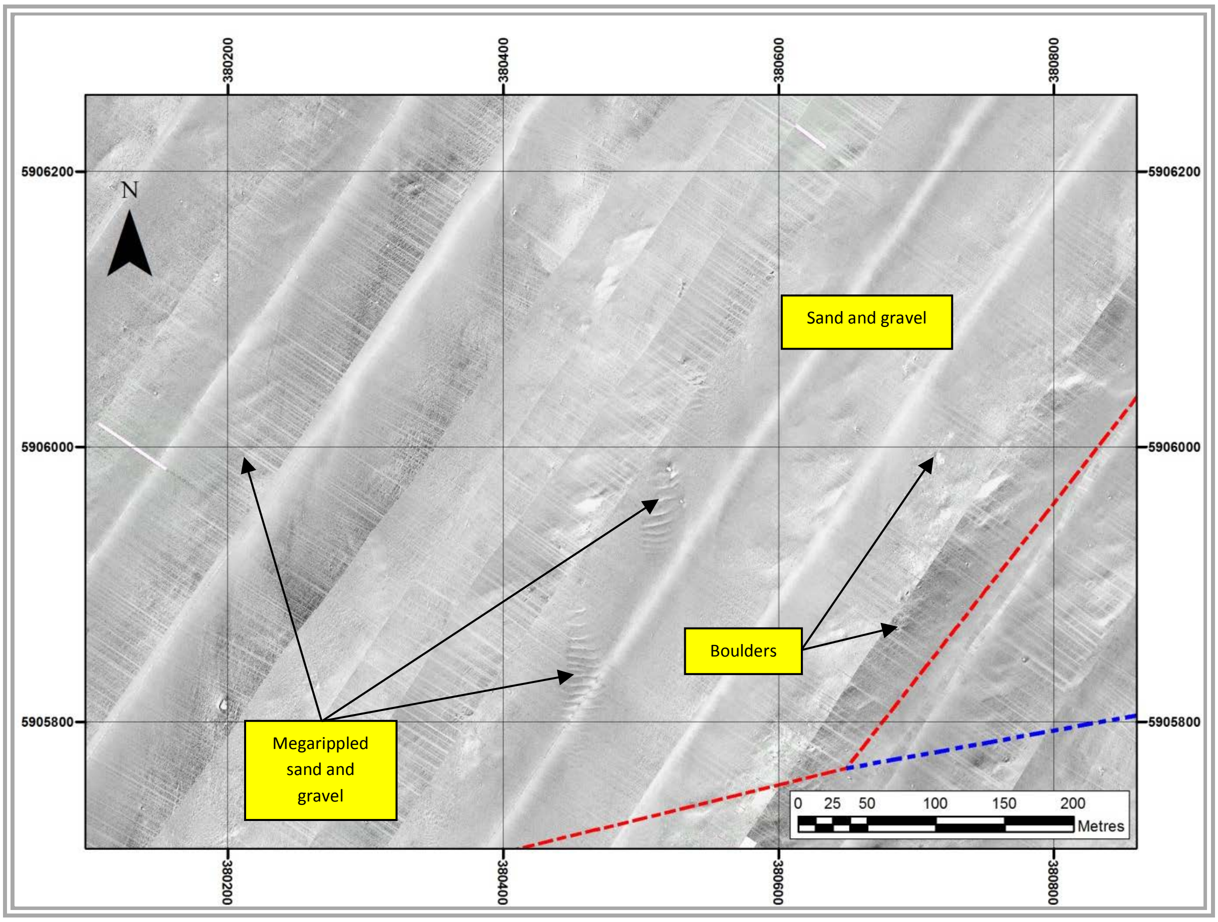


Figure 3: Seabed sediment distribution within the PDA

Given the considerable number of boulders noted across the entire survey area, a density analysis has been carried out, with only representative boulders being charted and listed. The density analysis results are shown on the Seabed Features Chart. In addition, for charting purposes, only large representative boulders (greater than 3.0m) have been plotted as sonar targets, together with identification number (ID). Any boulders smaller than 3.0m are presented separately; however, all representative boulders show an ID in the Sonar Contact Listings.

An average of approximately 1.6 boulders per 100m x 100m box (1.6 boulders per 100m^2) was noted across the PDA, with the exception of an area near the south-eastern limits, where the density averages 4.6 boulders per 100m^2. A total number of 79 representative boulders, with maximum dimensions of less than 3.0m, were noted across the PDA.

A total of 19 sonar contacts were identified and are presented in the table below; these include possible linear and discrete debris as well as 14 boulders with dimensions larger than 3.0m. None of the sonar targets were noted to have an associated magnetic anomaly.

Easting (m)	Northing (m)	Sonar Contact ID	Length (m)	Width (m)	Height (m)	Comment
381612.4	5908025.6	S122	4.0	3.7	2.1	Boulder >3.0m
380946.7	5908834.2	L123	5.1	0.1	0.5	Linear Contact
380407.3	5907749.7	S124	1.4	1.2	0.4	Possible debris
381256.8	5908090.1	S125	3.0	1.1	0.4	Possible debris
381210.6	5907394.5	S126	6.2	4.7	2.4	Boulder >3.0m
381330.7	5907340.6	S128	3.7	2.9	1.3	Boulder >3.0m
381214.0	5906986.6	S129	3.7	2.6	1.1	Boulder >3.0m
379708.3	5906359.3	L132	8.3	0.1	0.1	Linear Contact
379909.7	5906911.9	S133	1.5	1.4	0.3	Possible debris
381275.4	5908281.3	S821	4.2	1.8	0.8	Boulder >3.0m
381206.9	5907445.1	S834	5.8	2.9	0.6	Boulder >3.0m
380573.1	5906573.9	S838	3.1	0.5	0.5	Boulder >3.0m
381024.2	5906447.5	S855	4.2	1.7	0.4	Boulder >3.0m
380392.4	5907134.9	S868	3.3	1.2	0.3	Boulder >3.0m
380618.2	5906811.1	S872	3.6	2.9	0.3	Boulder >3.0m
381350.2	5907679.5	S877	3.5	2.6	0.3	Boulder >3.0m
380555.7	5906159.6	S884	3.6	2.8	0.8	Boulder >3.0m
380195.4	5905813.2	S888	7.6	6.4	0.6	Boulder >3.0m
379840.9	5905881.6	S904	3.3	0.7	0.3	Boulder >3.0m

Table 1: Sonar contacts identified within the PDA

2.1.3 Magnetometer Data

A total of 2 significant magnetic anomalies (<10nT) were noted towards the western extents of the PDA, within the broad channel feature and may indicate possible items of ferrous debris (see Table 2, below). No associated sonar contacts were identified on the seabed.

Easting (m)	Northing (m)	Magnetic Anomaly ID	Amplitude (nT)	Associated Sonar Contact ID	Sonar Contact Dimensions L x W x H (m)	Comment
380228.3	5907114.0	M118	12.0	No sonar target	N/A	Negative Monopole
380258.6	5907158.7	M119	11.7	No sonar target	N/A	Asymmetric Dipole

Table 2: Magnetic anomalies identified within the PDA

2.1.4 Shallow Soils

The sub-bottom profiling data within the PDA, indicate sediment thicknesses from a veneer, in localised areas to the north-northeast and southern limits, to up to 50.0m at the south-western extents of the area. The sub-bottom data within the surficial sediments exhibits parallel bedded sediments, possibly coarse grained materials.

At the deepest section of the seabed channel shown on the bathymetry, the sediment cover across bedrock ranges from approximately 10.0m to 15.0m, thickening rapidly to a maximum of about 50.0m at the western limits, across a well-defined trend to the west-southwest.

Across the remainder of the area, the sub-bottom data indicate undulating sediment cover from a veneer to thicknesses greater than 10.0m. Significant areas of sub-cropping rock (where sediment thicknesses are less than 1.0m) were noted at the north-eastern and southern corners of the PDA.

Two example records of sub-bottom data are shown on Figure 4 and Figure 5, below.

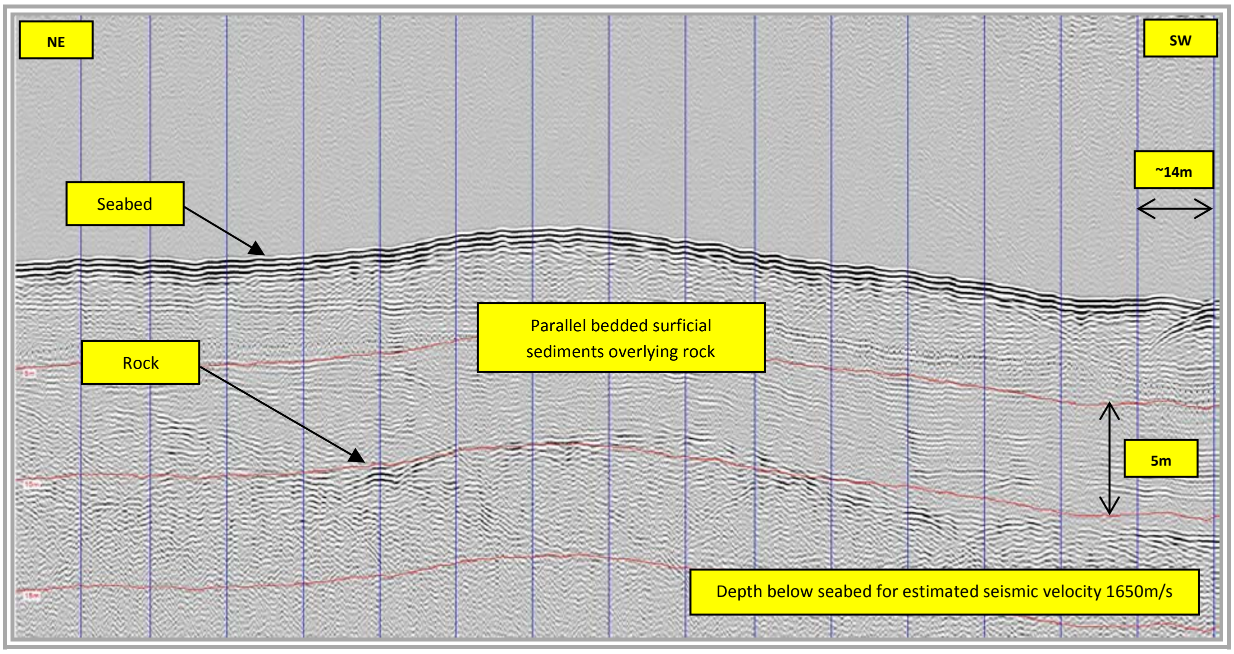


Figure 4: Pinger data example within PDA

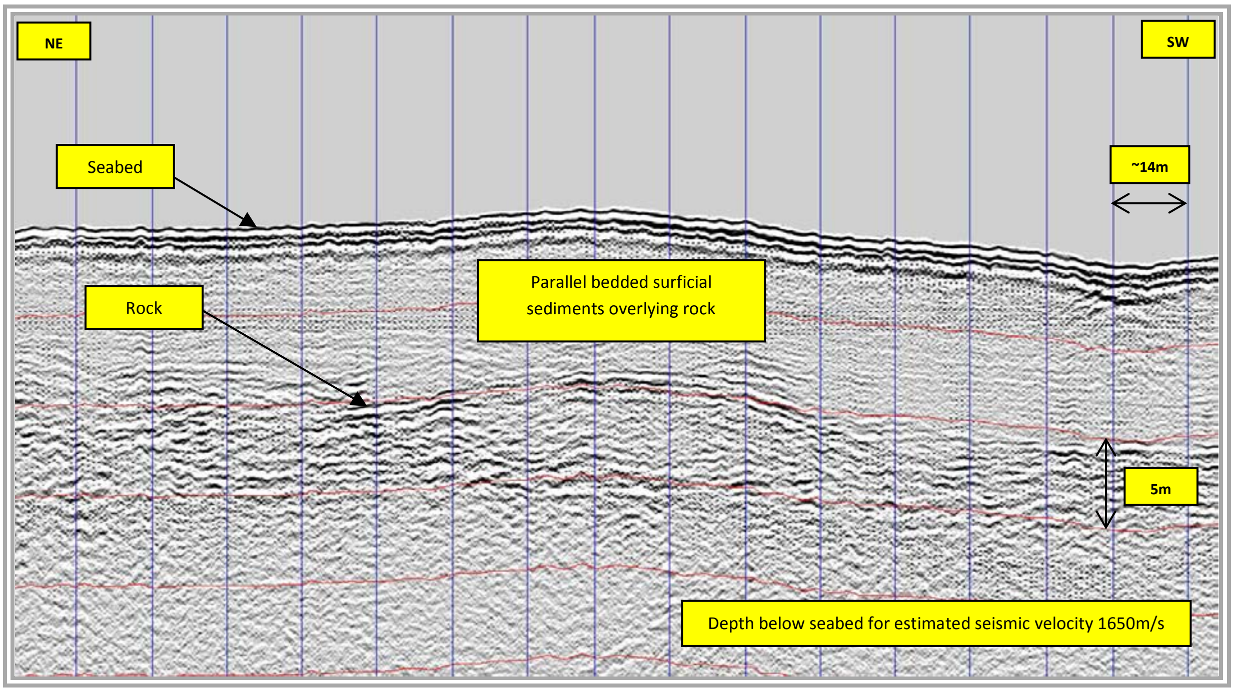


Figure 5: Boomer data example within PDA

Four sub-bottom targets were noted within the PDA and are shown on Table 3, below. There are no associated sonar contacts or magnetic anomalies.

Easting (m)	Northing (m)	ID	Depth from Seabed (m)
380954.1	5908330.7	P002	1.9
380132.0	5906688.8	P003	2.1
380101.7	5906643.8	P004	1.7
379805.7	5906204.3	P005	3.3

Table 3: Sub-bottom targets identified within the PDA

2.1.5 Geotechnical Sampling and Testing

Grab samples and camera stills were undertaken across the PDA and their locations have been plotted on the Seabed Features Chart. The grab samples were sent to CMACS for sample contamination testing and grain size analysis. The results will be integrated with the geophysical interpretation in the final report.

2.2 Export Cable Route

2.2.1 Bathymetry

Seabed levels within the route corridor range from a minimum of 3.5m below LAT near the inshore limits of the bathymetry data, to a maximum of approximately 88.0m below LAT in the offshore western edge of the corridor, immediately north of the PDA.

A minimum level of 3.5m below LAT has been noted at the inshore extents of the bathymetry data at approximately KP1.365, with the proposed route running towards the north-northeast.

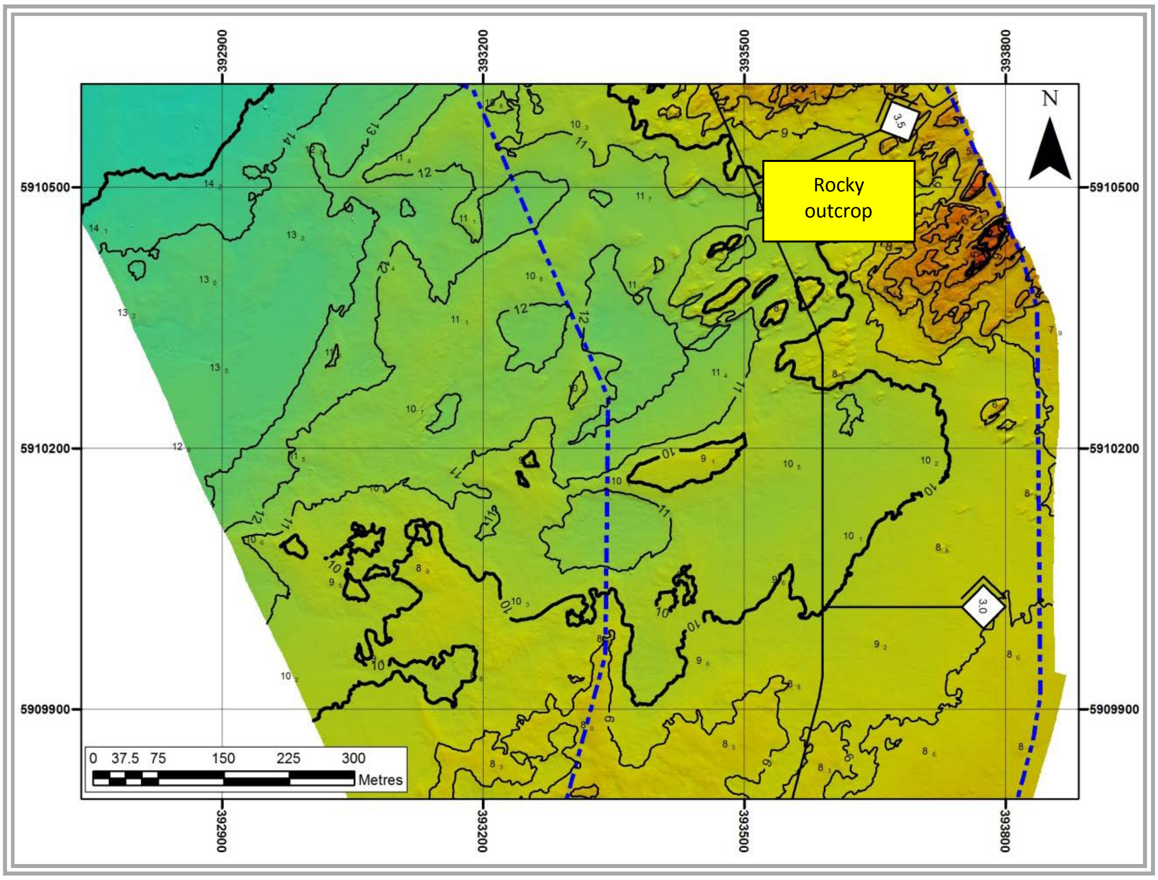


Figure 6: Shaded-relief image between KP3.000 and KP3.5000

Seabed levels deepen gently at average gradients of <1.0°, initially towards the north, and then towards the north-west, reaching 10.0m below LAT at approximately KP3.000 (see Figure 6, above).

Between KP3.00 and KP4.245, the proposed route turns towards the north and then the west-northwest, with seabed levels becoming very irregular across an area of outcropping rock, which lies mainly to the north-east of the route centre line. Seabed levels across this rocky area lie between 4.0m and 12.0m below LAT. Localised seabed gradients of 10° - 30° were noted around some of the rocky pinnacles in this area. Along the route centre line, localised gradients are steepest between KP3.245 and KP4.050, with seabed levels undulating between 7.5m and 13.0m below LAT. Seabed levels across the area of route development to the west-southwest of this rocky area dip gently towards the north-west, ranging from 8.0m to 16.0m below LAT.

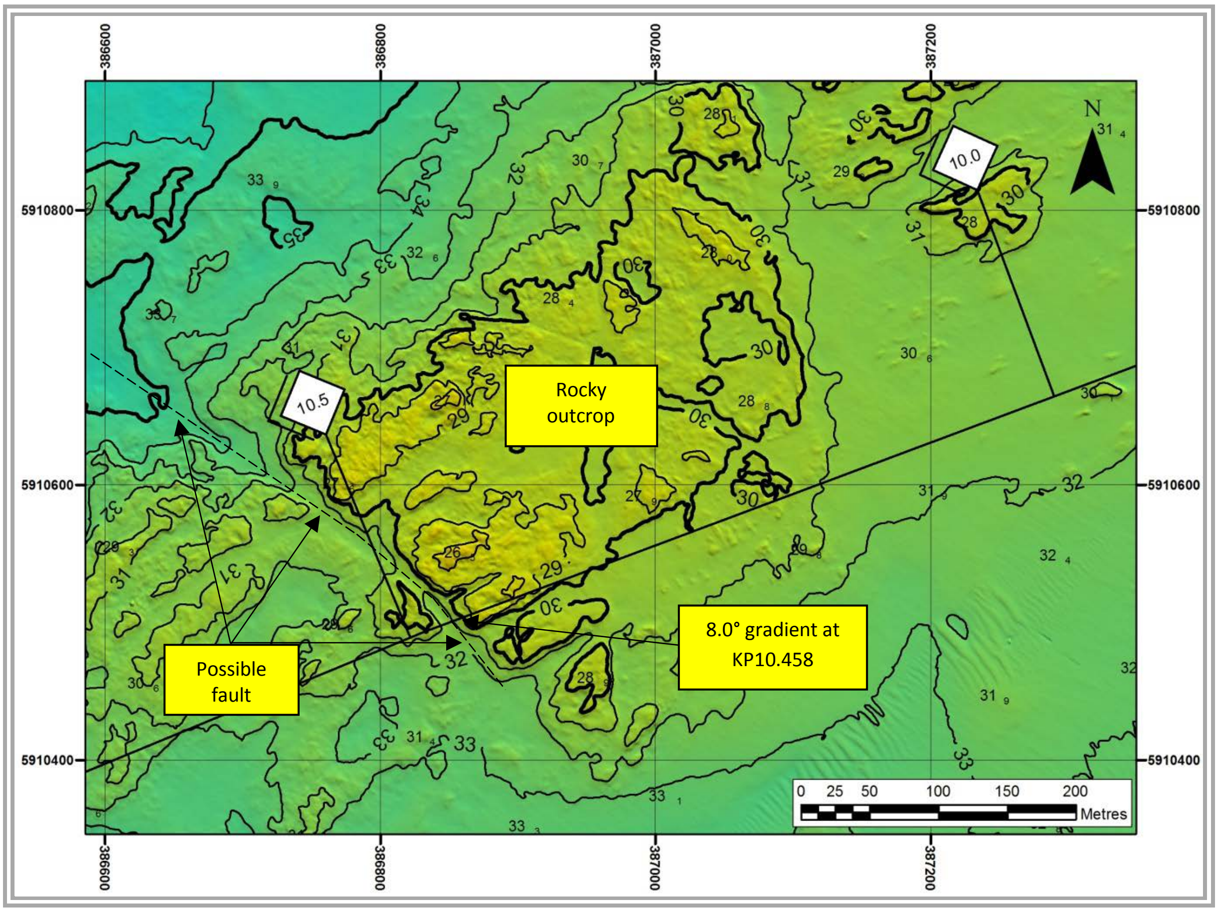


Figure 7: Shaded-relief image of rocky area between KP10.175 and KP10.600

To the west-northwest of the rocky outcrops, seabed levels dip westwards across a gently undulating seabed, deepening from 13.0m below LAT at KP4.050 to 40.0m below LAT at KP12.655 at an average gradient of less than 2.0°; however, some localised mounds and larger areas of outcropping rock are present along this section of the route, where seabed levels locally shoal by up to 4.0m and where localised gradients of up to 8.0° were noted (Figure 7, above).

The route crosses a narrow, linear channel feature at approximately KP10.470, which extends north-west to south-east across a rock outcrop. This geological feature is approximately 680m long by 8m wide and may be indicative of a fault (Figure 7, above). It is not possible to identify this feature in the sub-bottom data as it may be masked by the chaotic signal from the steep edges of the rocky outcrop and gravelly materials found in this area.

To the south-west of KP12.655, the seabed deepens more rapidly to the north-west across an irregular, undulating area of coarsely granular sediments; from 40.0m below LAT at KP12.655 to 50.0m below LAT at KP13.048 and 55.0m below LAT at KP13.770. Maximum gradients of up to 11.0° were noted at the steepest areas. Along the proposed cable route centre line, gradients reach a maximum of 7.2°.

The route traverses the northern extents of a seabed depression located approximately 180m south of the proposed route at KP13.500. Seabed levels deepen from 53.0m below LAT to 60.0m below LAT at the centre of this feature, which is approximately 490m long by 210m wide. Immediately to the west of this depression, the seabed shoals rapidly across an elongated mound, which is orientated north-east to south-west. It is approximately 600m long by 220m wide and stands up to 15.0m shallower than the surrounding seabed. Maximum gradients of over 10.0° were noted on the slopes of this mound feature (Figure 8, below).

Several other seabed mounds and depressions were noted on both sides of the proposed route within this section of the corridor. These features show similar characteristics to the above feature, which indicates that a north-east to south-west trend is apparent.

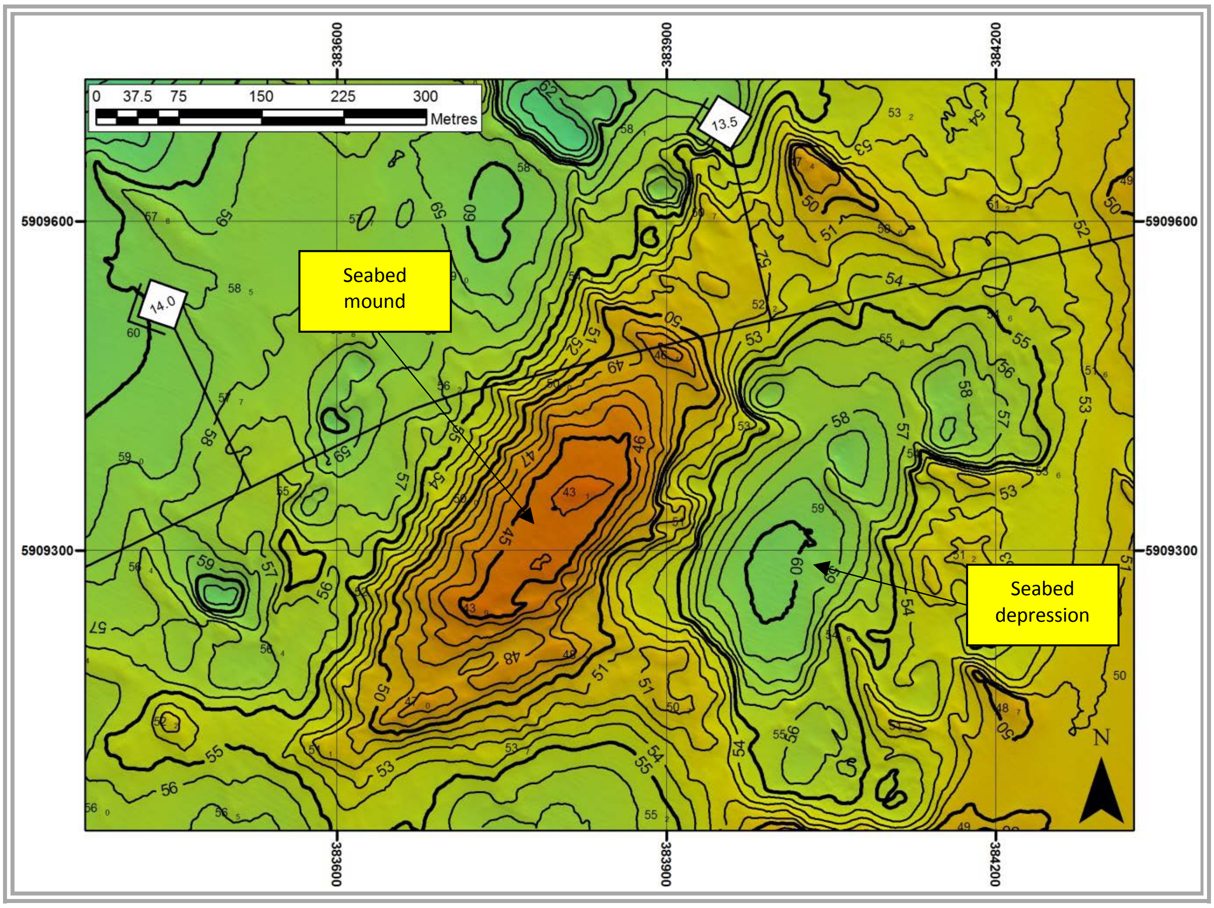


Figure 8: Seabed depression and ridge to south of route between KP13.0 and KP14.0

To the south-west of KP14.300, the seabed dips further towards the north-west across a very irregular area comprising mounds of coarsely granular sediments. Seabed levels in this area deepen from 60.0m below LAT at KP14.335 to 65.0m below LAT at KP14.742, before temporarily shoaling again to approximately 57.0m below LAT at KP15.120, with localised gradients of up to 10.0° noted along the proposed route centre line. Seabed levels along the proposed route then deepen towards the west, reaching approximately 70.0m below LAT, close to KP16.000, before shoaling again across a large area of outcropping rock, which lies between KP16.140 and the eastern edge of the PDA, at KP16.364. Minimum levels of close to 59.0m below LAT were noted on this rock outcrop, with localised slope gradients of up to 16.0° noted around its edges.

At the north-eastern edge of the deep channel feature that lies mainly within the area covered by the PDA, the seabed is very irregular, with scattered rocky pinnacles and outcrops that exhibit gradients of up to 14.7° (Figure 9, below).

Seabed levels in the westernmost section of the route corridor range from a minimum of 88.0m below LAT, within the channel feature to the north-northwest of KP16.364, to a maximum of 43.1m below LAT noted on a seabed mound to the south-eastern extents of the corridor.

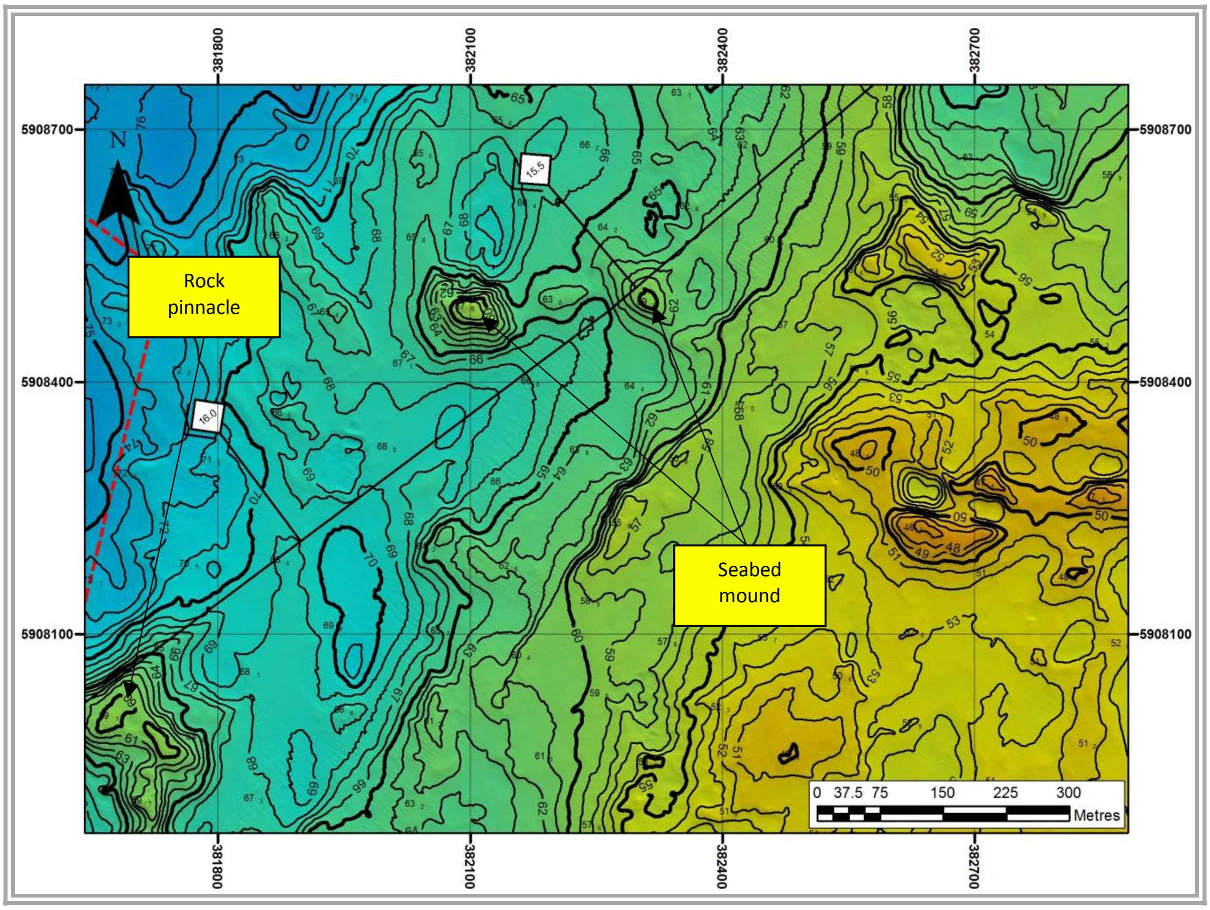


Figure 9: Seabed mounds and rock pinnacles at north-eastern edge of channel feature

2.2.2 Seabed Features

The seabed characterisation is based on the relative reflectivity of different grain sized materials present on the seabed, including the presence of boulders, and on the geological knowledge of the area.

The seabed within the route corridor comprises irregular areas of sub-cropping and outcropping rock, together with more extensive irregular areas of coarse grained sediments, generally containing numerous boulders, except near the inshore extents of the route, where the sediments are finer grained and boulders are much less frequent.

At the inshore limits of the side scan sonar data at KP0.227 the seabed sediments comprise generally featureless sand, with a few rocky areas located generally to the west-northwest of the proposed route centre line, up to KP1.100, with the proposed route crossing two rock outcrops between KP0.600 and KP0.935.

Some irregular patches of sand and gravel are present to the east of the centre line between KP1.500 and KP2.000, with the seabed sediments grading into an extensive area of gravels, with frequent cobbles and boulders to the north-east of approximately KP2.054. These coarser grained sediments extend across much of the route corridor up to KP6.102, interspersed with smaller areas or patches of sand or sand and gravel.

Within this large expanse of gravels, a large rock outcrop is present over much of the eastern side of the route corridor between KP3.240 and KP4.045, extending mainly to the north-east of the centre line, where the route veers to the north-west and then to the west-northwest (Figure 10, below).

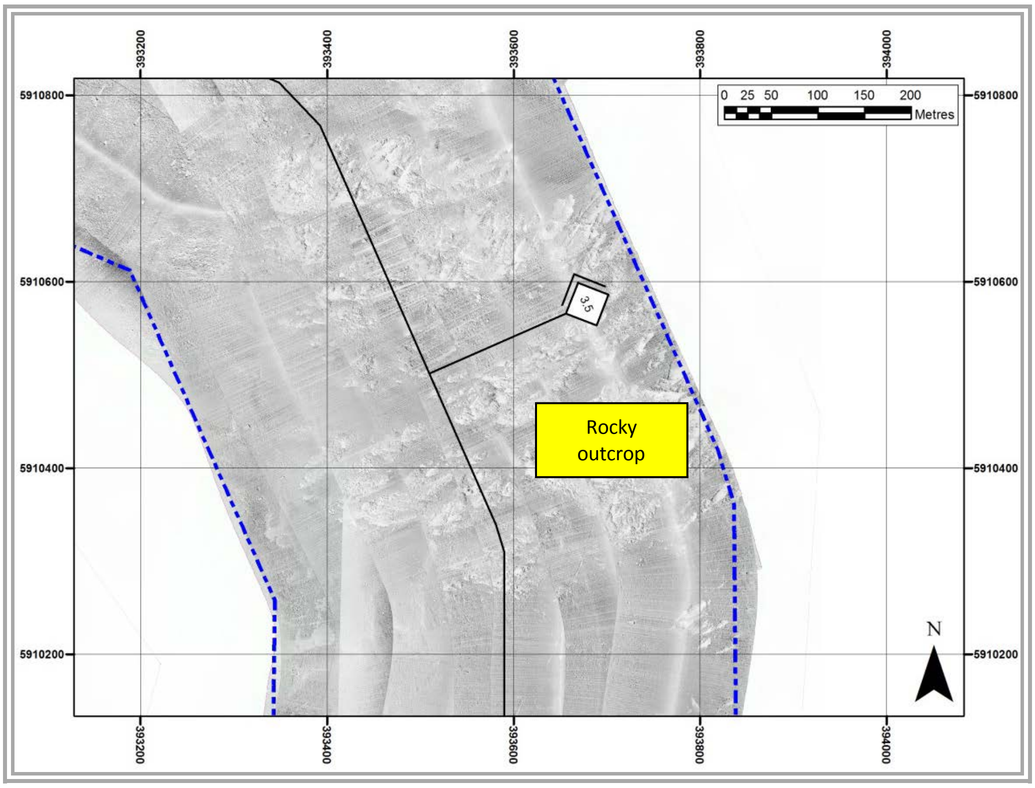


Figure 10: Rock outcrop between KP3.240 and KP4.025

Several small patches of megarippled sand and gravel are present to the north-west of this large rock outcrop, mainly to the north of the route centre line. The megaripples are orientated north-northeast to south-southwest, with wavelengths between 1m and 1.5m and heights of up to 0.5m. Numerous large boulders were noted within the gravelly seabed sediments between KP2.054 and KP6.102, with some of these boulders standing up to 1.4m higher than the surrounding seabed. Boulder densities vary between 0.5 boulders per 100m² near the patches of megaripples and 2.2 boulders per 100m², where the route runs towards the north east.

From KP6.102 to approximately KP7.500, the seabed sediments mainly comprise sands and gravels, with varying boulder densities and occasional small rock outcrops.

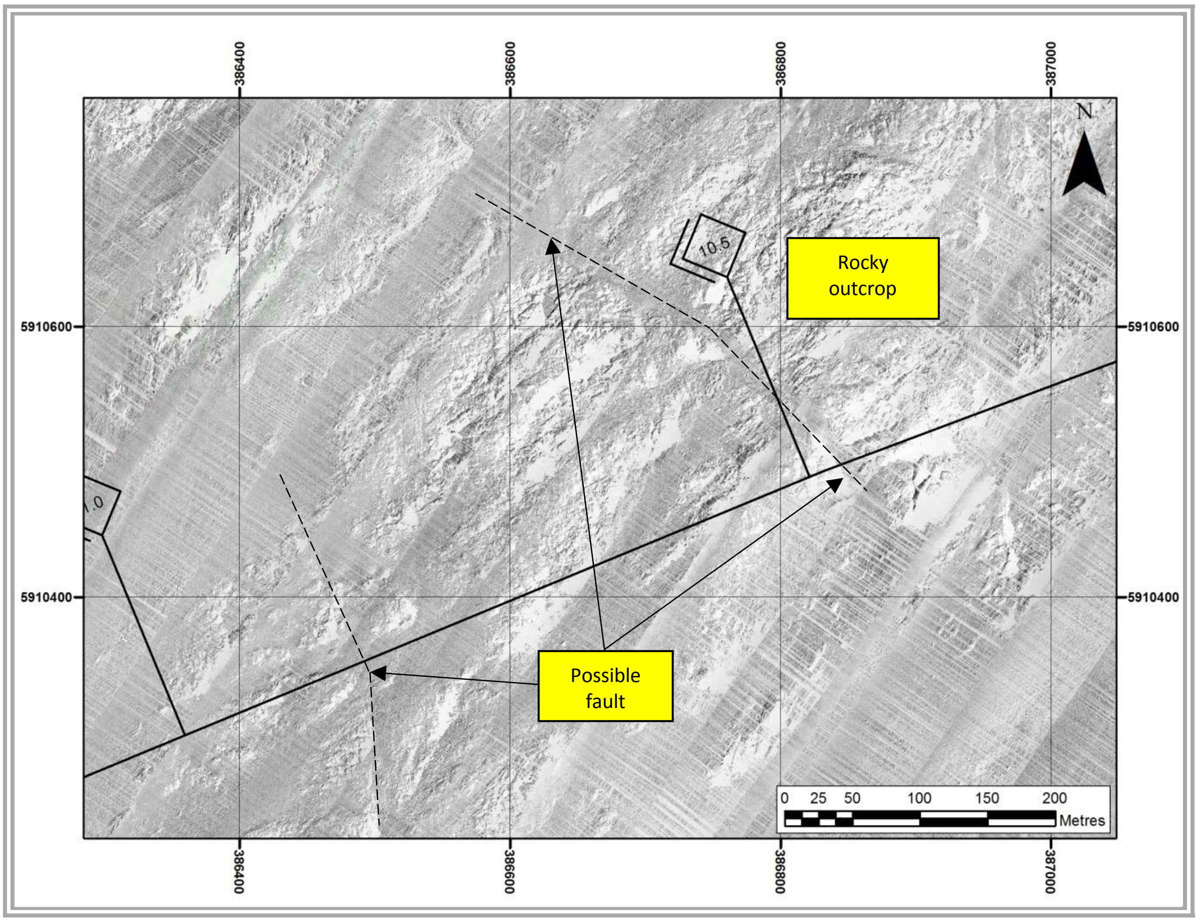


Figure 11: Large rock outcrop beneath route centre line between KP10.173 and KP11.016

Numerous rock outcrops are present across the route corridor between KP7.500 and KP12.000, with any bedrock structure exhibiting a general north-east to south-west trend. The proposed route centre line crosses the largest of these rock outcrops between KP10.173 and KP11.016, although this single, irregular rocky area alone extends to the north-west and south-east across an area of up to 1780m long by 1020m wide (Figure 11, above).

Two elongated sections of megaripples extend in intermittent patches across the proposed route from the north-east to the south-west between KP8.600 and KP11.450. The widths of these strips of megarippled sand and gravel range from 9m, near the proposed route centre line at KP9.550, to over 200m near the southern limits of the corridor at KP11.000. The megaripples are mainly orientated north-northwest to south-southeast, with a few patches orientated north-west to south-east or north-south. Wavelengths vary from a minimum of 2m, to the north of the route centre line, to a maximum of 14m to the south-east of the route centre line, with heights of up to 0.5m.

From KP12.000 to the offshore end of the proposed route centre line at approximately KP16.364, the seabed sediments once again comprise mainly sands and gravels, with varying boulder densities and occasional, relatively small rock outcrops.

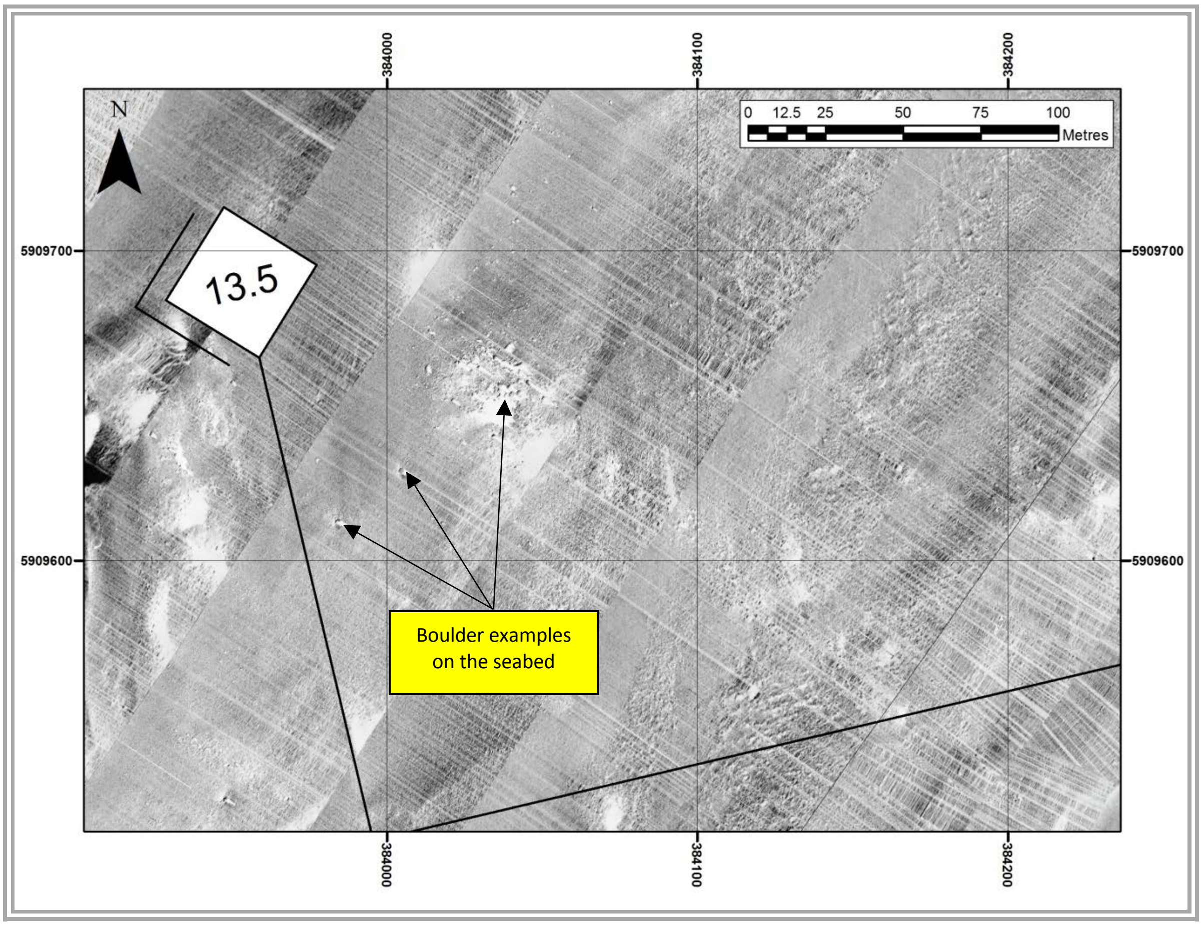


Figure 12: Concentrated area of boulders near KP13.500

A significant part of the route between KP11.450 and KP16.364 exhibits a higher density of boulders (Figure 12, above), with average density values of 1.7 boulders per 100m², with a maximum of 4.6 boulders per 100m² noted to the south-eastern extents of the route corridor.

A total of 671 representative boulders, with maximum dimensions of less than 1.0m, and a total of 145 sonar contacts were identified within the cable route corridor. Most of these contacts are classed as items of possible debris and comprise 57 linear contacts, 13 discrete contacts and 13 contacts associated with fishing gear. The remaining 62 contacts were classed as large boulders (greater than 3.0m).

A 6.7m long by 0.1m wide linear contact (L020) was noted to the south-east of KP1.234 and has an associated magnetic target (M134). At KP8.756 the route crosses a 240m long linear contact (L071) which may be a section of rope or chain possibly associated with fishing gear.

To the east of KP3.060, a 188m long linear contact (L032) is possibly associated with an existing infrastructure which runs offshore from Penrhos beach towards the north-east, veering towards the north-west at this location.

Linear contacts L034, L035, L036 and L039, located between KP3.294 and KP3.830, lie in the vicinity of infrastructure cables; however, given their orientation and offset to the charted cables it is not possible to establish a clear association.

Two wrecks (S053 and S089) have been identified outside the survey corridor. These and any sonar contacts noted outside the survey boundaries have not been shown on charts; however, they are included in the sonar listings, amounting to a total of 6 contacts.

Several sonar contacts are listed below and a full listing is provided in Appendix 1.

Easting (m)	Northing (m)	Sonar Contact ID	Length (m)	Width (m)	Height (m)	Comment
392843.3	5907616.7	S005	1.4	0.6	0.2	Possible debris
393147.7	5908254.4	L020	6.7	0.1	0.0	Linear contact associated with M134
393253.6	5908665.8	S021	3.6	1.4	0.2	Possible debris
393731.9	5910101.4	L032	187.9	0.1	0.1	Associated with existing infrastructure cable
393827.4	5910336.5	L034	61.8	0.1	0.0	Linear Contact
393620	5910514.7	L035	46.9	0.1	0.1	Linear Contact
393457.7	5910710.1	L036	38.3	0.1	0.0	Linear Contact
393365.9	5910778.3	L039	28.0	0.1	0.0	Linear Contact
389939.1	5911380.7	S061	1.4	1.1	0.2	Possible debris
388926.4	5911539.7	S069	2.4	1.7	0.5	Possible Anchor
387883.4	5910162.5	S074	2.0	1.3	3.2	Possible debris
385333.9	5909879.3	S085	4.6	3.5	0.5	Possible debris
385448.7	5909561	S086	2.3	1.6	0.6	Possible debris
385019.2	5909979.8	S088	2.2	1.2	0.5	Possible debris
383274.1	5910175.5	S097	0.7	0.4	0.2	Possible debris
382757.3	5909446.8	S103	2.7	1.3	1.6	Possible debris
381728.1	5909181.5	S112	1.0	0.6	0.4	Possible debris
381725.4	5909176.7	S113	4.3	3.9	0.6	Possible debris
381723.3	5909172.8	S114	0.9	0.8	0.5	Possible debris

Table 4: Sonar contact examples within the route corridor

2.2.3 Magnetometer Data

A total of 127 magnetic anomalies were identified within the cable route corridor of which 114 are deemed to be significant (>10nT). Of these, 35 anomalies present amplitudes greater than 50nT, with 7 anomalies showing values greater than 500nT.

Magnetic anomaly M134 (9.9nT) is associated with a small linear sonar contact (L020) and was noted to the south-east of KP1.234 towards the inshore section of the route corridor. It may be associated with debris from fishing activity, or a possible chain.

There are three linear magnetic anomalies, present towards the inshore limits of the route and a fourth, located where the route veers to the north-west. The anomaly noted closest to the beach, extends north-northwest to south-southeast along approximately 250m, and crosses the route centre line at KP0.331. This anomaly corresponds with the charted location of an outfall. The other two linear anomalies (628m and 1124m long) are orientated north-east to south-west and run relatively parallel to each other along the eastern side of the route corridor until KP1.370. Their location lie over existing infrastructure which run offshore from Penrhos beach. The magnetic linear anomaly located where the route veers to the north-west, lies over rock outcrop along 98m and extends north-west to south-east. There are no sonar targets associated with this anomaly, which may be associated with cable infrastructure crossing the route corridor.

Several magnetic anomalies, 6 in total, were noted outside the survey corridor and are presented on the listings enclosed to this report.

Magnetic anomalies with amplitudes greater than 10nT are presented on Table 5, below, and any anomalies with amplitudes greater than 50nT have been highlighted.

Easting (m)	Northing (m)	Magnetic Anomaly ID	Amplitude (nT)	Associated Sonar Contact ID	Sonar Contact Dimensions L x W x H (m)	Comment
383121.3	5908467.2	M001	19.4	N/A	N/A	Dipole
382469.8	5907324.8	M002	15.3	N/A	N/A	Positive Monopole
384133.7	5909388.4	M003	29.6	N/A	N/A	Positive Monopole
384754.0	5910026.9	M004	36.5	N/A	N/A	Dipole
385444.6	5910681.5	M005	57.5	N/A	N/A	Asymmetric Dipole
385332.0	5910510.2	M006	38.3	N/A	N/A	Positive Monopole
385257.8	5910389.6	M007	35.8	N/A	N/A	Dipole
385173.1	5910164.7	M008	30.5	N/A	N/A	Asymmetric Dipole
385628.7	5910744.1	M009	49.4	N/A	N/A	Dipole
385384.7	5910373.8	M010	31.2	N/A	N/A	Negative Monopole
384903.1	5909659.1	M011	30.3	N/A	N/A	Dipole
385892.6	5910811.3	M013	11.6	N/A	N/A	Asymmetric Dipole
386137.7	5911068.9	M014	88.4	N/A	N/A	Dipole
385220.7	5909369.9	M015	10.7	N/A	N/A	Positive Monopole
386294.0	5910802.4	M016	172.3	N/A	N/A	Positive Monopole
386380.6	5910734.0	M018	133.9	N/A	N/A	Positive Monopole
393149.6	5911074.9	M020	15.9	N/A	N/A	Dipole
392830.3	5911096.4	M021	38.4	N/A	N/A	Dipole
393293.6	5910956.2	M022	113.1	N/A	N/A	Dipole
391757.6	5911036.0	M024	1204.8	N/A	N/A	Dipole
393164.2	5910732.4	M025	14.8	N/A	N/A	Negative Monopole
393275.1	5910674.4	M026	32.2	N/A	N/A	Positive Monopole
393219.5	5910662.9	M027	172.6	N/A	N/A	Dipole
391378.1	5910686.7	M028	19.3	N/A	N/A	Asymmetric Dipole
391402.5	5910832.1	M029	109.4	N/A	N/A	Asymmetric Dipole
391188.8	5910832.3	M030	183.5	N/A	N/A	Negative Monopole
390816.8	5910486.9	M031	24.6	N/A	N/A	Asymmetric Dipole
390859.2	5910765.6	M032	78.4	N/A	N/A	Asymmetric Dipole
391002.3	5911080.6	M033	20.3	N/A	N/A	Dipole
390817.4	5910808.9	M034	15.5	N/A	N/A	Asymmetric Dipole
390749.4	5910707.4	M035	871.2	N/A	N/A	Dipole
390994.2	5911274.3	M036	14.3	N/A	N/A	Positive Monopole

Easting (m)	Northing (m)	Magnetic Anomaly ID	Amplitude (nT)	Associated Sonar Contact ID	Sonar Contact Dimensions	Comment
390621.8	5910716.6	M037	11.8	N/A	N/A	Dipole
390555.1	5910720.9	M039	13.1	N/A	N/A	Positive Monopole
390413.6	5910607.3	M040	11.7	N/A	N/A	Negative Monopole
390566.4	5910840.9	M041	12.4	N/A	N/A	Negative Monopole
390845.0	5911259.3	M042	175.0	N/A	N/A	Negative Monopole
390484.2	5910825.2	M043	100.6	N/A	N/A	Positive Monopole
390568.2	5911147.8	M044	46.3	N/A	N/A	Dipole
390481.1	5911150.3	M045	13.1	N/A	N/A	Dipole
390682.5	5911425.8	M046	25.6	N/A	N/A	Positive Monopole
389969.0	5910813.0	M050	10.2	N/A	N/A	Positive Monopole
390123.1	5911027.5	M051	12.5	N/A	N/A	Negative Monopole
389915.2	5911037.6	M055	246.3	N/A	N/A	Negative Monopole
389826.6	5910915.4	M056	10.5	N/A	N/A	Positive Monopole
389541.9	5910752.2	M057	22.2	N/A	N/A	Dipole
389710.1	5911099.5	M058	67.6	N/A	N/A	Positive Monopole
389894.7	5911482.9	M059	17.2	N/A	N/A	Negative Monopole
389613.0	5911357.2	M060	395.1	N/A	N/A	Dipole
393498.2	5910821.6	M062	40.8	N/A	N/A	Asymmetric Dipole
393560.1	5910651.2	M063	49.5	N/A	N/A	Asymmetric Dipole
393665.8	5910439.7	M064	48.6	N/A	N/A	Positive Monopole
393349.7	5910846.3	M065	30.7	N/A	N/A	Asymmetric Dipole
393499.7	5910530.8	M066	18.8	N/A	N/A	Positive Monopole
393564.2	5910385.5	M067	26.7	N/A	N/A	Negative Monopole
385976.4	5909448.7	M068	28.9	N/A	N/A	Positive Monopole
387098.3	5910963.4	M069	1538.8	N/A	N/A	Complex Anomaly
386246.8	5909663.7	M071	11.9	N/A	N/A	Positive Monopole
386283.6	5909708.5	M072	38.6	N/A	N/A	Negative Monopole
388092.7	5910235.9	M074	21.2	N/A	N/A	Positive Monopole
387547.0	5911357.0	M075	19.0	N/A	N/A	Asymmetric Dipole
387230.1	5910888.7	M076	64.5	N/A	N/A	Dipole
387088.1	5910677.6	M077	181.9	N/A	N/A	Dipole
386959.9	5910489.3	M078	617.4	N/A	N/A	Dipole
387199.3	5910729.8	M079	457.4	N/A	N/A	Dipole
387223.2	5910539.0	M080	346.7	N/A	N/A	Asymmetric Dipole
387079.0	5910329.8	M081	699.6	N/A	N/A	Asymmetric Dipole
386552.7	5909547.4	M082	359.0	N/A	N/A	Positive Monopole
388232.1	5910928.9	M084	389.5	N/A	N/A	Asymmetric Dipole
388405.0	5910628.7	M085	129.9	N/A	N/A	Asymmetric Dipole
388562.7	5910536.9	M086	19.6	N/A	N/A	Negative Monopole
387747.4	5910677.9	M087	69.0	N/A	N/A	Positive Monopole

Easting (m)	Northing (m)	Magnetic Anomaly ID	Amplitude (nT)	Associated Sonar Contact ID	Sonar Contact Dimensions	Comment
383883.1	5910023.4	M088	68.4	N/A	N/A	Dipole
393160.6	5908849.7	M090	26.4	N/A	N/A	Positive Monopole
393671.8	5909538.0	M091	26.5	N/A	N/A	Positive Monopole
393434.9	5910526.9	M094	24.0	N/A	N/A	Positive Monopole
393503.2	5910375.2	M095	10.7	N/A	N/A	Positive Monopole
393491.5	5910676.3	M096	37.1	N/A	N/A	Dipole
393353.4	5910721.6	M097	10.3	N/A	N/A	Positive Monopole
389704.5	5911219.0	M098	15.3	N/A	N/A	Positive Monopole
390288.2	5910730.7	M099	22.2	N/A	N/A	Positive Monopole
389148.2	5910747.0	M100	27.2	N/A	N/A	Negative Monopole
387749.6	5910838.3	M101	190.5	N/A	N/A	Asymmetric Dipole
387804.0	5910818.4	M102	79.6	N/A	N/A	Asymmetric Dipole
387184.7	5910211.0	M103	3763.6	N/A	N/A	Complex Anomaly
387623.4	5910056.2	M104	31.4	N/A	N/A	Dipole
386746.3	5910441.7	M105	38.4	N/A	N/A	Positive Monopole
383032.7	5910044.7	M107	33.0	N/A	N/A	Negative Monopole
383012.0	5910013.0	M108	32.9	N/A	N/A	Negative Monopole
383241.3	5910181.2	M109	43.5	N/A	N/A	Positive Monopole
382413.3	5908984.9	M110	25.9	N/A	N/A	Asymmetric Dipole
382287.4	5908705.4	M111	15.0	N/A	N/A	Positive Monopole
381239.9	5909085.3	M112	465.5	N/A	N/A	Complex Anomaly
381841.7	5908876.8	M113	20.8	N/A	N/A	Positive Monopole
382017.1	5909397.3	M114	25.1	N/A	N/A	Positive Monopole
382038.8	5909012.1	M115	126.8	N/A	N/A	Positive Monopole
381722.6	5908923.7	M116	25.1	N/A	N/A	Asymmetric Dipole
382629.3	5909873.2	M117	43.9	N/A	N/A	Positive Monopole
383397.5	5909634.2	M120	30.4	N/A	N/A	Asymmetric Dipole
383191.8	5909538.3	M121	19.0	N/A	N/A	Asymmetric Dipole
388647.2	5910656.4	M122	19.3	N/A	N/A	Positive Monopole
381455.8	5906609.5	M123	48.2	N/A	N/A	Positive Monopole
385699.2	5909149.8	M125	21.8	N/A	N/A	Complex Anomaly
388014.6	5910492.1	M126	18.0	N/A	N/A	Positive Monopole
387993.7	5910462.9	M127	20.9	N/A	N/A	Positive Monopole
388049.8	5910661.6	M128	30.0	N/A	N/A	Positive Monopole
387613.3	5910337.5	M129	29.3	N/A	N/A	Asymmetric Dipole
393041.0	5907492.4	M135	1152.2	N/A	N/A	Asymmetric Dipole
393057.3	5907548.1	M136	60.8	N/A	N/A	Positive Monopole
392678.0	5907525.9	M137	15.3	N/A	N/A	Asymmetric Dipole
392899.8	5907408.9	M138	25.3	N/A	N/A	Negative Monopole
392958.0	5907944.6	M139	30.1	N/A	N/A	Asymmetric Dipole

Easting (m)	Northing (m)	Magnetic Anomaly ID	Amplitude (nT)	Associated Sonar Contact ID	Sonar Contact Dimensions	Comment
392973.4	5908488.2	M140	19.1	N/A	N/A	Asymmetric Dipole
392784.8	5907705.0	M142	49.6	N/A	N/A	Asymmetric Dipole

Table 5: Significant magnetic anomalies (>10nT) within the route corridor

2.2.4 Shallow Soils

The sub-bottom profiling data, within the route corridor, indicate sediment thicknesses up to 15.0m across an undulating very coarse grained material/ bedrock surface. The sub-bottom signal within the surficial sediments is characteristic of coarse grained materials.

At the inshore limits of the sub-bottom data and where the route veers to the north-west, there are two infilled channels within the rock, at approximately KP2.075 and KP3.100, where sediments thicknesses range rapidly from 1.0m – 2.0m to up to 7.5m. These channels extend north-west to south-east across the route corridor and are approximately 150m wide.

To the north of the infilled channels, the rock shoals rapidly up to the surface denoting a large rock outcrop present over much of the eastern side of the route corridor, between KP3.240 and KP4.045. Localised small depression infills are present across the rock outcrop and to the south-west of this feature, surficial sediment coverage range from a veneer to around 2.0m – 3.0m. No sub-bottom profiling data was collected within the route development area.

Very few reflectors were detected within the sub-bottom data between KP4.045 and KP5.290, which denotes the presence of hard material near/at the surface or sub-cropping rock.

To the west of KP5.290, sediment thicknesses undulate over bedrock with no apparent trend, from a veneer to around 4.0m – 5.0m, showing few small rock outcrops in localised areas. Surficial sediment thicknesses average around 2.0m up to approximately KP7.500.

Numerous rock outcrops are present across the route corridor between KP7.500 and KP12.000, with any bedrock structure exhibiting a general north-east to south-west trend. Sediment cover is irregular across the outcrops varying from a veneer to approximately 7.5m, with the greatest thicknesses present within localised depression infills.

To the south-west of the large rock outcrop area, sediment cover ranges in average from 1.0m to 2.0m across large extensions, with numerous localised depressions and a complex distribution of infilled channels present across the route corridor. These features show sediment thicknesses up to 7.5m – 10.0m. There are several areas of sub-cropping rock, with two significant areas located to the north of KP 14.000 and south of KP14.250.

The rock shoals up rapidly at two locations towards the end of the route corridor, with the route centre line crossing a rock outcrop from KP16.155 to the PDA eastern extents. Several rock outcrops are present across the north-eastern limits of the route corridor, within the broad deep seabed channel feature which crosses the PDA.

A pinger and boomer example records of sub-bottom data are shown on Figure 13 and Figure 14, below.

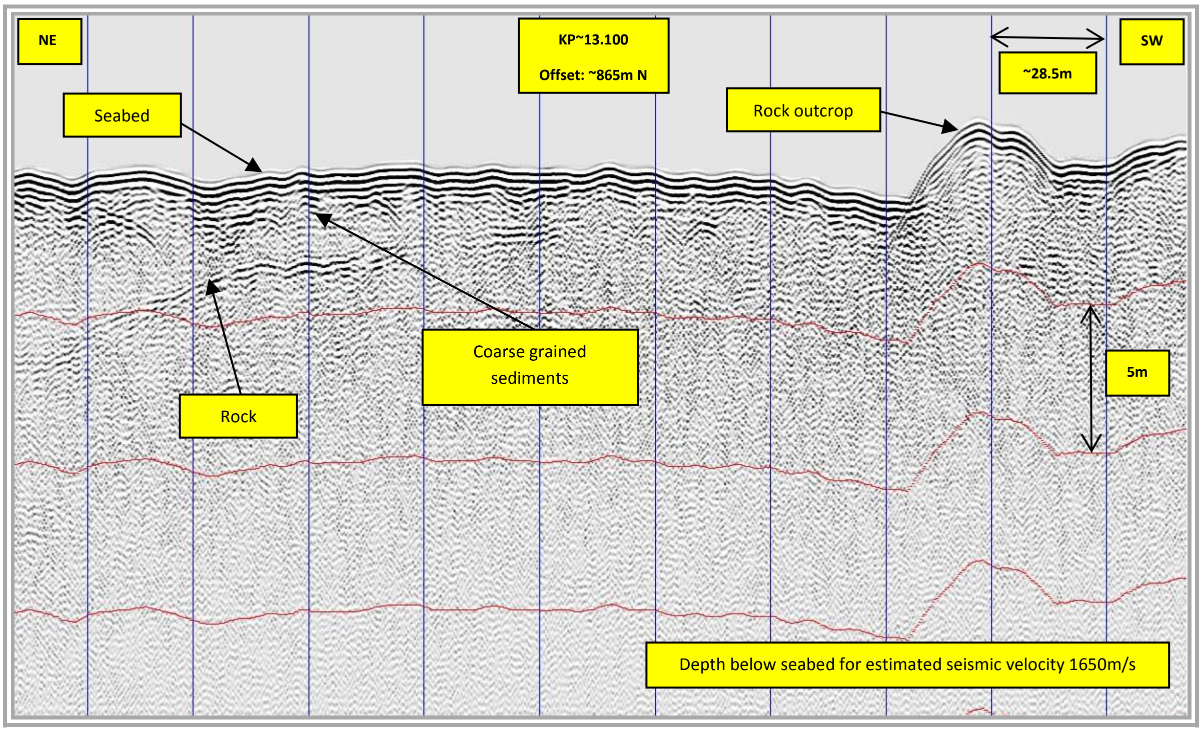


Figure 13: Pinger data example centred at KP13.100

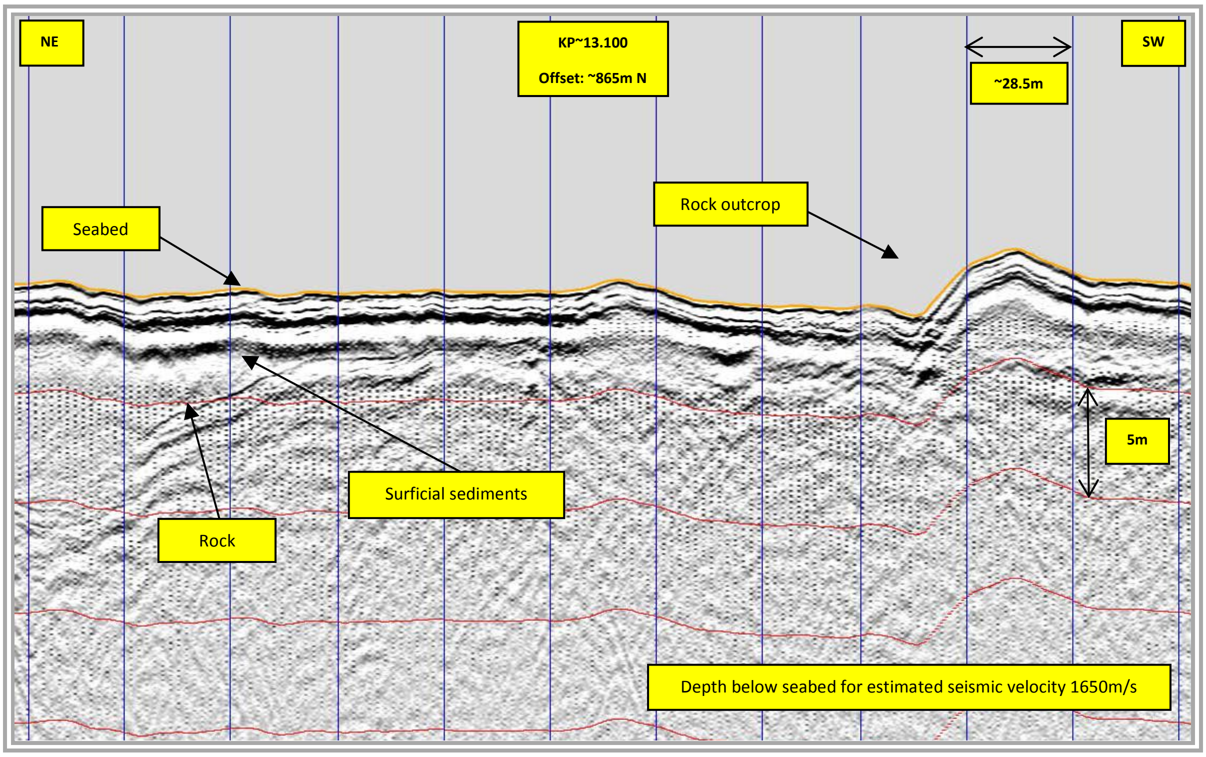


Figure 14: Boomer data example centred at KP13.100

One sub bottom target was identified across the route corridor and it is shown on Table 6, below. There are no sonar contacts or magnetic anomalies associated with this target.

Easting (m)	Northing (m)	ID	Depth from Seabed (m)
382402.4	5909185.2	P001	1.8

Table 6: Sub-bottom targets within the route corridor

2.1.5 Geotechnical Sampling and Testing

Grab samples and camera stills were undertaken across the PDA and their locations have been plotted on the Seabed Features Chart. The grab samples were sent to CMACS for sample contamination testing and grain size analysis. The results will be integrated with the geophysical interpretation in the final report.

3. Conclusion

Overall the survey area showed a significant expanse of coarse grained sediments with a few isolated areas of rock outcrops and pinnacles, with steep slopes in some sections, which may impose a rerouting of the preliminary cable layout. A large number of boulders were also noted throughout the entire site, denoting the coarse character of the seabed.

Numerous sonar and sub-bottom contacts and magnetic anomalies were encountered on site which may be associated with debris on the seabed.

The linear magnetic anomalies associated with an outfall and existing infrastructure should be taken into consideration as well as the linear contacts identified with the side scan sonar (L032, L034, L035, L036 and L039) which may also be associated with existing infrastructure.

Several sections of linear contacts, interpreted as possible cables/ rope or chain, which may pose constraints on the future works have been highlighted, namely L071 which crosses the route centre line at KP8.756. Linear contact L020 is also associated with a possible ferrous object, identified as anomaly M127.

The existing infrastructure known to cross the eastern section of the survey corridor between approximately KP3.000 and KP4.000 did not show a magnetic anomaly, apart from a small section mentioned above. This is due to the specific magnetic properties of the cables and to background noise encountered in the area which limited the detection of the existing cables.

Two wrecks (S053 and S089) have been identified; however these lie outside the limits of the PDA and cable route corridor.

List of Standard Abbreviations

ADCP	Acoustic Doppler Current Profiler	MLWN	Mean Low Water Neaps
CAD	Computer Aided Design	MLWS	Mean Low Water Springs
CD	Chart Datum	MNR	Mean Neap Range
CM	Central Meridian	MSL	Mean Sea Level
CPU	Central Processing Unit	MSR	Mean Spring Range
CTD	Conductivity Temperature Depth	OD(N)	Ordnance Datum (Newlyn)
dGPS	differential Global Positioning System	OSGB	Ordnance Survey of Great Britain
dxf	Drawing Exchange Format (AutoCAD file)	OSTN02	Ordnance Survey Transformation Network
ED50	European Datum 1950	PCS	Processing Control System
EGM96	Earth Gravitational Model 1996	PPE	Personal Protective Equipment
EGNOS	Euro Geostationary Navigation Overlay Service	PPM	Parts Per Million
ESA	European Space Agency	PPP	Precise Point Positioning
GAMS	GPS Azimuth Measurement Subsystem	PPS	Pulse per Second
GLA	General Lighthouse Authority	QC	Quality Control
GNSS	Global Navigation Satellite System	RIB	Rigid Inflatable Boat
GSM	Global System for Mobile Communications	RPL	Route Position List
HAT	Highest Astronomical Tide	RMS	Route Mean Square
HF	High Frequency	RTCM	Radio Technical Commission for Maritime Services
Hz	Hertz	RTK	Real Time Kinematic
IHO	International Hydrographic Organisation	SBAS	Satellite Based Augmentation System
IMO	International Maritime Organisation	SD	Standard Deviation
INS	Inertial Navigation System	SVP	Sound Velocity Probe
kHz	Kilohertz	SVP	Sound Velocity Profile
km	Kilometre	SVS	Sound Velocity Sensor
KP	Kilometre Post	TPU	Total Propagated Uncertainty
LAT	Lowest Astronomical Tide	TVG	Time Variable Gain
LRK	Long Range Kinematic	UHF	Ultra High Frequency
MCA	Maritime & Coastguard Agency	USBL	Ultra Short Base Line
MF	Medium Frequency	UTM	Universal Transverse Mercator
MHWI	Mean High Water Interval	VHF	Very High Frequency
MHWN	Mean High Water Neaps	WAAS	Wide Area Augmentation System
MHWS	Mean High Water Springs	WGS84	World Geodetic System 1984
MHz	Megahertz	WSM	Wideband Sub Mini
MLWI	Mean Low Water Interval		

Appendices

Appendix 1: Listings

Appendix 2: Charting

Appendix 3: Benthic Technical Report

Appendix 4: Habitat Assessment Report

Appendix 1

Side Scan Sonar Listing

Magnetometer Listing

Sub-Bottom Profiler Listing

Side Scan Sonar Listing

Easting (m)	Northing (m)	Sonar Contact ID	Length (m)	Width (m)	Height (m)	Description	Comment	Area
392690.3	5907417.1	S001	1.0	0.9	0.0	Fishing Gear		Cable Corridor
392686.7	5907425.6	L002	28.7	0.1	0.0	Linear Contact		Cable Corridor
392675.8	5907427.6	S003	0.8	0.6	0.1	Fishing Gear		Cable Corridor
392708.5	5907587.5	L004	72.2	0.1	0.0	Linear Contact		Cable Corridor
392843.3	5907616.7	S005	1.4	0.6	0.2	Possible debris		Cable Corridor
392839.9	5907623.2	L006	7.2	0.1	0.0	Linear Contact	Possible sewage pipe	Cable Corridor
392714.4	5907782.2	S007	1.3	0.1	0.0	Fishing Gear		Cable Corridor
392720.2	5907788.3	L008	11.6	0.1	0.0	Linear Contact		Cable Corridor
393160.9	5907707.8	S009	1.0	0.6	0.0	Fishing Gear		Cable Corridor
393148.5	5907716.1	S010	0.7	0.6	0.1	Fishing Gear		Cable Corridor
392881.7	5907789.1	S011	0.5	0.5	0.0	Fishing Gear		Cable Corridor
393134.3	5907722.9	S012	0.6	0.3	0.1	Fishing Gear		Cable Corridor
393122.4	5907731.4	S013	1.0	0.7	0.2	Fishing Gear		Cable Corridor
393153.3	5907723.8	S014	0.9	0.5	0.0	Fishing Gear		Cable Corridor
392881.1	5907791.8	L015	7.4	0.1	0.0	Linear Contact		Cable Corridor
393111.2	5907738.6	S016	0.6	0.5	0.1	Fishing Gear		Cable Corridor
393101.0	5907745.1	S017	0.6	0.6	0.4	Fishing Gear		Cable Corridor
393090.0	5907751.8	S018	0.7	0.3	0.2	Fishing Gear		Cable Corridor
393149.8	5907749.9	S019	0.4	0.4	0.0	Fishing Gear		Cable Corridor
393147.7	5908254.4	L020	6.7	0.1	0.0	Linear contact	Associated with M134	Cable Corridor
393253.6	5908665.8	S021	3.6	1.4	0.2	Possible debris		Cable Corridor
393459.3	5908596.0	L022	16.0	0.1	0.0	Linear Contact		Cable Corridor
393478.7	5908584.3	L023	5.5	0.1	0.0	Linear contact		Outside survey area
393182.6	5908926.8	L024	65.6	0.1	0.0	Linear Contact		Cable Corridor
393391.8	5908989.2	L025	18.2	0.1	0.0	Linear Contact		Cable Corridor
393416.3	5909035.8	L026	18.1	0.1	0.0	Linear Contact		Cable Corridor
393502.6	5909491.5	S027	3.0	2.2	1.1	Boulder >3.0m		Cable Corridor
393700.6	5909514.8	S028	2.0	2.0	1.0	Boulder <3.0m		Cable Corridor
393664.7	5909627.1	S029	2.6	2.0	1.3	Boulder <3.0m		Cable Corridor
393678.7	5909744.0	S030	3.7	2.9	1.0	Boulder >3.0m		Cable Corridor
393704.1	5909743.7	S031	3.2	2.0	1.4	Boulder >3.0m		Cable Corridor
393731.9	5910101.4	L032	187.9	0.1	0.1	Linear contact	Associated with existing infrastructure cable	Cable Corridor
393726.1	5910171.5	L033	17.3	0.1	0.1	Linear Contact		Cable Corridor
393827.4	5910336.5	L034	61.8	0.1	0.0	Linear Contact		Cable Corridor
393620.0	5910514.7	L035	46.9	0.1	0.1	Linear Contact		Cable Corridor
393457.7	5910710.1	L036	38.3	0.1	0.0	Linear Contact		Cable Corridor

Easting (m)	Northing (m)	Sonar Contact ID	Length (m)	Width (m)	Height (m)	Description	Comment	Area
393345.1	5910701.2	S037	5.0	1.2	1.0	Boulder >3.0m		Cable Corridor
393384.5	5910752.5	S038	3.2	1.9	1.1	Boulder >3.0m		Cable Corridor
393365.9	5910778.3	L039	28.0	0.1	0.0	Linear Contact		Cable Corridor
393483.5	5910902.4	S040	2.4	0.3	1.0	Boulder <3.0m		Cable Corridor
393513.6	5910992.4	S041	2.8	2.2	1.1	Boulder <3.0m		Cable Corridor
393203.2	5910687.3	S042	3.3	2.5	1.1	Boulder >3.0m		Cable Corridor
392621.1	5911247.5	L043	15.0	0.1	0.0	Linear Contact		Cable Corridor
392618.3	5911240.8	L044	16.9	0.1	0.0	Linear Contact		Cable Corridor
392608.3	5911230.1	L045	28.7	0.1	0.0	Linear Contact		Cable Corridor
392586.1	5911210.8	L046	8.7	0.1	0.0	Linear Contact		Cable Corridor
392191.0	5910948.4	S047	2.3	1.4	1.0	Boulder <3.0m		Cable Corridor
392145.8	5911109.3	S048	3.1	1.4	1.0	Boulder >3.0m		Cable Corridor
391966.9	5911017.6	S049	2.9	2.6	1.2	Boulder <3.0m		Cable Corridor
391897.5	5911072.4	L050	17.2	0.1	0.0	Linear Contact		Cable Corridor
391885.7	5911075.7	L051	12.3	0.1	0.0	Linear Contact		Cable Corridor
391878.8	5911079.1	L052	4.5	0.1	0.0	Linear Contact		Cable Corridor
391565.8	5910680.9	S053	30.9	15.0	2.6	Wreck		Outside survey area
391409.1	5910782.9	S054	0.8	0.7	1.1	Boulder <3.0m		Cable Corridor
391277.3	5911286.5	L055	26.2	0.1	0.0	Linear Contact		Cable Corridor
390970.7	5911126.4	L056	45.6	0.1	0.0	Linear Contact		Cable Corridor
390937.7	5911099.9	L057	32.3	0.1	0.0	Linear Contact		Cable Corridor
390881.2	5911100.7	L058	24.3	0.1	0.0	Linear Contact		Cable Corridor
390903.1	5910766.1	L059	3.4	0.1	0.2	Linear Contact		Cable Corridor
390896.6	5910765.5	L060	4.9	0.1	0.2	Linear Contact		Cable Corridor
389939.1	5911380.7	S061	1.4	1.1	0.2	Possible debris		Cable Corridor
389896.2	5910929.5	S062	2.1	0.8	1.0	Boulder <3.0m		Cable Corridor
389798.7	5910551.2	L063	12.8	0.1	0.0	Linear Contact		Cable Corridor
389628.4	5911107.5	L064	189.7	0.1	0.0	Linear Contact		Cable Corridor
389635.0	5911062.7	L065	18.4	0.1	0.0	Linear Contact		Cable Corridor
389429.6	5910297.9	L067	142.2	0.1	0.0	Linear contact		Outside survey area
388926.5	5911549.7	L068	27.5	0.1	0.1	Linear Contact	Possible chain	Cable Corridor
388926.4	5911539.7	S069	2.4	1.7	0.5	Possible debris	Possible Anchor	Cable Corridor
388826.6	5911060.2	S070	1.5	1.2	1.0	Boulder <3.0m		Cable Corridor
388593.6	5910968.7	L071	200.6	0.1	0.0	Linear Contact		Cable Corridor
388220.2	5911406.9	L072	22.4	0.1	0.0	Linear Contact		Cable Corridor
387910.0	5910296.9	L073	128.1	0.1	0.0	Linear Contact		Cable Corridor
387883.4	5910162.5	S074	2.0	1.3	3.2	Possible debris		Cable Corridor
387693.9	5910656.8	L075	46.7	0.1	0.0	Linear Contact		Cable Corridor
387643.4	5910553.4	L076	35.0	0.1	0.0	Linear Contact		Cable Corridor
386986.3	5909784.2	S077	1.8	0.8	1.1	Boulder <3.0m		Cable Corridor

Easting (m)	Northing (m)	Sonar Contact ID	Length (m)	Width (m)	Height (m)	Description	Comment	Area
386828.8	5909591.7	S078	2.1	1.4	1.1	Boulder <3.0m		Cable Corridor
386398.8	5910623.5	L079	7.6	0.1	0.0	Linear Contact		Cable Corridor
386193.9	5910748.3	L080	102.6	0.1	0.1	Linear Contact		Cable Corridor
386101.7	5910619.7	L081	33.1	0.1	0.1	Linear Contact		Cable Corridor
385860.9	5910245.6	L082	56.0	0.1	0.0	Linear Contact		Cable Corridor
385577.3	5910202.1	S083	2.6	1.3	1.1	Boulder <3.0m		Cable Corridor
385525.2	5909989.1	L084	23.0	0.1	0.0	Linear Contact		Cable Corridor
385333.9	5909879.3	S085	4.6	3.5	0.5	Possible debris		Cable Corridor
385448.7	5909561.0	S086	2.3	1.6	0.6	Possible debris		Cable Corridor
385426.6	5909576.6	S087	3.9	2.4	1.1	Boulder >3.0m		Cable Corridor
385019.2	5909979.8	S088	2.2	1.2	0.5	Possible debris		Cable Corridor
384442.9	5910610.6	S089	93.5	34.0	0.7	Wreck		Outside survey area
384369.7	5909669.4	L090	57.4	0.1	0.0	Linear Contact		Cable Corridor
384191.7	5910123.2	S091	1.8	1.3	1.2	Boulder <3.0m		Cable Corridor
384355.3	5909277.4	S092	4.1	3.8	1.0	Boulder >3.0m		Cable Corridor
383960.5	5909059.8	L093	12.1	0.1	0.0	Linear Contact		Cable Corridor
383742.1	5909252.8	L094	66.6	0.1	0.0	Linear Contact		Cable Corridor
383274.4	5910238.8	L095	79.6	0.1	0.1	Linear Contact		Cable Corridor
383253.5	5910255.6	S096	1.6	1.3	1.9	Boulder <3.0m		Cable Corridor
383274.1	5910175.5	S097	0.7	0.4	0.2	Possible debris		Cable Corridor
383688.6	5909186.4	L098	35.5	0.1	0.0	Linear Contact		Cable Corridor
383621.4	5909107.7	L099	72.4	0.1	0.0	Linear Contact		Cable Corridor
382881.9	5910031.6	L100	14.2	0.1	0.1	Linear Contact		Cable Corridor
382882.8	5910024.0	L101	6.4	0.1	0.1	Linear Contact		Cable Corridor
382885.1	5910015.8	L102	6.2	0.1	0.1	Linear Contact		Cable Corridor
382757.3	5909446.8	S103	2.7	1.3	1.6	Possible debris		Cable Corridor
382668.2	5909723.2	S104	2.1	1.3	1.4	Boulder <3.0m		Cable Corridor
382605.4	5909652.5	S105	2.8	1.8	1.1	Boulder <3.0m		Cable Corridor
382133.0	5909420.7	L106	37.9	0.1	0.1	Linear Contact		Cable Corridor
382916.4	5908138.7	S107	2.1	0.7	1.0	Boulder <3.0m		Cable Corridor
381961.5	5909254.5	S108	4.4	3.5	1.2	Boulder >3.0m		Cable Corridor
382415.3	5908586.0	L109	46.1	0.1	0.1	Linear Contact		Cable Corridor
381847.4	5909159.6	S110	2.6	1.2	1.3	Boulder <3.0m		Cable Corridor
382534.8	5908285.9	S111	3.6	2.3	1.4	Boulder >3.0m		Cable Corridor
381728.1	5909181.5	S112	1.0	0.6	0.4	Possible debris		Cable Corridor
381725.4	5909176.7	S113	4.3	3.9	0.6	Possible debris		Cable Corridor
381723.3	5909172.8	S114	0.9	0.8	0.5	Possible debris		Cable Corridor
382862.9	5907801.3	L115	6.7	0.1	0.0	Linear Contact		Cable Corridor
382429.8	5907969.2	L116	62.8	0.1	0.1	Linear Contact		Cable Corridor
381921.3	5908582.5	S117	3.1	1.7	1.0	Boulder >3.0m		Cable Corridor
382589.2	5907680.6	L118	23.4	0.1	0.0	Linear Contact		Cable Corridor

Easting (m)	Northing (m)	Sonar Contact ID	Length (m)	Width (m)	Height (m)	Description	Comment	Area
381435.8	5908928.7	S119	1.5	1.4	1.1	Boulder <3.0m		Cable Corridor
381778.2	5908123.4	S120	1.9	0.8	1.0	Boulder <3.0m		Cable Corridor
381635.6	5908016.6	S121	1.5	1.2	1.0	Boulder <3.0m		Cable Corridor
381612.4	5908025.6	S122	4.0	3.7	2.1	Boulder >3.0m		PDA
380946.7	5908834.2	L123	5.1	0.1	0.5	Linear Contact		PDA
380407.3	5907749.7	S124	1.4	1.2	0.4	Possible debris		PDA
381256.8	5908090.1	S125	3.0	1.1	0.4	Possible debris		PDA
381210.6	5907394.5	S126	6.2	4.7	2.4	Boulder >3.0m		PDA
381534.9	5907542.0	S127	4.6	3.6	1.7	Boulder >3.0m		Cable Corridor
381330.7	5907340.6	S128	3.7	2.9	1.3	Boulder >3.0m		PDA
381214.0	5906986.6	S129	3.7	2.6	1.1	Boulder >3.0m		PDA
381711.4	5907551.7	S130	2.2	1.4	1.0	Boulder <3.0m		Cable Corridor
382117.7	5906971.6	S131	1.0	0.9	1.0	Boulder <3.0m		Cable Corridor
379708.3	5906359.3	L132	8.3	0.1	0.1	Linear Contact		PDA
379909.7	5906911.9	S133	1.5	1.4	0.3	Possible debris		PDA
392661.6	5907471.9	S134	0.9	0.3	0.0	Boulder <3.0m		Cable Corridor
392662.6	5907476.2	S135	1.0	0.6	0.0	Boulder <3.0m		Cable Corridor
392666.7	5907478.5	S136	1.4	0.5	0.0	Boulder <3.0m		Cable Corridor
392670.1	5907679.1	S137	0.8	0.4	0.2	Boulder <3.0m		Cable Corridor
392662.2	5907689.9	S138	0.7	0.3	0.1	Boulder <3.0m		Cable Corridor
392655.3	5907697.1	S139	0.6	0.3	0.1	Boulder <3.0m		Cable Corridor
392762.3	5907683.9	S140	0.4	0.4	0.3	Boulder <3.0m		Cable Corridor
392762.5	5907685.3	S141	1.0	0.7	0.3	Boulder <3.0m		Cable Corridor
392737.2	5907717.8	S142	0.6	0.2	0.4	Boulder <3.0m		Cable Corridor
393008.3	5907676.7	S143	0.8	0.4	0.1	Boulder <3.0m		Cable Corridor
392903.4	5907733.1	S144	0.5	0.4	0.3	Boulder <3.0m		Cable Corridor
392917.3	5907739.2	S145	1.1	0.5	0.4	Boulder <3.0m		Cable Corridor
392972.9	5907739.9	S146	0.5	0.3	0.2	Boulder <3.0m		Cable Corridor
392887.7	5907767.4	S147	0.4	0.4	0.0	Boulder <3.0m		Cable Corridor
392979.9	5907765.2	S148	0.4	0.4	0.1	Boulder <3.0m		Cable Corridor
392975.5	5907770.9	S149	2.0	0.4	0.3	Boulder <3.0m		Cable Corridor
392964.4	5907785.4	S150	1.4	0.9	0.2	Boulder <3.0m		Cable Corridor
392989.5	5907815.4	S151	0.7	0.5	0.3	Boulder <3.0m		Cable Corridor
392986.3	5907875.3	S152	0.7	0.5	0.3	Boulder <3.0m		Cable Corridor
392943.9	5907981.2	S153	0.8	0.4	0.2	Boulder <3.0m		Cable Corridor
392928.1	5907991.9	S154	1.1	0.3	0.2	Boulder <3.0m		Cable Corridor
392959.9	5908099.1	S155	1.5	0.5	0.6	Boulder <3.0m		Cable Corridor
392937.5	5908298.9	S156	0.5	0.4	0.1	Boulder <3.0m		Cable Corridor
393372.2	5908595.1	S157	0.3	0.1	0.1	Boulder <3.0m		Cable Corridor
393336.4	5908634.7	S158	0.5	0.5	0.3	Boulder <3.0m		Cable Corridor
393247.2	5908695.0	S159	0.7	0.6	0.2	Boulder <3.0m		Cable Corridor

Easting (m)	Northing (m)	Sonar Contact ID	Length (m)	Width (m)	Height (m)	Description	Comment	Area
393441.6	5908653.1	S160	0.6	0.3	0.6	Boulder <3.0m		Cable Corridor
393403.5	5908692.2	S161	1.3	0.3	0.1	Boulder <3.0m		Cable Corridor
393405.2	5908694.7	S162	0.6	0.5	0.3	Boulder <3.0m		Cable Corridor
393351.0	5908879.2	S163	3.7	2.6	0.5	Boulder >3.0m		Cable Corridor
393186.9	5909242.3	S164	1.6	1.4	0.4	Boulder <3.0m		Cable Corridor
393253.4	5909239.4	S165	2.6	1.8	0.2	Boulder <3.0m		Cable Corridor
393230.7	5909318.9	S166	2.0	1.9	0.4	Boulder <3.0m		Cable Corridor
393653.8	5909291.8	S167	2.1	2.0	0.5	Boulder <3.0m		Cable Corridor
393262.4	5909487.7	S168	3.3	3.2	0.9	Boulder >3.0m		Cable Corridor
393278.8	5909514.1	S169	3.4	2.6	0.7	Boulder >3.0m		Cable Corridor
393454.0	5909563.0	S170	3.7	1.9	0.6	Boulder >3.0m		Cable Corridor
393573.6	5909622.5	S171	2.6	2.3	0.7	Boulder <3.0m		Cable Corridor
393474.8	5909799.1	S172	2.5	1.0	0.4	Boulder <3.0m		Cable Corridor
393527.8	5909789.6	S173	2.1	1.4	0.5	Boulder <3.0m		Cable Corridor
393661.5	5909791.9	S174	2.4	2.3	0.7	Boulder <3.0m		Cable Corridor
393711.3	5909804.2	S175	3.4	1.7	0.6	Boulder >3.0m		Cable Corridor
393787.3	5909819.2	S176	3.5	1.7	0.8	Boulder >3.0m		Cable Corridor
393601.0	5909887.1	S177	1.8	1.2	0.3	Boulder <3.0m		Cable Corridor
393610.7	5909912.8	S178	1.8	1.5	0.4	Boulder <3.0m		Cable Corridor
393679.9	5909950.3	S179	2.1	2.0	0.5	Boulder <3.0m		Cable Corridor
393811.1	5909963.9	S180	2.0	1.4	0.4	Boulder <3.0m		Cable Corridor
393603.6	5909978.4	S181	2.3	2.0	0.4	Boulder <3.0m		Cable Corridor
393795.4	5909991.2	S182	2.8	2.3	0.2	Boulder <3.0m		Cable Corridor
393493.9	5909998.8	S183	1.9	1.5	0.4	Boulder <3.0m		Cable Corridor
393799.5	5910005.1	S184	2.1	1.3	0.2	Boulder <3.0m		Cable Corridor
393812.3	5910039.5	S185	2.9	2.6	0.2	Boulder <3.0m		Cable Corridor
393372.1	5910054.6	S186	3.8	2.2	0.8	Boulder >3.0m		Cable Corridor
393729.8	5910233.6	S187	2.6	2.5	0.7	Boulder <3.0m		Cable Corridor
393440.6	5910276.0	S188	3.6	1.0	0.1	Boulder >3.0m		Cable Corridor
393726.3	5910321.5	S189	3.0	1.3	0.4	Boulder >3.0m		Cable Corridor
393573.1	5910559.0	S190	2.0	0.8	0.5	Boulder <3.0m		Cable Corridor
393564.8	5910585.3	S191	3.5	2.0	0.9	Boulder >3.0m		Cable Corridor
393498.4	5910808.6	S192	3.1	2.3	0.7	Boulder >3.0m		Cable Corridor
393450.4	5910800.0	S193	3.4	2.5	0.2	Boulder >3.0m		Cable Corridor
393407.3	5910959.8	S194	2.3	0.4	0.9	Boulder <3.0m		Cable Corridor
393411.3	5910970.0	S195	1.3	0.5	0.3	Boulder <3.0m		Cable Corridor
393349.3	5910978.2	S196	2.4	0.9	0.7	Boulder <3.0m		Cable Corridor
393341.3	5911010.8	S197	1.7	0.9	0.8	Boulder <3.0m		Cable Corridor
393295.9	5910948.2	S198	0.9	0.6	0.1	Boulder <3.0m		Cable Corridor
393251.7	5910866.0	S199	3.5	3.5	0.8	Boulder >3.0m		Cable Corridor
393249.1	5911038.7	S200	3.2	1.2	0.7	Boulder >3.0m		Cable Corridor

Easting (m)	Northing (m)	Sonar Contact ID	Length (m)	Width (m)	Height (m)	Description	Comment	Area
393232.5	5911000.3	S201	3.6	1.6	0.8	Boulder >3.0m		Cable Corridor
393189.9	5911091.8	S202	0.7	0.5	0.3	Boulder <3.0m		Cable Corridor
393166.7	5911112.3	S203	0.6	0.5	0.3	Boulder <3.0m		Cable Corridor
393112.5	5911055.6	S204	0.7	0.5	0.5	Boulder <3.0m		Cable Corridor
393065.7	5911090.7	S205	0.8	0.5	0.6	Boulder <3.0m		Cable Corridor
392972.0	5910943.1	S206	3.9	2.2	0.9	Boulder >3.0m		Cable Corridor
392971.8	5911108.0	S207	0.9	0.5	0.5	Boulder <3.0m		Cable Corridor
392973.3	5911195.9	S208	1.3	0.4	0.4	Boulder <3.0m		Cable Corridor
392946.7	5911213.9	S209	1.3	0.3	0.3	Boulder <3.0m		Cable Corridor
392884.2	5911212.9	S210	0.4	0.2	0.5	Boulder <3.0m		Cable Corridor
392811.8	5911095.7	S211	2.1	1.6	0.2	Boulder <3.0m		Cable Corridor
392693.0	5911225.4	S212	2.9	0.8	0.8	Boulder <3.0m		Cable Corridor
392649.1	5910996.4	S213	2.1	2.0	0.8	Boulder <3.0m		Cable Corridor
392600.1	5911229.7	S214	1.5	0.4	0.8	Boulder <3.0m		Cable Corridor
392580.9	5911242.4	S215	1.4	1.2	0.7	Boulder <3.0m		Cable Corridor
392482.9	5910798.6	S216	2.6	1.2	0.5	Boulder <3.0m		Cable Corridor
392490.6	5910972.6	S217	2.3	1.0	0.7	Boulder <3.0m		Cable Corridor
392507.3	5911171.7	S218	1.0	1.0	0.4	Boulder <3.0m		Cable Corridor
392370.0	5910907.2	S219	2.4	1.5	0.3	Boulder <3.0m		Cable Corridor
392232.2	5910916.4	S220	2.1	1.6	0.5	Boulder <3.0m		Cable Corridor
392218.4	5910910.6	S221	2.8	2.2	0.6	Boulder <3.0m		Cable Corridor
392178.7	5910887.6	S222	2.4	1.8	0.3	Boulder <3.0m		Cable Corridor
392142.2	5910916.8	S223	2.7	1.4	0.5	Boulder <3.0m		Cable Corridor
392128.9	5910815.8	S224	2.2	0.9	0.2	Boulder <3.0m		Cable Corridor
392182.5	5911294.1	S225	0.8	0.4	0.3	Boulder <3.0m		Cable Corridor
392154.9	5911204.0	S226	0.8	0.4	0.7	Boulder <3.0m		Cable Corridor
392135.4	5911048.4	S227	1.6	1.5	0.4	Boulder <3.0m		Cable Corridor
392131.0	5911194.8	S228	1.3	1.3	0.5	Boulder <3.0m		Cable Corridor
392118.7	5911193.1	S229	1.3	1.1	0.5	Boulder <3.0m		Cable Corridor
392096.9	5911138.9	S230	2.3	2.1	0.6	Boulder <3.0m		Cable Corridor
392089.8	5911135.1	S231	2.1	1.8	0.5	Boulder <3.0m		Cable Corridor
392026.4	5911203.8	S232	0.7	0.3	0.3	Boulder <3.0m		Cable Corridor
391970.4	5910948.7	S233	5.0	2.8	0.8	Boulder >3.0m		Cable Corridor
391952.8	5911223.7	S234	0.5	0.5	0.5	Boulder <3.0m		Cable Corridor
391856.7	5910859.9	S235	1.6	0.7	0.4	Boulder <3.0m		Cable Corridor
391856.9	5911304.6	S236	0.7	0.6	0.5	Boulder <3.0m		Cable Corridor
391797.9	5911334.7	S237	1.0	0.9	0.2	Boulder <3.0m		Cable Corridor
391716.6	5911292.2	S238	0.8	0.8	0.4	Boulder <3.0m		Cable Corridor
391745.8	5910860.1	S239	1.1	1.0	0.6	Boulder <3.0m		Cable Corridor
391599.3	5911234.3	S240	0.9	0.4	0.6	Boulder <3.0m		Cable Corridor
391602.2	5911118.1	S241	0.8	0.8	0.4	Boulder <3.0m		Cable Corridor

Easting (m)	Northing (m)	Sonar Contact ID	Length (m)	Width (m)	Height (m)	Description	Comment	Area
391357.1	5911115.2	S242	0.8	0.7	0.4	Boulder <3.0m		Cable Corridor
391356.0	5911068.1	S243	1.5	0.2	0.3	Boulder <3.0m		Cable Corridor
391379.6	5910878.0	S244	1.1	0.5	0.9	Boulder <3.0m		Cable Corridor
391314.2	5911016.1	S245	0.9	0.9	0.4	Boulder <3.0m		Cable Corridor
391357.6	5910749.7	S246	0.9	0.6	0.4	Boulder <3.0m		Cable Corridor
391367.4	5910688.4	S247	0.7	0.3	0.5	Boulder <3.0m		Cable Corridor
391264.4	5911108.6	S248	0.9	0.5	0.6	Boulder <3.0m		Cable Corridor
391186.3	5911335.8	S249	1.2	0.9	0.8	Boulder <3.0m		Cable Corridor
391159.0	5911286.8	S250	1.0	0.7	0.6	Boulder <3.0m		Cable Corridor
391199.8	5911023.7	S251	1.6	1.3	0.5	Boulder <3.0m		Cable Corridor
391086.8	5911400.9	S252	0.8	0.5	0.2	Boulder <3.0m		Cable Corridor
391186.1	5910710.5	S253	1.1	1.1	0.4	Boulder <3.0m		Cable Corridor
391019.1	5911309.0	S254	0.5	0.3	0.4	Boulder <3.0m		Cable Corridor
391004.8	5911328.8	S255	0.5	0.4	0.6	Boulder <3.0m		Cable Corridor
390972.3	5911301.9	S256	0.5	0.4	0.3	Boulder <3.0m		Cable Corridor
390964.5	5911220.7	S257	1.3	0.7	0.2	Boulder <3.0m		Cable Corridor
390931.4	5911372.4	S258	0.6	0.3	0.1	Boulder <3.0m		Cable Corridor
390923.4	5911390.5	S259	0.5	0.4	0.1	Boulder <3.0m		Cable Corridor
390947.6	5911240.6	S260	0.7	0.3	0.3	Boulder <3.0m		Cable Corridor
390944.3	5911245.6	S261	0.4	0.3	0.2	Boulder <3.0m		Cable Corridor
390932.0	5911266.7	S262	0.3	0.3	0.1	Boulder <3.0m		Cable Corridor
390903.8	5911389.9	S263	0.4	0.4	0.1	Boulder <3.0m		Cable Corridor
390883.2	5911402.4	S264	0.9	0.6	0.2	Boulder <3.0m		Cable Corridor
390941.3	5911016.7	S265	2.3	2.2	0.2	Boulder <3.0m		Cable Corridor
390978.5	5910705.9	S266	1.6	1.1	0.4	Boulder <3.0m		Cable Corridor
390951.1	5910573.0	S267	1.1	0.8	0.4	Boulder <3.0m		Cable Corridor
390828.8	5911235.9	S268	0.5	0.5	0.1	Boulder <3.0m		Cable Corridor
390806.2	5911165.2	S269	1.1	0.4	0.2	Boulder <3.0m		Cable Corridor
390790.1	5911167.4	S270	0.7	0.4	0.1	Boulder <3.0m		Cable Corridor
390880.3	5910586.5	S271	1.7	1.2	0.3	Boulder <3.0m		Cable Corridor
390870.2	5910570.8	S272	0.8	0.4	0.3	Boulder <3.0m		Cable Corridor
390796.1	5910849.7	S273	1.0	0.5	0.6	Boulder <3.0m		Cable Corridor
390740.7	5910806.2	S274	0.8	0.6	0.6	Boulder <3.0m		Cable Corridor
390717.7	5910866.1	S275	2.2	1.5	0.2	Boulder <3.0m		Cable Corridor
390701.0	5910577.7	S276	1.3	0.6	0.7	Boulder <3.0m		Cable Corridor
390697.4	5910768.7	S277	2.4	1.3	0.5	Boulder <3.0m		Cable Corridor
390690.7	5910437.9	S278	1.0	0.9	0.3	Boulder <3.0m		Cable Corridor
390683.7	5910716.8	S279	1.5	0.4	0.4	Boulder <3.0m		Cable Corridor
390676.5	5911284.1	S280	0.4	0.3	0.2	Boulder <3.0m		Cable Corridor
390670.7	5910566.8	S281	1.2	0.7	0.3	Boulder <3.0m		Cable Corridor
390647.7	5910614.7	S282	0.5	0.4	0.4	Boulder <3.0m		Cable Corridor

Easting (m)	Northing (m)	Sonar Contact ID	Length (m)	Width (m)	Height (m)	Description	Comment	Area
390645.6	5910611.2	S283	0.8	0.4	0.5	Boulder <3.0m		Cable Corridor
390638.7	5910871.0	S284	2.3	0.6	0.6	Boulder <3.0m		Cable Corridor
390616.2	5910973.7	S285	0.9	0.7	0.5	Boulder <3.0m		Cable Corridor
390613.7	5910954.5	S286	3.2	2.3	0.7	Boulder >3.0m		Cable Corridor
390560.0	5910980.7	S287	0.7	0.5	0.4	Boulder <3.0m		Cable Corridor
390534.6	5911051.0	S288	1.0	0.2	0.5	Boulder <3.0m		Cable Corridor
390488.4	5910788.7	S289	0.9	0.7	0.6	Boulder <3.0m		Cable Corridor
390481.7	5911392.7	S290	1.4	1.2	0.3	Boulder <3.0m		Cable Corridor
390454.0	5910845.3	S291	1.5	0.6	0.7	Boulder <3.0m		Cable Corridor
390405.4	5911147.8	S292	0.4	0.4	0.1	Boulder <3.0m		Cable Corridor
390401.8	5911142.3	S293	0.4	0.3	0.1	Boulder <3.0m		Cable Corridor
390397.1	5911116.0	S294	0.5	0.4	0.2	Boulder <3.0m		Cable Corridor
390398.2	5910885.9	S295	0.4	0.3	0.1	Boulder <3.0m		Cable Corridor
390388.4	5911139.8	S296	0.3	0.3	0.2	Boulder <3.0m		Cable Corridor
390390.7	5910728.3	S297	0.8	0.7	0.8	Boulder <3.0m		Cable Corridor
390385.0	5911096.2	S298	0.5	0.4	0.1	Boulder <3.0m		Cable Corridor
390384.7	5911120.2	S299	0.4	0.4	0.3	Boulder <3.0m		Cable Corridor
390362.9	5910977.8	S300	1.6	1.2	0.4	Boulder <3.0m		Cable Corridor
390360.3	5911209.4	S301	1.3	0.4	0.3	Boulder <3.0m		Cable Corridor
390350.2	5911066.3	S302	0.4	0.4	0.1	Boulder <3.0m		Cable Corridor
390344.9	5911097.6	S303	0.8	0.3	0.2	Boulder <3.0m		Cable Corridor
390343.0	5910668.8	S304	0.7	0.7	0.7	Boulder <3.0m		Cable Corridor
390336.8	5911060.2	S305	1.0	0.2	0.2	Boulder <3.0m		Cable Corridor
390335.3	5911155.4	S306	0.5	0.3	0.3	Boulder <3.0m		Cable Corridor
390334.9	5911084.1	S307	1.1	0.5	0.5	Boulder <3.0m		Cable Corridor
390325.7	5911071.1	S308	1.0	0.4	0.3	Boulder <3.0m		Cable Corridor
390328.1	5910649.5	S309	0.7	0.6	0.6	Boulder <3.0m		Cable Corridor
390323.6	5910394.2	S310	1.7	0.5	0.3	Boulder <3.0m		Cable Corridor
390317.6	5911060.0	S311	0.4	0.4	0.4	Boulder <3.0m		Cable Corridor
390314.8	5911112.2	S312	1.0	0.3	0.1	Boulder <3.0m		Cable Corridor
390313.0	5911002.1	S313	1.1	0.7	0.2	Boulder <3.0m		Cable Corridor
390311.6	5911195.5	S314	0.4	0.4	0.1	Boulder <3.0m		Cable Corridor
390307.5	5910965.2	S315	0.7	0.5	0.1	Boulder <3.0m		Cable Corridor
390296.9	5910974.2	S316	0.7	0.4	0.2	Boulder <3.0m		Cable Corridor
390289.4	5911453.6	S317	1.0	0.7	0.3	Boulder <3.0m		Cable Corridor
390289.5	5911069.7	S318	2.8	1.1	0.1	Boulder <3.0m		Cable Corridor
390278.7	5911083.3	S319	1.0	0.6	0.2	Boulder <3.0m		Cable Corridor
390273.3	5910887.9	S320	1.4	1.2	0.3	Boulder <3.0m		Cable Corridor
390269.7	5911177.0	S321	0.7	0.4	0.4	Boulder <3.0m		Cable Corridor
390268.4	5910781.0	S322	2.1	0.4	0.7	Boulder <3.0m		Cable Corridor
390263.9	5910902.1	S323	0.4	0.4	0.1	Boulder <3.0m		Cable Corridor

Easting (m)	Northing (m)	Sonar Contact ID	Length (m)	Width (m)	Height (m)	Description	Comment	Area
390257.8	5911184.5	S324	0.7	0.4	0.3	Boulder <3.0m		Cable Corridor
390252.1	5910944.5	S325	1.8	1.3	0.2	Boulder <3.0m		Cable Corridor
390241.3	5910982.6	S326	0.7	0.3	0.4	Boulder <3.0m		Cable Corridor
390239.8	5910925.6	S327	0.8	0.4	0.4	Boulder <3.0m		Cable Corridor
390235.9	5910929.1	S328	1.2	0.7	0.3	Boulder <3.0m		Cable Corridor
390235.7	5910910.4	S329	1.2	0.3	0.6	Boulder <3.0m		Cable Corridor
390230.7	5910919.9	S330	1.5	0.8	0.3	Boulder <3.0m		Cable Corridor
390220.0	5910970.0	S331	1.5	0.6	0.3	Boulder <3.0m		Cable Corridor
390217.1	5910984.7	S332	1.0	1.0	0.5	Boulder <3.0m		Cable Corridor
390205.6	5910899.0	S333	1.1	0.4	0.3	Boulder <3.0m		Cable Corridor
390187.5	5910968.4	S334	0.7	0.5	0.2	Boulder <3.0m		Cable Corridor
390184.2	5911437.5	S335	2.0	1.8	0.6	Boulder <3.0m		Cable Corridor
390132.7	5910768.2	S336	0.3	0.3	0.1	Boulder <3.0m		Cable Corridor
390123.5	5910820.2	S337	1.1	1.0	0.4	Boulder <3.0m		Cable Corridor
390118.1	5911165.7	S338	0.5	0.5	0.3	Boulder <3.0m		Cable Corridor
390108.6	5911358.5	S339	0.6	0.4	0.4	Boulder <3.0m		Cable Corridor
390106.8	5911332.8	S340	1.9	1.0	0.8	Boulder <3.0m		Cable Corridor
390103.0	5910899.8	S341	1.1	0.8	0.3	Boulder <3.0m		Cable Corridor
390098.3	5911046.9	S342	0.4	0.3	0.3	Boulder <3.0m		Cable Corridor
390087.7	5910821.3	S343	0.5	0.4	0.2	Boulder <3.0m		Cable Corridor
390087.0	5910840.7	S344	1.1	0.7	0.3	Boulder <3.0m		Cable Corridor
390081.9	5910906.2	S345	1.1	0.9	0.3	Boulder <3.0m		Cable Corridor
390076.3	5910829.4	S346	1.5	1.3	0.2	Boulder <3.0m		Cable Corridor
390033.7	5910819.1	S347	0.7	0.3	0.2	Boulder <3.0m		Cable Corridor
389997.4	5910779.8	S348	1.1	0.9	0.3	Boulder <3.0m		Cable Corridor
389952.5	5911128.0	S349	0.6	0.4	0.3	Boulder <3.0m		Cable Corridor
389944.9	5911140.5	S350	1.1	0.4	0.3	Boulder <3.0m		Cable Corridor
389936.9	5911155.6	S351	0.5	0.4	0.2	Boulder <3.0m		Cable Corridor
389924.1	5911148.7	S352	0.6	0.3	0.2	Boulder <3.0m		Cable Corridor
389923.1	5910512.2	S353	1.6	0.7	0.6	Boulder <3.0m		Cable Corridor
389855.5	5910642.0	S354	3.1	1.9	0.7	Boulder >3.0m		Cable Corridor
389845.2	5911210.1	S355	1.1	1.1	0.5	Boulder <3.0m		Cable Corridor
389728.8	5910843.0	S356	2.4	2.3	0.6	Boulder <3.0m		Cable Corridor
389708.0	5911185.5	S357	0.7	0.7	0.4	Boulder <3.0m		Cable Corridor
389672.7	5910976.6	S358	0.8	0.7	0.5	Boulder <3.0m		Cable Corridor
389620.2	5910472.6	S359	1.2	0.6	0.6	Boulder <3.0m		Cable Corridor
389587.8	5910675.2	S360	0.8	0.5	0.3	Boulder <3.0m		Cable Corridor
389575.1	5911113.0	S361	1.2	0.4	0.3	Boulder <3.0m		Cable Corridor
389566.8	5910386.7	S362	1.8	0.7	0.7	Boulder <3.0m		Cable Corridor
389525.9	5910744.9	S363	1.2	1.1	0.9	Boulder <3.0m		Cable Corridor
389486.0	5910589.9	S364	0.7	0.4	0.5	Boulder <3.0m		Cable Corridor

Easting (m)	Northing (m)	Sonar Contact ID	Length (m)	Width (m)	Height (m)	Description	Comment	Area
389485.7	5910618.6	S365	1.5	1.0	0.6	Boulder <3.0m		Cable Corridor
389403.3	5910952.1	S366	2.3	0.8	0.5	Boulder <3.0m		Cable Corridor
389390.7	5910436.0	S367	1.8	0.6	0.5	Boulder <3.0m		Cable Corridor
389369.0	5910645.9	S368	2.9	2.3	0.5	Boulder <3.0m		Cable Corridor
389369.5	5910431.2	S369	0.6	0.3	0.3	Boulder <3.0m		Cable Corridor
389332.1	5911477.2	S370	1.7	1.6	0.6	Boulder <3.0m		Cable Corridor
389325.4	5910525.5	S371	1.7	1.2	0.2	Boulder <3.0m		Cable Corridor
389319.0	5910398.0	S372	0.9	0.7	0.7	Boulder <3.0m		Cable Corridor
389318.7	5910364.7	S373	0.9	0.5	0.2	Boulder <3.0m		Cable Corridor
389312.4	5910372.4	S374	1.6	0.6	0.3	Boulder <3.0m		Cable Corridor
389308.7	5910378.8	S375	1.0	0.6	0.3	Boulder <3.0m		Cable Corridor
389283.0	5911263.8	S376	3.3	0.9	0.3	Boulder >3.0m		Cable Corridor
389278.4	5910898.8	S377	0.9	0.4	0.3	Boulder <3.0m		Cable Corridor
389277.2	5911073.1	S378	1.3	1.1	0.4	Boulder <3.0m		Cable Corridor
389264.0	5911513.6	S379	1.4	0.9	0.4	Boulder <3.0m		Cable Corridor
389267.1	5910969.9	S380	0.9	0.4	0.2	Boulder <3.0m		Cable Corridor
389266.2	5911086.8	S381	1.2	1.1	0.8	Boulder <3.0m		Cable Corridor
389249.9	5910971.3	S382	1.1	1.0	0.2	Boulder <3.0m		Cable Corridor
389247.9	5910915.3	S383	1.5	0.7	0.2	Boulder <3.0m		Cable Corridor
389234.9	5910841.4	S384	0.6	0.4	0.3	Boulder <3.0m		Cable Corridor
389229.1	5911265.4	S385	0.9	0.8	0.5	Boulder <3.0m		Cable Corridor
389217.4	5910932.4	S386	1.0	0.2	0.2	Boulder <3.0m		Cable Corridor
389213.7	5911442.9	S387	1.6	0.3	0.3	Boulder <3.0m		Cable Corridor
389186.4	5910319.1	S388	0.6	0.4	0.4	Boulder <3.0m		Cable Corridor
389170.9	5910540.9	S389	0.7	0.4	0.3	Boulder <3.0m		Cable Corridor
389130.0	5911483.7	S390	1.5	0.6	0.5	Boulder <3.0m		Cable Corridor
389104.3	5911472.1	S391	0.8	0.6	0.4	Boulder <3.0m		Cable Corridor
389060.7	5910607.9	S392	1.0	0.4	0.2	Boulder <3.0m		Cable Corridor
389053.0	5910939.1	S393	1.1	0.7	0.6	Boulder <3.0m		Cable Corridor
389042.9	5910582.8	S394	0.5	0.3	0.3	Boulder <3.0m		Cable Corridor
389012.4	5910537.2	S395	1.0	0.3	0.6	Boulder <3.0m		Cable Corridor
389010.8	5910538.1	S396	0.6	0.6	0.2	Boulder <3.0m		Cable Corridor
389007.0	5911166.7	S397	2.3	2.2	0.2	Boulder <3.0m		Cable Corridor
388997.6	5910597.6	S398	0.7	0.3	0.2	Boulder <3.0m		Cable Corridor
388995.5	5910914.0	S399	1.2	0.4	0.7	Boulder <3.0m		Cable Corridor
388994.9	5911168.1	S400	1.9	1.2	0.2	Boulder <3.0m		Cable Corridor
388991.0	5911032.1	S401	1.2	0.9	0.5	Boulder <3.0m		Cable Corridor
388984.1	5911373.7	S402	0.7	0.6	0.3	Boulder <3.0m		Cable Corridor
388975.2	5910681.4	S403	1.1	0.8	0.3	Boulder <3.0m		Cable Corridor
388953.4	5910551.0	S404	0.4	0.3	0.1	Boulder <3.0m		Cable Corridor
388939.1	5910564.2	S405	0.4	0.2	0.3	Boulder <3.0m		Cable Corridor

Easting (m)	Northing (m)	Sonar Contact ID	Length (m)	Width (m)	Height (m)	Description	Comment	Area
388932.6	5910487.2	S406	0.8	0.8	0.3	Boulder <3.0m		Cable Corridor
388924.5	5911337.5	S407	4.5	3.4	0.4	Boulder >3.0m		Cable Corridor
388922.9	5910481.4	S408	0.3	0.2	0.1	Boulder <3.0m		Cable Corridor
388917.4	5910498.6	S409	0.4	0.2	0.3	Boulder <3.0m		Cable Corridor
388903.0	5910494.1	S410	0.4	0.4	0.3	Boulder <3.0m		Cable Corridor
388901.8	5911221.1	S411	1.3	1.2	0.2	Boulder <3.0m		Cable Corridor
388892.5	5910843.9	S412	1.7	1.3	0.4	Boulder <3.0m		Cable Corridor
388890.5	5910455.8	S413	1.1	0.4	0.3	Boulder <3.0m		Cable Corridor
388877.9	5910561.0	S414	1.1	0.4	0.3	Boulder <3.0m		Cable Corridor
388850.6	5910635.7	S415	1.1	0.8	0.2	Boulder <3.0m		Cable Corridor
388838.9	5910679.2	S416	0.6	0.3	0.2	Boulder <3.0m		Cable Corridor
388837.4	5910863.3	S417	0.6	0.3	0.2	Boulder <3.0m		Cable Corridor
388834.3	5910538.7	S418	1.3	0.7	0.3	Boulder <3.0m		Cable Corridor
388833.1	5910589.0	S419	0.8	0.6	0.2	Boulder <3.0m		Cable Corridor
388831.2	5910637.3	S420	1.2	0.3	0.3	Boulder <3.0m		Cable Corridor
388830.3	5910603.8	S421	1.0	0.5	0.5	Boulder <3.0m		Cable Corridor
388828.9	5910512.2	S422	1.1	0.6	0.5	Boulder <3.0m		Cable Corridor
388819.0	5910490.7	S423	0.8	0.4	0.2	Boulder <3.0m		Cable Corridor
388816.1	5910566.6	S424	1.3	1.2	0.2	Boulder <3.0m		Cable Corridor
388803.3	5911034.2	S425	1.2	0.4	0.5	Boulder <3.0m		Cable Corridor
388793.0	5910629.2	S426	0.4	0.2	0.1	Boulder <3.0m		Cable Corridor
388791.5	5910845.0	S427	0.8	0.3	0.3	Boulder <3.0m		Cable Corridor
388786.7	5910718.9	S428	0.3	0.3	0.2	Boulder <3.0m		Cable Corridor
388783.3	5910719.3	S429	0.8	0.4	0.2	Boulder <3.0m		Cable Corridor
388777.2	5910649.9	S430	0.8	0.5	0.4	Boulder <3.0m		Cable Corridor
388776.6	5910827.0	S431	0.7	0.3	0.4	Boulder <3.0m		Cable Corridor
388773.0	5910923.5	S432	0.4	0.3	0.3	Boulder <3.0m		Cable Corridor
388767.0	5910249.2	S433	1.2	0.3	0.6	Boulder <3.0m		Cable Corridor
388736.2	5910553.2	S434	1.2	0.8	0.1	Boulder <3.0m		Cable Corridor
388733.6	5911117.1	S435	1.1	0.3	0.3	Boulder <3.0m		Cable Corridor
388731.4	5910543.5	S436	1.1	0.5	0.3	Boulder <3.0m		Cable Corridor
388726.3	5911124.1	S437	1.2	0.8	0.6	Boulder <3.0m		Cable Corridor
388723.0	5910977.7	S438	1.0	0.7	0.2	Boulder <3.0m		Cable Corridor
388708.0	5911310.4	S439	1.2	0.8	0.2	Boulder <3.0m		Cable Corridor
388701.3	5911301.6	S440	0.7	0.4	0.5	Boulder <3.0m		Cable Corridor
388699.9	5910598.5	S441	2.4	1.3	0.3	Boulder <3.0m		Cable Corridor
388696.3	5910528.6	S442	0.6	0.3	0.2	Boulder <3.0m		Cable Corridor
388691.3	5911124.2	S443	1.1	1.0	0.2	Boulder <3.0m		Cable Corridor
388686.7	5910949.8	S444	0.5	0.4	0.1	Boulder <3.0m		Cable Corridor
388680.2	5910882.8	S445	0.7	0.3	0.2	Boulder <3.0m		Cable Corridor
388679.6	5910957.3	S446	0.9	0.8	0.3	Boulder <3.0m		Cable Corridor

Easting (m)	Northing (m)	Sonar Contact ID	Length (m)	Width (m)	Height (m)	Description	Comment	Area
388674.5	5910885.2	S447	1.2	1.1	0.1	Boulder <3.0m		Cable Corridor
388665.3	5910899.0	S448	0.8	0.6	0.2	Boulder <3.0m		Cable Corridor
388658.7	5910882.8	S449	0.7	0.3	0.3	Boulder <3.0m		Cable Corridor
388655.5	5910446.2	S450	2.7	1.5	0.7	Boulder <3.0m		Cable Corridor
388651.2	5910514.2	S451	1.0	0.9	0.2	Boulder <3.0m		Cable Corridor
388650.3	5910903.8	S452	2.1	1.2	0.2	Boulder <3.0m		Cable Corridor
388641.6	5911054.8	S453	1.0	0.9	0.2	Boulder <3.0m		Cable Corridor
388634.8	5911027.3	S454	2.1	1.4	0.4	Boulder <3.0m		Cable Corridor
388614.7	5910563.9	S455	0.9	0.5	0.3	Boulder <3.0m		Cable Corridor
388612.6	5910656.7	S456	1.1	0.7	0.7	Boulder <3.0m		Cable Corridor
388607.0	5911009.0	S457	1.4	1.1	0.1	Boulder <3.0m		Cable Corridor
388601.6	5910576.9	S458	1.0	0.8	0.3	Boulder <3.0m		Cable Corridor
388600.2	5910951.2	S459	0.7	0.5	0.2	Boulder <3.0m		Cable Corridor
388588.9	5910995.9	S460	0.4	0.4	0.3	Boulder <3.0m		Cable Corridor
388582.9	5910937.6	S461	1.2	1.1	0.2	Boulder <3.0m		Cable Corridor
388582.3	5911525.8	S462	0.7	0.6	0.3	Boulder <3.0m		Cable Corridor
388580.2	5911523.5	S463	1.4	0.6	0.4	Boulder <3.0m		Cable Corridor
388578.8	5911521.9	S464	1.2	0.4	0.3	Boulder <3.0m		Cable Corridor
388566.2	5910921.3	S465	0.5	0.2	0.2	Boulder <3.0m		Cable Corridor
388562.7	5910950.8	S466	1.2	0.4	0.3	Boulder <3.0m		Cable Corridor
388558.6	5910989.1	S467	0.6	0.3	0.4	Boulder <3.0m		Cable Corridor
388524.2	5911323.9	S468	0.8	0.6	0.2	Boulder <3.0m		Cable Corridor
388556.9	5910918.5	S469	0.9	0.8	0.2	Boulder <3.0m		Cable Corridor
388562.2	5910766.6	S470	0.9	0.9	0.5	Boulder <3.0m		Cable Corridor
388545.8	5910751.1	S471	1.3	1.0	0.8	Boulder <3.0m		Cable Corridor
388559.7	5910587.0	S472	0.8	0.6	0.3	Boulder <3.0m		Cable Corridor
388547.0	5910609.9	S473	0.5	0.2	0.1	Boulder <3.0m		Cable Corridor
388538.5	5910608.1	S474	0.9	0.7	0.3	Boulder <3.0m		Cable Corridor
388494.5	5910903.3	S475	0.7	0.5	0.1	Boulder <3.0m		Cable Corridor
388518.6	5910533.7	S476	0.5	0.3	0.1	Boulder <3.0m		Cable Corridor
388422.2	5911540.4	S477	1.7	1.3	0.4	Boulder <3.0m		Cable Corridor
388482.3	5910848.0	S478	1.7	0.9	0.6	Boulder <3.0m		Cable Corridor
388469.7	5910937.9	S479	0.5	0.5	0.2	Boulder <3.0m		Cable Corridor
388504.5	5910526.8	S480	0.9	0.4	0.3	Boulder <3.0m		Cable Corridor
388496.5	5910582.4	S481	1.5	1.1	0.5	Boulder <3.0m		Cable Corridor
388470.2	5910855.4	S482	2.0	1.6	0.3	Boulder <3.0m		Cable Corridor
388413.3	5911344.7	S483	1.9	0.6	0.1	Boulder <3.0m		Cable Corridor
388467.1	5910698.6	S484	1.2	0.8	0.4	Boulder <3.0m		Cable Corridor
388450.0	5910792.6	S485	0.9	0.4	0.3	Boulder <3.0m		Cable Corridor
388446.0	5910771.3	S486	1.0	0.4	0.2	Boulder <3.0m		Cable Corridor
388416.0	5910844.8	S487	0.9	0.3	0.3	Boulder <3.0m		Cable Corridor

Easting (m)	Northing (m)	Sonar Contact ID	Length (m)	Width (m)	Height (m)	Description	Comment	Area
388401.5	5910851.2	S488	1.6	1.3	0.2	Boulder <3.0m		Cable Corridor
388422.3	5910602.8	S489	2.0	1.2	0.4	Boulder <3.0m		Cable Corridor
388389.0	5910960.3	S490	3.0	2.4	0.6	Boulder >3.0m		Cable Corridor
388418.7	5910598.8	S491	0.5	0.4	0.5	Boulder <3.0m		Cable Corridor
388378.8	5910667.9	S492	0.8	0.3	0.3	Boulder <3.0m		Cable Corridor
388372.4	5910701.3	S493	1.1	1.0	0.2	Boulder <3.0m		Cable Corridor
388374.1	5910660.9	S494	0.8	0.4	0.2	Boulder <3.0m		Cable Corridor
388360.9	5910772.4	S495	1.1	0.4	0.2	Boulder <3.0m		Cable Corridor
388347.1	5910883.4	S496	2.4	1.3	0.7	Boulder <3.0m		Cable Corridor
388357.5	5910750.6	S497	0.6	0.3	0.3	Boulder <3.0m		Cable Corridor
388358.0	5910739.6	S498	0.6	0.3	0.3	Boulder <3.0m		Cable Corridor
388333.2	5910919.5	S499	1.5	0.9	0.6	Boulder <3.0m		Cable Corridor
388374.8	5910251.9	S500	0.9	0.5	0.7	Boulder <3.0m		Cable Corridor
388307.8	5910841.8	S501	1.4	0.5	0.7	Boulder <3.0m		Cable Corridor
388274.7	5911197.5	S502	0.9	0.7	0.2	Boulder <3.0m		Cable Corridor
388247.8	5911407.1	S503	1.3	0.5	0.5	Boulder <3.0m		Cable Corridor
388278.8	5910880.2	S504	1.3	1.1	0.1	Boulder <3.0m		Cable Corridor
388296.0	5910632.6	S505	0.6	0.5	0.4	Boulder <3.0m		Cable Corridor
388218.1	5911439.3	S506	0.9	0.5	0.8	Boulder <3.0m		Cable Corridor
388277.6	5910789.9	S507	0.6	0.4	0.4	Boulder <3.0m		Cable Corridor
388210.4	5911431.0	S508	1.0	0.5	0.5	Boulder <3.0m		Cable Corridor
388239.4	5911110.4	S509	1.4	1.4	0.3	Boulder <3.0m		Cable Corridor
388309.8	5910330.6	S510	0.7	0.5	0.7	Boulder <3.0m		Cable Corridor
388254.3	5910863.5	S511	1.2	0.8	0.2	Boulder <3.0m		Cable Corridor
388303.9	5910302.0	S512	0.9	0.8	0.3	Boulder <3.0m		Cable Corridor
388245.6	5910862.7	S513	0.5	0.4	0.2	Boulder <3.0m		Cable Corridor
388224.8	5910885.9	S514	2.5	2.2	0.2	Boulder <3.0m		Cable Corridor
388223.7	5910883.2	S515	1.5	1.1	0.2	Boulder <3.0m		Cable Corridor
388197.5	5910936.1	S516	0.7	0.6	0.3	Boulder <3.0m		Cable Corridor
388245.8	5910366.4	S517	1.6	0.9	0.5	Boulder <3.0m		Cable Corridor
388238.8	5910441.9	S518	2.3	1.3	0.2	Boulder <3.0m		Cable Corridor
388212.4	5910557.0	S519	0.8	0.3	0.2	Boulder <3.0m		Cable Corridor
388157.2	5911066.2	S520	0.8	0.7	0.7	Boulder <3.0m		Cable Corridor
388173.3	5910672.8	S521	2.1	1.5	0.2	Boulder <3.0m		Cable Corridor
388200.1	5910404.2	S522	0.8	0.6	0.7	Boulder <3.0m		Cable Corridor
388129.8	5910745.8	S523	0.6	0.3	0.3	Boulder <3.0m		Cable Corridor
388033.2	5911196.5	S524	1.4	1.1	0.8	Boulder <3.0m		Cable Corridor
388078.3	5910705.8	S525	0.9	0.3	0.3	Boulder <3.0m		Cable Corridor
388075.7	5910691.2	S526	0.8	0.6	0.6	Boulder <3.0m		Cable Corridor
388036.6	5910264.7	S527	1.1	0.7	0.4	Boulder <3.0m		Cable Corridor
388030.8	5910240.5	S528	1.4	1.3	0.6	Boulder <3.0m		Cable Corridor

Easting (m)	Northing (m)	Sonar Contact ID	Length (m)	Width (m)	Height (m)	Description	Comment	Area
387954.2	5910805.0	S529	1.1	0.7	0.8	Boulder <3.0m		Cable Corridor
388017.2	5910165.6	S530	1.1	0.8	0.4	Boulder <3.0m		Cable Corridor
388002.6	5910235.0	S531	1.2	0.9	0.5	Boulder <3.0m		Cable Corridor
387874.9	5910951.0	S532	2.5	2.4	0.2	Boulder <3.0m		Cable Corridor
387846.1	5911132.4	S533	0.8	0.7	0.2	Boulder <3.0m		Cable Corridor
387838.1	5911053.3	S534	1.4	1.4	0.8	Boulder <3.0m		Cable Corridor
387766.4	5910607.6	S535	1.8	0.6	0.9	Boulder <3.0m		Cable Corridor
387740.2	5910573.5	S536	2.1	1.2	0.4	Boulder <3.0m		Cable Corridor
387780.3	5910406.4	S537	1.3	0.8	0.7	Boulder <3.0m		Cable Corridor
387365.9	5911506.0	S538	0.8	0.4	0.1	Boulder <3.0m		Cable Corridor
387368.1	5911498.9	S539	0.8	0.3	0.1	Boulder <3.0m		Cable Corridor
387348.2	5911496.2	S540	1.1	0.8	0.2	Boulder <3.0m		Cable Corridor
387672.5	5910595.8	S541	1.9	0.4	0.2	Boulder <3.0m		Cable Corridor
387453.5	5911130.9	S542	1.2	0.8	0.3	Boulder <3.0m		Cable Corridor
387452.8	5911131.9	S543	0.9	0.6	0.0	Boulder <3.0m		Cable Corridor
387374.9	5911333.7	S544	0.4	0.4	0.1	Boulder <3.0m		Cable Corridor
387451.0	5911128.6	S545	1.4	0.8	0.3	Boulder <3.0m		Cable Corridor
387358.9	5911321.6	S546	0.3	0.2	0.2	Boulder <3.0m		Cable Corridor
387252.4	5911472.1	S547	1.1	1.0	0.4	Boulder <3.0m		Cable Corridor
387702.5	5910102.4	S548	0.9	0.9	0.5	Boulder <3.0m		Cable Corridor
387569.3	5910448.9	S549	0.9	0.7	0.5	Boulder <3.0m		Cable Corridor
387229.0	5911248.8	S550	0.6	0.4	0.7	Boulder <3.0m		Cable Corridor
387601.8	5910224.9	S551	2.5	1.4	0.8	Boulder <3.0m		Cable Corridor
387218.6	5911205.4	S552	1.6	0.8	0.5	Boulder <3.0m		Cable Corridor
387434.3	5910516.7	S553	1.1	0.8	0.1	Boulder <3.0m		Cable Corridor
387544.3	5910207.1	S554	2.3	0.8	0.3	Boulder <3.0m		Cable Corridor
387090.5	5911365.0	S555	1.7	0.7	0.4	Boulder <3.0m		Cable Corridor
387146.2	5911204.1	S556	1.9	1.2	0.3	Boulder <3.0m		Cable Corridor
387405.4	5910479.6	S557	1.4	1.2	0.1	Boulder <3.0m		Cable Corridor
387399.9	5910485.5	S558	0.6	0.3	0.2	Boulder <3.0m		Cable Corridor
387376.2	5910485.0	S559	0.6	0.3	0.1	Boulder <3.0m		Cable Corridor
386999.4	5911426.4	S560	1.3	1.1	0.7	Boulder <3.0m		Cable Corridor
387179.7	5910750.8	S561	1.7	0.6	0.5	Boulder <3.0m		Cable Corridor
387425.4	5910006.8	S562	0.9	0.6	0.3	Boulder <3.0m		Cable Corridor
387128.8	5910651.6	S563	1.4	0.7	0.6	Boulder <3.0m		Cable Corridor
386964.0	5910915.5	S564	1.3	1.0	0.6	Boulder <3.0m		Cable Corridor
387149.9	5910375.2	S565	3.1	0.4	0.4	Boulder >3.0m		Cable Corridor
386839.5	5911169.6	S566	0.8	0.7	0.7	Boulder <3.0m		Cable Corridor
386866.3	5911077.7	S567	1.5	1.1	0.7	Boulder <3.0m		Cable Corridor
387193.4	5910165.3	S568	1.0	0.9	0.5	Boulder <3.0m		Cable Corridor
386717.1	5911254.6	S569	2.1	0.6	0.6	Boulder <3.0m		Cable Corridor

Easting (m)	Northing (m)	Sonar Contact ID	Length (m)	Width (m)	Height (m)	Description	Comment	Area
386703.5	5911274.0	S570	2.5	1.5	0.6	Boulder <3.0m		Cable Corridor
386696.9	5911236.4	S571	2.5	2.3	0.3	Boulder <3.0m		Cable Corridor
387129.6	5910061.0	S572	1.8	1.4	0.7	Boulder <3.0m		Cable Corridor
387041.9	5910190.2	S573	1.9	0.3	0.3	Boulder <3.0m		Cable Corridor
386548.9	5911215.4	S574	1.3	0.6	0.5	Boulder <3.0m		Cable Corridor
387032.0	5909942.4	S575	0.6	0.6	0.2	Boulder <3.0m		Cable Corridor
386644.3	5910788.5	S576	1.5	1.1	0.4	Boulder <3.0m		Cable Corridor
386738.6	5910518.0	S577	1.2	0.6	0.4	Boulder <3.0m		Cable Corridor
387019.4	5909797.6	S578	1.8	0.4	0.5	Boulder <3.0m		Cable Corridor
387061.1	5909693.0	S579	2.1	0.6	0.4	Boulder <3.0m		Cable Corridor
386460.8	5911084.8	S580	1.1	0.8	0.4	Boulder <3.0m		Cable Corridor
386833.2	5909894.1	S581	4.0	2.9	0.3	Boulder >3.0m		Cable Corridor
386827.6	5909894.6	S582	4.9	3.3	0.5	Boulder >3.0m		Cable Corridor
386751.2	5910023.1	S583	0.6	0.6	0.3	Boulder <3.0m		Cable Corridor
386856.1	5909724.2	S584	0.9	0.7	0.6	Boulder <3.0m		Cable Corridor
386828.1	5909791.3	S585	1.3	1.2	0.6	Boulder <3.0m		Cable Corridor
386811.9	5909637.7	S586	0.8	0.7	0.3	Boulder <3.0m		Cable Corridor
386800.1	5909616.6	S587	1.3	1.2	0.3	Boulder <3.0m		Cable Corridor
386260.3	5910870.9	S588	1.4	0.9	0.4	Boulder <3.0m		Cable Corridor
386237.5	5910881.3	S589	2.5	1.4	0.1	Boulder <3.0m		Cable Corridor
386168.3	5910680.0	S590	3.3	2.3	0.5	Boulder >3.0m		Cable Corridor
386115.2	5910403.2	S591	1.3	0.6	0.3	Boulder <3.0m		Cable Corridor
386196.2	5910091.2	S592	1.4	0.7	0.7	Boulder <3.0m		Cable Corridor
386154.1	5910182.3	S593	0.7	0.3	0.3	Boulder <3.0m		Cable Corridor
385854.3	5910673.1	S594	1.7	0.6	0.3	Boulder <3.0m		Cable Corridor
386333.5	5909494.6	S595	5.1	4.1	0.7	Boulder >3.0m		Cable Corridor
385696.3	5910896.0	S596	2.0	1.5	0.4	Boulder <3.0m		Cable Corridor
386080.5	5909878.0	S597	0.7	0.4	0.4	Boulder <3.0m		Cable Corridor
386255.8	5909388.8	S598	1.3	0.6	0.3	Boulder <3.0m		Cable Corridor
385773.1	5910426.6	S599	1.6	1.0	0.4	Boulder <3.0m		Cable Corridor
386017.6	5909774.3	S600	1.3	0.7	0.7	Boulder <3.0m		Cable Corridor
385714.6	5910489.0	S601	1.1	0.8	0.4	Boulder <3.0m		Cable Corridor
385672.0	5910334.0	S602	1.7	0.7	0.5	Boulder <3.0m		Cable Corridor
385498.7	5910599.8	S603	2.6	1.6	0.4	Boulder <3.0m		Cable Corridor
385487.8	5910582.2	S604	1.2	0.5	0.5	Boulder <3.0m		Cable Corridor
385588.0	5910316.3	S605	2.1	1.5	0.4	Boulder <3.0m		Cable Corridor
385399.8	5910671.1	S606	2.2	0.8	0.1	Boulder <3.0m		Cable Corridor
385512.4	5910396.5	S607	2.7	1.5	0.5	Boulder <3.0m		Cable Corridor
385890.4	5909349.2	S608	2.1	1.5	0.6	Boulder <3.0m		Cable Corridor
385750.5	5909590.8	S609	0.6	0.4	0.4	Boulder <3.0m		Cable Corridor
385781.3	5909503.3	S610	1.3	0.9	0.3	Boulder <3.0m		Cable Corridor

Easting (m)	Northing (m)	Sonar Contact ID	Length (m)	Width (m)	Height (m)	Description	Comment	Area
385670.4	5909737.8	S611	1.9	1.3	0.3	Boulder <3.0m		Cable Corridor
385393.9	5910369.8	S612	0.9	0.8	0.5	Boulder <3.0m		Cable Corridor
385592.5	5909850.0	S613	2.9	1.7	0.7	Boulder <3.0m		Cable Corridor
385591.3	5909847.8	S614	1.8	0.6	0.6	Boulder <3.0m		Cable Corridor
385587.8	5909834.4	S615	2.1	1.3	0.9	Boulder <3.0m		Cable Corridor
385810.7	5909273.5	S616	2.8	1.5	0.5	Boulder <3.0m		Cable Corridor
385687.6	5909546.0	S617	0.8	0.8	0.5	Boulder <3.0m		Cable Corridor
385749.7	5909386.7	S618	1.0	0.7	0.3	Boulder <3.0m		Cable Corridor
385479.5	5910035.0	S619	1.4	1.0	0.5	Boulder <3.0m		Cable Corridor
385358.5	5910320.2	S620	2.3	1.1	0.4	Boulder <3.0m		Cable Corridor
385696.5	5909487.8	S621	1.4	1.0	0.4	Boulder <3.0m		Cable Corridor
385395.4	5910135.3	S622	1.9	0.9	0.4	Boulder <3.0m		Cable Corridor
385700.4	5909398.5	S623	0.9	0.7	0.6	Boulder <3.0m		Cable Corridor
385505.3	5909756.3	S624	1.8	1.7	0.6	Boulder <3.0m		Cable Corridor
385678.1	5909257.6	S625	1.1	0.6	0.2	Boulder <3.0m		Cable Corridor
385715.2	5909127.3	S626	1.3	1.1	0.6	Boulder <3.0m		Cable Corridor
385662.4	5909234.5	S627	1.1	0.6	0.3	Boulder <3.0m		Cable Corridor
385148.0	5910283.4	S628	3.2	2.7	0.5	Boulder >3.0m		Cable Corridor
385198.1	5909896.9	S629	1.2	0.6	0.2	Boulder <3.0m		Cable Corridor
385297.4	5909611.9	S630	1.1	1.0	0.6	Boulder <3.0m		Cable Corridor
385179.3	5909876.4	S631	2.0	1.6	0.3	Boulder <3.0m		Cable Corridor
384898.9	5910513.0	S632	2.4	0.7	0.4	Boulder <3.0m		Cable Corridor
384992.0	5910282.8	S633	4.2	0.8	0.7	Boulder >3.0m		Cable Corridor
385284.2	5909523.5	S634	0.8	0.7	0.4	Boulder <3.0m		Cable Corridor
385122.4	5909874.0	S635	2.1	1.7	0.7	Boulder <3.0m		Cable Corridor
385002.6	5910102.8	S636	1.4	0.5	0.3	Boulder <3.0m		Cable Corridor
385370.0	5909079.7	S637	1.2	1.0	0.5	Boulder <3.0m		Cable Corridor
385211.0	5909415.6	S638	2.1	0.6	0.4	Boulder <3.0m		Cable Corridor
384970.4	5909723.1	S639	1.6	0.6	0.6	Boulder <3.0m		Cable Corridor
385051.8	5909354.4	S640	2.5	1.6	0.2	Boulder <3.0m		Cable Corridor
385069.5	5909219.9	S641	1.2	0.4	0.2	Boulder <3.0m		Cable Corridor
384875.4	5909700.1	S642	2.1	0.6	0.4	Boulder <3.0m		Cable Corridor
384881.5	5909630.9	S643	1.6	1.2	0.3	Boulder <3.0m		Cable Corridor
385019.5	5909033.3	S644	2.2	0.5	0.4	Boulder <3.0m		Cable Corridor
384910.7	5909431.0	S645	1.6	0.5	0.3	Boulder <3.0m		Cable Corridor
384925.3	5909338.0	S646	1.1	0.7	0.2	Boulder <3.0m		Cable Corridor
384749.2	5910071.4	S647	2.8	1.5	0.8	Boulder <3.0m		Cable Corridor
384922.4	5909332.2	S648	3.3	0.7	0.3	Boulder >3.0m		Cable Corridor
384712.0	5909668.4	S649	1.8	1.4	0.8	Boulder <3.0m		Cable Corridor
384512.7	5910167.0	S650	2.0	0.8	0.5	Boulder <3.0m		Cable Corridor
384659.9	5909508.7	S651	2.6	2.3	0.6	Boulder <3.0m		Cable Corridor

Easting (m)	Northing (m)	Sonar Contact ID	Length (m)	Width (m)	Height (m)	Description	Comment	Area
384421.6	5910382.2	S652	2.9	0.9	0.7	Boulder <3.0m		Cable Corridor
384507.2	5910005.5	S653	2.2	0.7	0.5	Boulder <3.0m		Cable Corridor
384632.1	5909397.1	S654	2.2	1.5	0.4	Boulder <3.0m		Cable Corridor
384734.4	5908882.2	S655	0.6	0.6	0.2	Boulder <3.0m		Cable Corridor
384720.3	5908896.4	S656	1.6	1.6	0.3	Boulder <3.0m		Cable Corridor
384742.8	5908776.8	S657	1.4	0.9	0.5	Boulder <3.0m		Cable Corridor
384647.6	5908904.7	S658	1.9	0.8	0.3	Boulder <3.0m		Cable Corridor
384462.4	5909647.5	S659	1.8	0.8	0.8	Boulder <3.0m		Cable Corridor
384335.9	5910081.7	S660	2.4	1.6	0.5	Boulder <3.0m		Cable Corridor
384524.7	5909121.0	S661	1.1	0.5	0.4	Boulder <3.0m		Cable Corridor
384598.5	5908712.8	S662	2.1	1.4	0.5	Boulder <3.0m		Cable Corridor
384156.3	5910335.6	S663	1.2	0.6	0.2	Boulder <3.0m		Cable Corridor
384067.4	5910465.3	S664	2.2	0.6	0.7	Boulder <3.0m		Cable Corridor
384077.1	5910366.1	S665	1.9	1.1	0.3	Boulder <3.0m		Cable Corridor
384059.8	5910373.5	S666	1.9	1.3	0.5	Boulder <3.0m		Cable Corridor
384297.4	5909312.2	S667	1.6	0.5	0.4	Boulder <3.0m		Cable Corridor
384217.7	5909585.5	S668	2.1	1.3	0.6	Boulder <3.0m		Cable Corridor
384038.7	5909669.5	S669	3.2	2.4	0.4	Boulder >3.0m		Cable Corridor
384188.1	5908884.1	S670	1.8	0.6	0.7	Boulder <3.0m		Cable Corridor
384008.7	5909632.3	S671	2.0	1.0	0.4	Boulder <3.0m		Cable Corridor
383987.8	5909616.3	S672	2.5	1.7	0.4	Boulder <3.0m		Cable Corridor
384085.0	5909009.8	S673	2.0	1.5	0.6	Boulder <3.0m		Cable Corridor
384105.1	5908826.5	S674	2.4	0.7	0.6	Boulder <3.0m		Cable Corridor
383865.9	5909714.3	S675	2.1	0.8	0.6	Boulder <3.0m		Cable Corridor
384025.4	5908902.6	S676	1.8	0.7	0.3	Boulder <3.0m		Cable Corridor
384018.7	5908907.1	S677	1.2	0.5	0.5	Boulder <3.0m		Cable Corridor
383679.0	5910139.7	S678	1.9	1.6	0.7	Boulder <3.0m		Cable Corridor
383723.7	5909711.0	S679	2.0	0.9	0.3	Boulder <3.0m		Cable Corridor
383698.5	5909640.3	S680	1.7	1.0	0.4	Boulder <3.0m		Cable Corridor
383631.7	5909841.7	S681	1.6	0.9	0.6	Boulder <3.0m		Cable Corridor
383604.8	5909834.8	S682	3.1	2.6	0.6	Boulder >3.0m		Cable Corridor
383456.7	5910267.0	S683	2.7	1.2	0.5	Boulder <3.0m		Cable Corridor
383449.7	5910235.0	S684	0.3	0.2	0.2	Boulder <3.0m		Cable Corridor
383460.6	5910150.1	S685	0.3	0.3	0.1	Boulder <3.0m		Cable Corridor
383458.0	5910139.9	S686	0.3	0.3	0.2	Boulder <3.0m		Cable Corridor
383433.6	5910208.4	S687	1.0	1.0	0.1	Boulder <3.0m		Cable Corridor
383429.8	5910218.2	S688	0.4	0.1	0.1	Boulder <3.0m		Cable Corridor
383426.2	5910192.7	S689	0.6	0.2	0.1	Boulder <3.0m		Cable Corridor
383428.8	5910000.7	S690	0.3	0.2	0.3	Boulder <3.0m		Cable Corridor
383399.2	5910159.4	S691	0.5	0.4	0.2	Boulder <3.0m		Cable Corridor
383433.1	5910100.1	S692	0.7	0.6	0.2	Boulder <3.0m		Cable Corridor

Easting (m)	Northing (m)	Sonar Contact ID	Length (m)	Width (m)	Height (m)	Description	Comment	Area
383411.9	5909952.1	S693	0.4	0.4	0.2	Boulder <3.0m		Cable Corridor
383321.6	5910133.5	S694	0.6	0.5	0.1	Boulder <3.0m		Cable Corridor
383400.7	5909955.7	S695	0.3	0.2	0.2	Boulder <3.0m		Cable Corridor
383488.0	5909769.4	S696	1.0	0.8	0.4	Boulder <3.0m		Cable Corridor
383389.4	5909935.4	S697	0.4	0.3	0.2	Boulder <3.0m		Cable Corridor
383385.8	5909937.0	S698	0.4	0.2	0.1	Boulder <3.0m		Cable Corridor
383380.6	5909939.1	S699	0.5	0.1	0.3	Boulder <3.0m		Cable Corridor
383378.4	5909937.5	S700	1.0	0.8	0.2	Boulder <3.0m		Cable Corridor
383385.0	5909919.7	S701	0.4	0.2	0.4	Boulder <3.0m		Cable Corridor
383383.9	5909917.7	S702	0.3	0.3	0.2	Boulder <3.0m		Cable Corridor
383368.8	5909928.1	S703	0.5	0.3	0.2	Boulder <3.0m		Cable Corridor
383358.7	5909932.3	S704	0.6	0.5	0.3	Boulder <3.0m		Cable Corridor
383357.7	5909930.8	S705	0.5	0.4	0.3	Boulder <3.0m		Cable Corridor
383350.4	5909942.0	S706	0.3	0.3	0.3	Boulder <3.0m		Cable Corridor
383353.9	5909929.2	S707	0.6	0.3	0.4	Boulder <3.0m		Cable Corridor
383337.2	5909953.7	S708	0.5	0.3	0.1	Boulder <3.0m		Cable Corridor
383343.8	5909937.9	S709	0.4	0.3	0.2	Boulder <3.0m		Cable Corridor
383270.5	5910089.2	S710	0.3	0.2	0.2	Boulder <3.0m		Cable Corridor
383345.3	5909933.6	S711	0.5	0.4	0.3	Boulder <3.0m		Cable Corridor
383352.9	5909916.5	S712	0.7	0.3	0.1	Boulder <3.0m		Cable Corridor
383340.6	5909938.4	S713	0.4	0.2	0.2	Boulder <3.0m		Cable Corridor
383341.0	5909914.1	S714	0.8	0.6	0.5	Boulder <3.0m		Cable Corridor
383648.3	5909276.1	S715	1.3	0.9	0.4	Boulder <3.0m		Cable Corridor
383339.2	5909912.1	S716	0.9	0.5	0.2	Boulder <3.0m		Cable Corridor
383337.5	5909913.9	S717	0.4	0.3	0.2	Boulder <3.0m		Cable Corridor
383330.7	5909915.5	S718	0.4	0.3	0.3	Boulder <3.0m		Cable Corridor
383325.3	5909912.5	S719	1.4	1.1	0.1	Boulder <3.0m		Cable Corridor
383469.2	5909589.0	S720	1.9	1.1	0.4	Boulder <3.0m		Cable Corridor
383425.3	5909677.4	S721	2.4	0.9	0.4	Boulder <3.0m		Cable Corridor
383679.3	5909142.6	S722	3.2	0.7	0.7	Boulder >3.0m		Cable Corridor
383270.9	5909958.4	S723	1.4	0.4	0.5	Boulder <3.0m		Cable Corridor
383642.9	5909187.0	S724	1.2	0.7	0.6	Boulder <3.0m		Cable Corridor
383200.8	5910079.0	S725	0.5	0.3	0.2	Boulder <3.0m		Cable Corridor
383300.7	5909859.4	S726	0.4	0.1	0.3	Boulder <3.0m		Cable Corridor
383230.7	5910000.7	S727	0.4	0.2	0.1	Boulder <3.0m		Cable Corridor
383301.4	5909825.7	S728	0.6	0.4	0.2	Boulder <3.0m		Cable Corridor
383260.2	5909880.2	S729	1.1	0.3	0.1	Boulder <3.0m		Cable Corridor
383249.6	5909891.1	S730	0.3	0.2	0.2	Boulder <3.0m		Cable Corridor
383348.1	5909649.5	S731	3.1	1.7	0.4	Boulder >3.0m		Cable Corridor
383227.2	5909876.4	S732	0.5	0.4	0.3	Boulder <3.0m		Cable Corridor
383448.7	5909343.3	S733	2.6	2.3	0.8	Boulder <3.0m		Cable Corridor

Easting (m)	Northing (m)	Sonar Contact ID	Length (m)	Width (m)	Height (m)	Description	Comment	Area
383822.0	5908516.6	S734	2.7	1.5	0.6	Boulder <3.0m		Cable Corridor
383304.8	5909585.4	S735	1.5	0.7	0.7	Boulder <3.0m		Cable Corridor
383717.3	5908547.6	S736	1.4	0.9	0.3	Boulder <3.0m		Cable Corridor
383072.7	5909876.6	S737	0.6	0.3	0.1	Boulder <3.0m		Cable Corridor
383272.7	5909295.0	S738	3.4	1.4	0.4	Boulder >3.0m		Cable Corridor
383485.5	5908797.7	S739	1.7	1.3	0.3	Boulder <3.0m		Cable Corridor
383008.8	5909770.9	S740	1.0	0.4	0.2	Boulder <3.0m		Cable Corridor
382989.2	5909774.9	S741	0.5	0.3	0.6	Boulder <3.0m		Cable Corridor
382957.0	5909810.2	S742	1.2	0.2	0.1	Boulder <3.0m		Cable Corridor
382954.3	5909799.4	S743	1.0	1.0	0.3	Boulder <3.0m		Cable Corridor
382921.4	5909847.2	S744	3.5	2.7	0.5	Boulder >3.0m		Cable Corridor
382937.0	5909813.3	S745	2.1	0.6	0.4	Boulder <3.0m		Cable Corridor
382941.5	5909797.4	S746	0.7	0.6	0.2	Boulder <3.0m		Cable Corridor
382945.5	5909788.6	S747	0.9	0.6	0.3	Boulder <3.0m		Cable Corridor
382938.9	5909789.5	S748	0.9	0.3	0.1	Boulder <3.0m		Cable Corridor
382977.7	5909625.5	S749	2.4	0.9	0.6	Boulder <3.0m		Cable Corridor
383094.9	5909371.7	S750	1.9	0.6	0.3	Boulder <3.0m		Cable Corridor
383225.1	5909076.7	S751	2.5	1.5	0.6	Boulder <3.0m		Cable Corridor
382888.2	5909696.7	S752	0.7	0.6	0.2	Boulder <3.0m		Cable Corridor
383122.6	5909128.0	S753	1.6	1.2	0.3	Boulder <3.0m		Cable Corridor
383176.6	5908938.9	S754	2.1	1.1	0.7	Boulder <3.0m		Cable Corridor
382783.5	5909558.7	S755	1.2	0.6	0.5	Boulder <3.0m		Cable Corridor
382897.8	5909320.1	S756	2.4	1.2	0.5	Boulder <3.0m		Cable Corridor
382623.1	5909522.5	S757	1.7	0.8	0.6	Boulder <3.0m		Cable Corridor
382666.9	5909376.6	S758	2.4	0.6	0.3	Boulder <3.0m		Cable Corridor
382689.8	5909319.0	S759	2.3	0.8	0.7	Boulder <3.0m		Cable Corridor
383269.2	5908534.6	S760	3.0	0.7	0.8	Boulder >3.0m		Cable Corridor
382939.2	5908697.9	S761	1.4	0.9	0.4	Boulder <3.0m		Cable Corridor
382902.7	5908711.1	S762	2.3	1.3	0.8	Boulder <3.0m		Cable Corridor
382403.5	5909173.7	S763	2.0	1.0	0.7	Boulder <3.0m		Cable Corridor
383236.0	5908197.8	S764	0.9	0.6	0.4	Boulder <3.0m		Cable Corridor
382159.4	5909437.9	S765	2.7	1.9	0.3	Boulder <3.0m		Cable Corridor
382064.8	5909505.4	S766	1.7	0.6	0.5	Boulder <3.0m		Cable Corridor
382315.5	5909203.8	S767	2.6	1.1	0.6	Boulder <3.0m		Cable Corridor
383110.6	5908272.6	S768	2.0	1.0	0.6	Boulder <3.0m		Cable Corridor
382947.2	5908460.3	S769	1.4	0.8	0.7	Boulder <3.0m		Cable Corridor
382034.9	5909525.7	S770	3.9	1.9	0.3	Boulder >3.0m		Cable Corridor
382747.2	5908658.0	S771	0.9	0.7	0.3	Boulder <3.0m		Cable Corridor
382883.2	5908377.9	S772	1.8	0.9	0.4	Boulder <3.0m		Cable Corridor
382127.6	5909188.5	S773	2.7	1.6	0.3	Boulder <3.0m		Cable Corridor
382665.7	5908555.7	S774	2.2	1.0	0.7	Boulder <3.0m		Cable Corridor

Easting (m)	Northing (m)	Sonar Contact ID	Length (m)	Width (m)	Height (m)	Description	Comment	Area
382863.9	5908268.3	S775	1.6	0.9	0.5	Boulder <3.0m		Cable Corridor
381804.0	5909449.9	S776	2.3	1.1	0.4	Boulder <3.0m		Cable Corridor
382808.5	5908239.5	S777	1.3	0.8	0.5	Boulder <3.0m		Cable Corridor
382042.5	5909128.2	S778	2.2	1.2	0.4	Boulder <3.0m		Cable Corridor
382212.0	5908858.9	S779	2.3	0.8	0.5	Boulder <3.0m		Cable Corridor
381850.0	5909267.1	S780	2.6	1.5	0.4	Boulder <3.0m		Cable Corridor
382153.8	5908903.6	S781	2.5	1.8	0.7	Boulder <3.0m		Cable Corridor
381888.1	5909206.3	S782	2.2	0.7	0.7	Boulder <3.0m		Cable Corridor
381770.9	5909198.6	S783	3.2	2.0	0.7	Boulder >3.0m		Cable Corridor
382204.2	5908679.6	S784	4.1	2.1	0.4	Boulder >3.0m		Cable Corridor
382576.1	5908129.4	S785	3.1	2.0	0.5	Boulder >3.0m		Cable Corridor
382713.8	5907904.2	S786	3.0	1.0	0.5	Boulder >3.0m		Cable Corridor
382847.6	5907663.7	S787	2.1	1.2	0.5	Boulder <3.0m		Cable Corridor
382123.1	5908543.5	S788	1.6	1.6	0.6	Boulder <3.0m		Cable Corridor
382129.2	5908534.1	S789	3.2	1.0	0.3	Boulder >3.0m		Cable Corridor
382035.4	5908645.3	S790	2.0	1.6	0.6	Boulder <3.0m		Cable Corridor
382126.1	5908504.6	S791	2.2	1.7	0.8	Boulder <3.0m		Cable Corridor
382236.6	5908268.4	S792	2.5	0.8	0.4	Boulder <3.0m		Cable Corridor
381749.2	5908841.0	S793	1.4	0.9	0.4	Boulder <3.0m		Cable Corridor
382267.3	5908106.5	S794	3.5	2.3	0.9	Boulder >3.0m		Cable Corridor
381535.6	5908959.9	S795	4.3	3.8	0.8	Boulder >3.0m		Cable Corridor
381548.2	5908935.6	S796	2.0	0.7	0.5	Boulder <3.0m		Cable Corridor
381797.4	5908558.0	S797	2.5	0.9	0.4	Boulder <3.0m		Cable Corridor
381968.0	5908308.7	S798	2.6	0.8	0.3	Boulder <3.0m		Cable Corridor
382605.9	5907431.3	S799	3.7	2.8	0.6	Boulder >3.0m		Cable Corridor
382573.6	5907474.5	S800	2.8	1.0	0.8	Boulder <3.0m		Cable Corridor
381487.5	5908840.8	S801	2.0	0.7	0.4	Boulder <3.0m		Cable Corridor
381269.3	5909050.8	S802	1.7	0.8	0.2	Boulder <3.0m		Cable Corridor
381276.1	5908996.1	S803	2.3	1.4	0.7	Boulder <3.0m		Cable Corridor
382453.0	5907408.4	S804	3.3	1.2	0.5	Boulder >3.0m		Cable Corridor
381243.7	5908987.8	S805	2.4	1.2	0.6	Boulder <3.0m		Cable Corridor
381600.8	5908488.2	S806	2.2	1.5	0.7	Boulder <3.0m		PDA
381952.8	5908007.2	S807	2.6	2.0	0.9	Boulder <3.0m		Cable Corridor
381742.2	5908261.2	S808	2.3	0.8	0.6	Boulder <3.0m		Cable Corridor
381764.4	5908228.2	S809	2.2	1.5	0.8	Boulder <3.0m		Cable Corridor
381593.4	5908445.8	S810	2.3	0.9	0.5	Boulder <3.0m		PDA
381786.6	5908163.9	S811	1.5	0.9	0.6	Boulder <3.0m		Cable Corridor
381570.7	5908365.0	S812	1.7	1.1	0.4	Boulder <3.0m		PDA
381686.3	5908106.8	S813	1.6	0.8	0.7	Boulder <3.0m		Cable Corridor
382059.7	5907498.5	S814	2.7	2.0	0.4	Boulder <3.0m		Cable Corridor
381686.8	5907980.7	S815	2.1	1.0	0.4	Boulder <3.0m		Cable Corridor

Easting (m)	Northing (m)	Sonar Contact ID	Length (m)	Width (m)	Height (m)	Description	Comment	Area
380985.2	5908881.2	S816	1.1	0.5	0.2	Boulder <3.0m		PDA
382053.8	5907409.0	S817	2.5	1.0	0.4	Boulder <3.0m		Cable Corridor
381656.3	5907931.9	S818	4.1	3.9	0.7	Boulder >3.0m		Cable Corridor
381879.9	5906973.6	S819	1.5	1.0	0.9	Boulder <3.0m		Cable Corridor
381153.7	5906342.5	S820	2.2	0.6	0.8	Boulder <3.0m		Cable Corridor
381275.4	5908281.3	S821	4.2	1.8	0.8	Boulder >3.0m		PDA
382064.6	5906881.3	S822	1.0	1.0	0.8	Boulder <3.0m		Cable Corridor
382247.2	5907122.0	S823	1.2	0.7	0.8	Boulder <3.0m		Cable Corridor
380444.3	5907023.9	S824	2.8	1.4	0.7	Boulder <3.0m		PDA
380842.0	5907740.2	S825	2.4	0.6	0.7	Boulder <3.0m		PDA
381333.4	5907670.1	S826	2.8	2.5	0.7	Boulder <3.0m		PDA
381399.2	5906744.7	S827	2.3	0.8	0.7	Boulder <3.0m		Cable Corridor
381556.8	5907882.4	S828	2.7	1.0	0.7	Boulder <3.0m		PDA
381565.1	5907827.4	S829	2.4	1.3	0.7	Boulder <3.0m		PDA
380477.0	5907027.2	S830	2.6	2.5	0.6	Boulder <3.0m		PDA
380581.1	5907809.4	S831	1.7	1.4	0.6	Boulder <3.0m		PDA
380889.6	5907696.7	S832	2.1	1.0	0.6	Boulder <3.0m		PDA
381024.0	5907423.8	S833	2.7	2.3	0.6	Boulder <3.0m		PDA
381206.9	5907445.1	S834	5.8	2.9	0.6	Boulder >3.0m		PDA
381617.2	5907060.9	S835	1.6	1.3	0.6	Boulder <3.0m		Cable Corridor
380235.5	5906617.8	S836	2.3	0.8	0.5	Boulder <3.0m		PDA
380547.2	5907339.3	S837	1.9	0.7	0.5	Boulder <3.0m		PDA
380573.1	5906573.9	S838	3.1	0.5	0.5	Boulder >3.0m		PDA
380630.5	5906521.1	S839	2.5	1.1	0.5	Boulder <3.0m		PDA
380685.1	5907346.4	S840	1.7	0.7	0.5	Boulder <3.0m		PDA
380848.0	5907957.6	S841	1.4	0.7	0.5	Boulder <3.0m		PDA
380865.0	5907369.4	S842	2.5	1.0	0.5	Boulder <3.0m		PDA
380870.8	5906893.4	S843	1.4	1.1	0.5	Boulder <3.0m		PDA
381376.1	5907522.2	S844	1.9	1.3	0.5	Boulder <3.0m		PDA
381425.4	5907605.5	S845	2.1	1.6	0.5	Boulder <3.0m		PDA
381503.9	5907913.9	S846	2.2	1.9	0.5	Boulder <3.0m		PDA
380094.8	5906972.2	S847	2.9	1.0	0.4	Boulder <3.0m		PDA
380585.4	5907672.0	S848	2.7	2.2	0.4	Boulder <3.0m		PDA
380694.2	5906658.7	S849	0.8	0.8	0.4	Boulder <3.0m		PDA
380707.1	5908171.8	S850	1.6	1.1	0.4	Boulder <3.0m		PDA
380791.6	5907731.7	S851	1.8	1.3	0.4	Boulder <3.0m		PDA
380888.0	5908683.6	S852	1.6	0.7	0.4	Boulder <3.0m		PDA
380913.2	5908394.2	S853	2.9	0.6	0.4	Boulder <3.0m		PDA
380933.6	5908683.7	S854	2.0	0.6	0.4	Boulder <3.0m		PDA
381024.2	5906447.5	S855	4.2	1.7	0.4	Boulder >3.0m		PDA
381056.3	5908600.7	S856	2.6	0.8	0.4	Boulder <3.0m		PDA

Easting (m)	Northing (m)	Sonar Contact ID	Length (m)	Width (m)	Height (m)	Description	Comment	Area
381176.0	5906706.4	S857	2.6	1.2	0.4	Boulder <3.0m		PDA
381312.7	5906423.8	S858	2.3	1.3	0.4	Boulder <3.0m		Cable Corridor
381340.4	5906666.7	S859	2.3	1.6	0.4	Boulder <3.0m		Cable Corridor
381587.8	5907925.1	S860	1.8	0.7	0.4	Boulder <3.0m		PDA
381712.2	5906635.2	S861	2.5	0.8	0.4	Boulder <3.0m		Cable Corridor
379926.0	5907064.5	S862	1.4	1.1	0.3	Boulder <3.0m		PDA
379982.7	5907314.3	S863	2.5	1.7	0.3	Boulder <3.0m		PDA
380040.6	5906930.9	S864	1.1	0.8	0.3	Boulder <3.0m		PDA
380227.3	5907060.5	S865	2.6	1.3	0.3	Boulder <3.0m		PDA
380278.2	5907609.9	S866	2.0	0.7	0.3	Boulder <3.0m		PDA
380380.8	5907431.8	S867	1.9	0.8	0.3	Boulder <3.0m		PDA
380392.4	5907134.9	S868	3.3	1.2	0.3	Boulder >3.0m		PDA
380405.9	5907112.1	S869	2.4	1.8	0.3	Boulder <3.0m		PDA
380562.0	5908134.8	S870	2.3	1.5	0.3	Boulder <3.0m		PDA
380600.8	5906289.7	S871	2.4	2.0	0.3	Boulder <3.0m		PDA
380618.2	5906811.1	S872	3.6	2.9	0.3	Boulder >3.0m		PDA
380683.2	5908006.4	S873	1.1	0.6	0.3	Boulder <3.0m		PDA
380693.3	5906562.6	S874	1.3	0.7	0.3	Boulder <3.0m		PDA
380874.2	5908029.5	S875	1.3	1.3	0.3	Boulder <3.0m		PDA
381221.9	5906354.7	S876	1.9	0.6	0.3	Boulder <3.0m		Cable Corridor
381350.2	5907679.5	S877	3.5	2.6	0.3	Boulder >3.0m		PDA
381388.6	5906443.2	S878	1.3	0.4	0.3	Boulder <3.0m		Cable Corridor
381408.5	5907139.0	S879	1.8	0.9	0.3	Boulder <3.0m		Cable Corridor
381554.2	5907759.2	S880	1.7	1.4	0.3	Boulder <3.0m		Cable Corridor
380012.4	5907319.0	S881	2.7	1.6	0.2	Boulder <3.0m		PDA
380576.5	5906347.6	S882	2.3	0.7	0.2	Boulder <3.0m		PDA
381759.1	5907487.1	S883	2.4	1.3	0.2	Boulder <3.0m		Cable Corridor
380555.7	5906159.6	S884	3.6	2.8	0.8	Boulder >3.0m		PDA
380884.5	5905758.9	S885	2.8	1.0	0.7	Boulder <3.0m		Outside survey area
379948.0	5906140.6	S886	2.2	1.2	0.6	Boulder <3.0m		PDA
379972.2	5906399.9	S887	1.7	0.7	0.6	Boulder <3.0m		PDA
380195.4	5905813.2	S888	7.6	6.4	0.6	Boulder >3.0m		PDA
380273.1	5906461.4	S889	1.6	1.3	0.6	Boulder <3.0m		PDA
380522.2	5905982.5	S890	1.9	1.7	0.6	Boulder <3.0m		PDA
380530.7	5905959.6	S891	1.7	1.2	0.6	Boulder <3.0m		PDA
380784.5	5905664.2	S892	2.3	1.0	0.6	Boulder <3.0m		Outside survey area
380070.9	5906482.2	S893	1.9	1.6	0.5	Boulder <3.0m		PDA
380407.5	5906170.6	S894	1.7	0.8	0.5	Boulder <3.0m		PDA
380592.8	5906122.0	S895	2.8	0.9	0.5	Boulder <3.0m		PDA
379975.9	5906550.4	S896	2.3	1.2	0.4	Boulder <3.0m		PDA

Easting (m)	Northing (m)	Sonar Contact ID	Length (m)	Width (m)	Height (m)	Description	Comment	Area
380106.7	5905676.7	S897	1.7	0.9	0.4	Boulder <3.0m		PDA
380240.4	5905747.2	S898	2.0	0.7	0.4	Boulder <3.0m		PDA
380364.6	5906182.9	S899	1.5	0.8	0.4	Boulder <3.0m		PDA
380481.5	5906262.3	S900	1.4	1.0	0.4	Boulder <3.0m		PDA
379696.6	5905889.3	S901	1.8	0.6	0.3	Boulder <3.0m		PDA
379711.8	5906396.4	S902	2.2	0.7	0.3	Boulder <3.0m		PDA
379742.6	5906911.0	S903	2.4	0.9	0.3	Boulder <3.0m		PDA
379840.9	5905881.6	S904	3.3	0.7	0.3	Boulder >3.0m		PDA
379936.1	5905848.7	S905	0.9	0.5	0.3	Boulder <3.0m		PDA
380040.4	5906432.9	S906	1.6	1.1	0.3	Boulder <3.0m		PDA
380439.3	5906095.0	S907	1.9	1.6	0.3	Boulder <3.0m		PDA
381216.5	5905907.5	S908	3.0	1.1	0.3	Boulder >3.0m		Cable Corridor
379665.0	5906621.4	S909	1.7	1.4	0.2	Boulder <3.0m		PDA
379827.6	5905974.7	S910	1.7	0.6	0.2	Boulder <3.0m		PDA
379883.2	5905738.1	S911	1.0	0.4	0.2	Boulder <3.0m		PDA
379895.3	5905921.9	S912	0.5	0.5	0.2	Boulder <3.0m		PDA
379897.7	5905908.6	S913	0.5	0.2	0.2	Boulder <3.0m		PDA
379901.6	5905912.8	S914	0.6	0.4	0.2	Boulder <3.0m		PDA
379902.9	5905911.2	S915	1.1	0.7	0.2	Boulder <3.0m		PDA
379920.2	5905884.5	S916	0.8	0.8	0.2	Boulder <3.0m		PDA
379944.2	5905871.5	S917	0.8	0.6	0.2	Boulder <3.0m		PDA
380833.9	5905864.6	S918	2.4	1.6	0.2	Boulder <3.0m		Cable Corridor
379874.2	5905935.6	S919	1.5	0.4	0.1	Boulder <3.0m		PDA
379878.3	5905846.2	S920	0.5	0.3	0.1	Boulder <3.0m		PDA
379880.3	5905927.2	S921	1.1	0.4	0.1	Boulder <3.0m		PDA

Magnetometer Listing

Easting (m)	Northing (m)	Magnetic Anomaly ID	Amplitude (nT)	Width (m)	Morphology	Comment	Area
383121.3	5908467.2	M001	19.4	27.7	Dipole		Cable Route
382469.8	5907324.8	M002	15.3	5.9	Positive Monopole		Cable Route
384133.7	5909388.4	M003	29.6	14.7	Positive Monopole		Cable Route
384754.0	5910026.9	M004	36.5	26.6	Dipole		Cable Route
385444.6	5910681.5	M005	57.5	22.5	Asymmetric Dipole		Cable Route
385332.0	5910510.2	M006	38.3	17.1	Positive Monopole		Cable Route
385257.8	5910389.6	M007	35.8	20.4	Dipole		Cable Route
385173.1	5910164.7	M008	30.5	20.3	Asymmetric Dipole		Cable Route
385628.7	5910744.1	M009	49.4	9.6	Dipole		Cable Route
385384.7	5910373.8	M010	31.2	6.1	Negative Monopole		Cable Route
384903.1	5909659.1	M011	30.3	10.9	Dipole		Cable Route
384397.0	5908781.6	M012	6.6	10.6	Positive Monopole		Cable Route
385892.6	5910811.3	M013	11.6	14.8	Asymmetric Dipole		Cable Route
386137.7	5911068.9	M014	88.4	14.9	Dipole		Cable Route
385220.7	5909369.9	M015	10.7	19.9	Positive Monopole		Cable Route
386294.0	5910802.4	M016	172.3	21.7	Positive Monopole		Cable Route
386875.4	5911419.0	M017	255.1	37.5	Negative Monopole		Outside survey area
386380.6	5910734.0	M018	133.9	23.1	Positive Monopole		Cable Route
393063.7	5911131.2	M019	9.0	8.6	Negative Monopole		Cable Route
393149.6	5911074.9	M020	15.9	17.6	Dipole		Cable Route
392830.3	5911096.4	M021	38.4	24.1	Dipole		Cable Route
393293.6	5910956.2	M022	113.1	30.1	Dipole		Cable Route
393004.8	5910936.1	M023	7.4	12.9	Negative Monopole		Cable Route
391757.6	5911036.0	M024	1204.8	41.8	Dipole		Cable Route
393164.2	5910732.4	M025	14.8	17.0	Negative Monopole		Cable Route
393275.1	5910674.4	M026	32.2	8.3	Positive Monopole		Cable Route
393219.5	5910662.9	M027	172.6	27.7	Dipole		Cable Route
391378.1	5910686.7	M028	19.3	28.8	Asymmetric Dipole		Cable Route
391402.5	5910832.1	M029	109.4	20.1	Asymmetric Dipole		Cable Route
391188.8	5910832.3	M030	183.5	27.3	Negative Monopole		Cable Route
390816.8	5910486.9	M031	24.6	17.1	Asymmetric Dipole		Cable Route
390859.2	5910765.6	M032	78.4	59.0	Asymmetric Dipole		Cable Route
391002.3	5911080.6	M033	20.3	19.7	Dipole		Cable Route
390817.4	5910808.9	M034	15.5	25.2	Asymmetric Dipole		Cable Route
390749.4	5910707.4	M035	871.2	35.2	Dipole		Cable Route
390994.2	5911274.3	M036	14.3	11.7	Positive Monopole		Cable Route
390621.8	5910716.6	M037	11.8	17.0	Dipole		Cable Route
390534.5	5910583.1	M038	9.2	20.7	Negative Monopole		Cable Route
390555.1	5910720.9	M039	13.1	15.3	Positive Monopole		Cable Route
390413.6	5910607.3	M040	11.7	22.3	Negative Monopole		Cable Route

Easting (m)	Northing (m)	Magnetic Anomaly	Amplitude (nT)	Width (m)	Morphology	Comment	Area
390566.4	5910840.9	M041	12.4	11.6	Negative Monopole		Cable Route
390845.0	5911259.3	M042	175.0	34.3	Negative Monopole		Cable Route
390484.2	5910825.2	M043	100.6	42.9	Positive Monopole		Cable Route
390568.2	5911147.8	M044	46.3	28.6	Dipole		Cable Route
390481.1	5911150.3	M045	13.1	33.6	Dipole		Cable Route
390682.5	5911425.8	M046	25.6	12.3	Positive Monopole		Cable Route
390624.6	5911443.3	M047	8.5	13.8	Positive Monopole		Outside survey area
390299.5	5911059.0	M048	8.4	8.4	Positive Monopole		Cable Route
390483.3	5911449.2	M049	12.8	27.8	Dipole		Outside survey area
389969.0	5910813.0	M050	10.2	9.4	Positive Monopole		Cable Route
390123.1	5911027.5	M051	12.5	13.6	Negative Monopole		Cable Route
389463.1	5910315.4	M053	25.9	27.6	Asymmetric Dipole		Outside survey area
390131.9	5911342.6	M054	7.2	9.2	Negative Monopole		Cable Route
389915.2	5911037.6	M055	246.3	29.0	Negative Monopole		Cable Route
389826.6	5910915.4	M056	10.5	11.4	Positive Monopole		Cable Route
389541.9	5910752.2	M057	22.2	16.3	Dipole		Cable Route
389710.1	5911099.5	M058	67.6	29.5	Positive Monopole		Cable Route
389894.7	5911482.9	M059	17.2	10.1	Negative Monopole		Cable Route
389613.0	5911357.2	M060	395.1	30.2	Dipole		Cable Route
393498.2	5910821.6	M062	40.8	17.8	Asymmetric Dipole		Cable Route
393560.1	5910651.2	M063	49.5	18.1	Asymmetric Dipole		Cable Route
393665.8	5910439.7	M064	48.6	23.0	Positive Monopole		Cable Route
393349.7	5910846.3	M065	30.7	21.8	Asymmetric Dipole		Cable Route
393499.7	5910530.8	M066	18.8	16.1	Positive Monopole		Cable Route
393564.2	5910385.5	M067	26.7	19.1	Negative Monopole		Cable Route
385976.4	5909448.7	M068	28.9	16.3	Positive Monopole		Cable Route
387098.3	5910963.4	M069	1538.8	68.5	Complex Anomaly		Cable Route
386238.6	5909741.9	M070	9.7	19.9	Negative Monopole		Cable Route
386246.8	5909663.7	M071	11.9	3.4	Positive Monopole		Cable Route
386283.6	5909708.5	M072	38.6	3.4	Negative Monopole		Cable Route
388092.7	5910235.9	M074	21.2	7.0	Positive Monopole		Cable Route
387547.0	5911357.0	M075	19.0	32.5	Asymmetric Dipole		Cable Route
387230.1	5910888.7	M076	64.5	40.9	Dipole		Cable Route
387088.1	5910677.6	M077	181.9	66.9	Dipole		Cable Route
386959.9	5910489.3	M078	617.4	60.8	Dipole		Cable Route
387199.3	5910729.8	M079	457.4	44.3	Dipole		Cable Route
387223.2	5910539.0	M080	346.7	37.0	Asymmetric Dipole		Cable Route
387079.0	5910329.8	M081	699.6	41.6	Asymmetric Dipole		Cable Route
386552.7	5909547.4	M082	359.0	29.4	Positive Monopole		Cable Route
387916.2	5910040.1	M083	2912.9	47.9	Positive Monopole		Outside survey area
388232.1	5910928.9	M084	389.5	35.7	Asymmetric Dipole		Cable Route
388405.0	5910628.7	M085	129.9	50.5	Asymmetric Dipole		Cable Route

Easting (m)	Northing (m)	Magnetic Anomaly	Amplitude (nT)	Width (m)	Morphology	Comment	Area
388562.7	5910536.9	M086	19.6	22.8	Negative Monopole		Cable Route
387747.4	5910677.9	M087	69.0	34.6	Positive Monopole		Cable Route
383883.1	5910023.4	M088	68.4	22.2	Dipole		Cable Route
393160.6	5908849.7	M090	26.4	35.5	Positive Monopole		Cable Route
393671.8	5909538.0	M091	26.5	31.7	Positive Monopole		Cable Route
393434.9	5910526.9	M094	24.0	28.9	Positive Monopole		Cable Route
393503.2	5910375.2	M095	10.7	28.0	Positive Monopole		Cable Route
393491.5	5910676.3	M096	37.1	72.9	Dipole		Cable Route
393353.4	5910721.6	M097	10.3	13.0	Positive Monopole		Cable Route
389704.5	5911219.0	M098	15.3	31.7	Positive Monopole		Cable Route
390288.2	5910730.7	M099	22.2	38.6	Positive Monopole		Cable Route
389148.2	5910747.0	M100	27.2	18.8	Negative Monopole		Cable Route
387749.6	5910838.3	M101	190.5	73.0	Asymmetric Dipole		Cable Route
387804.0	5910818.4	M102	79.6	64.7	Asymmetric Dipole		Cable Route
387184.7	5910211.0	M103	3763.6	104.9	Complex Anomaly		Cable Route
387623.4	5910056.2	M104	31.4	66.3	Dipole		Cable Route
386746.3	5910441.7	M105	38.4	28.5	Positive Monopole		Cable Route
384484.7	5910608.8	M106	13132.2	91.1	Complex Anomaly	Associated with wreck	Outside survey area
383032.7	5910044.7	M107	33.0	13.9	Negative Monopole		Cable Route
383012.0	5910013.0	M108	32.9	19.8	Negative Monopole		Cable Route
383241.3	5910181.2	M109	43.5	20.2	Positive Monopole		Cable Route
382413.3	5908984.9	M110	25.9	32.4	Asymmetric Dipole		Cable Route
382287.4	5908705.4	M111	15.0	19.1	Positive Monopole		Cable Route
381239.9	5909085.3	M112	465.5	438.3	Complex Anomaly		Cable Route
381841.7	5908876.8	M113	20.8	35.8	Positive Monopole		Cable Route
382017.1	5909397.3	M114	25.1	73.1	Positive Monopole		Cable Route
382038.8	5909012.1	M115	126.8	127.0	Positive Monopole		Cable Route
381722.6	5908923.7	M116	25.1	53.1	Asymmetric Dipole		Cable Route
382629.3	5909873.2	M117	43.9	81.5	Positive Monopole		Cable Route
380228.3	5907114.0	M118	12.0	13.5	Negative Monopole		PDA
380258.6	5907158.7	M119	11.7	23.0	Asymmetric Dipole		PDA
383397.5	5909634.2	M120	30.4	45.3	Asymmetric Dipole		Cable Route
383191.8	5909538.3	M121	19.0	48.4	Asymmetric Dipole		Cable Route
388647.2	5910656.4	M122	19.3	45.9	Positive Monopole		Cable Route
381455.8	5906609.5	M123	48.2	10.1	Positive Monopole		Cable Route
385699.2	5909149.8	M125	21.8	97.3	Complex Anomaly		Cable Route
388014.6	5910492.1	M126	18.0	46.7	Positive Monopole		Cable Route
387993.7	5910462.9	M127	20.9	32.0	Positive Monopole		Cable Route
388049.8	5910661.6	M128	30.0	52.1	Positive Monopole		Cable Route
387613.3	5910337.5	M129	29.3	73.5	Asymmetric Dipole		Cable Route
393163.6	5908132.9	M130	7.3	17.6	Positive Monopole		Cable Route

Easting (m)	Northing (m)	Magnetic Anomaly	Amplitude (nT)	Width (m)	Morphology	Comment	Area
393175.0	5908156.1	M131	5.8	13.5	Positive Monopole		Cable Route
393272.7	5908590.4	M132	3.7	22.6	Positive Monopole		Cable Route
393169.9	5908303.3	M133	3.1	16.5	Negative Monopole		Cable Route
393147.4	5908250.2	M134	9.9	20.7	Asymmetric Dipole	Associated with sonar target L020	Cable Route
393041.0	5907492.4	M135	1152.2	29.9	Asymmetric Dipole		Cable Route
393057.3	5907548.1	M136	60.8	11.2	Positive Monopole		Cable Route
392678.0	5907525.9	M137	15.3	11.2	Asymmetric Dipole		Cable Route
392899.8	5907408.9	M138	25.3	10.1	Negative Monopole		Cable Route
392958.0	5907944.6	M139	30.1	21.5	Asymmetric Dipole		Cable Route
392973.4	5908488.2	M140	19.1	41.7	Asymmetric Dipole		Cable Route
392756.0	5907582.5	M141	7.7	10.0	Dipole		Cable Route
392784.8	5907705.0	M142	49.6	19.6	Asymmetric Dipole		Cable Route

Sub-Bottom Profiler Listing

Easting (m)	Northing (m)	ID	Depth from Seabed (m)
382402.4	5909185.2	P001	1.8
380954.1	5908330.7	P002	1.9
380132.0	5906688.8	P003	2.1
380101.7	5906643.8	P004	1.7
379805.7	5906204.3	P005	3.3

Appendix 2

Charting

Charts (1:5000)

2015-021-PL-001a-SBF-5000	Seabed Features Chart
2015-021-PL-001b-SBF-5000	Seabed Features Chart
2015-021-PL-001c-SBF-5000	Seabed Features Chart
2015-021-PL-001d-SBF-5000	Seabed Features Chart
2015-021-PL-001e-SBF-5000	Seabed Features Chart
2015-021-PL-002a-BTY-5000	Bathymetry Chart
2015-021-PL-002b-BTY-5000	Bathymetry Chart
2015-021-PL-002c-BTY-5000	Bathymetry Chart
2015-021-PL-002d-BTY-5000	Bathymetry Chart
2015-021-PL-002e-BTY-5000	Bathymetry Chart
2015-021-PL-003a-ISO-5000	Isopachyte Chart
2015-021-PL-003b-ISO-5000	Isopachyte Chart
2015-021-PL-003c-ISO-5000	Isopachyte Chart
2015-021-PL-003d-ISO-5000	Isopachyte Chart
2015-021-PL-003e-ISO-5000	Isopachyte Chart

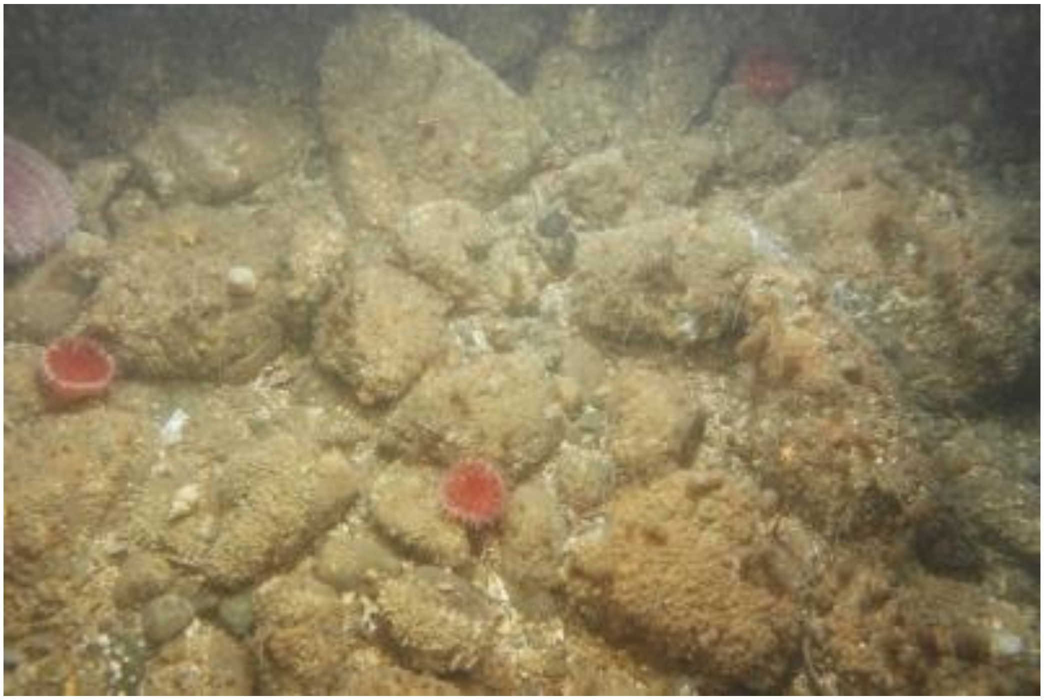
Charts (Horiz. 1:20,000; Vert. 1:500)

2015-021-PL-004-PRO-20000	Sub-bottom Profiles

Appendix 3

Benthic Technical Report

Deep Green Project
Holyhead Deep



Benthic technical report

CMACS Job Number: 3279

Prepared for: Xodus Group (on behalf of Minesto Ltd)
FAO: Joanna Lester

Document: J3279 Xodus Group (Deep Green benthic technical report) v2

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1	5/10/15	Issued Draft	KN/SD	IGP	IGP
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Front Cover Photo: Boulder and cobble with dahlia anemone Urticina sp. (Station 28, Deep Green CMACS Survey)

Contents

Table of Figures

1. INTRODUCTION

1.1 Project background

The Deep Green Project proposed by Minesto Ltd. is a tidal power project to be located in the Holyhead Deep approximately 6km west of Holy Island, Anglesey. The Project will consist of three tidal generation units anchored to the seabed along with infrastructure such as an export cable to transfer power to shore and a subsea transformer. The Project Development Area (PDA) and associated export cable, which is planned to be located within a cable route corridor (CRC) area and make landfall at Penrhos Beach, are displayed in Figure 1.

As part of the application for consent to install the Project, an Environmental Impact Assessment (EIA) is required. Xodus Group on behalf of Minesto Ltd. has contracted the Centre for Marine & Coastal Studies Ltd. (CMACS) to characterise the main benthic habitats and sediments of the PDA and the CRC to inform this assessment.

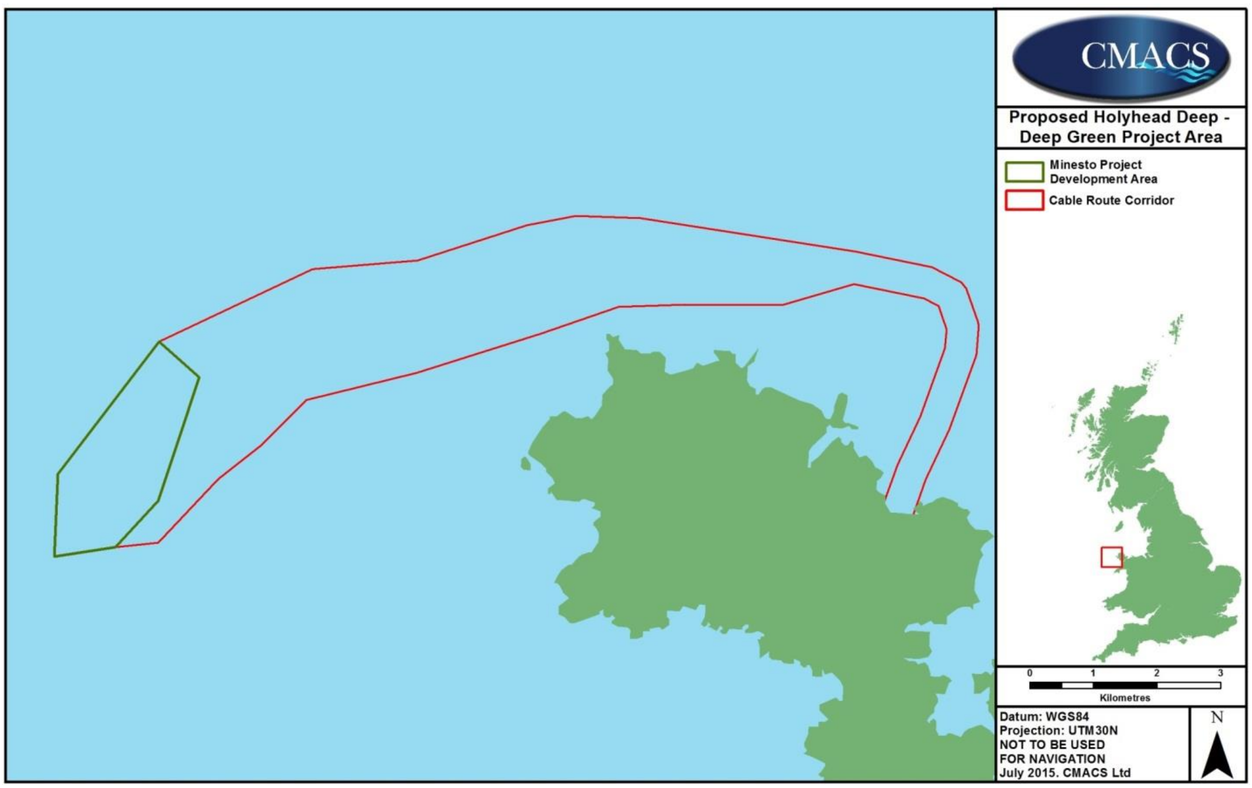

Figure 1. Deep Green Project Development Area.

1.2 Environmental characterisation

The objectives of the benthic ecological characterisation survey were:

- To characterise and describe the spatial distribution of seabed habitats in the Deep Green Holyhead Deep PDA and along the proposed export cable corridor (as defined in Figure 1);
- To document the presence of any seabed features or species of conservation interest, e.g. Annex I and map their extent within the Deep Green Holyhead Deep PDA and along the proposed export cable corridor;
- To quantify any contaminants present in the surface sediments of the Deep Green Holyhead Deep PDA and along the export cable corridor.

The above objectives were pursued through a combination of benthic grab and underwater camera survey. A geophysical survey was completed by Bibby Hydromap in June 2015 and was important in providing broad scale information on seabed habitats to allow the benthic survey to be refined; however, the results from this survey were reported separately (Bibby HydroMap, 2015) and this report focuses on the benthic ecological survey.

2. METHODS

2.1 Field survey

2.1.1 Station selection

Side-scan sonar mosaics and bathymetric data derived from the geophysical survey of the PDA and CRC undertaken by Bibby Hydromap in June 2015 were used to differentiate seabed habitats. The large majority of the surveyed seabed was identified to be coarse sediment with the remainder consisting of bedrock and areas that had a 'texture' that suggested seabed features such as biogenic reef may be present.

For general seabed habitat classification purposes, stations were spread throughout the PDA and CRC to ensure a representative coverage of all predicted habitats (based upon the geophysical data). Areas identified from the review of the geophysical data as having potential for Annex I habitats were targeted directly. In addition, some stations were added outside the PDA and CRC areas, which could provide sample stations for any future monitoring as near-field reference stations, since they were within a tidal excursion.

A total of forty-one sample stations were selected for both drop down camera survey and grab sampling. Of these, six were intended for camera survey only owing to the likely presence of bedrock or very large particles (as identified from the geophysical survey results). All stations were surveyed using drop down camera prior to grabbing to ensure that: a) there were no species or habitats of conservation concern that may be damaged or killed at the station; b) the seabed was suitable for grabbing. Figure 2 and Figure 3 below display the camera and grab stations respectively.

In accordance with the methodology specified by Xodus Ltd., a single grab sample for faunal analysis was proposed for each sample station along with a second grab for sediment particle size and contaminant analysis.

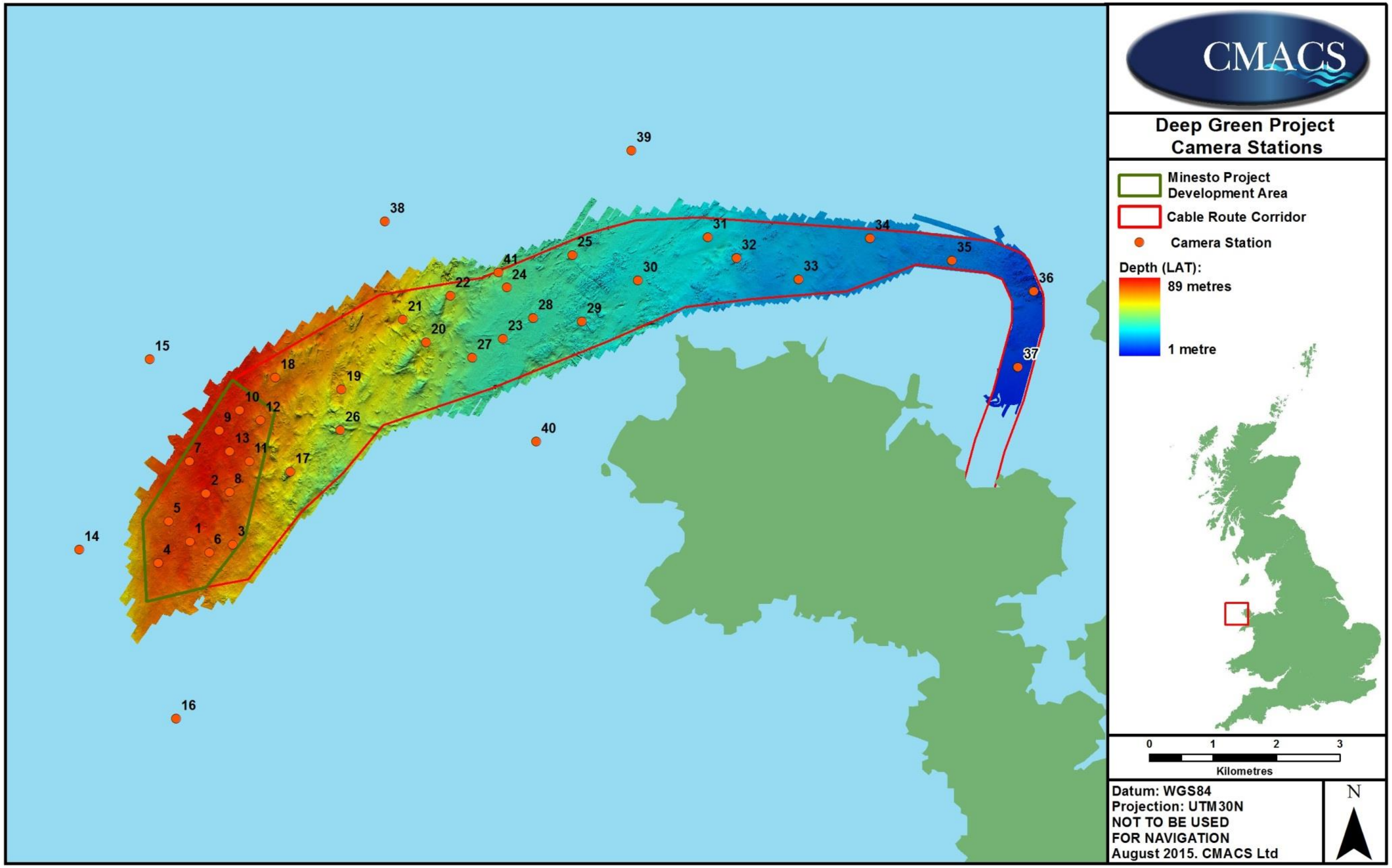

Figure 2. Location of camera survey stations with PDA and CRC bathymetry.

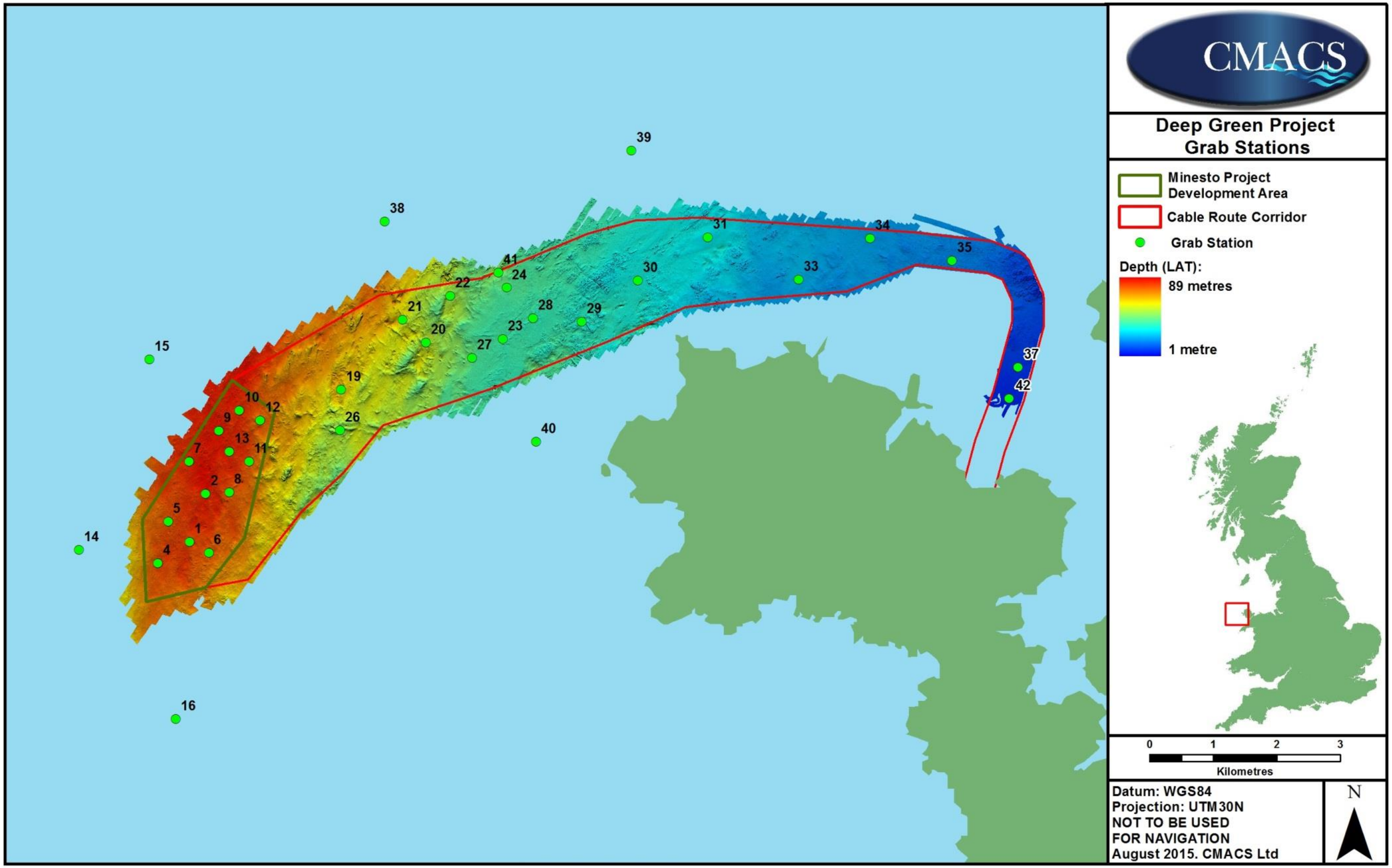

Figure 3. Location of grab survey stations with PDA and CRC bathymetry.

2.1.2 Data acquisition

All benthic survey work was completed from the Bibby Hydromap *Chartwell*, a 26.5m purpose-built survey vessel with 24hr survey capability and an endurance of five days at sea (see Plate 1). The survey was completed between 24th June and 1st July 2015 operating out of Holyhead port on a twelve hour basis.

Plate 1. The survey vessel, *Chartwell*

2.1.3 Drop down camera

A Seaspyder drop down camera (see Plate 2) was deployed slowly to the seabed whilst the vessel drifted over the target. An ultra-short baseline (USBL) was attached to the camera so that the surveyors could ensure that the camera landed on the seabed within a 50m zone around the target. The lead biologist captured and logged camera stills and video footage from each station in addition to associated data such as water depth, time and brief notes on the sediment type and any identifiable epifauna (Appendix 2 Field notes from Camera survey).

A single position fix was obtained when the camera was first deployed to the seabed. On a subset of inshore stations, the camera was re-deployed on four further occasions at each station by lifting off the seabed then lowering again within a few metres of the original target position. This approach became untenable at the majority of stations, however, as the depth of water combined with the strength of the current did not allow for the camera to be repositioned within the 50m zone.

Particular attention was paid to the potential presence of any habitats or species of conservation interest e.g. Annex I habitat.

Video was obtained at all but one of the sample stations; no survey was attempted at Station 40 owing to the vessel master’s reservations regarding vessel safety on deploying equipment to the seabed close to the coast in strong tidal currents.

Stills images were obtained at thirty nine sample stations. Owing to equipment failure, a still image could not be obtained at Station 12 and habitat characterisation was undertaken using the video footage.

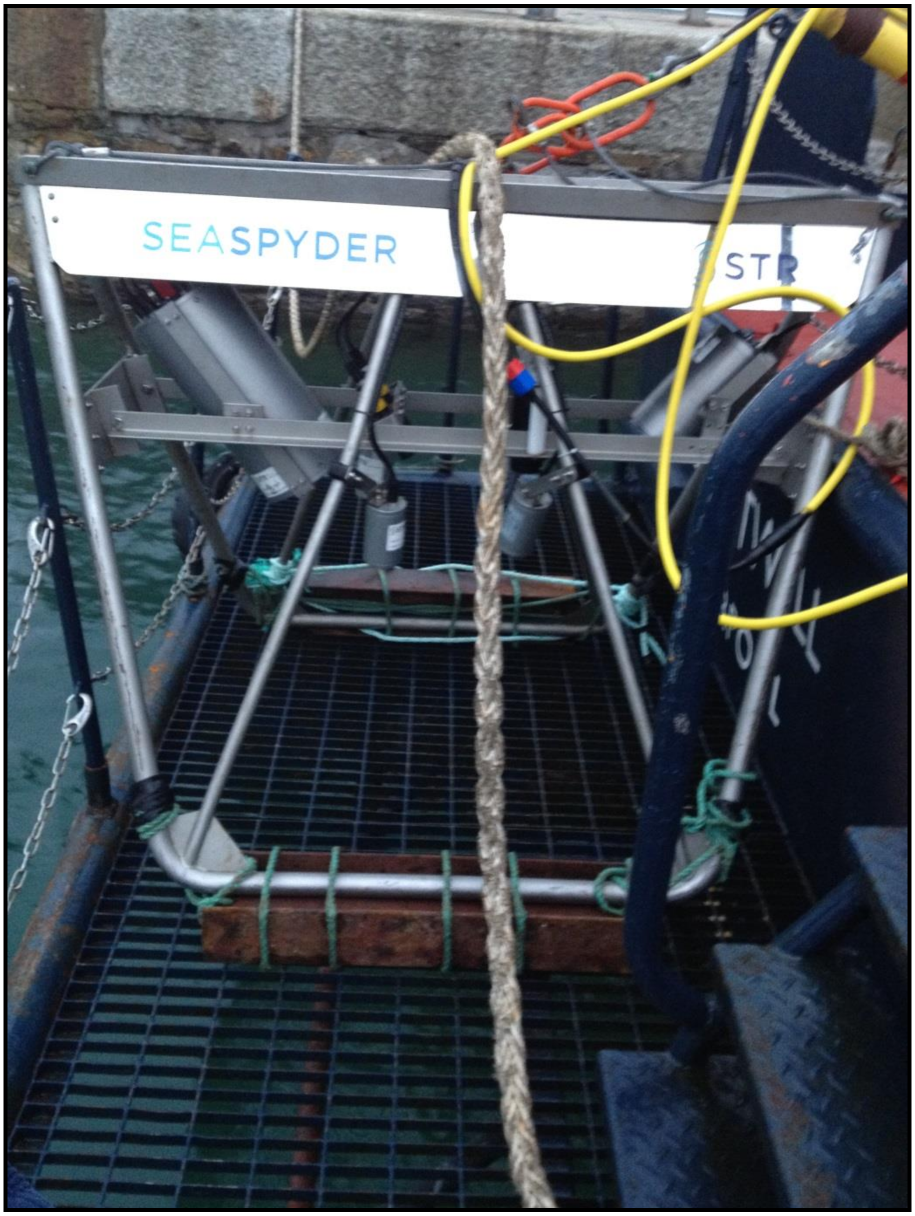

Plate 2. Seaspyder drop down camera system provided by STR.

2.1.4 Grab survey

A standard weighted mini-Hamon grab with a $0.1m^2$ sample area was used for all the sediment sampling (see Plate 3). All samples were collected from within 50m of the target location.

Upon contact with the seabed, the Ultra Short Baseline (USBL) was used to derive a positional fix. Upon retrieval of each sample, the date, time and water depth were recorded, along with a description of the volume of sample. A digital photograph of each faunal grab sample was taken then notes were made on sediment type, colour, volume and any species of note prior to washing over a 1mm sieve. Samples were then gently backwashed into suitable containers prior to fixing in 4% formalin solution as soon as possible, ready for subsequent faunal analysis. Field notes are provided within Appendix 3. Field notes from Grab survey

At each sample station, a second grab was then collected for sediment analysis (both contaminants testing and particle size analysis). After initial observations and photographs, a representative subsample of approximately 500g was removed for particle size analysis (PSA) and total organic carbon (TOC) analysis. Subsamples were then taken as per standard methodology (e.g. JNCC, 2001); a plastic trowel and plastic tubs were utilised to collect a sample for metal contaminants analysis (so as to avoid possible contamination from metallic tools etc.) and a metal trowel and glass jars were used to collect a sample for hydrocarbon analysis. All PSA and contaminants samples were frozen immediately upon collection on board the survey vessel.

Grab samples of less than 5 litres (or 2.5 litres on hard-packed substrates) in volume were rejected. Samples were also rejected if the grab jaw was not properly closed upon retrieval.

Grab samples were obtained from 23 of the 41 targeted stations. Many failures were due to the very coarse nature of the seabed sediments, which often prevented a suitable volume of sediment from being collected or particles became trapped in the jaw of the grab, leading to repeated sample rejection. At Station 41, a hand-held Van Veen grab was used to obtain a sediment sample (owing to the shallow nature of the station, it was sampled using Bibby's shallow draught catamaran). The Van Veen grab was used to ground truth the side-scan data but a suitable sample for sediment PSA was also taken; unfortunately, a sample suitable for faunal analysis could not be obtained from this station.

The success of grab sampling is summarised in Figure 4 (see also Appendix 4).

Plate 3. Mini-Hamon grab used for grab survey

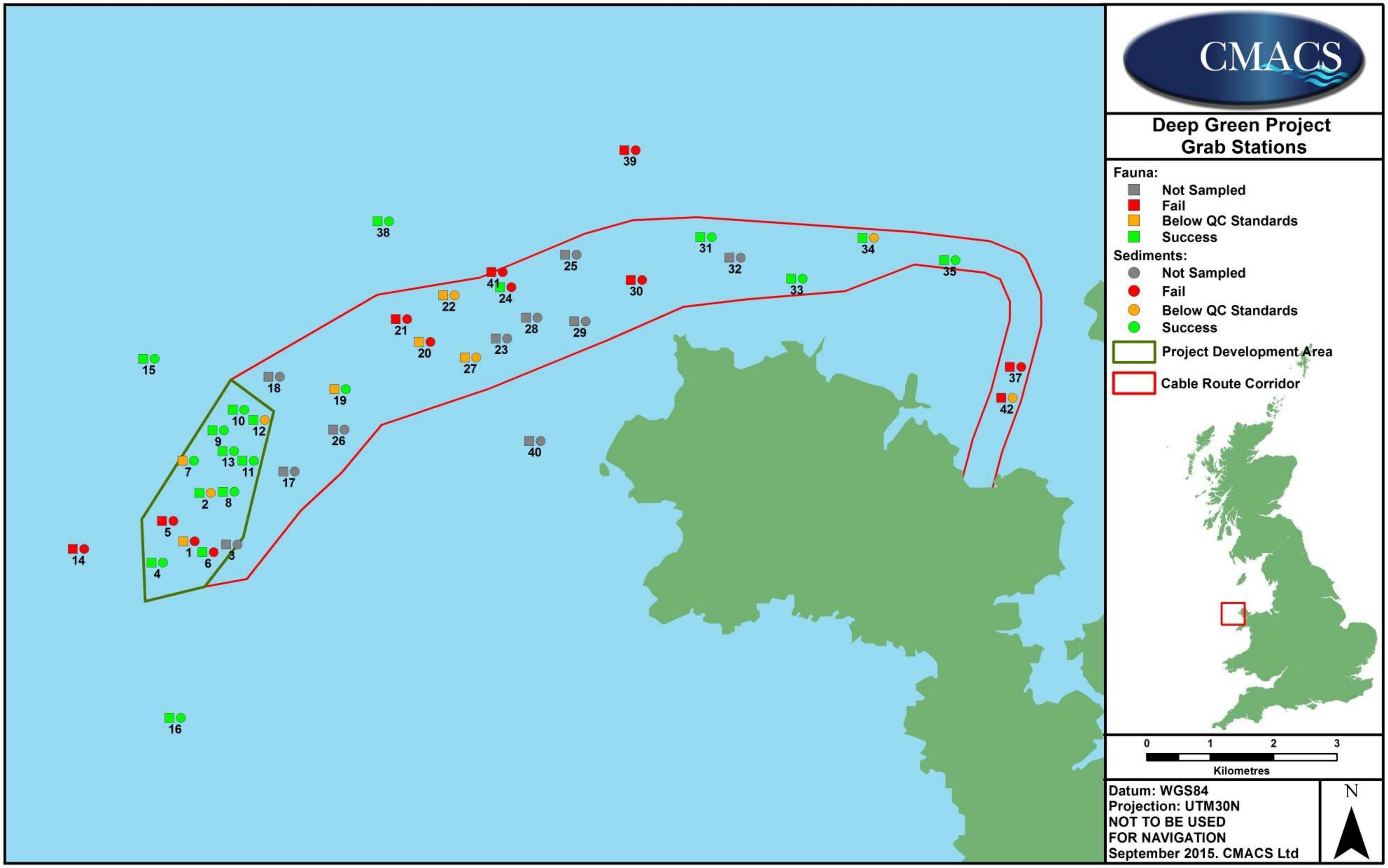

Figure 4. Fauna and sediment grab success and failures.

2.2 Laboratory methods

2.2.1 Particle size analysis

Particle size analysis (PSA) was undertaken at the CMACS laboratory in Eastham, which participates in the National Marine Biological Analytical Quality Control (NMBAQC) scheme.

With the exception of any samples that obviously contained a high proportion of silt, sediment samples were dried for 24 hours at 80^0C before fractionation by sieving. Samples were separated with a half-phi sieve series (see Table 1) on a Retsch AS200 sieve shaker.

Samples with a high proportion of fine sediment (e.g. more than 5% retained on the <63µm fraction) were wet-sieved at 2mm to separate out coarse sediment, with the two fractions subsequently treated as follows:

- The fraction of particles 2mm in diameter and larger was dried at 80^oC for at least 24 hours and then dry-sieved over a half-phi sieve series (see Table 1 below) for twenty minutes with a Retsch AS 200 sieve shaker. Once the fractions had been separated, each one was weighed to a hundredth of a gram.

- The fraction of particles 2mm and smaller was transferred to a bottle and left to stand to allow the very fine particles to settle out of suspension. Once the liquid and solid had separated, the excess water was siphoned off the top of the sample (taking care not to disturb the fine sediments). Prior to analysis, the sample was homogenized as best as possible before a sub-sample was taken and the sediment analysed with a Coulter Laser Sizer. Once the data had been generated from the laser sizer, the less than 2mm fraction was also dried and weighed to a hundredth of a gram.

- Using the percentages of the laser size data, it was then possible to estimate masses of each fine grain fraction and then re-calculate percentage of the sample with the mass of the coarse fraction included.

Proportional masses and volumes of sediment were then used to calculate mean and median particle sizes, and the determination of sorting index by calculating the standard deviation of Phi. Sediment analysis (PSA) was completed using the statistical analysis package Gradistat (Blott & Pye, 2001). Data were then used to determine sediment type according to the definitions of Buchanan (1984) (see Table 2 & Table 3) and also the Folk and Ward classification system as used by the British Geological Survey (BGS) (Long, 2006) (see Figure 5).

Table 1. Sieve series used for analysis.

Half-phi mesh sizes (coarse sediment in mm)												
63.0	45.0	31.5	22.4	16.0	11.2	8.0	5.6	4.0	2.8	2.0	1.4	1.0
Half-phi mesh sizes (fine sediment in µm)												
710	500	355	250	180	125	90	63					

Table 2.Classification used for defining sediment type (from Buchanan, 1984).

Wentworth Scale (mm)	Phi units	Sediment types
>256mm	<-8	Boulders
64 - 256 mm	-8 to -6	Cobble
4 - 64 mm	-6 to -2	Pebble
2 - 4 mm	-2 to -1	Granule
1 - 2 mm	-1 to -0	Very coarse sand
0.5 - 1 mm	0 - 1	Coarse sand
250 - 500 µm	1 - 2	Medium sand
125 - 250 µm	2 - 3	Fine sand
63 - 125 µm	3 - 4	Very fine sand
4 - 63 µm	4 – 8	Silt
1 – 4 µm	8 – 10	Clay
<1 µm	>10	Colloids

Table 3.Classification used to define the degree of sediment sorting (from Buchanan, 1984).

Standard Deviation of mean Phi	Classification
<0.35	Very well sorted
0.35 - 0.5	Well sorted
0.5 - 0.71	Moderately well sorted
0.71 - 1	Moderately sorted
1 - 2	Poorly sorted
2 - 4	Very poorly sorted
>4	Extremely poorly sorted

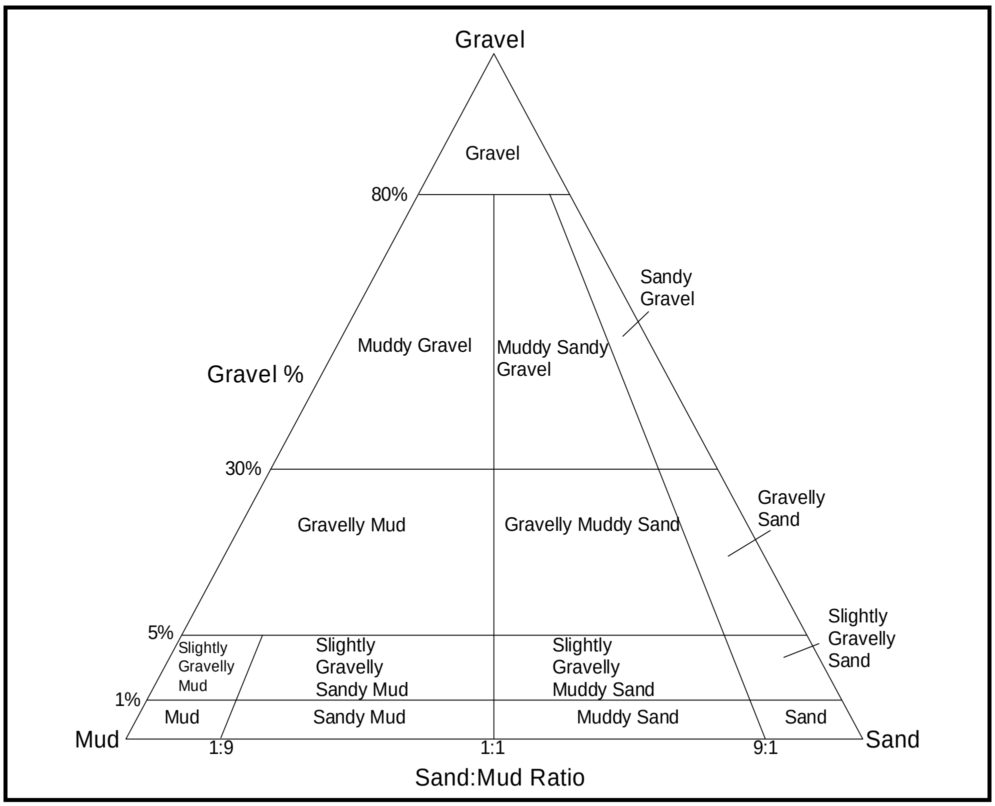

Figure 5. Sediment classification after Folk (1954) as also used by the BGS. "Gravel" is greater than 2mm and "mud" is less than 63µm.

2.2.2 Total organic content

Total organic content of the sediments was determined through loss on ignition (LOI). Dried and pre-weighed sub-samples were placed in a muffle furnace using combustion at 480˚C for 4 hours. Analysis was carried out on the fraction of sediment less than 1 mm to avoid undue influence from large stones.

2.2.3 Sediment contaminants analysis

Analysis for metal contaminants within sediments was performed by RPS Laboratories (Manchester), a UKAS accredited laboratory also participating within the QUASIMEME Proficiency Testing Scheme. All analysis was carried out on the <2mm diameter fraction of the sediment.

The trace and heavy metals requested for detection analysis were tested using inductively coupled plasma mass spectrometry (ICP-MS) analysis following microwave assisted digestion in hydrofluoric acid of the dried (<30°C) and ground sediment. Limits of detection were set at the minimum levels given in Table 4.

Table 4. Trace and heavy metals to be tested and their limits of detection

Metal	Symbol	Detection limits
Aluminium	Al	10 µg.g-1
Arsenic	As	3 µg.g-1
Barium	Ba	1 µg.g-1
Cadmium	Cd	1 µg.g-1
Copper	Cu	1 µg.g-1
Vanadium	V	1 µg.g-1
Chromium	Cr	2 µg.g-1
Nickel	Ni	2 µg.g-1
Zinc	Zn	2 µg.g-1
Lead	Pb	5 ng.g-1
Tin	Sn	5 ng.g-1
Mercury	Hg	0.01 ng.g-1

The hydrocarbon analysis of the sediment samples was also completed by RPS Laboratories (Manchester).

Total hydrocarbon concentration (THC), unresolved complex mixture (UCM) concentration and individual and total n-alkane concentrations were completed using gas chromatography with flame ionisation detection (GC-FID) analysis following extraction of the wet sediment with dichloromethane:methanol by ultrasonic extraction and subsequent partitioning with water (extract cleaned-up with silica and activated copper).

2.2.4 Faunal analysis

Macrofaunal analysis of the benthic grab samples was completed at the CMACS Isle of Man laboratory, which participates in the NMBAQC scheme.

All samples were carefully washed in fresh water over a 1mm mesh until all formalin was removed. The samples were then carefully sorted with the aid of low power microscopes where necessary, and all fauna removed into pots containing the major groups (e.g. Mollusca, Annelida, Crustacea, Echinodermata and “others”) in 70% alcohol. Quality control procedures included the preparation of a reference collection of all taxa and re-sorting of a random selection of the samples (typically 10%) by an experienced taxonomist on the understanding that if specimens equating to more than 5% of the total specimens found (or more than 10% of any one group), then the relevant batch of samples would all be re-sorted.

All the sorted organisms were identified to species level where possible, or the lowest practical taxonomic level, and enumerated (partial specimens were only included in counts if the head of the organism was still present). Juveniles were recorded separately since they may introduce a seasonal bias in the results, which should be accounted for in later data interpretation. Colonial organisms (e.g. bryozoans) were recorded as present and for the purposes of abundance counts, were allocated a numerical value of one. Specimen coding was in accordance with Picton and Howson (2000). Any encrusting organisms or epifauna within the samples were identified and presence/absence noted.

Faunal data was used in conjunction with sediment analysis and image data from the camera survey to classify the seabed into biotopes following Connor *et al.* (2004).

2.3 Statistical analysis

2.3.1 Sediments

Raw sieve and laser size data were combined into Wentworth categories prior to statistical analysis to allow the number of variables to be kept to a meaningful number.

Sediment data was then subject to Principal Components Analysis (PCA) carried out in the Primer 6.0 multivariate analysis package. The sediment data was input as percentages and therefore did not require any pre-treatment as it was already standardised. Analysing data with a small number of variables using PCA has the advantage over Multidimensional Scaling (MDS) of being able to include eigenvectors to indicate which variables are determining the position of samples on the plot.

2.3.2 Fauna

Prior to multivariate analysis (using Primer 6.0), data was square-root transformed to reduce the influence of highly abundant taxa. The transformed data was then used to create a similarity matrix with the Bray-Curtis process, which was in turn used to generate a dendrogram (with SIMPROF test for groups that were not significantly different from one another) and MDS plots.

The SIMPROF test was used to assign sample stations into groups with faunal communities that were not significantly different from one another and then these groupings analysed with a SIMPER routine to examine what the differences in groups were. To keep the number of groups to a minimum and to prevent there being any groups with just single sample stations, any isolated sample stations were included in the next most similar group.

Diversity indices were derived from the untransformed data, which included Margalef's, Shannon-Wiener, Simpson's, Pielou's evenness index and rarefaction.

2.3.3 Camera stills analysis

All images were thoroughly reviewed by an experienced marine biologist, with quality checks performed on at least 10% by an equally or more experienced colleague. Image analysis was performed to describe the seabed habitat, estimate the abundance of fauna and flora, which in turn informed an assessment of the presence of Annex I habitat. Organisms such as anemones, decapods and gastropods were enumerated in each image whereas the abundance of organisms such as hydroids and sponges was estimated by percentage cover.

It should be noted that determination of sand size fractions (fine, medium, coarse sand etc.) is not often possible from video or stills images and, moreover, the visible sediment surface does not always accurately reflect what is immediately below the surface; for example, there is sometimes a very thin layer of fine shell, sand or silt overlying rather different sediments. For these reasons, more reliance should be placed on the results of PSA from grab samples when considering sedimentary areas; the main objective of the camera survey was to investigate areas of likely hard substratum which cannot be readily sampled using other survey techniques and to investigate potential areas of Annex I habitat.

The quality of any biogenic reef (as defined by its 'reefiness') was assessed using the criteria of Gubbay (2007) and that of stony reef using the criteria of Irving (2009) but reference was also made to Limpenny *et al*. (2010) when assessing both types of reef habitat.

Habitat and visible fauna were used to classify biotopes (in conjunction with the infaunal grab data) according to Connor *et al*. (2004); the side scan mosaic was then used to extrapolate the boundaries of each biotope within the PDA and CRC.

3. RESULTS

3.1 Sediments

3.1.1 Particle size analysis

Raw data is provided in Appendix 5 with a summary of the results provided in Table 5 below. The majority of sediment samples contained a wide range of sediment particles from cobble to clay.

- ***Sediment Type***

Five sediment types (according to BGS classification) were described across the survey area. These were sandy gravel, muddy sandy gravel, gravel, gravelly sand and muddy sand (see Table 5 and Figure 7). Two stations were characterised by cobble, whereas most other stations had similar sediments to one another with pebble characterising the samples (see Figure 6) and this majority of samples were classified as muddy sandy gravel or sandy gravel. The remaining stations were classified as follows: Station 27 (central CRC) with a low percentage of sand and little mud, which was classified as gravel; Stations 33 and 34 (also within the CRC) which were classified as gravelly sand; and at Station 42 (the closest inshore on the CRC), the sediment was mainly fine sand and mud and therefore was classified as muddy sand (see Figure 7 for classifications and Figure 8 for percentage composition).

- ***Sediment Grain Size***

Sediment particle size data are summarised in Table 5.

Mean particle size was greatest at stations within the PDA which exhibited higher proportions of gravel particles. Smaller grain sizes were recorded from the stations within the CRC and closest inshore and were associated with increased sand composition. Mean phi results reflect these trends and are presented in Figure 9.

The distribution of samples on the PCA plot was mostly driven by the percentage of pebble in the sample with increasing proportion of this grain size towards the right of the plot. Sediments at two stations (4 and 8) were much coarser than those at all other stations and characterised by their cobble content. Stations 33 and 34 were characterised by medium and coarse sands while Station 42 was characterised by very fine sediments.

3.1.2 Total organic matter

Results of LOI analysis are provided in Table 5 with full results provided in Appendix 6.

TOM was found to be below 3% across the survey area (see Figure 10) with relatively higher levels recorded from stations where muddy sands were present and stations which had a greater percentage of mud. This relationship is unsurprising since organic matter is associated with silty and muddy sediments rather than more mobile sediments such as coarse sand.

The mean TOM level was 1.79 ± 0.48% with a maximum of 2.82% at DG12 in the north west of the PDA. Lower TOM levels were recorded from the CRC at stations with coarser sediments and higher proportions of sand.

Table 5.Sediment analysis according to station

Station	Depth (m)	Mean mm	Mean Phi	%LOI	Gravel (%)	Sand (%)	Mud (%)	Sediment type
DG2	88.3	3.48	-1.798	1.261	48.7	48.9	2.4	Sandy Gravel
DG4	81.6	15.13	-3.919	1.737	76.5	20.6	2.9	Muddy Sandy Gravel
DG7	86.3	10.77	-3.429	1.469	71.1	26.5	2.4	Sandy Gravel
DG8	81.3	11.61	-3.537	1.720	77.6	20.0	2.4	Muddy Sandy Gravel
DG9	88.4	9.72	-3.281	2.213	70.7	24.4	4.9	Muddy Sandy Gravel
DG10	86.3	9.55	-3.255	2.275	69.2	25.3	5.5	Muddy Sandy Gravel
DG11	80.9	12.13	-3.600	2.066	76.5	21.1	2.4	Muddy Sandy Gravel
DG12	77.8	12.67	-3.664	2.821	78.7	17.6	3.7	Muddy Sandy Gravel
DG13	87.4	9.18	-3.198	1.694	63.0	33.9	3.2	Sandy Gravel
DG15	60.2	5.38	-2.429	1.902	59.5	34.5	5.9	Muddy Sandy Gravel
DG16	66.8	8.12	-3.021	1.827	61.3	34.6	4.1	Muddy Sandy Gravel
DG19	68.6	11.41	-3.512	2.474	75.9	19.5	4.6	Muddy Sandy Gravel
DG22	52.2	5.23	-2.388	1.524	58.1	39.8	2.2	Sandy Gravel
DG27	44.9	13.01	-3.702	1.382	81.8	17.8	0.4	Gravel
DG31	30.6	5.49	-2.458	1.218	69.9	29.1	1.0	Sandy Gravel
DG33	24.2	1.07	-0.096	1.271	23.2	75.1	1.6	Gravelly Sand
DG34	22.6	0.98	0.035	1.027	27.6	70.3	2.1	Gravelly Sand
DG35	19.7	4.38	-2.130	1.448	60.5	37.0	2.6	Sandy Gravel
DG38	80.9	7.45	-2.896	2.295	64.6	31.0	4.4	Muddy Sandy Gravel
DG42	10.0	0.06	4.105	2.260	0.0	67.4	32.3	Muddy Sand

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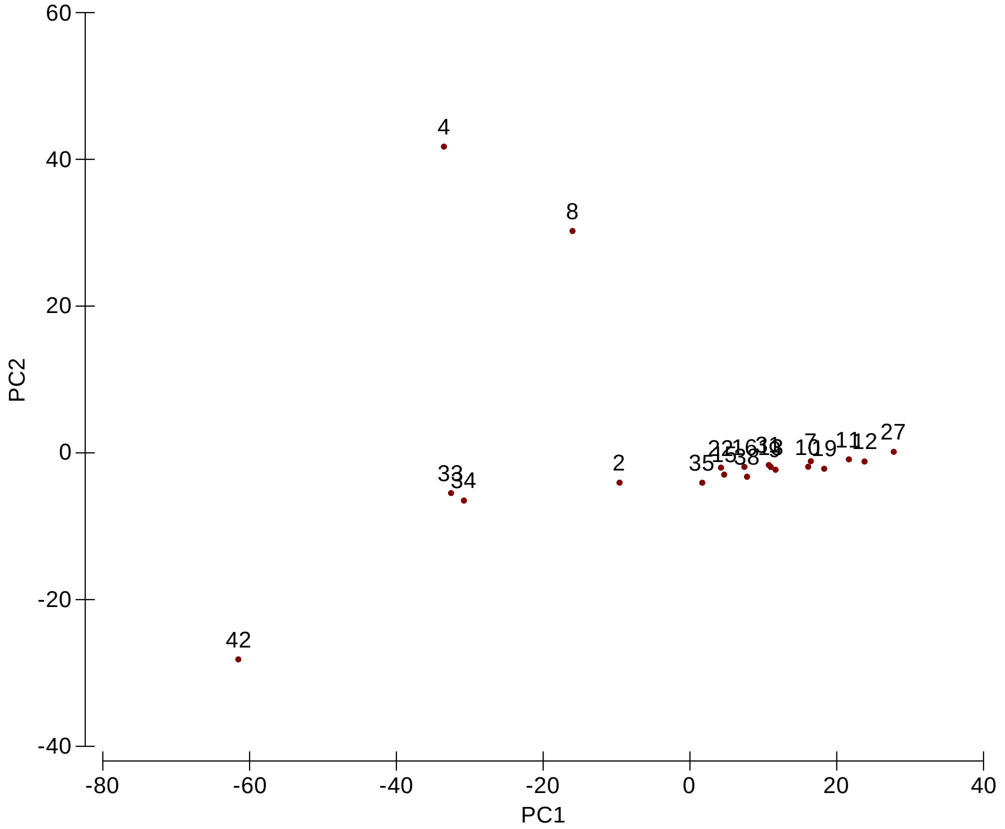

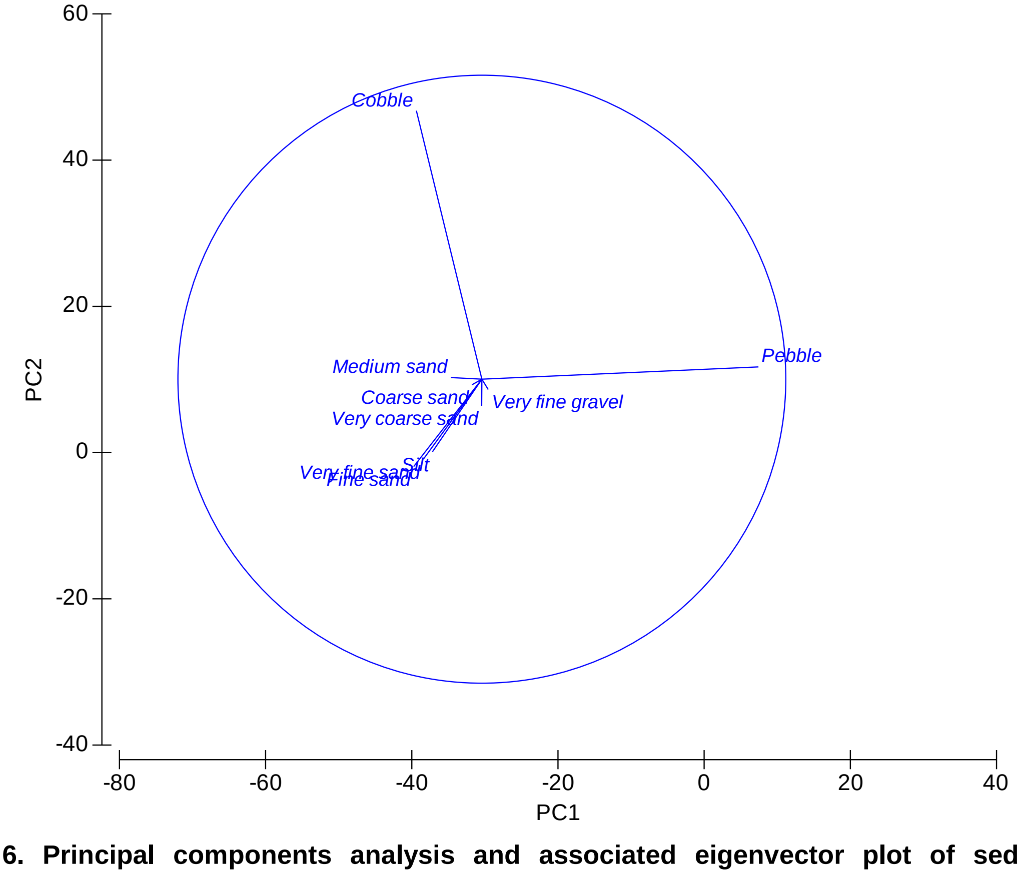

Figure 6. Principal components analysis and associated eigenvector plot of sediments.

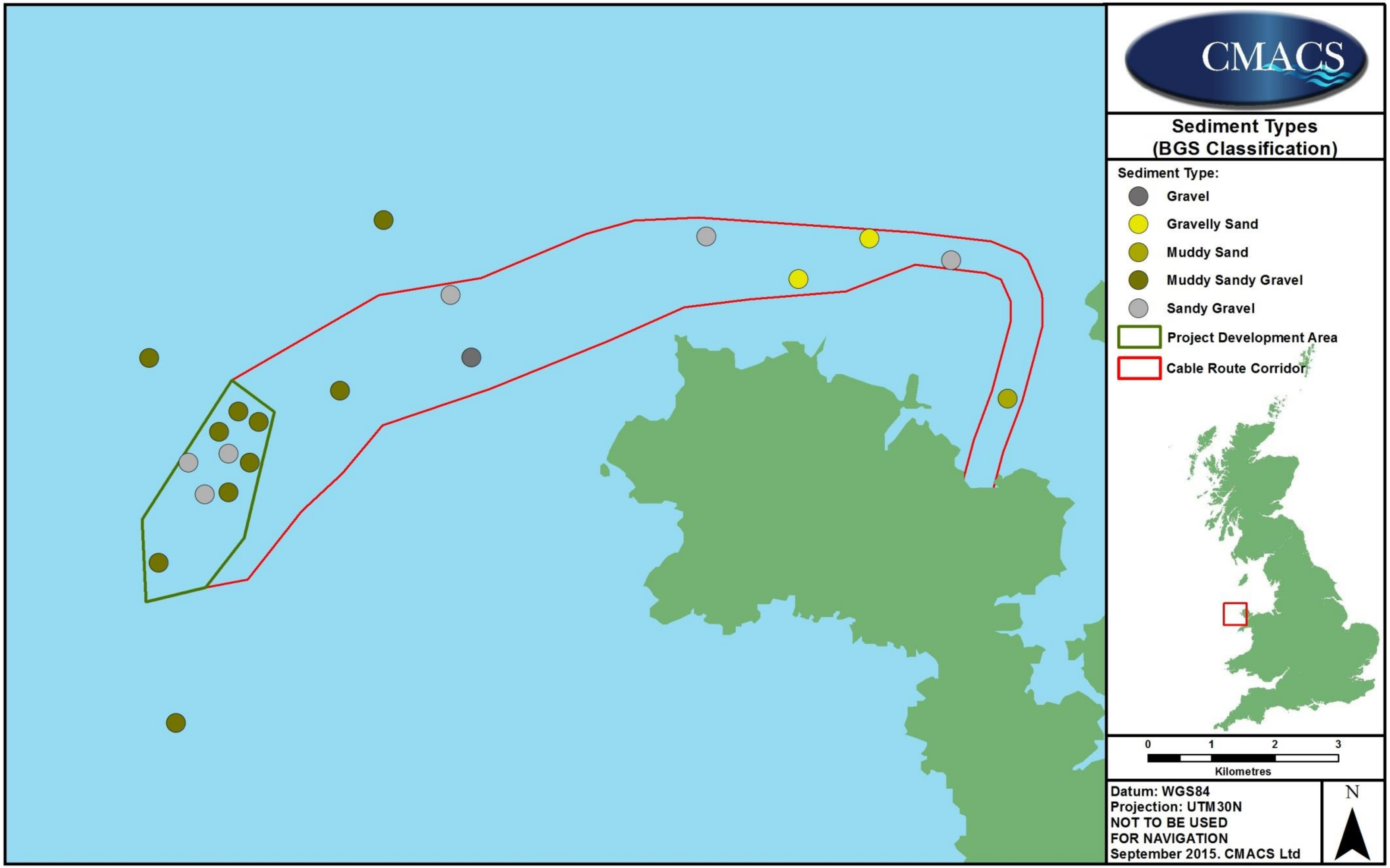

Figure 7. Sediment types according to BGS classifications

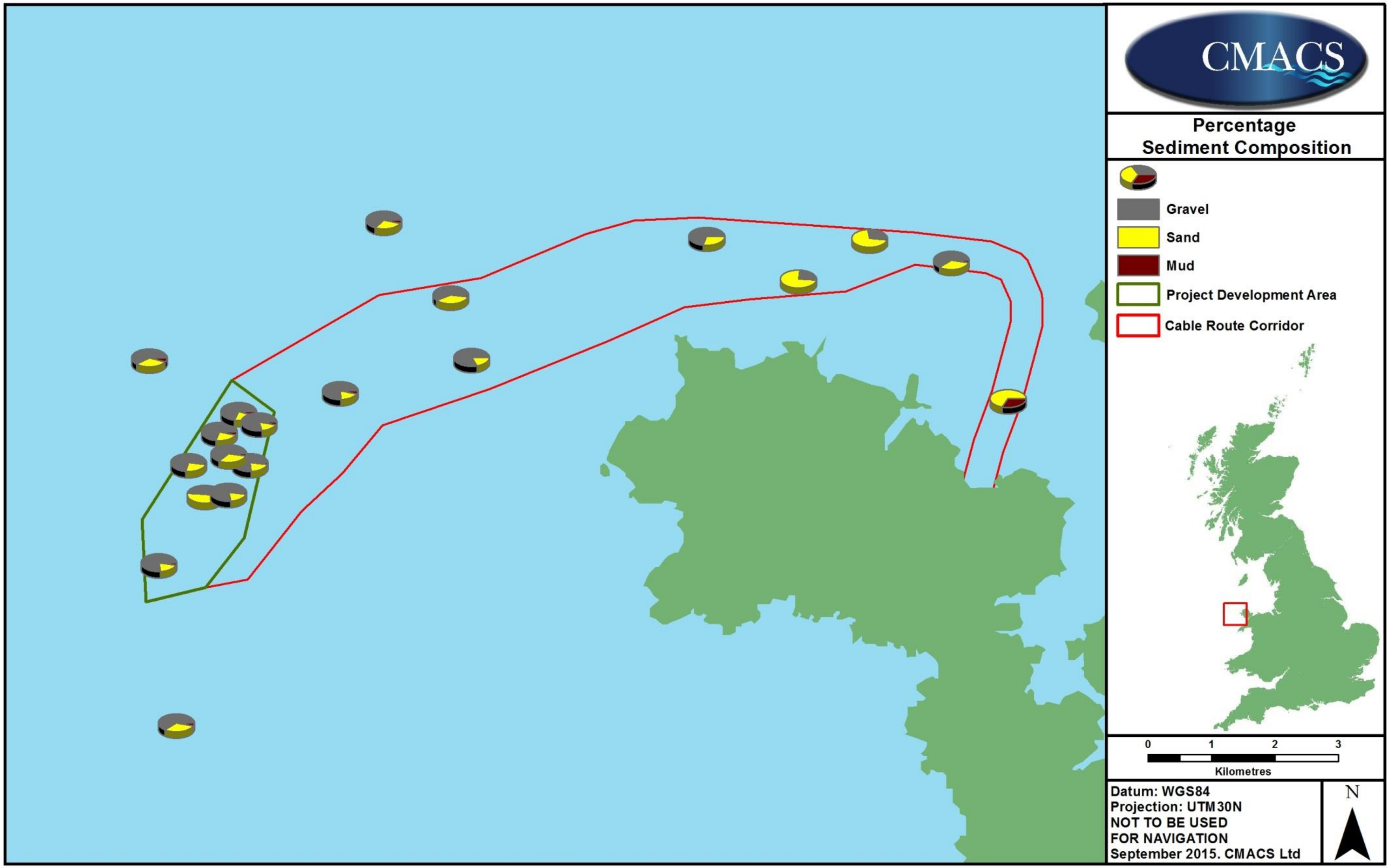

Figure 8. Percentage sediment composition of sand, gravel and mud at each station.

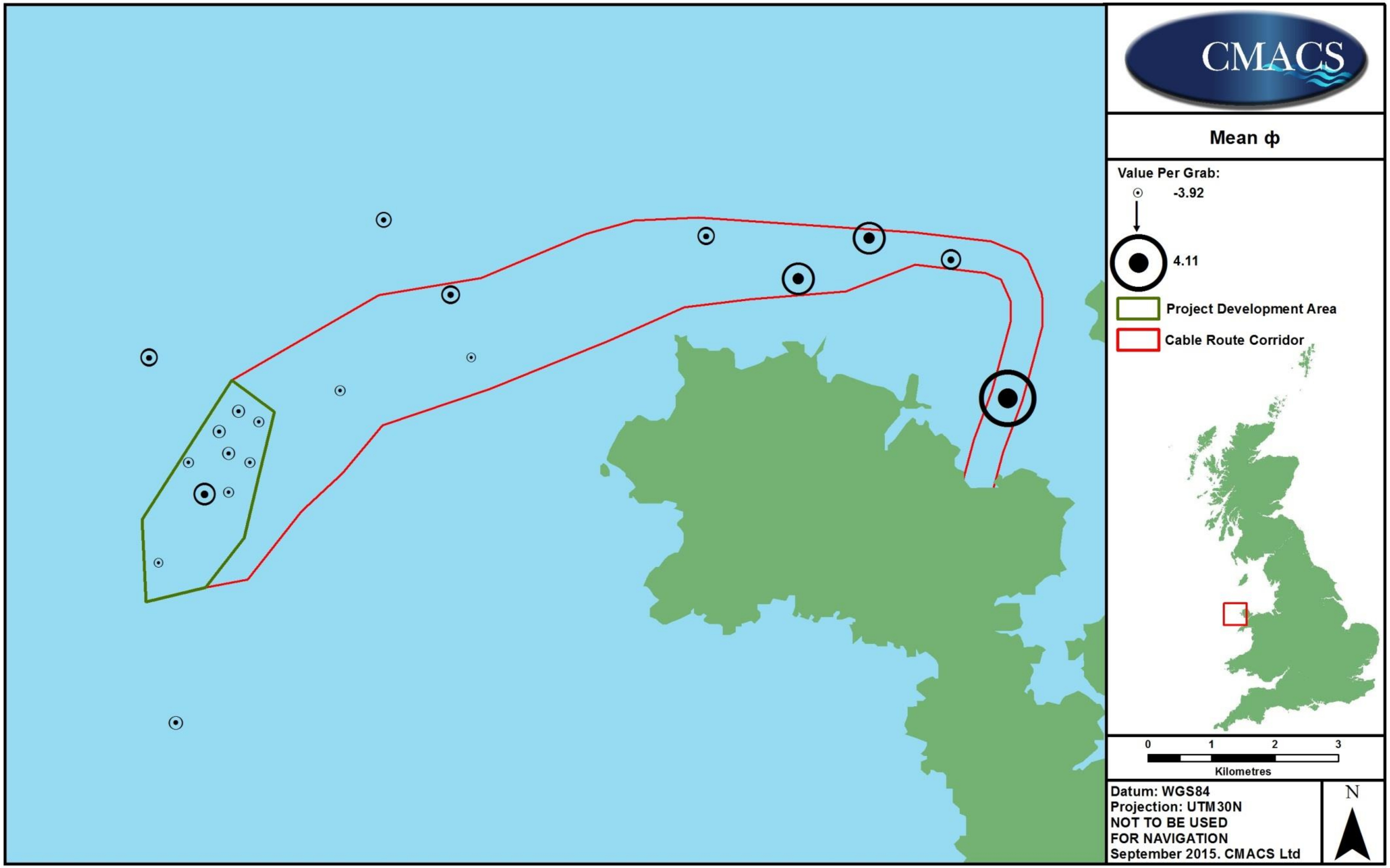

Figure 9. Mean phi of sediments at each station

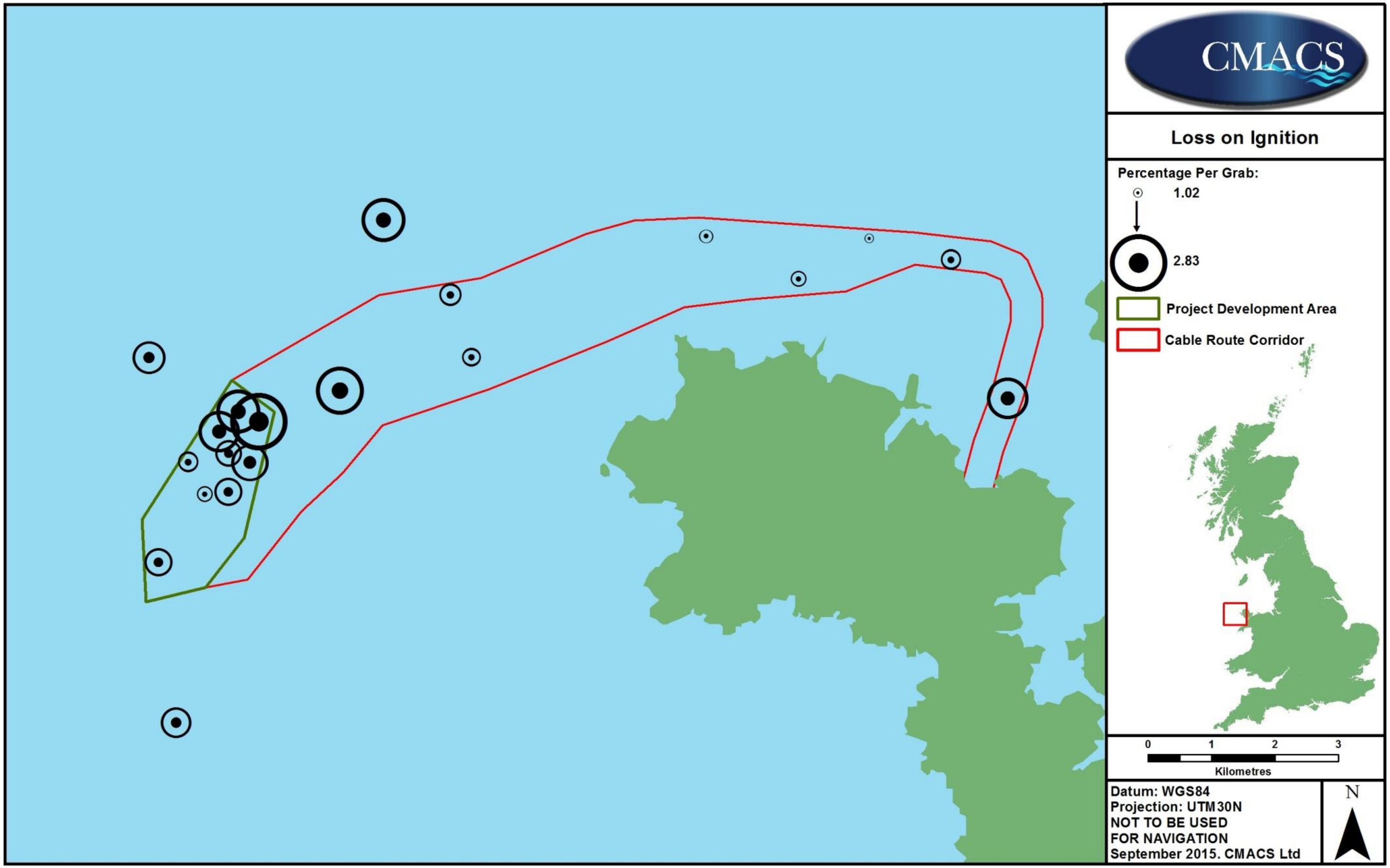

Figure 10. TOM of sediments at each station (analysed using LOI).

3.1.3 Contaminant analysis

The results of the contaminants testing for heavy and trace metals are presented in Table 7. Interim Sediment Quality Guidelines (ISQG[1]), Probable Effect Levels (PEL) and Cefas Guideline Action Levels for the Disposal of Dredged Material (AL)[2] are also provided within Table 7 to enable the results to be reviewed within the context of marine contamination thresholds.

High concentrations of aluminium were recorded from the sediments at all stations. There are no ISQG or PEL values set for this metal.

The level of arsenic recorded was above the ISGQ levels at all but two of the thirteen stations tested with the highest concentration of 9.98 mg/kg recorded from Station 9 within the PDA (see Table 7). However, the results from all of the stations were well below the Probable Effects Level (PEL) of 41.6 mg/kg.

Chromium was elevated slightly above Cefas Action Level 1 (AL1) at five stations (only one of which (Station 13) was within the PDA) but only above the ISQG level at one station (31- located within the CRC off the north coast of Holy Island, Anglesey). Levels of nickel were also recorded slightly above the AL1 at stations 19 and 35 but were well below Action Level 2 (AL2). There are no probable effect levels available for this metal.

Lead was found to be elevated slightly above ISQG at three stations (33, 35 and 19-all from within the CRC) but well below the action levels and PEL.

Mercury was recorded in low concentrations across the area and at station 7 (within the PDA) was recorded above the ISQG and slightly over the AL1 (0.31 compared to the AL1 of 0.30). This level was below the PEL of 0.7 mg/kg.

Cadmium, copper, tin, vanadium, barium and zinc were detected in samples from all stations but all were present at low levels (below quoted ISQG levels or Cefas action levels).

Metal levels in the current survey are compared with those from a survey (Seastar Surveys, 2013) at the Rhiannon wind farm development area (Table 6), which was also off the north coast of Anglesey (though predominantly much further offshore than the Deep Green area). It can be seen that levels of some metals were much higher in the Deep Green area than in the Rhiannon area.

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[1] ISGQ (Interim Sediment Quality Guidelines) levels are a national standard to which contaminant levels are compared. Levels of contamination below ISGQ level are expected to have no effect on marine ecosystems, levels above the PEL (probable effect level) are likely to have an effect on the marine ecosystem and contamination levels between the two tiers may need further research to determine any likely effects.

[2] Cefas Guideline Action Levels for the disposal of dredged material are not statutory contaminant concentrations for dredged material but are used as part of a weight of evidence approach to decision-making on the disposal of dredged material to sea. The action levels are therefore not 'pass/fail' criteria but triggers for further assessment. In general, contaminant levels in dredged material below action level 1 are of no concern and are unlikely to influence the licensing decision. However, dredged material with contaminant levels above action level 2 is generally considered unsuitable for sea disposal. Dredged material with contaminant levels between action levels 1 and 2 requires further consideration and testing before a decision can be made.

Table 6. Comparison of metal levels in sediments in the Deep Green PDA and CRC with those for the Rhiannon Round 3 wind farm development area.

Parameter	Deep Green	Rhiannon OWF
Aluminium	11,300-25,200 mg/kg	1,600-7,100 mg/kg
Arsenic	7.19-10.20 mg/kg	5.3-22.0 mg/kg
Cadmium	<0.10 mg/kg	0.2-0.3 mg/kg
Chromium	22.9-69.1 mg/kg	4.9-12.0 mg/kg
Copper	5.21-11.80 mg/kg	2.4-8.8 mg/kg
Lead	10.2-41.2 mg/kg	5.9-12.0 mg/kg
Mercury	0.02-0.31 mg/kg	<0.05 mg/kg
Nickel	11.9-22.0 mg/kg	4.2-13.0 mg/kg
Vanadium	32.3-55.9 mg/kg	14-31 mg/kg
Tin	0.74-4.46 mg/kg	n/a
Barium	87.4-219.6 mg/kg	13-37 mg/kg
Zinc	28.4-72.7 mg/kg	17-40 mg/kg

Table 7. Heavy and Trace Metal Contaminant Analysis Results (results all expressed as mg/kg)

Metal	LOD	7	8	9	10	11	13	15	16	19	ISQG	PEL	AL 1	AL 2
Aluminium	10 µg.g-1	16500	18900	22500	19400	19700	22300	20800	12400	25200	n/a*	n/a	n/a	n/a
Arsenic	3 µg.g-1	9.52	7.19	9.98	7.38	7.22	7.70	8.22	8.46	8.14	7.24	41.6	20	100
Cadmium	1 µg.g-1	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	0.7	4.2	0.4	5
Chromium	2 µg.g-1	29.8	26.6	39.3	32.5	30.1	47.4	50.4	22.9	44.1	52.3	160	40	400
Copper	1 µg.g-1	6.90	7.17	8.75	8.22	7.66	7.20	6.67	5.45	11.7	18.7	108	40	400
Lead	5 ng.g-1	16.8	17.4	21.3	19.9	19.3	17.8	16.1	13.9	41.2	30.2	112	50	500
Mercury	0.01 ng.g-1	0.31	0.04	0.05	0.04	0.05	0.04	0.03	0.03	0.06	0.13	0.7	0.3	3
Nickel	2 µg.g-1	13.1	11.9	17.1	14.0	13.9	13.3	16.8	10.5	22.0	n/a	n/a	20	200
Vanadium	1 µg.g-1	40.50	37.30	52.00	42.60	41.20	40.40	48.50	32.30	55.90	124	271	130	800
Tin	5 ng.g-1	1.56	1.49	1.98	2.07	1.70	1.50	1.92	1.16	2.43	n/a	n/a	n/a	n/a
Barium	1 µg.g-1	126.60	124.70	160.40	152.50	141.20	130.70	155.50	127.40	219.60	n/a	n/a	n/a	n/a
Zinc	2 µg.g-1	44.5	44.2	57.3	47.8	48.0	48.4	42.6	32.6	72.7	n/a	n/a	n/a	n/a

N.B. Concentrations that were recorded above ISQG or PEL are highlighted with the appropriate colour.

*n/a = no value

Table 7 continued. Heavy and Trace Metal Contaminant Analysis Results (results all expressed as mg/kg)

Metal	LOD	31	33	35	38	ISQG	PEL	AL 1	AL 2
Aluminium	10 µg.g-1	11300	10900	16100	20400	n/a*	n/a	n/a	n/a
Arsenic	3 µg.g-1	8.69	9.62	10.2	8.33	7.24	41.6	20	100
Cadmium	1 µg.g-1	< 0.10	< 0.10	< 0.10	< 0.10	0.7	4.2	0.4	5
Chromium	2 µg.g-1	69.1	25.2	49.2	38.6	52.3	160	40	400
Copper	1 µg.g-1	5.21	11.8	11.0	9.42	18.7	108	40	400
Lead	5 ng.g-1	10.2	37.9	33.3	21.8	30.2	112	50	500
Mercury	0.01 ng.g-1	0.02	0.03	0.04	0.04	0.13	0.7	0.3	3
Nickel	2 µg.g-1	15.9	16.4	20.7	17.6	n/a	n/a	20	200
Vanadium	1 µg.g-1	34.40	37.30	48.40	49.50	124	271	130	800
Tin	5 ng.g-1	0.74	0.94	4.46	1.82	n/a	n/a	n/a	n/a
Barium	1 µg.g-1	87.40	122.60	191.30	161.50	n/a	n/a	n/a	n/a
Zinc	2 µg.g-1	28.4	56.3	56.1	58.2	n/a	n/a	n/a	n/a

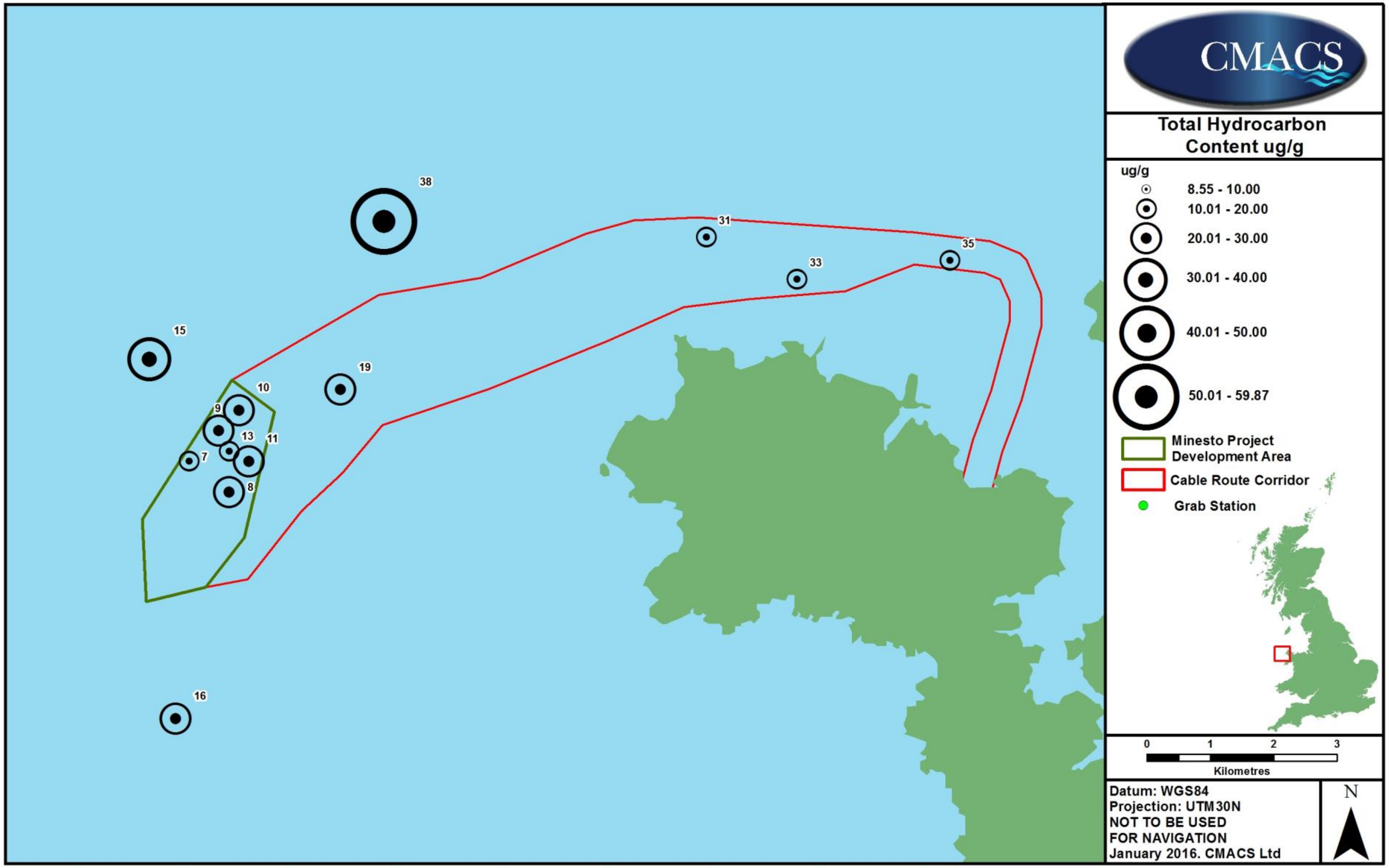


Figure 11. Estimated levels of hydrocarbon at each sample station (where a sample was successfully obtained).

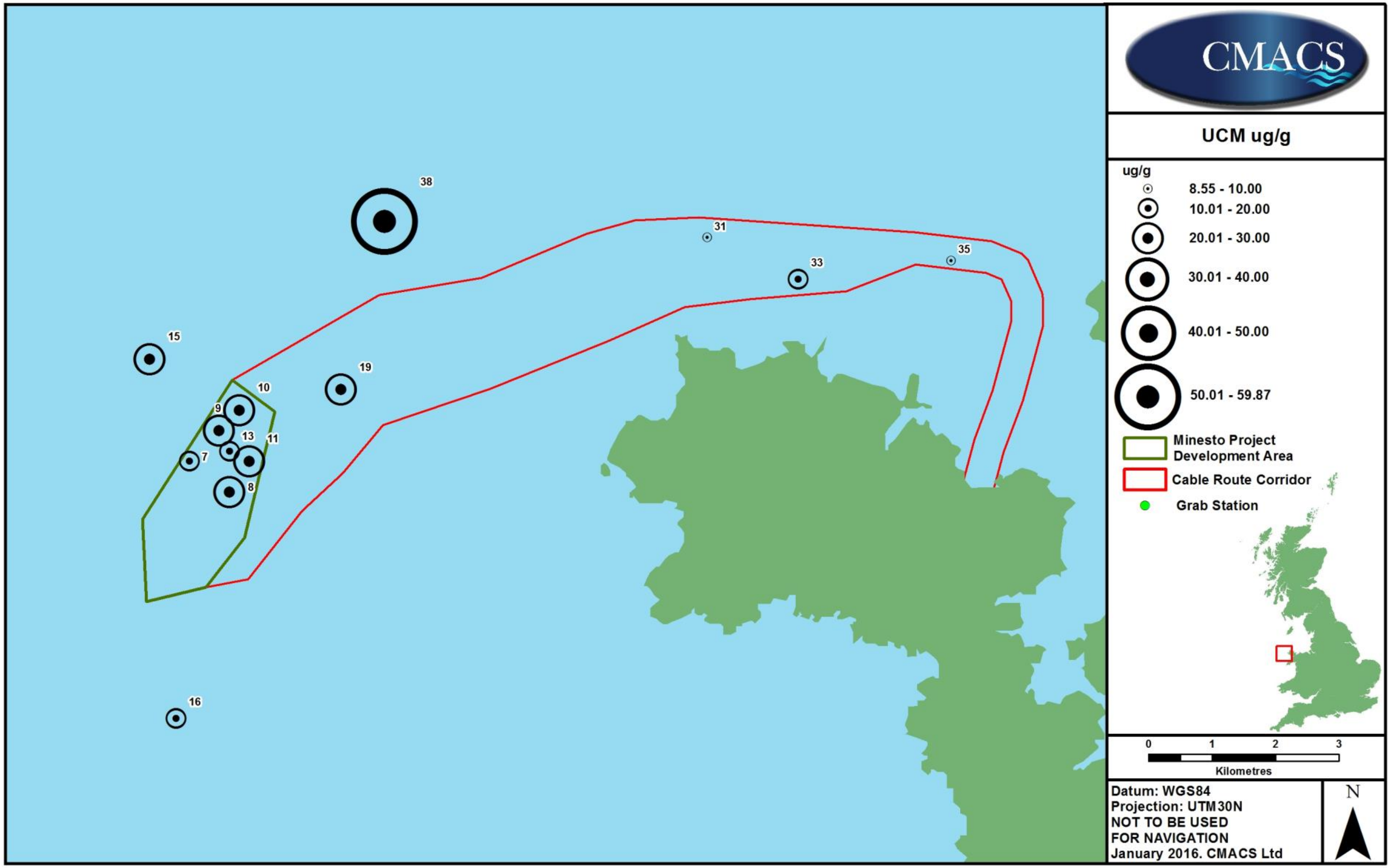


Figure 12. Estimated levels of unresolved complex mixture (UCM) at each of the sample stations

The results of the hydrocarbon analysis are presented in Table 8 with full results displayed in Appendix 7. Results from all stations were between 10.79 and 59.87 µg/g with the highest value being recorded from Station 38 (north (offshore) of the CRC). At this station, the sediment was a muddy sandy gravel similar to that at many of the other stations. In all cases, unresolved complex mixtures comprised the majority of the samples (Table 8; Figure 11 & Figure 12) whilst N9-N40 alkanes comprised a small proportion (Appendix 7). For both total hydrocarbons and UCM, the values were lower along the inner section of the CRC (Stations 31, 33 and 35) than further offshore. These stations had lower mud contents than the other contaminant sampling stations, and overall there seems to be a link with mud content, with the less muddy stations within the PDA also having lower hydrocarbon content.

Table 8. Results from Hydrocarbon analysis of sediments

Station	Total Hydrocarbon Content*	Pristane	Phytane	Ratio (Pris:Phyt)	Carbon preference index	UCM
	µg/g	µg/g	µg/g			µg/g
DG7	13.415	0.013	0.010	1.29	2.459	11.987
DG8	24.299	0.020	0.016	1.27	1.683	22.415
DG9	26.147	0.023	0.014	1.66	1.703	24.063
DG10	29.107	0.024	0.020	1.18	2.400	26.605
DG11	28.924	0.029	0.011	2.63	2.225	26.519
DG13	16.968	0.017	0.009	1.85	2.093	15.194
DG15	34.407	0.065	0.012	5.27	1.852	29.910
DG16	20.246	0.020	0.016	1.30	1.519	18.300
DG19	26.725	0.022	0.014	1.56	1.919	24.554
DG31	12.482	0.004	0.010	0.41	1.053	8.555
DG33	16.176	0.027	0.013	2.02	1.801	14.185
DG35	10.786	0.019	0.011	1.67	1.813	9.399
DG38	59.869	0.035	0.005	6.70	3.159	53.540

Surveys in support of the proposed Rhiannon Offshore Windfarm cable corridor in 2012 (Seastar surveys, 2013) found total petroleum hydrocarbon levels of between 0.2 and 22.6 µg/g in sediments within circa 1-2 km off the northeast of Anglesey. Further offshore in the proposed cable corridor out to around 20 km, values were between 0.2 and 8.8 µg/g. Further offshore for the same project (roughly midway between Anglesey and the Isle of Man), values of <10 µg/g were found in 2012 at four stations, with a further eight stations showing values of 40-510 (average c. 130) µg/g (CMACS, 2013). Thus the values found in the present project are broadly within the large range of values found recently in nearby areas off Anglesey.

There are no guidelines of mandatory levels with which total hydrocarbons can be compared. However, Battelle (2007) provides suggested benchmark levels for aliphatic fractions as shown in Table 9. These levels were considered very stringent and applicable to all aquatic sediments including with very low organic content

(0.1%); suggested benchmark levels for sediments with higher levels of organic content could potentially be much higher.

Table 9. Comparison of values for aliphatic fractions in sediments from grab sample stations with suggested benchmark values (Battelle 2007).

Aliphatic hydrocarbon fraction	Stringent Benchmark level (Battelle 2007) µg/g	Values in Deep green sediments µg/g
$C_9 – C_{12}$	2.72	0.43 - 0.92
$C_{13} – C_{18}$	5.54	0.05 – 0.36
$C_{19} – C_{36}$	9.88	0.55 – 4.25 *

* maximum of 4.25 at station 38 outside of proposed development/cable corridor; all other values less than 2.9

Pristane/phytane ratios can be used as an indication of sources of hydrocarbons, although there are many confounding factors and this needs to be interpreted with caution. According to Moustafa and Morsi (2012), Pristane/phytane ratios substantially below one could be taken as an indicator of petroleum origin and/or highly reducing depositional environments; very high Pr/Ph ratios (more than 3) are associated with terrestrial sediments; and Pr/Ph ratios ranging between 1 and 3 reflect oxidizing depositional environments. It is interesting that the stations with the highest values for total hydrocarbons (DG15 and DG38) have the highest Pr/Ph ratios of 5.27 and 6.7 respectively, whilst the only station with a ratio lower than one (indicating likely petroleum origin) is station 31, in the central part of the cable route corridor, where the total hydrocarbon content was amongst the lowest at c. 12.5 µg/g (Table 8). Thus there is no evidence from this ratio of significant anthropogenic sources for the hydrocarbon contents.

Carbon preference index (which measures the ration of odd to even numbered alkanes) can also give some indication of the potential source of hydrocarbons, although again this needs to be interpreted with caution. According to Deshpande *et al*. (2001) and references therein, hydrocarbon mixtures originating from terrestrial plant materials show a predominance of odd-numbered carbon chains with CPI values >5-7, whilst a CPI value of 1.0 may indicate a petrogenic or algal origin of the hydrocarbons. The values in Table 8 suggest the possibility of terrestrial plant-derived contributions at some stations, notably at station 38 where the total hydrocarbon content was highest (CPI of 3.159).

3.2 Fauna from grabs

Full data from the faunal analysis are provided in Appendix 8. A total of 13,078 individuals[3] from 318 taxa were recorded from the 23 grabs. The vast majority of individuals were identified to genus or species level, with the exception of some juveniles.

The total number of species and individual organisms at each station has been spatially displayed in Figure 13 and Figure 14. Abundance was highest at Station 38 located to the north of the PDA and CRC with 2140 individuals from 75 taxa (1,726 of the individuals were the barnacle *Balanus crenatus*). Stations within the PDA also had a high abundance (see Figures 13 and 14). The lowest numbers were from stations within the CRC and two of these (19 and 27) were grabs which were below the 5L QC volume (but were analysed to provide some qualitative information[4]). It should be noted that stations 1 and 7 within the PDA were also both below QC standards, however; both of these stations had high numbers of countable taxa and individuals (827 individuals from 77 taxa at Station 1 and 415 individuals from 81 taxa at Station 7).

[3] Colonial species were assigned a value of 1.

[4] Samples below QC levels were analysed for qualitative purposes and were not scaled up to levels above QC standards

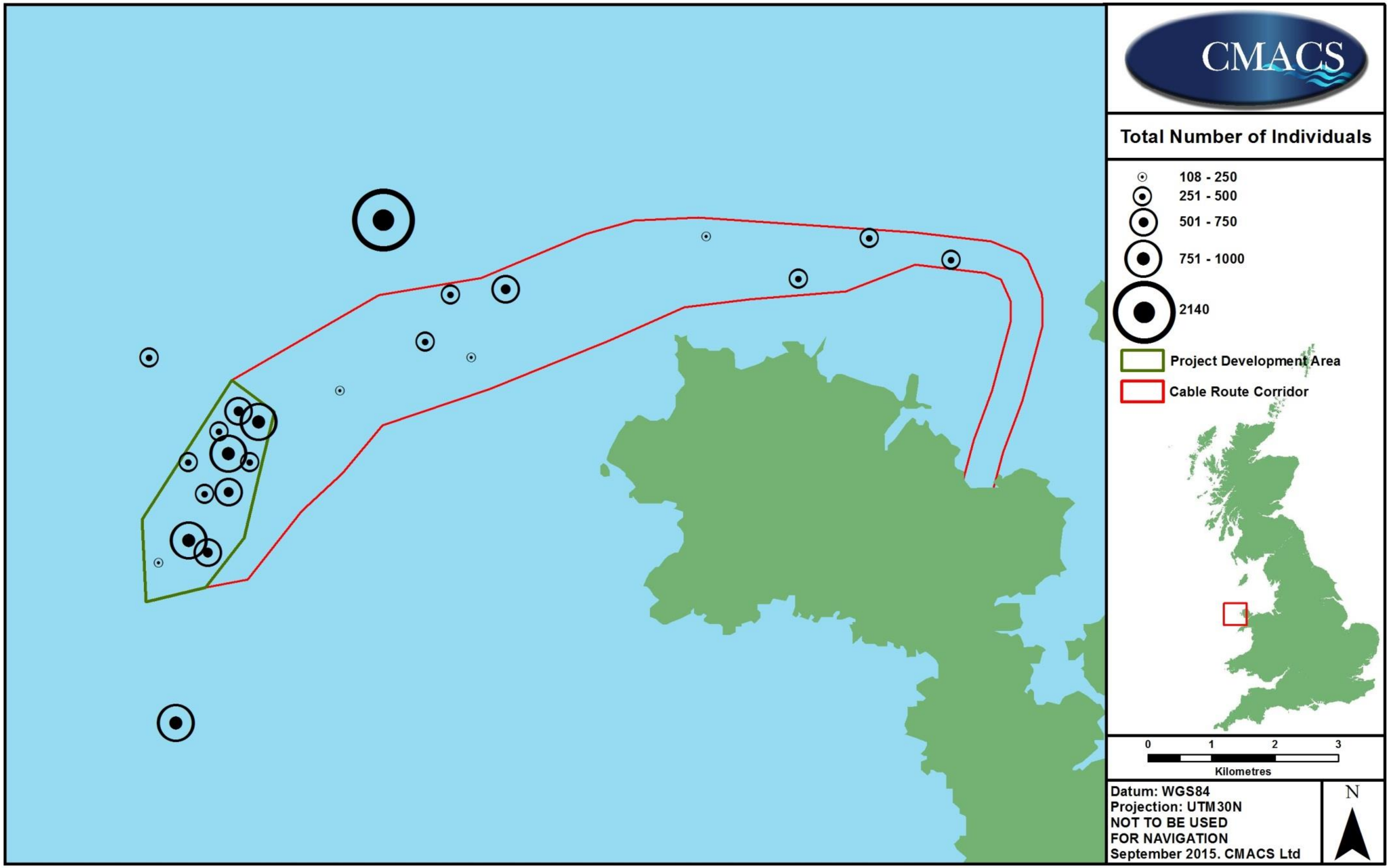


Figure 13. Total number of individuals at each station

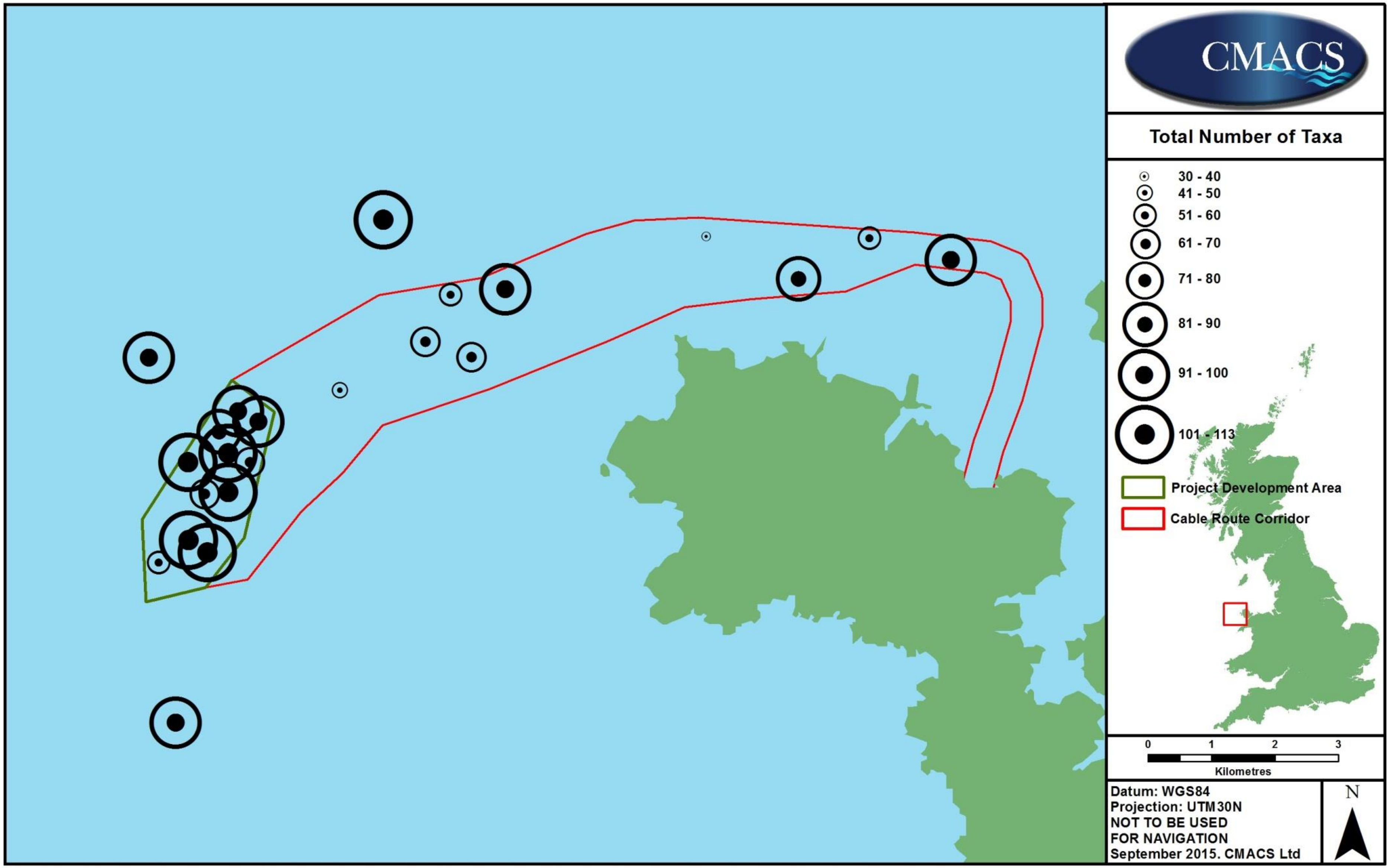


Figure 14. Total number of taxa at each station

3.2.1 Species composition

Faunal communities were generally dominated by annelid worms and molluscs followed by Crustacea (Figure 15). Groups classified into the 'Others' category, e.g. tunicates, were represented by fewer taxa but high numbers of individuals (see Figure 16).

The high abundance of molluscs was attributable to large numbers of two species (*Nucula nitidosa* and *Abra alba*) at two of the stations (32 and 35- both located towards the landfall end of the CRC off the north coast of Anglesey). These two species accounted for approximately 40% of the total individual molluscs.

The high numbers of crustaceans were almost all due to barnacles (total crustaceans with barnacles was 2,997 and without was 292). However, by far the most abundant species recorded during the grab survey were annelid worms. More than 46% of annelids were *Sabellaria* spp. (mostly *S. spinulosa*) but several others were abundant notably *Melinna elisabethae*, *Jasmineira elegans*, *Lumbrineris cf. cingulata*, *Syllis variegata*, *Syllis armillaris*, *Lepidonotus squamatus*. There were 138 annelid taxa altogether, 18 of which contributed over 50 individuals.

High numbers of 'others' were attributable to high numbers of the tunicate *Dendrodoa grossularia* as well as high numbers of nemertea, nematoda, sipunculans, sea spiders especially *Achelia* sp., phoronids, and other tunicate species.

The top fifty taxa recorded (in terms of total number) are presented in Table 10.

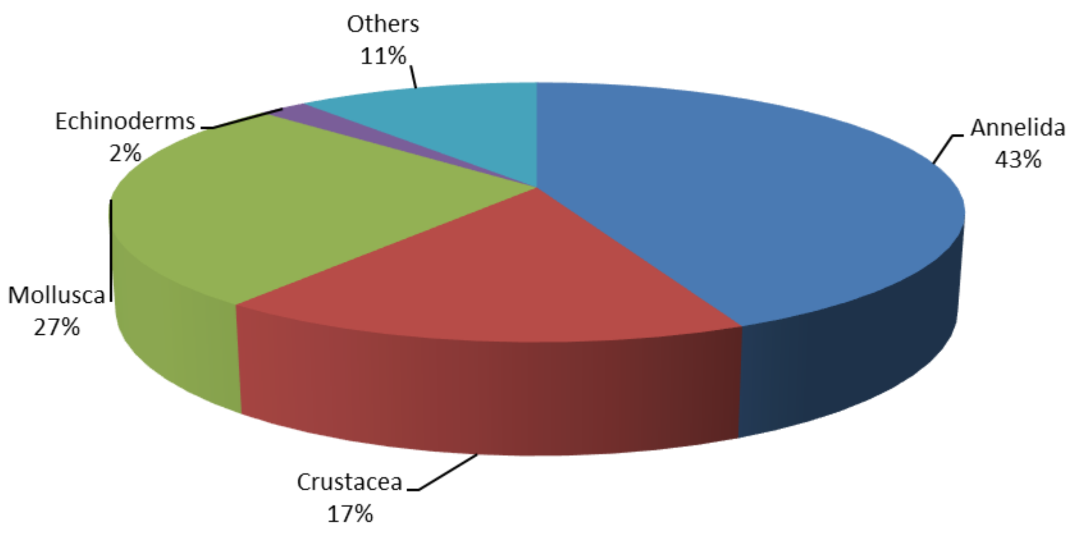


Figure 15. Percentage of taxa by major group (including colonials)

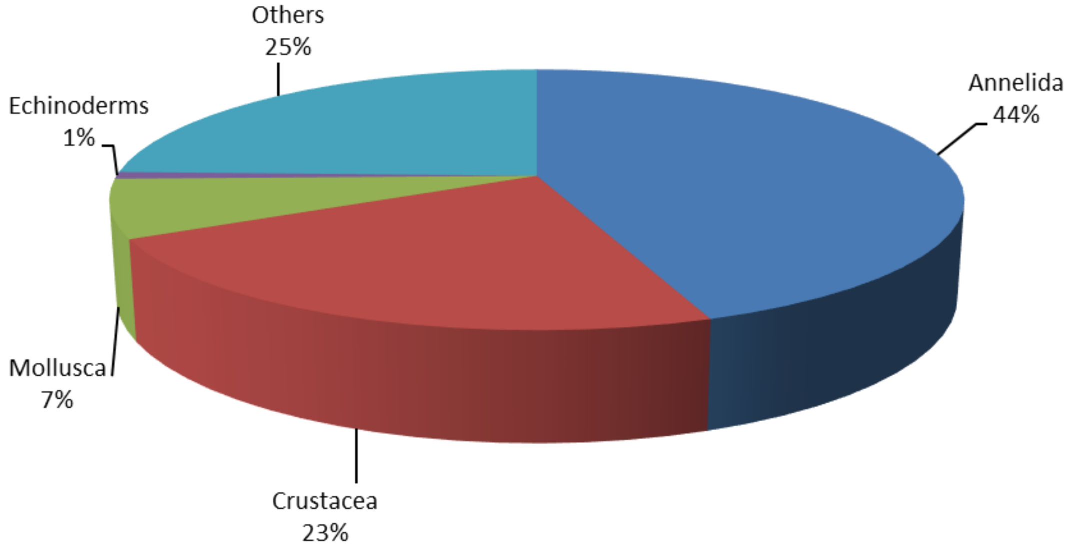


Figure 16. Percentage of individuals by major group (excluding colonials).

The most abundant organisms recorded during the grab survey are all commonly found around British coastlines with similar substrata. The five most abundant species are discussed further below with spatial distribution displayed in Figures 14-18.

Table 10. Top fifty species recorded from all stations

Group	Name	Total
Annelida	*Sabellaria spinulosa*	2,385
Crustacea	*Balanus crenatus*	2,243
Tunicata	*Dendrodoa grossularia*	1,339
Annelida	*Melinna elisabethae*	654
Crustacea	*Verruca stroemia*	374
Nematoda	Nematoda spp.	357
Annelida	*Sabellaria alveolata*	328
Mollusca	*Nucula nucleus*	270
Mollusca	*Sphenia binghami*	259
Annelida	*Jasmineira elegans*	231
Nemertea	Nemertea spp.	208
Annelida	*Lumbrineris* cf. *cingulata*	166
Annelida	*Syllis variegata*	161
Annelida	*Syllis armillaris*	151
Sipunicula	*Nephasoma minutum*	130
Annelida	*Lepidonotus squamatus*	113
Chelicerata	*Achelia echinata*	101

Group	Name	Total
Phoronida	*Phoronis* spp.	95
Annelida	*Dipolydora coeca*	94
Annelida	*Lysidice unicornis*	93
Sipuncula	Sipuncula spp. Juv.	92
Annelida	*Pseudopotamilla reniformis*	89
Echinodermata	*Amphipholis squamata*	89
Tunicata	*Pyura tessellata*	85
Annelida	*Thelepus setosus*	84
Mollusca	*Leptochiton asellus*	81
Annelida	*Sphaerosyllis bulbosa*	74
Mollusca	*Abra alba*	73
Annelida	*Paradoneis lyra*	71
Tunicata	Ascidiacea spp.	61
Crustacea	Balanidae spat	60
Annelida	*Spirobranchus lamarcki*	56
Annelida	*Myrianida* spp.	56
Chelicerata	*Nymphon brevirostre*	56
Annelida	*Pholoe baltica*	53
Annelida	*Mediomastus fragilis*	51
Mollusca	*Heteranomia squamula*	51
Tunicata	*Molgula* spp. Juv.	49
Sipuncula	*Golfingia (Golfingia) elongata*	46
Annelida	*Polycirrus* spp.	45
Mollusca	*Hiatella arctica*	45
Crustacea	*Caprella septentrionalis*	38
Annelida	*Eunereis longissima*	35
Crustacea	*Pisidia longicornis*	34
Crustacea	*Monodaeus couchii*	32
Annelida	*Paraehlersia ferrugina*	31
Annelida	*Syllis garciai*	30
Annelida	*Notoproctus* sp.	30
Cnidaria	Actiniaria spp.	29
Annelida	*Notomastus* spp.	29

Sabellaria spinulosa, also known as the Ross worm, is a polychaete worm that lives in tubes it builds from sand, small gravel and shell fragments. It is found subtidally in exposed areas favouring localities where strong currents or waves churn up sand into the water column and where there are areas of hard substratum so they can become established. Where the worms crowd together the tubes can aggregate to form a pronounced habitat many metres across and up to 60cm high, which then provide a habitat for other marine species such as crustaceans and juvenile fish (Jackson & Hiscock, 2008). These distinct aggregations are termed biogenic reef and are protected Annex I habitat because of the biodiversity they support and their fragility, as they are at risk from human activities such as trawl fishing. *S. spinulosa* worms do not form biogenic reefs over most of their range, being found mostly as individuals or forming thin crusts and/or small aggregations which generally break up in adverse weather storm conditions. This was the most numerous species and was recorded from all grabs. Higher numbers were recorded from the PDA and offshore near-field stations than within the CRC (see Figure 17). Potential Annex I status of this species for the PDA and CRC has been assessed within Section 3.2.6.

Balanus crenatus is primarily a sublittoral species that can sometimes be found under stones or overhangs on the lower shore. *Balanus crenatus* colonizes cobbles, shells, bedrock, molluscs and artificial substrata. *B. crenatus* is one of the most common sublittoral barnacles in Britain. It has six shell plates and grows up to 25 mm in diameter. Figure 18 shows the distribution of this species recorded from the grab survey. The high numbers of this species are mainly attributable to 1,726 individuals being recorded from one station (35 located to the north of the CRC). This species was recorded at lower numbers within the north east of the PDA and along the CRC.

Dendrodoa grossularia, also known as the gooseberry sea squirt, is a reddish-brown sea squirt, up to 2 cm long and 1.5 cm in diameter, occurring either singly or aggregated in dense clusters. It is a widely distributed species being commonly recorded around British and Irish coasts. *D. grossularia* is found on the lower shore and sublittorally to a depth of 600m on a variety of substrata including rock, shell, other ascidians and algae. It is particularly abundant and dominates rocks in two contrasting situations; in surge gullies and caves exposed to severe wave action and in locations entirely sheltered from wave action where tidal streams are moderate to strong (Avant, 2008). *D. grossularia* was recorded in higher numbers in the north of the PDA and in the northern part of the CRC (see Figure 19).

Melinna elisabethae is a polychaete worm recorded from sand or mud from 12m down to 2,900m. A total of 654 individual were recorded from the grab survey with most of these records being from the PDA area (see Figure 20). The highest number at any one station was 173 individuals recorded from the southernmost near-field reference station (16).

Verruca stroemia is a small grey box-like barnacle growing up to 1 cm in diameter and found mainly subtidally between extreme low water and 500 m depth but can also be found on rocky shores attached to the undersides of rocks and in crevices. Figure 21 shows this species to be mainly recorded from the PDA, especially at those stations located on the harder substratum in the east of the PDA. Only small numbers of this species were recorded from the CRC.

The following species of interest were also noted from the grab survey:

Sabellaria alveolata, also known as the honeycomb worm, is an annelid worm which cements coarse sand and/or shell fragments into tubes and can aggregate to form biogenic reefs like *S. spinulosa*. This species was recorded across the survey area (see Figure 22) at low numbers in and around the PDA and along the CRC. At Station 33 on the CRC off the north coast of Holy Island, Anglesey, quite high numbers were present in the grab (154 individuals). Although normally intertidal, this species can occur in shallow subtidal and have regularly been reported from 20m or more off the Irish east coast (e.g. CMACS Ltd. 2006 and Ecoserve 2001).

Modiolus modiolus, the horse mussel, is a large bivalve mollusc which can aggregate to form biogenic reefs (which are designated Annex I habitat and features of UK marine SACs). *M. modiolus* were recorded from four stations. Three of these were located within the CRC: 24 (11 individuals), 33 (7) and 35 (1). The other location with *Modiolus* present was Station 38 to the north of the CRC which yielded one individual. All of the *M. modiolus* recorded from the gab survey were relatively small in size but the density of 11 and 7 individuals recorded per $0.1m^2$ from stations 24 and 33 respectively in the CRC, indicate potential biogenic reef. See Section 3.2.6 for further information.

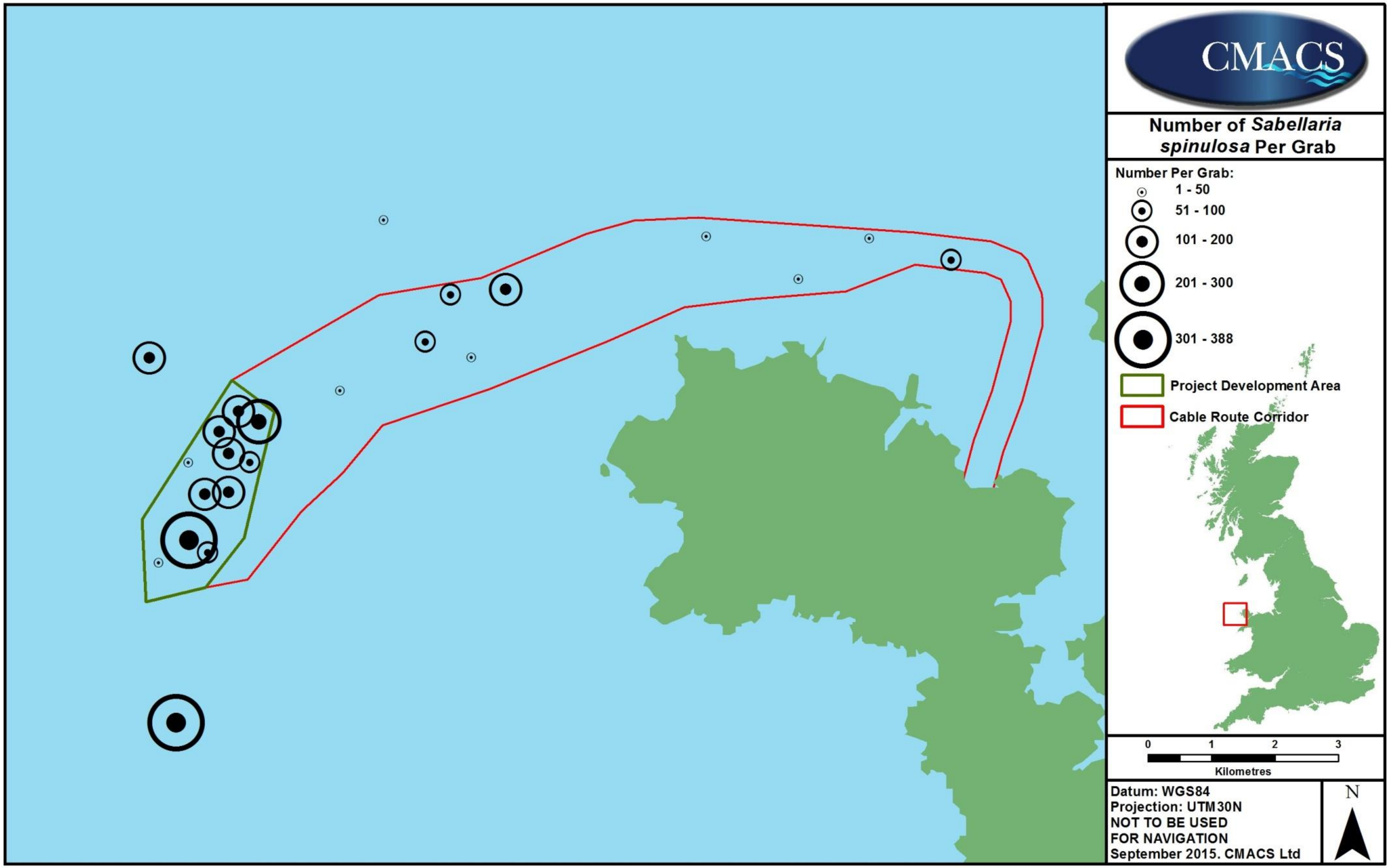


Figure 17. *Sabellaria spinulosa* numbers per grab at each station.

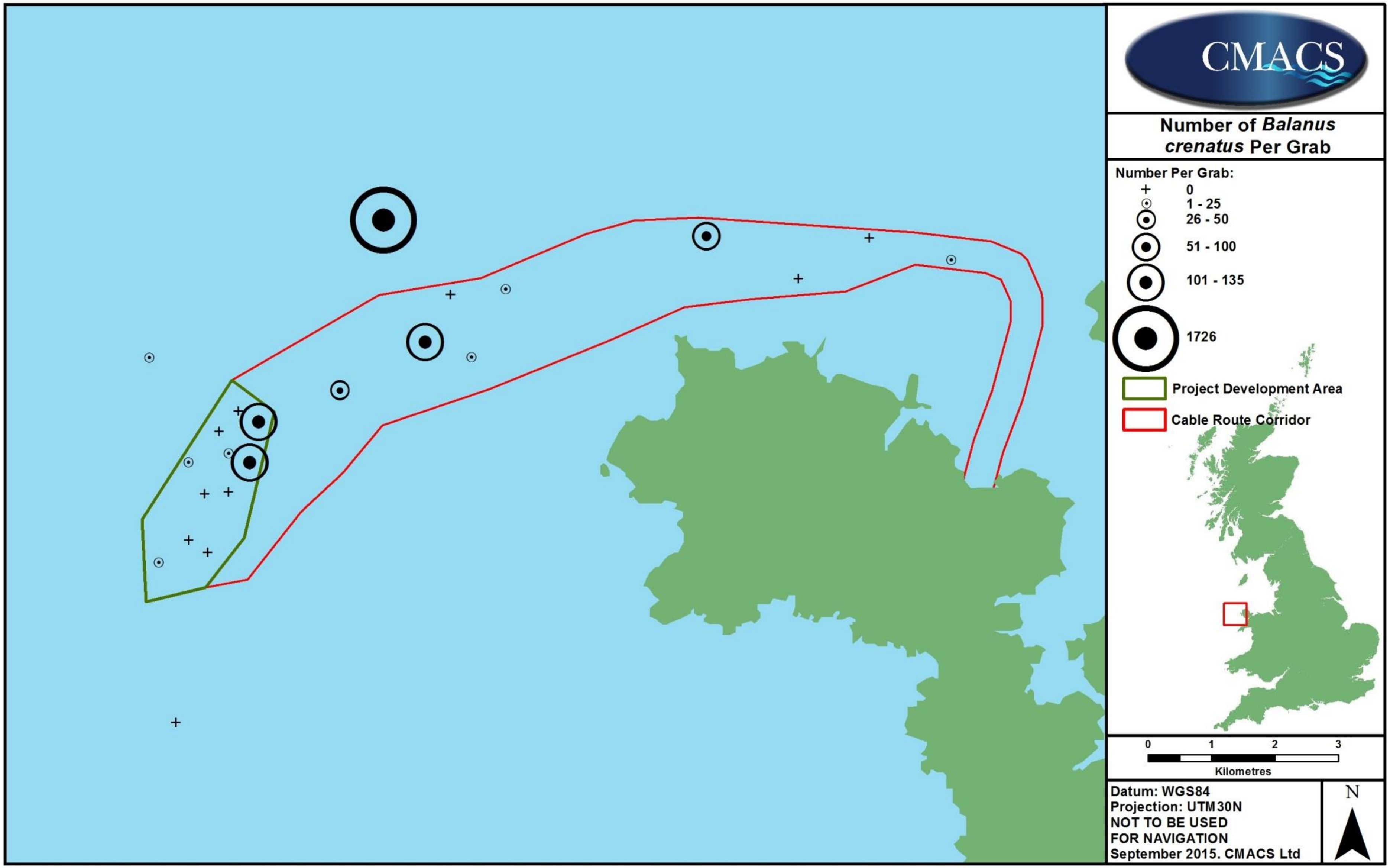


Figure 18. *Balanus crenatus* numbers per grab at each station.

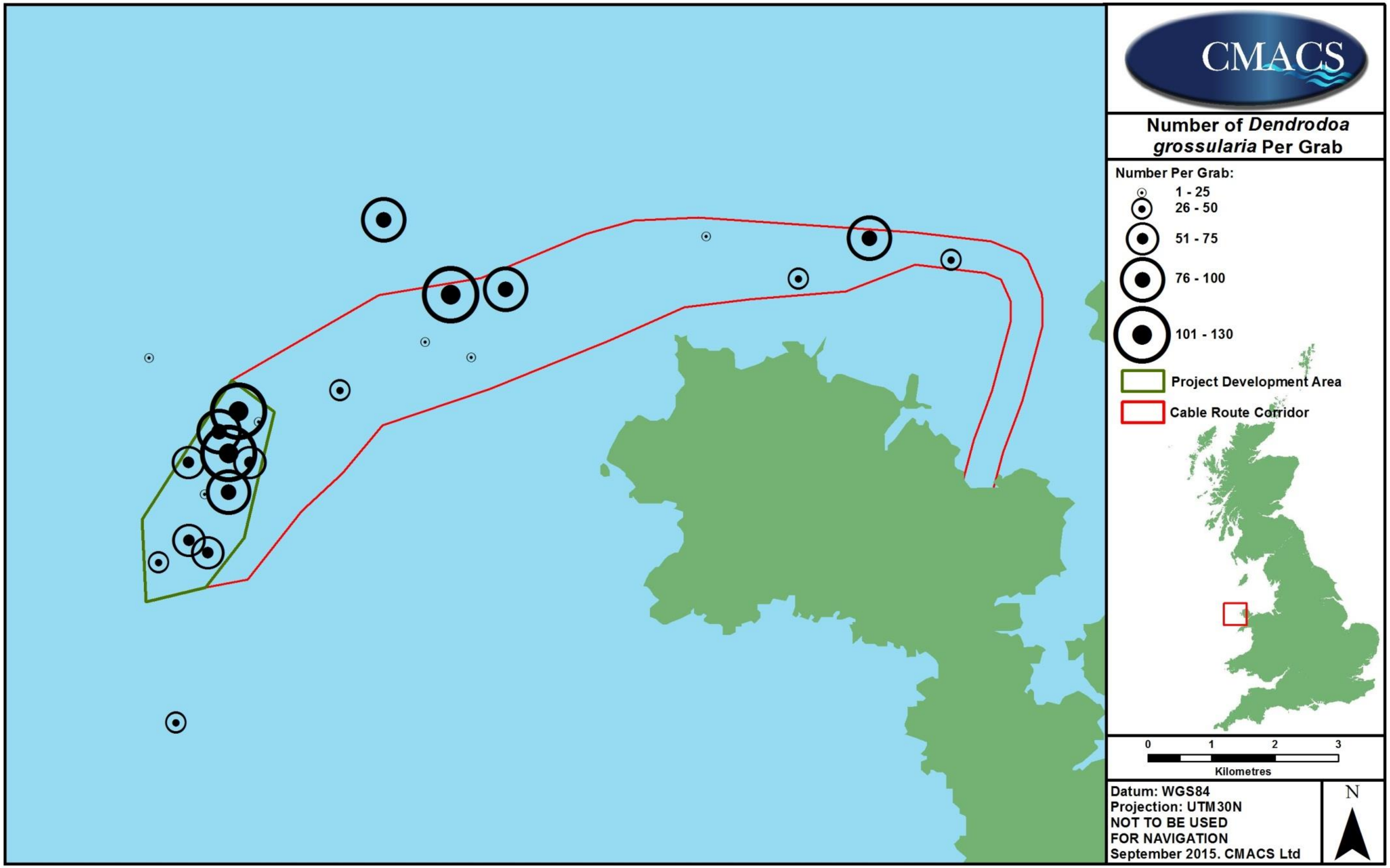


Figure 19. *Dendrodoa grossularia* numbers per grab at each station.

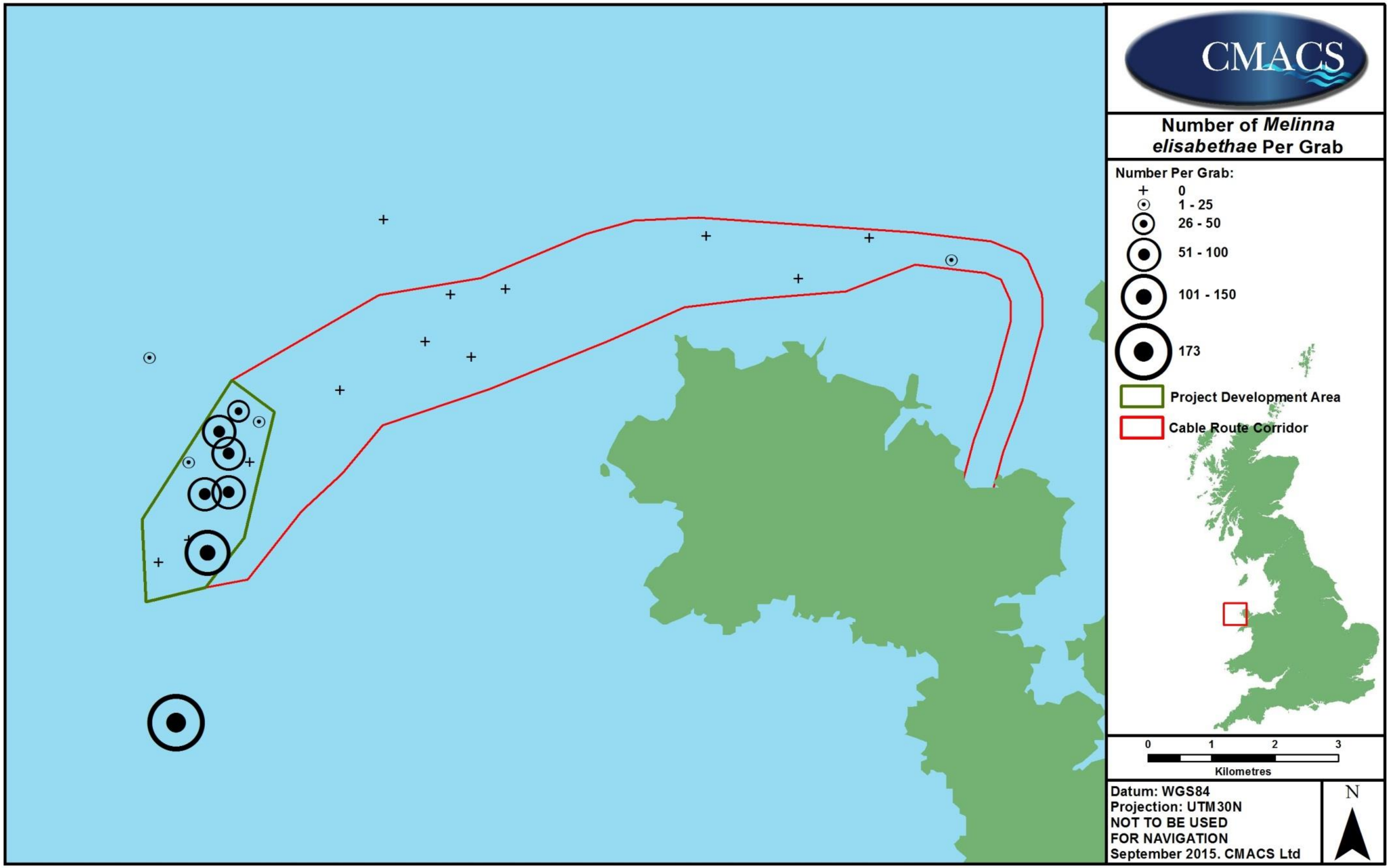


Figure 20. *Melinna elisabethae* numbers per grab at each station.

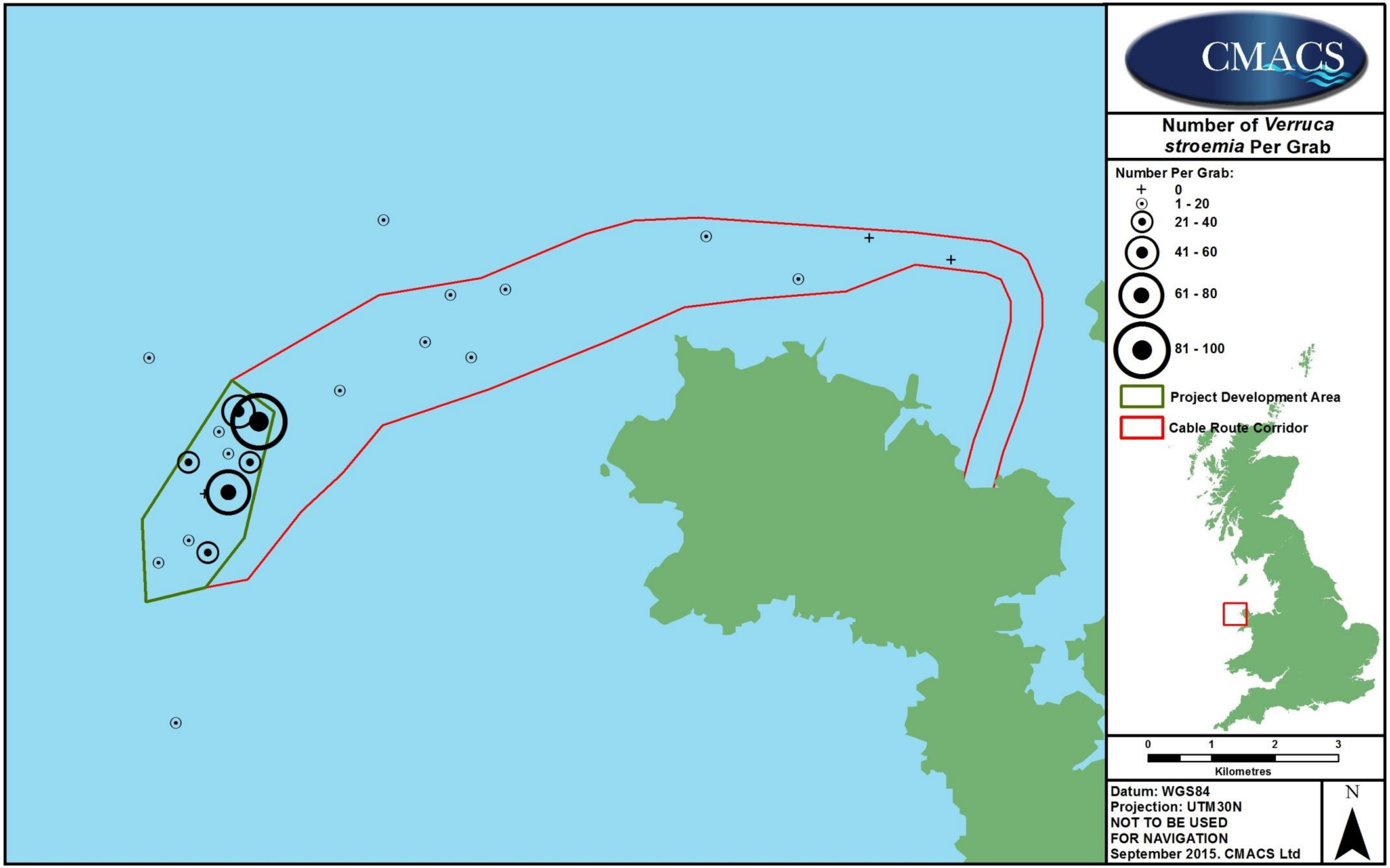


Figure 21. *Verruca stroemia* numbers per grab at each station.

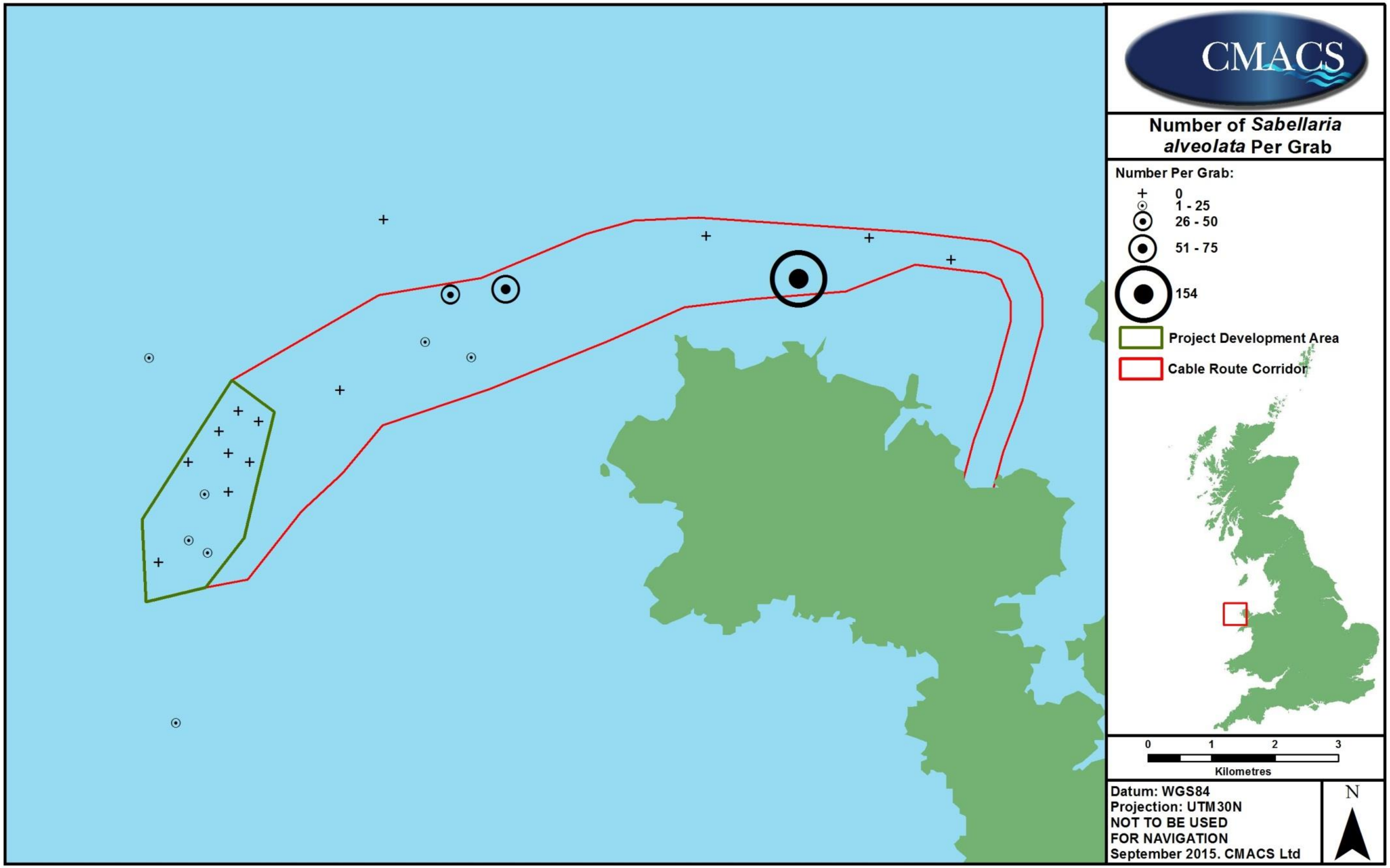


Figure 22. *Sabellaria alveolata* numbers per grab at each station.

3.2.2 Statistical analysis

The number of taxa, individuals and diversity indices for each faunal grab station are provided in Table 11. Overall, samples were generally very diverse; twelve of the twenty three samples had a Shannon-Wiener index of greater than 3.0 (Simpson's over 0.9) and seven of the remaining samples were over 2.5 (Simpson's over 0.75). The least diverse stations were 31 and 38, the latter of which had a Shannon-Wiener of just over 1.0 (Simpson's of 0.35). Stations 1 and 7 within the PDA and stations 19, 20, 22 and 27 within the CRC were all below the QC levels for testing. Station 7 was the most diverse station from the entire grab survey and station 27 was also one of the most diverse with a Shannon-Wiener of 3.38 (see Figure 23 for Shannon-Wiener diversity index spatial distribution and Figure 24 for Simpsons Index).

Pielou's evenness index was over 0.6 in most samples and was over 0.7 at many, which indicates, along with the diversity indices, that not only were there large numbers of taxa in each sample but that numbers of individuals were not dominated by any one taxa. Rarefaction values were also generally high with most samples estimating 30 to 47 taxa per 100 random individuals, which again suggests numbers of individuals were fairly even between taxa (see Figure 25 for spatial distribution).

Sample stations were divided into eight groups using the dendrogram and associated SIMPROF test (Figure 26). Similarities between groups and, indeed, sample stations was generally low with the first split at around 30% (group A from the rest of the samples) and the last split at 60-70% (group F and the differences in samples within it). The sample groupings did not show any geographical trend with many groups containing samples from across the survey area.

The SIMPER analysis indicated that the faunal community at almost all of the samples stations was characterised by a relatively high abundance of the tube-building polychaete *Sabellaria spinulosa* and the highly aggregative ascidian *Dendrodoa grossularia* with cumulative similarity between stations of between 40% and 60% as a result of these two species.

The exception was in group A where samples were mainly characterised by the barnacle *Balanus crenatus* but also with *Sabellaria spinulosa*, burrowing anemones (Edwardsiidae), nematodes and the errant polychaete *Eulalia mustela* contributing to the similarity between samples. Groups B and C were characterised by *Sabellaria alveolata* and nematode worms (in addition to *S. spinulosa* and *D. grossularia*), while group D was characterised by the barnacle *Verruca stroemia*, the sea spider *Achelia echinata* and the bivalve *Sphenia binghami*.

Group E was similar to group C in the most abundant taxa with *S. spinulosa, D. grossularia*, nematode and nemertean worms as well as *Syllis variegata* in common between the two groups but were separated by differences in abundance of S*. spinulosa*, *Mellina elisabethae* and *Balanus crenatus*. Group F was characterised by the terebellid polychaete *Mellina elisabethae* and *Verruca stroemia* the latter of which was also a characteristic species of Group G but the two groups were separated on the basis of differing abundance of *Balanus crenatus*, *M. elisabethae* and *Dendrodoa grossularia*. Group G was characterised by *Nucula nucleus,* sipunculids and *Polycirrus* (a polychaete genus in the family Terebellidae).

The MDS plot (Figure 27) also reveals a low similarity between sample stations and with a stress level of 0.14 that the two-dimensional ordination is not a good representation of the distribution and samples are more dissimilar than they appear in the plot, especially the small cluster placed centre-right in the plot. The MDS was re-plotted with sediment type (Figure 28), which did not reveal any particular trend with samples apparently placed at random with regard to sediment type.

Table 11. Number of taxa, individuals and diversity indices for each faunal sample. Ordered from most diverse to least (according to Shannon-Wiener index). Highlighted stations indicate samples which were taken for faunal analysis despite being below QC standards e.g. stone in jaws or below requisite 5 litres.

Sample	Total taxa	Total individuals	Margalef	Pielou's	Rarefaction	Shannon-Wiener	Simpson's
7	111	415	18.25	0.82	46.66	3.86	0.96
15	95	479	15.23	0.76	41.13	3.44	0.90
13	113	758	16.89	0.72	35.94	3.40	0.93
27	67	204	12.41	0.80	41.62	3.38	0.93
6	110	629	16.91	0.71	36.42	3.33	0.91
8	102	655	15.58	0.72	35.60	3.31	0.92
24	93	717	13.99	0.73	33.46	3.29	0.93
10	95	607	14.67	0.72	35.27	3.26	0.91
35	94	470	15.12	0.72	35.40	3.25	0.92
4	60	186	11.29	0.79	41.09	3.24	0.91
12	99	783	14.71	0.67	33.18	3.09	0.89
33	84	438	13.65	0.69	35.40	3.05	0.86
9	83	461	13.37	0.68	32.85	3.00	0.88
20	67	393	11.05	0.70	32.66	2.95	0.87
16	100	930	14.48	0.59	28.63	2.71	0.82
1	101	827	14.89	0.58	30.77	2.70	0.77
11	66	442	10.67	0.64	27.15	2.68	0.85
19	50	212	9.15	0.68	30.62	2.66	0.85
2	64	479	10.21	0.62	26.81	2.58	0.81
22	55	333	9.30	0.59	24.13	2.37	0.81
34	59	412	9.63	0.53	22.52	2.15	0.73
31	31	108	6.41	0.58	29.48	1.99	0.64
38	101	2140	13.04	0.26	14.44	1.19	0.35

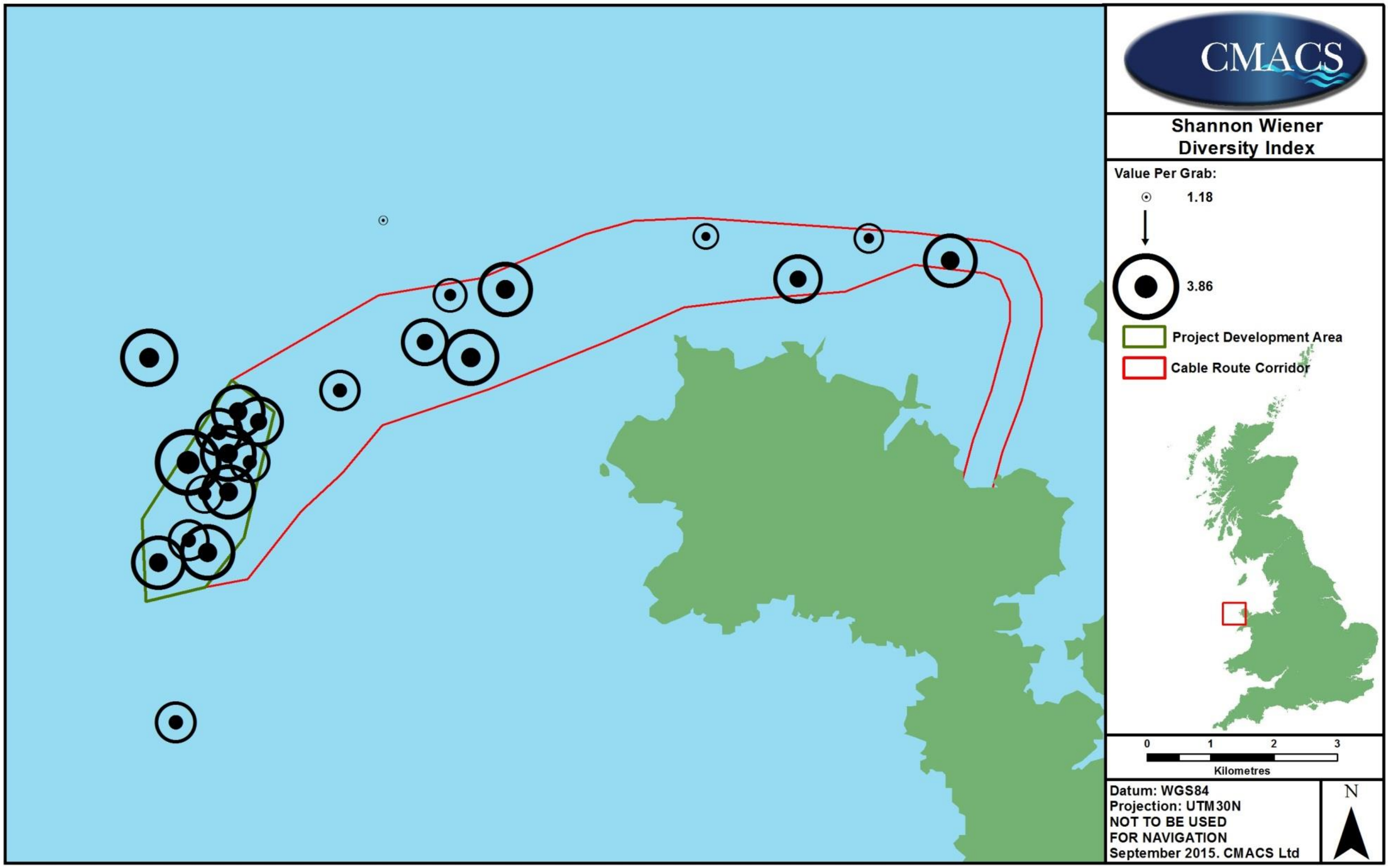


Figure 23. Shannon Wiener diversity indices at each grab station

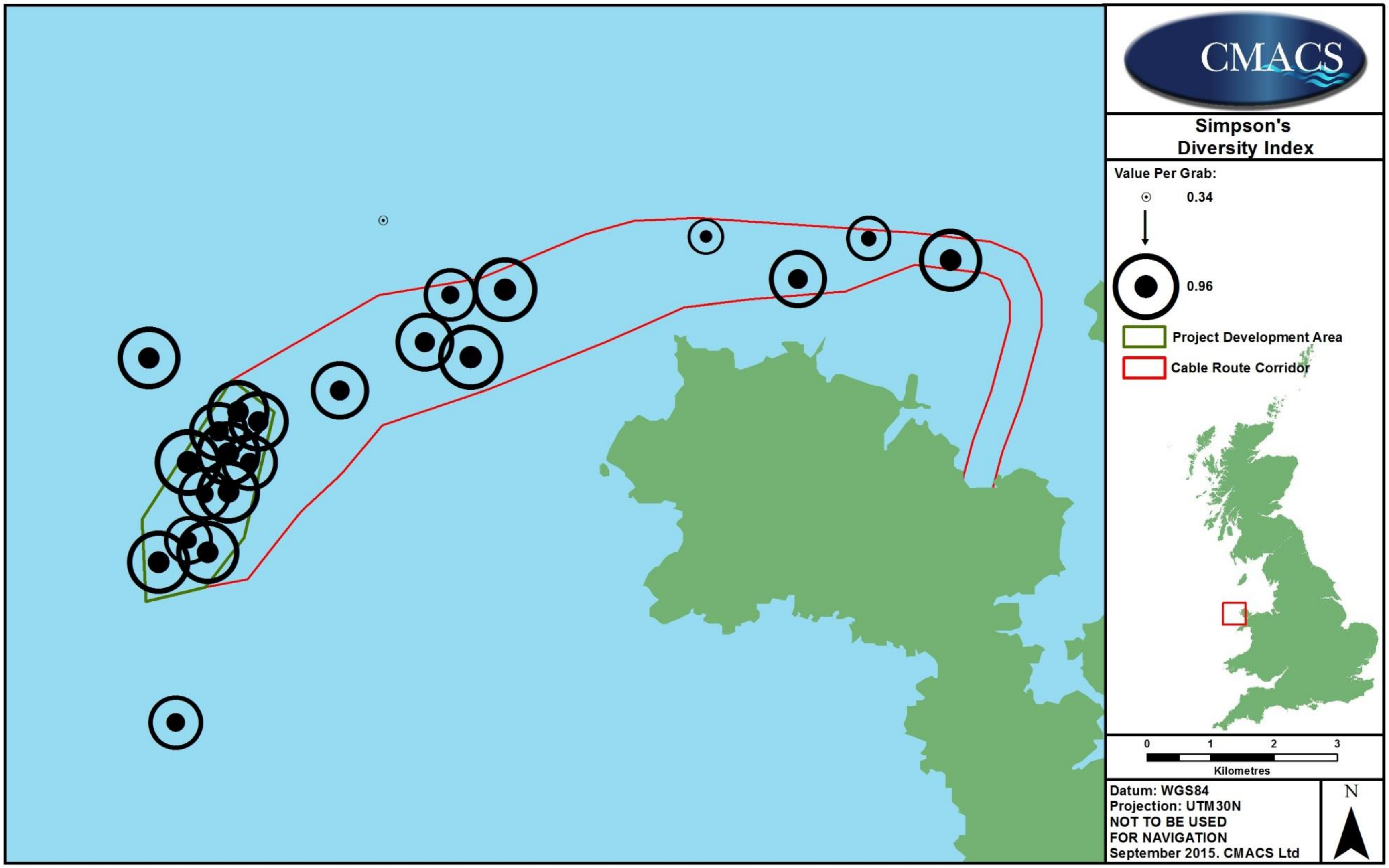


Figure 24. Simpson's diversity index at each grab station

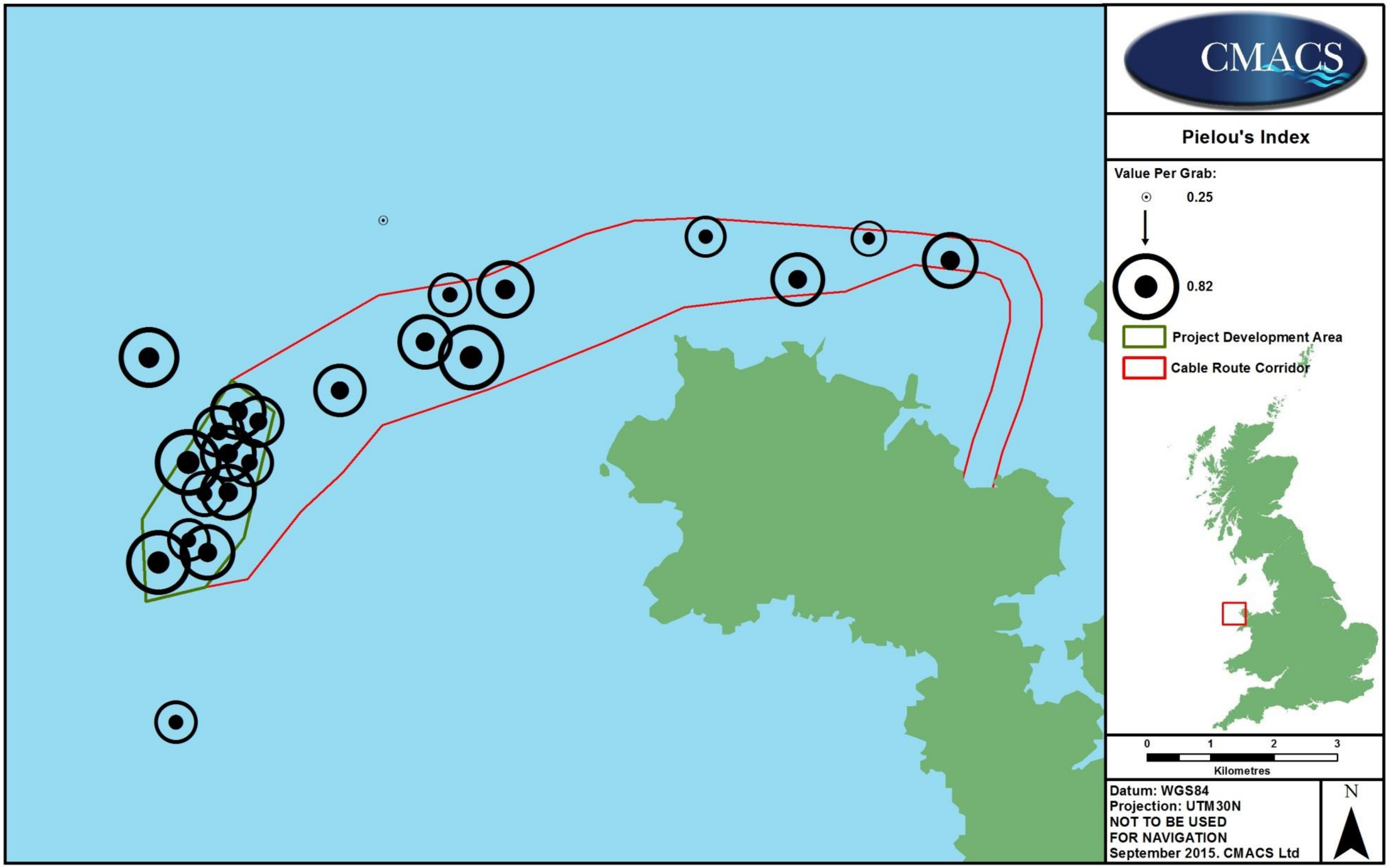


Figure 25. Pielou's diversity index at each grab station.

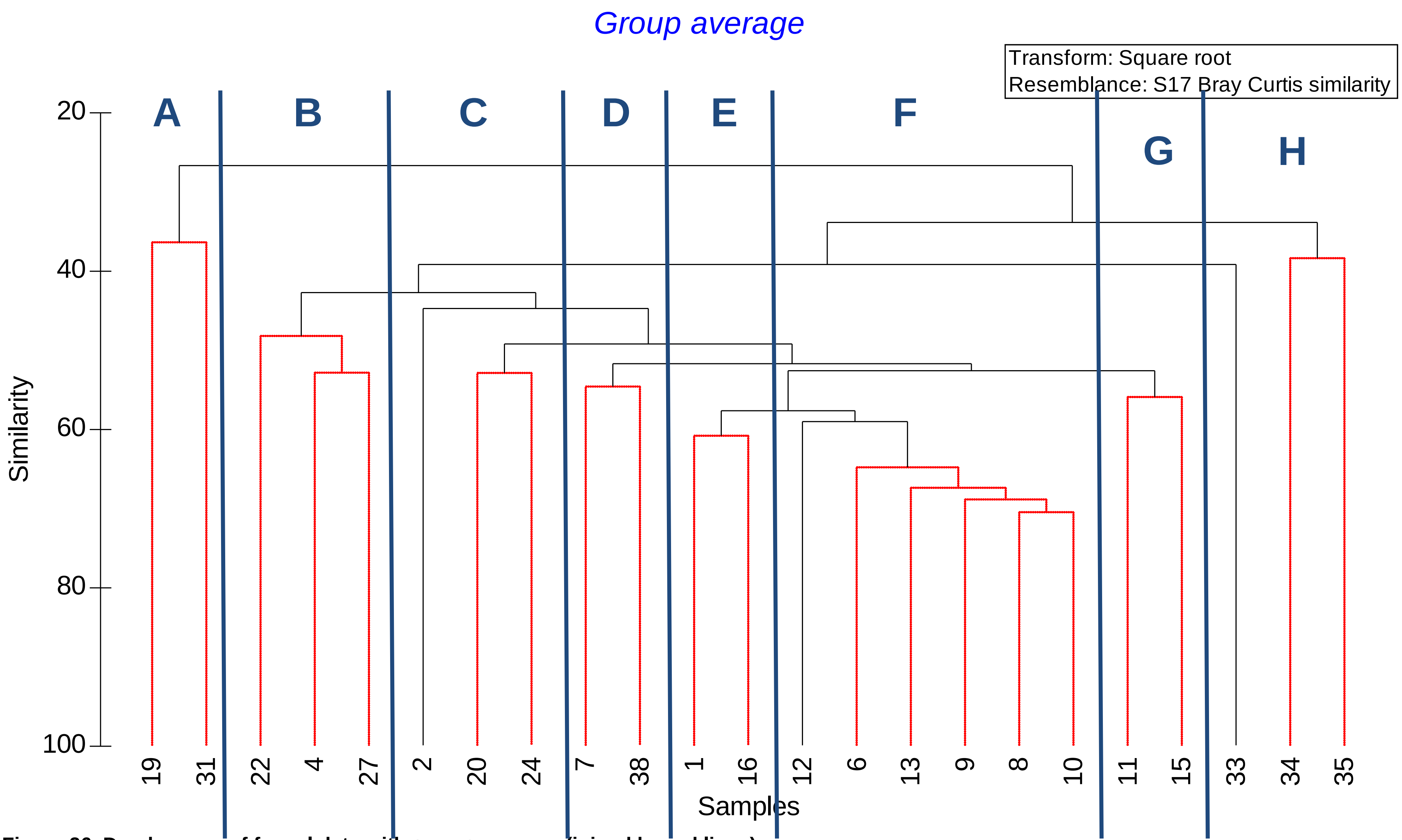


Figure 26. Dendrogram of faunal data with SIMPROF groups (joined by red lines).

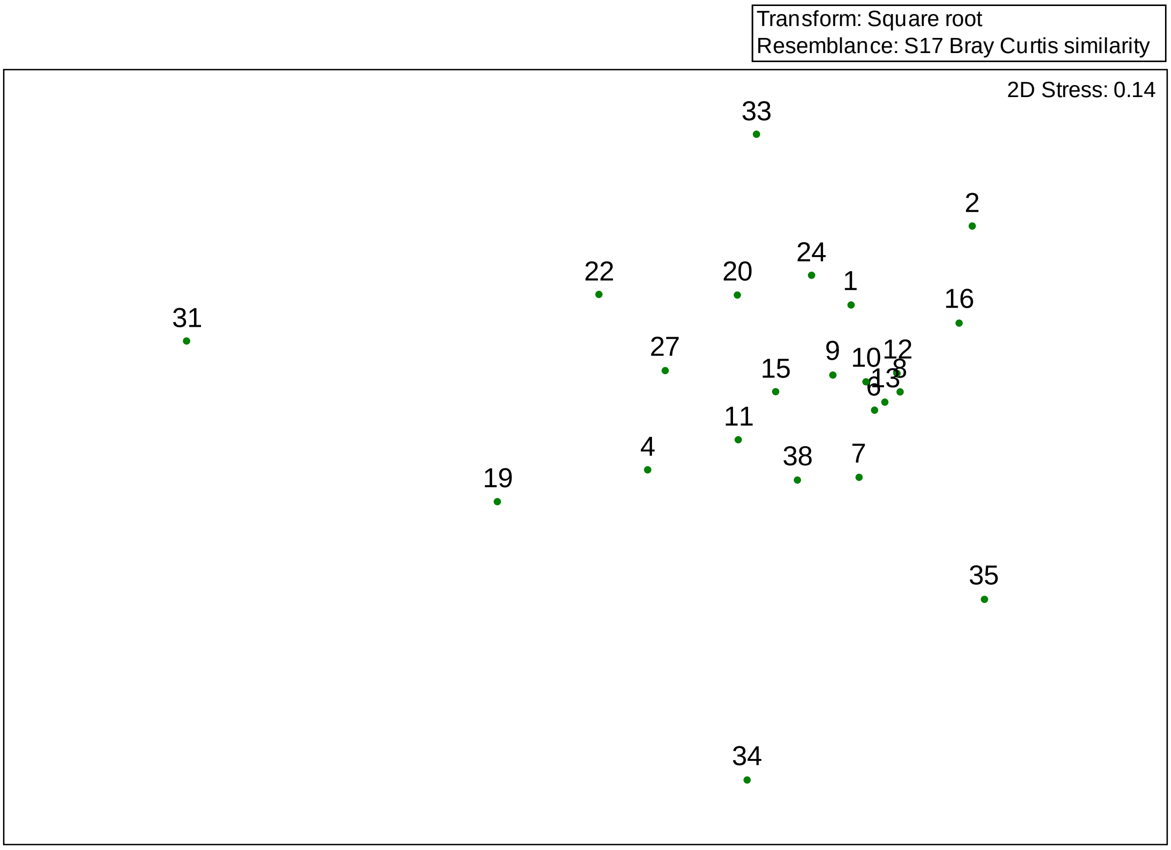


Figure 27. MDS plot of faunal data.

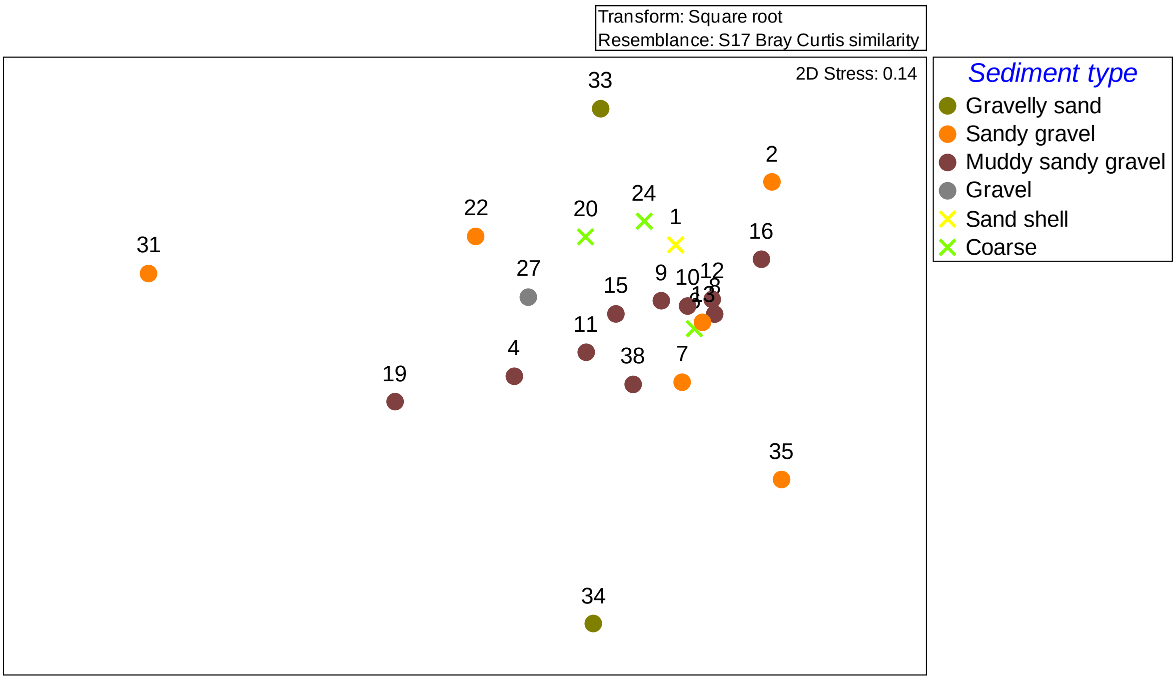


Figure 28. MDS plot of faunal data with sediment type. Cross symbols represent stations where no PSA sample was obtained and therefore sediment type has been described from drop down camera images.

3.2.3 Subtidal community structure

The groupings from the statistical analysis and the raw data from each station were analysed against the marine sublittoral biotope classifications for Britain and Ireland rich species (Connor *et al.,* 2004) and are summarised in Table 13. One grab sample at each station makes it difficult to fully describe the biotope communities accurately especially when not all stations were able to yield a sample for fauna or sometimes sediment analysis; however it is considered enough to characterise the overall seabed habitat along with the information from the drop down camera survey of the stations as discussed in Section 3.2.4 below.

The coarse sand and gravel sediments recorded from the PDA yielded a rich variety of species dominated by the tubeworm *S. spinulosa*, and a diverse mixture of annelid worms, crustaceans, tunicates, molluscs and nematode worms. Station 1 in particular had over 3,000 individual *S. spinulosa* worms per square metre. Depths at the PDA stations were between 71-88 metres and the sediments either sandy gravel or muddy sandy gravel. These stations are considered to be offshore circalittoral mixed sediments (SS.SMX.OMx) and a match (albeit not a very good one due to a low number of venerid bivalves and not all typical defining species being present) for the biotope **SS.SMX.OMx.PoVen**- Polychaete-rich deep Venus community in offshore mixed sediments. This deep Venus community (also described as the Boreal Offshore Gravel Association) is prevalent throughout the deeper parts of the Irish Sea. At the PDA this biotope is interspersed with the biotope **SS.SBR.PoR.SspiMx**- *Sabellaria spinulosa* on stable circalittoral mixed sediment at stations 1, 2, 8 and 12 where *S. spinulosa* counts were >1,316 individuals per m^2 (as defined for this biotope in Connor *et al.* (2004). Station 24 (depth 44m) on the CRC was also a match for this *S. spinulosa* biotope as was the near-field reference stations 16 (depth 67m) with 3,500 individual worms per m^2 and station 15 (depth 64m) 1,380 individuals per m^2. This biotope supports a diverse range of fauna and is usually recorded down to depths of 30m where the *S. spinulosa* tubes typically form loose agglomerations of tubes over a low lying matrix of sand, gravel and mud on the seabed. The stations where this biotope was recorded here are all deeper (between 44m-88m) than this but were nonetheless considered a close enough match based upon sediment type and species.

Station 38 located to the north of the CRC on muddy sandy gravel had extremely high numbers of barnacles *B. crenatus (*17,260 per square metre) as well as supporting high numbers of tunicates annelid and nematode worms and tunicates, molluscs and crustacea. The infaunal community recorded here is likely to be a variant of the deep Venus polychaete rich community (offshore circalittoral mixed sediments) as found at the PDA but the high number of barnacles indicates coarser material on the seabed such as cobble and pebble overlaying this biotope (this is discussed further in Section 3.2.4 below).

Along the CRC, stations 33, 34 and 35 along the north coast of Anglesey is considered a match for the biotope **SS.SCS.CCS.MedLumVen**- *Mediomastus fragilis, Lumbrineris* spp. This biotope also forms part of the 'Deep Venus' biotope complex/Boreal offshore gravel association (Connor *et al*., 2004). Species were similar to those identified from the polychaete-rich community (SS.SMX.OMX.PoVen) as identified at the PDA, but increased bivalve species and greater numbers of defining species for the MedLumVen biotope made it a better match. Stations 19, 20 and 21 within the CRC are all considered to be offshore mixed sediments more like the polychaete-rich deep Venus community as found at the PDA.

3.2.4 Camera survey fauna

Results from the drop down camera survey image analysis are provided in Appendix 9. All underwater photographs and any video footage from all stations are provided on DVD. The main habitats and species identified from the camera survey are discussed below.

3.2.5 Habitat classification/biotopes

The large majority of images showed a seabed of very coarse sediment, predominantly pebble and gravel but with varying proportions of cobble, boulder, sand and shells of dead bivalves. In the PDA, the seabed consisted mainly of pebble and gravel with sand and/or cobble at a few stations and a relatively small area supporting aggregations of *S. spinulosa*. At the western end of the CRC, the seabed consisted of coarser particles than in the PDA and there were also small areas of exposed bedrock. Bedrock became more prevalent further to the east in the PDA and was interspersed with areas of pebble and gravel as well biogenic reef. In the more eastern parts of the CRC, there were finer sediments including areas of predominantly sand but also an area of pebble and gravel supporting encrusting growths of *S. spinulosa* and another area of exposed bedrock.

Epifauna was variable but generally sparse (with a few exceptions) and was principally made up of scour tolerant taxa including various anemones, hydroids, erect bryozoa and epifaunal polychaetes.

Thirteen broad biotope classifications were assigned (see Table 12 for summary and Figure 29 for a map) which are described in full below, with selection of representative images of the different biotopes which. Notes on image analysis are provided in Appendix 9.

Note that at Station 32 two different biotopes were assigned to different photographs, and that at some locations more than one biotope was considered to be present.

With regard to those sample stations where there is both faunal and camera data, a comparison of assigned biotopes is provided in Table 12. Broadly, the assigned biotopes were similar between the two survey types with offshore mixed sediment classified from the camera survey refined to specific biotopes with the aid of infaunal data. Likewise, there was some agreement between the two surveys on *Sabellaria* biotopes although there were some stations that differed owing to *Sabellaria* being abundant but not obvious in the images. There were also some differences where epifauna-dominated biotopes had been assigned from the camera data but an infauna-dominated one had been assigned from the grab data. This was to be expected and in these cases, it is likely there is some spatial heterogeneity of the seabed. Where very coarse particles predominate, the epifauna-derived biotope will be prevalent and where there are patches of finer sediments (which the grab will select for in order to collect suitable samples), the infauna-derived biotope will be prevalent.

Table 12. Biotopes assigned at each sample station from camera survey (see also Figure 29)

Biotope	Stations	Depth range (metres)
CR.HCR.FaT	17, 18	56 to 71
CR.HCR.FaT.BalTub	23, 25, 38	35 to 38
CR.HCR.XFa	3	72
CR.LCR.BrAs.AntAsH	36	8
CR.MCR.Csab.Sspi	1, 24, 27	40 to 80
CR.MCR.Csab.Sspi/SS.SBT.PoR.SspiMx	16	66
CR.MCR.EcCr.UrtScr	19, 20, 21, 32	26 to 65
CR.MCR.EcCr.UrtScr/CR.HCR.FaT.BalTub	26, 28, 29	35 to 52
SS.SCS.ICS.SSh	30, 31	28 to 32
SS.SMX.CMx.FluHyd	6, 9, 10	77 to 87
SS.SMX.IMx	33, 34, 35, 37	6 to 22
SS.SMX.OMx	2, 4, 5, 7, 8, 11, 12, 13, 14, 39, 41	48 to 87
SS.SMX.OMx/CR.MCR.Csab	22	50
SS.SSA.IfiSa.ScupHyd	32	26

CR.HCR.FaT 'Very tide-swept faunal communities' Stations 17, 18.

Stations 17 and 18 were assigned this broad classification according to substratum type of bedrock, but could not be taken any further owing to the low diversity and abundance of the fauna.

Station 18 CR.HCR.FaT	**Notes**
	Bedrock with dahlia anemone *Urticina* sp., barnacles (probably a species of *Balanus*) and a low faunal turf probably of erect bryozoa and hydroids. Mobile fauna is restricted to a single painted topshell *Calliostoma zizyphinum*.

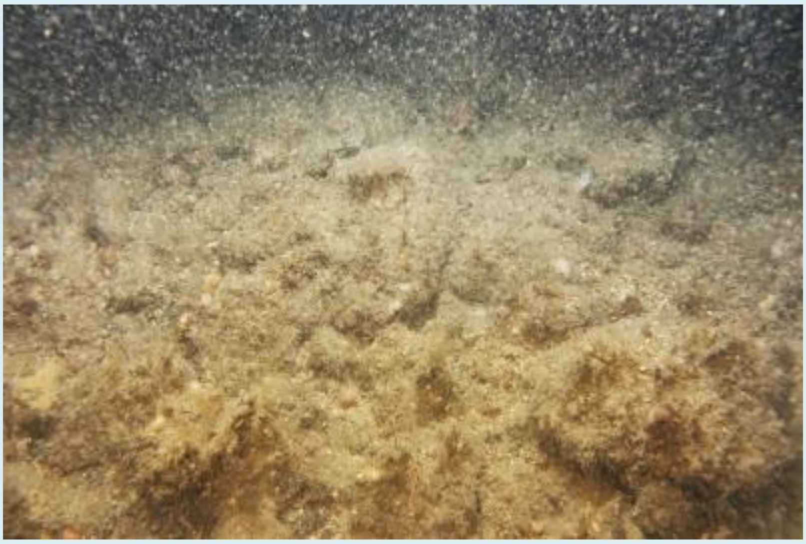
At three stations this biotope was further refined to CR.HCR.FaT.BalTub '*Balanus crenatus* and *Tubularia indivisa* on extremely tide-swept circalittoral rock' based on the abundance of barnacles but this can be considered as a 'best fit' as the epifauna at these stations was not as diverse as the biotope description suggests. Habitat at these stations was a mixture of boulder, cobble, pebble and gravel.

Stations 23, 25, 38.

Station 23 CR.HCR.FaT.BalTub	**Notes**
	Boulder, cobble, pebble and gravel with abundant barnacles. Dahlia anemone are present as is a small area of hydroid. Mobile fauna includes small gastropods (possibly *Nucella lapillus*) and a hermit crab (a member of the Paguridae family of indeterminate species).

<u>CR.HCR.Xfa</u> 'Mixed faunal turf communities' Station 3.

Only Station 3 was included in this classification, which was assigned owing to the dense coverage of the hard substratum with sessile epifauna, mainly hydroids and bryozoans the majority of which could not be identified further.

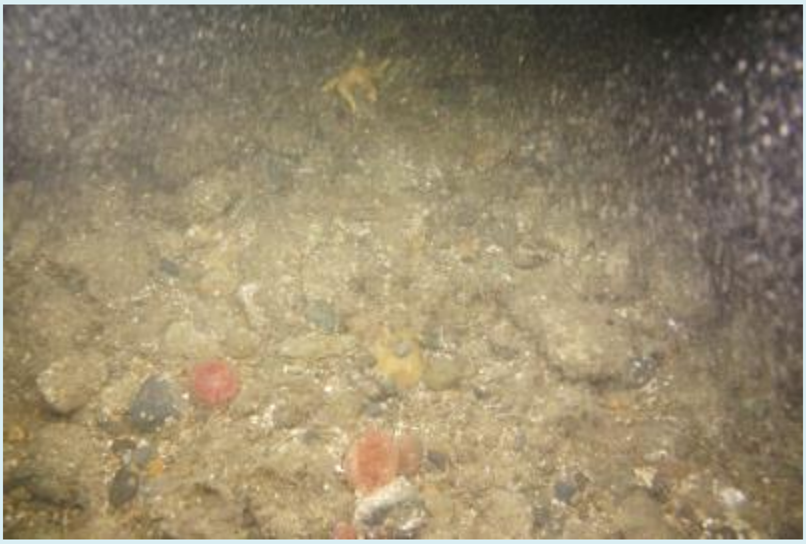
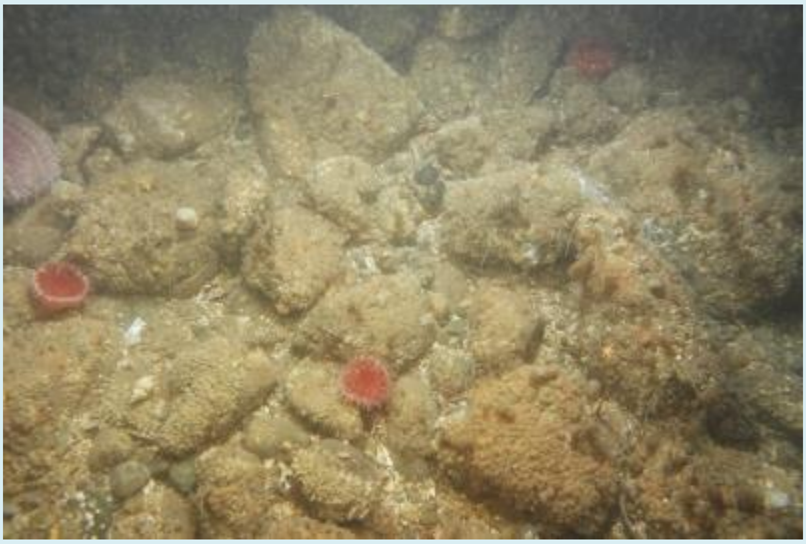
Station 3 CR.HCR.Xfa	**Notes**
	Cobble with some pebble, gravel and shell fragments. The larger particles are covered with a turf of erect fauna which may include the hydroid *Hydrallmania falcata* and the sponge *Hemimycale columella*.

CR.MCR.EcCr.UrtScr ‘*Urticina felina* and sand-tolerant fauna on sand-scoured or covered circalittoral rock’ Stations 19, 20, 21, part of 32.

This biotope was assigned to a number of stations mainly with habitat of cobble and pebble but with bedrock at one station. Epifauna was generally sparse and was characterised by scour-tolerant taxa such as dahlia anemone, keelworms (Serpulidae) and barnacles.

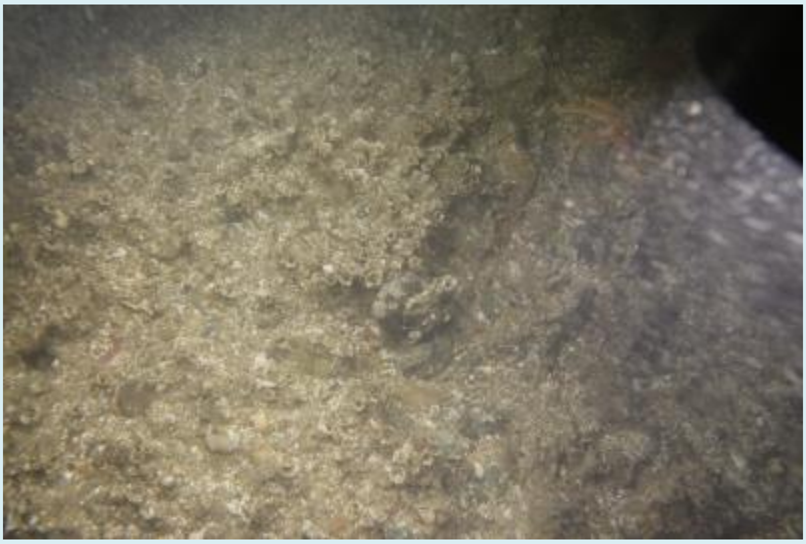
At a few stations, there was a slightly richer epifauna with characteristics of CR.MCR.EcCr.UrtScr but also some that matched CR.HCR.FaT.BalTub. To account for this, the stations in question were classified as a combination of the two biotopes.

Stations 26, 28, 29

Station 21 CR.MCR.EcCr.UrtScr	**Notes**
	Cobble, pebble and gravel with some shell fragments. A sparse covering of barnacles and faunal turf indicates regular disturbance of seabed particles. There are several dahlia anemones and a single common starfish *Asterias rubens*.
Station 28 CR.MCR.EcCr.UrtScr/ CR.HCR.FaT.BalTub	**Notes**
	Boulder and cobble with some pebble and shell. The larger particles are covered in a moderately rich epifauna of barnacles, ascidians (possibly *Dendrodoa grossularia* or *Distomus variolosus*) and the erect bryozoan *Alcyonidium diaphanum* as well as dahlia anemone *Urticina* sp. Mobile epifauna includes the sea urchin *Echinus esculentus*, the painted topshell *Calliostoma zizyphinum*, hermit crab and a small starfish.

<u>CR.MCR.CSab.Sspi</u> '*Sabellaria spinulosa* encrusted circalittoral rock' stations 1, 24, 27.

There were five stations where honeycomb/ross worm was deemed to be in sufficient abundance that a *Sabellaria spinulosa* biotope could be assigned. Images generally showed a few aggregations of *Sabellaria* sp., mostly on coarse particles such as cobble and pebble but with some sand and possibly bedrock. Only Stations 22, 24 (see below) and 27 were deemed to have a sufficient abundance and elevation of *Sabellaria* aggregations to be considered as reef which is discussed further in the next section. At Station 16, the seabed was made up of finer sediment than at the other stations with *Sabellaria* and this shared as many features of the subtidal sediment biotope (SS.SBR.PoR.SSpiMx) as the circalittoral rock and has been classified as a combination of the two.

Station 24 CR.MCR.CSab.Sspi	**Notes**
	Cobble and boulder (possibly bedrock) with elevated aggregations of *Sabellaria* sp.. A common starfish *Asterias rubens* and an indeterminate anemone species are also present.

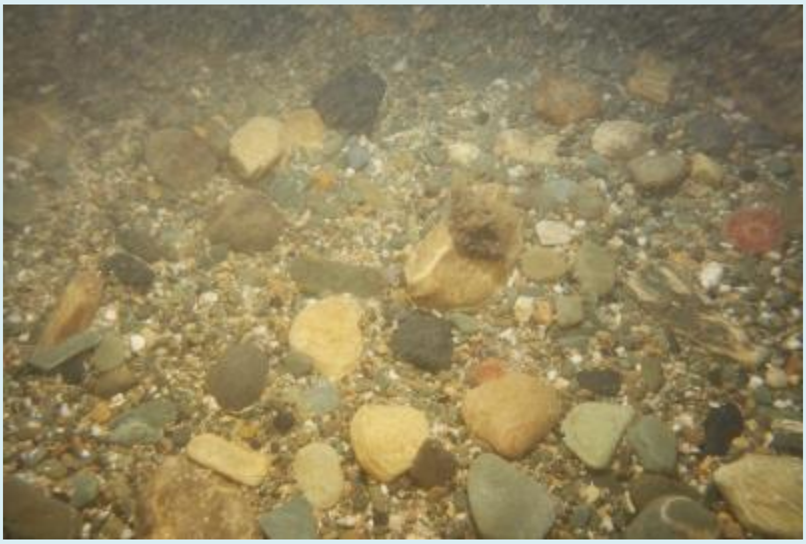
CR.LCR.BrAs.AntAsH '*Antedon* spp., solitary ascidians and fine hydroids on sheltered circalittoral rock' Station 36.

This biotope was assigned to a single station that was in a sheltered location on the cable route, as evidenced by the prevalence of a layer of fine sediment over bedrock. The epifauna was quite limited, and the characterising brachiopods were not seen (although these are typically very small and difficult to see in camera images) but there were numerous feather stars *Antedon bifida* and lightbulb sea squirt *Clavelina lepadiformis* which gave a best match for this biotope.

Station 36 CR.LCR.BrAs.AntAsH	**Notes**
	Silty bedrock or very large boulders. Identifiable epifauna was mainly feather stars and solitary ascidians but also with the erect bryozoan *Alcyonidium diaphanum*. There also appeared to be a short faunal turf and occasional fronds of a red alga

<u>SS.SCS.ICS.SSh</u> ‘Sparse fauna on highly mobile sublittoral shingle (cobbles and pebbles)’ Stations 30, 31.

The seabed at two stations was characterised by clean pebble and gravel, with an apparent lack of fine sediment, indicating that the sediment was mobile. At one station, there were cobbles the largest of which supported growths of mussels, which were probably *Musculus discors* and dahlia anemone were also present. The mussels were not at sufficient density to base a biotope classification on and the general lack of epifauna led to SS.SCS.ICS.SSh being assigned to this station.

Station 30 SS.SCS.ICS.SSh	**Notes**
	Cobble, pebble and gravel. Small aggregations of mussels, probably *Musculus discors*, on larger particles and one dahlia anemone.

<u>SS.SMX.IMx</u> 'Infralittoral mixed sediment' Stations 33, 34, 35, 37.

At two stations on the cable route, there were a variety of coarse sediment, predominantly gravel but with some cobble. Epifauna was sparse but more conspicuous than at station 30 (see above) which in combination with the likely presence of fine sediment and the relatively shallow depth of the station, it was designated as SS.SMX.IMx. The habitat at these stations are likely to be infauna-dominated and the biotope will be redefined upon interpretation of the grab faunal data.

Station 34 SS.SMX.IMx	**Notes**
	Gravel and pebble with hermit crabs, hydroids and serpulid worms.
Station 35 SS.SMX.IMx	**Notes**
	Cobble and pebble with some boulder and gravel. Epifauna includes various hydroids and anemones with gastropods and the brittlestar *Ophiura albida*

<u>SS.SMX.CMx.FluHyd</u> '*Flustra foliacea* and *Hydrallmania falcata* on tide-swept circalittoral mixed sediment' Stations 6, 9, 10.

There were three stations in the PDA, where the seabed was heavily encrusted with a faunal turf and all of them supported hornwrack *Flustra foliacea* though generally at low abundance. Other sessile fauna included sea anemones (*Sagartia* sp. and *Urticina* sp.), serpulid worms, the hydroid *Nemertesia antennina* and a sabellid worm at station 9.

Station 10 SS.SMX.CMx.FluHyd	**Notes**
	Pebble and gravel with coarse sand. Sessile epifauna includes *Flustra foliacea*, the hydroid *Nemertesia antennina*, sea squirts of indeterminate species and anemones possibly *Sagartia* sp. Mobile fauna visible in the image was restricted to bloody henry starfish *Henricia* sp.

<u>SS.SSA.IFiSa.ScupHyd</u> '*Sertularia cupressina* and *Hydrallmania falcata* on tide-swept sublittoral sand with cobbles or pebbles.'

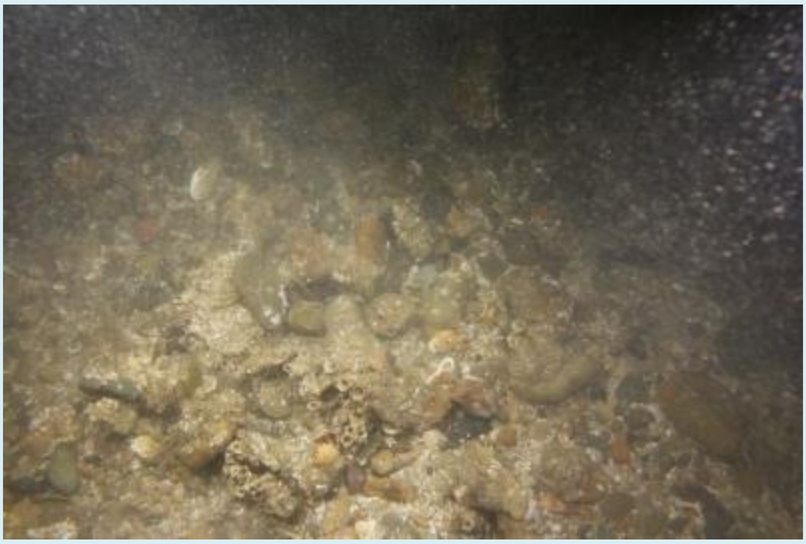
There was one station towards the eastern end of the CRC where five images were obtained one of which showed bedrock and anemones (see CR.MCR.EcCr.UrtScr above) but the remainder showed a seabed of showed a seabed of sand, gravel and dead bivalve shells. This supported a varied epifauna but hydroids dominated and the seabed in these images was classified as SS.SSA.IFiSa.ScupHyd.

Station 32 SS.SSA.IFiSa.ScupHyd	**Notes**
	Coarse sand and horse mussel shell. The horse mussel shell supports growths of hydroids including *Hydrallmania falcata*. Other sessile fauna includes serpulid worms and small anemones of an indeterminate species.

SS.SMX.OMx 'Offshore circalittoral mixed sediment' Stations 2, 4, 5, 7, 8, 11, 12, 13, 14, 39, 41.

At most stations in the PDA the seabed was of coarse particles, mainly pebble and gravel but with variable proportions of cobble and sand. There were variable quantities of epifauna between stations but it is likely that these stations are infauna dominated and therefore the classification was limited to SS.SMX.OMx.

Station 7 SS.SMX.OMx	**Notes**
	Pebble and gravel and some sand with *Modiolus* shell. Some of the larger particles support a faunal turf, a small patch of sponge and a hydroid that may be *Sertularia* sp.
Station 13 SS.SMX.OMx	**Notes**
	Pebble, gravel, shell fragments and broken *Sabellaria* tubes. Larger particles support faunal turf and serpulid worms. Mobile epifauna included a sea urchin *Psammechinus miliaris* and a crab of indeterminate species.

Station 41 SS.SMX.OMx	**Notes**
	Cobble, pebble and gravel with small aggregations of *Sabellaria* sp. This station was investigated for *Modiolus modiolus* reef which is further discussed in Section 3.2.6.

<u>SS.SMX.Omx/CR.MCR.Csab</u> Offshore circalittoral mixed sediment' and 'Circalittoral *Sabellaria* reefs'. Station 22.

At this station in the CRC, the seabed had many characteristics of the offshore mixed sediments seen elsewhere (particularly in the PDA) but also had some seabed coverage of *Sabellaria* aggregations, though not sufficient to assign the station purely to a *Sabellaria* biotope. As a result, this station was assigned as a combination of the two biotopes.

Station 22 SS.SMX.Omx/CR.MCR.Csab	**Notes**
	Gravel, pebble, cobble and probably boulder. Obvious epifauna consists of two relatively large aggregations of *Sabellaria* sp., anemones *Urticina* sp. and hydroids including *Hydrallmania falcata*.

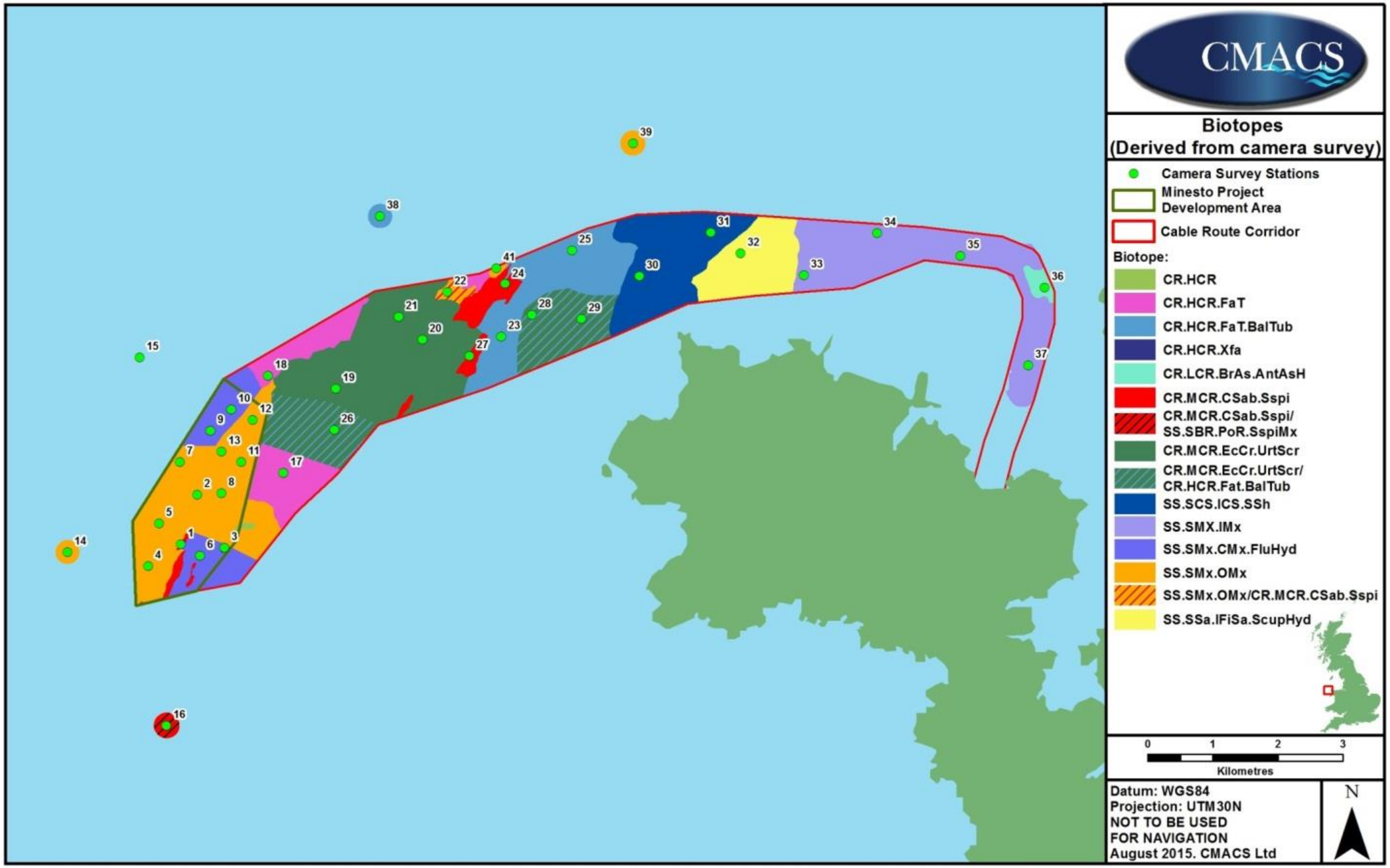


Figure 29. Indicative biotope map based on side scan sonar mosaic and drop down camera images.

Table 13. Comparison of biotopes in each of the SIMPROF groups (see Figure 24), with camera-derived biotopes also. Note: this table differs from Table 12 as it only considers stations where a grab was successfully obtained.

Simprof group	Sample station	Biotopes*	Biotopes‡
A	19, 31	SS.SMX.OMx.PoVen	CR.MCR.EcCr.UrtScr, SS.SCS.ICS.SSh
B	4, 22, 27	SS.SMX.OMx.PoVen	SS.SMX.OMx, CR.MCR.CSab.Sspi
C	2, 20, 24	SS.SBR.PoR.SspiMx, SS.SMX.OMX.PoVen	SS.SMX.OMx, CR.MCR.CSab.Sspi, CR.MCR.EcCr.UrtScr
D	7, 38	SS.SMX.OMx.PoVen	SS.SMX.OMx, CR.HCR.FaT.BalTub
E	1, 16	SS.SBR.PoR.SspiMx	CR.MCR.Csab.Sspi/SS.SBT.PoR.SspiMx
F	6, 8, 9, 10, 12, 13	SS.SBR.PoR.SspiMx	SS.SMX.CMx.FluHyd, SS.SMX.OMx
G	11, 15	SS.SMX.OMx.PoVen, SS.SBR.PoR.SspiMx	SS.SMX.OMx
H	33, 34, 35	SS.SCS.CCS.MedLumVen	SS.SMX.IMx

*based on grab sample data ‡based on drop down camera images

3.2.6 Habitats of conservation importance

Benthic images were screened for potential Annex I habitats which, where possible, were classified into a quality category according to present guidelines. Any other habitats of conservation importance were also noted. A map of habitat types extrapolated from benthic data, with reference to bathymetric and side scan sonar data is presented in Figure 30. Extensive bedrock platforms were obvious around stations 29, 32 and 36 (see Figure 2) though the outcrops at the western end of the CRC were bedrock only around station 17. Elsewhere on this part of the CRC (e.g. around stations 19-21), the seabed was predominantly of cobble and this was classified as stony reef. The majority of the PDA and large swathes of the CRC had a seabed of coarse sediment (e.g. gravel and pebble) with insufficient elevation to be considered stony reef but this habitat is further discussed below as a habitat of principal importance.

Sabellaria spinulosa was a common species in the grab samples and was found throughout the survey area but reef structures identified from benthic imagery were less widespread. Based on drop down camera images and reflectivity on the side scan sonar data, areas of differing reef quality were mapped and were mainly in the centre of the CRC. Each Annex I habitat is discussed further below.

Sabellaria spinulosa biogenic reef

There were five stations (see Table 14) with aggregations of *Sabellaria* sp. which were assessed against “reefiness” according to the guidelines of Gubbay (2007; defined in Table 15) and their approximate extent is mapped in Figure 30.

Table 14. Stations assessed for *S. spinulosa* reef

Station	Elevation	Area[5]	Patchiness	Reef quality
1	<2cm	19,000m^2	10%	Not a reef
16	<2cm	Unknown	10-20%	Not a reef
22	5-10cm	140,000m^2	10%	Low-medium
24	2-5cm	398,000m^2	20%	Low
27	2-5cm	123,000m^2	10%	Low

[5] These are estimates based on extrapolation of area from the sidescan mosaic.

Table 15. Assessment of reefiness according to Gubbay (2007)

Measure of 'reefiness'	Not a reef	Low	Medium	High
Elevation (average tube height, cm)	<2	2-5	5-10	>10
Area (m^2)	<25	25-10,000	10,000-1,000,000	>1,000,000
Patchiness (% cover)	<10	10-20	20-30	>30

Elevation and patchiness were estimated from still and video images, whilst the extent was estimated from sidescan images. At most stations where obvious aggregations of *Sabellaria* sp. were present, they were sparse and often restricted to encrusting the larger stones. The aggregations were generally not consolidating sediment and were typically of low elevation, and therefore were either considered to be "not a reef" (due primarily to lack of elevation), or of low 'reefiness' according to the guidance. At Station 22, due to the combination of elevation appearing to be predominantly between 5 and 10cm, and the considerable area involved (estimated 140,000m^2) the habitat is considered to represent low-medium reefiness, although even here the patchiness is estimated at around 10% which is at the lower limit of what is considered as reef.

Stony reef

There were nine stations (see Table 16) where the proportion of large particles was high enough that they might be considered as stony reef. These were assigned a reefiness score using the guidelines outlined in Table 17 (Irving, 2009).

Table 16. Stations assessed for stony reef

Station	Composition	Elevation	Extent	Biota	Patchiness	Reefiness
3	10-40%	<64mm	>25m^2	>80% epifauna	20%	Medium
19	<10%	<64mm	>25m^2	<80% epifauna	10%	Low
20	<10%	<64mm	>25m^2	<80% epifauna	30%	Low
21	<10%	<64mm	>25m^2	<80% epifauna	25%	Low
23	80%	64mm-5m	>25m^2	Likely epifauna dominated	>75%	Medium
25	50%	64mm-5m	>25m^2	Likely epifauna dominated	50%	Medium
28	80%	<64mm	>25m^2	Likely epifauna dominated	>75%	Medium
29	70%	64mm-5m	>25m^2	Likely epifauna dominated	>75%	Medium
35	20%	<64mm	>25m^2	<80% epifauna	20%	Low

Table 17. Guidelines for assessing stony reef according to Irving (2009)

		'Reefiness'		
Characteristic	**Not a 'stony reef'**	**Low**	**Medium**	**High**
Composition Boulders/cobbles (>64mm)	<10%	10-40% (Matrix supported)	40-95%	>95% (Clast supported)
Elevation	Flat or undulating seabed	<64mm	64mm-5m	>5m
Extent	<25m^2	← >25m^2 →		
Biota	Dominated by infauna			>80% epifauna
Patchiness	10%	10-50%	50-75%	>75%

None of the stations were classified as having high reefiness but there were five that were of medium and four of low reefiness. This was mainly of the basis of the physical characteristics as biota were limited in many cases.

Bedrock reef

There are no current guidelines specifically for determining the quality or reefiness of bedrock reef but there were four stations (17, 18, 32, 36) that could be assessed as this habitat. Arguably the elements of extent, patchiness and elevation could be used, whilst composition and biota are not relevant to assessing reefiness of bedrock. Although patchiness is unclear, the bedrock at the four stations identified as such was clearly between 64mm and 5m and extent was clearly over 25m^2, hence suggesting a medium reefiness according to these criteria. The substrate at Station 32 was certainly patchy to some degree, since both sedimentary and bedrock biotopes were identified at this station. The associated fauna at all four stations was neither rich nor diverse, typically consisting of scattered dahlia anemones with sparse hydroids, sponges and barnacles.

Possible horse mussel reef

The images of the seabed in the region of Station 41, where possible horse mussel reef was identified from sidescan sonar records, were reviewed but there was no indication of *Modiolus* reef (no grab data could be obtained from this Station). No live *Modiolus* were seen, and only one or two empty shells. A few *Sabellaria* tubes were seen, although these were sparse and therefore did not present *Sabellaria* reef. This station was classified as SS.SMX.OMx.

The faunal grab from Station 24 (on the CRC) yielded 11 individual *M. modiolus* (all small specimens) corresponding to 110 per m^2 and Station 33 yielded 70 per m^2 (both levels are high enough to be potential *Modiolus modiolus* reef e.g. Tyler-

Walters (2007) and Dr. T.J.Holt pers comm). Station 24 was dominated by the *S. spinulosa* community and there was no evidence from the camera survey of any *M. modiolus* aggregations at either of these stations. It is therefore likely that these were individuals growing on the coarse sediments interspersed with the *S. spinulosa* aggregations.

Tide-swept channels

The 'Tide-swept channels' habitat was identified by Xodus in the Scope of Works as being near, but not present, in the PDA. This habitat is a habitat of principal importance in Wales (previously UKBAP). Results from the drop down camera are in agreement with this; while the seabed was subject to strong tidal currents, it did not support the diverse array of epifauna that is typical of tide-swept channels such as that found between The Skerries and mainland Anglesey located a few miles to the north-east of the PDA and CRC.

Sublittoral sands and gravels

This habitat (including muddy sands) is a Marine Conservation Zone (MCZ) feature of interest and is also a habitat of principal importance in Wales (previously UK BAP). Most of the sediments of the PDA and CRC were described as this habitat.

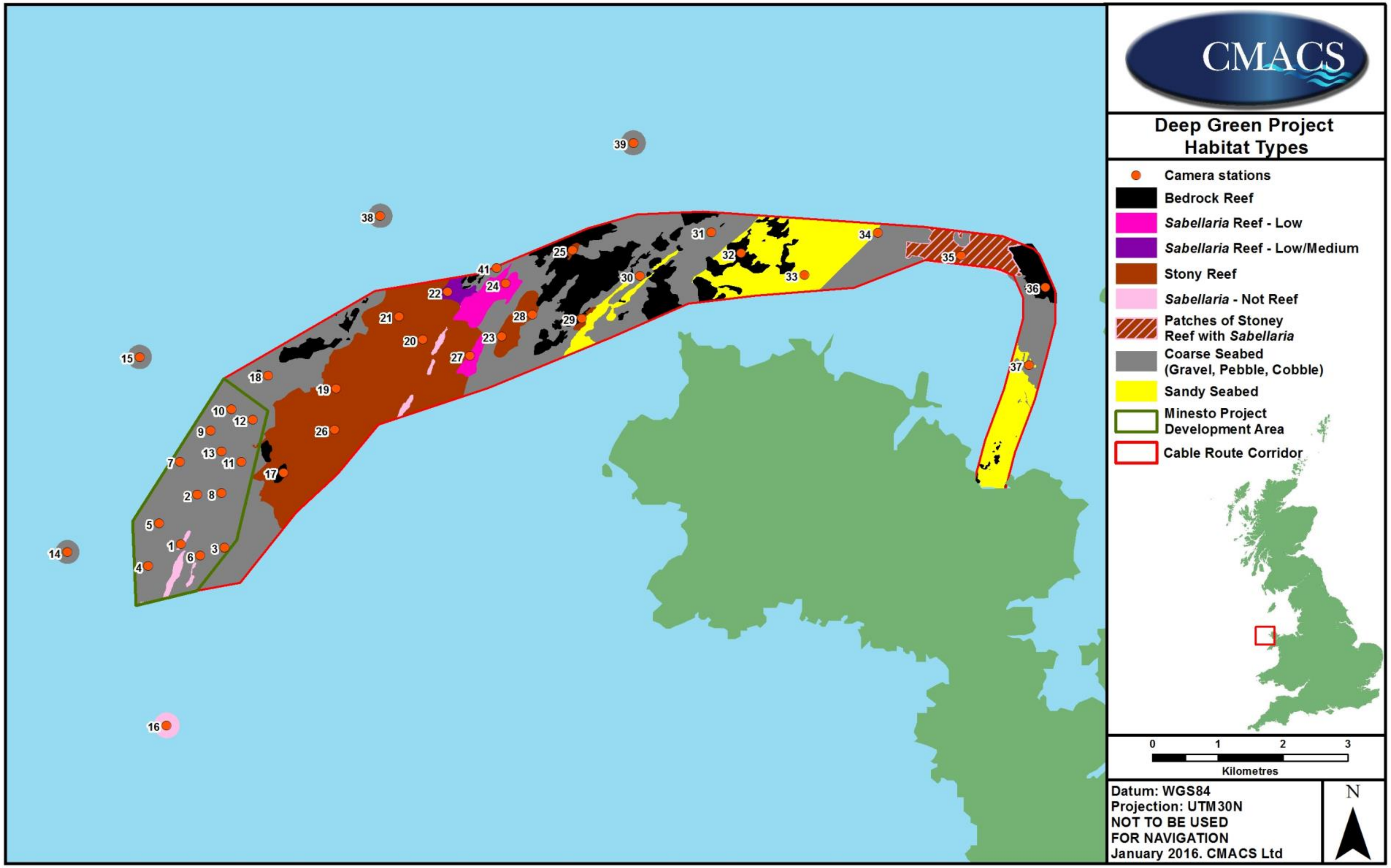


Figure 30. Habitat types and reef quality in the PDA, CRC and on reference stations.

4. DISCUSSION AND CONCLUSIONS

Sediments

Results from the camera and grab survey showed the main seabed habitats to be coarse sands and gravel with pebble, cobble, boulders and some outcrops of bedrock at the western end of the CRC. Sediments at the PDA were mainly coarse sands and gravels with occasional pebble and cobble. Muddy sand was recorded from the inshore CRC area. Because of the coarse sediments the majority of stations were sampled using the camera as they were considered unsuitable for grab sampling e.g. exposed bedrock and areas of cobble. Some of the infaunal grab samples were retained for analysis despite only small amounts of material being obtained. The rationale for this was the high number of stations failing to yield any samples from the grab survey and the fact that some qualitative information on the infaunal species could be obtained which would assist the characterisation of the seabed habitats.

The contaminant analysis revealed elevated levels of certain trace and heavy metals within the seabed sediments. The sediments of the Irish Sea potentially act as a sink for contaminants. Elevated metal concentrations in these sediments originate from inputs as a result of processes such as natural mineralization (weathering), mining, industrial and other anthropogenic sources, with estuaries along the coasts of Anglesey, North Wales and North West England acting as a source. The concentration of metals within marine sediments in the coastal zone and around the estuaries of the region are generally higher than offshore as a result of this riverine input. Cadmium, mercury, lead and zinc all have relatively high residues occurring in the eastern Irish Sea sediments (Defra, 2000).

High concentrations of aluminium (relative to the other trace and heavy metals tested for) were recorded at all stations. This metal is present in marine sediments resulting from erosion of land masses and may also be discharged from anthropogenic sources such as mining or industry and are often found in high levels around the UK coastline (Langston *et al.,* 2003), especially in or near large estuaries (Cole *et al.,* 1999).

Although well below the Probable Effects Level (PEL), arsenic levels were recorded above the ISQG levels at all but two of the thirteen stations tested for heavy and trace metal contaminants. Arsenic is historically recorded at elevated levels in the eastern Irish Sea (e.g. Camacho-Ibar *et al.,* 1992). Studies have found that such elevated arsenic levels are not attributable to anthropogenic sources of pollution such as historic offshore dumping activities (sewage sludge can contain arsenic) or direct introduction to the riverine system (Leah *et al.,* 1992). Instead the main sources are thought to be of natural origin as a result of weathering of glaciated regions such as North Wales and the Lake District (e.g. Thornton *et al.,* 1975). Nickel was also found to be above the Cefas Action level 1 at two stations. Nickel source in the marine environment can be attributed to riverine input.

Other trace elements present in very high concentrations in the sediments of the eastern Irish Sea are zinc and lead as a result of historic sphalerite and galena mining in the past (Elderfield *et al.,* 1971). Of these two metals, only lead was found to be elevated slightly above guideline levels at three stations (all located within the CRC) but well below the level of probable effect.

Mercury was found in low concentrations across the area but raised above the ISQG and Action Level 1 at one station within the PDA. Mercury source in the marine environment is attributable to historic industry and mining sources e.g. Camacho-Ibar (1992) found the level of mercury within sediments at the mouth of the Mersey Estuary to be almost six times higher than natural background levels as a result of the past discharges into the river from the chloro-alkali chemical industry. However, reduced inputs of mercury in recent times have resulted in some long-term reduction in sediment concentrations throughout the Liverpool Bay area (Leah *et al.*, 1993).

Although some of the trace and heavy metal contaminants were recorded as being above the ISQG levels, none were above the level of probable effect (PEL level). It is therefore determined that the areas sampled within and around the PDA and CRC areas do not harbour any sinks for metal contaminants and that all metal contaminant levels recorded were as expected for the sediments of the eastern Irish Sea.

Contaminants such as hydrocarbons reach the sediments of the marine environment via sewage discharges, surface run-off, industrial discharges, oil spillages, offshore oil and gas production activity and deposition from the atmosphere. The Irish Sea as a whole is thought to contain relatively large amounts of hydrocarbons attributable in particular to oil and gas extraction activity, shipping and proximity to pyrogenic sources (Defra, 2000). Levels of hydrocarbons in the sediment were found to be low across of the PDA and CRC areas and comparable to those from surveys in support of developments in this part of the Irish Sea.

Fauna

The analysis of the fauna from the grab and camera surveys found the stations to be extremely rich and generally very diverse in species, as is often typical of offshore sands and gravels (JNCC, 2015). All fauna identified has previously been recorded from the Irish Sea and analysis indicated that the faunal community at almost all of the stations was characterised by a relatively high abundance of the tube-building polychaete *Sabellaria spinulosa* and the highly aggregative ascidian *Dendrodoa grossularia*. The habitat was classified as being a best fit (rather than an excellent match) for the ‘Deep Venus’ complex (also known as the Boreal offshore gravel complex) on coarse gravelly sediments with patches of *Sabellaria spinulosa* biotope, as identified at the PDA and CRC. These are both very rich communities which can also be quite variable over time.

The ‘Deep Venus’ (which includes the MedLumVen habitat) biotope is prevalent throughout the offshore areas of the Irish Sea (Connor *et al*, 2004). Classification to this biotope was more of a best fit rather than an excellent match as although samples were very speciose not all defining species for these biotopes were present and low numbers of venerid bivalves were indeed recorded. Venerid bivalves are often under sampled in benthic grab surveys and as such may be inconspicuous in many infaunal data sets (Connor *et al.*, 2004). This is likely to be the case here. Additionally, Connor *et al*, (2004) also states that there are likely a number of sub-biotopes for this biotope complex which are yet to be defined (Connor *et al.*, 2004).

Potential Annex I reef habitat was identified as being present across the PDA and CRC areas. This reef habitat included biogenic reef (*Sabellaria spinulosa*), stony reef and exposed bedrock reef.

Although high numbers of *S. spinulosa* were recorded from across the PDA and CRC, the camera survey revealed that the aggregations were sparse and restricted to encrusting pebble and cobble and were generally not consolidating and therefore not considered to be reef. At one station on the CRC, the *S. spinulosa* aggregations had a greater elevation covering a larger area and were assessed as being of low-medium reefiness, although the patchiness was estimated at around 10%, which is at the lower limit of what is considered as reef. Epifauna recorded from this station were anemones including Urticina sp., hydroids including *H. falcata* and the keel worm, *P. triqueter.*

Low or medium quality stony reef was recorded from the camera survey at nine locations (one in the east of the PDA, the rest from within the CRC) these sites were considered as being likely epifaunal dominated but assessment of reef classification was interpreted mainly from the physical characteristics of the habitat rather than the epifauna which was mainly sparse. Epifaunal species included encrusting barnacles, tunicates, anemones and bryozoans.

At a further four stations (all located within the CRC), areas of bedrock were tentatively described as being of medium 'reefiness' (there are no current guidelines for determining bedrock reef quality). The associated epifauna for all four of these stations was neither rich nor diverse, typically consisting of scattered dahlia anemones with sparse hydroids, sponges and barnacles.

Although known to be present off the North Wales coastline (e.g. within the Pen Llyn a'r Sarnau SAC) no potential horse mussel (*M. modiolus*) reef (an Annex I reef habitat) was recorded in the survey. Elevated numbers of horse mussels recorded at two sites were not aggregated into reef formations. The 'tide-swept channel' habitat, a habitat of principal importance in Wales (previously UKBAP) was also considered but concluded not to have been recorded in the survey.

Most of the sediments at the PDA and CRC were described as being sublittoral sand and gravels (including muddy sands). This is a habitat of principal importance in Wales (formerly UKBAP) and is also a Marine Conservation Zone (MCZ) feature. Sand and gravel habitats are widespread in UK waters (JNCC, 2015). In deeper areas, these habitats can support some of the richest marine life communities with a variety of annelids, bivalves, anemones. Offshore gravel and sand habitats are also important habitats for commercially fished species such as scallops and flatfish and are also important nursery grounds for other commercially fished species and species of conservation interest e.g. elasmobranchs (JNCC, 2015).

No other rare or designated species or habitats were recorded.

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Appendix 1 Survey Position Fixes

Sample station	X_WGS84	Y_WGS84	X_UTM30N	Y_UTM30N	Notes
1	-4.794403	53.294022	380402.2	5906480.6	Possible *Sabellaria*
2	-4.790912	53.300907	380654.0	5907240.6	Possible *Sabellaria*
3	-4.784285	53.293723	381075.6	5906430.4	
4	-4.80175	53.290885	379903.7	5906143.9	Bedrock camera station only
5	-4.799557	53.296818	380066.5	5906800.3	
6	-4.789824	53.292527	380703.2	5906306.6	
7	-4.795046	53.305406	380391.1	5907748.0	Rough ground
8	-4.785324	53.301185	381027.2	5907262.2	
9	-4.788158	53.309826	380862.3	5908228.0	
10	-4.783455	53.312815	381184.0	5908552.7	
11	-4.780885	53.305622	381335.2	5907748.3	Rough ground
12	-4.778552	53.311457	381506.8	5908393.5	
13	-4.785603	53.306936	381024.5	5907902.3	
14	-4.82048	53.292538	378660.1	5906359.5	Reference station (near field)
15	-4.804991	53.319706	379768.7	5909355.3	Reference station (near field)
16	-4.796617	53.268956	380184.5	5903696.2	Reference station (near field)
17	-4.771135	53.304246	381981.1	5907579.1	Bedrock camera station only
18	-4.775261	53.317586	381743.0	5909069.8	Bedrock camera station only
19	-4.759563	53.316073	382784.5	5908875.6	
20	-4.739844	53.323082	384117.0	5909623.1	Possible *Sabellaria*
21	-4.745435	53.326206	383753.1	5909979.7	
22	-4.734344	53.329751	384501.2	5910356.0	Possible *Sabellaria*
23	-4.721662	53.323822	385329.9	5909676.0	
24	-4.721003	53.331114	385393.3	5910486.0	Possible *Sabellaria*

Sample station	X_WGS84	Y_WGS84	X_UTM30N	Y_UTM30N	Notes
25	-4.705757	53.335922	386421.2	5910996.5	Bedrock camera station only
26	-4.759635	53.31036	382764.0	5908240.3	
27	-4.728884	53.321008	384841.3	5909374.7	Possible *Sabellaria*
28	-4.714642	53.326888	385805.5	5910005.8	
29	-4.703179	53.326528	386568.0	5909947.5	
31	-4.673871	53.338877	388551.9	5911275.0	
32	-4.666905	53.336037	389008.3	5910948.2	Bedrock camera station only
33	-4.652111	53.333258	389986.2	5910616.2	
30	-4.685847	53.332822	387738.7	5910620.3	Possible bedrock maybe camera station only
34	-4.63548	53.339294	391108.9	5911262.2	
35	-4.616078	53.336406	392393.3	5910911.6	
36	-4.596539	53.332317	393684.1	5910427.4	
37	-4.599913	53.321505	393432.5	5909229.7	
38	-4.750299	53.340012	383466.8	5911523.3	Cable route reference station
39	-4.692353	53.350938	387353.3	5912645.6	Cable route reference station
40	-4.713192	53.309428	385855.5	5908061.4	Cable route reference station
41	-4.630739	53.322965	391383.1	5909438.6	Cable route reference station

Appendix 2 Field notes from Camera survey

Station Number	Date	Time (BST)	Depth (m)	Fix on bottom	Image Number	Description & notes
36	24/6/15	16:15	12.6	48 to 50	18 to 23	Boulders covered in silt and epifauna. *Asterias rubens*, hydroids and one anemone.
35	24/6/15	16:42	22.1	52 to 56	24 to 31	Coarse seabed, pebble, gravel, some cobble. Possible encrusting *Sabellaria*, hydroids
34	24/6/15	17:06	25.0	57 to 61	32 to 37	Shelly gravel with hermit crab (one image) and hydroid, possibly *Rhizocaulus*.
33	24/6/15	17:16	26.2	62 to 66	38 to 43	Gravel and *Modiolus* shell. Hermit crab, some hydroid.
32	24/6/15	17:36	28.0	67	44	Only one image which was a veneer of sediment over bedrock, numerous *Urticina* sp.
37	24/6/15	18:08	10.8	68 to 72	45 to 50	Sand and silt
32	25/6/15	08:55	28.6	73 to 76	51 to 54	Gravel and shell, pebbles with abundant hydroids
31	25/6/15	09:20	30.8	77 to 81	55 to 59	Clean gravel and pebble. Two *Urticina* sp. in image 59.
30	25/6/15	09:35	34.5	82 to 86	60 to 64	Clean pebble and cobble, some encrusting growths and *Urticina* sp.
25	25/6/15	09:50	37.1	87 to 89	65 to 67	Cobbles and boulder over bedrock. Numerous *Urticina* sp., *Henricia* and *Crossaster*, hydroids.
29	25/6/15	15:50	N/A	N/A	68	Coarse seabed. Currents very strong and pulled camera over. Small-spotted catshark in video.
29	27/6/15	06:35	39.2	108	69	Boulder or cobbles with abundant epifauna including hydroids, *Urticina* and keelworm

Station Number	Date	Time (BST)	Depth (m)	Fix on bottom	Image Number	Description & notes
28	27/6/15	06:49	40.7	109	70	Boulder and cobble with epifauna
24	27/6/15	07:00	43.8	110	71	Pebbles with *Sabellaria* and an *Asterias rubens*
41	27/6/15	07:29	51.9	111	72	Pebbles with some *Sabellaria* tubes
23	27/6/15	07:48	42.5	112	73	Cobble, boulder with epifauna including *Urticina*
27	27/6/15	07:58	47.4	113	74	Pebble and gravel, some *Sabellaria*, prawn seen in video
22	27/6/15	08:09	53.8	114	75	Pebble and gravel, some *Sabellaria*
20	27/6/15	08:20	54.9	115	76	Pebble, gravel, shell and cobble
21	27/6/15	08:30	63.6	116	77	Pebble and cobble, *Urticina*, *Asterias* and hydroids
19	27/6/15	08:42	69.7	118	78	Cobble and pebble, one *Urticina*
26	27/6/15	08:55	55.0	119	79	Cobble and pebble
17	27/6/15	09:22	56.0	120	80	Bedrock with *Flustra* and sponges
11	27/6/15	09:30	82.6	122	81 & 82	Pebbles and cobbles, visibility not great owing to strong tide
8	27/6/15	09:38	83.6	123	83	Camera on its side? Some *Flustra* seen
2	27/6/15	09:49	N/A	N/A	-	No visibility, camera probably landed on its side
38	27/6/15	10:48	79.3	125	84	Gravel and pebble, one *Urticina*

Station Number	Date	Time (BST)	Depth (m)	Fix on bottom	Image Number	Description & notes
39	27/6/15	11:37	39.8	126	85	Gravel and pebble, hydroids, barnacles and hermit crabs
18	29/6/15	14:44	74.0	173	86	Visibility not great, bedrock with barnacles and *Urticina* and painted topshell
12	29/6/15	14:54	71.0	175	87	Stills camera froze only got an image just as the camera lifted off the seabed. Seabed of pebbles with barnacles and hydroids
10	29/6/15	15:05	84.6	177	88	Pebble and cobble, *Flustra* and *Asterias*, hydroids
9	29/6/15	15:17	88.4	178	89	Pebbles and gravel with some shell, hydroids. Dogfish on video
13	29/6/15	15:26	85.7	180	90	Pebble and sand with hydroids
7	29/6/15	15:41	86.8	181	91	Pebble and shell with hydroids and gravel
2	29/6/15	15:51	88.0	182	92 & 93	Pebble, gravel and shell. Hydroids and some encrusting *Sabellaria*
8	29/6/15	16:03	79.8	183	94	Cobble and pebble with *Asterias*
3	29/6/15	16:16	75.3	184	95	Cobble and boulder with hydroid
6	29/6/15	16:29	79.5	185	96	Pebble and gravel with *Urticina* and hydroid and *Flustra*
1	29/6/15	16:36	81.2	186	97 & 98	Sand and shell possibly with boulder or cobble
5	29/6/15	16:45	80.4	187	-	No still image – fault with camera, video okay. Pebble, gravel and cobble, quite clean some serpulids
4	29/6/15	16:57	81.5	188	99	Pebble and gravel
16	29/6/15	17:16	67.0	189	100	Sand, shell and gravel with hydroids. Broken *Sabellaria* tubes make up much of sediment, some pebble

Station Number	Date	Time (BST)	Depth (m)	Fix on bottom	Image Number	Description & notes
14	29/6/15	17:36	51.6	190	101	Gravel, pebble and shell
15	29/6/15	17:50	63.9	191	102	Very poor visibility but looks like pebble and gravel with a starfish.

Appendix 3. Field notes from Grab survey

Sample number	Date	Time (UTC)	Depth (m)	Fix	Sample volume (litres)	Sediment description
35b	25/6/15	11:21	19.3	18091	5	Sand, gravel, pebble, larger particles, some epifauna. Attempt a (fix 18090) failed to obtain a suitable sample.
35d	25/6/15	11:34	19.7	18093	5	Sand, gravel, pebble, larger particles, some epifauna. Attempt c (fix 18092) failed to obtain a suitable sample.
34a	25/6/15	11:49	22.6	18094	6	Sand and gravel
34d	25/6/15	11:57	22.6	18097	2	Sand, gravel, pebble, *Sabellaria* aggregation. Kept for PSA but not contaminants. Attempts b & c (fixes 18095 and 18096) failed to obtain a suitable sample.
33a	25/6/15	12:11	24.8	18098	7	Shelly sand and gravel, some pebble, *Sabellaria* aggregations encrusting pebble
33b	25/6/15	12:13	24.2	18099	5	Shelly sand and gravel with some pebble
31b	25/6/15	12:32	30.5	18102	6	Coarse sand, pebble and gravel, large polychaete, hermit crab, anemone. Attempt a (fix 18101) failed to obtain a suitable sample.
31d	25/6/15	12:39	30.6	18104	7	Pebble and gravel with some coarse sand and shell. Attempt c (fix 18103) failed to obtain a suitable sample.
30	25/6/15	12:59	34.9	18105-7		Three attempts, all unsuccessful (no sample at all)
37	27/6/15	11:31	8.4	18127-34	≤2	3 attempts with Day grab, 5 attempts with Hamon grab. Small samples of fine sand and pebble. No sample taken.
41	29/6/15					3 attempts, no sample, a few grains of sand in grab (re-attempted on 1st July)
24	29/6/15					As above

Sample number	Date	Time (UTC)	Depth (m)	Fix	Sample volume (litres)	Sediment description
27b	29/6/15	07:25	47.6	18141	≈3	Small sample but taken for fauna. Attempt a (fix 18140) failed to obtain a suitable sample.
27c	29/6/15	07:34	44.9	18142	≈2	Small sample but taken for PSA only
20a	29/6/15	07:49	54.9	18143	≈3	Cobble, pebbles, some finer sediment, anemones, crab, hydroids.
20d	29/6/15	08:00	54.8	18146	≈2	1 large cobble and some pebbles. No sample kept. *Sabellaria* on the cobble. Attempts b & c (fixes 18144 and 18145) failed to obtain a suitable sample.
21	29/6/15	08:10	62.0	18147-49	≤1	Pebble and gravel. Some shell fragments and soft clay (?), barnacles. No sample obtained.
22c	29/6/15	08:39	53.2	18152	2-3	Pebble, gravel, shells, some sand and clay. *Sabellaria* tubes. Small sample but kept for fauna. Attempts a & b (fixes 18150 and 18151) failed to obtain a suitable sample.
22d	29/6/15	08:43	52.2	18153	2-3	As above. Kept for PSA but not enough fine sediment for contaminants
38b	29/6/15	09:03	79.5	18156	8	Pebbles, gravel, clay and shell fragments. Some barnacles and hydroids. Fix 18154 was a failure grab failed to fire. Attempt a (fix 18155) failed to obtain a suitable sample.
38c	29/6/15	09:07	80.9	18157	8	Pebbles, gravel, clay and shell fragments. Some barnacles and hydroids.
19a	29/6/15	09:27	66.7	18158	3	Pebble and gravel, taken for fauna.
19e	29/6/15	09:54	68.8	18162	5	Pebble and gravel with clay and shell fragments. Attempts b to d (fixes 18159 to 18161) failed to obtain a suitable sample. Attempt c had a good sample but a large cobble was in the jaw of the grab
11b	29/6/15	10:14	84.3	18164	5	Clay, pebble, gravel, shell. Attempt a (fix 18163) obtained 3 litres of sediment - discarded.

Sample number	Date	Time (UTC)	Depth (m)	Fix	Sample volume (litres)	Sediment description
11c	29/6/15	10:19	80.9	165	5	Clay, pebble, grave and shell
24c	29/6/15	10:56	44.3	166	5	Clay, pebble, gravel and shell. Taken for fauna. Attempts a & b (fixes 18167 and 18168) obtained a suitable sample but stones were caught in the jaws.
39	29/6/15	11:32	39.7	18169-72	≤1	Pebble, gravel, some sand and shell, encrusting *Sabellaria*, hydroids, *Psammechinus miliaris*
12b	1/7/15	12:09	76.7	19490	6	Some clay, mostly pebble, hydroids
12d	1/7/15	12:21	77.8	19492	5	Some clay and pebble, large cobble caught in jaws. Kept a PSA sample but not contaminants.
10a	1/7/15	12:35	86.7	19494	8	Clay and pebble and hydroids
10b	1/7/15	12:42	86.3	19495	8	Clay and pebble and hydroids
9b	1/7/15	12:58	88.7	19497	6	Clay, shell fragments, pebble and gravel, hydroid. 9a good sample but stones in jaws.
9c	1/7/15	13:05	88.4	19498	5	Clay, shell fragments, pebble and gravel, hydroid.
13b	1/7/15	13:23	88.3	19500	6	Clay, shell, pebble and gravel, *Sabellaria* tubes, hydroids 13a: good sample but stone in jaws
13c	1/7/15	13:29	87.4	19501	6	Clay, pebble and gravel, some shell and sand. Spider crab and large polychaete.
7a	1/7/15	13:37	86.8	19502	6	Attempt a: Stone in jaws. Mud, pebble and gravel, abundant hydroids, *Pisidia*, kept for fauna but note stone in jaws. Attempt b: 1 litre of sediment, gravel, pebble and shell fragments
7c	1/7/15	13:50	86.3	19504	6	Attempt c: cobble, pebble, gravel and clay

Sample number	Date	Time (UTC)	Depth (m)	Fix	Sample volume (litres)	Sediment description
						Attempt d: 1 litre of sediment, station abandoned
2a	1/7/15	14:04	88.3	19506	5	First attempt large cobble in jaws (see photo). Sample kept for PSA. Second attempt less than 1 litre of sediment.
2c	1/7/15	14:15	88.7	19509	6	Kept for fauna. Clay, pebble and gravel. Crabs and hydroid.
8a	1/7/15	14:24	81.3	19510	8	Clay, pebble, hydroids. 2nd attempt sample ≤1 litre.
8c	1/7/15	14:34	80.4	19512	6	Cobble, pebble and clay
6a	1/7/15	14:44	78.4	19513	8	Clay, sand, pebble.
6b	1/7/15	14:48		19514	≤1	Pebbles. Attempt c (fix 19515) also failed. Faunal sample only at this station
1a	1/7/15	15:00	80.9	19517	4	First sample kept for fauna. Cobble and pebble with *Sabellaria*. Second sample *Sabellaria* 1 litre of sediment. Third attempt <1 litre of sediment
5a	1/7/15	15:17	79.5	19520	3	Cobble, pebble, gravel and clay. Fail
5b	1/7/15	15:22	79.8	19521	1	Cobble, pebble and gravel. Fail. Attempt c (fix 19522) <1 litre sediment.
4b	1/7/15	15:41	81.6	19524	5	Pebble, gravel, some clay, gravel
4c	1/7/15	15:47	81.3	19525	8	Cobble, pebble and clay
16a	1/7/15	16:00	64.3	19526	7	Cobble, pebble, gravel, sand and clay
16b	1/7/15	16:05	66.8	19527	8	Cobble, pebble, gravel, sand and clay
14a	1/7/15	16:20	49.3	19528	≈2	Pebble, gravel and shell, some sand. Hydroids. Attempt b (at 16:23, fix 19529) similar. Stones in jaws and samples rejected.

Sample number	Date	Time (UTC)	Depth (m)	Fix	Sample volume (litres)	Sediment description
14c	1/7/15	16:23	49.0	19530	≤1	Pebble, gravel and shell, some sand. Stones in jaws and sample rejected.
15a	1/7/15	16:42	60.6	19531	8	Almost solid lump of clay with some pebble and gravel
15b	1/7/15	16:46	60.2	19532	8	Almost solid lump of clay with some pebble and gravel. *Asterias rubens* and *Pisa* sp. in sample.
41d	1/7/15	17:13	49.0	19533	≤1	Pebble and gravel some shell. Brittlestar. Attempt e (at 17:19, fix 19534) ≈2 litres of sediment; pebble, gravel and shell.
41f	1/7/15	17:22	49.1	19535	≈2	Pebble, gravel and shell
24d	1/7/15	17:28	42.3	19536	≤1	Pebble and gravel.

Appendix 4. Sediment and faunal grab success and failures

Station	Fauna	PSA	Contaminants	Notes
1	-	x	x	could not get a suitable second grab
2		-	x	cobble in jaws of psa, not enough for contaminants
3	x	x	x	not sampled
4				
5	x	x	x	station abandoned
6		x	x	could not get a suitable second grab
7	-			stone in jaws
8				
9				
10				
11				
12		-	x	stone in psa jaw not enough for conts
13				
14	x	x	x	station abandoned
15				
16				
17	x	x	x	not sampled
18	x	x	x	not sampled
19	-			
20	-	x	x	no sample suitable for psa/conts analysis
21	x	x	x	station abandoned
22	-	-	x	not enough for cont
23	x	x	x	not sampled
24		x	x	no sample suitable for psa/conts analysis
25	x	x	x	not sampled
26	x	x	x	not sampled
27	-	-	x	not enough for contaminants
28	x	x	x	not sampled
29	x	x	x	not sampled
30	x	x	x	station abandoned
31				
32	x	x	x	not sampled
33				
34		-	x	not enough for contaminants
35				

32	x	x	x	not sampled
37	x	x	x	station abandoned
38				
39	x	x	x	station abandoned
40	x	x	x	not sampled
41	x	x	x	station abandoned
42	x	-	x	due to sediments being from hand held van veen grab

Key

x	No suitable sample obtained
-	Sample below QC standards taken
	Sample conforming to QC standards taken
x	Station identified as bedrock on video so no grab deployed

Appendix 5. Particle size analysis data

	Mesh size, mm														Mesh size, µm												
Station	**90.0**	**63.0**	**45.0**	**31.5**	**22.4**	**16.0**	**11.2**	**8.0**	**5.6**	**4.0**	**2.8**	**2.0**	**1.4**	**1.0**	**707**	**500**	**355**	**250**	**177**	**125**	**88**	**63**	**<63**	**Gravel**	**Sand**	**Mud**	**Sediment type**
DG2	0.0	0.0	0.0	18.8	11.3	2.1	1.8	0.9	1.1	2.0	4.3	6.4	9.3	13.7	11.3	5.5	4.9	2.2	0.8	0.5	0.4	0.4	2.4	48.7	48.9	2.4	Sandy Gravel
DG4	0.0	50.1	0.0	7.0	6.0	0.5	3.0	2.8	2.7	1.6	1.6	1.3	1.1	2.5	3.5	3.6	5.5	2.7	0.6	0.3	0.4	0.4	2.9	76.5	20.6	2.9	Muddy Sandy Gravel
DG7	0.0	0.0	24.0	28.1	2.4	1.1	1.5	1.9	3.9	3.5	2.7	2.1	3.1	5.1	6.2	4.5	4.5	1.8	0.6	0.3	0.3	0.3	2.4	71.1	26.5	2.4	Sandy Gravel
DG8	19.6	16.6	24.2	4.8	2.6	2.2	1.9	1.6	1.0	0.8	1.1	1.1	0.9	2.4	4.0	4.7	5.0	1.2	0.7	0.4	0.4	0.3	2.4	77.6	20.0	2.4	Muddy Sandy Gravel
DG9	0.0	0.0	30.6	10.1	11.1	1.9	1.7	0.9	1.4	3.4	5.4	4.0	3.3	5.7	4.8	3.4	3.6	1.6	0.6	0.4	0.5	0.5	4.9	70.7	24.4	4.9	Muddy Sandy Gravel
DG10	0.0	0.0	23.2	25.4	5.5	7.6	2.5	1.1	0.8	0.6	1.2	1.4	1.9	3.9	6.8	5.0	3.8	1.4	0.7	0.6	0.6	0.6	5.5	69.2	25.3	5.5	Muddy Sandy Gravel
DG11	0.0	0.0	27.1	27.4	4.8	0.8	5.2	1.9	2.4	2.1	2.3	2.5	3.8	4.1	4.2	3.2	3.1	1.1	0.6	0.3	0.4	0.3	2.4	76.5	21.1	2.4	Muddy Sandy Gravel
DG12	0.0	0.0	38.7	12.3	5.2	6.6	3.2	3.7	2.6	2.0	2.1	2.4	3.1	3.7	2.9	2.1	2.2	1.2	0.8	0.6	0.6	0.5	3.7	78.7	17.6	3.7	Muddy Sandy Gravel
DG13	0.0	0.0	17.5	19.7	13.7	3.5	2.6	1.5	1.1	0.9	1.0	1.3	2.5	8.5	10.9	5.2	3.7	1.2	0.6	0.4	0.5	0.4	3.2	63.0	33.9	3.2	Sandy Gravel
DG15	0.0	0.0	16.4	18.6	8.4	3.7	2.0	1.3	2.4	2.3	2.5	2.0	2.4	5.2	6.3	5.4	7.1	4.5	1.6	0.6	0.8	0.7	6.0	59.5	34.5	5.9	Muddy Sandy Gravel
DG16	0.0	0.0	46.7	0.0	1.8	2.1	1.7	1.8	1.8	1.4	1.9	2.3	1.8	4.4	9.8	8.7	5.8	2.4	0.6	0.3	0.4	0.4	4.1	61.3	34.6	4.1	Muddy Sandy Gravel
DG19	0.0	0.0	37.5	11.3	3.4	5.7	3.4	2.1	2.3	2.7	3.5	3.9	3.4	4.4	3.7	1.8	1.4	1.1	1.3	0.9	0.9	0.6	4.6	75.9	19.5	4.6	Muddy Sandy Gravel
DG22	0.0	0.0	0.0	26.5	14.5	3.3	3.6	2.5	2.0	1.6	1.7	2.4	4.0	5.5	6.8	8.0	8.6	4.3	1.3	0.4	0.4	0.4	2.2	58.1	39.8	2.2	Sandy Gravel
DG27	0.0	0.0	32.1	6.5	19.8	6.0	2.3	5.8	3.2	1.9	2.0	2.0	3.5	4.0	3.5	2.2	2.2	1.6	0.5	0.1	0.1	0.1	0.4	81.8	17.8	0.4	Gravel
DG31	0.0	0.0	0.0	13.5	15.2	3.7	4.4	7.6	8.4	6.7	6.3	4.2	4.6	6.9	7.4	4.3	2.8	1.5	1.0	0.3	0.2	0.1	1.0	69.9	29.1	1.0	Sandy Gravel
DG33	0.0	0.0	0.0	0.0	0.7	1.0	1.2	2.6	4.6	5.3	5.2	2.6	7.5	13.9	15.8	11.2	12.7	9.2	3.5	0.8	0.5	0.1	1.6	23.2	75.1	1.6	Gravelly Sand
DG34	0.0	0.0	0.0	0.0	0.0	1.4	2.0	2.4	6.1	7.2	5.2	3.2	5.6	8.6	10.2	8.0	11.0	15.5	8.9	1.4	0.7	0.3	2.1	27.6	70.3	2.1	Gravelly Sand
DG35	0.0	0.0	21.2	14.7	0.0	1.4	4.2	2.6	3.8	4.2	4.6	3.9	4.5	5.6	5.0	3.8	4.9	4.3	4.3	2.4	1.5	0.6	2.6	60.5	37.0	2.6	Sandy Gravel
DG38	0.0	0.0	18.0	10.0	11.4	6.5	4.3	1.8	2.7	2.4	3.5	3.9	6.8	8.6	5.2	2.3	2.3	2.2	1.7	0.8	0.7	0.5	4.4	64.6	31.0	4.4	Muddy Sandy Gravel
DG42	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	9.9	23.7	25.6	8.3	32.6	0.0	67.4	32.3	Muddy Sand

All table values are percentages of the sample in each fraction.

Appendix 6. Total organic content (from loss on ignition)

Sample	Crucible No	Weight Empty	Wt with Air Dry Soil	Wt Oven Dry	Wt After Ignition	% Moisture	% LOI
DG2	10	10.6959	17.2985	17.2688	17.1859	0.449823	1.261239
DG4	11	10.606	14.3632	14.3367	14.2719	0.705312	1.736939
DG7	12	10.618	15.0816	15.0163	14.9517	1.462945	1.468749
DG8	13	10.4475	13.9518	13.9303	13.8704	0.613532	1.719881
DG9	14	10.3411	13.7929	13.7434	13.6681	1.434034	2.213209
DG10	15	10.5832	14.0186	13.9891	13.9116	0.858706	2.275463
DG11	16	10.7615	15.2766	15.2249	15.1327	1.145047	2.06569
DG12	17	10.5361	13.8132	13.7867	13.695	0.808642	2.821018
DG13	18	10.4941	14.4813	14.4599	14.3927	0.536717	1.694488
DG15	19	10.8672	14.5002	14.4692	14.4007	0.853289	1.901721
DG16	20	10.5855	14.2708	14.2465	14.1796	0.659376	1.82737
DG19	21	10.3038	13.9123	13.8735	13.7852	1.075239	2.473597
DG22	22	10.5813	14.8328	14.8146	14.7501	0.428084	1.523634
DG27	23	10.7654	14.7251	14.6667	14.6128	1.474859	1.381591
DG31	24	9.4252	13.9933	13.9752	13.9198	0.396226	1.217582
DG33	25	10.7359	15.009	14.9923	14.9382	0.390817	1.271027
DG34	26	10.509	14.9301	14.9102	14.865	0.450114	1.026993
DG35	27	10.7491	15.2864	15.2603	15.195	0.575232	1.447508
DG38	28	10.3761	13.855	13.8273	13.7481	0.796229	2.294854
DG 42	9	10.183	13.054	13.0326	12.9682	0.745385	2.259966

Appendix 7. Hydrocarbon Contaminant analysis results

SAMPLE NUMBER	DG7	DG8	DG9	DG10	DG11	DG13	DG15	DG16	DG19	DG31	DG33	DG35	DG38
Compound	Amount (µg/g)												
nC9	0.00000	0.01963	0.00000	0.01729	0.01979	0.01917	0.04558	0.033704	0.062219	0.007759	0.046648	0.039518	0.008581
nC10	0.47010	0.32677	0.51742	0.55968	0.48214	0.57219	0.41697	0.385403	0.550431	0.746336	0.557298	0.514175	0.349608
nC11	0.10349	0.07217	0.11005	0.12763	0.10377	0.11765	0.09177	0.076529	0.112385	0.125182	0.109398	0.097055	0.068467
nC12	0.02849	0.01514	0.03323	0.02158	0.01905	0.02540	0.02427	0.016411	0.027416	0.014933	0.020028	0.012956	0.490499
nC13	0.00356	0.00486	0.00404	0.00494	0.00410	0.00394	0.00337	0.005727	0.007282	0.006631	0.003156	0.002498	0.002129
ISA Heptamethylnonane													
nC14	0.02057	0.02990	0.03059	0.03647	0.03662	0.02462	0.04553	0.031088	0.031769	0.009228	0.032814	0.017582	0.034193
nC15	0.01838	0.03124	0.00297	0.03371	0.03122	0.02386	0.00609	0.025635	0.030968	0.016526	0.028003	0.018295	0.01081
ISB D34													
nC16	0.01649	0.02160	0.02400	0.03110	0.02738	0.01842	0.03696	0.021436	0.021861	0.005668	0.024849	0.014461	0.019383
nC17	0.02378	0.06699	0.03868	0.05760	0.04858	0.03113	0.06838	0.03665	0.05913	0.022938	0.040881	0.025409	0.037125
Pristane	0.01258	0.02025	0.02338	0.02377	0.02925	0.01681	0.06468	0.020196	0.021817	0.004262	0.027238	0.019212	0.034547
nC18	0.03004	0.04478	0.05598	0.06482	0.05508	0.00314	0.23540	0.040802	0.002963	0.010255	0.005286	0.030101	0.261771
Phytane	0.00972	0.01590	0.01411	0.02021	0.01111	0.00911	0.01227	0.015545	0.013989	0.010377	0.013496	0.011495	0.005162
nC19	0.00805	0.00734	0.00819	0.01453	0.01228	0.00408	0.02243	0.006835	0.007292	0.005269	0.010645	0.006408	0.048473
ISC Squalane													
nC20	0.01944	0.02719	0.03175	0.03257	0.03184	0.02367	0.04824	0.031602	0.029143	0.018182	0.031575	0.015942	0.029322
nC21	0.01701	0.02620	0.02816	0.03192	0.03530	0.02005	0.05502	0.029514	0.02622	0.036781	0.030189	0.017088	0.024866
nC22	0.04460	0.08879	0.09358	0.08759	0.09897	0.06649	0.91486	0.076482	0.113361	0.084351	0.084124	0.041256	2.388225
nC23	0.01180	0.02416	0.02981	0.02614	0.03113	0.02072	0.16545	0.017818	0.030236	0.004061	0.028099	0.013965	0.345601
nC24	0.00253	0.00682	0.00704	0.00914	0.00786	0.00616	0.02796	0.004226	0.006293	0.00508	0.006441	0.005397	0.015326
nC25	0.02225	0.02775	0.03147	0.03868	0.04027	0.02308	0.04660	0.078486	0.027157	0.243772	0.03221	0.016025	0.016722
nC26	0.01031	0.05777	0.06055	0.05607	0.02946	0.01959	0.03326	0.114377	0.022336	0.469331	0.054458	0.012013	0.168677
ISD D42 Eicosane													
nC27	0.06034	0.08998	0.09480	0.12426	0.12078	0.07533	0.13946	0.131837	0.094501	0.481809	0.094138	0.048411	0.160879
nC28	0.04812	0.06803	0.05871	0.07049	0.09219	0.04440	0.07478	0.098292	0.047973	0.432853	0.057325	0.043529	0.057814

SAMPLE NUMBER	DG7	DG8	DG9	DG10	DG11	DG13	DG15	DG16	DG19	DG31	DG33	DG35	DG38
Compound	Amount (µg/g)												
nC29	0.12171	0.21561	0.24295	0.27493	0.29049	0.18168	0.65486	0.199453	0.242426	0.377688	0.201601	0.096598	0.004747
nC30	0.04861	0.13140	0.14606	0.11432	0.12719	0.10224	0.34108	0.111115	0.162041	0.269358	0.11593	0.044762	0
nC31	0.09436	0.15350	0.12914	0.24138	0.20306	0.11987	0.19801	0.118389	0.146332	0.177438	0.127509	0.063755	0.399722
nC32	0.01931	0.04453	0.03624	0.04791	0.05840	0.02928	0.04760	0.044691	0.038609	0.120945	0.040224	0.026903	0.023134
nC33	0.04594	0.07201	0.06605	0.09769	0.10856	0.05793	0.10119	0.061045	0.069587	0.088848	0.068421	0.035347	0.252327
nC34	0.02724	0.05760	0.05620	0.06553	0.06902	0.04357	0.24762	0.036175	0.06115	0.010938	0.041677	0.02915	0.013654
nC35	0.01631	0.01711	0.02836	0.02646	0.03680	0.01515	0.07314	0.020089	0.019565	0.041455	0.016536	0.016794	0.085285
nC36	0.01506	0.02680	0.02872	0.03708	0.03333	0.01881	0.02156	0.01967	0.023924	0.0274	0.013277	0.014663	0.218617
nC37	0.02733	0.01251	0.00439	0.03725	0.00874	0.00151	0.20348	0.005568	0.018951	0.009726	0.005724	0.009048	0.052515
nC38	0.00800	0.00000	0.01540	0.01974	0.01648	0.01334	0.01035	0.014187	0.016752	0.016055	0.007835	0.008596	0.624306
nC39	0.01189	0.03516	0.01467	0.02413	0.06075	0.01287	0.01959	0.00759	0.01254	0.014146	0.0073	0.008484	0.036991
nC40	0.00991	0.02420	0.01713	0.02582	0.02371	0.00865	0.00000	0.008816	0.011893	0.01121	0.00626	0.00978	0.039613
Total area nC9-nC40 (inc UCM and IS)	0.01341	0.02430	0.02615	0.02911	0.02892	0.01697	0.03441	0.02025	0.02672	0.012482	0.016176	0.010786	0.059869
Total Resolved µg/g	0.00227	0.00300	0.00303	0.00358	0.00347	0.00268	0.00604	0.002954	0.00305	0.004967	0.002889	0.002258	0.0086
UCM µg/g	0.01115	0.02129	0.02312	0.02552	0.02546	0.01429	0.02836	0.01729	0.02367	0.00751	0.01329	0.00853	0.05127

Appendix 8 Faunal Data from grab survey

‘3279 Xodus Group (Deep Green Benthic Technical Report) v1 App 8’ is provided under separate cover.

Appendix 9 Drop down camera Analysis

‘3279 Xodus Group (Deep Green Benthic Technical Report) v1 App 9’ is provided under separate cover.

Appendix 4

Habitat Assessment Report

Centre for Marine and Coastal Studies Ltd

Deep Green Project – Holyhead Deep

Habitat Assessment Report

CMACS Job Number: J3279

Prepared for: Xodus
FAO: Joanna Lester

Version	Date	Description	Prepared by	Checked by	Approved by
1	31/7/2015	First draft	Ken Neal	TJH	TJH
2	21/8/2015	Revisions after client comments	Ken Neal	TJH	TJH
3	4/12/2015	Revised draft	Ken Neal	TJH	TJH

Report reference: Deep Green Project – Holyhead Deep

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Table of Contents

Appendices

List of Figures

1. Introduction

The Deep Green Project proposed for Holyhead Deep is a tidal power project under development by Minesto Ltd. The Project will consist of three tidal generation units anchored to the seabed along with infrastructure such as an export cable to transfer power to shore and a subsea transformer.

As part of the application for consent to install the Project, an environmental impact assessment is required, which in turn needs characterisation data of the seabed to inform the assessment. Xodus Group on behalf of Minesto have contracted CMACS Ltd to carry out benthic characterisation surveys in the project development area (PDA) and associated cable route corridor (CRC).

This report provides an initial assessment of the habitats and biotopes present in the survey area (see Figure 1) using images of the seabed taken during the drop down camera survey. A later Environmental Baseline Report will characterise the sediments and infauna (from grab samples), and refine the biotope classifications based on that data and the information presented here.

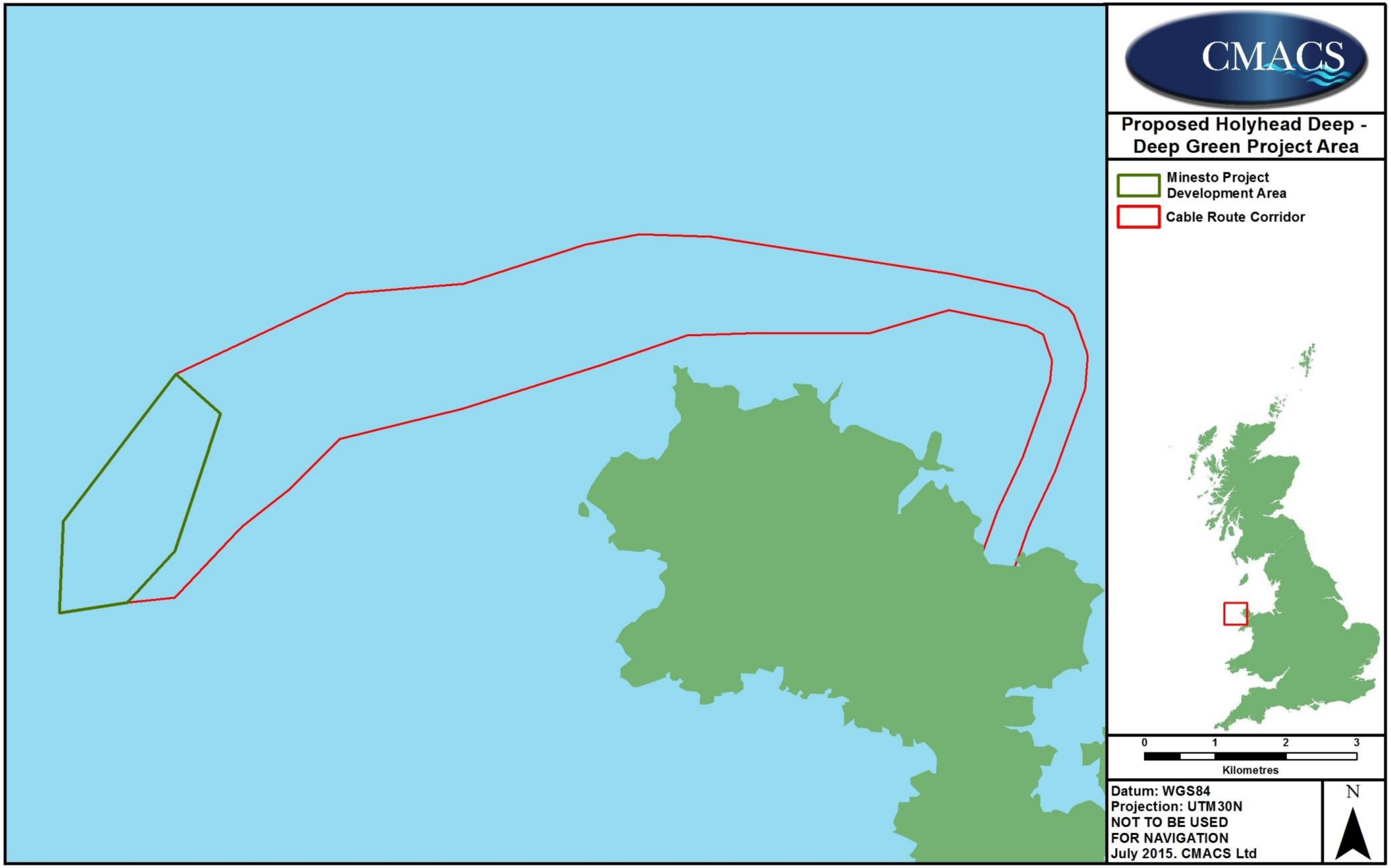


Figure 1: Overview of project development area and associated cable route corridor.

2. Methods

The environmental survey programme was designed to ground-truth the acoustic data acquired during the geophysical survey as well as characterise the biota that the benthic habitats support.

The environmental survey programme comprised:

- Drop down camera (Figure 2).
- Grab sampling (Figure 3).

2.1 Sample station selection

Sidescan sonar mosaics and bathymetric data derived from a geophysical survey (BibbyHydromap, 2015) of the PDA and CRC in June 2015 were used to differentiate seabed habitats. The large majority of the surveyed seabed habitat appeared in the side scan sonar mosaic to be coarse sediment with the remainder consisting of bedrock and areas that had a 'texture' that suggested biogenic reef may be present

A random stratified approach was taken to placing sample stations to ensure that adequate coverage was provided on all predicted habitats (Table 1). In addition, seven stations were added outside the PDA and CRC as reference stations, which could provide sample stations for any future monitoring. One of these stations (41) was subsequently moved into the CRC to investigate an area where side scan sonar records showed images suggesting the possibility of horse mussel reef. Depths of water at the sample stations ranged from 11 metres below Chart Datum at station 37 inshore on the CRC to 89 metres below Chart Datum at station 2 in the centre of the PDA. There was considerable surface relief at some locations in the survey area particularly between stations 17 and 22 and in the areas around stations 25 and 29 (see Figure 2 and Figure 3) indicating possible projections of bedrock through the surface sediments. A number of camera stations were located on these areas of relief to investigate the habitat type and epifauna.

Most of the stations placed were intended for both drop down camera survey and grab sampling but there were six stations that were suitable for camera survey only owing to the likely presence of bedrock or very large particles.

2.2 Camera survey

A Seaspyder drop down camera (see Plate 1) was deployed slowly to the seabed whilst the vessel drifted over the target. An ultra-short baseline (USBL) was attached to the camera so that the surveyors could ensure that the camera landed on the seabed within a 50m zone around the target. The lead biologist captured and logged stills and video imagery from each site in addition to associated data such as depth, time and brief notes on the sediment type and any identifiable epifauna (Appendix 1: Field notes from Camera survey).

A single position fix was obtained when the camera was first deployed to the seabed. On a subset of inshore stations, the camera was re-deployed on four further occasions at each station by lifting off the seabed then lowering again within a few metres of the original target position. This approach became untenable at the majority of stations, however, as the depth of water combined with the strength of the current did not allow for the camera to be repositioned within the 50m zone.

Particular attention was paid to the potential presence of any habitat of conservation concern, particularly those known or suspected to occur in the vicinity (e.g. *Sabellaria spinulosa* or *Modiolus modiolus* reef under the EC Habitats Directive and UK Biodiversity Framework) or rare/sensitive species (e.g. those listed under the OSPAR Commission).

2.3 Grab survey

A standard weighted Hamon grab with a $0.1m^2$ sample area was used for all the sediment sampling. All samples were collected from within 50m of the target location.

Upon contact with the seabed, the USBL was used to derive a positional fix. Upon retrieval of each sample the date, time and water depth were recorded, along with a description of the volume of sample and also the dominant sediment type. A digital photograph of each faunal grab was taken of the sample prior to any sieving. Notes were made on sediment type, colour, volume and any species of note in each grab sample (Appendix 2: Field notes from Grab survey). At each sample station, the intention was to collect two samples; one for faunal analysis with a second sample for contaminants and particle size analysis.

Grab samples of less than 5 litres (or 2.5 litres on hard-packed substrates) in volume were rejected. Samples were also rejected if the grab jaw was not properly closed.

After initial observations and photographs a representative subsample of approximately 500g was removed for particle size analysis (PSA) and total organic carbon (TOC) analysis. All sediment samples were frozen immediately on board the survey vessel.

Contaminants sampling and analysis will be described in a subsequent technical report.

Table 1. Selection notes for each sample station in the PDA and CRC.

Sample station	Station selection notes
1	Possible *Sabellaria* reef.
2	Possible *Sabellaria* reef.
3	Bedrock. Camera station only.
4	Coarse ground.
5	Coarse ground.
6	Coarse ground.
7	Rougher ground investigated for possible stony reef.
8	Coarse ground.
9	Coarse ground.
10	Coarse ground.
11	Rougher ground investigated for possible stony reef.
12	Coarse ground.
13	Coarse ground.
14	Reference station (near field).
15	Reference station (near field).
16	Reference station (near field).
17	Bedrock camera station only.
18	Bedrock camera station only.
19	Coarse ground.
20	Possible *Sabellaria* reef.
21	Coarse ground

Sample station	Station selection notes
22	Possible *Sabellaria* reef.
23	Coarse ground.
24	Possible *Sabellaria* reef.
25	Bedrock camera station only.
26	Coarse ground.
27	Possible *Sabellaria* reef.
28	Coarse ground.
29	Coarse ground.
30	Coarse ground.
31	Coarse ground.
32	Bedrock camera station only.
33	Coarse ground.
34	Coarse ground.
35	Coarse ground.
36	Bedrock camera station only.
37	Fine sediment
38	Cable route reference station.
39	Cable route reference station.
40	Cable route reference station.
41	Possible *Modiolus* reef.

2.3 Sample analysis

Drop down camera images

Images from each drop down camera station were used to describe the seabed habitat, estimate the abundance of fauna and flora, which in turn informed an assessment of the presence of Annex I habitat. Organisms such as anemones, decapods and gastropods were enumerated from each image whereas the abundance of organisms such as hydroids and sponges was estimated by percentage cover of the substratum.

The quality of biogenic reef (as defined by its 'reefiness') was assessed using the criteria of Gubbay (2007) and that of stony reef using the criteria of Irving (2009) but reference was also made to Limpenny *et al*. (2010) when assessing both types of reef.

Habitat and visible fauna were used to classify biotopes according to Connor *et al*. (2004), the side scan mosaic was then used to extrapolate the boundaries of each biotope within the PDA and CRC. Note that many biotope classifications are tentative and will be refined once infaunal data is available and will be the subject of a further report.

Particle size analysis

The majority of sediment samples contained a wide range of sediment particles from cobble to clay. Each sediment sample was first wet sieved over a 2mm mesh with the two fractions subsequently treated as follows:

- The fraction of particles 2mm in diameter and larger was dried at 80^{o}C for at least 24 hours and then dry sieved over a half-phi sieve series (see Table 2 below)
- The fraction of particles 2mm and smaller was transferred to a bottle and left to stand to allow the very fine particles to settle out of suspension. Once the liquid and solid had separated, the excess water was siphoned off the top of the sample (taking care not to disturb the fine sediments) and the sediment analysed with a Coulter Laser Sizer.

Table 2. Half-phi sieve series for dry fractionation.

Mesh aperture, mm										
63.0	45.0	31.5	22.4	16.0	11.2	8.0	5.6	4.0	2.8	2.0

Once complete this information will be used to ground-truth the geophysical data as well as create a map of habitat types for the PDA and CRC.

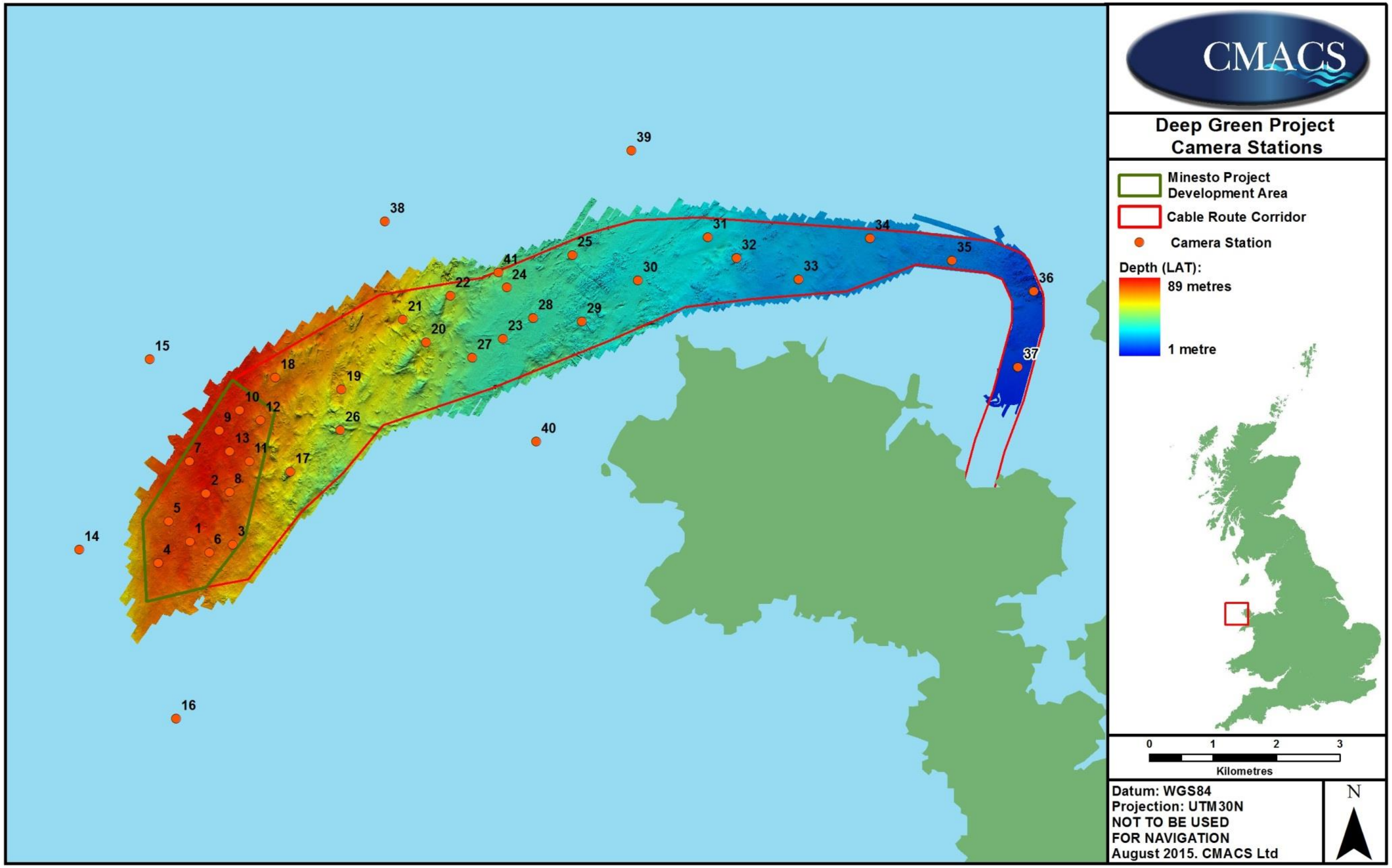


Figure 2: Location of camera survey stations with PDA and CRC bathymetry.

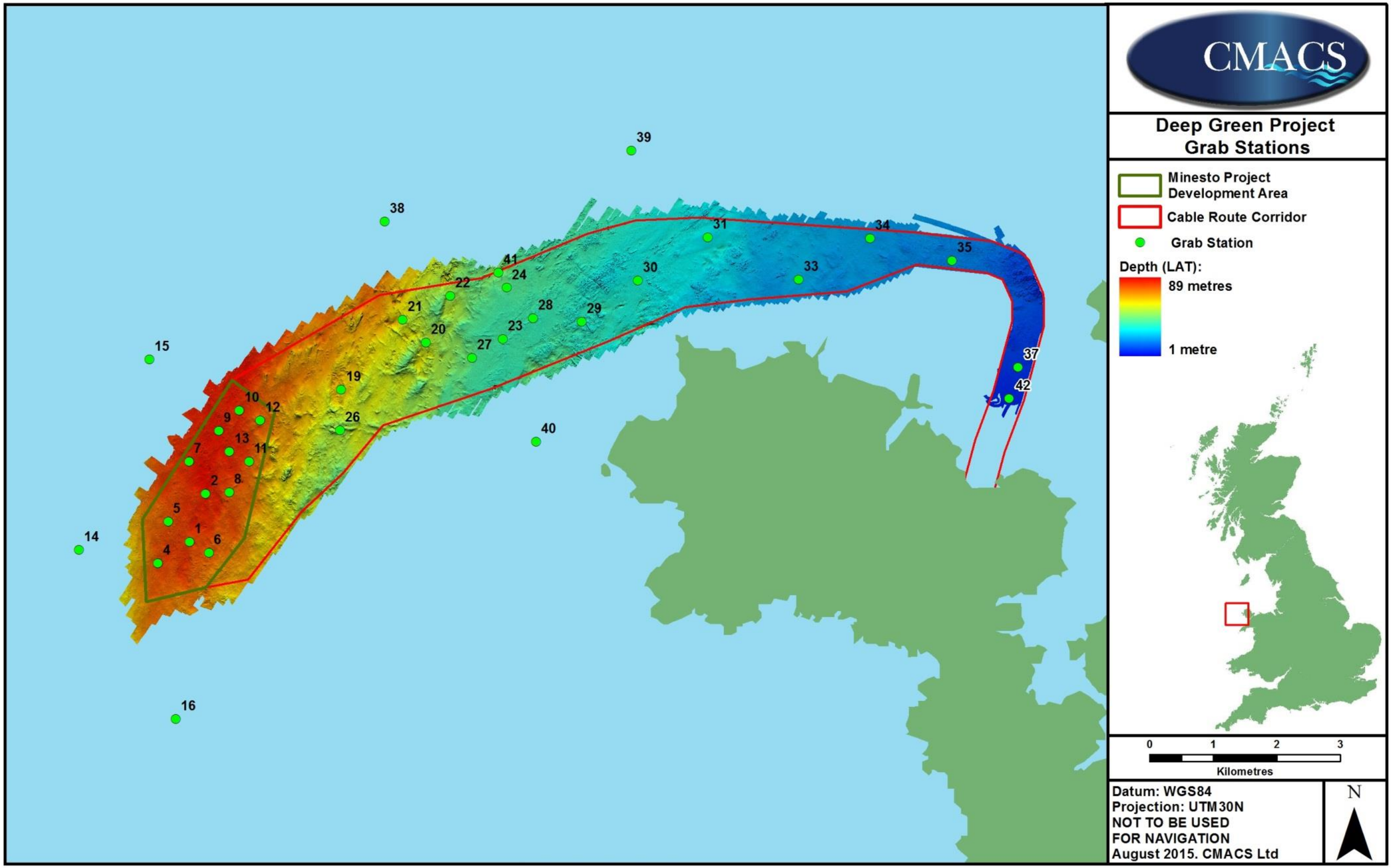


Figure 3: Location of grab survey stations with PDA and CRC bathymetry.

3. Survey

Video was obtained at all but one of the sample stations; no survey was attempted at station 40 owing the vessel master's reservations regarding vessel safety on deploying equipment to the seabed close to the coast in strong tidal currents.

Stills images were obtained at thirty nine sample stations. Owing to equipment failure, a still image could not be obtained at Station 12 and habitat characterisation was undertaken using the video footage.

Grab samples were obtained from twenty three sample stations, with many failures owing to the very coarse nature of the seabed sediments which often prevented a suitable volume of sediment from being collected or particles became trapped in the jaw of the grab, leading to repeated sample rejection.

4. Habitats and species

4.1 Drop down camera

The large majority of images showed a seabed of very coarse sediment, predominantly pebble and gravel but with varying proportions of cobble, boulder, sand and shells of dead bivalves (habitat and fauna descriptions and depth at each station are provided in Appendix 1: Field notes from Camera survey and Appendix 3. Drop down camera habitat and faunal data. In the PDA, the seabed consisted mainly of pebble and gravel with sand and/or cobble at a few stations (Figure 4) and a relatively small area supporting aggregations of *Sabellaria* (see section 5 for more details). At the western end of the CRC, the seabed consisted of coarser particles than in the PDA and there were also small areas of exposed bedrock. Bedrock became more prevalent further to the east in the PDA and was interspersed with areas of pebble and gravel as well as biogenic reef. In the more eastern parts of the CRC, there were finer sediments including areas of predominantly sand but also an area of pebble and gravel supporting encrusting growths of *Sabellaria* and another area of exposed bedrock. Overall the ground-truthing broadly confirmed the preliminary interpretation from acoustic data of generally coarse seabed with outcrops of bedrock, although there was slightly more bedrock in parts of the CDC than initially considered.

Epifauna was variable but generally sparse (with a few exceptions) and was principally made up of scour tolerant taxa including various anemones, hydroids, erect bryozoa and epifaunal polychaetes.

A selection of representative images of the different habitats are shown below, and all images can be made available on digital media upon request.

Thirteen broad biotope classifications were assigned (see Table 3 for summary along with associated water depths) which are described in full below and shown in Figure 5.

Note that at Station 32 two different biotopes were assigned to different photographs, and that at some locations more than one biotope was considered to be present.

Table 3. Biotopes assigned at each sample station.

Biotope	Stations	Depth range (metres)
CR.HCR.FaT	17, 18	56 to 71
CR.HCR.FaT.BalTub	23, 25, 38	35 to 38
CR.HCR.XFa	3	72
CR.LCR.BrAs.AntAsH	36	8
CR.MCR.Csab.Sspi	1, 24, 27	40 to 80
CR.MCR.Csab.Sspi/SS.SBR.PoR.SspiMx	16	66
CR.MCR.EcCr.UrtScr	19, 20, 21, 32	26 to 65
CR.MCR.EcCr.UrtScr/CR.HCR.FaT.BalTub	26, 28, 29	35 to 52
SS.SCS.ICS.SSh	30, 31	28 to 32
SS.SMX.CMx.FluHyd	6, 9, 10	77 to 87
SS.SMX.IMx	33, 34, 35, 37	6 to 22
SS.SMX.OMx	2, 4, 5, 7, 8, 11, 12, 13, 14, 39, 41	48 to 87
SS.SMX.OMx/CR.MCR.Csab	22	50
SS.SSA.IfiSa.ScupHyd	32	26

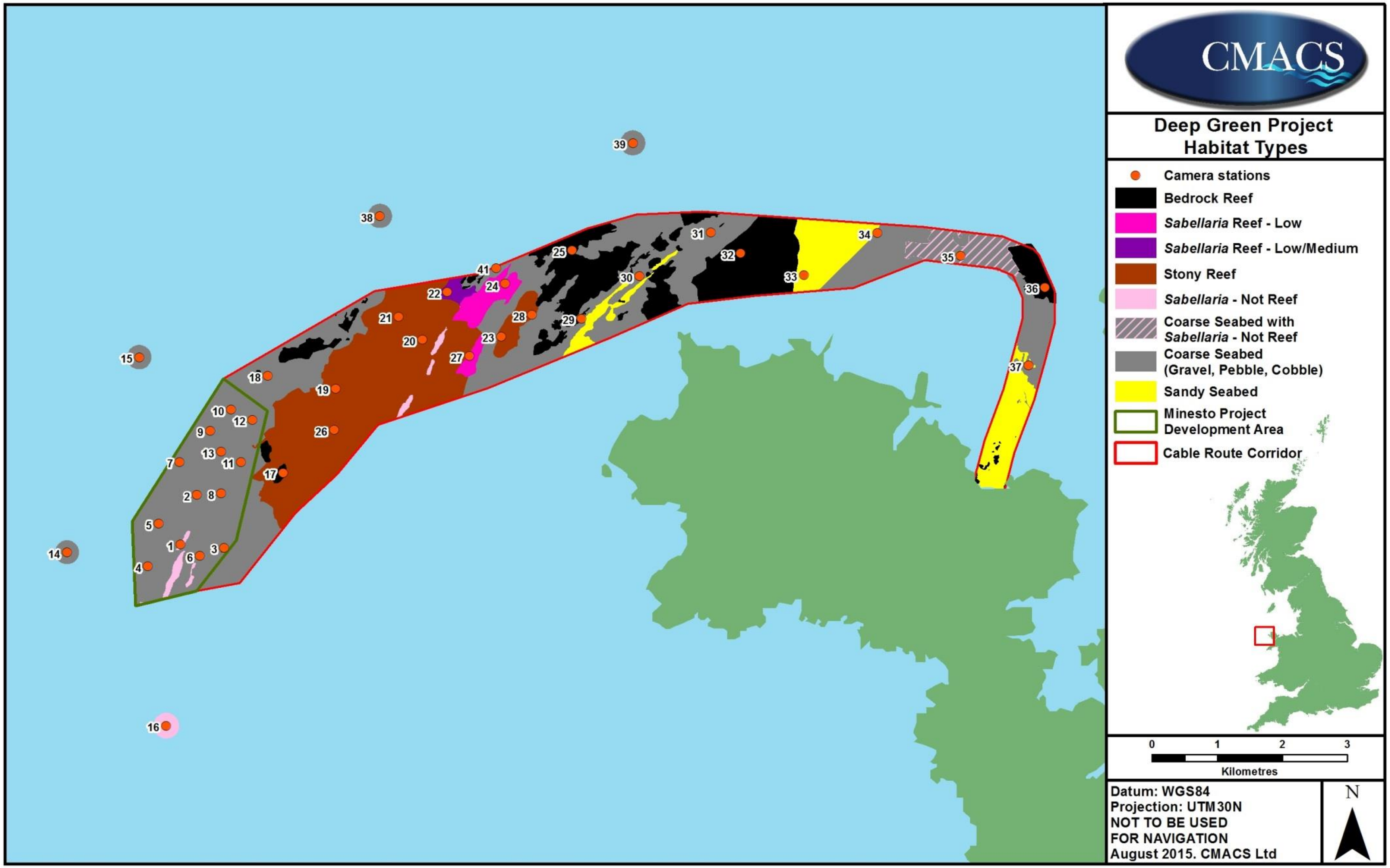


Figure 4. Habitat types and reef quality in the PDA, CRC and on reference stations.

CR.HCR.FaT 'Very tide-swept faunal communities'. Stations 17, 18.

Stations 17 and 18 were assigned this broad classification according to substratum type of bedrock, but could not be taken any further owing to the low diversity and abundance of the fauna.

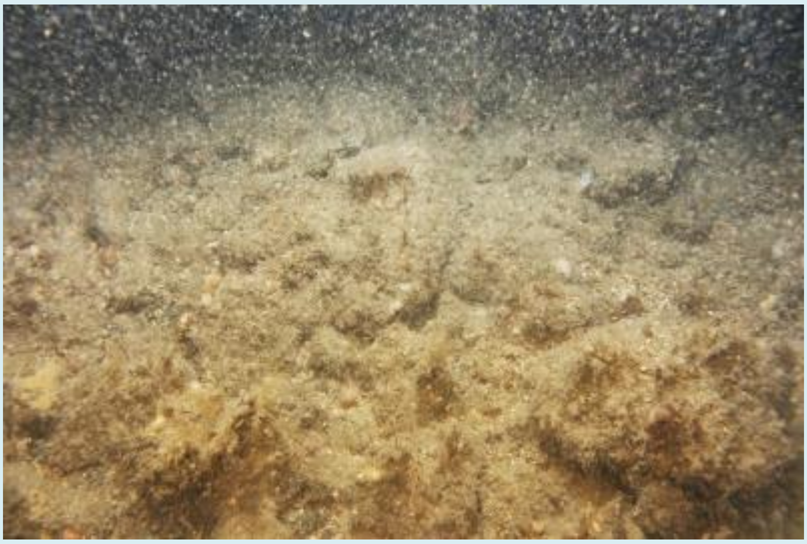
Station 18 CR.HCR.FaT	**Notes**
	Bedrock with dahlia anemone *Urticina* sp., barnacles (probably a species of *Balanus*) and a low faunal turf probably of erect bryozoa and hydroids. Mobile fauna is restricted to a single painted topshell *Calliostoma zizyphinum*.

At three stations this biotope was further refined to CR.HCR.FaT.BalTub '*Balanus crenatus* and *Tubularia indivisa* on extremely tide-swept circalittoral rock' based on the abundance of barnacles but this can be considered as a 'best fit' as the epifauna at these stations was not as diverse as the biotope description suggests. Habitat at these stations was a mixture of boulder, cobble, pebble and gravel.
Stations 23, 25, 38.

Station 23 CR.HCR.FaT.BalTub	**Notes**
	Boulder, cobble, pebble and gravel with abundant barnacles. Dahlia anemone are present as is a small area of hydroid. Mobile fauna includes small gastropods (possibly *Nucella lapillus*) and a hermit crab (a member of the Paguridae family of indeterminate species).

<u>CR.HCR.Xfa</u> 'Mixed faunal turf communities'. Station 3.

Only Station 3 was included in this classification, which was assigned owing to the dense coverage of the hard substratum with sessile epifauna, mainly hydroids and bryozoans the majority of which could not be identified further.

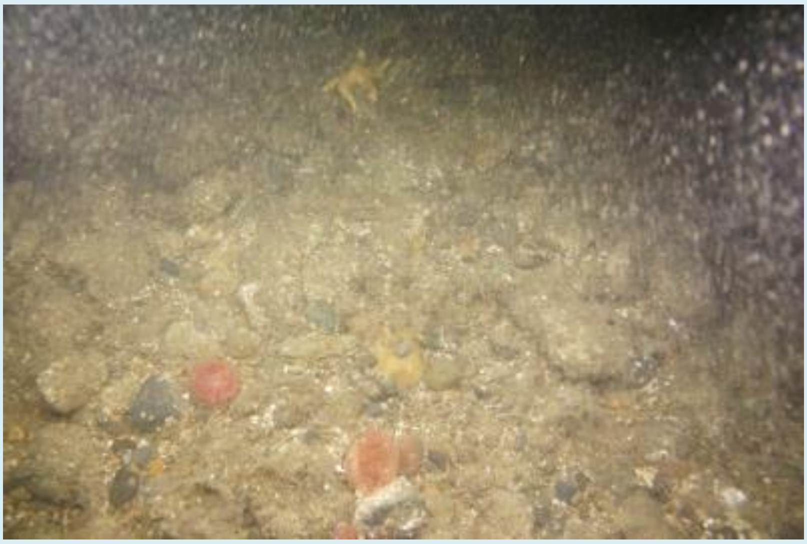
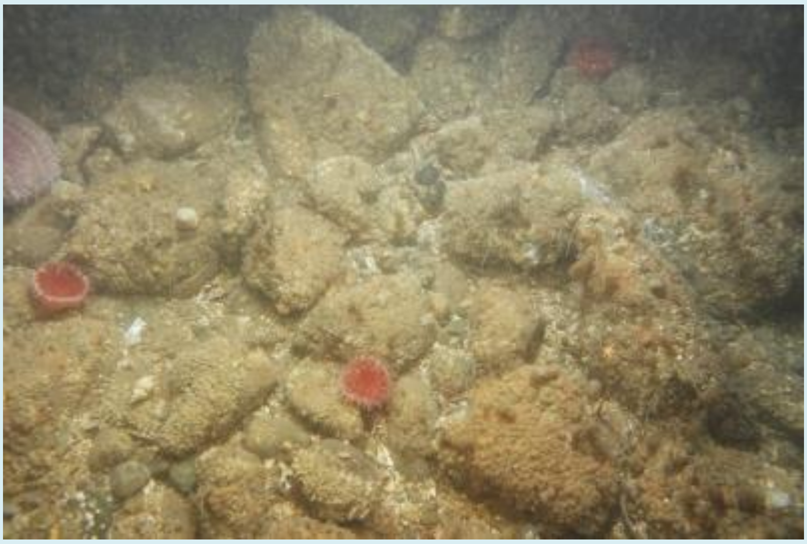
Station 3 CR.HCR.Xfa	**Notes**
	Cobble with some pebble, gravel and shell fragments. The larger particles are covered with a turf of erect fauna which may include the hydroid *Hydrallmania falcata* and the sponge *Hemimycale columella*. CR.HCR.Xfa

<u>CR.MCR.EcCr.UrtScr</u> '*Urticina felina* and sand-tolerant fauna on sand-scoured or covered circalittoral rock'. Stations 19, 20, 21, part of 32.

This biotope was assigned to a number of stations mainly with habitat of cobble and pebble but with bedrock at one station. Epifauna was generally sparse and was characterised by scour-tolerant taxa such as dahlia anemone, keelworms (Serpulidae) and barnacles.

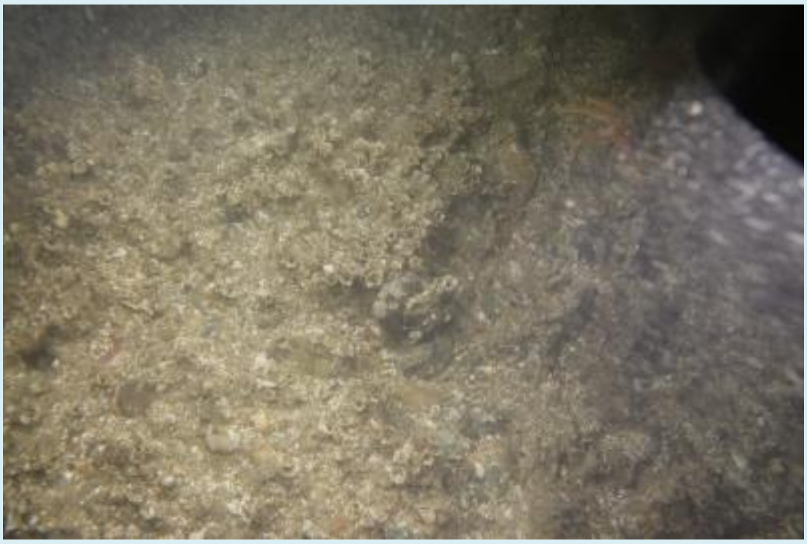
At a few stations, there was a slightly richer epifauna with characteristics of CR.MCR.EcCr.UrtScr but also some that matched CR.HCR.FaT.BalTub. To account for this, the stations in question (see Table 3) were classified as a combination of the two biotopes.

Stations 26, 28, 29

<table>
<tr><th>Station 21 CR.MCR.EcCr.UrtScr</th><th>Notes</th></tr>
<tr><td></td><td>Cobble, pebble and gravel with some shell fragments. A sparse covering of barnacles and faunal turf indicates regular disturbance of seabed particles. There are several dahlia anemones and a single common starfish Asterias rubens.</td></tr>
<tr><th>Station 28 CR.MCR.EcCr.UrtScr/ CR.HCR.FaT.BalTub</th><th>Notes</th></tr>
<tr><td></td><td>Boulder and cobble with some pebble and shell. The larger particles are covered in a moderately rich epifauna of barnacles, ascidians (possibly Dendrodoa grossularia or Distomus variolosus) and the erect bryozoan Alcyonidium diaphanum as well as dahlia anemone Urticina sp.
Mobile epifauna includes the sea urchin Echinus esculentus, the painted topshell Calliostoma zizyphinum, hermit crab and a small starfish.</td></tr>
</table>

<u>CR.MCR.CSab.Sspi</u> **'***Sabellaria spinulosa* encrusted circalittoral rock'. Stations 1, 24, 27.

There were five stations where honeycomb/ross worm was deemed to be in sufficient abundance that a *Sabellaria spinulosa* biotope could be assigned. Images generally showed a few aggregations of *Sabellaria* sp., mostly on coarse particles such as cobble and pebble but with some sand and possibly bedrock. Only Stations 22, 24 (see below) and 27 were deemed to have a sufficient abundance and elevation of *Sabellaria* aggregations to be considered as reef which is discussed further in the next section. At Station 16, the seabed was made up of finer sediment than at the other stations with *Sabellaria* and this shared as many features of the subtidal sediment biotope (SS.SBR.PoR.SSpiMx) as the circalittoral rock and has been classified as a combination of the two.

Station 24 CR.MCR.CSab.Sspi	**Notes**
	Cobble and boulder (possibly bedrock) with elevated aggregations of *Sabellaria* sp.. A common starfish *Asterias rubens* and an indeterminate anemone species are also present.

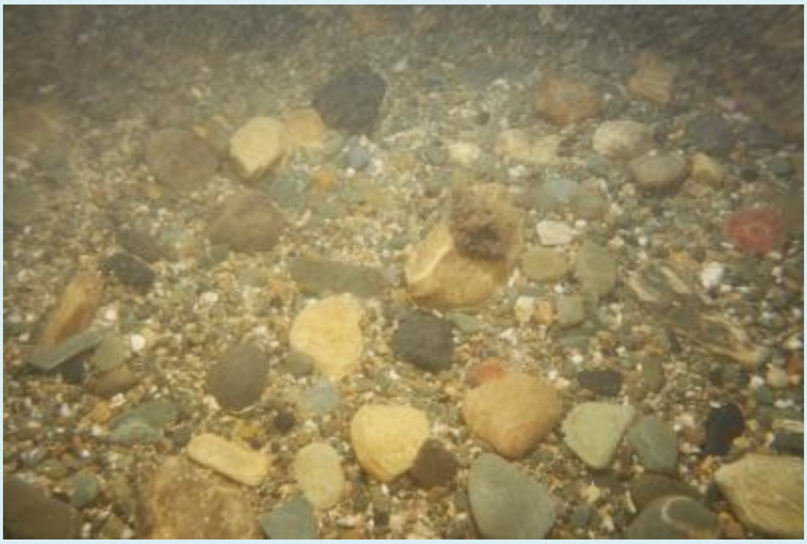
CR.LCR.BrAs.AntAsH '*Antedon* spp., solitary ascidians and fine hydroids on sheltered circalittoral rock' Station 36.

This biotope was assigned to a single station that was in a sheltered location on the cable route, as evidenced by the prevalence of a layer of fine sediment over bedrock. The epifauna was quite limited, and the characterising brachiopods were not seen (although these are typically very small and difficult to see in camera images) but there were numerous feather stars *Antedon bifida* and lightbulb sea squirt *Clavelina lepadiformis* which gave a best match for this biotope.

Station 36 CR.LCR.BrAs.AntAsH	**Notes**
	Silty bedrock or very large boulders. Identifiable epifauna was mainly feather stars and solitary ascidians but also with the erect bryozoan *Alcyonidium diaphanum*. There also appeared to be a short faunal turf and occasional fronds of a red alga

<u>SS.SCS.ICS.SSh</u> 'Sparse fauna on highly mobile sublittoral shingle (cobbles and pebbles)' Stations 30, 31.

The seabed at two stations was characterised by clean pebble and gravel, with an apparent lack of fine sediment, indicating that the sediment was mobile. At one station, there were cobbles the largest of which supported growths of mussels, which were probably *Musculus discors* and dahlia anemone were also present. The mussels were not at sufficient density to base a biotope classification on and the general lack of epifauna led to SS.SCS.ICS.SSh being assigned to this station.

Station 30 SS.SCS.ICS.SSh	**Notes**
	Cobble, pebble and gravel. Small aggregations of mussels, probably *Musculus discors*, on larger particles and one dahlia anemone.

<u>SS.SMX.IMx</u> 'Infralittoral mixed sediment' Stations 33, 34, 35, 37.

At two stations on the cable route, there were a variety of coarse sediment, predominantly gravel but with some cobble. Epifauna was sparse but more conspicuous than at station 30 (see above) which in combination with the likely presence of fine sediment and the relatively shallow depth of the station, it was designated as SS.SMX.IMx. The habitat at these stations are likely to be infauna-dominated and the biotope will be redefined upon interpretation of the grab faunal data.

Station 34 SS.SMX.IMx	**Notes**
	Gravel and pebble with hermit crabs, hydroids and serpulid worms.
Station 35 SS.SMX.IMx	**Notes**
	Cobble and pebble with some boulder and gravel. Epifauna includes various hydroids and anemones with gastropods and the brittlestar *Ophiura albida*

<u>SS.SMX.CMx.FluHyd</u> '*Flustra foliacea* and *Hydrallmania falcata* on tide-swept circalittoral mixed sediment'. Stations 6, 9, 10.

There were three stations in the PDA, where the seabed was heavily encrusted with a faunal turf and all of them supported hornwrack *Flustra foliacea* though generally at low abundance. Other sessile fauna included sea anemones (*Sagartia* sp. and *Urticina* sp.), serpulid worms, the hydroid *Nemertesia antennina* and a sabellid worm at station 9.

Station 10 SS.SMX.CMx.FluHyd	**Notes**
	Pebble and gravel with coarse sand. Sessile epifauna includes *Flustra foliacea*, the hydroid *Nemertesia antennina*, sea squirts of indeterminate species and anemones possibly *Sagartia* sp. Mobile fauna visible in the image was restricted to bloody henry starfish *Henricia* sp.

<u>SS.SSA.IFiSa.ScupHyd</u> ‘*Sertularia cupressina* and *Hydrallmania falcata* on tide-swept sublittoral sand with cobbles or pebbles.’ Station 32 part.

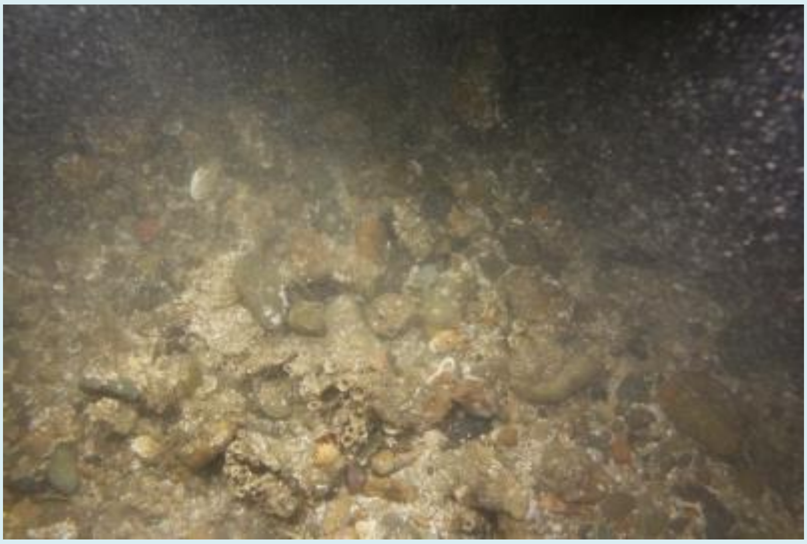
There was one station towards the eastern end of the CRC where five images were obtained one of which showed bedrock and anemones (see CR.MCR.EcCr.UrtScr above) but the remainder showed a seabed of showed a seabed of sand, gravel and dead bivalve shells. This supported a varied epifauna but hydroids dominated and the seabed in these images was classified as SS.SSA.IFiSa.ScupHyd.

Station 32 SS.SSA.IFiSa.ScupHyd	**Notes**
	Coarse sand and horse mussel shell. The horse mussel shell supports growths of hydroids including *Hydrallmania falcata*. Other sessile fauna inclides serpulid worms and small anemones of an indeterminate species.

<u>SS.SMX.OMx</u> 'Offshore circalittoral mixed sediment'. Stations 2, 4, 5, 7, 8, 11, 12, 13, 14, 39, 41.

At most stations in the PDA the seabed was of coarse particles, mainly pebble and gravel but with variable proportions of cobble and sand. There were variable quantities of epifauna between stations but it is likely that these stations are infauna dominated and therefore the classification was limited to SS.SMX.OMx but this will be refined once grab data has been interpreted.

Station 7 SS.SMX.OMx	**Notes**
	Pebble and gravel and some sand with *Modiolus* shell. Some of the larger particles support a faunal turf, a small patch of sponge and a hydroid that may be *Sertularia* sp.
Station 13 SS.SMX.OMx	**Notes**
	Pebble, gravel, shell fragments and broken *Sabellaria* tubes. Larger particles support faunal turf and serpulid worms. Mobile epifauna included a sea urchin *Psammechinus miliaris* and a crab of indeterminate species.

Station 41 SS.SMX.OMx	**Notes**
	Cobble, pebble and gravel with small aggregations of *Sabellaria* sp. This station was investigated for *Modiolus modiolus* reef which is further discussed in Section 0.

SS.SMX.Omx/CR.MCR.Csab 'Offshore circalittoral mixed sediment' and 'Circalittoral Sabellaria reefs'. Station 22.

At this station in the CRC, the seabed had many characteristics of the offshore mixed sediments seen elsewhere (particularly in the PDA) but also had some seabed coverage of *Sabellaria* aggregations, though not sufficient to assign the station purely to a *Sabellaria* biotope. As a result, this station was assigned as a combination of the two biotopes.

Station 22 SS.SMX.Omx/CR.MCR.Csab	**Notes**
	Gravel, pebble, cobble and probably boulder. Obvious epifauna consists of two relatively large aggregations of *Sabellaria* sp., anemones *Urticina* sp. and hydroids including *Hydrallmania falcata*.

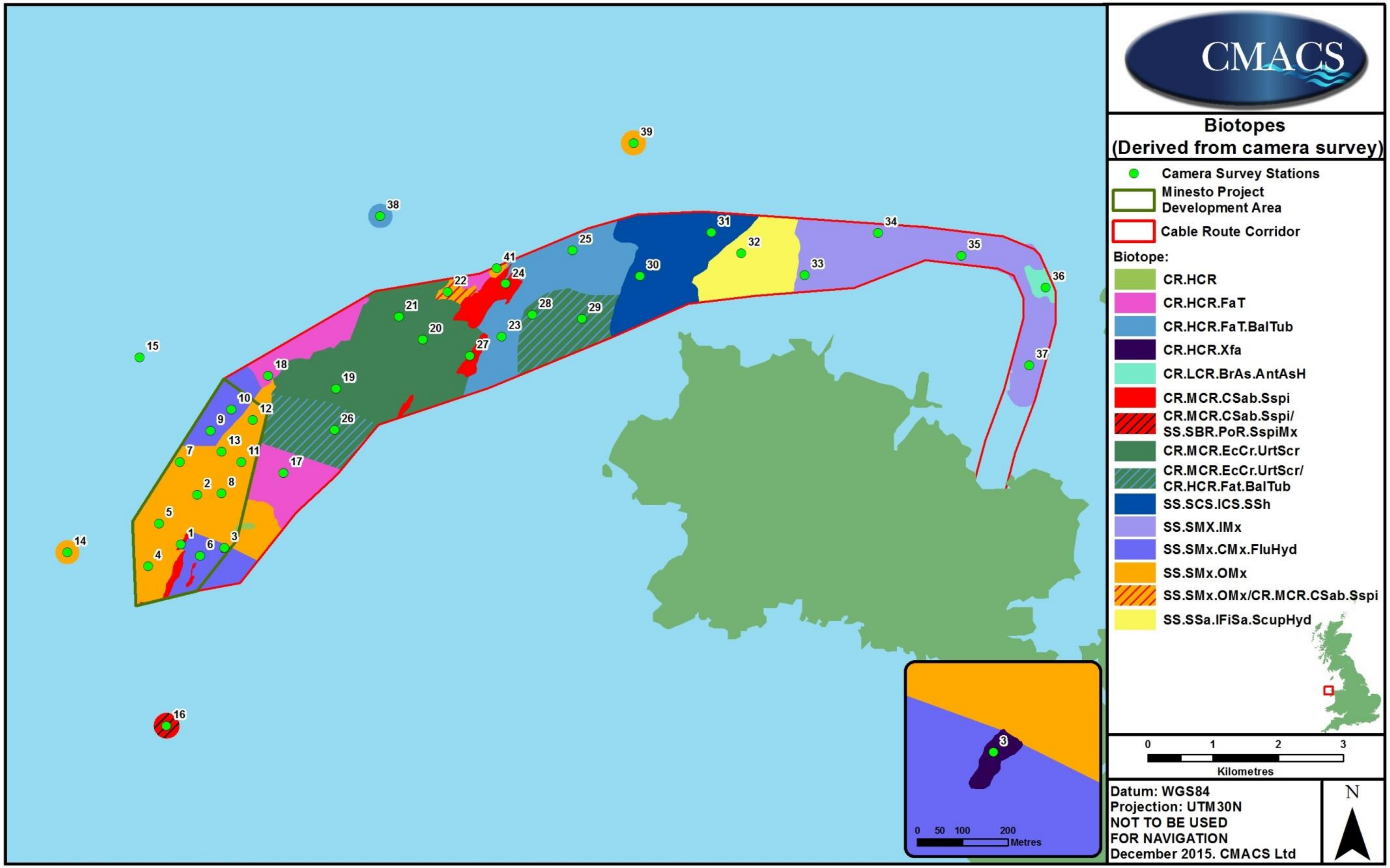


Figure 5. Indicative biotope map based on side scan sonar mosaic and drop down camera images.

4.2 Particle size analysis

Raw data is provided in Appendix 4. Particle size analysis data

Most samples were classified as muddy sandy gravel or sandy gravel, with exceptions at four sample stations: at station 27 (located in the middle of the cable route) there was very little mud with a low percentage of sand and the sediment at this station was classified as gravel; at stations 33 and 34 (located in the cable route just off the northern coast of Holy Island) the sand fraction was three times larger than the gravel fraction and the sediments at these stations were classified as gravelly sand. At station 42, the sediment sample was made up of fine sand and mud and therefore was classified as muddy sand.

5. Habitats of conservation importance

Benthic images were screened for potential Annex I habitats which, where possible, were classified into a quality category according to present guidelines. Any habitats of conservation importance were also noted.

***Sabellaria* reef**

There were five stations (see Figure 4) where there were large aggregations of *Sabellaria* sp. which were assessed against "reefiness" according to the guidelines of Gubbay (2007) which are defined as follows:

Measure of 'reefiness'	Not a reef	Low	Medium	High
Elevation (average tube height, cm)	<2	2-5	5-10	>10
Area (m^2)	<25	25-10,000	10,000-1,000,000	>1,000,000
Patchiness (% cover)	<10	10-20	20-30	>30

Station	Elevation	Area[1]	Patchiness	Reef quality
1	<2	19,000m^2	10%	Not a reef
16	<2	Unknown	10-20%	Not a reef
22	5-10	140,000m^2	10%	Low-medium
24	2-5	398,000m^2	20%	Low
27	2-5	123,000m^2	10%	Low

Elevation and patchiness were estimated from still and video images, whilst the extent was estimated from sidescan images. At most stations where obvious aggregations of *Sabellaria* sp. were present, they were sparse and often restricted to encrusting the larger stones. The aggregations were generally not consolidating sediment and were typically of low elevation, and therefore were either considered to be "not a reef" (due primarily to lack of elevation), or

[1] These are estimates based on extrapolation of area from the sidescan mosaic.

of low ‘reefiness’ according to the guidance. At station 22, due to the combination of elevation appearing to be predominantly between 5 and 10cm, and the considerable area involved (estimated 140,000m^2) the habitat is considered to represent low-medium reefiness, although even here the patchiness is estimated at around 10% which is at the lower limit of what is considered as reef.

Stony reef

There were nine stations (see Figure 4) where the proportion of large particles was high enough that they might be considered as stony reef which were assigned a reefiness under the following guidelines (Irving, 2009):

		‘Reefiness’		
Characteristic	**Not a ‘stony reef’**	**Low**	**Medium**	**High**
Composition Boulders/cobbles (>64mm)	<10%	10-40% (Matrix supported)	40-95%	>95% (Clast supported)
Elevation	Flat or undulating seabed	<64mm	64mm-5m	>5m
Extent	<25m^2	←	>25m^2	→
Biota	Dominated by infauna			>80% epifauna
Patchiness	10%	10-50%	50-75%	>75%

Station	Composition	Elevation	Extent	Biota	Patchiness	Reef quality
3	10-40%	<64mm	>25m^2	>80% epifauna	20%	Medium
19	<10%	<64mm	>25m^2	<80% epifauna	10%	Low
20	<10%	<64mm	>25m^2	<80% epifauna	30%	Low
21	<10%	<64mm	>25m^2	<80% epifauna	25%	Low
23	80%	64mm-5m	>25m^2	Likely epifauna dominated	>75%	Medium
25	50%	64mm-5m	>25m^2	Likely epifauna dominated	50%	Medium
28	80%	<64mm	>25m^2	Likely epifauna dominated	>75%	Medium
29	70%	64mm-5m	>25m^2	Likely epifauna dominated	>75%	Medium
35	20%	<64mm	>25m^2	<80% epifauna	20%	Low

None of the stations were classified as high reefiness but there were five that were of medium and four of low reefiness. This was mainly of the basis of the physical characteristics as biota was limited in many cases.

Bedrock reef

There are no current guidelines specifically for determining the quality or reefiness of bedrock reef but there were four stations (17, 18, 32, 36) that could be qualified as this habitat. Arguably the elements of extent, patchiness and elevation could be used, whilst composition and biota are not relevant to assessing reefiness of bedrock. Although patchiness is unclear, the bedrock at the four stations identified as such was clearly between

64mm and 5m and extent was clearly over $25m^2$, hence suggesting a medium reefiness according to these criteria. The substrate at station 32 was certainly patchy to some degree, since both sedimentary and bedrock biotopes were identified at this station (Table 3). The associated fauna at all four stations was neither rich nor diverse, typically consisting of scattered dahlia anemones with sparse hydroids, sponges and barnacles.

Possible horse mussel reef

The image from the seabed in the region of station 41, where possible horse mussel reef was identified from sidescan sonar records, were reviewed but there was no indication of *Modiolus* reef. No live *Modiolus* were seen, and only one or two empty shells. A few *Sabellaria* tubes were seen, although these were sparse and therefore did not present *Sabellaria* reef. This station was classified as SS.SMX.OMx.

Tide-swept channels – UK BAP habitat.

Tide-swept channels habitat was identified in the Scope of Works as being near, but not present, in the development area. Results from the drop down camera are in agreement with this; while the seabed was subject to strong tidal currents, it did not support the diverse array of epifauna that is typical of tide-swept channels such as that found between The Skerries and mainland Anglesey a few miles to the north-east of the PDA and CRC.

6. Conclusions/summary

The findings of the survey described here are in line with those of previous benthic investigations carried out in the same general area; a seabed of predominantly coarse particles with the presence of some Annex I habitat.

The drop down camera survey revealed that the seabed of very coarse sediment supported a limited epifauna, likely owing to scour from suspended particles in strong tidal flows.

Much of the cable route corridor was similar but also with bedrock at some locations and a much greater proportion of finer particles at stations near to the proposed landfall.

Three Annex I habitats were identified from the benthic images with low quality *Sabellaria* reef at two locations, low to medium quality *Sabellaria* reef at a further location, low or medium quality stony reef at nine locations and bedrock reef, tentatively described as medium reefiness, at a further four stations. No potential *Modiolus* reef was found.

7. References

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8. Plates

Plate 1. Seaspyder dropdown camera system provided by STR.

Appendix 1: Field notes from Camera survey

Site Number	Date	Time (BST)	Depth (m)	Fix on bottom	Image Number	Description & notes
36	24/6/15	16:15	12.6	48 to 50	18 to 23	Boulders covered in silt and epifauna. *Asterias rubens*, hydroids and one anemone.
35	24/6/15	16:42	22.1	52 to 56	24 to 31	Coarse seabed, pebble, gravel, some cobble. Possible encrusting *Sabellaria*, hydroids
34	24/6/15	17:06	25.0	57 to 61	32 to 37	Shelly gravel with hermit crab (one image) and hydroid, possibly *Rhizocaulus*.
33	24/6/15	17:16	26.2	62 to 66	38 to 43	Gravel and *Modiolus* shell. Hermit crab, some hydroid.
32	24/6/15	17:36	28.0	67	44	Only one image which was a veneer of sediment over bedrock, numerous *Urticina* sp.
37	24/6/15	18:08	10.8	68 to 72	45 to 50	Sand and silt
32	25/6/15	08:55	28.6	73 to 76	51 to 54	Gravel and shell, pebbles with abundant hydroids
31	25/6/15	09:20	30.8	77 to 81	55 to 59	Clean gravel and pebble. Two *Urticina* sp. in image 59.
30	25/6/15	09:35	34.5	82 to 86	60 to 64	Clean pebble and cobble, some encrusting growths and *Urticina* sp.
25	25/6/15	09:50	37.1	87 to 89	65 to 67	Cobbles and boulder over bedrock. Numerous *Urticina* sp., *Henricia* and *Crossaster*, hydroids.
29	25/6/15	15:50	N/A	N/A	68	Coarse seabed. Currents very strong and pulled camera over. Small-spotted catshark in video.
29	27/6/15	06:35	39.2	108	69	Boulder or cobbles with abundant epifauna including hydroids, *Urticina* and keelworm
28	27/6/15	06:49	40.7	109	70	Boulder and cobble with epifauna
24	27/6/15	07:00	43.8	110	71	Pebbles with *Sabellaria* and an *Asterias rubens*
41	27/6/15	07:29	51.9	111	72	Pebbles with some *Sabellaria* tubes

Site Number	Date	Time (BST)	Depth (m)	Fix on bottom	Image Number	Description & notes
23	27/6/15	07:48	42.5	112	73	Cobble, boulder with epifauna including *Urticina*
27	27/6/15	07:58	47.4	113	74	Pebble and gravel, some *Sabellaria*, prawn seen in video
22	27/6/15	08:09	53.8	114	75	Pebble and gravel, some *Sabellaria*
20	27/6/15	08:20	54.9	115	76	Pebble, gravel, shell and cobble
21	27/6/15	08:30	63.6	116	77	Pebble and cobble, *Urticina*, *Asterias* and hydroids
19	27/6/15	08:42	69.7	118	78	Cobble and pebble, one *Urticina*
26	27/6/15	08:55	55.0	119	79	Cobble and pebble
17	27/6/15	09:22	56.0	120	80	Bedrock with *Flustra* and sponges
11	27/6/15	09:30	82.6	122	81 & 82	Pebbles and cobbles, visibility not great owing to strong tide
8	27/6/15	09:38	83.6	123	83	Camera on its side? Some *Flustra* seen
2	27/6/15	09:49	N/A	N/A	-	No visibility, camera probably landed on its side
38	27/6/15	10:48	79.3	125	84	Gravel and pebble, one *Urticina*
39	27/6/15	11:37	39.8	126	85	Gravel and pebble, hydroids, barnacles and hermit crabs
18	29/6/15	14:44	74.0	173	86	Visibility not great, bedrock with barnacles and *Urticina* and painted topshell
12	29/6/15	14:54	71.0	175	87	Stills camera froze only got an image just as the camera lifted off the seabed. Seabed of pebbles with barnacles and hydroids
10	29/6/15	15:05	84.6	177	88	Pebble and cobble, *Flustra* and *Asterias*, hydroids

Site Number	Date	Time (BST)	Depth (m)	Fix on bottom	Image Number	Description & notes
9	29/6/15	15:17	88.4	178	89	Pebbles and gravel with some shell, hydroids. Dogfish on video
13	29/6/15	15:26	85.7	180	90	Pebble and sand with hydroids
7	29/6/15	15:41	86.8	181	91	Pebble and shell with hydroids and gravel
2	29/6/15	15:51	88.0	182	92 & 93	Pebble, gravel and shell. Hydroids and some encrusting *Sabellaria*
8	29/6/15	16:03	79.8	183	94	Cobble and pebble with *Asterias*
3	29/6/15	16:16	75.3	184	95	Cobble and boulder with hydroid
6	29/6/15	16:29	79.5	185	96	Pebble and gravel with *Urticina* and hydroid and *Flustra*
1	29/6/15	16:36	81.2	186	97 & 98	Sand and shell possibly with boulder or cobble
5	29/6/15	16:45	80.4	187	-	No still image – fault with camera, video okay. Pebble, gravel and cobble, quite clean some serpulids
4	29/6/15	16:57	81.5	188	99	Pebble and gravel
16	29/6/15	17:16	67.0	189	100	Sand, shell and gravel with hydroids. Broken *Sabellaria* tubes make up much of sediment, some pebble
14	29/6/15	17:36	51.6	190	101	Gravel, pebble and shell
15	29/6/15	17:50	63.9	191	102	Very poor visibility but looks like pebble and gravel with a starfish.

Appendix 2: Field notes from Grab survey

Sample number	Date	Time (UTC)	Depth (m)	Fix	Sample volume (litres)	Sediment description
35b	25/6/15	11:21	19.3	18091	5	Sand, gravel, pebble, larger particles, some epifauna. Attempt a (fix 18090) failed to obtain a suitable sample.
35d	25/6/15	11:34	19.7	18093	5	Sand, gravel, pebble, larger particles, some epifauna. Attempt c (fix 18092) failed to obtain a suitable sample.
34a	25/6/15	11:49	22.6	18094	6	Sand and gravel
34d	25/6/15	11:57	22.6	18097	2	Sand, gravel, pebble, *Sabellaria* aggregation. Kept for PSA but not contaminants. Attempts b & c (fixes 18095 and 18096) failed to obtain a suitable sample.
33a	25/6/15	12:11	24.8	18098	7	Shelly sand and gravel, some pebble, *Sabellaria* aggregations encrusting pebble
33b	25/6/15	12:13	24.2	18099	5	Shelly sand and gravel with some pebble
31b	25/6/15	12:32	30.5	18102	6	Coarse sand, pebble and gravel, large polychaete, hermit crab, anemone. Attempt a (fix 18101) failed to obtain a suitable sample.
31d	25/6/15	12:39	30.6	18104	7	Pebble and gravel with some coarse sand and shell. Attempt c (fix 18103) failed to obtain a suitable sample.
30	25/6/15	12:59	34.9	18105-7		Three attempts, all unsuccessful (no sample at all)
37	27/6/15	11:31	8.4	18127-34	≤2	3 attempts with Day grab, 5 attempts with Hamon grab. Small samples of fine sand and pebble. No sample taken.
41	29/6/15					3 attempts, no sample, a few grains of sand in grab (re-attempted on 1st July)
24	29/6/15					As above
27b	29/6/15	07:25	47.6	18141	≈3	Small sample but taken for fauna. Attempt a (fix 18140) failed to obtain a suitable sample.
27c	29/6/15	07:34	44.9	18142	≈2	Small sample but taken for PSA only
20a	29/6/15	07:49	54.9	18143	≈3	Cobble, pebbles, some finer sediment, anemones, crab, hydroids.
20d	29/6/15	08:00	54.8	18146	≈2	1 large cobble and some pebbles. No sample kept. *Sabellaria* on the cobble. Attempts b & c (fixes 18144 and 18145) failed to obtain a suitable sample.
21	29/6/15	08:10	62.0	18147-49	≤1	Pebble and gravel. Some shell fragments and soft clay (?), barnacles. No sample obtained.
22c	29/6/15	08:39	53.2	18152	2-3	Pebble, gravel, shells, some sand and clay. *Sabellaria* tubes. Small sample but kept for fauna. Attempts a & b (fixes 18150 and 18151) failed to obtain a suitable sample.
22d	29/6/15	08:43	52.2	18153	2-3	As above. Kept for PSA but not enough fine sediment for contaminants
38b	29/6/15	09:03	79.5	18156	8	Pebbles, gravel, clay and shell fragments. Some barnacles and hydroids. Fix 18154 was a failure grab failed to fire. Attempt a (fix 18155) failed to obtain a suitable sample.

Sample number	Date	Time (UTC)	Depth (m)	Fix	Sample volume (litres)	Sediment description
38c	29/6/15	09:07	80.9	18157	8	Pebbles, gravel, clay and shell fragments. Some barnacles and hydroids.
19a	29/6/15	09:27	66.7	18158	3	Pebble and gravel, taken for fauna.
19e	29/6/15	09:54	68.8	18162	5	Pebble and gravel with clay and shell fragments. Attempts b to d (fixes 18159 to 18161) failed to obtain a suitable sample. Attempt c had a good sample but a large cobble was in the jaw of the grab
11b	29/6/15	10:14	84.3	18164	5	Clay, pebble, gravel, shell. Attempt a (fix 18163) obtained 3 litres of sediment - discarded.
11c	29/6/15	10:19	80.9	165	5	Clay, pebble, grave and shell
24c	29/6/15	10:56	44.3	166	5	Clay, pebble, gravel and shell. Taken for fauna. Attempts a & b (fixes 18167 and 18168) obtained a suitable sample but stones were caught in the jaws.
39	29/6/15	11:32	39.7	18169-72	≤1	Pebble, gravel, some sand and shell, encrusting *Sabellaria*, hydroids, *Psammechinus miliaris*
12b	1/7/15	12:09	76.7	19490	6	Some clay, mostly pebble, hydroids
12d	1/7/15	12:21	77.8	19492	5	Some clay and pebble, large cobble caught in jaws. Kept a PSA sample but not contaminants.
10a	1/7/15	12:35	86.7	19494	8	Clay and pebble and hydroids
10b	1/7/15	12:42	86.3	19495	8	Clay and pebble and hydroids
9b	1/7/15	12:58	88.7	19497	6	Clay, shell fragments, pebble and gravel, hydroid. 9a good sample but stones in jaws.
9c	1/7/15	13:05	88.4	19498	5	Clay, shell fragments, pebble and gravel, hydroid.
13b	1/7/15	13:23	88.3	19500	6	Clay, shell, pebble and gravel, *Sabellaria* tubes, hydroids 13a: good sample but stone in jaws
13c	1/7/15	13:29	87.4	19501	6	Clay, pebble and gravel, some shell and sand. Spider crab and large polychaete.
7a	1/7/15	13:37	86.8	19502	6	Attempt a: Stone in jaws. Mud, pebble and gravel, abundant hydroids, *Pisidia*, kept for fauna but note stone in jaws. Attempt b: 1 litre of sediment, gravel, pebble and shell fragments
7c	1/7/15	13:50	86.3	19504	6	Attempt c: cobble, pebble, gravel and clay Attempt d: 1 litre of sediment, station abandoned
2a	1/7/15	14:04	88.3	19506	5	First attempt large cobble in jaws (see photo). Sample kept for PSA. Second attempt less than 1 litre of sediment.
2c	1/7/15	14:15	88.7	19509	6	Kept for fauna. Clay, pebble and gravel. Crabs and hydroid.
8a	1/7/15	14:24	81.3	19510	8	Clay, pebble, hydroids. 2nd attempt sample ≤1 litre.
8c	1/7/15	14:34	80.4	19512	6	Cobble, pebble and clay
6a	1/7/15	14:44	78.4	19513	8	Clay, sand, pebble.
6b	1/7/15	14:48		19514	≤1	Pebbles. Attempt c (fix 19515) also failed. Faunal sample only at this station

Sample number	Date	Time (UTC)	Depth (m)	Fix	Sample volume (litres)	Sediment description
1a	1/7/15	15:00	80.9	19517	4	First sample kept for fauna. Cobble and pebble with *Sabellaria*. Second sample *Sabellaria* 1 litre of sediment. Third attempt <1 litre of sediment
5a	1/7/15	15:17	79.5	19520	3	Cobble, pebble, gravel and clay. Fail
5b	1/7/15	15:22	79.8	19521	1	Cobble, pebble and gravel. Fail. Attempt c (fix 19522) <1 litre sediment.
4b	1/7/15	15:41	81.6	19524	5	Pebble, gravel, some clay, gravel
4c	1/7/15	15:47	81.3	19525	8	Cobble, pebble and clay
16a	1/7/15	16:00	64.3	19526	7	Cobble, pebble, gravel, sand and clay
16b	1/7/15	16:05	66.8	19527	8	Cobble, pebble, gravel, sand and clay
14a	1/7/15	16:20	49.3	19528	≈2	Pebble, gravel and shell, some sand. Hydroids. Attempt b (at 16:23, fix 19529) similar. Stones in jaws and samples rejected.
14c	1/7/15	16:23	49.0	19530	≤1	Pebble, gravel and shell, some sand. Stones in jaws and sample rejected.
15a	1/7/15	16:42	60.6	19531	8	Almost solid lump of clay with some pebble and gravel
15b	1/7/15	16:46	60.2	19532	8	Almost solid lump of clay with some pebble and gravel. *Asterias rubens* and *Pisa* sp. in sample.
41d	1/7/15	17:13	49.0	19533	≤1	Pebble and gravel some shell. Brittlestar. Attempt e (at 17:19, fix 19534) ≈2 litres of sediment; pebble, gravel and shell.
41f	1/7/15	17:22	49.1	19535	≈2	Pebble, gravel and shell
24d	1/7/15	17:28	42.3	19536	≤1	Pebble and gravel.

Appendix 3. Drop down camera habitat and faunal data

Station	Replicate	Annex I	Image quality	Habitat	Taxon	Abundance	SACFOR	Notes	Grab?	Biotope
1	n/a	No	M	Sand and broken shell (including some *Modiolus*) with one area of slightly exposed bedrock	*Henricia* sp.	1	A		Yes	CR.MCR.Csab.Sspi
					Sagartia sp.?	4	F			
					Paguridae indet	1	C			
					Sabellaria sp.	10%	F			
					Faunal turf	10%	F			
					Flustra foliacea	<1%	R			
2	n/a	No	G	Coarse sand, shell fragments and pebble	Actinaria indet	6	F		Yes	SS.SMX.OMx
					Serpulidae indet	2	F			
					Sabellaria sp.	≈1%	R			
					Hydroida indet	≈1%	R			
3	n/a	Stony reef of low 'reefiness'	M	Cobble with some pebble, gravel and shell fragments	Actinaria (*Sagartia* sp.?)	9	F	Faunal turf includes porifera (possibly *Hemimycale columella* amongst others), hydroids (possibly *Hydrallmania falcata* amongst others and small sessile ascidians.	No	Cr.HCR.Xfa
					Faunal turf	90%	S			
4	n/a	No	M	Clean pebble and gravel with some shell	Serpulidae indet	≤10	F		Yes	SS.SMX.OMx
5	n/a	No	M	Clean pebble and gravel with some shell	Serpulidae indet	≤10	F	Analysis done on video, no still for this station.	No	SS.SMX.OMx
					Hydroida indet	<1%	R			
6	n/a	No	G	Pebble and gravel with some sand and shell	*Flustra foliacea*	<5%	O		Yes	SS.SMX.CMx.FluHyd
					Actinaria indet (Sagartia?)	2	F			
					Urticina sp.	1	C			
					Nemertesia antennina	2	A			
					Faunal turf	≈10%	F			
					Brachyura indet	1	C			
					Serpulidae indet	13	C			
					Ascidacea indet (*Molgula* sp.?)	1	F			
7	n/a	No	G	Pebble and gravel with some sand and *Modiolus* shell	*Gibbula cinerea* (?)	2	F		Yes	SS.SMX.OMx
					Sertularia sp. (?)	<1%	R			
					Faunal turf	≈10%	F			
					Porifera indet	<1%	R			
8	n/a	No	G	Pebble and gravel with some sand	*Asterias rubens*	1	A		Yes	SS.SMX.OMx
					Henricia sp.	1	A			
					Urticina sp.	1	C			
					Porifera indet (*Hemimycale* ?)	<1%	R			
					Erect branched sponge	1	C			
					Faunal turf	50%	A			
9	n/a	No	M	Gravel with pebbles and shell fragments	Sabellidae indet	1	A		Yes	SS.SMX.CMx.FluHyd
					Flustra foliacea	<1%	R			
					Faunal turf	10%	F			
					Sagartia sp.?	1	F			
					Urticina sp.	2	C			
					Serpulidae indet	5	F			
10	n/a	No	M	Pebble, gravel and coarse sand	*Henricia* sp.	2	A		Yes	SS.SMX.CMx.FluHyd
					Flustra foliacea	≈5%	R			
					Actinaria indet (*Sagartia* ?)	6	F			
					Nemertesia antennina	1	A			
					Ascidacea indet	5	F			
					Faunal turf	50%	A			

Station	Replicate	Annex I	Image quality	Habitat	Taxon	Abundance	SACFOR	Notes	Grab?	Biotope
11	n/a	No	M	Cobble , pebble and gravel	Serpulidae indet	2	F	Numerous attachment scars of barnacles on most cobbles and some pebbles	Yes	SS.SMX.OMx
					Faunal turf	10-20%	F			
12	n/a	No	n/a	Cobble , pebble and gravel	Serpulidae indet	12	C	Data derived from video, no still for this station.	Yes	SS.SMX.OMx
13	n/a	No	M	Pebble, gravel, shell fragments and broken *Sabellaria* tubes	Brachyura indet	1	C		Yes	SS.SMX.OMx
					Psammechinus miliaris	1	C			
					Faunal turf	10-20%	F			
					Serpulidae indet	6	F			
14	n/a	No	G	Clean pebble and gravel. Possibly some cobble.	Serpulidae indet	17	C		No	SS.SMX.OMx
					Encrusting bryozoa	Present				
15	n/a	?	P	Barely visible, gravel and shell	*Henricia* sp.	1	A		Yes	
16	n/a	No	G	Mostly broken *Sabellaria* tubes with gravel and pebble	*Sabellaria* sp.	10-20%	F	Scattered low-lying aggregations of *Sabellaria* which provide attachment for hydroids.	Yes	CR.MCR.Csab. Sspi/SS.SBT.PoR.SspiMx
					Hydroida indet	10-20%	F			
					Halecium sp (?)	1	C			
17	n/a	Yes. Bedrock reef	M	Bedrock with some gravel.	*Flustra foliacea*	10%	C		No	CR.HCR.FaT
					Yellow sponge (porifera indet)	10%	C			
					Hydroida indet	<1%	R			
					Urticina sp.	1	C			
					Faunal turf	80%	S			
18	n/a	Yes. Bedrock reef	M	Bedrock	*Calliostoma zizyphinum*	2	F		No	CR.HCR.FaT
					Urticina sp.	8	C			
					Barnacles (*Balanus balanus* ?)	<1%	R			
					Faunal turf	20%	C			
19	n/a	Yes. stony reef of low 'reefiness'	G	Cobble, pebble and gravel	*Urticina* sp.	2	C		Yes	CR.MCR.EcCr.UrtScr
					Serpulidae indet	14	C			
					Barnacles indet	<1%	R			
					Faunal turf	10%	F			
20	n/a	Yes. stony reef of low 'reefiness'	G	Cobble, pebble and gravel with shell fragments and possibly some bedrock.	*Urticina* sp.	3	C		Yes	CR.MCR.EcCr.UrtScr
					Sabellaria sp.	≈1%	R			
					Hydroida indet	<1%	R			
					Barnacles (*Balanus balanus* ?)	1	F			
					Serpulidae indet	2	F			
21	n/a	Yes. stony reef of low 'reefiness'	G	Cobble, pebble and gravel with shell fragments.	*Asterias rubens*	1	A	Faunal turf includes a few encrusting tubes of *Sabellaria*	No	CR.MCR.EcCr.UrtScr
					Urticina sp.	3	C			
					Barnacle	5%	R			
					Faunal turf	20%	C			
22	n/a	No	G	Pebble and gravel with shell fragments	*Sabellaria* sp.	10%	F		Yes	SS.SMX.OMx/CR.MCR.Csab
					Urticina sp.	2	C			
					Serpulidae indet	4	F			
					Flustra foliacea	<1%	R			
					Hydrallmania falcata	5%	O			
					Hydroida indet	5%	O			
23	n/a	Yes. Stony reef of low or medium reefiness	G	Boulder, cobble, pebble and gravel	*Urticina* sp.	3	C		No	CR.HCR.FaT.BalTub
					Serpulidae indet	1	F			
					Paguridae indet	1	C			
					Muricidae indet	13	A			
					Barnacles	80%	S			
					Hydroida indet	<1%	R			

Station	Replicate	Annex I	Image quality	Habitat	Taxon	Abundance	SACFOR	Notes	Grab?	Biotope
24	n/a	Potentially *Sabellaria spinulosa* reef of	G	Boulder, cobble, pebble, possibly bedrock	*Sabellaria* sp.	20%	F		Yes	Cr.MCR.CSab
					Asterias rubens	1	C			
					Actinaria indet	1	C			
25	a	Yes. Stony reef of low or medium reefiness	G	Boulder, cobble and pebble	*Henricia* sp.	1	A		No	CR.HCR.FaT.BalTub
					Urticina sp.	9	C			
					Barnacle	60%	A			
					Serpulidae indet	4	F			
					Actinaria indet	1	C			
					Gastropoda indet	1	A			
25	b	Yes. Stony reef of low or medium reefiness	G	Boulder, cobble and pebble	*Urticina* sp.	2	C		No	
					Actinaria indet	2	C			
					Porifera indet	1%	R			
					Barnacle	40%	A			
					Hydroida indet	5%	F			
					Serpulidae indet	3	F			
					Muricidae indet	1	C			
25	c	Yes. Stony reef of low or medium reefiness	G	Bedrock, cobble and pebble.	*Crossaster papposus*	1	A		No	
					Urticina sp.	2	C			
					Calliostoma zizyphinum	2	F			
					Barnacle	40%	A			
					Hydroid (possibly Sertularia)	1%	O			
26	n/a	Yes. Stony reef of low reefiness	G	Boulder, cobble and pebble. Some sand and gravel.	*Urticina* sp.	1	C		No	CR.MCR.EcCr.UrtScr/CR.HCR.FaT.BalTub
					Gastropoda indet	2	C			
					Barnacle	50%	A			
					Serpulidae indet	5	F			
					Faunal turf	5%	O			
27	n/a	No	G	Cobble and pebble. Some sand and gravel.	*Sabellaria* sp.	10%	F		Yes	CR.MCR.Csab.Sspi
					Urticina sp.	1	C			
					Buccinum undatum	1	C			
					Actinaria indet	1	C			
					Compound ascidian?	<1%	R			
					Serpulidae indet	8	F			
					Hydroid (possibly Sertularia)	<1%	R			
					Diodora graeca ?	1	C			
28	n/a	Yes. Stony reef of low or medium 'reefiness'	G	Boulder, cobble with some pebble and shell.	*Echinus esculentus*	1	A		No	CR.MCR.EcCr.UrtScr/CR.HCR.FaT.BalTub
					Calliostoma zizyphinum	1	F			
					Urticina sp.	3	C			
					Paguridae indet	1	C			
					Asteroidea juvenile	1	C			
					Actinaria indet	1	C			
					Tubularia sp.	<1%	R			
					Hydroida indet	5%	O			
					Barnacles	20%	C			
					Alcyonidium?	5%	C			
					Ascidiacea (Distomus or Dendrodoa)	10%	F			

Station	Replicate	Annex I	Image quality	Habitat	Taxon	Abundance	SACFOR	Notes	Grab?	Biotope
29	n/a	Yes. Stony reef of low or medium 'reefiness'	G	Boulder and cobble with some pebble and shell	*Urticina* sp.	8	C		No	CR.MCR.EcCr.UrtScr/CR.HCR.FaT.BalTub
					Barnacle	40%	A			
					Calliostoma zizyphinum	1	F			
					Alcyonidium ?	1%	O			
					Porifera indet	1%	R			
					Serpulidae indet	2	F			
					Hydroida indet	10%	C			
30	a	No	G	Gravel and pebble with some cobble and boulder.	Mussel aggregation (*Musculus* sp.?)	1%	R		No	SS.SCS.ICS.SSh
					Hydroida indet	<1%	R			
30	b	No	G	Gravel and pebble with some cobble and boulder.	Mussel aggregation (*Musculus* sp.?)	1%	R			
					Hydroida indet	<1%	R			
30	c	No	G	Gravel and pebble with some cobble and boulder.	Mussel aggregation (*Musculus* sp.?)	5%	R			
					Hydroida indet	<1%	R			
30	d	No	G	Gravel and pebble with some cobble and boulder.	Mussel aggregation (*Musculus* sp.?)	<1%	R			
					Hydroida indet	<1%	R			
					Urticina sp.	2	C			
30	e	No	G	Gravel and pebble with some cobble and boulder.	Mussel aggregation (*Musculus* sp.?)	1%	R			
					Hydroida indet	<1%	R			
					Urticina sp.	2	C			
31	a	No	G	Mostly clean gravel and pebble with some cobble	Barnacle	<1%	R		Yes	SS.SCS.ICS.SSh
					Serpulidae indet	2	F			
					Gibbula cinerea (?)	1	F			
31	b	No	G	Clean gravel and pebble with some cobble	Barnacle	<1%	R			
					Serpulidae indet	5	F			
					Gibbula cinerea (?)	3	F			
					Hydroida indet	<1%	R			
31	c	No	G	Clean gravel and pebble with some cobble	*Urticina* sp.	1	C			
					Barnacle	<1%	R			
31	d	No	G	Clean gravel and pebble with some cobble	Barnacle	<1%	R			
					Serpulidae indet	1	F			
					Gibbula cinerea (?)	1	F			
					Hydroida indet	<1%	R			
31	e	No	G	Clean gravel and pebble with some cobble	*Urticina* sp.	2	C			
					Barnacle	<1%	R			
					Faunal turf	<1%	R			
					Serpulidae indet	1	F			
					Gibbula cinerea (?)	1	F			

Station	Replicate	Annex I	Image quality	Habitat	Taxon	Abundance	SACFOR	Notes	Grab?	Biotope
32	a	Yes. Bedrock reef	G	Bedrock with a veneer of sand and shell in places	*Urticina* sp.	4	C		No	CR.MCR.EcCr.UrtScr
					Faunal turf	15%	F			
					Majidae indet	1	C			
					Sabellaria sp.	<1%	R			
32	b	No	G	Modiolus shell and sand	Hydroida indet	40%	S	Hydroid turf includes some Hydrallmania falcata		SS.SSA.IFiSa.ScupHyd
					Actinaria indet	1	C			
					Serpulidae indet	9	F			
32	c	No	G	Gravel and pebble with some shell.	*Buccinum undatum*	1	C	Hydroid turf includes some Hydrallmania falcata		
					Hydroida indet	20%	A			
					Flustra foliacea	<1%	R			
					Serpulidae indet	3	F			
32	d	No	M	Gravel and pebble with some shell.	Whelk/hermit crab	1	C			
					Hydroida indet	20%	A			
					Serpulidae indet	2	F			
32	e	No	M	Gravel and pebble with some shell.	*Urticina* sp.	1	C	Hydroid turf includes some Hydrallmania falcata		
					Serpulidae indet	5	F			
					Hydroida indet	20%	A			
33	a	No	G	Sand, gravel and Modiolus shell.	Serpulidae indet	5	F		Yes	SS.SMX.IMx
33	b	No	G	Sand, gravel and Modiolus shell.	Serpulidae indet	3	F			
33	c	No	G	Sand, gravel and Modiolus shell.	Serpulidae indet	1	F			
					Paguridae indet	2	C			
33	d	No	G	Sand, gravel and Modiolus shell.	Serpulidae indet	1	F			
					Paguridae indet	1	C			
					Hydroida indet	<1%	R			
33	e	No	G	Sand, gravel and Modiolus shell.	Serpulidae indet	1	F			
					Hydroida indet	<1%	R			
34	a	No	M	Gravel with some pebble and shell	Paguridae indet	1	C		Yes	SS.SMX.IMx
					Ophiura albida	4	F			
34	b	No	M	Gravel with some pebble and shell	Hydroida indet	5%	O			
34	c	No	M	Gravel with some pebble and shell	Hydroida indet	3%	O			
					Gastropoda indet	1	C			
34	d	No	M	Gravel with some pebble and shell	Hydroida indet	<1%	R			
					Paguridae indet	4	C			
					Serpulidae indet	4	F			
34	e	No	G	Gravel with some pebble and shell	Hydroida indet	3%	O	Hydroid turf may include *Rhizocaulus verticillatus* and/or *Sertularia*		
					Paguridae indet	1	C			
					Serpulidae indet	2	F			

Station	Replicate	Annex I	Image quality	Habitat	Taxon	Abundance	SACFOR	Notes	Grab?	Biotope
35	a	Yes, potential biogenic reef of low 'reefiness'	G	Gravel with some pebble and shell	*Sabellaria* sp.	40%	S		Yes	SS.SMX.IMx
					Urticina sp.	1	C			
					Sabellidae indet	1	A			
35	b	No	G	Gravel and sand with shell	Serpulidae indet	1	F			
35	c	No	G	Sand and gravel with shell	Hydroida indet	<1%	R			
					Sabellidae indet	1	A			
					Ophiura albida	1	F			
35	d	No	G	Pebble, cobble and boulder with some shell	Hydroida indet	1%	O			
					Ophiura albida	1	F			
					Nemertesia antennina	1	A			
					Faunal turf	10%	F			
					Actinaria indet	2	C			
					Gastropoda indet	15	C			
35	e	Yes. Rocky reef of low reefiness	M	Boulder, cobble, pebble, gravel and shell	Faunal turf	30%	C			
					Sabellidae indet	1	A			
36	a	Yes. Rocky or bedrock reef	G	Large boulders or bedrock	Rhodophyta indet	5%	O		No	CR.LCR.BrAs (impoverished)
					Faunal turf	85%	S			
					Clavelina lepadiformis	1%	O			
					Alcyonidium diaphanum	2	A			
36	b	Yes. Rocky or bedrock reef	G	Large boulders and bedrock with some silt	*Asterias rubens*	1	C			
					Clavelina lepadiformis	5%	F			
					Antedon bifida	5%	C			
					Faunal turf	50%	S			
36	c	Yes. Bedrock reef	G	Silty bedrock	*Urticina* sp.	1	C			
					Antedon bifida	5%	C			
					Rhodophyta indet	<1%	R			
					Clavelina lepadiformis	5%	F			
37	a	No	P	Silt with occasional cobble	Faunal turf	5%	F		No	SS.SMX.IMx
37	b	No	G	Silt with occasional cobble	Faunal turf	5%	F			
					Ophiura albida	1	F			
37	c	No	P	Silt with occasional cobble	None visible					
37	d	No	G	Silt	*Ophiura albida*	7	F			
37	e	No	G	Silt, a few pebbles	*Antedon bifida*	1	C			
38	n/a	No	G	Pebble and gravel	Urticina sp.	1	C		Yes	CR.HCR.FaT.BalTub
					Barnacle	40%	A			
					Faunal turf	5%	O			
39	n/a	No	G	Cobble, pebble and gravel	Paguridae indet	2	C	Faunal turf includes some encrusting tubes of *Sabellaria*	No	SS.SMX.OMx
					Psammechinus miliaris	1	C			
					Hydroida indet	5%	O			
					Faunal turf	15%	F			
41	n/a	No	G	Cobble, pebble and gravel	Serpulidae indet	8	F		No	SS.SMX.OMx
					Sabellaria sp.	5%	F			
					Actinaria indet	1	C			

Appendix 4. Particle size analysis data

	Mesh size, mm														Mesh size, µm												
Station	**90.0**	**63.0**	**45.0**	**31.5**	**22.4**	**16.0**	**11.2**	**8.0**	**5.6**	**4.0**	**2.8**	**2.0**	**1.4**	**1.0**	**707**	**500**	**355**	**250**	**177**	**125**	**88**	**63**	**<63**	**Gravel**	**Sand**	**Mud**	**Sediment type**
DG2	0.0	0.0	0.0	18.8	11.3	2.1	1.8	0.9	1.1	2.0	4.3	6.4	9.3	13.7	11.3	5.5	4.9	2.2	0.8	0.5	0.4	0.4	2.4	48.7	48.9	2.4	Sandy Gravel
DG4	0.0	50.1	0.0	7.0	6.0	0.5	3.0	2.8	2.7	1.6	1.6	1.3	1.1	2.5	3.5	3.6	5.5	2.7	0.6	0.3	0.4	0.4	2.9	76.5	20.6	2.9	Muddy Sandy Gravel
DG7	0.0	0.0	24.0	28.1	2.4	1.1	1.5	1.9	3.9	3.5	2.7	2.1	3.1	5.1	6.2	4.5	4.5	1.8	0.6	0.3	0.3	0.3	2.4	71.1	26.5	2.4	Sandy Gravel
DG8	19.6	16.6	24.2	4.8	2.6	2.2	1.9	1.6	1.0	0.8	1.1	1.1	0.9	2.4	4.0	4.7	5.0	1.2	0.7	0.4	0.4	0.3	2.4	77.6	20.0	2.4	Muddy Sandy Gravel
DG9	0.0	0.0	30.6	10.1	11.1	1.9	1.7	0.9	1.4	3.4	5.4	4.0	3.3	5.7	4.8	3.4	3.6	1.6	0.6	0.4	0.5	0.5	4.9	70.7	24.4	4.9	Muddy Sandy Gravel
DG10	0.0	0.0	23.2	25.4	5.5	7.6	2.5	1.1	0.8	0.6	1.2	1.4	1.9	3.9	6.8	5.0	3.8	1.4	0.7	0.6	0.6	0.6	5.5	69.2	25.3	5.5	Muddy Sandy Gravel
DG11	0.0	0.0	27.1	27.4	4.8	0.8	5.2	1.9	2.4	2.1	2.3	2.5	3.8	4.1	4.2	3.2	3.1	1.1	0.6	0.3	0.4	0.3	2.4	76.5	21.1	2.4	Muddy Sandy Gravel
DG12	0.0	0.0	38.7	12.3	5.2	6.6	3.2	3.7	2.6	2.0	2.1	2.4	3.1	3.7	2.9	2.1	2.2	1.2	0.8	0.6	0.6	0.5	3.7	78.7	17.6	3.7	Muddy Sandy Gravel
DG13	0.0	0.0	17.5	19.7	13.7	3.5	2.6	1.5	1.1	0.9	1.0	1.3	2.5	8.5	10.9	5.2	3.7	1.2	0.6	0.4	0.5	0.4	3.2	63.0	33.9	3.2	Sandy Gravel
DG15	0.0	0.0	16.4	18.6	8.4	3.7	2.0	1.3	2.4	2.3	2.5	2.0	2.4	5.2	6.3	5.4	7.1	4.5	1.6	0.6	0.8	0.7	6.0	59.5	34.5	5.9	Muddy Sandy Gravel
DG16	0.0	0.0	46.7	0.0	1.8	2.1	1.7	1.8	1.8	1.4	1.9	2.3	1.8	4.4	9.8	8.7	5.8	2.4	0.6	0.3	0.4	0.4	4.1	61.3	34.6	4.1	Muddy Sandy Gravel
DG19	0.0	0.0	37.5	11.3	3.4	5.7	3.4	2.1	2.3	2.7	3.5	3.9	3.4	4.4	3.7	1.8	1.4	1.1	1.3	0.9	0.9	0.6	4.6	75.9	19.5	4.6	Muddy Sandy Gravel
DG22	0.0	0.0	0.0	26.5	14.5	3.3	3.6	2.5	2.0	1.6	1.7	2.4	4.0	5.5	6.8	8.0	8.6	4.3	1.3	0.4	0.4	0.4	2.2	58.1	39.8	2.2	Sandy Gravel
DG27	0.0	0.0	32.1	6.5	19.8	6.0	2.3	5.8	3.2	1.9	2.0	2.0	3.5	4.0	3.5	2.2	2.2	1.6	0.5	0.1	0.1	0.1	0.4	81.8	17.8	0.4	Gravel
DG31	0.0	0.0	0.0	13.5	15.2	3.7	4.4	7.6	8.4	6.7	6.3	4.2	4.6	6.9	7.4	4.3	2.8	1.5	1.0	0.3	0.2	0.1	1.0	69.9	29.1	1.0	Sandy Gravel
DG33	0.0	0.0	0.0	0.0	0.7	1.0	1.2	2.6	4.6	5.3	5.2	2.6	7.5	13.9	15.8	11.2	12.7	9.2	3.5	0.8	0.5	0.1	1.6	23.2	75.1	1.6	Gravelly Sand
DG34	0.0	0.0	0.0	0.0	0.0	1.4	2.0	2.4	6.1	7.2	5.2	3.2	5.6	8.6	10.2	8.0	11.0	15.5	8.9	1.4	0.7	0.3	2.1	27.6	70.3	2.1	Gravelly Sand
DG35	0.0	0.0	21.2	14.7	0.0	1.4	4.2	2.6	3.8	4.2	4.6	3.9	4.5	5.6	5.0	3.8	4.9	4.3	4.3	2.4	1.5	0.6	2.6	60.5	37.0	2.6	Sandy Gravel
DG38	0.0	0.0	18.0	10.0	11.4	6.5	4.3	1.8	2.7	2.4	3.5	3.9	6.8	8.6	5.2	2.3	2.3	2.2	1.7	0.8	0.7	0.5	4.4	64.6	31.0	4.4	Muddy Sandy Gravel
DG42	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	9.9	23.7	25.6	8.3	32.6	0.0	67.4	32.3	Muddy Sand

All table values are percentages of the sample in each fraction.