MachairWind Offshore Windfarm

Appendix B – Third-Party Benthic Subtidal Survey Interpretative Report

SEPTEMBER 2024

DOCUMENT ID: MCW-GEN-ENV-REP-IBR-000002
Revision 3

This page is intentionally blank

Benthic Subtidal Survey Interpretative Report - Baseline characterisation of W1 and the proposed cable corridor

Document Reference	[redacted] *Sea-nature Studies*
Date	1 March 2024
Date of Next Review	
Classification	[redacted]

Briggs Commercial Ltd, Seaforth House, Seaforth Place, Burntisland, Fife, KY3 9AX
T: +44 (0)1592 872939 E: enquiries@briggsmarine.com W: briggsmarine.com
Registered in Scotland | Registration No. SC051566 | VAT No. GB 502 9444 61

Executive summary

The benthic ecology survey operations within the W1 area and the proposed cable corridor were completed in August and September 2021. The field survey work comprised grab sampling of sediment for macrofauna, particle size analysis, contaminants and faecal indicator organisms and the acquisition of drop down video footage for the classification of seabed habitats.

This technical interpretive report provides a baseline characterisation of those areas sampled within the proposed development and was produced by Sea-nature Studies who were contracted by Briggs to write the report.

Sampling was successful in the majority of cases with 204 grabs taken for fauna and sediment using a mini-Hamon grab. Forty-three sites across the survey area were targeted with drop-down video with footage successfully taken at 42 of these locations. Contaminant samples were taken from 68 of the grab sample locations visited. Sediment samples for the analysis of bacterial faecal indicators were collected from 15 sites concentrated in the area where the proposed cable corridor makes landfall.

The dominant physical habitat sampled was slightly gravelly sand identified at 75 of the 204 sites sampled. No other class was as consistently encountered. Gravelly sand, sandy mud and mud accounted for a further 21 sites each. Looking at the percentages of gravel, sand and mud the area surveyed could be divoverall pattern, or structure,ided in to three sections these being offshore sand; a mid-section of coarse, more variable sediments; and, muddy sediments within the Firth of Clyde. The physical habitats predicted by the EUSeaMap 2023 were largely consistent with those classifications identified by the particle size analysis. Multivariate statistical analysis refined the picture further finding five, statistically significant, groups, containing the majority of sites and, two smaller groups. The overall pattern, or structure, of site separation observed in an ordination from this analysis was seen to be attributable, in large part, to the fine sand component. Video analysis picked out seabed features such as bedrock, boulders and cobbles largely at sites within the coarse mid-section referred to above as well as the importance of shell debris within some of the soft sediment areas.

Benthic infaunal invertebrate communities in the survey area were described by the five major groups normally encountered in soft sediment habitats in the UK (annelids, molluscs, crustaceans, echinoderms and ‘others’, comprising the less common phyla). Annelid worms dominated both in terms of the number of taxa and the abundances recorded. Crustaceans and molluscan fauna were in second and third place with respect to the number of taxa, though in terms of abundance molluscs were second with just over a quarter of the number of individuals. In terms of biomass molluscs dominated, though this was almost entirely due to the presence of the large and long lived bivalve, *Arctica islandica*. Similarly, echinoderms were placed second for biomass due to the presence of large burrowing urchins in the sandy sediments such as the sea-potato, *Echinocardium cordatum*, and *Brissopsis lyrifera* a species of heart urchin.

Epifaunal species were of importance particularly in those more mixed and coarse sediments were bryozoans or sea-mats were the dominant colonial epifauna followed by hydrozoan (sea-firs).

Seven faunal groups were identified by multivariate statistical analysis. The largest was characterised by gravelly sand and was consistent with the level 4 habitat 'Offshore circalittoral coarse sediment'. One of the discriminating species here the Ross worm, *Sabellaria spinulosa*, though no evidence from grab or video work found the reef features that can sometimes be formed under certain conditions by this annelid. The second and third largest faunal groups were both inhabitants of slightly gravelly sand, the associated sites being found almost entirely in the W1 area. The allocated level 5 biotopes for these two groups were '*Abra prismatica*, *Bathyporeia elegans* and polychaetes in circalittoral fine sand' and '*Abra alba* and *Nucula nitidosa* in circalittoral muddy sand or slightly mixed sediment'. Top and tailing the deep-water muds of the Firth of Clyde was the fourth largest group which was consistent with the level 5 biotope '*Amphiura filiformis*, *Kurtiella bidentata* and *Abra nitida* in Atlantic circalittoral sandy mud'. Whilst the faunistically poor deep-water muds in the Firth of Clyde were identified as the level 4 habitat, 'Circalittoral fine mud'. The fifth largest group found, with sites in two separate areas, was another faunal association with sediment categorised by slightly gravelly sand. This was the level 5 biotope '*Echinocyamus pusillus*, *Ophelia borealis* and *Abra prismatica* in circalittoral fine sand'. The final group off Islay, again slightly gravelly sand, but with a mean grain size of coarse sand, was again as with the largest group, the habitat 'SS.SCS.OCS Offshore circalittoral coarse sediment' or 'Faunal communities in Atlantic offshore circalittoral coarse sediment'.

Habitats identified from the drop down video included the level 3 EUNIS habitat '*Atlantic circalittoral sand*' for many of those sites within the proposed W1 option array area. Sites within the proposed cable corridor were characterised by a range of level 3 habitats including '*Atlantic circalittoral rock*'; '*Atlantic circalittoral sand*'; '*Atlantic circalittoral mixed sediment*'; '*Atlantic circalittoral coarse sediment*'; and, '*Atlantic circalittoral mud*'. Level 5 and 6 EUNIS biotopes here were '*Echinoderms and crustose communities on Atlantic circalittoral rock*'; 'Flustra foliacea *on slightly scoured silty Atlantic circalittoral rock*'; and, '*Faunal and algal crusts with* Pomatoceros triqueter *and sparse* Alcyonium digitatum *on exposed to moderately wave-exposed Atlantic circalittoral rock*'. There was good agreement with the high level predicted habitats of the EUSeaMap 2023 expected to occur in the area, as well those from a previous study carried out to the west of Islay in 2014. The section of the proposed cable corridor approaching the landfall area was largely characterised by '*Atlantic circalittoral mixed sediment*' and '*Atlantic circalittoral mud*'.

The potential presence of Annex 1 reef was assessed for the sites visited, the results indicating low and medium resemblance to reef, or 'Not a reef'. Where bedrock was encountered it was described by the habitat '*Atlantic circalittoral rock*', or biotopes included within, which, in line with the literature, suggests it could correlate to Annex I reef.

An assessment for '*Sea-pens and burrowing megafauna communities*' was made for two sites within the Firth of Clyde which identified as being potential burrowed mud habitat. Only one individual sea-pen was observed but small faunal burrows were common at both sites as were larger burrows, likely made by the Norway lobster (*Nephrops norvegicus*).

The presence of dense aggregations of suspension-feeders such as the brittlestar *O. fragilis* seen at three sites, including site DDV34 on the Clyde Sea Sill MPA was a good indication of locally high primary production in keeping, in that instance, with the front located there.

Across the survey area, sand eels (Ammodytidae) were identified from video data, whilst from grab data *Ammodytes marinus* and *Ammodytes tobianus* were identified at three and 16 stations respectively. In addition, *Gymnammodytes semisquamatus* was found at three sites and *Hyperoplus lanceolatus* was at a single site. *A. marinus*, *A. tobianus* are in the PMF list, whilst these two sand eels along with *H. lanceolatus* are included in the Northern Ireland Priority Species list. Furthermore, Low intensity spawning grounds for sand eels are present to the north of the survey area. The sand eel habitat preference assessment identified 113 sites at which the sediment would be categorized as 'Preferred' for sand eels; 17 sites indicated a sediment which would be 'Marginal' sand eel habitat; and, the remaining 74 sites indicated 'Unsuitable' sediment for sand eel habitats.

The Ocean Quahog *Arctica islandica*, which is included in the threatened and/or declining species list for OSPAR Regions II and III, was found at 17 sites and included both adults and juveniles.

The results from the bacterial faecal indicator analysis indicated that the sampled sediment was not contaminated.

Analysis for the concentration of contaminants in the sediments for sites within the Firth of Clyde found exceedances for polyaromatic hydrocarbons, metals, polybrominated diphenyl ethers and organochlorine pesticides.

Contents

Appendices

Appendix 1	*Contaminants report*
Appendix 2	*Faecal indicator organisms report*
Appendix 3	*Particle Size Analysis results*
Appendix 4	*Macrofaunal species x abundance data (Counts and Presence / Absence) (including macrofaunal QA report)*
Appendix 5	*Macrofaunal major group biomass*
Appendix 6	*Diversity indices from Primer (v7)*
Appendix 7	*Full SIMPER results*

Tables

Figures

1. Introduct on

Briggs Marine Contractors Ltd (Briggs) were contracted by [redacted], a global leader in the transition to renewable energy, to provide an interpretive report on benthic survey work undertaken on W1 and the proposed cable corridor (Figure 1).

As indicated in Figure 1, the 'Survey Area', or area of study, is bounded by the W1 area and the associated proposed cable corridors within which all survey work was carried out and samples taken.

The benthic ecology survey operations were completed in August and September 2021, a Preliminary Survey Report issued, and the final Field Report delivered 6th December 2021 (both documents are available and should be consulted for the site selection; survey methodologies employed; and, other fieldwork related accounts).

This technical interpretive report provides a baseline characterisation of those sites visited within the survey area and was produced by Sea-nature Studies who were contracted by Briggs to write the report.

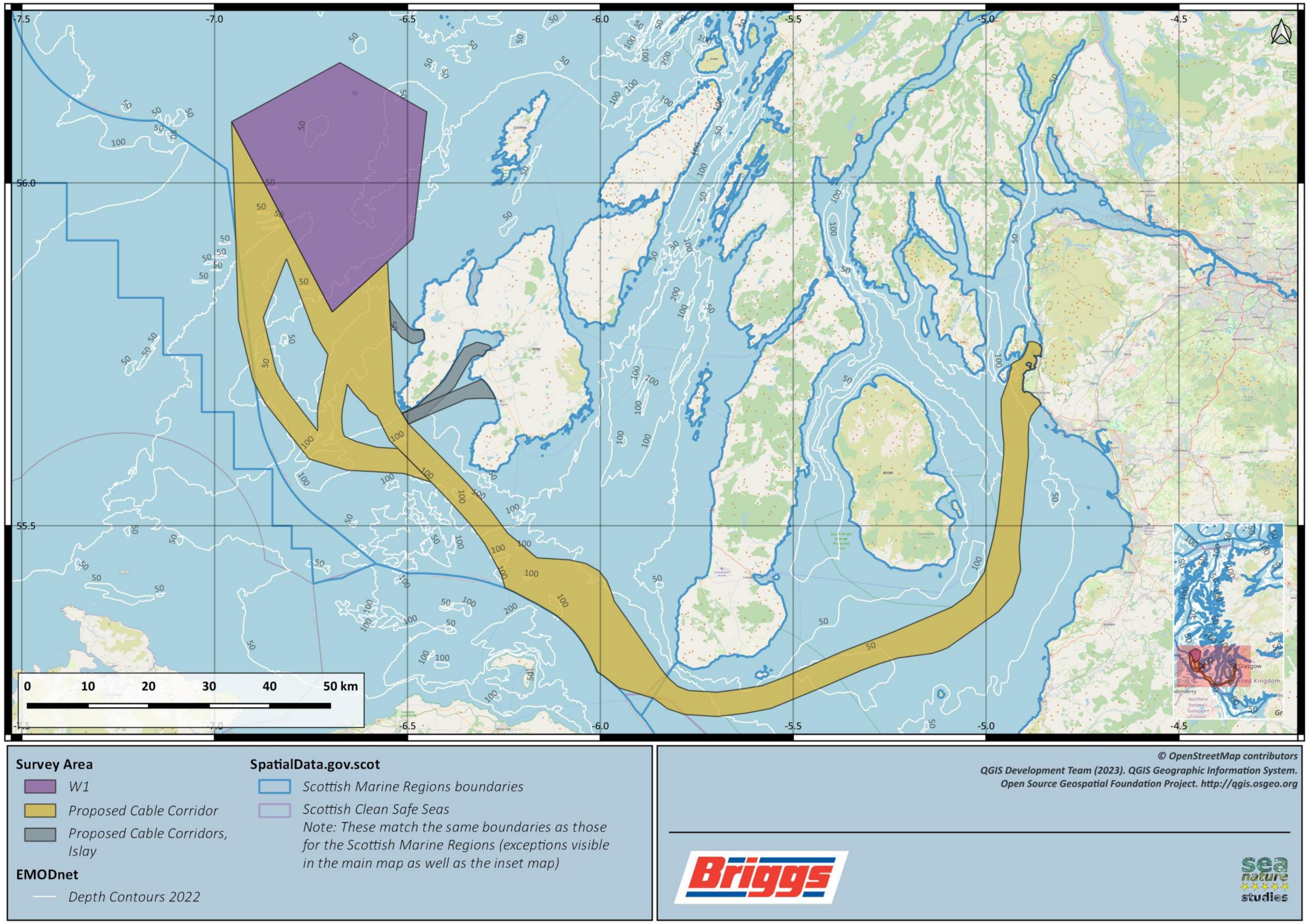


Figure 1 Location of W1 and the proposed cable corridor

1.1 Area of study

The W1 area is within the *Earra-Ghàidheal*, the Scottish marine region for Argyll, as detailed in, 'The Scottish Marine Regions Order 2015' (Figure 2). The proposed cable corridors are located within this region before crossing the *Cluaidh*, the Scottish marine region for the Clyde, to make landfall in North Aryshire. The proposed cable corridor also crosses the boundary of the Hebrides Shelf marine region to the west.

The W1 area is northwest of Islay, 7km from the nearest point on the island to the edge of the boundary and, 22.6km to the centre of the site. The area encompassed by the site is 754km^2. The proposed cable corridor covers an area of 1,450km^2 and, depending on the route followed, the distance to landfall would be between 185 – 220km.

Looking at Marine Scotlands National Marine Plan interactive map (NMPi), annual mean sea surface temperatures vary from over 9 to 10°C in the near shore area surveyed whilst west of Islay temperatures are generally slightly higher between 10 and 11°C. Near seabed temperatures vary less in terms of the annual mean temperature across the area surveyed, and are between 9.5 to 9.9°C. Annual mean salinity varies from 33.5ppt in the Firth of Clyde to 34.9ppt west of Islay.

The topography, hydrodynamics, exposure and other gradients encountered across the survey area means a wide range of habitats were sampled. The region is known for its complex bathymetry created from the scouring action of ice-sheets in the last 2 million years. But also because of the variation in bedrock lithology including the common occurrence of highly resistant rocks. The area west of Islay, and Mull, is generally flat and between 40 – 80m in depth whilst to the east and south much deeper channels are found down to 100m or more (Barne *et al*., 1997). Where the proposed cable corridor skirts around Rathlin Island at the northern end of the North Channel, depths exceed 240m (Figure 1).

A condition worth noting east of Malin Head, is that the tidal range at mean spring tides in the waters between Islay, Kintyre and Northern Ireland is less than 1m. This is due to the presence of an amphidromic system and the associated amphidromic point, or tidal node, sometimes referred to as the 'Rathlin Island' amphidromic point (Connor and Little 1998; Neill *et al*., 2017). These tidal systems or wave patterns are created due to the interplay of physical constituents such as basins and bays with the Coriolis effect resulting in rotary tidal structures. Consequently, at such locations, there is little or no difference between high tide and low tide.

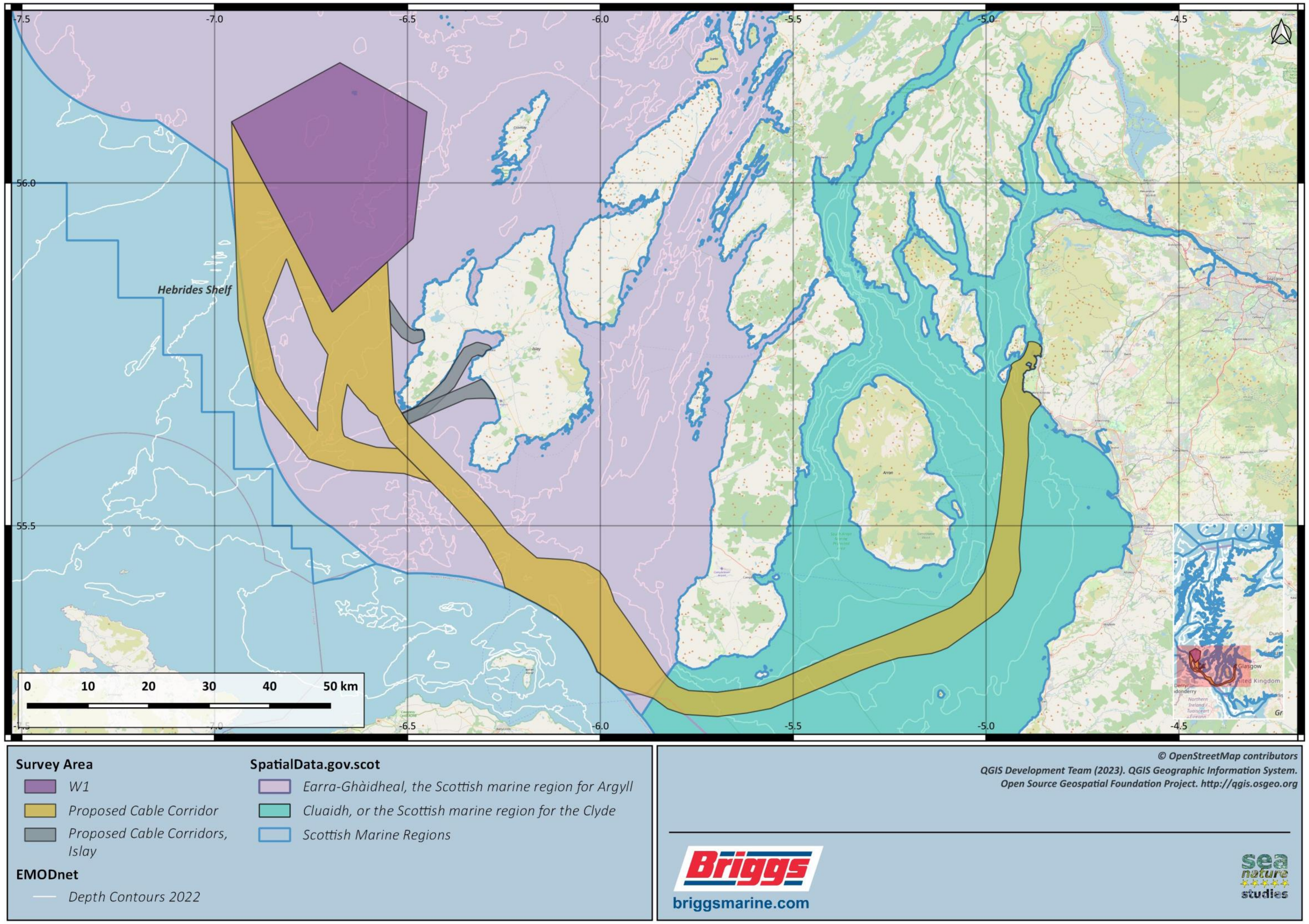


Figure 2 Scottish Marine Regions and the W1 area and proposed cable corridor

In addition, just west of this amphidrome, north of Malin Head, off the isle of Islay there is the Islay Front (Simpson *et al*., 1979). This is one of two fronts found in the area surveyed (Figure 3).

The Islay Front

The Islay Front, between the Scottish and Irish coasts consists of two classes (Hill and Simpson, 1989; Simpson *et al*., 1979; Petitgas, 2010). Type 1 exists throughout the year and, '*forms the boundary of a low salinity coastal current in which the frontal interface extends continuously from the sea surface to the seabed*'; Type 2 only develops in spring and summer and marks, '*the transition between mixed and thermally stratified water*' (Hill and Simpson, 1989). The position of both frontal types changes seasonally with the latter manifesting in early spring to the west of the former when thermal stratification begins to develop. Then in late spring / early summer the Type 2 front drifts east disrupting the Type 1 feature resulting in vertical haline stratification. In autumn this haline density gradient may, for a time, inhibit the breakdown of thermal stratification.

Enhanced productivity is well documented for many frontal systems, and this is a valuable aspect of the Islay Front which is understood to be an important driver of productivity for coastal ecology in the region (Ferreira *et al*., 2022). Simpson *et al*., (1979) in their description of the Islay Front identified that the standing crop of phytoplankton here was '*several times greater*' than that recorded for the vertically mixed inshore waters east of the front; with high chlorophyll concentrations extending westwards, on the offshore side of the front. Not only that, but there was also clear evidence that the phytoplankton community at the front was healthier than that sampled in the mixed, inshore waters. It was also noted that chlorophyll was '*vertically stratified*' both at the front and in the '*density-layered water offshore*'. The authors were thus able to speculate that the evidently high standing crop produced by the front could be the result of the conjunction of nutrients, algae and light availability in the euphotic zone.

The Clyde Sea Front

The Clyde Sea Front sits on a sill feature known as the Great Plateau separating the tidally mixed waters of the North Channel from the relatively undisturbed, more stratified waters and weak tidal currents of the Clyde Sea, or Firth of Clyde (Figure 3) (McIntyre *et al*., 2012; Kasai *et al*., 1999; Edwards *et al*., 1986). The Clyde Sea Sill Marine Protected Area (MPA) was designated in part because of the thermo-haline front located here and its fundamental importance to local fish stocks including cod and other higher marine predators like black guillemot. As with any front its position is subject to shift, depending here on the interplay of mixing, which is predominantly wind-driven, and stratifying processes such as the supply of buoyancy (Midgley, 1998; Edwards *et al*., 1986). Density currents flowing in from the sills produce a characterising grading of the bottom sediments from coarse to fine away from the sills (Edwards *et al*., 1986). Much of the seabed in the outer basin and inner Firth is made up of muddy and locally sandy habitats with a fine-scale transition from coarser-grained sediment close to the coast to fine-grained sediments in deeper offshore waters (Pace *et al*., 2021).

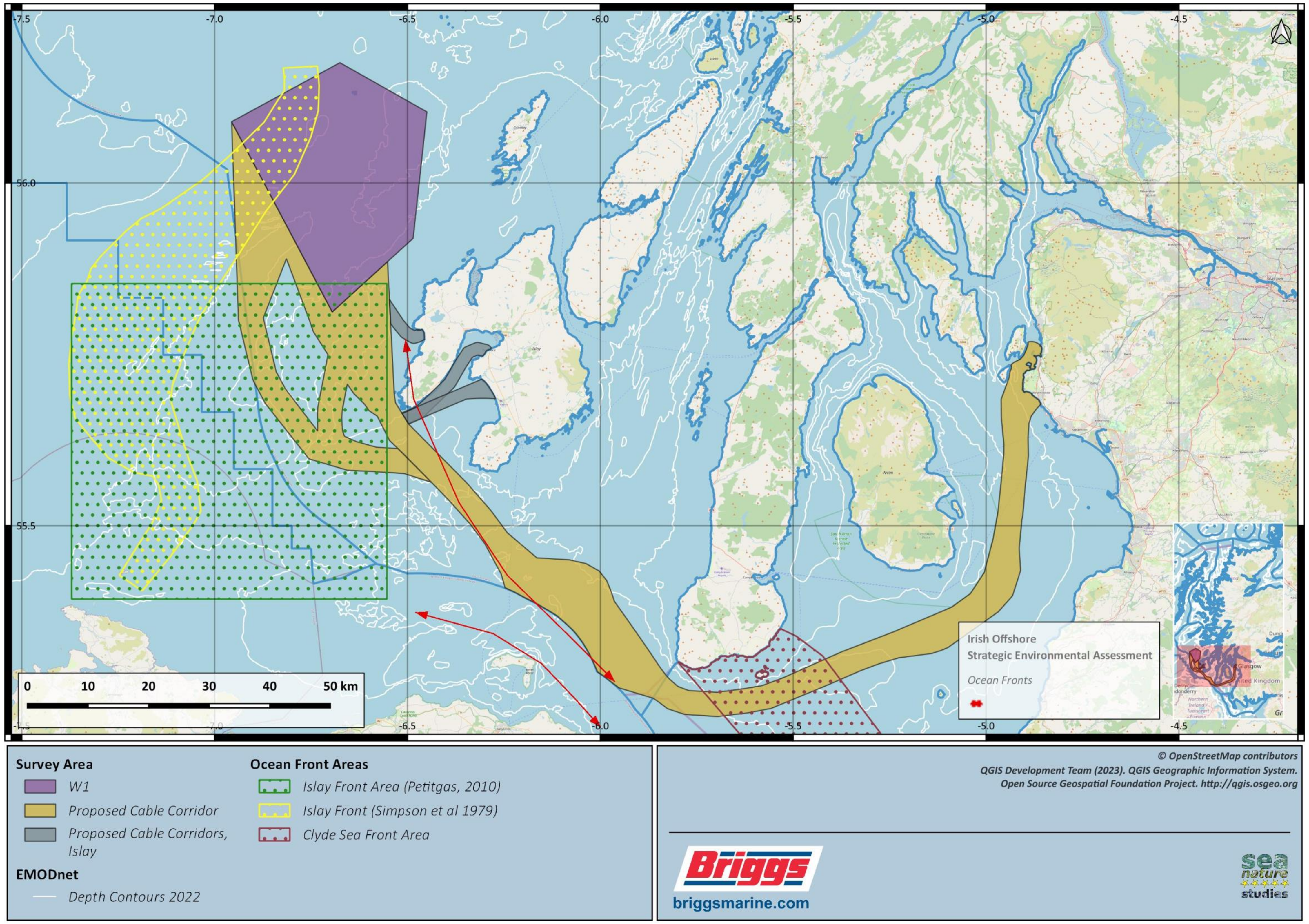


Figure 3 Ocean Fronts and the W1 area and proposed cable corridor (note the red arrows also indicate frontal data (Irish Offshore SEA 4))

Knowledge of these oceanographic systems is integral to understanding and contextualising the local benthic ecology that is the subject of this report. The planktonic biomass which can balloon in such locations does not remain in the water column, but will, by varied pathways, be exported elsewhere and evidence of these subsequent stages of the local carbon-cycle may be manifest, for example, in deeper pelagic, or benthic communities (Wikipedia Contributors, 2023). Benthic-pelagic coupling is a well-studied mechanism and of great importance to ecosystem function in marine and transitional coastal areas (Cibic *et al*., 2022). Studies show that this downward pathway can be strong in frontal regions, as well as in the associated mixing zones, compared to that in stratified areas; whilst the increased supply of organic matter benefits not only surface-dwelling filter-feeders but also members of the subsurface macrobenthic community via burrowing activity (Josefson and Conley, 1997). This flow of energy propagates the benefits, cascading support through layers or networks of functional processes and the ecosystem services supported by these (Cibic *et al*., 2022). Productivity benefits engineered by fronts and the augmented food supply this represents can attract a diverse range of species underlining the importance of these locations.

All these elements are relevant to the 'Area of Study' because they will play a significant role in structuring the benthic communities which flourish here. Together they create the conditions which, by-and-large, drive productivity within this Scottish coastal region.

1.2 Predicted seabed habitats

The European Marine Observation and Data Networks (EMODnet) Seabed Habitats initiative (www.emodnet-seabedhabitats.eu), '*EUSeaMap 2023 Broad-Scale Predictive Habitat Map for Europe*' shows there are a variety of sedimentary habitats predicted to occur across the area surveyed (Figure 4). The dominant 'Benthic Broad Habitat Type' or BBHT, mapped within W1 and covering an estimated 75% of the area is circalittoral sand (note that the BBHT is a Marine Strategy Framework Directive, MSFD, category). Offshore circalittoral sand is found in small patches to the northwest, northeast and south-southwest; and, along the southeastern boundary a band of circalittoral coarse sediment is predicted within which are scattered discrete areas of circalittoral rock and biogenic reef.

The proposed cable corridor begins with circalittoral sand but this quickly shifts to an extended area of offshore circalittoral coarse sediment that gives way to circalittoral coarse sediment off Rhinns Point, southwest Islay. Then, except for an elliptical patch of offshore circalittoral mixed sediment in the Straits of Moyle at the northern end of the North Channel, circalittoral coarse sediment dominates until the eastern edge of the Clyde Sea Sill. Here the predicted sediments transition to offshore circalittoral sand and then offshore circalittoral mud within the Firth of Clyde.

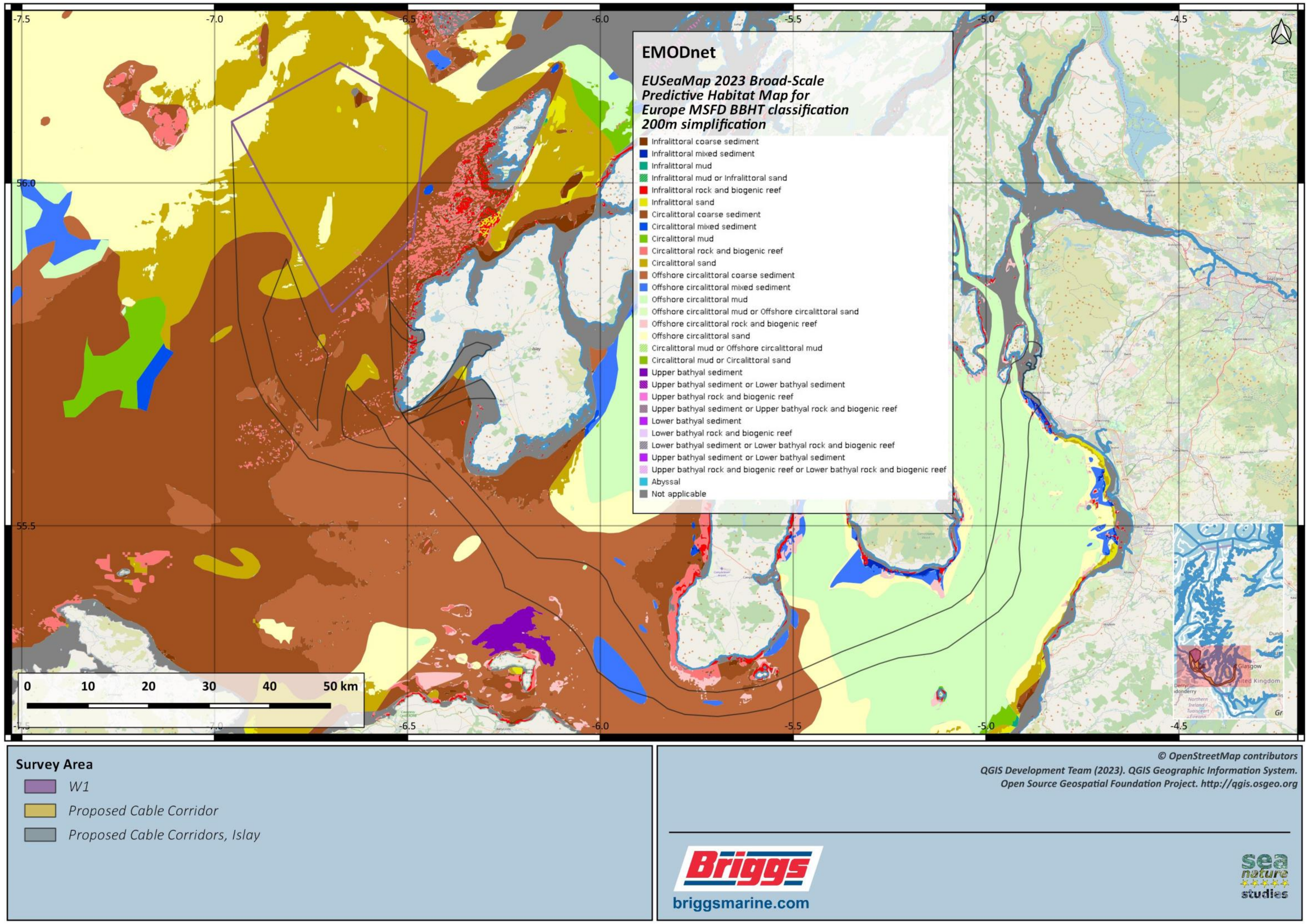


Figure 4 EUSeaMap 2023 predictive habitat map (Source: EMODnet)

Figure 5 uses a layer from the Marine Environmental Mapping Programme (MAREMAP) and is based on data provided by the British Geological Survey (BGS). This agrees well with the predictive EUSeaMap but provides more subtle divisions with Folk (1954) sediment categories (which are also reported here from the particle size distribution (PSD) data). Thus, W1 is again dominated by sand but at the eastern boundary it transitions through slightly gravelly sand ((g)S); to gravelly sand (gS); and, at the start of the proposed cable corridor at that boundary, sandy gravel (sG). The rest of the corridor to the Clyde Sea Sill is then a mosaic of patches largely made up of gS, (g)S, sG and Gravel (G) with the elliptical patch of offshore circalittoral mixed sediment in the Straits of Moyle, identified as muddy sandy gravel (msG). From the Great Plateau the transition from coarse to fine sediments goes, sG; gS; (g)S; sand (S); muddy sand (mS); sandy mud (sM); and, finally mud (M) in the deeper more sheltered areas of the Firth of Clyde south and east of Arran.

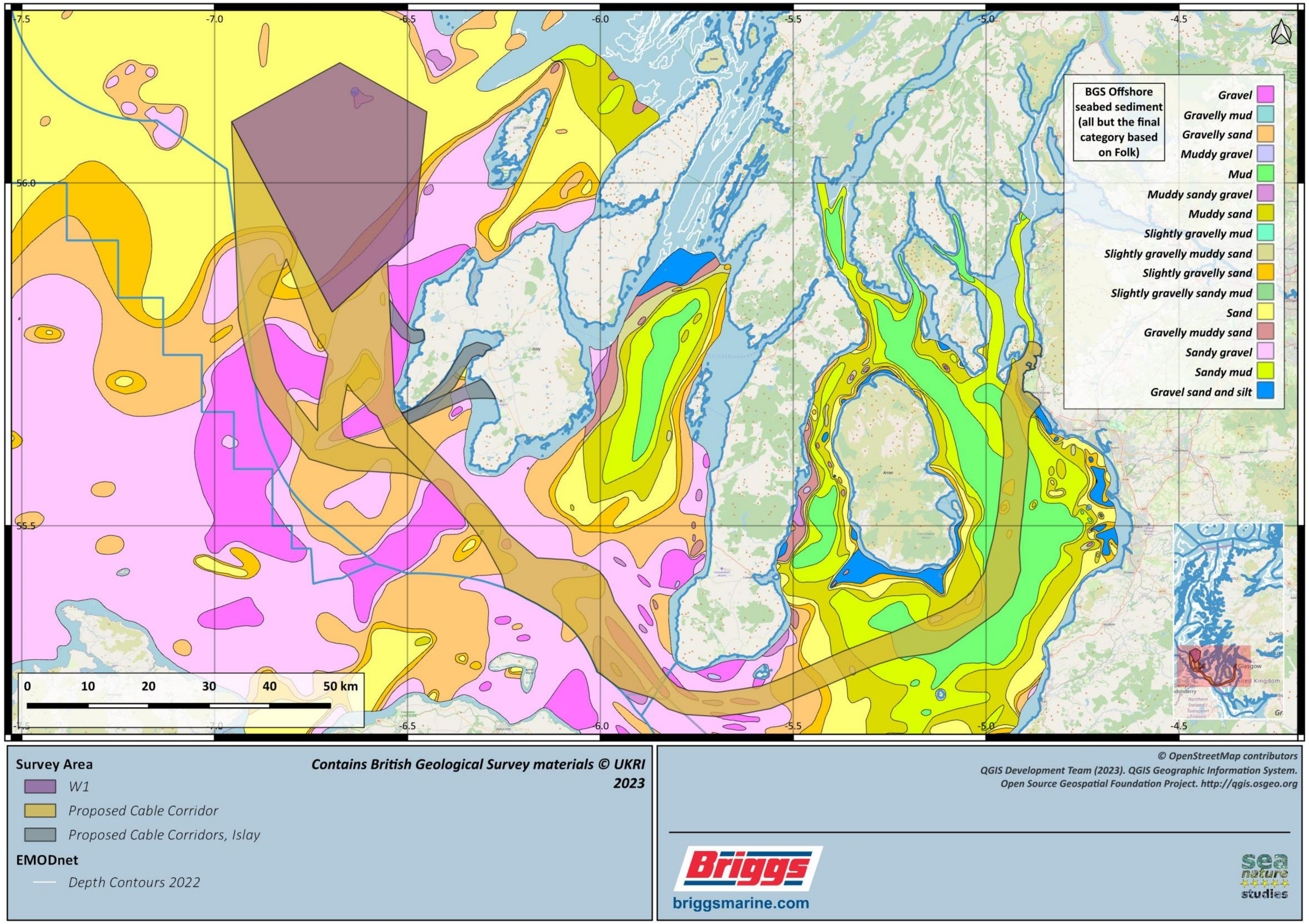


Figure 5 British Geological Survey offshore 1:250 000-scale seabed sediment (Source: BGS)

1.3 Designated sites and protected and sensitive features

Designated sites of relevance to the benthic ecosystems across the area and in the wider region of the proposed development, have been mapped and tabulated (Figure 6; Table 1).

Of the six Nature Conservation Marine Protected Areas (MPA(NC)) perhaps the most significant potential interaction occurs where the proposed cable corridor crosses the Clyde Sea Sill MPA(NC) to the south of Kintyre, covering a distance of 20km (Table 1). Notably, this MPA was designated in part for the 'Inshore sublittoral sediment (Marine)' category, *Circalittoral and offshore sand and coarse sediment communities* as well as the frontal system mentioned previously (NatureScot, 2023a).

The proposed cable corridor in the Firth of Clyde borders the South Arran MPA(NC) for 18km. There are four protected features here in the 'Inshore sublittoral sediment (Marine)' category and these are *Burrowed mud*; *Kelp and seaweed communities on sublittoral sediment*; *Maerl beds*; and, *Maerl or coarse shell gravel with burrowing sea cucumbers* (NatureScot, 2023b).

As the proposed cable corridor approaches landfall its western edge overlaps with the eastern edge of the Cumbraes Marine Consultation Area (MCA) that surrounds the islands of Great and Little Crumbrae. MCA's are '*non-statutory areas identified by NatureScot as deserving particular distinction in respect of the quality and sensitivity of the marine environment within them*' (MarineScotland, 2023). Their selection encourages coastal communities and management bodies to be aware of marine conservation issues in the area. This is a 'current' feature mapped on Marine Scotlands NMPi map. The parameters of this ongoing consultation include, for example, aspects such as those communities found within the macroalgae and seagrass habitats occurring within the survey area; fish abundance; habitat characterisation; habitat extent; and, water column and seabed faunal / floral abundances (BODC (British Oceanographic Data Centre), 2010). As these areas are non-statutory, they are not considered further here but have been acknowledged in Figure 6.

Within the Cumbraes MCA but just outside the envelop of the proposed cable corridor there are the intertidal Sites of Special Scientific Interest (SSSI), Ballochmartin Bay and Kames Bay (NatureScot, 2023c; NatureScot, 2023d). These are designated for the 'Sandflats' habitat, under the category 'Marine (including marine mammals)'. For example, the citation for Ballochmartin Bay states that this is, '*the most varied section of coast on Great Cumbrae*'; and, that the '*the flora and fauna of the intertidal area have been intensively surveyed and studied, and the site is of considerable importance for research and the teaching of marine biology*'.

In the northern section of the potential landfall area on the North Ayrshire coast there is the Southannan Sands SSSI (NatureScot, 2023e). As with Ballochmartin and Kames Bay this was notified for its 'Sandflats', under the category 'Marine (including marine mammals)' with the citation indicating it to be, '*one of the best examples of intertidal sandflats habitat within the coastal cell covering the entire Clyde coastline*'.

To the north, 1.4km from the W1 boundary there is the Sea of the Hebrides Marine Protected Area (Nature Conservation) (MPA(NC)) (Figure 6) (NatureScot, 2023f). Four features are protected under this site, Basking shark (*Cetorhinus maximus*); Fronts, categorised as a '*Large-scale feature (Marine)*'; Marine Geomorphology of the Scottish Shelf Seabed; and, Minke whale (*Balaenoptera acutorostrata*) (Table 1).

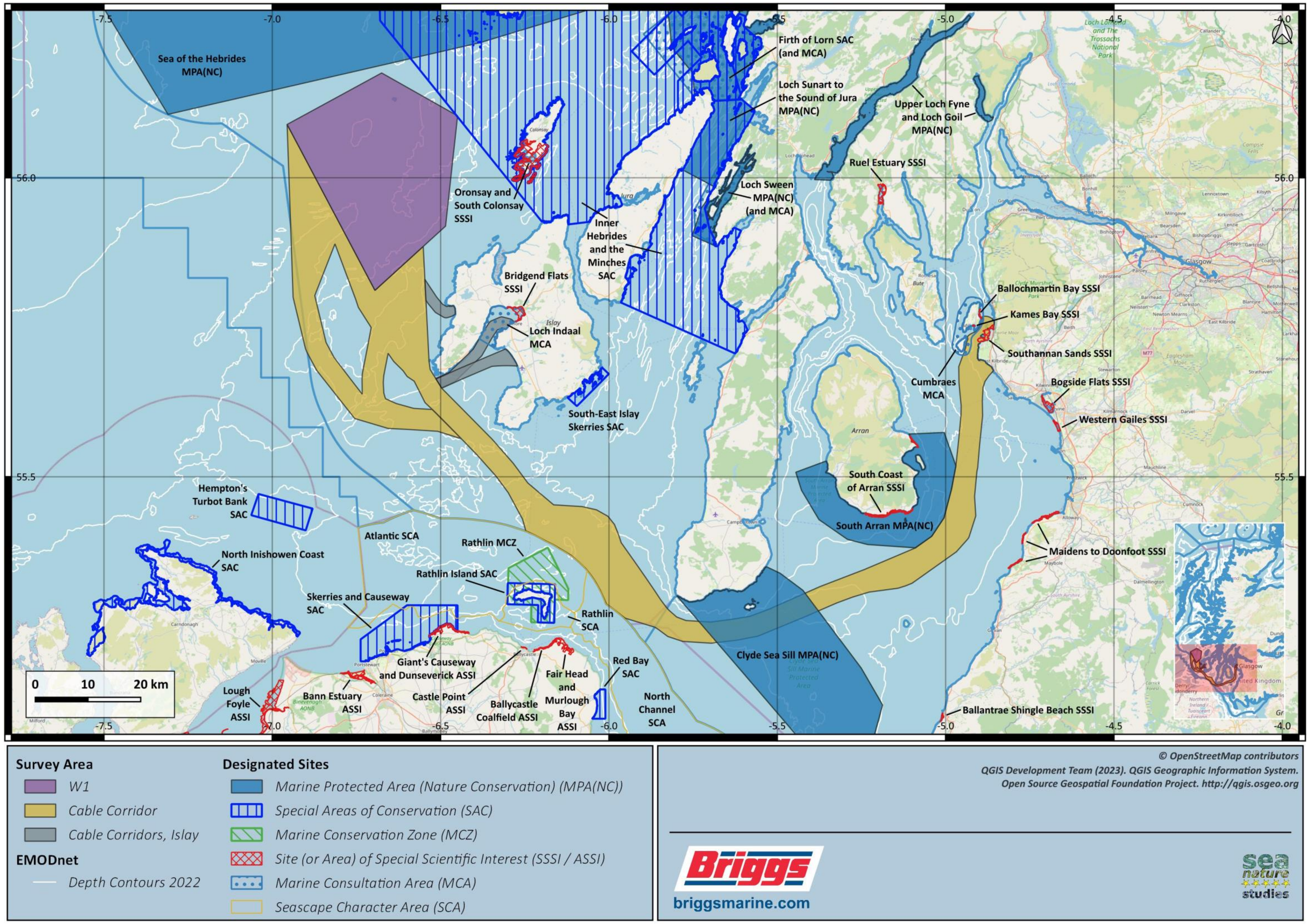


Figure 6 Sites of importance across the wider region (Source: NatureScot, the Northern Ireland Department of Agriculture, Environment and Rural Affairs (NI DAERA) and the EU Natura 2000 network)

Table 1 Designated sites and relevant features of nature conservation interest in relation to the survey area

Designation	Area (ha)	Designated feature(s)	Distance* (km)	Link
Marine Protected Area (Nature Conservation) (MPA(NC))				
Clyde Sea Sill [555560461]	71200	Fronts Circalittoral and offshore sand and coarse sediment communities Marine Geomorphology of the Scottish Shelf Seabed	0	https://sitelink.nature.scot/site/10414
South Arran [555560474]	28000	Burrowed mud Maerl beds Maerl or coarse shell gravel with burrowing sea cucumbers Kelp and seaweed communities on sublittoral sediment	0	https://sitelink.nature.scot/site/10423
Upper Loch Fyne and Loch Goil [555560475]	8800	Burrowed mud Horse mussel beds Flame shell beds Ocean quahog aggregations (*Arctica islandica*)	47 / 37.3	https://sitelink.nature.scot/site/10424
Loch Sween [555560467]	4100	Burrowed mud Maerl beds Native oysters Sublittoral mud and mixed sediment communities	54.5	https://sitelink.nature.scot/site/10419
Loch Sunart to the Sound of Jura [555560466]	74100	Flapper skate (*Dipturus intermedius*)	41.8	https://sitelink.nature.scot/site/10418
Sea of the Hebrides [555703754]	1003900	Basking shark (*Cetorhinus maximus*) Fronts Marine Geomorphology of the Scottish Shelf Seabed Minke whale (*Balaenoptera acutorostrata*)	1.4	https://sitelink.nature.scot/site/10474
Special Area of Conservation (SAC)				
Hempton's Turbot Bank [IE0002999]	4492.67	1110 Sandbanks which are slightly covered by sea water all the time	18.6	https://www.npws.ie/protected-sites/sac/002999
North Inishowen Coast [IE0002012]	7068.25	1140 Mudflats and sandflats not covered by seawater at low tide	46.7	https://www.npws.ie/protected-sites/sac/002012
Skerries and Causeway [UK0030383]	10867.43	1110 Sandbanks which are slightly covered by sea water all the time 1170 Reefs 8330 Submerged or partially submerged sea caves	19	https://www.daera-ni.gov.uk/protected-areas/skerries-and-causeway-sac
Rathlin Island [UK0030055]	3346.59	1170 Reefs 1230 Vegetated sea cliffs of the Atlantic and Baltic Coasts 8330 Submerged or partially submerged sea caves	6	https://www.daera-ni.gov.uk/protected-areas/rathlin-island-sac
Red Bay [UK0030365]	966.279	1110 Sandbanks which are slightly covered by sea water all the time	14	https://www.daera-ni.gov.uk/protected-areas/red-bay-sac
South-East Islay Skerries [UK0030067]	1500.41	1365 Harbour seal *Phoca vitulina*	16	https://sitelink.nature.scot/site/8381
Inner Hebrides and the Minches [UK0030393]	1381391.4	1351 Harbour porpoise *Phocoena phocoena*	0	https://sitelink.nature.scot/site/10508
Firth of Lorn [UK0030041]	20999.35	1170 Reefs	34.3	https://sitelink.nature.scot/site/8256
Marine Conservation Zone (MCZ)				
Rathlin	9057	Deep-sea bed Geological/Geomorphological	0.95	https://www.daera-ni.gov.uk/protected-areas/rathlin-mcz
Site of Special Scientific Interest (SSSI)				
Bridgend Flats [135522]	331.16	Sandflats Saltmarsh	0.34	https://sitelink.nature.scot/site/260
Southannan Sands [555559226]	255.68	Sandflats	0	https://sitelink.nature.scot/site/10261
Ballochmartin Bay [135726]	18.9	Sandflats	0.15	https://sitelink.nature.scot/site/132
Kames Bay [135657]	4.6	Sandflats	1.2	https://sitelink.nature.scot/site/825
Bogside Flats [135744]	254.72	Mudflats Saltmarsh	17	https://sitelink.nature.scot/site/239
Western Gailes [135600]	92.58	Invertebrate assemblage Sand dunes	13.2	https://sitelink.nature.scot/site/1618
Maidens to Doonfoot [135574]	216.05	Invertebrate assemblage Shingle	9.6	https://sitelink.nature.scot/site/1121
Ballantrae Shingle Beach [139895]	32.74	Shingle	25.7	https://sitelink.nature.scot/site/126
South Coast of Arran [135550]	220.64	Shingle	6	https://sitelink.nature.scot/site/1451
Clauchlands Point – Corrygills [135603]	46.18	Saltmarsh	7.4	https://sitelink.nature.scot/site/363
Ruel Estuary [135764]	332.78	Saltmarsh	30	https://sitelink.nature.scot/site/1395
Oronsay and South Colonsay [341281]	2178.36	Grey seal (*Halichoerus grypus*)	11.3	https://sitelink.nature.scot/site/9192
Area of Special Scientific Interest (ASSI), Northern Ireland				
Lough Foyle	2004.97	Biological interest includes intertidal and shore vegetation, rare estuarine fish species and the presence of a small Common Seal *Phoca vitulina* colony.	57	https://www.daera-ni.gov.uk/protected-areas/lough-foyle-assi
Bann Estuary	347.94	Saltmarsh	44	https://www.daera-ni.gov.uk/protected-areas/bann-estuary-assi
Giant's Causeway and Dunseverick	226.33	Saltmarsh Intertidal communities	22.4	https://www.daera-ni.gov.uk/protected-areas/giants-causeway-and-dunseverick-assi
Castle Point	8.54	Intertidal communities	17.2	https://www.daera-ni.gov.uk/protected-areas/castle-point-assi
Ballycastle Coalfield	68.4	Saltmarsh (limited)	12.1	https://www.daera-ni.gov.uk/protected-areas/ballycastle-coalfield-assi
Fair Head and Murlough Bay	251.26	Intertidal communities	10.5	https://www.daera-ni.gov.uk/protected-areas/fair-head-and-murlough-bay-assi

NOTES: *Nearest point distance to the survey area; [] = EU Site Code; Bird features not listed; SAC – Only features that are a primary reason for selection; SSSI – Does not include fully terrestrial or geological features or, SSSIs only designated for birds; MPA(NC) – Does not include geological interest features

To the north and east W1 overlaps a boundary of the Inner Hebrides and the Minches designated Special Area of Conservation (SAC) west of Colonsay by 80m (Figure 6; Table 1; NatureScot, 2023g). This SAC covers an area of 13,813.91km^2 and the primary reason for the selection of the site was the Annex II species Harbour porpoise (*Phocoena Phocoena*). The Standard Data Form notes that this, "*is considered to be one of the best areas in the United Kingdom*" for the species (UK0030393); and, the presence of the following components are noted sand, shingle, gravel, mud, boulder, subtidal rock (including rocky reefs) and subtidal sediments (including sandbank/mud). The important ecological characteristics on which the site likely depends are the high degree of water mixing and the inherent strong tidal streams; high biological productivity; and, the associated concentrations of small prey fish (Joint Nature Conservation Committee (JNCC), 2023).

On Islay, one of the proposed cable corridors there crosses through the Loch Indaal MCA to make landfall on the south shore of the Loch. At the head of Loch Indall, just east of the proposed corridor there is the Bridgend Flats SSSI (Figure 6; Table 1; NatureScot, 2023h). According to the SSSI citation this site was notified for the saltmarsh at the top of the shore which is considered of '*national importance*'; the sandflats (including marine mammals); its Breeding bird assemblage; and the non-breeding, over-wintering, Greenland barnacle goose (*Branta leucopsis*). The sandflats are noted to be, '*one of the most extensive areas of intertidal sand and silt flats in the Hebrides*' supporting, '*a large variety of waders and waterfowl*'.

The 'Deep-sea bed' feature identified for Rathlin MCZ is considered unique in Northern Ireland nearshore waters and, importantly, is thought to be in a '*near natural or undisturbed condition*' (DAERA-NI, 2016). The feature slopes steeply to over 200m and includes deep subtidal sands, mixed sediments and rock. Surveys have shown that the area, marked as 'Upper Bathyal Sediment' in Figure 4, has, '*deep mobile sediment interspersed with stony reef and other areas of cobbles and boulders*' (DAERA-NI, 2016).

Seascape Character Assessments were undertaken in NI because the UK is a signatory of the European Landscape Convention (ELC). The identified Seascape Character Areas (SCAs) in Northern Island (NI) have been included in Figure 6 because of their link to the UK Marine Policy Statement (MPS). The MPS provides a statutory duty for all public authorities taking decisions capable of affecting the marine environment to do so in accordance with the Statement. Integral to the MPS is the objective to '*Ensure a sustainable marine environment which promotes healthy, functioning marine ecosystems and protects marine habitats, species and our heritage assets*'. SCAs therefore provide an evidence base to inform policy development and other land use planning activity that may be undertaken (NI Environment Agency, 2014). As SCAs are not designations they have not been outlined in Table 1 but the areas considered can be seen in Figure 6.

There are marine protected areas that also contribute to the Oslo Paris Commission (OSPAR) MPA network (Figure 7).

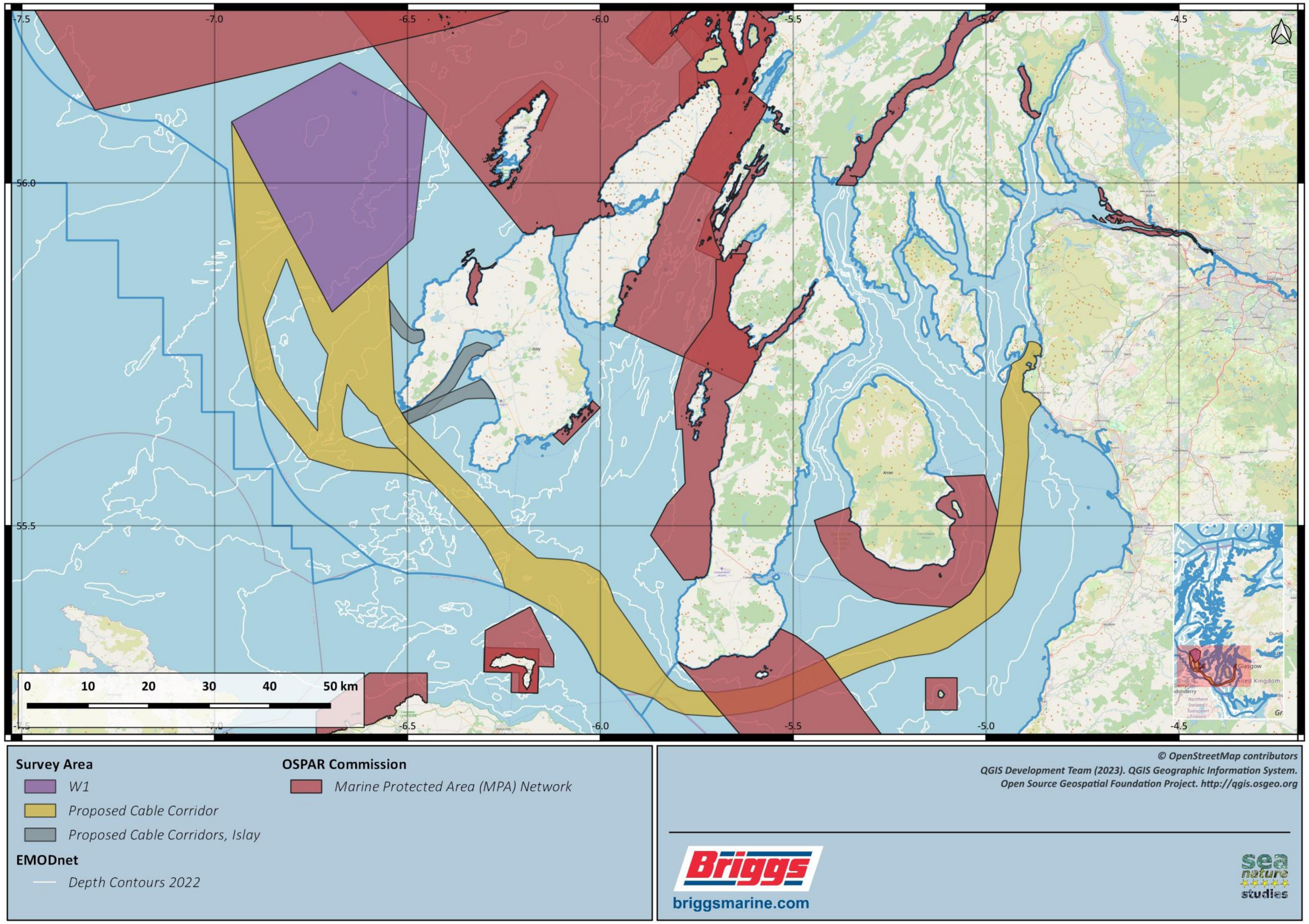


Figure 7 OSPAR MPAs (Source: OSPAR Commission)

1.4 Habitats and species

1.4.1 Priority Marine Features (PMF) and Annex I Habitats

NatureScot have records of important habitats spread across the region including Annex I and Priority Marine Features. These are accessible within the 'Geodatabase of Marine features adjacent to Scotland' (GeMS) (Figure 8). Features like Annex I reef within which biotopes such as '*Faunal and algal crusts on exposed to moderately wave-exposed circalittoral rock*' (CR.MCR.EcCr.FaAlCr) including variants of this such as FaAlCr.Flu, dominated by the silt and scour tolerant bryozoan *Flustra foliacea* (greater hornwrack); FaAlCr.Sec dominated by *Securiflustra securifrons* (narrow-leaved hornwrack); FaAlCr.Adig on steep vertical bedrock with *Alcyonium digitatum* (dead-mens fingers); and, FaAlCr.Bri with its dense covering of brittlestars such as *Ophiothrix fragilis*, are present. To the east, in the Firth of Clyde the PMF 'burrowed mud' dominates, with *Funiculina quadrangularis* (tall seapen) (Figure 8). The biotope representing this habitat is, '*Seapens, including* Funiculina quadrangularis*, and burrowing megafauna in undisturbed circalittoral fine mud*' (SS.SMu.CFiMu.SpnMeg.Fun). Burrowed mud is also the OSPAR threatened and declining habitat, 'sea-pen and burrowing megafauna communities'.

In Loch Indaal on Islay, both within and outside the proposed cable corridor, in the MCA and SSSI, the seagrass biotope 'Zostera marina/angustifolia *beds on lower shore or infralittoral clean or muddy sand*' (SS.SMp.SSgr.Zmar) has been recorded. These records are listed as the Annex I sub-feature type, 'Sandbank feature (Seagrass beds)' and marked as, '*Possible Sandbanks which are slightly covered by sea water all the time*'. In addition, within the Bridgend Flats SSSI at the head of Loch Indaal there are multiple records for the Annex I habitat '*Mudflats and sandflats not covered by seawater at low tide*'. Biotopes mapped here include 'Polychaetes and *Angulus tenuis* in littoral fine sand' (LS.LSa.FiSa.Po.Aten) and '*Cerastoderma edule* and polychaetes in littoral muddy sand' (LS.LSa.MuSa.CerPo). Blue mussel beds, '*Mytilus edulis* beds on littoral mixed substrata' (LS.LBR.LMus.Myt.Mx) indicating possible Annex I reef have also been recorded in the Bridgend Flats and just east of the cable landfall at Bowmore. There is also a record for the, 'Kelp and seaweed communities on sublittoral sediment' (SS.SMp.KSwSS) biotope within the Loch; indicating, '*Possible Sandbanks which are slightly covered by sea water all the time*' Annex I habitat; and, linked to this at a point in the outer Loch, a further example of 'KSwSS', has been recorded; namely, '*Laminaria saccharina* and filamentous red algae on infralittoral sand' (SS.SMp.KSwSS.LsacR.Sa). Further out still, just off the eastern side of the Rhinns, within the proposed Islay cable corridor, there are point records for the PMF 'kelp beds' with the biotope recorded as, '*Laminaria hyperborea* forest with a faunal cushion (sponges and polyclinids) and foliose red seaweeds on very exposed upper infralittoral rock' (IR.HIR.KFaR.LhypFa). Further evidence of kelp beds occurs within the adjacent bay here.

Where the proposed cable route corridor makes landfall at the Southannan Sands SSSI there are many PMF seagrass habitat data points. These records are of the intertidal dwarf seagrass biotope '*Zostera noltii* beds in littoral muddy sand' (LS.LMp.LSgr.Znol). The records are therefore also marked as Annex I habitat, '*Mudflats and sandflats not covered by seawater at low tide*'; and, the Annex I sub-feature type, 'Sediment flat feature (Seagrass beds)'. The Annex I habitat, '*Mudflats and sandflats not covered by seawater at low tide*' has also been recorded at several locations here within the SSSI and coupled to this, the biotope, ‘Polychaetes and *Angulus tenuis* in littoral fine sand’ (LS.LSa.FiSa.Po.Aten) noted.

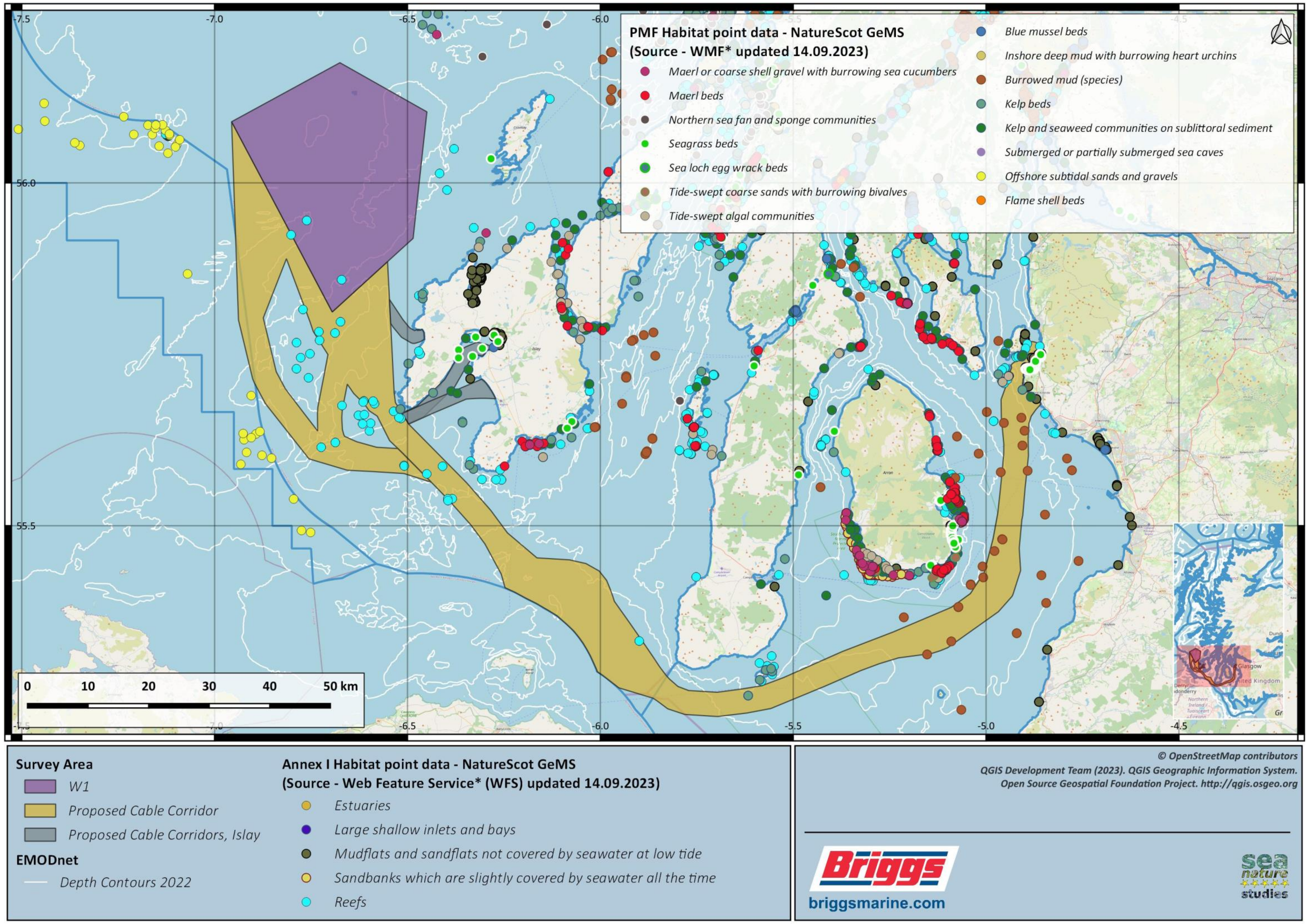


Figure 8 Annex I and Priority Marine Feature (PMF) habitats (Source: NatureScot Geodatabase of Marine features adjacent to Scotland (GeMS))

1.4.2 PMF Species

NatureScot have records of important species spread across the region (Figure 9). In the proposed W1 option sandeels have been recorded, clustered largely, in the southern half of the area. Further south and to the west of Islay, in the proposed cable corridor there is a European spiny lobster (*Palinurus elephas*) record from 2012. According to the EUSeaMap this record is on circalittoral coarse sediment (Figure 4). The species is understood to be primarily associated with areas of subtidal rock (Tyler-Walters *et al*., 2016). East and west of this point, both within and without the mapped corridor, circalittoral rock and biogenic reef are predicted (Figure 4). *P. elephas* was also recorded adjacent to the proposed cable corridor within the Cumbraes MCA (Figure 9).

According to GeMS data the dominant PMF species to the east is the ocean quahog, *Arctica islandica*, a long-lived bivalve mollusc which also occurs on the OSPAR List of Threatened and/or Declining Species (Figure 9). In this area it has been found within the proposed cable corridor off the island of Great Cumbrae, but it is clearly widely distributed across the region (this can also be seen if the NBN Atlas data for the species is viewed). The species has also been recorded from within the proposed Islay cable corridor in Loch Indaal (Figure 9).

Other PMF species records of note, several just outside parts of the survey area include horse mussel, *Modiolus modiolus* in Loch Indaal (1982, from the Oil Pollution Research Unit Jura and Islay sublittoral survey). Fan mussel, *Atrina fragilis* just east of Sanda Island in the Clyde Sea Sill MPA (date uncertain but somewhere between 1764-1969); off Holy Island on the east side of Arran (date uncertain but somewhere between 1764-1969); off Largs just north of the proposed landfall site (date uncertain); and, more recently, in the Upper Loch Fyne MPA (2012). Lastly, there is a record of heart cockle, *Glossus humanus*, just east of the proposed cable corridor (2001).

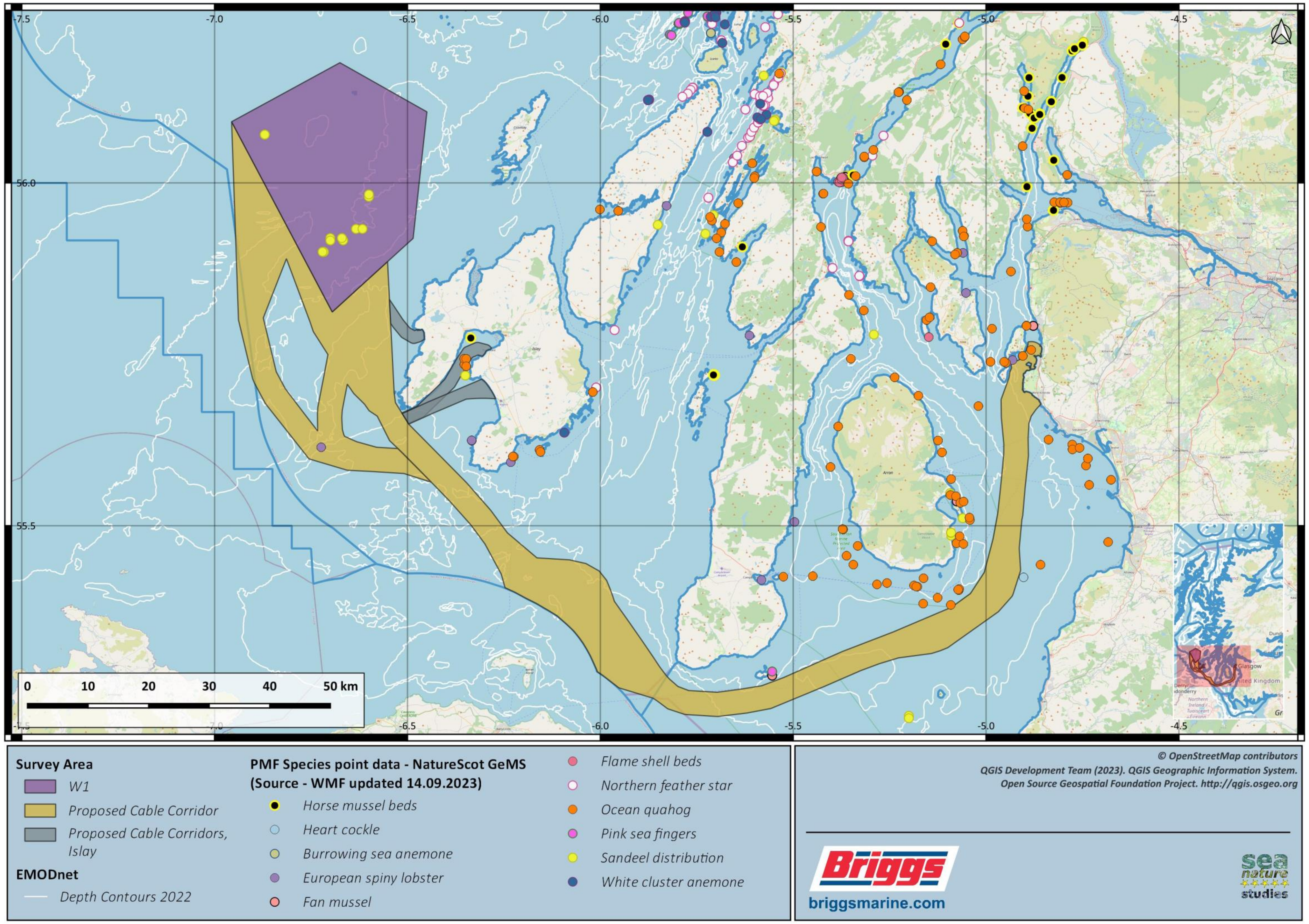


Figure 9 Species of conservation interest (Sources: NatureScot Geodatabase of Marine features adjacent to Scotland (GeMS))

1.4.3 Regionally important Species

As NatureScot makes clear, '*public bodies in Scotland have a duty to further the conservation of biodiversity when carrying out their responsibilities*' under the Nature Conservation (Scotland) Act 2004. There are 74 marine invertebrate species and 8 algal species on the Scottish Biodiversity List.

In Northern Ireland the Wildlife and Natural Environment Act (Northern Ireland) 2011 places a duty on the Department of Agriculture, Environment and Rural Affairs (DAERA) to publish a list of the species of flora and fauna and types of habitats which are of principal importance for the purpose of conserving biodiversity. This Northern Ireland Priority Species List contains 73 marine invertebrate species and 13 algal species.

These lists were cross-referenced with the data generated from the survey work that is the subject of this report and reported on in a subsequent section.

2. Methods

All methodologies employed in the field survey work are available in the 'Benthic Ecology Survey Field Report 06 December 2021' covering:

- Drop-Down Video Transects and Stills;
- Grabs for infaunal and particle size analysis (PSA);
- Day Grabs for contaminant analysis;
- Turbidity casts and samples; and,
- Faecal indicator grabs

The methodology for each of these aspects are described in Sections 2.4.1 to 2.4.5 of that field report.

2.2 Laboratory processing

2.2.1 Particle Size Analysis (PSA)

PSA was undertaken by APEM Ltd, the company which runs the particle size analysis component of the National Marine Biological Analytical Quality Control Scheme (NMBAQC). Detailed methodology for standard practice can be found in Mason (2016).

All samples are initially assessed visually prior to PSA. This is a standardised procedure, using the least dominant to most dominant sediment type present, therefore if the sediment consists predominantly of sand, with some mud, it is recorded as muddy sand. Descriptions also include details regarding composition, for example, whether it is shelly.

A representative subsample of the bulk sample is taken. From this a further subsample is taken for laser diffraction analysis of the <1mm sediment fraction. Where there was no sediment >1mm (i.e. there was nothing left on a 1mm mesh), then no further analysis was required.

Dry sieving of the >1mm sediment fraction was undertaken at 0.5ϕ intervals and the weight retained by each sieve recorded. Dried sediment is kept in a labelled bag for quality assurance purposes.

The sieve and laser diffraction data are subsequently merged to produce a complete Particle Size Distribution (PSD) at 0.5ϕ intervals. Percentages of the distribution are provided in each 'half-phi' size interval, expressed in µm (sieving for >1mm fraction, laser diffraction for <1mm fraction). Samples are categorized by the Folk (1954) classification system and percentage weights provided for each of the 16 descriptive terms as necessary. Sediment statistics were calculated using Folk and Ward (1957) formulae.

Laser analysis of twenty replicate subsamples was performed for quality control purposes.

2.2.2 Faunal

Grab samples were re-sieved over a 1 mm mesh to remove all remaining fine sediment and fixative. Fauna were sorted from the sediment by elutriation and subsequent examination under a stereomicroscope.

Macro-invertebrates collected from the grab samples were identified to species level, where practicable, and enumerated. Colonial, encrusting epifaunal species were allocated a P (present) value. A reference collection was prepared with one individual of each species identified retained.

Eco Marine Consultants Limited (Eco Marine) conducted the external quality assurance of macrofaunal samples collected from the survey. A total of 204 samples were analysed by Apem Ltd as part of the project, of which 10 were selected for QA purposes. Overall, the samples were deemed to have been processed within acceptable limits and no remedial action was recommended.

Faunal biomass analysis was based on a wet-blot method with estimates of ash-free dry weight made based on conversion factors provided by Eleftheriou and Basford (1989). Mollusc biomass included the weight of the flesh plus shell.

2.2.3 Contaminants

The Marine Department of SOCOTEC undertook the laboratory analysis of contaminant samples from the survey and applied the methods outlined in Table 2 (full details are available in the report, Appendix 1).

Table 2 SOCOTEC laboratory methodological summaries for sediment contaminant samples

Method	Sample and Fraction Size	Method Summary
Total Solids	Wet Sediment	Calculation (100%-Moisture Content). Moisture content determined by drying a portion of the sample at 120°C to constant weight.
Total Organic Carbon (TOC)	Air dried and ground	Carbonate removal and sulphurous acid/combustion at 1600°C/NDIR.
Total Carbon	Air dried and ground	Combustion at 1600°C/NDIR.
Metals	Air dried and ground	Aqua-regia extraction followed by ICP analysis.
Organotins	Wet Sediment	Solvent extraction and derivatisation followed by GC-MS analysis.
Polyaromatic Hydrocarbons (PAH)	Wet Sediment	Solvent extraction and clean up followed by GC-MS analysis.
Polychlorinated Biphenyls (PCBs)	Air dried and seived to <2mm	Solvent extraction and clean up followed by GC-MS-MS analysis.
Organochlorine Pesticides (OCPs)	Air dried and seived to <2mm	Solvent extraction and clean up followed by GC-MS-MS analysis.
PBDEs	Air dried and seived to <2mm	Solvent extraction followed by GC Triple Quad analysis

2.2.4 Faecal indicator organisms

Oakshire Environmental arranged and managed the sediment testing for faecal indicator organisms. A UKAS accredited laboratory Melbec Microbiology Ltd, undertook the analysis. Full details are available in the report (Appendix 2).

Samples were tested for the following bacterial contaminants: *Escherichia coli*, Enterococci and Total Coliforms. These are common indicators for the presence of faecal matter.

Laboratory testing involved adding 1g of sampled sediment to 9ml of a sterile diluent which was then vortexed for 30 seconds and allowed to sit for around 15 minutes or until the sediment was fully dissolved/dispersed into the diluent. 1ml of the solution was then taken and added to agar plates. These were then allowed to grow for a prescribed time and the identified results were reported.

2.3 Data analysis

2.3.1 Rationalisation of the faunal data matrices

Prior to analysis, the macrofaunal dataset was rationalised. The rationalisation process encompasses removing indeterminable taxa and juvenile stages to avoid spurious enhancement of the species list (94 taxa had been flagged as juveniles).

Duplicates have been merged and removed from the species list (e.g., '*Eusyllis blomstrandi* epitoke', Station 137 was added to *Eusyllis blomstrandi*).

All abundance's listed as 'Frag.', for 'fragments' is not count data (either the taxa was present as an identifiable head or tail section or it was not). In total there were 161 of these entries.

2.3.2 Univariate statistical analysis

Diversity indices including total species (S); total individuals (N); species richness (Margalef) (d); Pielou's evenness (J'); Shannon-Wiener diversity index (H'(log2); and, Simpson's dominance index (λ) were generated for each site using the 'Diverse' routine available in the PRIMER (v7).

2.3.3 Multivariate statistical analysis

Multivariate statistical techniques were applied to the sediment and the macrofauna (abundance) to investigate patterns of similarity in PRIMER v7 after applying a square root transformation. These techniques included:

- 'Cluster Analysis' - A hierarchical clustering analysis to group samples based on the nearest neighbour sorting of a resemblance matrix of sample similarities produced using Bray Curtis similarity (macrofaunal data) or the Euclidean distance measure (sediment data);
- 'nMDS' - Non-metric multi-dimensional scaling ordination of Bray Curtis and Euclidean Distance similarity/distance matrices;
- 'SIMPROF' - Similarity profiling to identify statistically significant clusters interpreted in ecological terms (Clarke et al., 2008);
- 'SIMPER' - Similarity percentage analysis to describe each of the multivariate groups; and,
- 'PCA' - Principal Component Analysis to identify spatial patterns and relationships between variables.

2.4 Recognition of seabed habitats (DDV)

Habitats within the survey area have been classified following 'The Marine Habitat Classification for Britain and Ireland – Version 22.04' (JNCC, 2022). Classifications were assigned to each habitat type observed within the video and stills photography and to faunal clusters derived from the multivariate analysis of the macrofaunal data. The biotopes are assigned to distinct areas of characterising features occurring in areas whose extent is of at least 25 m^2; biotope mosaics were considered where features or more biotopes were observed (Parry, 2019).

2.4.1 Sediment categorisation

Descriptions of the substrate composition, corresponding to sediment changes supported the European Nature Information System (EUNIS) habitat identification (Long, 2006). These descriptions were largely based on a reclassification of the Folk (1954) sediment classes, with the Wentworth (1922) classification also considered for the sizes of pebbles, cobbles and boulders. The Folk (1954) sediment classification was reclassified into 'coarse sediment', 'mixed sediment', 'mud and sandy mud' and 'sand and muddy sand' (Long, 2006). In addition, sub-categories, namely 'mud', sandy mud' and 'muddy sand' are utilised to further account for differences in sediment in the 'mud to sandy mud' fraction (Kaskela et al., 2019). The European Marine Observation and Data Network (EMODnet) Geology Consortium further revised these categories to include an additional category 'Rock and Boulders' (Kaskela et al., 2019) to encompass the Wentworth (1922) categories 'boulders' and 'cobbles'.

2.4.3 Identification of sensitive habitats or species

Habitats and biotopes were subsequently assessed for their ecological and conservation importance. The correlation spreadsheet which allows translation between the EUNIS marine classification, the Marine Habitat Classification for Britain and Ireland, and other marine habitats listed for conservation importance under current conservation legislation was used (JNCC, 2018). Drop-down video data were reviewed to assess the seabed and associated faunal communities against the definition of 'Sea pen and burrowing megafauna communities' (JNCC, 2014) and Annex I Stony Reef Assessment (Irving, 2009; Golding *et al*., 2020; and, Duncan *et al*., 2022).

2.4.3.1 Sea pen and burrowing megafauna communities

To assess the presence of 'Sea pen and burrowing megafauna communities', faunal burrows and sea pens were counted and counts where then converted to SACFOR abundance scale (Hiscock, 1996). Table 3 provides the SACFOR scales used for sea pen, mound and burrow density assessment.

Table 3 SACFOR abundance scales

SACFOR Scale	3 cm to 15 cm*		> 15 cm†	
	Individuals per m^2	Density	Individuals per m^2	Density
Superabundant	100 – 1000	1 – 9/0.01 m^2 (10 × 10 cm)	10 – 99	1 – 9/0.1 m^2
Abundant	10 – 99	1 – 9/0.1 m^2	1 – 9	1 – 9/m^2
Common	1 – 9	1 – 9/ m^2	0.1 – 0.99	1 – 9/10 m^2 (3.16 × 3.16 m)
Frequent	0.1 – 1.0	1 – 9/10 m^2 (3.16 × 3.16 m)	0.01 – 0.09	1 – 9/100 m^2 (10 × 10 m)
Occasional	0.01 – 0.09	1 – 9/100 m^2 (10 × 10 m)	0.001 – 0.009	1 – 9/1000 m^2 (31.6 × 31.6 m)
Rare	0.001 – 0.009	1 – 9/1000 m^2 (31.6 × 31.6 m)	0.0001 – 0.0009	< 1/1000 m^2

* = 3 cm to 15 cm: *Pennatula phosphorea*, *Virgularia* sp., mounds and megafaunal burrows
† = > 15 cm: *Funiculina quadrangularis*, *Nephrops norvegicus* burrows

2.4.3.2 Annex I Reef (geogenic)

Reefs are described as either biogenic concretions or of geogenic origin, forming hard compact substrata topographically distinct from the surrounding seabed in the sublittoral and littoral zone (CEC, 2013). Hard compact substrata include rocks (both hard and soft), boulders and cobbles and the JNCC has further described the subtypes 'Stony', which refers specifically to boulders and cobbles, generally >64 mm in diameter of geogenic origin and 'Bedrock', which refers to rocks, including soft rock such as chalk, of geogenic origin (Duncan et al., 2022).

Annex I subtype habitat 'Stony reef' habitats assessment is based on the proportional composition of cobbles and boulders, the elevation and extent, as well as the biota colonising them (Irving, 2009; Golding 2020). Annex I subtype bedrock reef features are also assessed using their correlation with the EUNIS habitat classification and the EUNIS habitats MC1 and MC12 (formerly referred as A4) (Duncan et al., 2022). Table 4 provides the 'Stony reef assessment criteria' (Irving, 2009).

Table 4 Irving (2009) stony reef assessment criteria

Stony Reef (Irving, 2009)				
Characteristic	**Resemblance to a 'Stony reef'**			
	Not a Reef	Low	Medium	High
Composition Diameter of cobbles/boulders >64 mm. Percentage cover of a minimum area of 25 m^2	< 10 %	10 % - 40 %	40 % - 95 %	> 95 %
Elevation Minimum height 64 mm to >5m with feature distinct from the surrounding seabed	Flat seabed	< 64 mm	64 mm - 5 m	> 5 m
Extent	< 25 m^2	> 25 m^2		
Biota	Prevalence of infaunal species	-	-	> 80 % of epifaunal species

2.4.3.3 Species of conservation interest

Macrofaunal data were also reviewed for evidence of sensitive habitats, as well as species, recorded within the survey area. Habitats and species were assessed for their conservation status using the Annex I habitats list (JNCC, 2019a), Annex II species list (JNCC, 2019b), OSPAR threatened and/or declining species and habitats (OSPAR, 2023), Scottish biodiversity list species and habitats (NatScot, 2020a), PMFs (NatScot, 2020b) and the List of Northern Ireland priority species 2023 (DAERA, 2023). Reference to the International Union for Conservation of Nature [IUCN] Red List (IUCN, 2022) status of the sensitive taxa identified was also considered, where appropriate.

3. Results

3.1 Fieldwork

3.1.1 Grab samples

Grab samples for fauna and sediment were successfully taken at 204 sites across the survey area using a mini Hamon grab (Figure 10). Note that grab samples were also taken at seven of the drop down video locations.

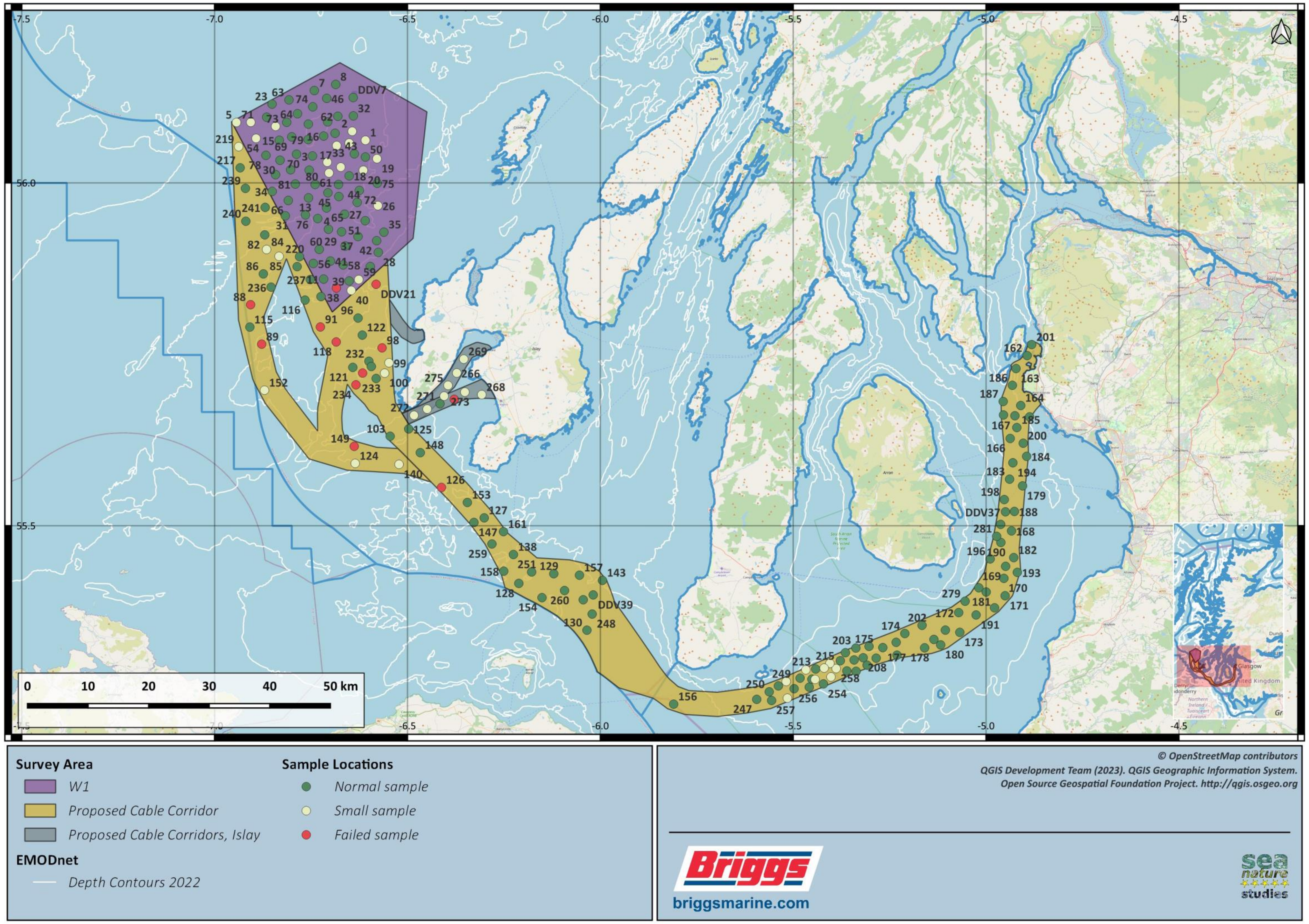


Figure 10 Grab sample locations within the area surveyed, August / September 2021

3.1.2 Drop Down Video

Drop down video footage was taken at 43 sites within the survey area, almost half of which were concentrated within the W1 option boundary (Figure 11). Note there was no usable data from site DDV1.

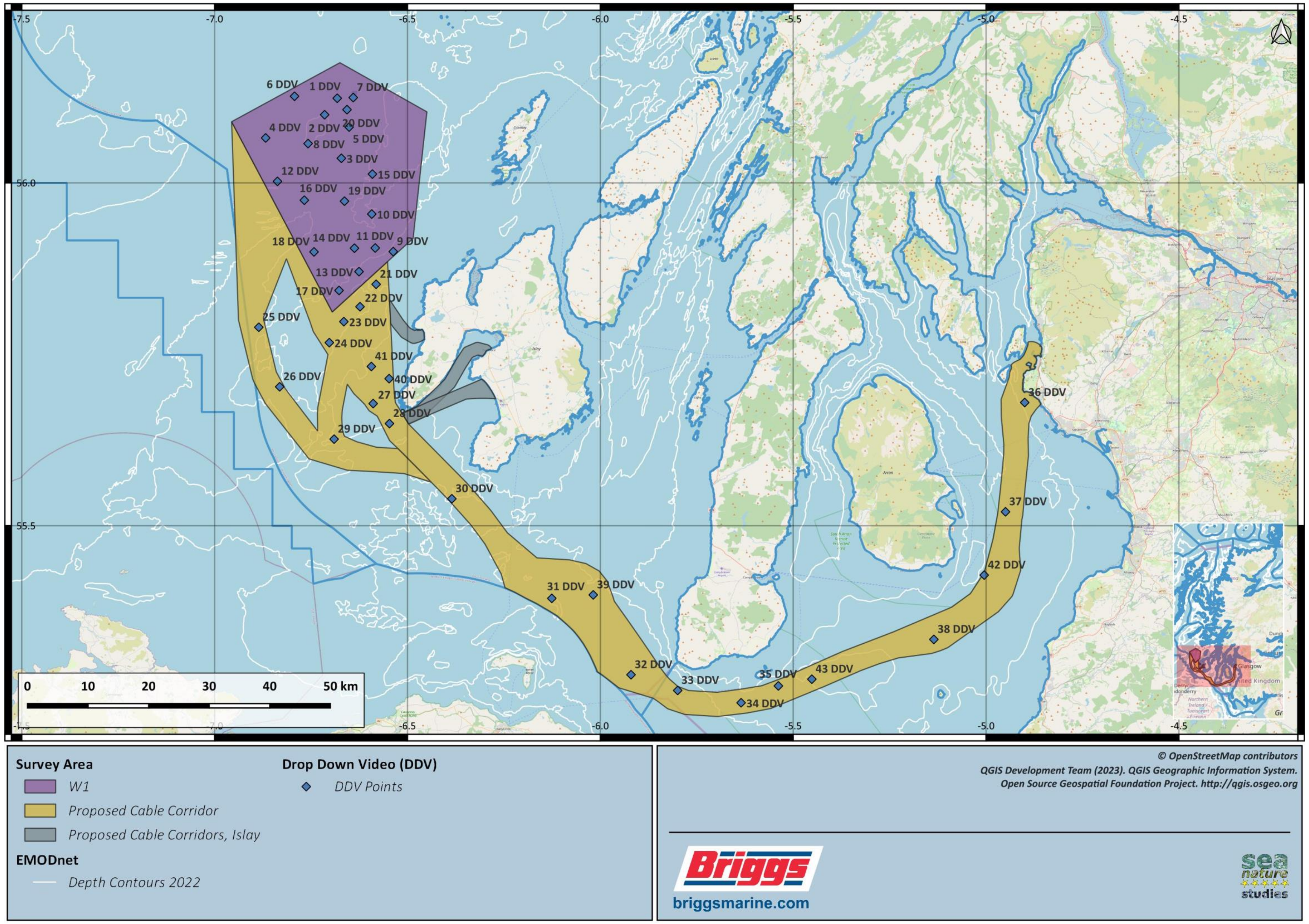


Figure 11 Drop down video sample locations within the survey area, August / September 2021

3.2 Physical sediment characteristics

Samples from a total of 204 sites were successfully taken during the field survey work. The full results of the sediment particle size distribution (PSD) analysis are provided in Appendix 3.

3.2.1 Particle Size Distribution

Depending on the relative proportions of the following three principal constituents, a range of textural sediment groups can be classified (Folk 1954):

- Gravel (material coarser than 2000 µm i.e.2mm);
- Sand (material between 63µm and 2000 µm); and,
- Mud (material finer than 63µm, i.e., silt plus clay).

The dominant Folk textural group encountered at 75 of the 204 sites sampled was slightly gravelly Sand or, (g)S (Figure 12).

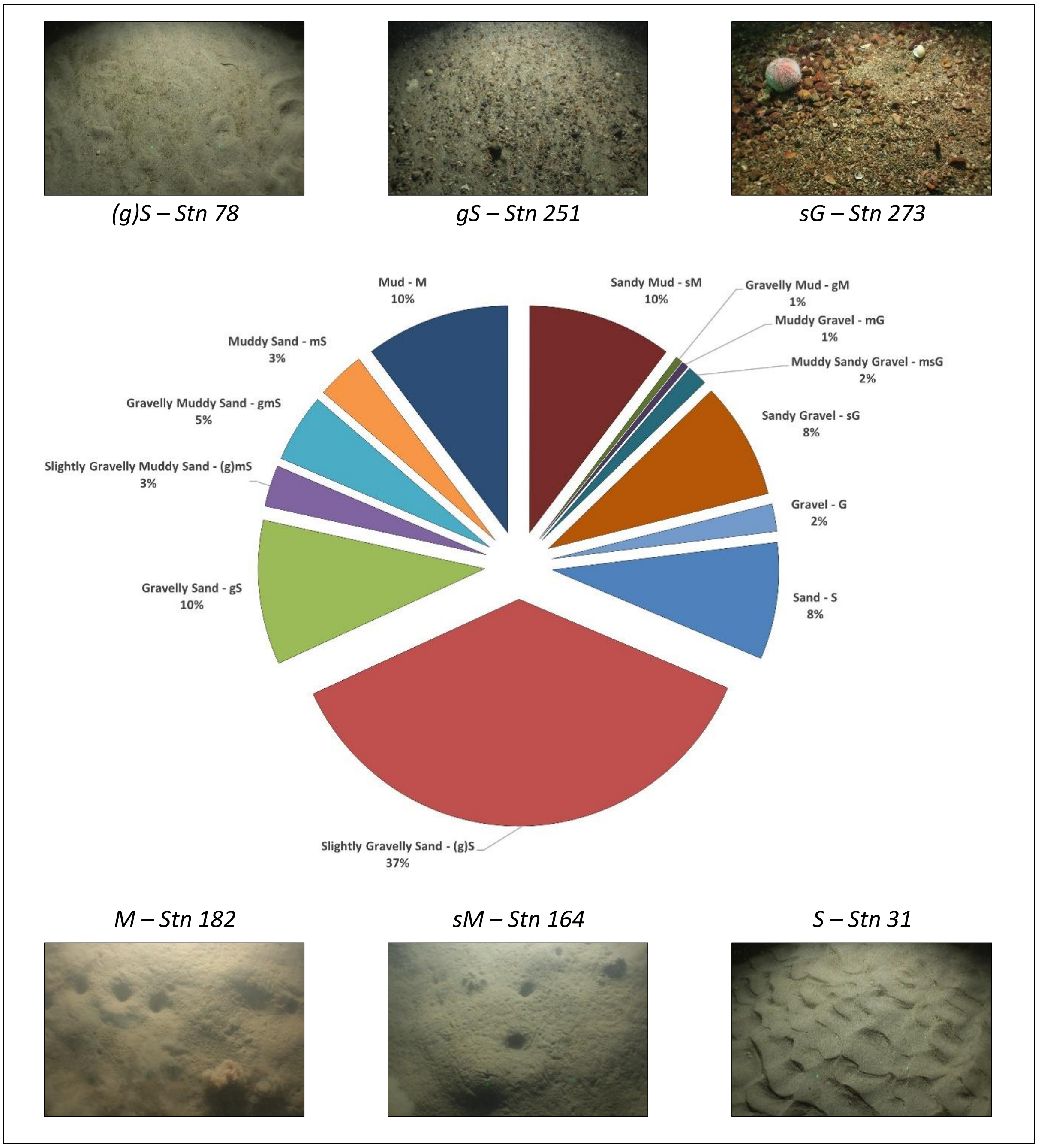


Figure 12 The percentages of Folk (1954) textural groups identified from all sediment samples taken (plus example imagery from selected stations (Stn))

3.2.2 Gravel, sand, mud and Folk (1954) descriptors

The variation in the percentage distribution of gravel, sand and mud at each grab location across the survey area indicates that three areas can be distinguished, offshore sand; a mid-section of coarse, more variable sediments; and, muddy sediments within the Firth of Clyde (Figure 13). This observation is consistent with an exposure gradient from the offshore Atlantic conditions to the more sheltered inshore waters.

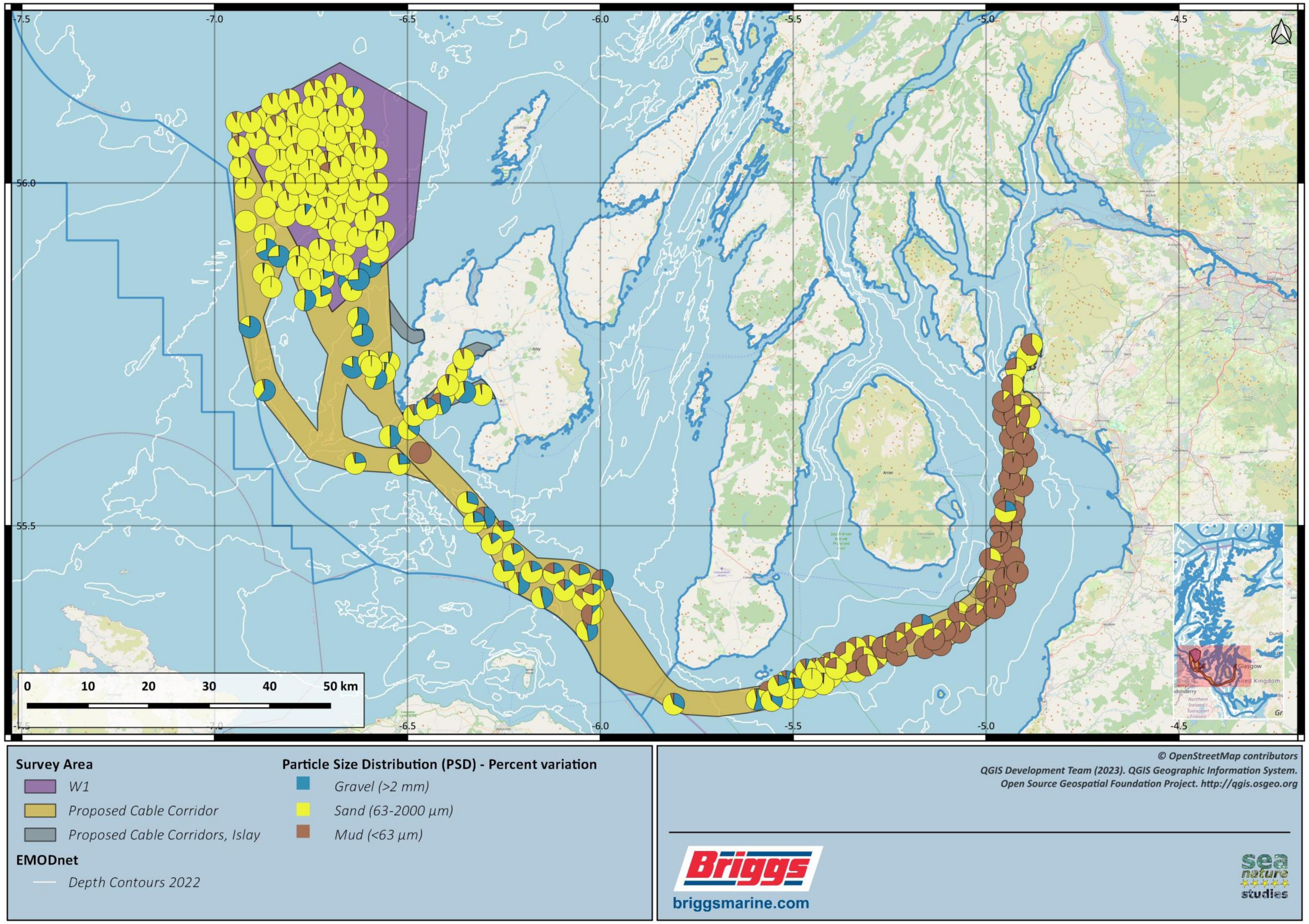


Figure 13 Variation in the percentages of gravel, sand and mud from grab locations across the survey area

Some support for this can be inferred if the sediment sorting coefficients are plotted (Figure 14). Sorting is a measure of the spread of the grain sizes around the average and may be used as a proxy measure of the energy of the environment (Blott and Pye 2001; Garrison 2009). Medium and fine sands tend to exhibit better sorting (low sorting index values) than muds and gravels (Blott and Pye 2001). Well sorted sediments can indicate a consistent input of energy with little fluctuation; while poorly sorted sediments can indicate an inconsistent energy input and, as a consequence, a wide fluctuation in grain size about the mean (Garrison 2009). This is of value here because well-sorted sediments are understood to tend towards homogeneity and, are typical of areas with high wave and current activity (high energy areas), such as those found offshore in and around the W1 area (Gray et al., 2009). In contrast, poorly sorted sediments are heterogenous and more typical of lower wave and current activity (low energy areas) exemplified, for example, by those sites in the Firth of Clyde. Note the small cluster of more well sorted sites on the Firth-side of the Clyde Sea Sill. This suggests higher energy interactions likely driven by the frontal system active here and the associated hydrodynamic forces sorting the finer sedimentary components found on the slopes at this location.

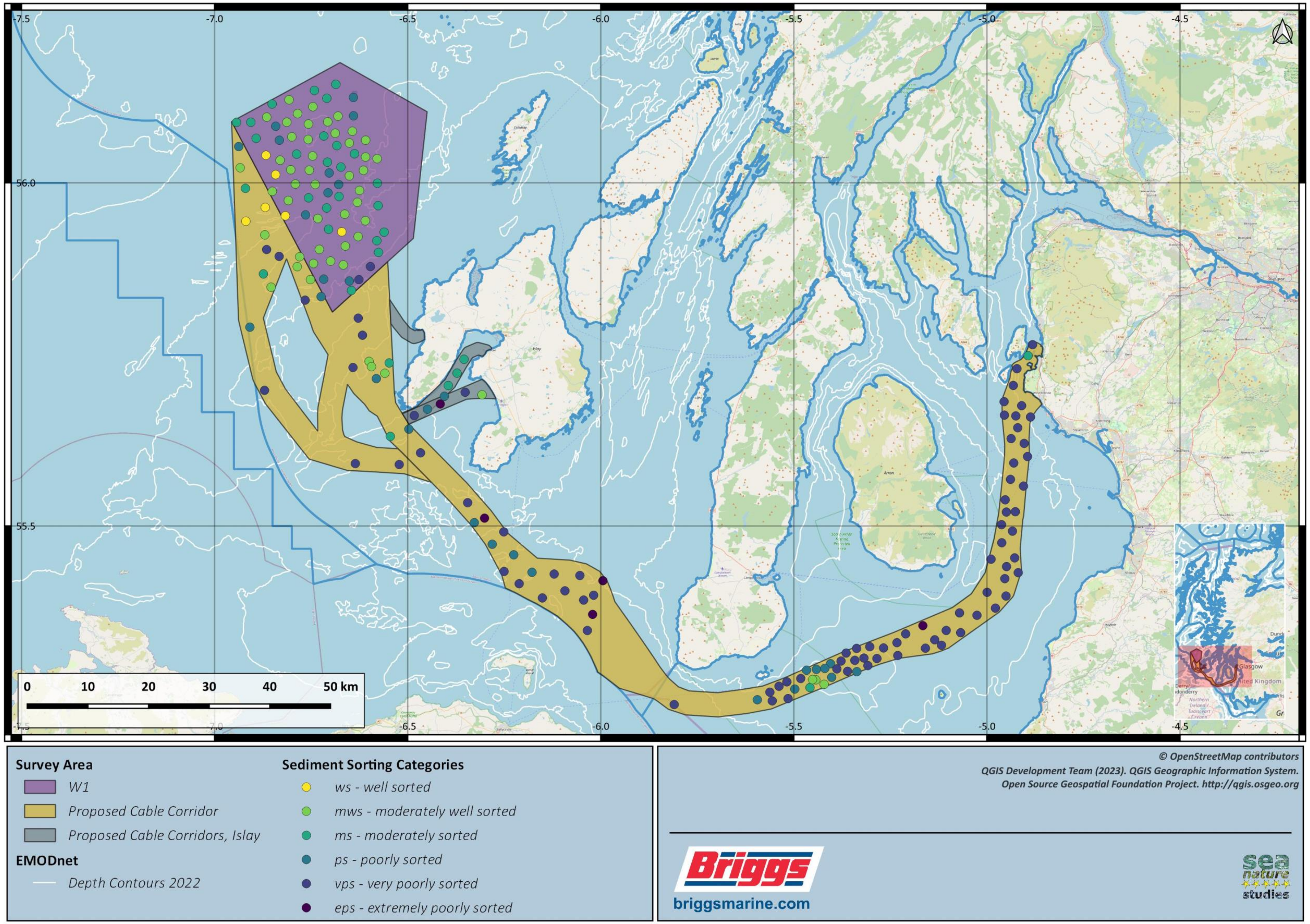


Figure 14 Sediment sorting categories from grab locations across the survey area

The Folk (1954) descriptors have been applied as part of the PSD analysis and mapped to further detail the changes in seabed sediments across the survey area (Figure 15).

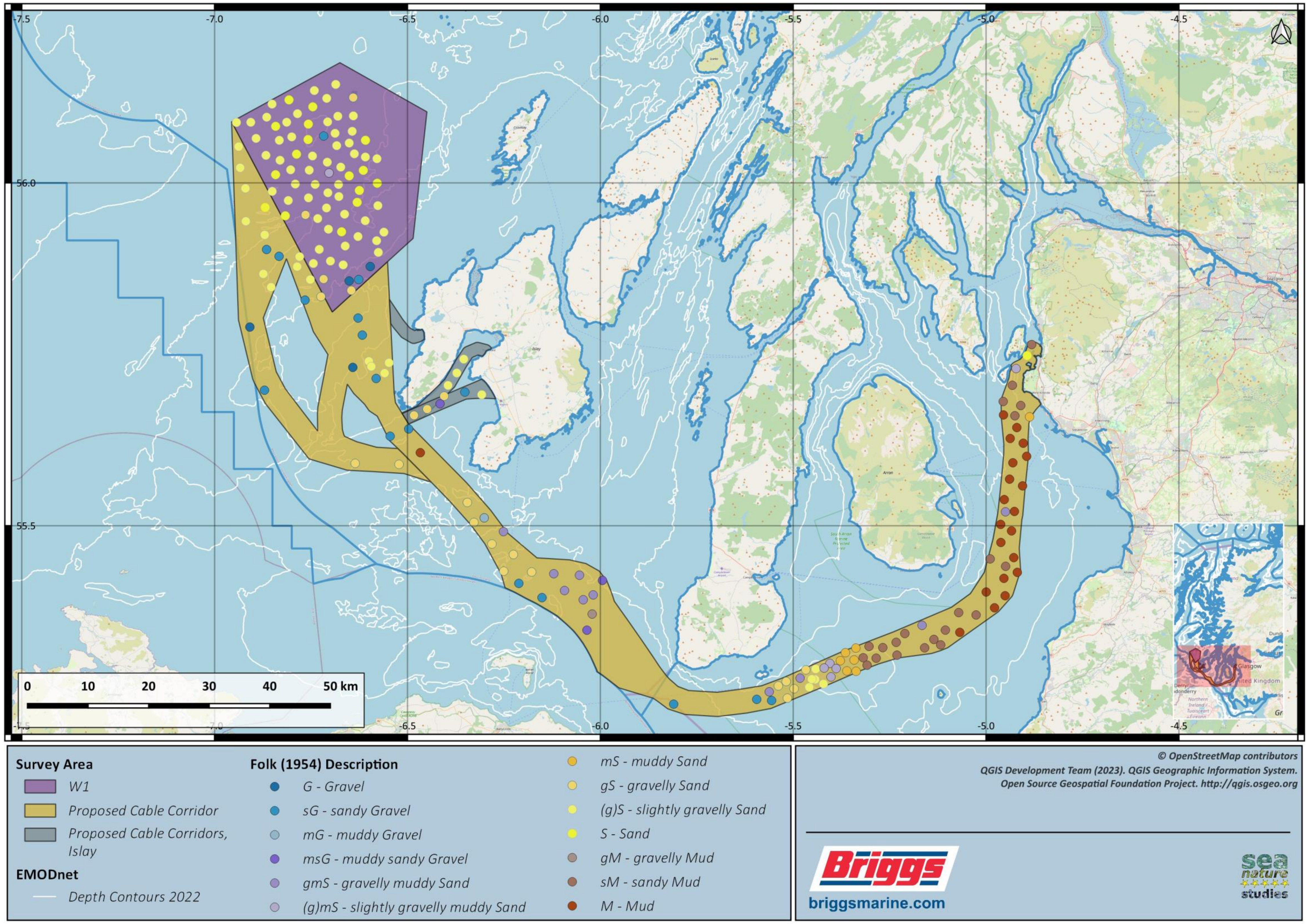
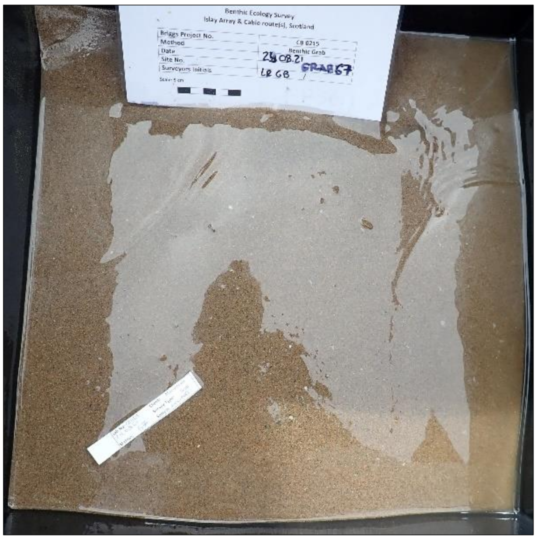
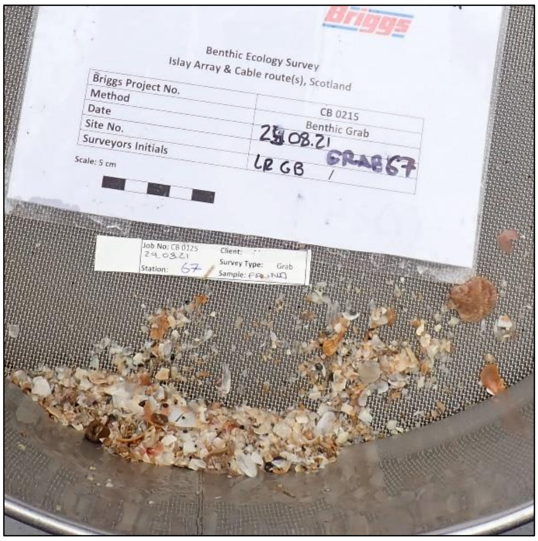


Figure 15 Folk (1954) sediment descriptions from grab locations across the survey area

Photographs taken of the grabs on deck before and after sieving illustrate some of the component detail of the sediments sampled, for example site 67, was (g)S with gravel at that site comprising shell debris:



Site 67 – unseived – (g)S



Site 67 – seived – (g)S

Within the W1 area the dominant component is the sand fraction (Figure 13). Folk (1954) descriptors, or groups, indicate that at most sites the sediment consists of slightly gravelly Sand, as might be expected from an area exposed to the Atlantic conditions encountered here (Figure 15). This is consistent with the habitat predicted in the EUSeaMap 2023 of circalittoral sand and offshore circalittoral sand (Figure 4).

On the southern edge of the W1 option, and to the west and south, the sediments become coarser, as evidenced by the large increases in the proportion of gravel at these locations such that, at a number of stations, it is the dominant fraction. The sediments at a scattering of stations here are therefore classified as belonging to the Folk groups of gravel and sandy gravel (Figure 15). Again, this is consistent with the EUSeaMap which has a band of circalittoral coarse sediment mapped in this area (Figure 4).

The protection from exposure to the Atlantic conditions afforded by the Rhinns on Islay is seen at those sites sheltered here as the sediments are more mixed, though largely dominated by sand (Figure 13). Gravel drops away on the approach to, and within, Loch Indaal, and at the inshore site within the adjacent bay, such that the sand fraction is again dominant (Figure 13). Though the Folk groupings highlight the continued influence of gravel in this area (Figure 15). Note, the anomalous pocket of mud indicated by the results for grab site 148, within the proposed cable corridor offshore of Laggan Bay, between Rhinns Point and the Mull Oa. This result is at odds with the still image of the grab and the video taken prior to deploying the grab which clearly show substantial gravel, shell and pebble sedimentary components and no visible mud. This PSD result should therefore be considered erroneous and ignored.

Further south and east, between Islay and Kintyre, the sediments in the proposed cable corridor, though mostly dominated by sand, are more mixed, some with significant proportions of gravel and many with a percentage of mud (Figure 13). This is reflected in the associated Folk descriptive terms for the sediment samples analysed (Figure 15). The area of offshore circalittoral coarse sediment predicted here does have several discreet patches of offshore circalittoral mixed sediment to the east (Figure 4). Whilst in the Straits of Moyle a much larger ellipse of mixed sediment, more than 40km^2, mostly within the proposed corridor, is predicted (Figure 4). The survey results therefore suggest that the predicted coarse sedimentary environment between Islay and Kintyre may be, in reality, more patchy or mixed in nature (Figure 13; Figure 15).

The solitary grab site, number 113, off the Mull of Kintyre illustrates that the coarse sediment, though with small fractions of mud, continues around the Mull of Kintyre and this is reinforced by the sandy Gravel Folk category (Figure 13; Figure 15). This again agrees well with the predicted habitat from the EUSeaMap and continues onto the Great Plateau (Figure 4; Figure 15). On the Clyde Sea Sill, there is a good match between the samples and the predicted transition from coarser sediments to offshore circalittoral sand, to offshore circalittoral mud. Nevertheless, the PSD results from survey samples are suggestive of a more nuanced transition with the percentages of gravel, sand and mud shifting with depth from coarser sediments in the shallower areas, dominated by gravel and sand, to more mixed conditions followed by sands and muds and finally muds (Figure 13; Figure 15).

Once in the Firth, almost without exception, mud dominates matching very accurately the predicted offshore circalittoral mud until the seabed slopes upwards towards the Cumbraes and the Fairlie Roads where the sand fraction increases again (Figure 13; Figure 15; Figure 4). This is all in good agreement with the habitat description for offshore circalittoral mud which underlines the presence of '*mud and cohesive sandy mud*' in such zones (JNCC, 2022). The exception, at a site just off the eastern edge of the South Arran MPA is predicted to be offshore circalittoral rock and biogenic reef and the sample taken here at DDV site 37 has fractions of gravel, sand and mud indicative of mixed sediments as shown by the Folk category of gravelly muddy Sand (Figure 13; Figure 15).

3.2.3 Sample groups from multivariate sample sorting of PSD data

Sedimentary data was investigated using the multivariate sample sorting techniques available in PRIMER (v7). This analysis was applied to the sixteen categories of percentage fractional weight data available for each sample, from very coarse gravel, 32 to 64mm; to clay, <63um (Appendix 3). The data was not transformed prior to the analysis.

A triangular resemblance matrix was generated using the measure D1 Euclidean distance (the measure commonly applied to environmental data such as the weight data presented here). The resemblance matrix was then subjected to hierarchical group average clustering to produce the tree diagram or dendrogram (Figure 16A). The option to run a similarity profile (SIMPROF) test at a significance level of 5%, was selected as part of this process to identify any statistically significant group structure (note, a significance of 1% was also applied but this rendered the same result and was therefore discarded). The level of significance is important because it, '*erects a hurdle over which one must jump before further interpretation is pursued*' (Clarke *et al.* 2008). The more stringent the significance (e.g. 1% instead of 5%), the harder the hurdle is to overcome, a property which tends to reduce the number of groups identified. Multiple SIMPROF groups were generated but such fine divisions are not necessarily interpretable, or of practical value in terms of statistical and ecological significance (Clarke et al., 2008). Creating coarser groupings is entirely appropriate, provided that the resulting clusters are always supersets of the SIMPROF groups. In this way, a slice at a distance measure of 42 identified seven groups, a to g (Table 5; Figure 16A).

Table 5 Key metrics of the seven SimProf groups identified from the PSD data

SimProf group	No. of samples	Mean % gravel	Mean % sand	Mean % mud	Dominant Folk class	Dominant mean grain size	Mean sorting
a	36	0.72	98.01	1.27	(g)S	medium sand	0.66 (mws)
b	56	0.52	93.49	5.99	(g)S	fine sand	0.87 (ms)
c	49	0	20.66	79.34	M / sM	medium silt	2.36 (vps)
d	2	40.9	58.15	0.95	sG	very coarse sand	0.91 (ms)
e	3	1.57	98.3	0.13	(g)S	coarse sand	0.61 (mws)
f	42	20.7	71.6	7.71	gS	coarse sand	2.17 (vps)
g	16	63.94	29.11	6.97	sG	fine gravel	2.85 (vps)

The resemblance matrix was then analysed using non-metric multidimensional scaling (nMDS, or MDS) to produce the ordination in Figure 16B, which indicates the pattern of site relatedness in 2 dimensions. Individual sediment samples are represented by symbols corresponding to the relevant SIMPROF super-group and labels indicate the abbreviated Folk textural category (note, the circles further identify the dendrogram slice used to group the samples). The low '2D Stress' value of 0.08 for the ordination indicates that the observable pattern is a '*good*' representation of the multivariate relationship between samples, with '*no real prospect of a misleading interpretation*' (Clark and Warwick 2001). Figure 16C and Figure 16D are the same ordination plot but with coloured circles overlain to illustrate the variation in the proportion of fine sand (C) and coarse sand (D) associated with a particular site sample. From this the fine sand dominant in group 'b' and the coarser nature of the samples in groups 'd' - 'g' can be clearly seen.

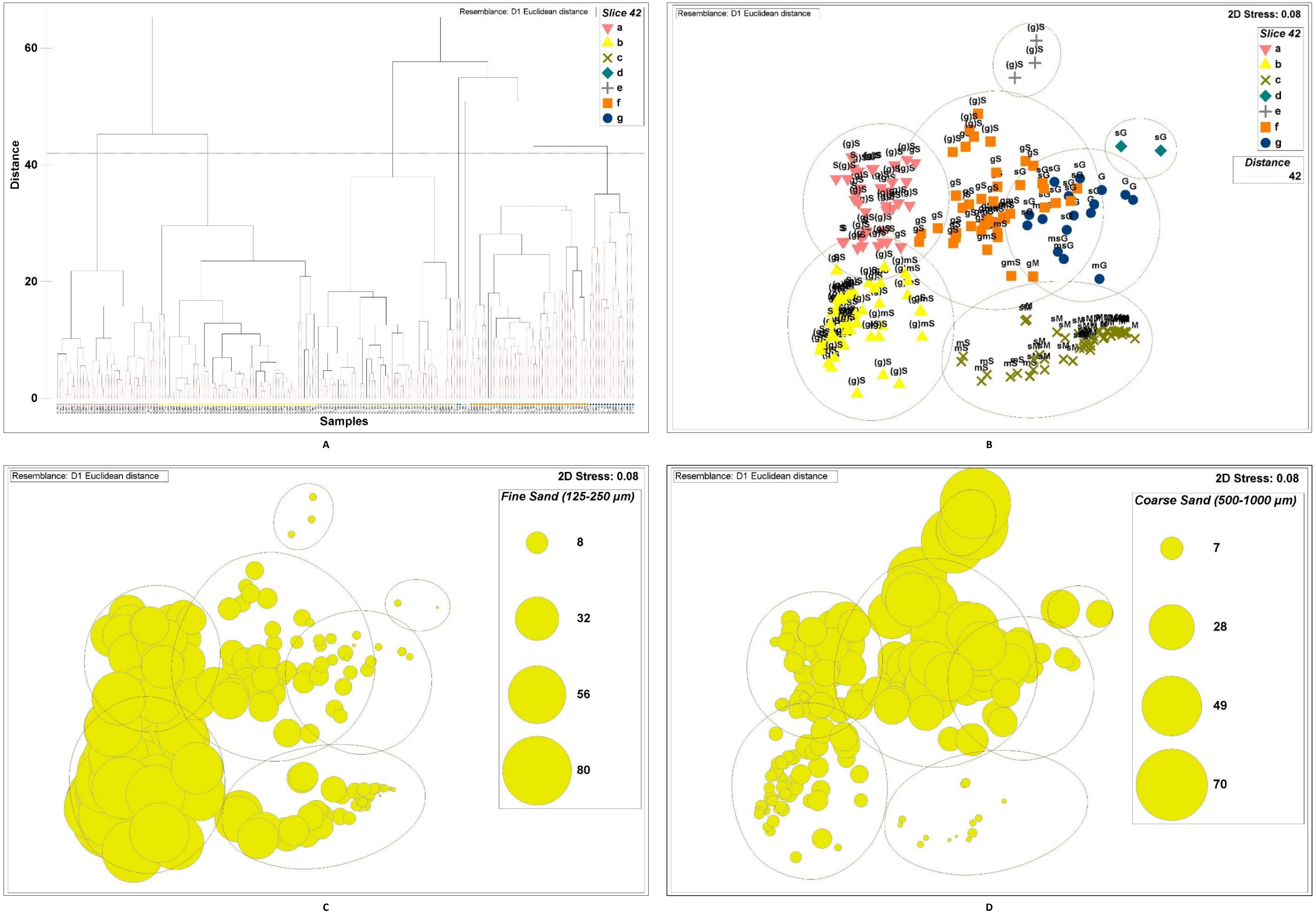


Figure 16 Dendrogram (A) and nMDS ordinations (B – D) of percent fractional weight data from the particle size analytical results

The SIMPROF groups have been mapped using the same symbology as generated from Primer (v7) so that their geographic distribution across the survey can be observed (Figure 17). Note the overall structure and its consistency with other data presented here i.e. Figure 4, Figure 13, Figure 15.

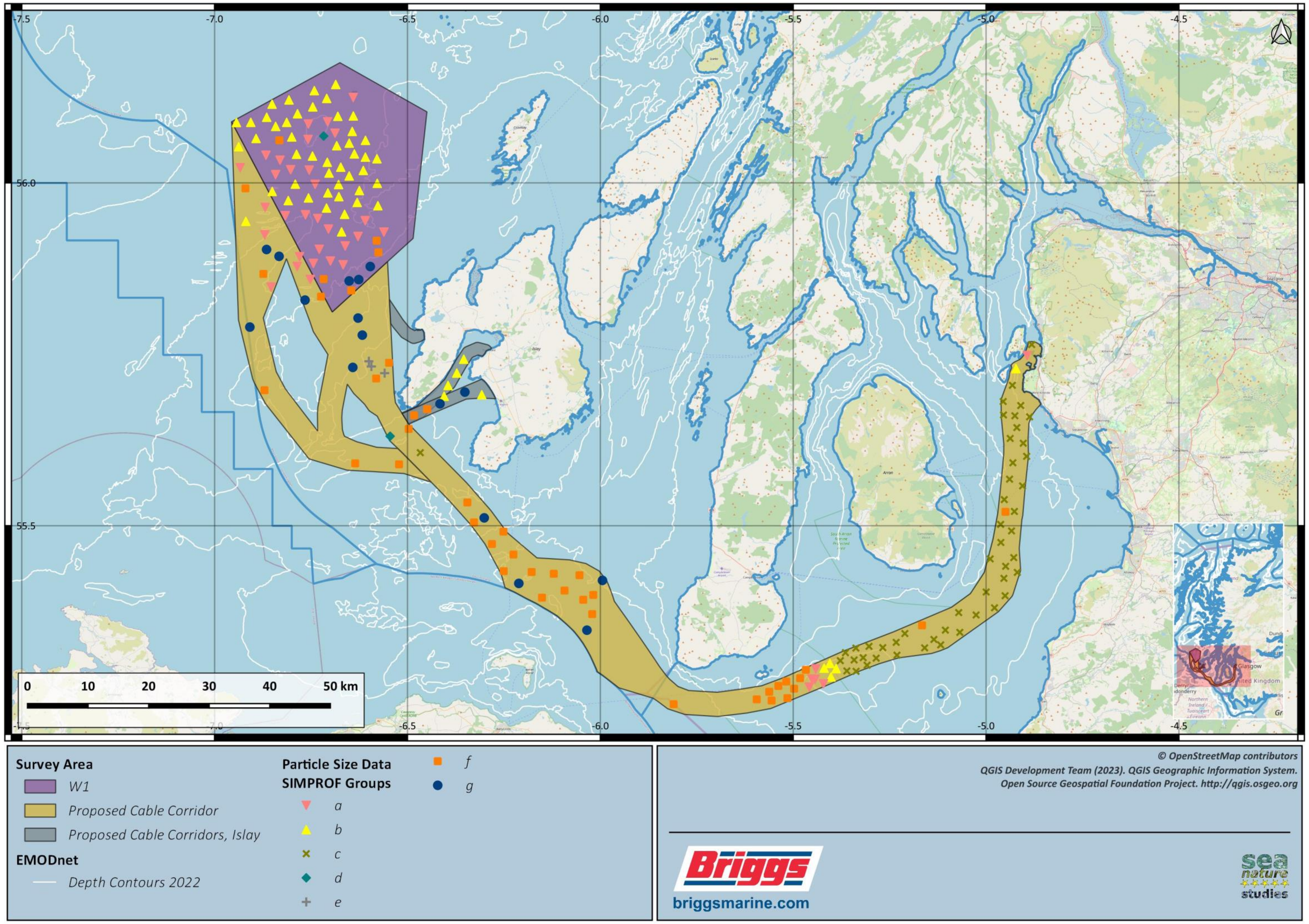


Figure 17 SimProf groups from PSD data at grab locations across the survey area

The largest of the seven groups, group ‘b’, comprising 56 sites, was dominated by slightly gravelly Sand, (g)S), with 68% of sites falling into this Folk category (Table 5). The other 3 Folk categories in group ‘b’ were Sand, S (20% of the sites in group b); all 6, slightly gravelly muddy Sands, (g)mS, from the survey; and, a single gravelly Sand, gS, site. The description of the mean grain size identified from these sites was almost invariably fine sand (125-250µm). Most sites which belonged to group ‘b’ were located in the proposed W1 area (Figure 17).

Group ‘a’ was smaller than group ‘b’ with 36 sites, but as with group ‘b’ it was also dominated by (g)S with 78% falling into this category, the remainder being Sand and gravelly Sand (Table 5). In contrast to group ‘b’, group ‘a’ mean grain size was 100% medium sand (250-500µm). Again, the majority of group ‘a’ sites were in the proposed W1 area (Figure 17).

Group ‘c’ was the second largest group with 49 sites and was dominated by Mud, M, and sandy Mud, sM, in equal amounts (the mean grain size comprising various grades of silt); with the remaining 7 sites falling into the muddy Sand, mS, category (Table 5). Group ‘c’ sites were all located within the Firth of Clyde from just beyond the Clyde Sea Sill to the entrance to the Fairlie Roads (Figure 17)

The 4 remaining groups, ‘d’, ‘e’, ‘f’ and ‘g’ were dominated by coarser sediment fractions (Table 5). Group ‘f’ was the third largest group within which 64% of sites had a mean grain size of mostly, coarse sand (500-1000µm) or, very coarse sand (1-2mm). All of the 16 sites in Group ‘g’, the fifth largest group, fell into one of 4 categories of Gravel, half of which were sG. The mean grain size at 81% of the sites within this group was fine or very fine gravel (4-8 mm or 2-4 mm respectively). Groups ‘d’ and ‘e’ were small with just 2 and 3 sites respectively, the former being sG with a mean grain size of very coarse sand and the latter (g)S with a mean grain size of coarse sand. As has been noted previously these more coarse sediment sites were located in the proposed cable route corridors from west of Islay to the Clyde Sea Sill (Figure 17).

3.2.4 Ordination by Principal Components Analysis

Ordination of percentage fractional weight sediment data by Principal Components Analysis (PCA) was used to identify those variables most responsible for the observed pattern of separation (Figure 18A).

The principal component one (PC1) axis was strongly positively correlated with fine sand (125-250 µm) and accounted for 49.8% of the variation. Medium Sand (250-500 µm) accounted for a further 27.5% of the variation along the principal component two (PC2) axis, whilst Coarse Sand (500-1000 µm) contributed 9.9% of the variation along the principal component three (PC3) axis. With PC1 and PC2 together accounting for 77.4% of the original variability the 2-dimensional PCA plot can be considered a good description, or account, of the overall structure observed (Clarke and Warwick, 2001). The importance of the % fine sand and % medium sand fractions in structuring the patterns seen can be inferred from the bubble plots in Figure 18 (B and C respectively).

The abundance of individual species can be overlaid on the PCA plot (e.g. the small, shiny nut clam *Nucula nitidosa* in Figure 18D). As indicated in the example provided species characteristic of fine sand habitats will favour those environments and therefore will flourish more at such locations than at others where they may be entirely absent. However, they can also be associated with habitats where that sand can be found as a component of muddier sediments (such as in those, largely, muddy Sand sites within group ‘c’). Studies show that this species has a preference for firm muddy sand but avoids mud as it cannot adequately maintain its position for feeding and respiratory purposes; and, is absent from gravel habitats as it cannot burrow effectively in coarse sediments (Trevallion, 1965, cited by Wilson and Shelly, 1986).

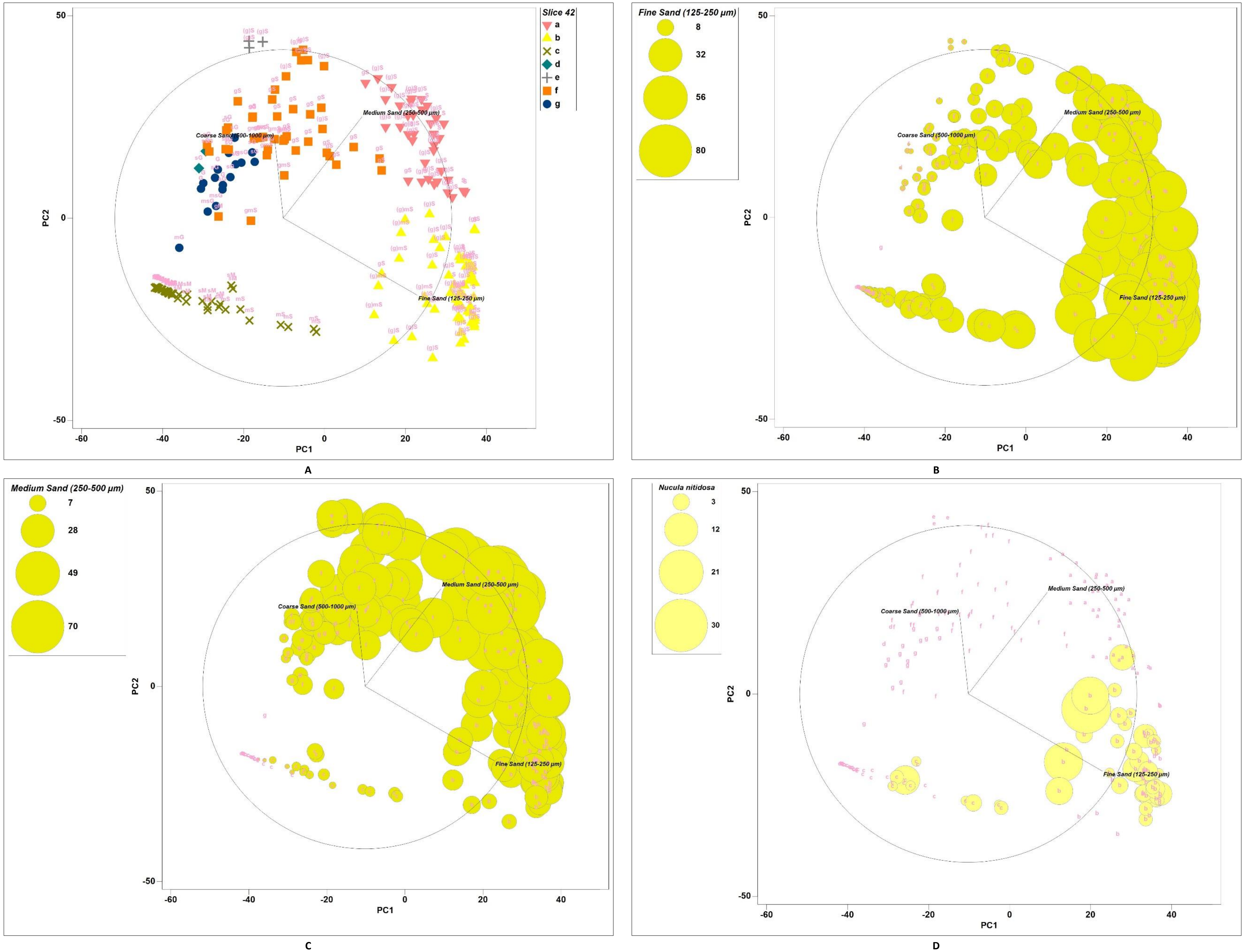


Figure 18 Principal Components Analysis (PCA) of percent fractional weight data from the particle size analytical results

3.3 Biological sediment characteristics

Macrofaunal grab samples from a total of 204 sites were successfully taken during the survey (Figure 10). The infaunal species abundance numerical raw data presented as the number of individuals per $0.1m^2$ and the epifaunal species present, recorded as 'P', from each site are provided in Appendix 4 (this Appendix includes the QA report). Species data are presented with the relevant AphiaID included as a reference to names currently accepted by the World Register of Marine Species (WoRMS) (WoRMS Editorial Board (2023). Biomass per major group was also recorded as blotted dry weight (Appendix 5).

A total of 586 quantitative taxa were recorded from the samples with over 19,000 individuals counted.

3.3.1 Major group composition

Quantitatively recorded taxa can be split into five major components or taxonomic groups. The five major groups are the annelid worms, almost entirely made up of polycheates, or bristle worms; molluscs; crustaceans; echinoderms; and 'others', which includes a range of minor phyla such as anemones, flatworms, ribbon worms, acorn worms, horseshoe worms and sipunculids or peanut worms. The percentage contribution to each of the quantitative major taxonomic groups in terms of number of species and abundance is presented in Figure 19A and B; and biomass Figure 19C (note that in Figure 19 A and B Crustacea have been split into two subgroups representing Cirripedia, or barnacles, (R) and all other Crustacea (S)).

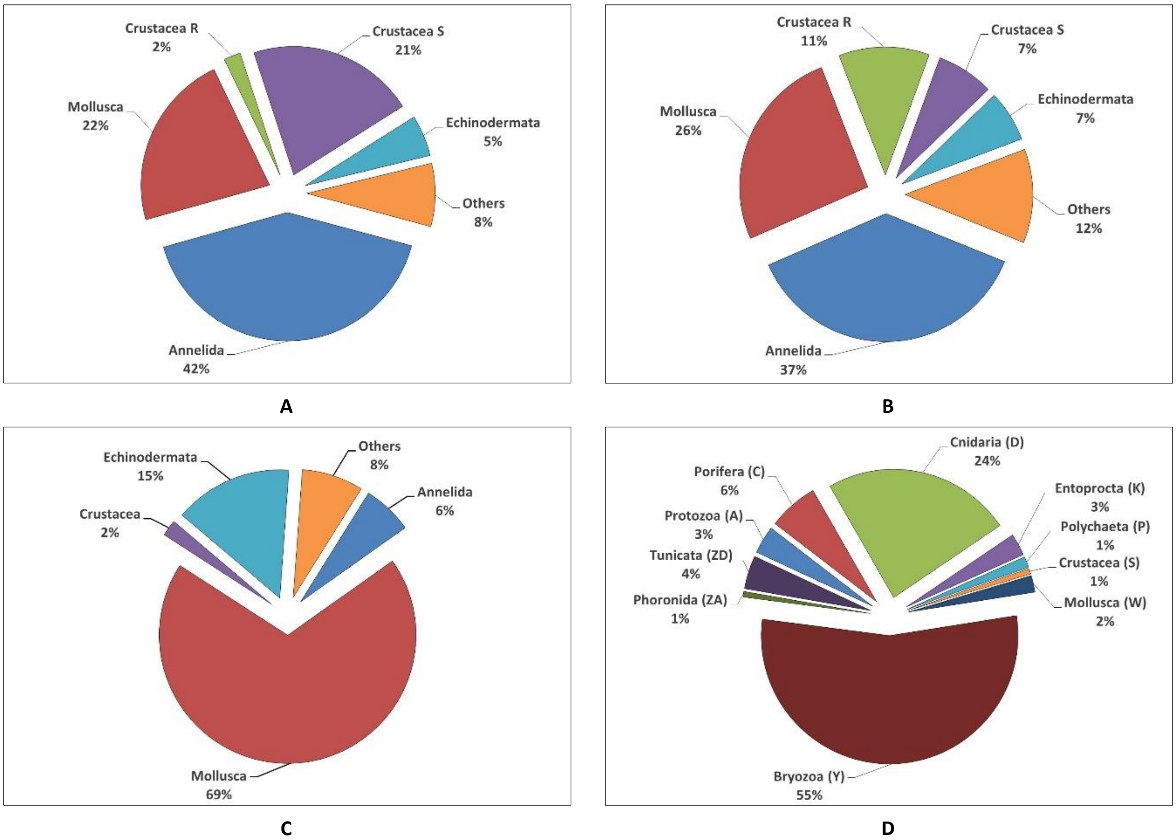


Figure 19 Percentage contribution to the major taxon groups of the number of species (A); abundances (B); biomass as Ash Free Dry Weight (C); and, qualitative epifaunal records (D), from all grabs across the survey area

In addition, there were 156 qualitative taxa identified. These were largely colonial epifaunal species and predominantly bryozoans, hydroids, some sponges and seaquirts (Figure 19D).

As is common in many sublittoral sediments polychaetes are the most taxonomically diverse group in the macrobenthic communities sampled in the survey area constituting over a 42% of the recorded species (Figure 19A). The group with the second highest number of recorded taxa was crustaceans (23%) closely followed by molluscs (22%). ‘Others’ (8%) and echinoderms (5%) had fewer taxa recorded which is not unusual as these groups are themselves considerably less taxonomically diverse.

The group with the highest percentage contribution in terms of abundance with over 7,000 individuals counted was the annelids at 37% (Figure 19B). The abundance of molluscs was second highest at 26% whilst third at 18% was the crustaceans though for this group two species of barnacles alone from just three sites 140, 133 and 96 accounted for almost half of that overall abundance. The most notable being the Wart barnacle, *Verruca stroemia*, with 451 individuals recorded from the gravelly Sand at site 140 southwest of Islay. Lastly, 12% of the overall abundance was from ‘others’ and, echinoderms contributed just 7% with just under half of the sites recording 0 or 1 individual. However, evidence from the drop down video shows that there were sample locations where the epifaunal common brittlestar *Ophiothrix fragilis* was recorded in high numbers.

Molluscs accounted for 69% of the total biomass and a single species was responsible for 75% of the contribution attributable to molluscs (Figure 19C). That species was *Arctica islandica*, the ocean quahog. Single specimens, and in one case 2 specimens, were found at each of the eleven sites that together contributed in excess of 1500g to the blotted dry weight total of just over 2000g. *A. islandica* is an exceptionally long-lived bivalve mollusc that can grow to a large size of up to 14cm (Huber 2010).

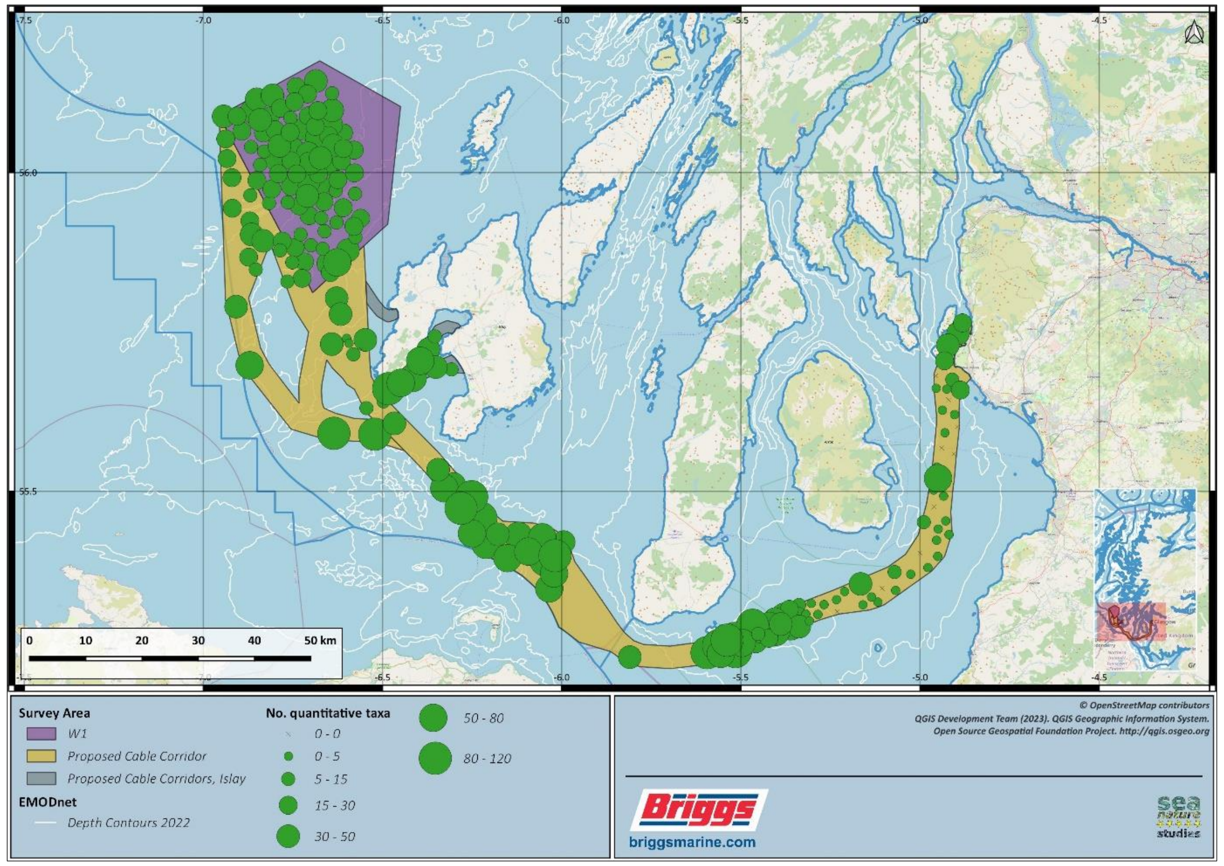
Echinodermata were the next highest contributor to biomass, again due to the presence of large species encountered in some of the grabs, notably burrowing urchins such as *Echinocardium cordatum*, the sea-potato, and *Brissopsis lyrifera*, a species of heart urchin.

Bryozoans dominated the colonial epifauna taxa recorded from the survey with 55% of those recorded belonging to this phylum followed by Cnidaria, or hydroids, with less than half that amount at 24%.

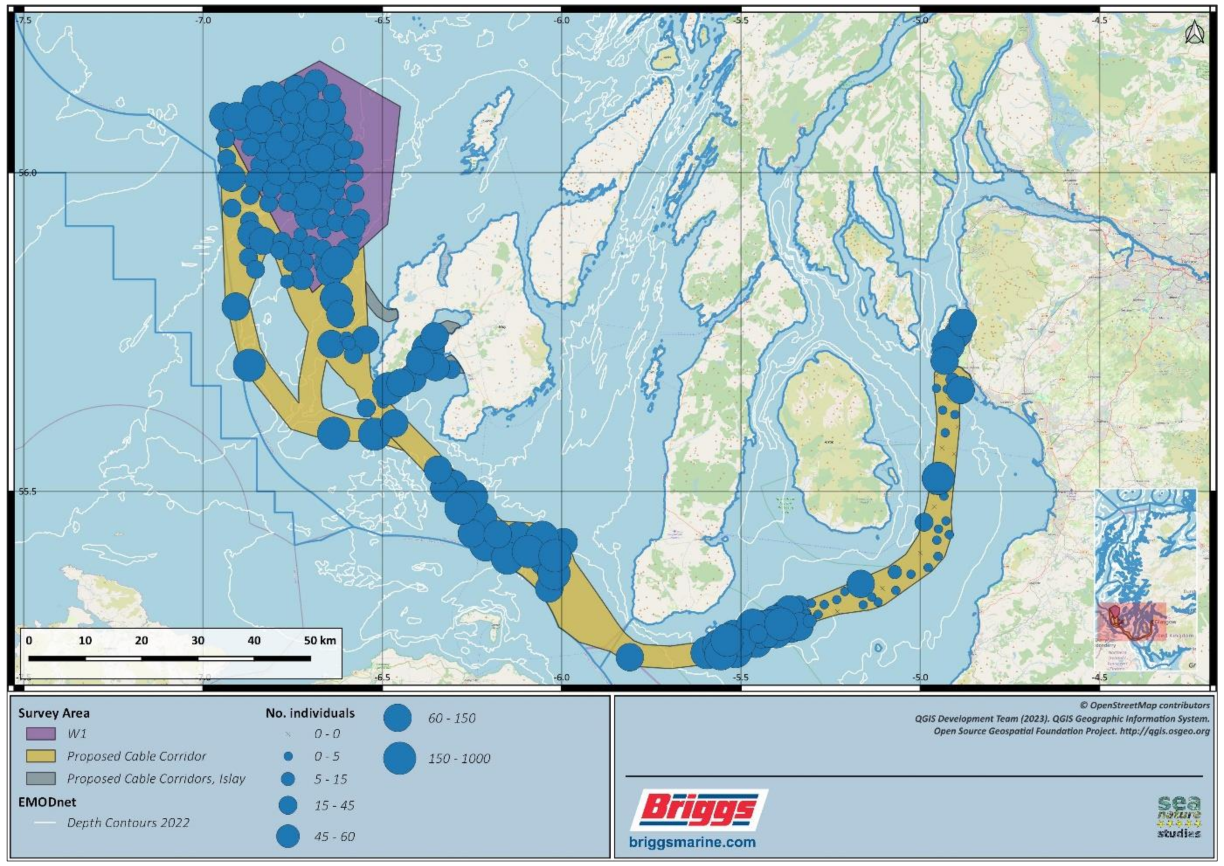
3.3.2 Community diversity indices

Diversity indices including total species (S); total individuals (N); species richness (Margalef) (d); Pielou's evenness (J'); Shannon-Wiener diversity index (H'(log2); and, Simpson's dominance index (λ) were generated for each site from the PRIMER (v7) package of statistical routines and are available in Appendix 6. These analyses are used to extract features of communities which are not the function of specific taxa therefore assemblages with no species in common could have, more or less, equivalent values.

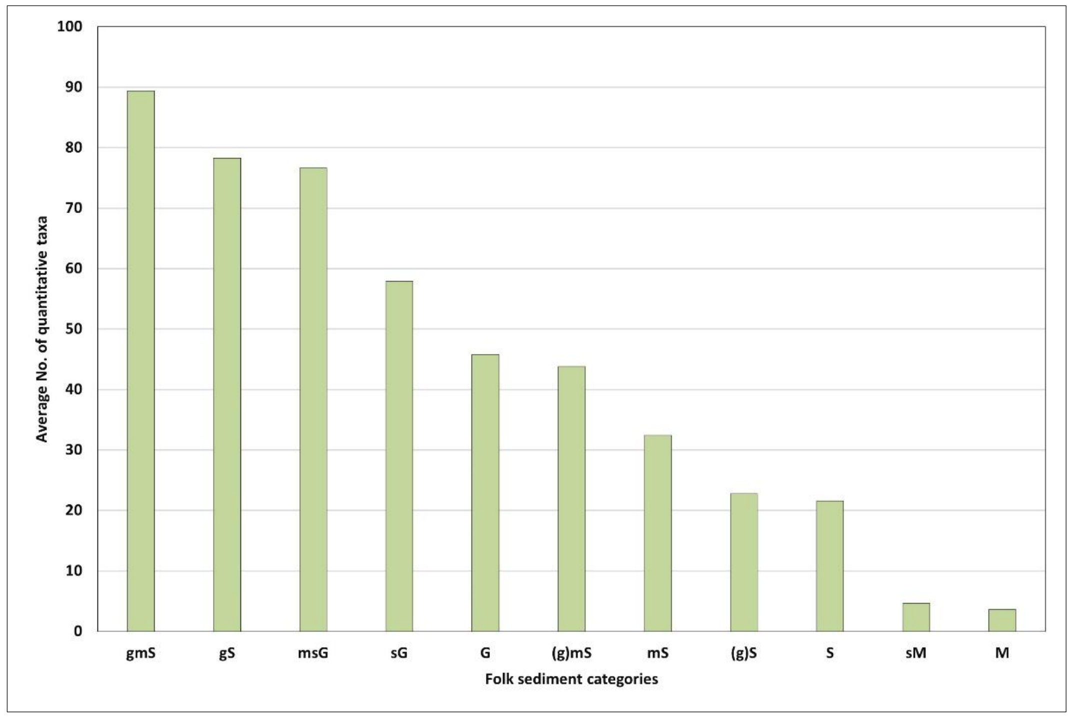
In grabs from the deeper water, mud sediments, of the Firth of Clyde there were, in general, few species recorded and those that were sampled were in low abundances (Figure 20A and B; Figure 13; Figure 15). While in areas of more mixed sediments such as those on, and just off, the Clyde Sea Sill and locations further west and north in the proposed cable corridor, communities with higher numbers of taxa, in higher abundances were sampled (Figure 20A and B; Figure 13; Figure 15). The variation in the average numbers of quantitative taxa associated with the recorded Folk categories illustrates the importance of coarser, mixed sediments as does the variation in the numbers of polychaete taxa (Figure 20C and D, respectively).



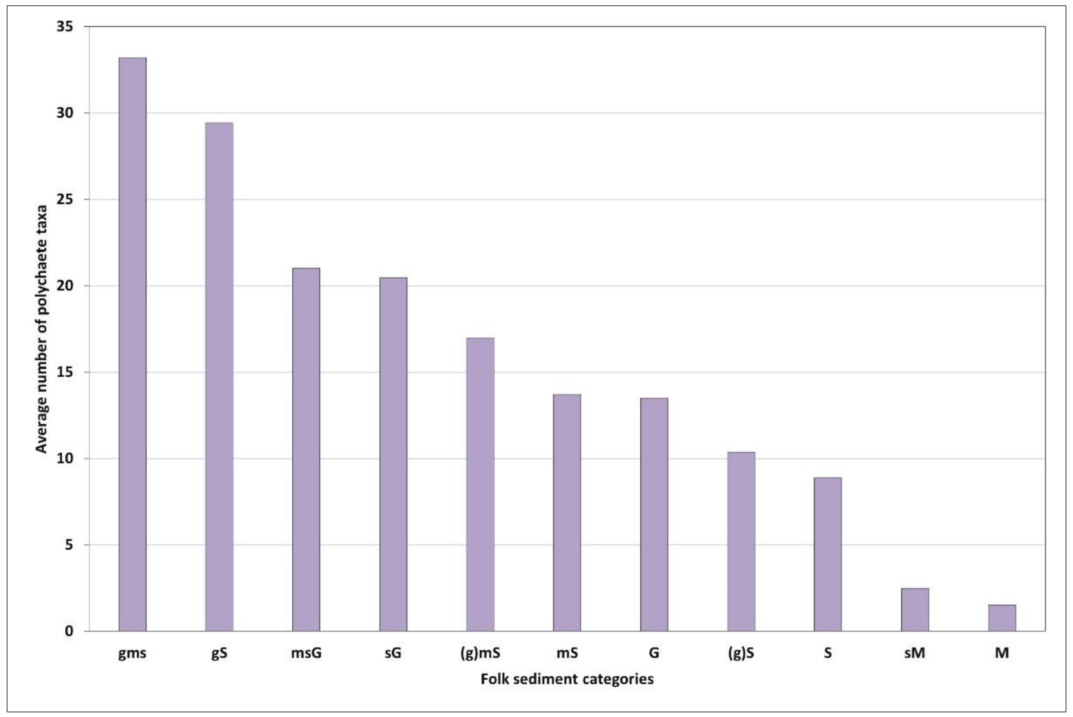
A



B



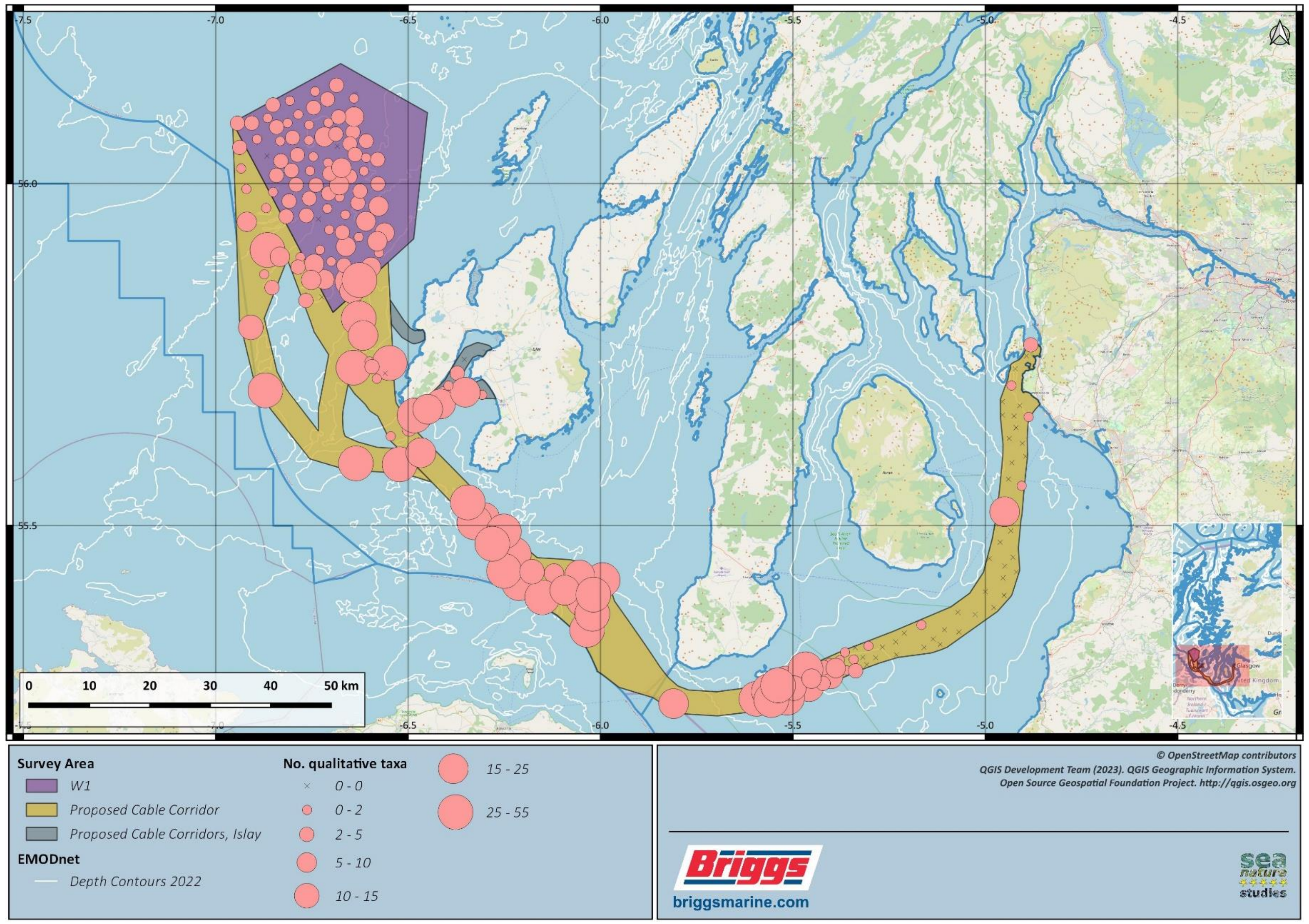
C



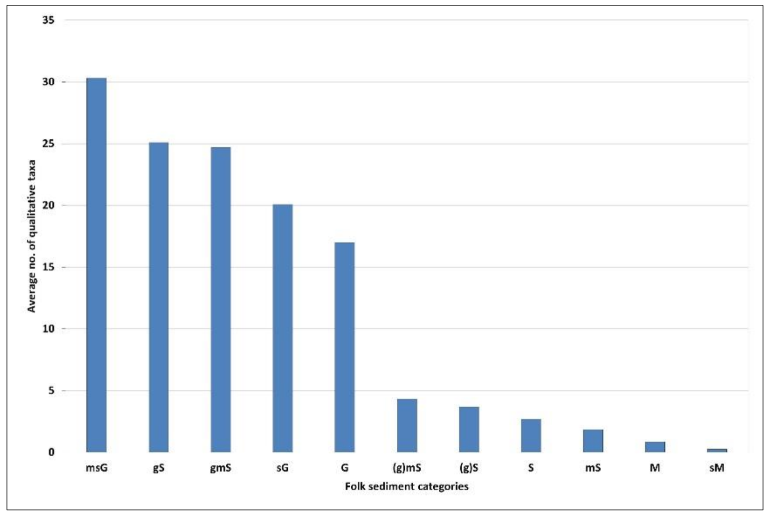
D

Figure 20 Numbers of quantitatively recorded taxa (A) and the associated abundances (B) from grab sites across the survey area; and average nos. of quantitative taxa (C) and average nos. of polychates (D) per Folk group

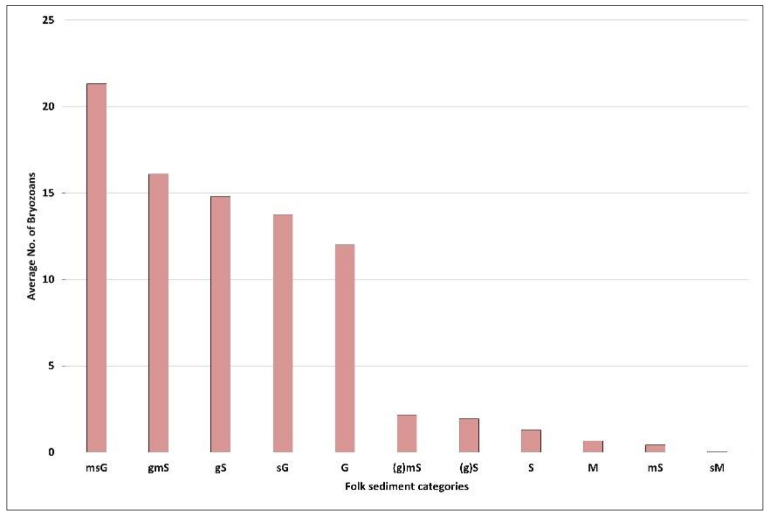
Colonial and other epifaunal taxa identified from the grab samples and recorded on a presence / absence basis require suitable attachment surfaces such as shell and gravel. The absence of any such species in the mud sediment of the Firth of Clyde and their relative absence from sandy sites is expected as are the higher numbers found in samples from coarser, mixed sediments across the survey area (Figure 21A-C; Figure 13; Figure 15).



A



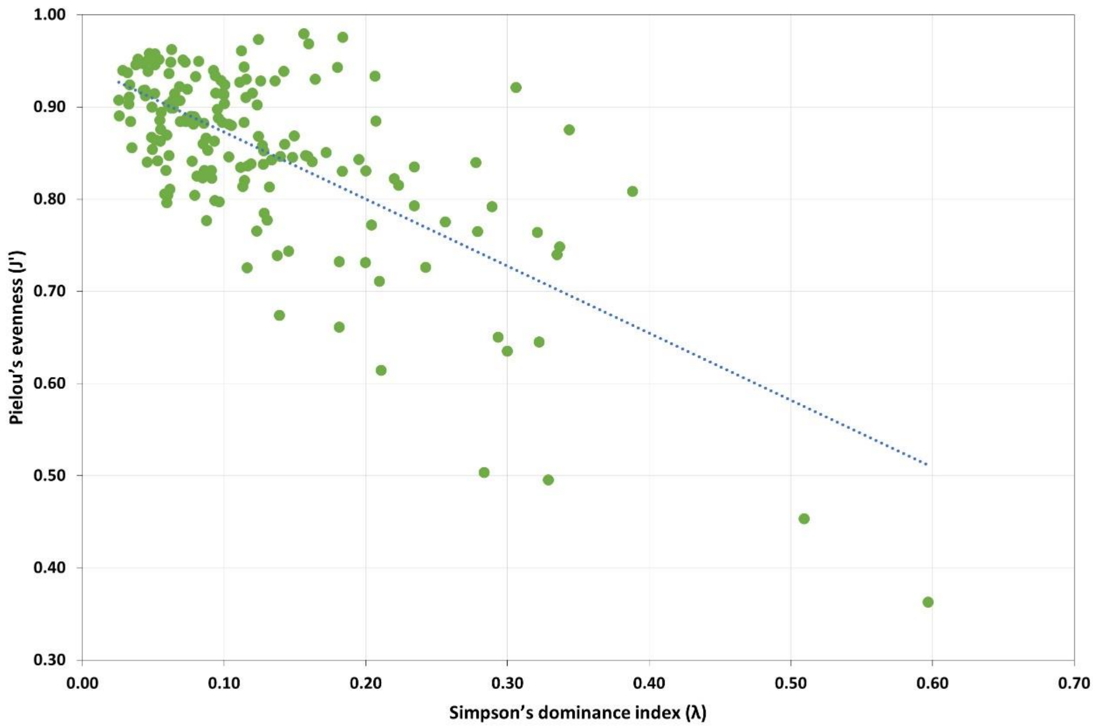
B



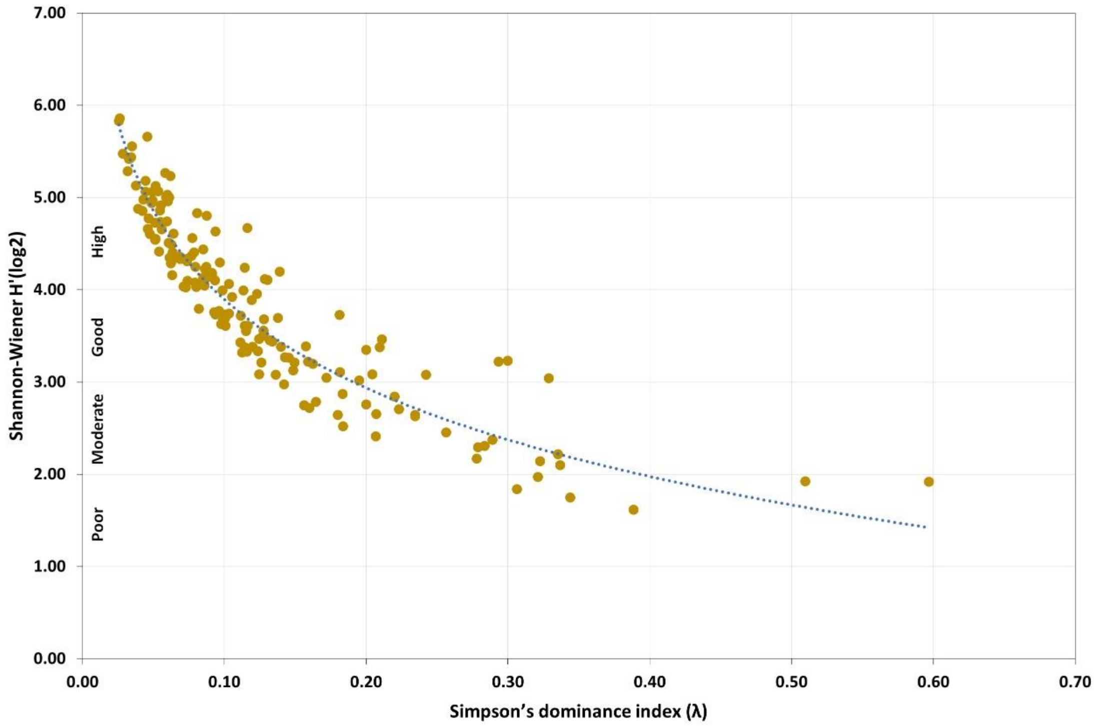
C

Figure 21 Numbers of qualitatively recorded taxa from grab sites across the survey area; and average nos. of these taxa (C) and average nos. of Bryozoa (D) per Folk group

Pielou's evenness (J') is a measure of how the number of individuals are distributed across the number of species found in a sample. If the number of individuals is equally spread amongst the species then the community is said to be even. The closer Pielou's evenness is to 1, the more even the distribution of abundance is amongst the species. The nearer the value is to 0, the less even the community is, with some species having much higher abundances than others (Figure 22A). Communities with greater evenness tend to be more diverse. Conversely, Simpson's dominance index (λ) is a measure of the probability that two individuals randomly selected from a sample will belong to the same species. λ ranges from 0 where all taxa are equally present, to 1, where one taxon dominates the community completely (Figure 22A). Communities with higher values of λ tend to be less diverse. The relationship between Shannon-Wiener diversity , H', and λ for the macrofaunal samples from the survey illustrate this trend well (Figure 22B).



A



B

Figure 22 The relationship of Simpson's dominance index to Pielou's evenness and Shannon-Wiener diversity for macrofaunal grab sites across the survey area

The results for H’ from the survey samples show that the majority of the sites had moderate or better, values for diversity, H’ (Figure 22B; Appendix 6).

From the quantitative data, the top ten most abundant and frequently recorded taxa in grab samples were identified (Table 6). Two barnacles topping the most abundant taxa and two polychaetes the most frequently occurring taxa (Table 6).

Table 6 Top 10 most abundant and frequently recorded taxa from grab sample quantitative data (not including juveniles)

Most abundant taxa	Total	Most frequently occurring taxa	Total number of samples
Verruca stroemia	1195	*Lumbrineris cingulata*	95
Balanus crenatus	762	*Spiophanes bombyx*	83
Sabellaria spinulosa	573	*Abra prismatica*	82
Lumbrineris cingulata	525	Nemertea	73
Kurtiella bidentata	460	*Owenia*	70
Modiolula phaseolina	389	*Echinocyamus pusillus*	67
Leptochiton asellus	372	*Aonides paucibranchiata*	64
Dendrodoa grossularia	350	*Polycirrus*	59
Abra prismatica	315	*Bathyporeia elegans*	56
Aonides paucibranchiata	293	*Sthenelais limicola*	53

The high abundance of the barnacles at a few sites has already been referred to but in addition to this *V. stroemia* and *Balanus crentatus* also occur at a relatively limited total number of sites, 19% and 15% respectively, hence these species do not occur in the top ten most frequently occurring taxa (Table 6; Appendix 4).

The Ross worm, *Sabellaria spinulosa*, was the third most abundant taxon and was found at 36, or 17.7%, of the sites sampled by grab. Its recorded total numbers were not as confined as the barnacles, to just a few sites, with higher abundances counted from a wider range of locations (Table 6; Appendix 4). Another polychaete, *Lumbrineris cingulata*, was both the fourth most abundant taxon and the most frequently recorded species, occurring at 95, or 47%, of the sites sampled by grab. More than 95% of the species occurred at fewer than 20% of the sites.

3.3.3 Multivariate community analyses

Biological community structure was investigated using the multivariate sample sorting techniques available in PRIMER (v7). The species abundance data matrix (Appendix 4) from the mini-Hamon grab site samples was imported into PRIMER and square root transformed to reduce the influence of quantitatively dominant fauna on any subsequent patterns observed. By increasing the influence of less abundant fauna in the data set the resulting picture derives, to a greater degree, from the broader community rather than being driven by a restricted number of numerically dominant taxa. Juveniles were not included, and 21 ‘outlying’ sites were removed from the analysis due to exceptionally low numbers of taxa negatively impacting the analysis.

A triangular resemblance matrix was generated using the Bray-Curtis measure of similarity. In this analysis the resemblance between every pair of samples is based on whether the taxon abundances take similar or dissimilar values. So, if two samples were identical their similarity ‘S’ would be 100%

and conversely where two samples have no taxa in common 'S' would equal zero. Another property of the Bray-Curtis coefficient, which makes it a suitable choice ecologically, is that joint absences do not effect 'S'. In other words, similarity does not depend on taxa which, though present in the overall dataset, might be absent from both samples.

The resemblance matrix was then subjected to hierarchical group average clustering to produce the tree diagram or dendrogram (Figure 23A). This process groups samples into successively smaller numbers of clusters, of larger sizes, as similarity gradually decreases. A similarity profile (SIMPROF) test at a significance of 1%, was run in conjunction with this process in order to identify any statistically significant group structure. The level of significance is important because it, '*erects a hurdle over which one must jump before further interpretation is pursued*' (Clarke *et al.* 2008). The more stringent the significance (eg 1% instead of 5%), the harder the hurdle is to overcome, a property which tends to reduce the number of groups identified. Multiple SIMPROF groups were generated from the analysis (Figure 23A). To simplify this complex picture further, supersets of SIMPROF groups were identified yielding seven faunal groups and two single station sites (Figure 23B). As Clarke *et al.* (2008) explain, '*sample structure identified by a significant SIMPROF test could be rather minimal, and not necessarily biologically important to interpret*. It is therefore entirely appropriate '*to define coarser groupings*' provided '*that the resulting clusters are always supersets of the SIMPROF groups*'. This analysis provided a more biologically relevant broad ecological picture.

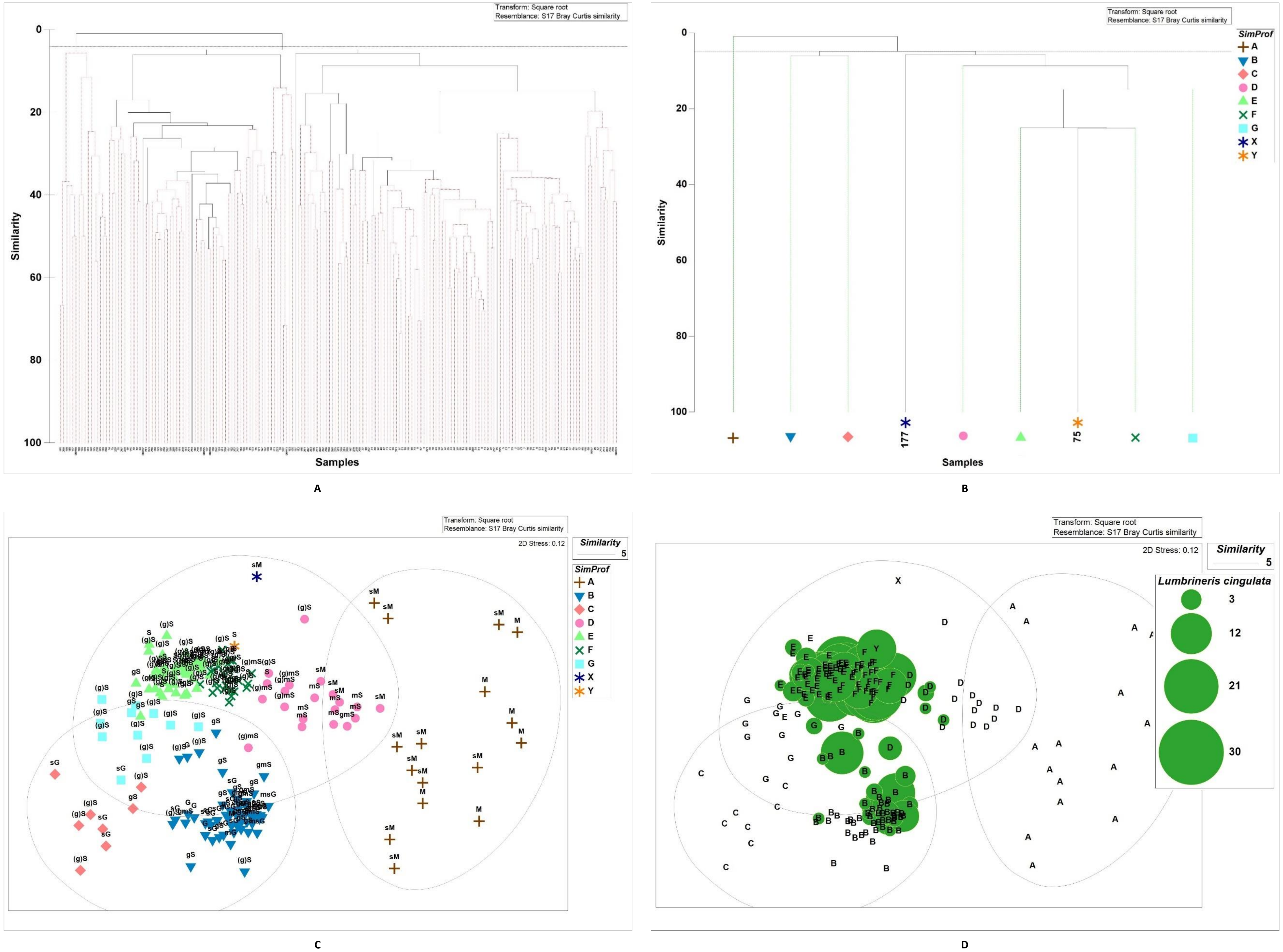


Figure 23 Dendrogram (A) and nMDS ordinations (B – D) of species abundance data from samples within the survey area

In order to map sample similarity, the resemblance matrix was further analysed using the ordination technique of non-metric multidimensional scaling (nMDS or MDS) (Figure 23C and D). The points presented do not represent geographical location but reflect instead the biological similarity of the communities sampled. To be more precise, sites which are placed closer together have very similar communities whilst those further apart have fewer taxa in common, or the same taxa but, '*at very different levels of abundance*' (Clarke and Warwick 2001). Note the 2D stress of 0.12. Good ordinations, with no real prospect of a misleading interpretation have stress values of <0.1. Stress values of <0.2 are considered useful 2D plots, particularly if as here, the stress value is in the lower end of the range indicated (in the upper end of the range more caution is required). The higher dimensional ordination, or 3D plot, produced by PRIMER has a stress value of 0.1 which, along with the super-imposed faunal group symbology from the stringent SIMPROF analysis supported the broad 2D group pattern observed from which it is reasonable to infer the reliability of the interpretations.

The identified faunal groups from SIMPROF are associated with particular sedimentary environments as identified by the Folk (1954) classification labels, Figure 23C. For example, the second biggest group 'E' is largely composed of slightly gravelly Sand (g)S (Figure 23C). Numbers of individuals represented as proportional circles illustrates the preference that the polychaete, *Lumbrineris cingulata*, the most frequently occurring and fourth most abundant taxa sampled during the grab survey, has for particular expressions of this sedimentary environment (Figure 23D). Note too, the three high level groups picked out by the 5% similarity slice which separates the sites into those influenced by mud, sand and gravel (moving anti-clockwise from the top right of the plot). This grouping is consistent with that observed in Section 3.2.2 from Figure 13.

The SIMPROF groups have been mapped using the same symbology as generated from Primer (v7) so that their geographic distribution across the survey can be observed (Figure 24).

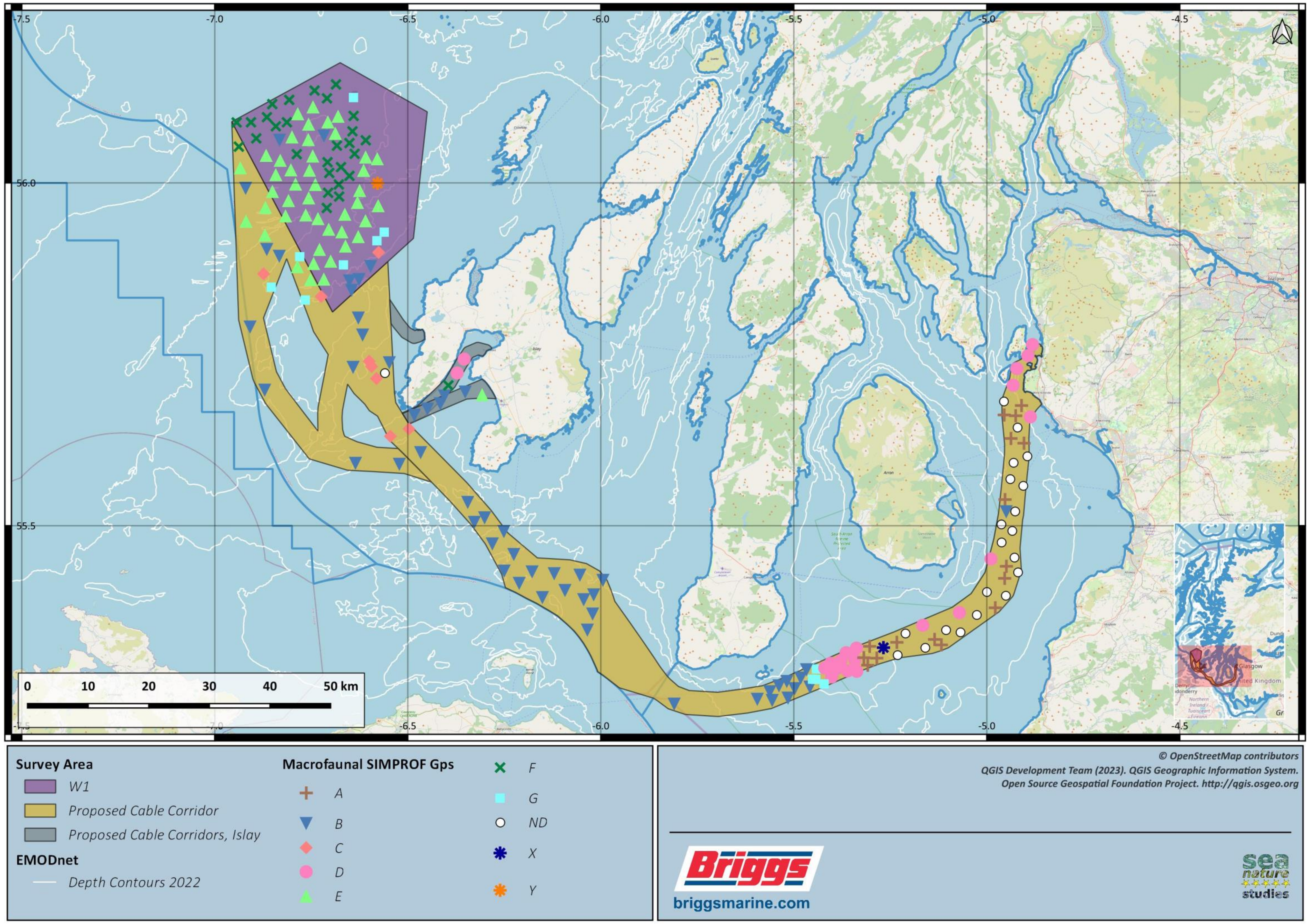


Figure 24 SIMPROF groups from macrofaunal data for grab locations across the survey area (ND or, 'No Data', sites are those that were removed prior to the analysis)

Table 7 presents a summary of some of the attributes of each of the faunal sample groupings from the SIMPROF analysis. It includes the characteristic species identified by the PRIMER (v7) similarity percentage (SIMPER) routine as well as the biotopes attributed to each of the groups (equivalent European Nature Information System, 'EUNIS' codes are also provided). SIMPER analysis looks at the role individual species have, to within group similarity (or, consequently, the separation between groups). Full SIMPER results are available in Appendix 7.

Table 7 Characterising species from SIMPER for the SIMPROF faunal groups including summary attributes and biotopes, JNCC 2022 (2022 EUNIS Code)

Faunal Group	**Number of sites Dominant Folk class Mean grain size**	**S: No. of species N: No. of individuals (as average (min / max))**	**J' λ H'(log2)**	**Species (SIMPER)**	**Cumulative % abundance**
A Average similarity: 17.11	16 sandy Mud medium silt	3 (2/6) 3 (2/7)	0.99 0.40 1.39	***Dasybranchus*** *Nephtys incisa*	44.92 72.69
Biotope - SS.SMu.CFiMu Circalittoral fine mud (MD621)					
B Average similarity: 26.43	53 gravelly Sand coarse sand	52 (19/107) 202 (38/806)	0.83 0.10 4.60	***Aonides paucibranchiata*** *Polycirrus* Nemertea *Verruca stroemia* *Sabellaria spinulosa* Serpulidae *Leptochiton asellus* *Glycera lapidum* Nematoda *Harmothoe impar* *Modiolula phaseolina* *Timoclea ovata* *Spirobranchus triqueter* *Balanus crenatus* *Echinocyamus pusillus* *Amphipholis squamata* *Laonice irinae* *Lysidice unicornis* *Hiatella arctica* *Steromphala tumida* *Hydroides norvegica* *Dendrodoa grossularia* *Mediomastus fragilis* *Lumbrineris cingulata* *Dipolydora caulleryi*	5.86 11.03 15.48 19.44 23.26 27.03 30.40 33.63 36.68 39.70 42.70 45.63 48.46 51.24 53.77 56.24 58.38 60.47 62.10 63.65 65.12 66.58 68.02 69.46 70.66
Biotope - SS.SCS.OCS Offshore circalittoral coarse sediment (MD321)					
C Average similarity: 20.33	8 Slightly gravelly Sand coarse sand	9 (4/19) 19 (8/48)	0.87 0.24 2.53	***Pisione remota*** Nematoda *Glycera lapidum*	42.85 63.48 71.50
Biotope - SS.SCS.OCS Offshore circalittoral coarse sediment (MD321)					
D Average similarity: 22.60	20 muddy Sand very coarse silt	29 (8/65) 114 (13/288)	0.77 0.17 3.55	***Abra nitida*** *Kurtiella bidentata* *Spiophanes kroyeri* *Nucula nitidosa* *Amphiura filiformis* *Abra alba* *Dasybranchus* *Phoronis* *Cylichna cylindracea* *Turritellinella tricarinata* *Phaxas pellucidus* *Pholoe baltica* *Thyasira flexuosa* *Scalibregma inflatum*	14.21 25.23 31.94 38.19 43.11 47.19 51.13 54.81 58.36 61.44 64.03 66.45 68.67 70.46
Biotope - SS.SMu.CSaMu.AfilKurAnit *Amphiura filiformis*, *Kurtiella bidentata* and *Abra nitida* in circalittoral sandy mud (MC6211)					
E Average similarity: 36.86	45 Slightly gravelly Sand medium sand	14 (6/25) 31 (11/64)	0.88 0.14 3.31	***Bathyporeia elegans*** *Lumbrineris cingulata* *Abra prismatica* *Spiophanes bombyx* *Nephtys cirrosa* *Sthenelais limicola*	20.24 35.80 51.10 63.34 68.11 72.22
Biotope - SS.SSa.CFiSa.ApriBatPo *Abra prismatica*, *Bathyporeia elegans* and polychaetes in circalittoral fine sand (MC5212)					
F Average similarity: 37.51	28 Slightly gravelly Sand fine sand	29 (16/44) 65 (29/108)	0.90 0.07 4.36	*Abra prismatica* *Lumbrineris cingulata* *Bathyporeia tenuipes* *Magelona filiformis* **Edwardsiidae** *Nucula nitidosa*	8.98 17.64 25.96 33.82 41.44 48.26

Faunal Group	Number of sites Dominant Folk class Mean grain size	S: No. of species N: No. of individuals (as average (min / max))	J' λ H'(log2)	Species (SIMPER)	Cumulative % abundance
				Spiophanes bombyx *Chaetozone christiei* *Sthenelais limicola* *Owenia* *Cylichna cylindracea*	54.55 60.70 64.54 67.58 70.21
Biotope - SS.SSa.CMuSa.AalbNuc *Abra alba* and *Nucula nitidosa* in circalittoral muddy sand or slightly mixed sediment (MC5214)					
G Average similarity: 24.79	11 Slightly gravelly Sand medium sand	13 (6/22) 30 (10/66)	0.89 0.15 3.21	*Abra prismatica* *Polycirrus* *Asbjornsenia pygmaea* ***Echinocyamus pusillus*** *Ophelia borealis* *Nephtys cirrosa* *Sthenelais limicola*	15.14 27.54 39.38 50.73 59.59 66.91 73.59
Biotope - SS.SSa.CFiSa.EpusOborApri *Echinocyamus pusillus*, *Ophelia borealis* and *Abra prismatica* in circalittoral fine sand (MC5211)					
X	1 (Site 177) sandy Mud coarse silt	3 3	1.00 0.33 1.58	*Pholoe baltica* *Spiophanes bombyx* *Scutopus ventrolineatus*	N/A
Biotope - SS.SMu.CSaMu Circalittoral sandy mud (MC621)					
Y	1 (Site 75) S Fine sand	14 38	0.86 0.14 3.27	*Lumbrineris cingulata* *Abra alba* *Nucula nitidosa* *Kurtiella bidentata* *Hippomedon denticulatus* *Bathyporeia elegans* *Pariambus typicus* *Spadella cephaloptera* *Sigalion mathildae* *Eumida bahusiensis* *Poecilochaetus serpens* *Spiophanes bombyx* *Scalibregma inflatum* *Perioculodes longimanus*	N/A
Biotope - SS.SSa.CMuSa.AalbNuc *Abra alba* and *Nucula nitidosa* in circalittoral muddy sand or slightly mixed sediment (MC5214)					
Species in bold had a higher value for the ratio of the average similarity to standard deviation (Sim/SD) **X and Y were single sites therefore the species selected were identified by ranked abundance, not SIMPER.*					

Group 'B', that with the largest number of sites, covers a wide region of the proposed cable corridor from the boundary of W1 to the Clyde Sea Sill (Figure 24; Table 7). The 53 sites within the group are composed of coarse and mixed sediments (Figure 24; Table 7; Groups 'g' an 'f' from Figure 17 and Table 5). The most frequent Folk category was gravelly Sand, 'gS', at a third of the sites; a quarter were sandy Gravel, 'sG'; and, almost a quarter were gravelly muddy Sand, 'gmS' or muddy sandy Gravel, 'msG'. The most common mean grain size for these sites was coarse sand, while the average Shannon-Wiener H' score of 4.6 indicates diversity was 'high' (Dauvin *et al*., 2012) (Figure 22B; Table 7).

The SIMPER analysis, with a cut off for low contributions of 70%, identified 25 characterising species for group 'B' (Table 7). The ratio of the average similarity and standard deviation (Sim/SD) SIMPER provides is a measure of how consistently each taxon contributes to similarities within groups. Taxa displaying a high Sim/SD ratio and a high contribution are considered to be good discriminating species (Clarke and Warwick 2001). For group 'B' the spionid polychaete, *Aonides paucibranchiata* was highlighted (Table 7; Figure 25(I)). Note the relative fidelity of the species to sites within the group. However, its distribution is not bound or restricted to group 'B'. This indicates some inherent plasticity to the physical and biological parameters encountered but also that the conditions experienced at those sites in group 'B' were more optimal.

Proportional circles (referred to as bubble plots within PRIMER), generated from the taxa abundance data, and superimposed on the nMDS plot give a clear indication of the influence characteristic fauna have on the observed multivariate site distribution pattern (Figure 25(I)) (those sites where the species was not found are simply marked by the letter applied for the SIMPROF group within which they fall). The geographical abundance distribution for *A. paucibranchiata* across the survey area can be seen in Figure 25(II).

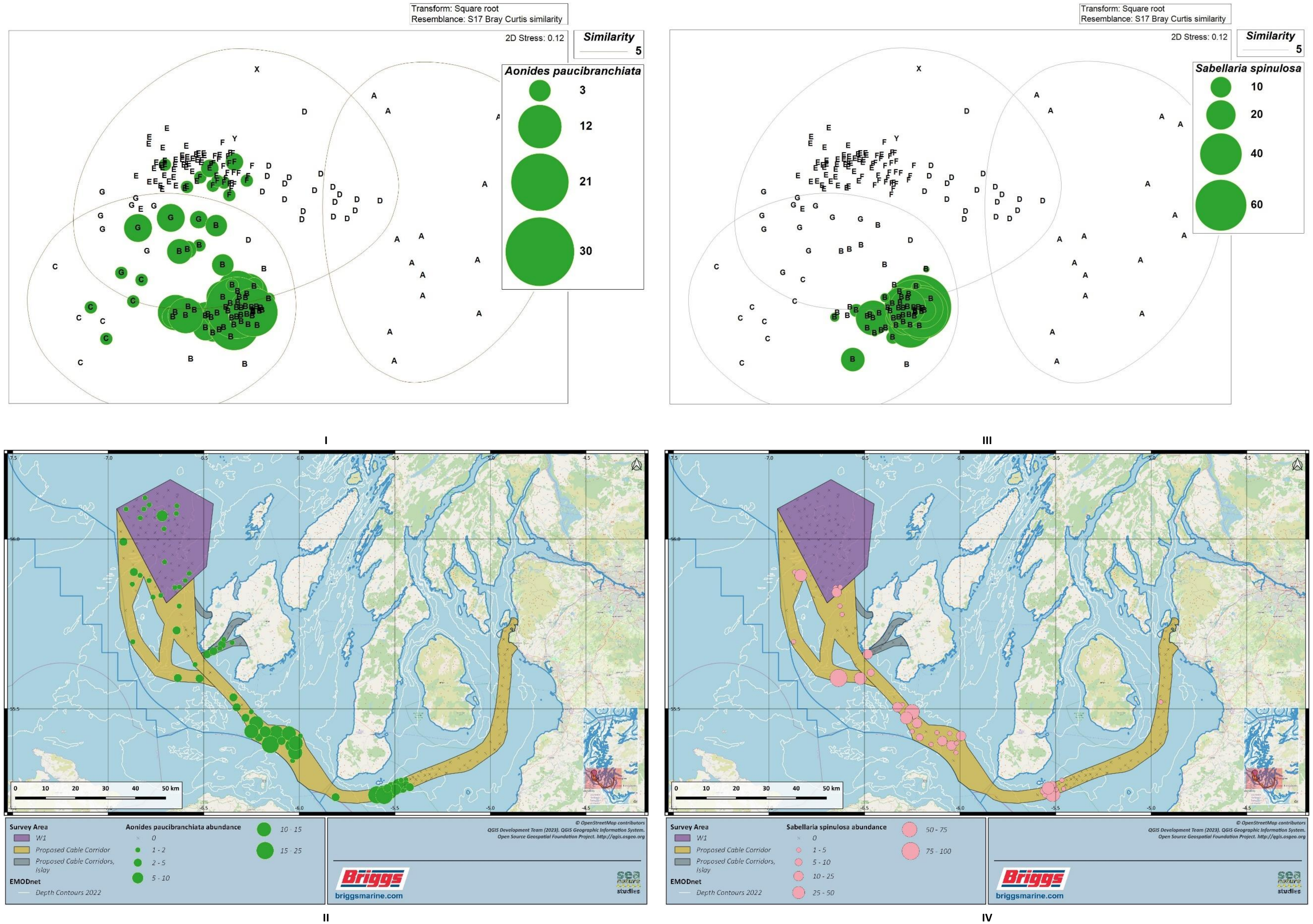


Figure 25 Bubble plots of SIMPER derived discriminating species for SIMPROF group 'B' (I and III); and below, their geographical abundance distribution (II and IV) across the survey area

Another notable species that helps to characterise this group was the Ross worm, *Sabellaria spinulosa* (Figure 25(III); Figure 25(IV)). The habitat classification selected as representative for the group 'B' was 'SS.SCS.OCS Offshore circalittoral coarse sediment' (Figure 26). The JNCC description for the habitat notes that it may cover, '*large areas of the offshore continental shelf*' but at present there is little quantitative data available. The selection was therefore restricted to 'SS.SCS.OCS' or, EUNIS level 4 (MD321, 'Faunal communities in Atlantic offshore circalittoral coarse sediment'). Note that the distribution of 'SS.SCS.OCS' sites from the analysis of benthic macrofauna is consistent with the pattern described for the associated sediments from the PSD analysis (Table 5; Figure 17).

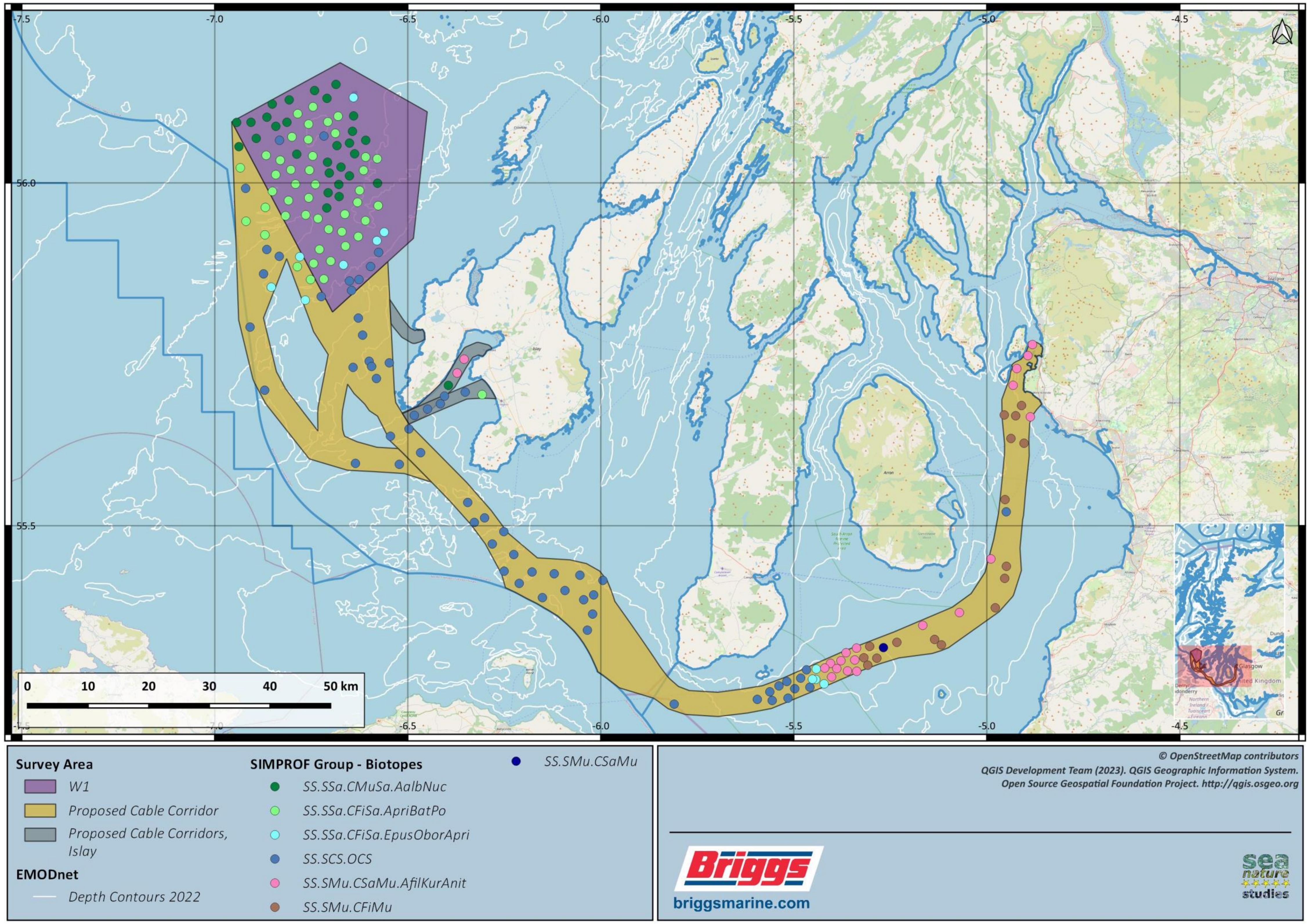
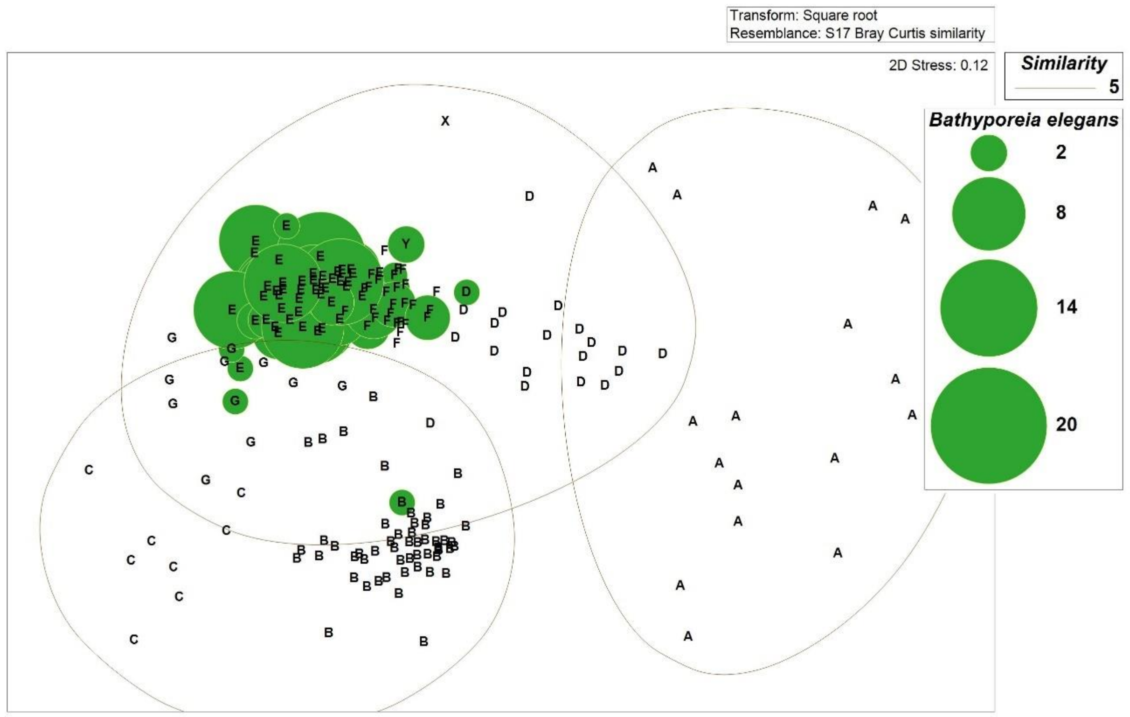


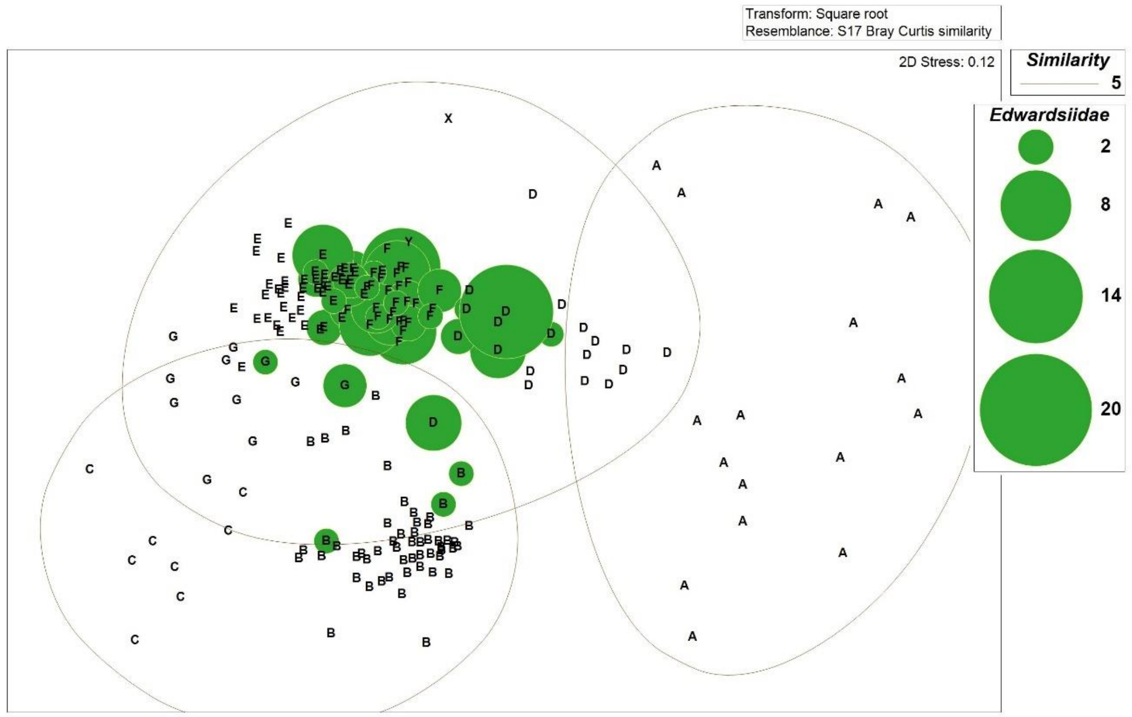
Figure 26 SIMPROF group biotopes for grab locations across the survey area

Groups ‘E’ and ‘F’, the second and third largest groups, encompass those communities particular to the (g)S sediments within the proposed W1 development area where the dominant mean grain size was medium and fine sand respectively (Figure 24; Table 7; Figure 17; Table 5). The average H’ diversity score for these areas was ‘good’ and ‘high’ (Dauvin *et al*., 2012) (Table 7). Characterising species for the two groups show some overlap with the occurrence of *Lumbrineris cingulata*, *Abra prismatica* and *Spiophanes bombyx*. But the SIM / SD ratio indicates that *Bathyporeia elegans* is a strong discriminating species for Group ‘E’ whilst in the finer sediments of group ‘F’ it is a burrowing anemone in the family Edwardsiidae.

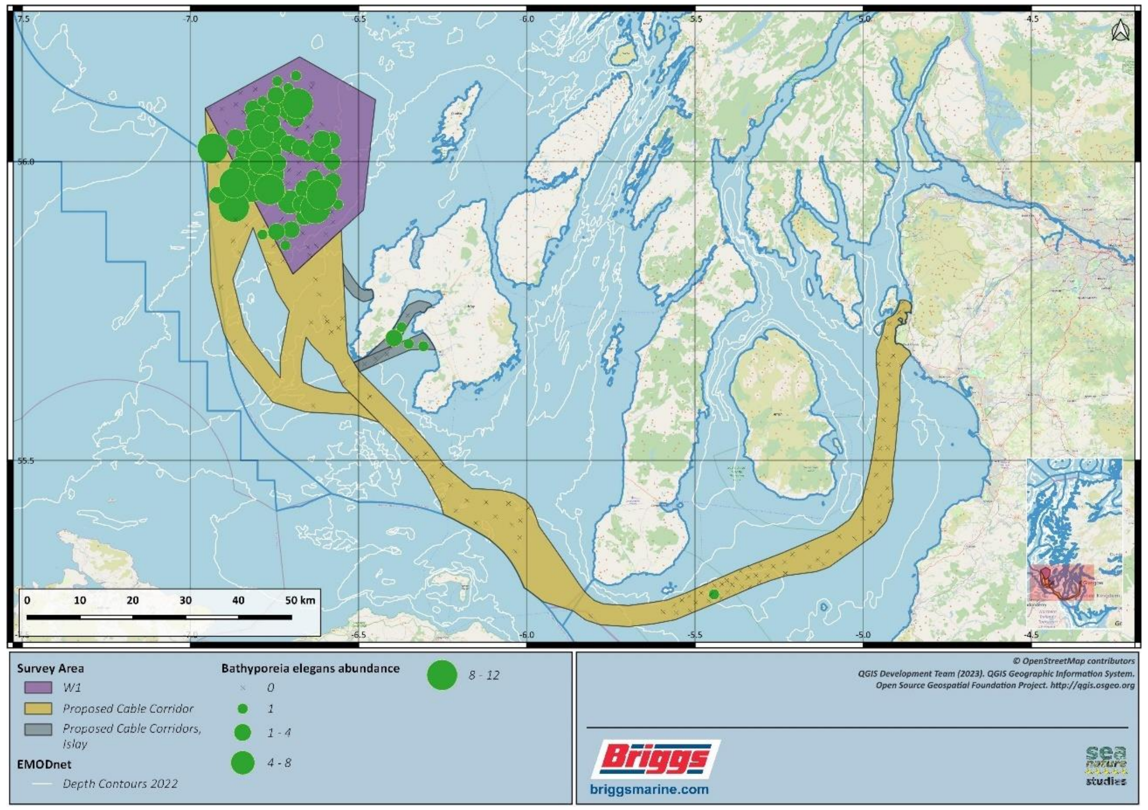
Bubble plots of the abundances of *Bathyporeia elegans* and Edwardsiidae for groups ‘E’ and ‘F’ illustrate their influence on the observed multivariate site distribution pattern and their importance in terms of characterising these groups (Figure 27 (I) and (III) respectively). The corresponding geographical abundance distributions for these species across the survey area can be seen in Figure 27 (II and IV).



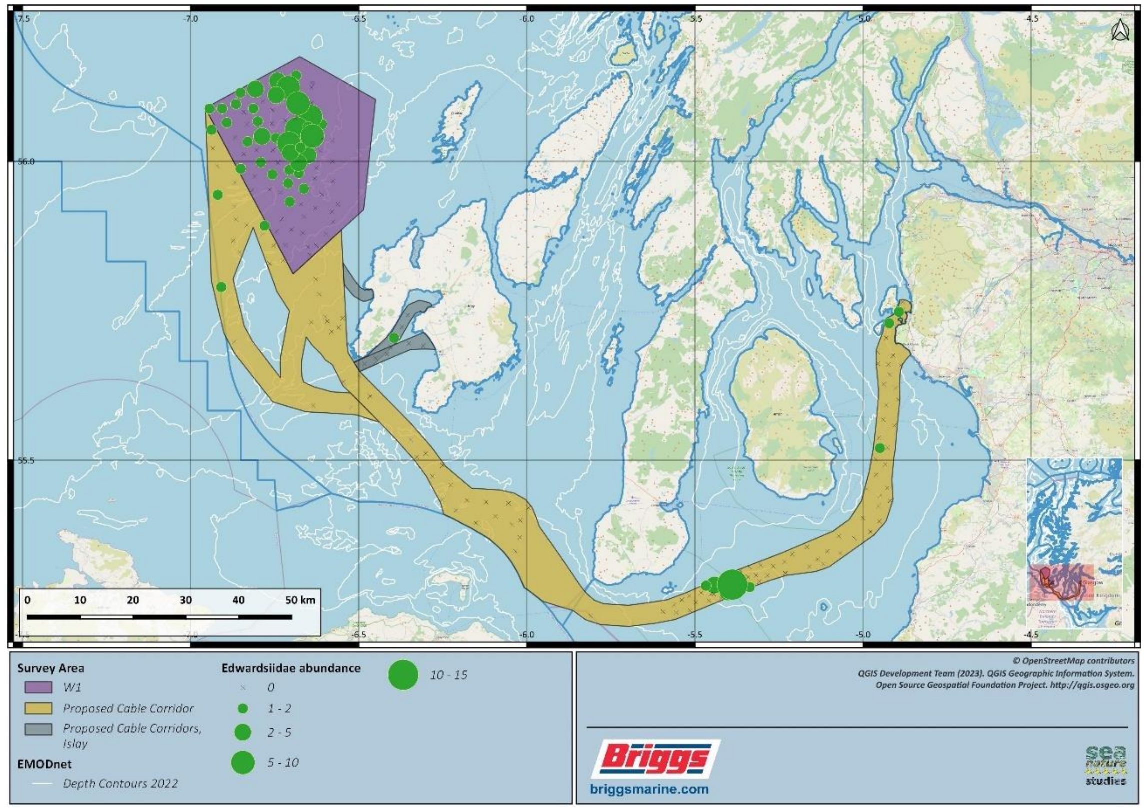
I



III



II

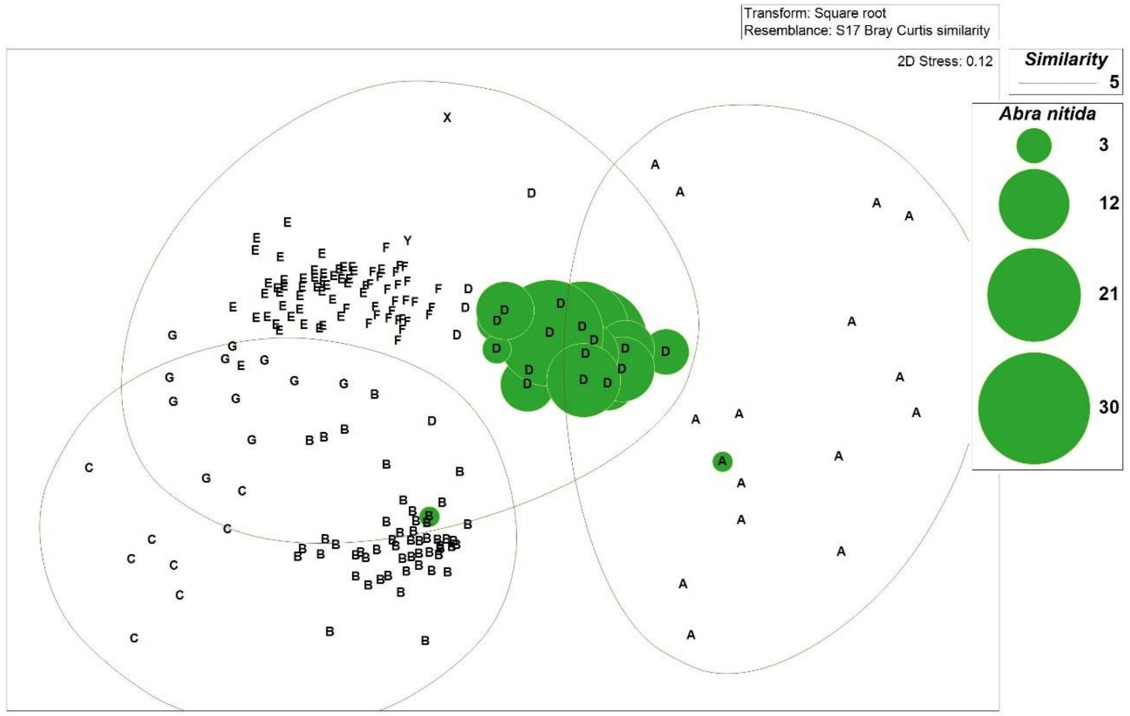


IV

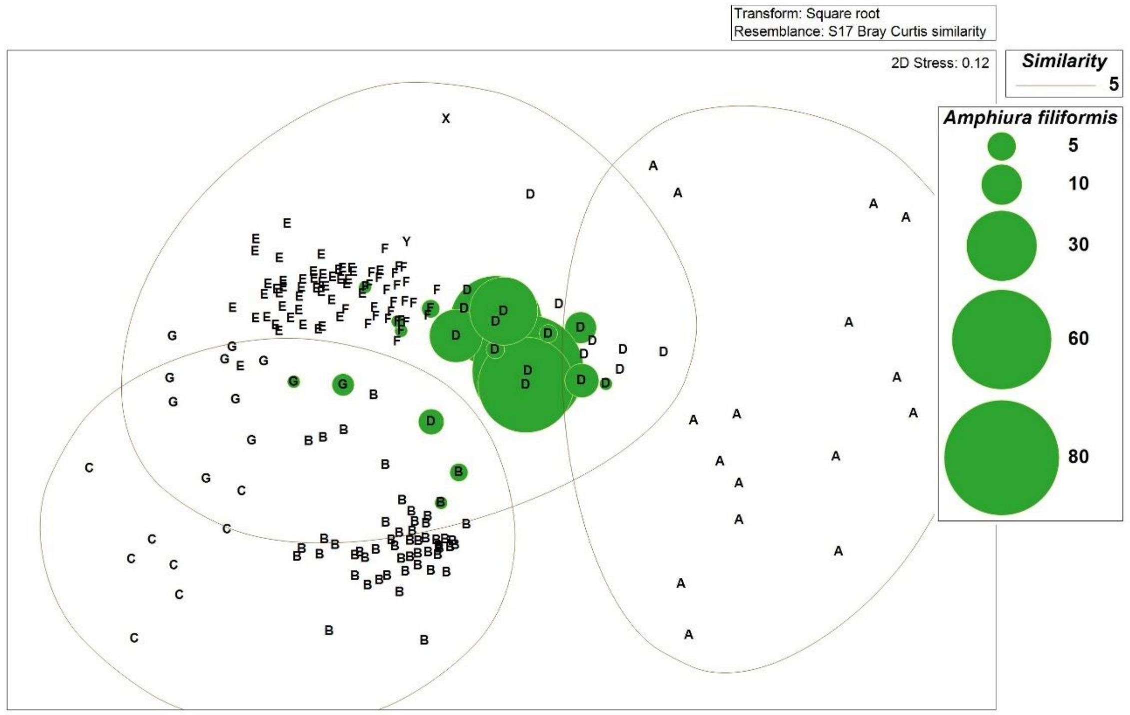
Figure 27 Bubble plots of SIMPER derived discriminating species for SIMPROF groups 'E' (I) and 'F' (III); and below, their geographical abundance distribution (II and IV) across the survey area

The discriminated biotopes for groups 'E' and 'F' are 'SS.SSa.CFiSa.ApriBatPo *Abra prismatica, Bathyporeia elegans* and polychaetes in circalittoral fine sand' for group 'E' (EUNIS Level 5, MC5212); and, 'SS.SSa.CMuSa.AalbNuc *Abra alba* and *Nucula nitidosa* in circalittoral muddy sand or slightly mixed sediment' for group 'F' (EUNIS Level 5, MC5214) (Table 7; Figure 26). The latter choice is further supported by the Marine Habitat Classification for Britain and Ireland physical comparative tables 2004. This data source indicates that the 'SS.SSa.CMuSa.AalbNuc' biotope has a mean percentage of 90.12% sand and 7.26% mud (there is no equivalent data for 'SS.SSa.CFiSa.ApriBatPo'). These values are not too dissimilar to those average values for group F sites which are, 93% sand and 6% mud.

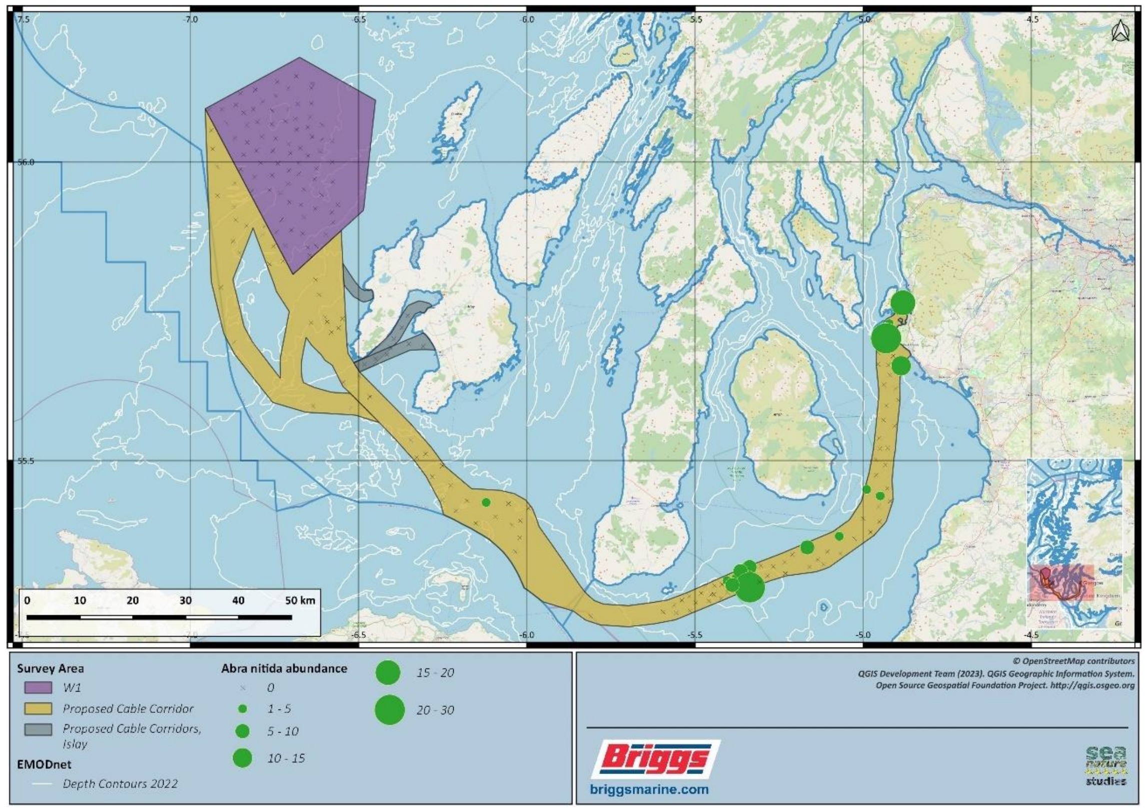
Half the sites within SIMPROF group 'D', the fourth largest with 20 stations, were clustered in the (g)S transition zone from the shallower waters of the Clyde Sea Sill to the deeper waters of the Firth of Clyde (Figure 24; Table 7; Figure 17; Table 5). The majority of the remaining sites within this group describing the communities at the end of the proposed cable corridor as mud transitions to coarser sediments near the entrance to the shallower waters of the coast and the Fairlie Roads (Figure 24; Table 7). The dominant Folk (1954) category at just over a third of sites within this group was muddy Sand; slightly gravelly muddy Sand at a quarter; and, sandy Mud at a fifth. The most frequent mean grain size was very coarse silt which, with coarse silt, accounted for over 50% of the sites, although fine sand and very fine sand also contributed (Table 7). The average H' diversity score at 3.55, was 'good' (Dauvin *et al*., 2012) (Table 7). SIMPER analysis identified 14 characterising species for group 'D' with the Sim / SD ratio indicating that *Abra nitida* was a strong discriminating species (Table 7). Other characterising fauna included *Kurtiella bidentata*, *Spiophanes kroyeri* and the brittlestar, *Amphiura filiformis*. Bubble plots of abundance provided for *Abra nitida* and *Amphiura filiformis* give a useful visual representation of this relationship (Figure 28(I) and (III)). The corresponding abundance distributions for these species across the survey area put this in a geographical context (Figure 28 (II and IV).



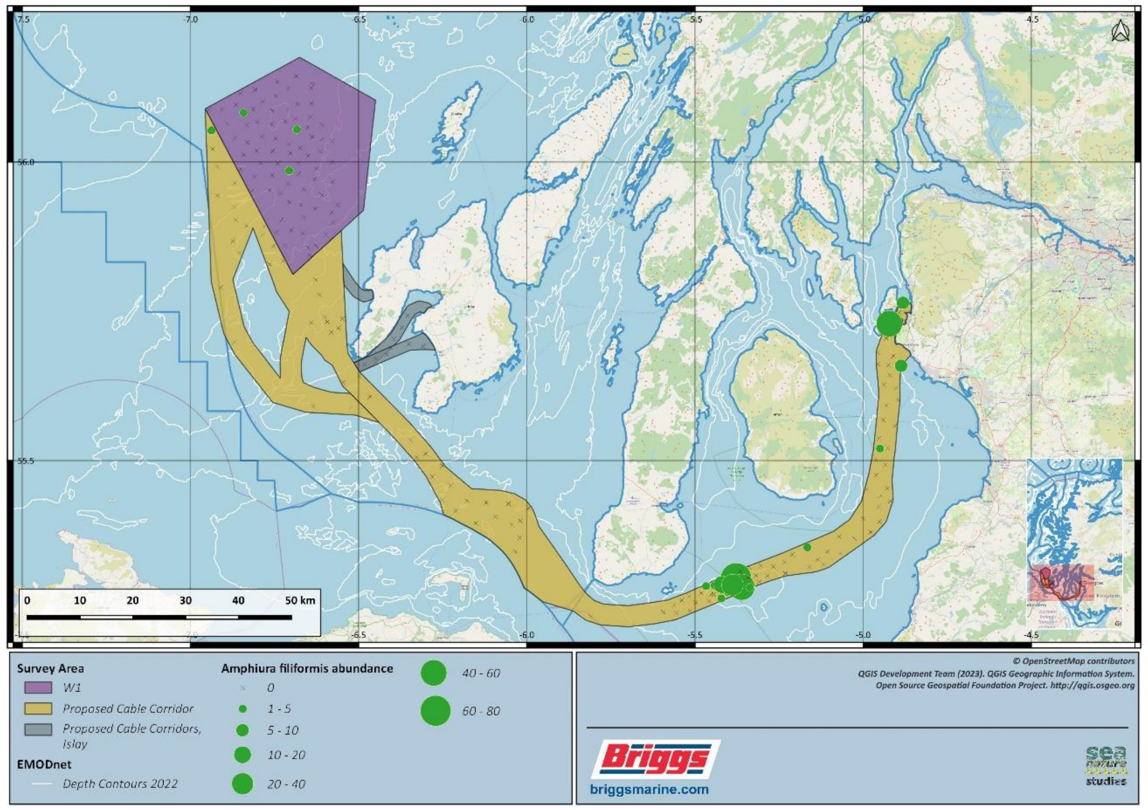
I



III



II

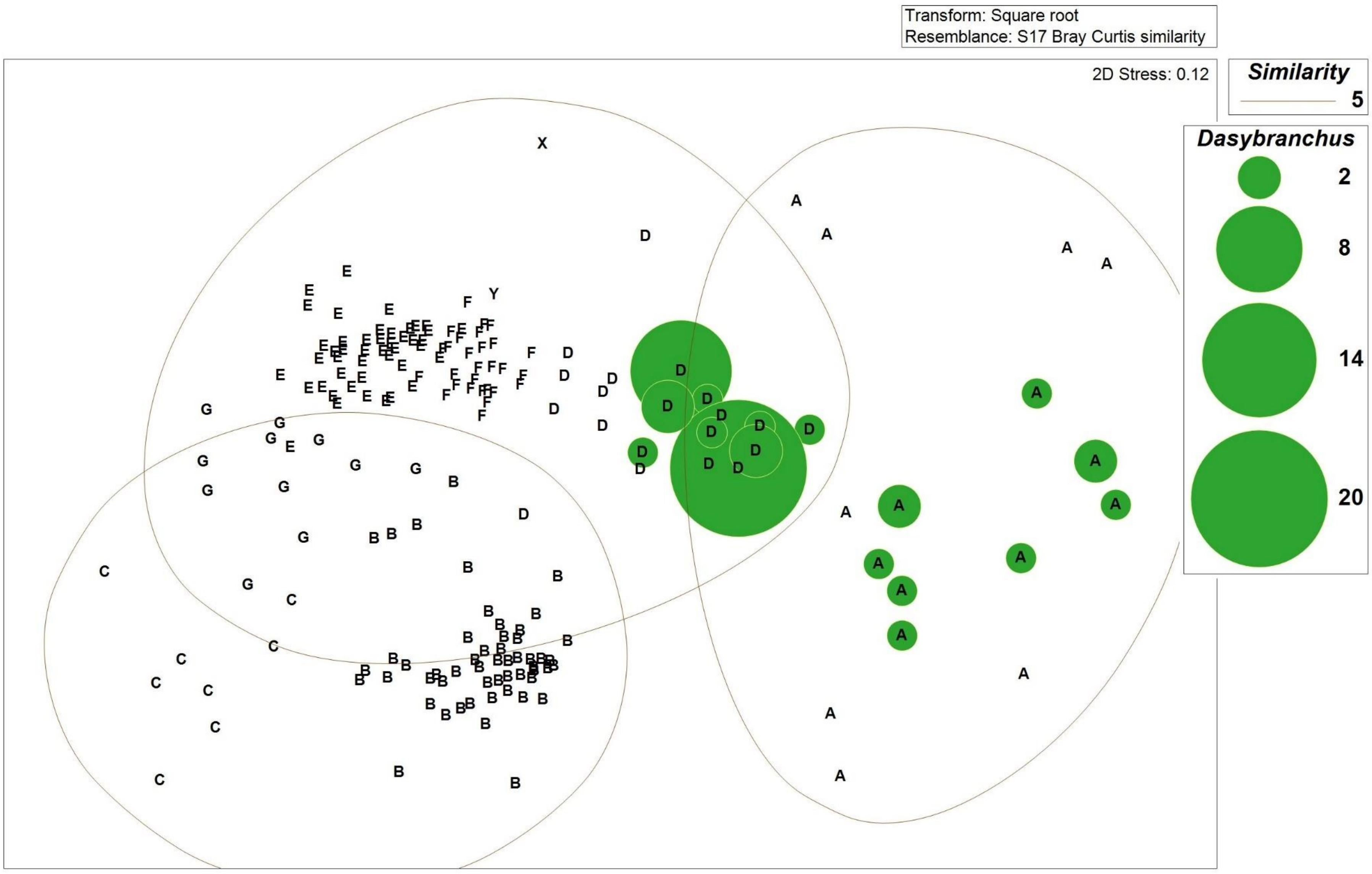


IV

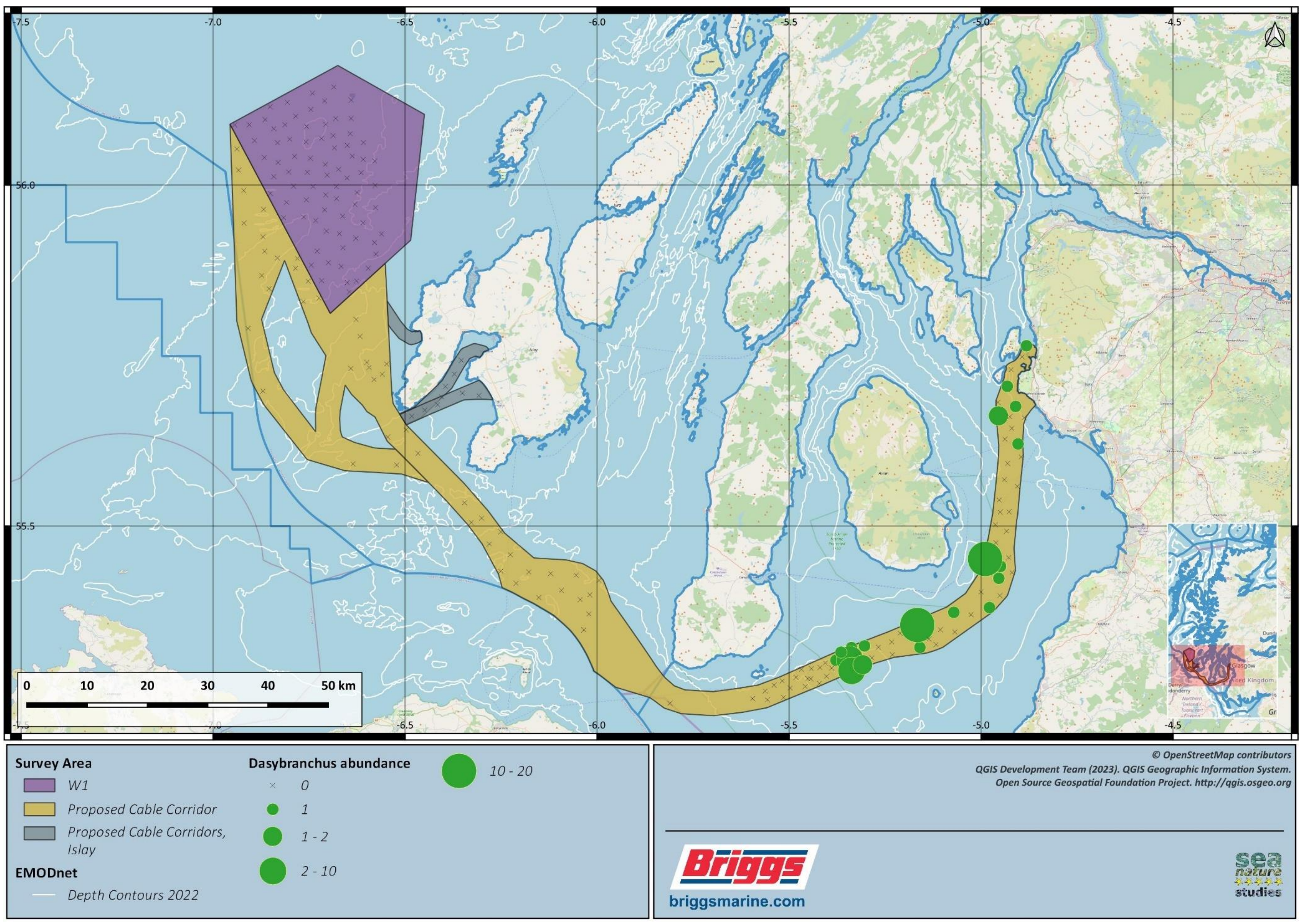
Figure 28 Bubble plots of SIMPER derived discriminating species for SIMPROF group ‘D’ (I and III); and below, their geographical abundance distribution (II and IV) across the survey area

The biotope attributed to this group was 'SS.SMu.CSaMu.AfilKurAnit *Amphiura filiformis, Kurtiella bidentata* and *Abra nitida* in circalittoral sandy mud' (EUNIS Level 5, MC6211) (Figure 26). *Nucula nitidosa* was also a characterising species and is considered to be associated with more offshore examples of this biotope (Table 7).

The deep-water muddy habitats between the two transition areas in the Firth of Clyde referred to above are where the 16 sites of group 'A' occur (Figure 24; Table 7). This group is defined by sandy Mud and Mud, with a mean grain size of medium silt (Table 7). These sites were faunistically impoverished, and this is reflected in the low numbers of taxa and abundances and the 'poor' Shannon-Wiener score of 1.39 (Dauvin *et al*., 2012) (Table 7). Of the two species identified by SIMPER the capitellid polychaete *Dasybranchus* was highlighted as the strongest discriminating species for the group with low numbers occurring in half the sites in group 'A' (Table 7; Figure 29(I) and (II)). From the limited pool of species, *Dasybranchus* and *Nephtys incisa* were the only two found with any consistency across the sites in group 'A'. Therefore, despite the low abundances, and sub-optimal conditions, these species are definitive for group 'A'. The habitat classification selected as representative for the group was 'SS.SMu.CFiMu Circalittoral fine mud' (EUNIS Level 4, MD621) (Figure 26).



I



II

Figure 29 SIMPER derived discriminating species for SIMPROF group 'A' (I); and, its geographical abundance distribution (II) across the survey area

The eleven sites in group ‘G’ were mostly scattered to the west of Islay. The remaining four were sandwiched between sites from groups ‘B’ and ‘D’ on the eastern edge of the Clyde Sea Sill (Figure 24; Table 7). The group was composed almost entirely of sites in the slightly gravelly Sand Folk (1954) category and the mean grain size was medium sand. The two exceptions to this had sandy Gravel sediments (site 116 being notable in this regard with over 50% gravel recorded in contrast to other sites in group ‘G’, though the mean grain size here was very fine gravel). Evenness was fairly high and dominance fairly low so the diversity value H’ was ‘good’ at 3.21 (Dauvin *et al*., 2012) (Table 7). Seven species were recognised as characterising for the group by SIMPER including the pea urchin *Echinocyamus pusillus*, and the polychaete, *Ophelia borealis* (Table 7; Figure 30(I and II); Figure 30(III and IV)). The Sim / SD ratio indicated that *Echinocyamus pusillus* was a strong discriminating species for group ‘G’.

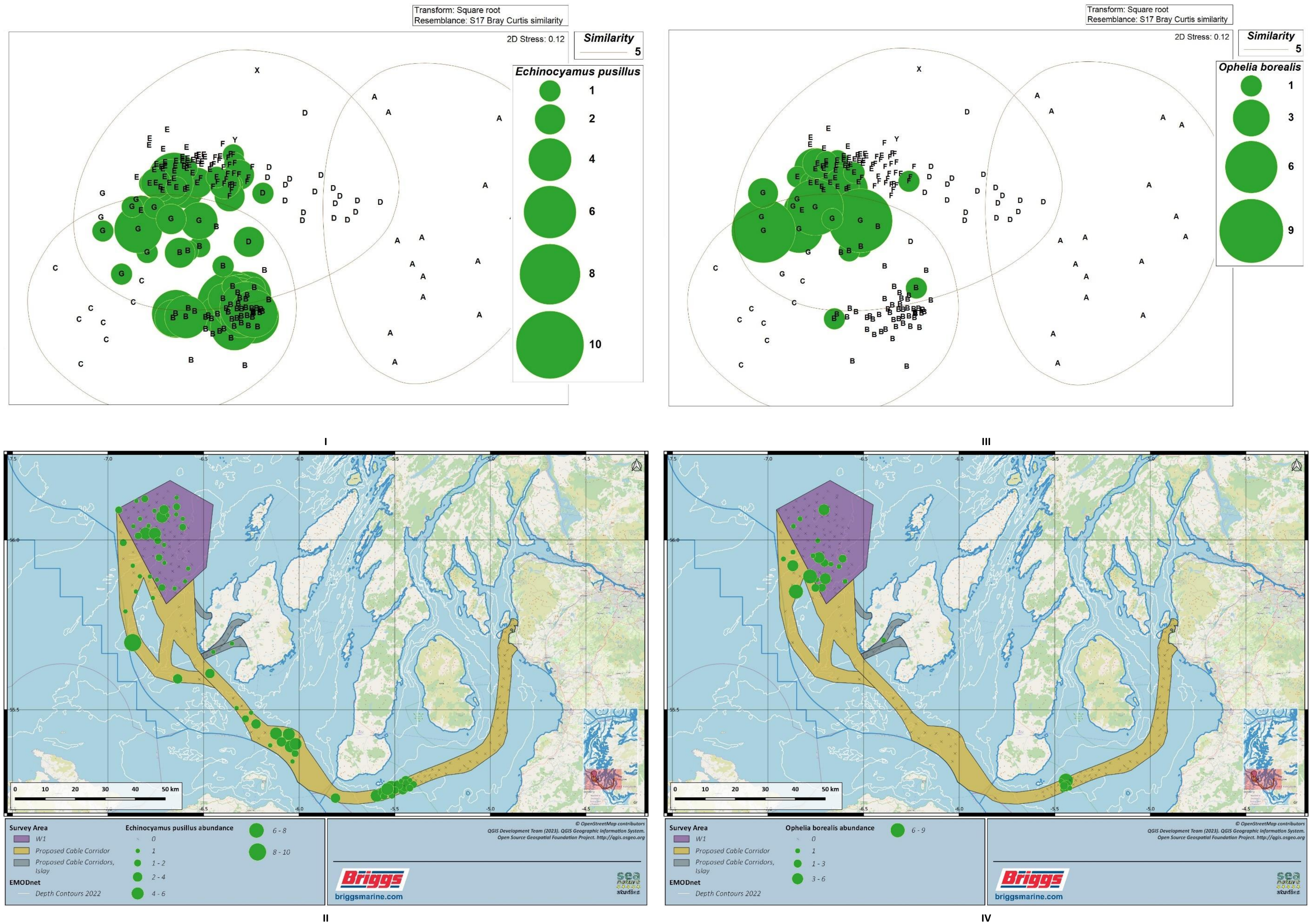
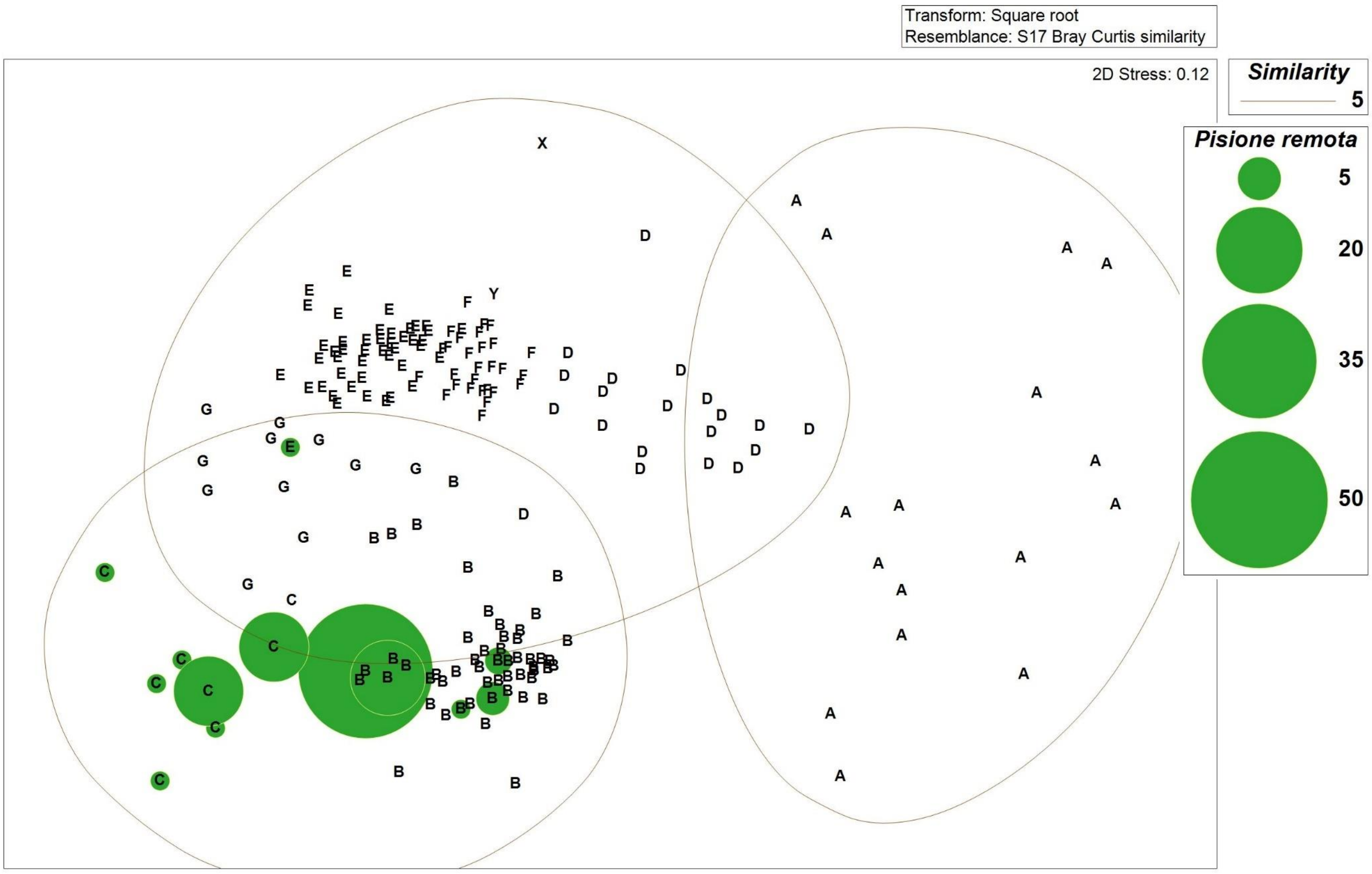


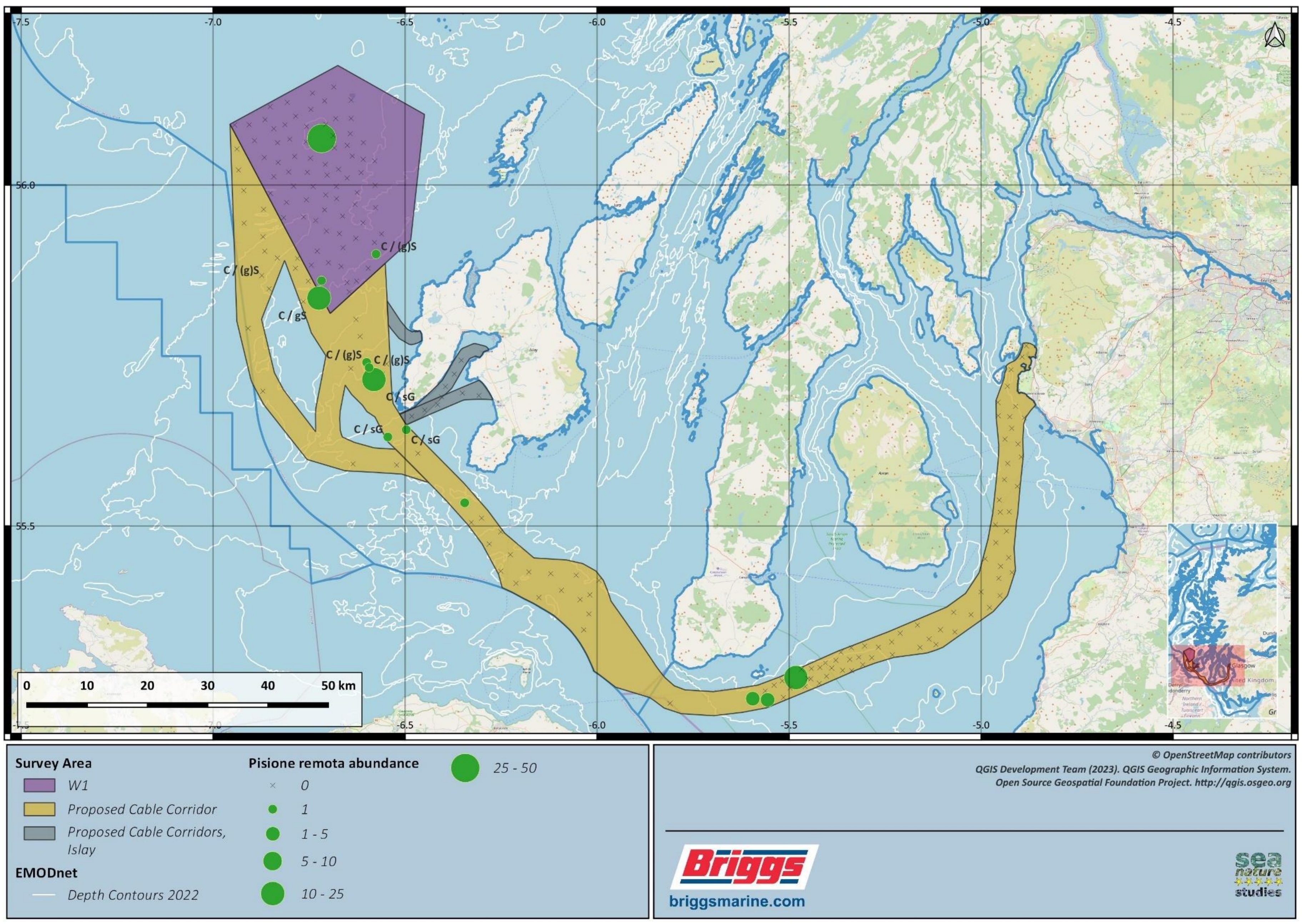
Figure 30 Bubble plots of SIMPER derived discriminating species for SIMPROF group 'G' (I and III); and below, their geographical abundance distribution (II and IV) across the survey area

Consideration of the species present and absent, particularly with regard to the SIMPER analysis and in conjunction with other parameters lead to the selection of the biotope, 'SS.SSa.CFiSa.EpusOborApri *Echinocyamus pusillus*, *Ophelia borealis* and *Abra prismatica* in circalittoral fine sand' for group 'G' (EUNIS Level 5, MC5211) (Table 7; Figure 26). The description for this biotope states that the substratum is '*circalittoral and offshore* medium *to fine sand*' which is consistent with the mean grain size for this group.

The final group, 'C', with just 8 sites had the lowest average number of taxa and abundance for any of the groups apart from group 'A' (the sites within the group were 28, 86, 103, 111, 125, 232, 233 and DDV41) (Figure 24; Table 7). These sites were scattered just northwest, west and southwest of Islay and the dominant Folk category was slightly gravelly Sand (with gravelly Sand and sandy Gravel also contributing). The mean grain size was coarse sand. Of the three species identified by SIMPER as characteristic of group 'C', *Pisione remota*, a polychaete associated with coarse sediment biotopes, was indicated as a good discriminating species (Gutow et al., 2022) (Table 7; Figure 31(I and II)).



I



II

Figure 31 SIMPER derived discriminating species for SIMPROF group 'C' (I); and, its geographical abundance distribution (II) across the survey area

For similar reasons to Group ‘B’, the habitat classification selected as representative for the group was ‘SS.SCS.OCS Offshore circalittoral coarse sediment’ (EUNIS Level 4, MD321) (Figure 26).

3.4 Seabed habitat classification

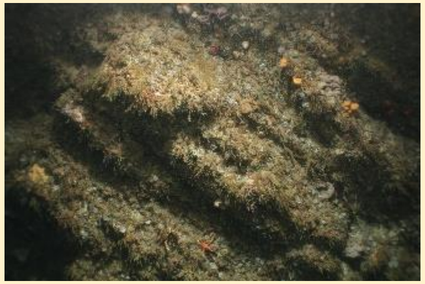
From the analysis of the video data the seabed was described by a range of sediment types. Sand and mud largely described the survey area, with areas characterised by coarser sediment comprised of pebbles, cobbles and boulders. Other survey sites presented bedrock outcrop. Results of the video data analysis indicated the presence of the following habitats and biotopes:

- High energy and moderate energy ‘Atlantic circalittoral rock’ (MC12), assigned to 7 stations;
- ‘Echinoderms and crustose communities on Atlantic circalittoral rock’ (MC122), assigned to 1 station;
- ‘*Flustra foliacea* on slightly scoured silty Atlantic circalittoral rock’ (MC12241), assigned to 1 stations;
- ‘Faunal and algal crusts with *Pomatoceros triqueter* and sparse *Alcyonium digitatum* on exposed to moderately wave-exposed Atlantic circalittoral rock’ (MC12245), assigned to 4 stations;
- ‘Circalittoral coarse sediment’ (MC3), assigned to 5 stations and to sections of one station;
- ‘*Pomatoceros triqueter* with barnacles and bryozoan crusts on Atlantic circalittoral unstable cobbles and pebbles’ (MC3211), assigned to 1 station;
- ‘Atlantic circalittoral mixed sediment’ (MC42), assigned to 7 stations;
- ‘Atlantic circalittoral sand’ (MC52), assigned to 17 stations and to sections of 2 additional stations;
- ‘Atlantic circalittoral mud’ (MC62), assigned to 2 stations and to sections of 2 additional stations.

Table 8 summarises the habitats and biotopes described for the survey area and the following sections describe them. Figure 32 presents the habitat and biotope distribution across the survey area (note that the white points in the Figure simply represent the location with the outer ring indicating the identified biotopes for that location).

No evidence for either *Sabellaria spinulosa* reef, *Modiolus modiolus*, horse mussel reefs or maerl beds were observed from any of the video and associated stills taken during the survey.

Table 8 Habitats and biotopes within the survey area

Level 1	Level 2	Level 3	Level 4	Level 5	Level 6	Sites	Photo
M	MC1 Circalittoral Rock	MC12 Atlantic circalittoral rock	-	-	-	DDV24, DDV26, DDV27, DDV28, DDV29, DDV30, DDV31	 DDV_STILL_2021_08_23_0691
			MC122 Echinoderms and crustose communities on Atlantic circalittoral rock	-	-	DDV9	 DDV_STILL_2021_08_21_0177
				MC1224 Faunal and algal crusts on exposed to moderately wave-exposed Atlantic circalittoral rock	MC12241 *Flustra foliacea* on slightly scoured silty Atlantic circalittoral rock	DDV13	 DDV_STILL_2021_08_20_1449

Level 1	Level 2	Level 3	Level 4	Level 5	Level 6	Sites	Photo
					MC12245 Faunal and algal crusts with *Pomatoceros triqueter* and sparse *Alcyonium digitatum* on exposed to moderately wave-exposed Atlantic circalittoral rock	DDV14, DDV21, DDV22, DDV23	 DDV_STILL_2021_08_23_0585
	MC3 Circalittoral coarse sediment	MC32 Atlantic circalittoral coarse sediment	-	-	-	DDV7, DDV21, DDV25, DDV32, DDV39	 DDV_STILL_2021_08_20_1418
			MC321 Faunal communities of Atlantic circalittoral coarse sediment	MC3211 *Pomatoceros triqueter* with barnacles and bryozoan crusts on Atlantic circalittoral unstable cobbles and pebbles	-	DDV17	 DDV_STILL_2021_08_07_576

Level 1	Level 2	Level 3	Level 4	Level 5	Level 6	Sites	Photo
	MC4 Circalittoral mixed sediment	MC42 Atlantic circalittoral mixed sediment	-	-	-	DDV21, DDV33, DDV34, DDV35, DDV36, DDV37, DDV40	 DDV_STILL_2021_08_17_1098
	MC4 Circalittoral mixed sediment	MC42 Atlantic circalittoral mixed sediment	MC421 Faunal communities of Atlantic circalittoral mixed sediment	MC4215 *Ophiothrix fragilis* and/or *Ophiocomina nigra* brittlestar beds on circalittoral mixed sediment	-	DDV9, DDV31, DDV34	 DDV_STILL_2021_08_03_069
	MC6 Circalittoral mud	MC62 Atlantic circalittoral mud	-	-	-	DDV36, DDV38, DDV42	 DDV_STILL_2021_08_18_1157

Level 1	Level 2	Level 3	Level 4	Level 5	Level 6	Sites	Photo
	MC5 Circalittoral sand	MC52 Atlantic circalittoral sand	-	-	-	DDV2, DDV3, DDV4, DDV5, DDV6, DDV7, DDV8, DDV10, DDV11, DDV12, DDV13, DDV14, DDV15, DDV16, DDV18, DDV19, DDV20, DDV41, DDV43	 DDV_STILL_2021_08_10_778  DDV_STILL_2021_08_10_867

Note: Sites were classified to the lowest level possible based on the observable evidence and therefore some cells in the above table are, of necessity, blank.

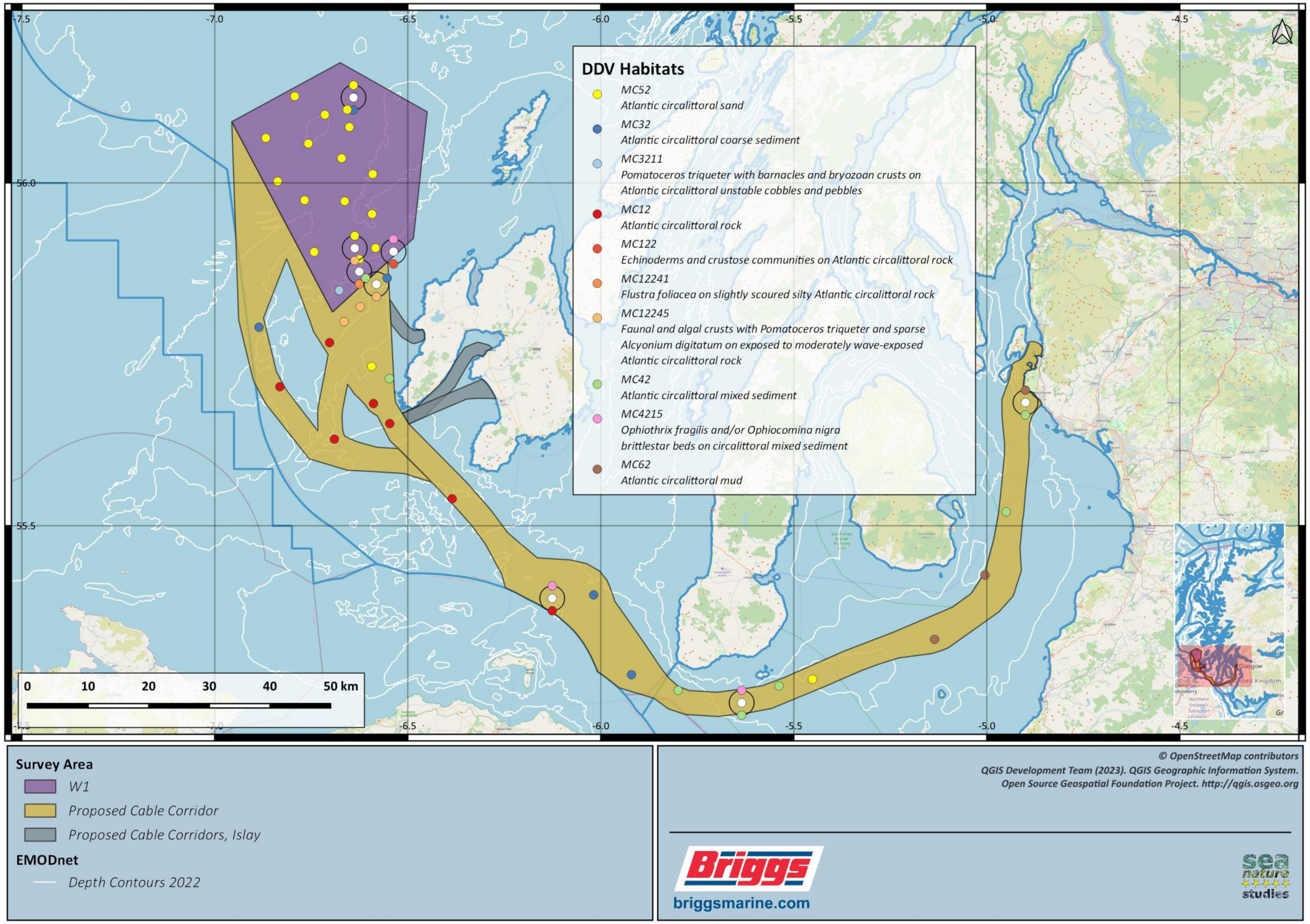


Figure 32 The habitat and biotope distribution from DDV data across the survey area

3.4.1 'High energy and moderate energy 'Atlantic circalittoral rock' (MC12)

This habitat can be described by three energy level categories (high, moderate and low), therefore the characteristic fauna varies enormously and is affected mainly by wave action, tidal stream strength, salinity, turbidity, the degree of scouring and rock topography (EUNIS, 2022).

The habitat was assigned to stations DDV24, DDV26, DDV27, DDV28, DDV29, DDV30 and DDV31 where the seabed was largely characterised by pebbles, cobbles and boulders on sand at a depth range between approximately 40m and 70m. Cobbles and boulder were commonly colonised by epifaunal taxa which included bryozoans (Bryozoa including *Flustra folicea* and *Alcyonium digitatum*), sponges (Porifera), faunal turf (Hydrozoa/Bryozoa), brittlestars (Ophiuroidea), starfish (Asteroidea including *Crossaster papposus*, *Asterias rubens*), sea urchin (*Echinus esculentus*), anemone (Actiniaria), cirripeds (*Balanus* spp.), polychaetes (*Spirobranchus* sp., formerly *Pomatoceros* sp.), crabs (*Necora puber*) and sea snails (Gastropoda).

At stations DDV27 and DDV30 the seabed is also characterised by bedrock outcrop as well as cobbles and boulders, covered by epifauna (including *A. digitatum*, *E. esculentus*, Asteroidea, anemones, and Hydrozoa/Bryozoa,) which accounted for >80% of the fauna observed. At station DDV30 cobbled and boulders presented an elevation and a reef which topographically raises from a depth of 65.6m to a depth of 49.6m. Due to lack of SSS and bathymetric data, this is inferred by the video analysis showing a steep wall covered by a similar epifaunal assemblage. The end of the transect presents cobbles and another topographical step raising from a depth of 49.6m to a depth of 42.8m.

3.4.2 'Echinoderms and crustose communities on Atlantic circalittoral rock' (MC122)

This habitat occurs on wave-exposed, moderately strong to weakly tide-swept, circalittoral bedrock and boulders, usually dominated by echinoderms and faunal and algal crusts (red encrusting algae). Commonly occurring fauna include the starfish *A. rubens*, the brittlestar *Ophiothrix fragilis* and the sea urchin *E. esculentus* as well as isolated clusters of the hydroids *Nemertesia antennina* and *Abietinaria abietina*, the bryozoan *A. digitatum*, the anemone *Urticina felina* and the cup coral *Caryophyllia smithii* are also commonly found (EUNIS, 2022).

The habitat was assigned to station DDV9 located to the west of the cable route section approaching the main array, at a distance of 7 Km off the coast of Islay. The seabed was characterised by pebbles and cobbles on sand at an approximate depth of 49.3m.

Brittlestar bed, largely formed by *O. fragilis*, characterised this site. Other taxa observed included brittlestars (*Ophiocomina nigra*), sea urchin (*E. esculentus*) and starfish (*C. papposus*, *Luidia sarsi*), hydroid/bryozoan turf (Hydrozoa/Bryozoa including *F. foliacea*, *A. digitatum*), sponges (*Suberites ficus*), anemone *(U. felina*), polychaete (*Spirobranchus triquiter*) and fish (Osteichthys, including Labridae).

3.4.3 'Flustra foliacea on slightly scoured silty Atlantic circalittoral rock' (MC12241)

This biotope is a variant which is typically found on the upper faces of moderately wave-exposed circalittoral bedrock or boulders subjected to moderately strong tidal streams, which may be interspersed with gravelly sand patches. Dominating fauna includes the bryozoan *F. foliacea*, whilst

A. digitatum may also be seen attached to the rocky substratum. Other epifaunal taxa included the polychaete *S. triqueter*, the sea urchin *E. esculentus* the starfish *A. rubens*, the common brittlestar *O. fragilis* and clumps of hydroids (Hydrozoa), with the sandy/gravelly patches colonised by the anemone *U. felina* (EUNIS, 2022).

The biotope was assigned at station DDV13 and described as sublittoral sand with sparse cobbles at depths between 42.3m to 50.1m. The substrate was colonised by bryozoans (*F. foliacea* and *A. digitatum*), hydroids (Hydrozoa) and sponges (Porifera).

3.4.4 'Faunal and algal crusts with Pomatoceros triqueter and sparse Alcyonium digitatum on exposed to moderately wave-exposed Atlantic circalittoral rock' (MC12245)

This biotope is a variant which is typically found on the upper faces of moderately wave-exposed circalittoral bedrock or boulders subjected to moderately strong tidal streams. The rocky substratum is generally covered with encrusting red algae and the white, calcareous tubes of the polychaete *S. triqueter*, dotted with the abundant urchin *E. esculentus*. Other epifaunal taxa encountered include bryozoans (e.g. *A.* digitatum, *Parasmittina trispinosa*), sparse clumps of hydroids (e.g. *Abietinaria abietina*), brittlestars (e.g. *O. fragilis* and *O. nigra*), crab (*Cancer pagurus*) and the starfish *A. rubens* (EUNIS, 2022).

The biotope was assigned at 4 stations, where the seabed was described as coarse sand interspersed with boulders (DDV14), mixed sediment (section of DDV21) and sublittoral rock (DDV22 and DDV23) at depth ranging from 26.8m to 52.4m. Epifaunal assemblages at these sites were characterised by the polychaete (*Spirobranchus* sp., formerly *Pomatoceros* sp.), bryozoans (*F. folicea* and *A. digitatum*), hydroids and bryozoans turf (Hydrozoa/Bryozoa), sponges (Porifera, including *S. ficus*), sea urchins (*E. esculentus*), brittlestars (*O. fragilis* and *O. nigra*), starfish (*C. papposus*) anemones (Actiniaria), sea snails (Gastropoda), and algae (encrusting pink algae, red algae).

3.4.5 'Circalittoral coarse sediment' (MC3)

The habitat 'Circalittoral coarse sediment' (MC3) is described as tide-swept circalittoral coarse sands, gravel and shingle at depths over 20 m, characterised by robust infaunal polychaetes, mobile crustacea and bivalves (EUNIS, 2022).

This habitat was assigned to 5 stations where the seabed was described as coarse sediment with shells and small proportions of gravel (DDV7), sand interspersed with boulders, cobbles and bedrock (section of DDV21), pebbles, cobbles and small proportions of gravel (DDV25), pebbles, cobbles, gravel and shells (DDV32) and pebbles, gravel and shells (DDV39) at a depth range from 49.4m to 113.3m. Epifaunal assemblages at these sites were characterised by bryozoans (Bryozoa), including *F. foliacea*), starfish (*A. rubens*?), amenones (Actiniaria), crab (Decapoda) and polychaetes (*Spirobramchus* sp.). Sandeels (Ammodytidae) were recorded at station DDV7, whilst no epifaunal taxa were recorded at stations DDV39.

3.4.6 'Pomatoceros triqueter with barnacles and bryozoan crusts on Atlantic circalittoral unstable cobbles and pebbles' (MC3211)

This biotope is characterised by species which colonise pebbles and unstable cobbles. The main encrusting taxa are generally calcareous tube worms such as *S. triqueter* (or *S. lamarcki*), barnacles such as *Balanus crenatus* and *B. balanus*, and a few bryozoan and coralline algal crusts. In tide-swept conditions tufts of hydroids could occasionally be present. This biotope is found on exposed open coasts as well as at the entrance to marine inlets (EUNIS, 2022).

The biotope was assigned to station DDV17 which was largely characterised by pebbles with cobbles and gravel at a depth of 49.7m. The epifaunal assemblage at this site was characterised by the encrusting polychaete (*Spirobranchus* sp.), barnacles (*Balanus* spp.), hydroids (Hydrozoa) and sponges (Porifera).

3.4.7 'Atlantic circalittoral mixed sediment' (MC42)

This habitat is described as well mixed muddy gravelly sands or very poorly sorted mosaics of shell, cobbles and pebbles embedded in or lying upon mud, sand or gravel at a depth generally below 15-20m. Characteristic fauna includes a wide range of infaunal polychaetes, bivalves, echinoderms and burrowing anemones and the presence of hard substrata (shells and stones) on the surface enables epifaunal species to become established, particularly hydroids (EUNIS, 2022).

The habitat was assigned to 7 stations, characterised by sparse cobbles on sand (sections of DDV21), shelly gravel with pebbles, cobbles and boulders (DDV33, DDV34, DDV35, DDV37), pebbles with cobbles, boulders gravel and shells (DDV40) or pebbles with cobbles, boulders and gravel on mud (DDV36). Bedrock outcrop was visible at station DDV33. Characteristic epifaunal taxa included starfish (Asteroidea including *A. rubens*), brittlestars (Ophiuroidea), turf (Hydrozoa/Bryozoa), polychaete (*Spirobranchus* sp.) barnacles (*Balanus* spp.), squat lobsters (Galtheoidea), anemone (Actiniaria) and sponges (Porifera).

3.4.8 '*Ophiothrix fragilis* and/or *Ophiocomina nigra* brittlestar beds on circalittoral mixed sediment' (MC4215)

This biotope is characterised by circalittoral mixed sediment dominated by hundreds to thousands of brittlestars per square metre, forming dense beds, living on boulders, gravel or sedimentary substrata. *Ophiothrix fragilis* and *Ophiocomina nigra* are the two main bed-forming species. Other taxa mainly include large suspension feeders such as the octocoral *A. digitatum*, the anemone *Metridium senile* and *Urticina felina*, and the hydroid *Nemertesia antennina*, large mobile animals such as the starfish *A. rubens*, *C. papposus* and *L. ciliaris*, the urchins *E. esculentus* and *Psammechinus miliaris*, edible crabs *Cancer pagurus*, swimming crabs *Necora puber*, *Liocarcinus* spp., and hermit crabs *Pagurus bernhardus* (EUNIS, 2022).

The habitat was assigned to stations DDV9 and DDV34 and the initial section of stations DDV31, which were characterised by cobbles, pebbles, small boulders and gravel at a depth range of 50m to 90m. Epifaunal taxa observed included hundreds to thousands of brittlestars including *O. fragilis* and *O. nigra*, anemones (Actinaria), hydroids (Hydrozoa, including *Nemertesia* sp.), bryozoans (Bryozoa including *A. digitatum*), starfish (A. rubens) and sponges (Porifera).

3.4.9 'Atlantic circalittoral mud' (MC62)

This biotope complex is described by circalittoral, cohesive sandy mud, with generally over 20% of silt/clay at depths > 10m, with weak or very weak tidal streams. Generally found in deeper areas and marine inlets, this habitat is often characterised the presence of sea pens such as *Virgularia mirabilis* and *Pennatula phosphorea* as well as burrowing megafauna. Where the relatively stable conditions occur the establishment of burrowing megafaunal species, such as *Nephrops norvegicus*, is observed (EUNIS, 2022).

The habitat was assigned to stations DDV38, DDV42, fully characterised by mud and to a sections of stations DDV36, also largely characterised by mud. At stations DDV38 and DDV42 the seabed was characterised by small and large faunal burrows, within which the Norway lobster *Nephrops norvegicus* was observed, whilst one individual of *Virgularia* sp. was recorded at stations DDV38. At station DDV36, where coarser sediment was also present overlying the mud sediment, epifaunal taxa included starfish (Asteroidea) anemones (Actiniaria) and tube worms (*Spirobranchus* sp.).

3.4.10 'Atlantic circalittoral sand' (MC52)

This habitat is described as sand, with less than 5% silt/clay, characterised by echinoderms (including *Echinocyamus pusillus*), polychaetes and bivalves, and muddy sand with silt content ranging from 5% to 20%, characterised by polychaetes, bivalves such as *Abra alba* and *Nucula nitidosa*, and echinoderms such as *Amphiura* spp. and *Ophiura* spp. and *Astropecten irregularis* (EUNIS, 2022).

The habitat was assigned to 19 stations characterised by sand at depth range from 40.6m to 67.8m. At most sites no epifaunal taxa were observed. Where they occurred, they included fish (Osteichthys, including sand eels Ammodytidae), flat fish (Pleuronectiformes).

3.5 Habitats and species of conservation interest

3.5.1 Sea-pen and burrowing megafauna communities analysis

Following the observation of the Norway lobster (*Nephrops norvegicus*) and its associated burrows, along with smaller faunal burrows, drop-down video stations DDV38 and DDV42 were assessed for the presence of the OSPAR listed threatened and/or declining habitat 'Sea-pens and burrowing megafauna communities'.

Except for one individual of *Virgularia* sp. at station DDV38, which was assessed as 'Occasional', no sea-pens were observed along the transects, whilst small faunal burrows (3 cm to 15 cm) were assessed as 'common' at both stations and larger burrows (>15 cm), likely made by the Norway lobster (*Nephrops norvegicus*), were assessed as 'common' at station DDV42 and 'abundant' at station DDV38 (Table 9).

Table 9 SACFOR assessment for sea-pens and burrowing megafauna*

Video	Length (m)	Sea-pens			Mounds and burrows		
		Funinculina quadrangularis	*Pennatula phosphorea**	*Virgularia* sp.*	Mounds	*Nephrops norvegicus* burrows†	Other burrows*
DDV38	95	Absent	Absent	Occasional	Absent	Common	Common
DDV42	77	Absent	Absent	Absent	Absent	Abundant	Common

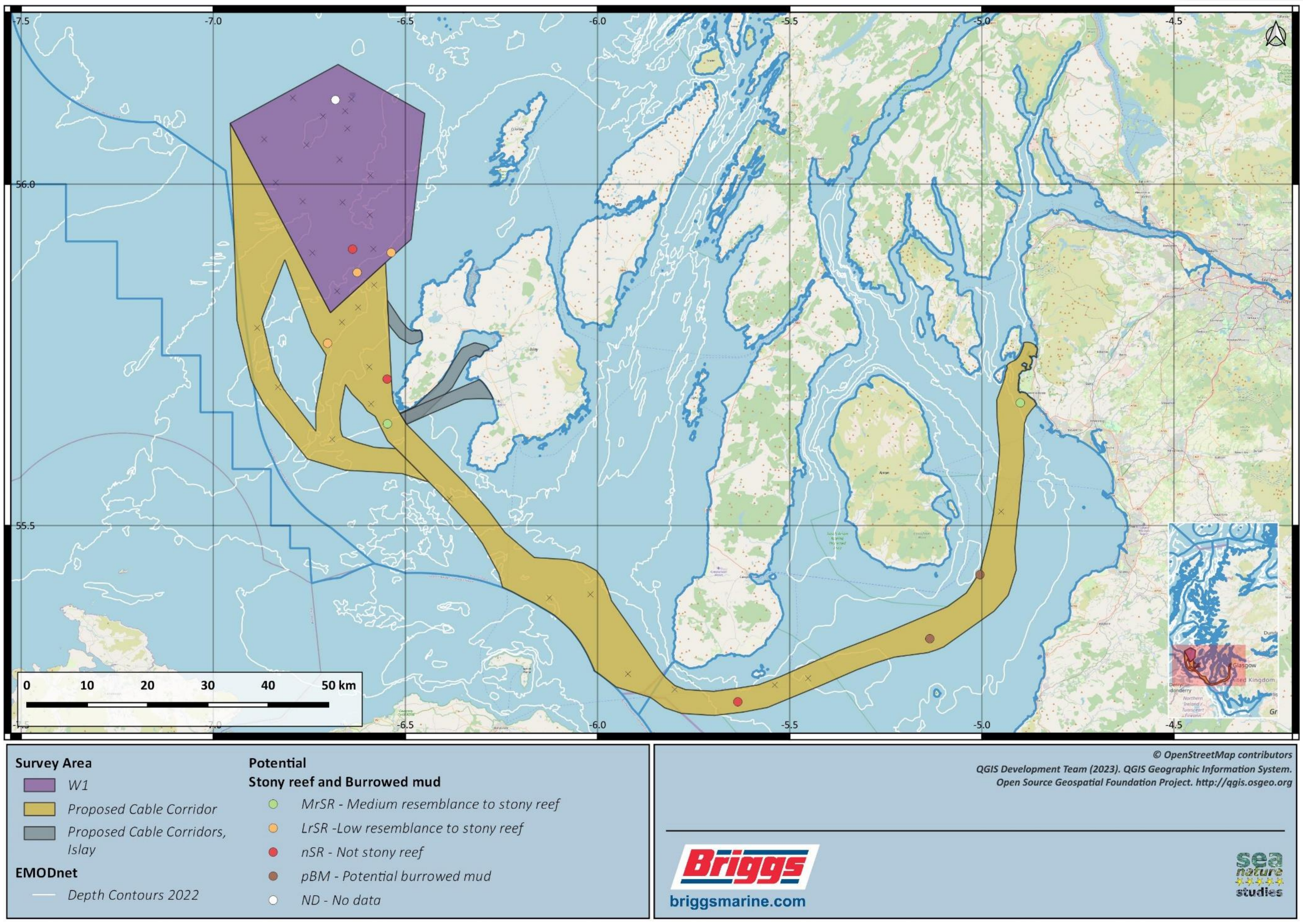
SACFOR Classifications: (3 cm to 15 cm)		SACFOR Classifications: (> 15 cm)	
Superabundant =	1 - 9/0.01 m^2	Superabundant =	1 - 9/0.1 m^2
Abundant =	1 - 9/0.1 m^2	Abundant =	1 - 9/1 m^2
Common =	1 - 9/1 m^2	Common =	1 - 9/10 m^2
Frequent =	1 - 9/10 m^2	Frequent =	1 - 9/100 m^2
Occasional =	1 - 9/100 m^2	Occasional =	1 - 9/1000 m^2
Rare =	1 - 9/1000 m^2	Rare =	1 - 9/< 1000 m^2

* = SACFOR Classification based adult maximum size of 3 cm to 15 cm
† = SACFOR Classification based adult maximum size > 15 cm

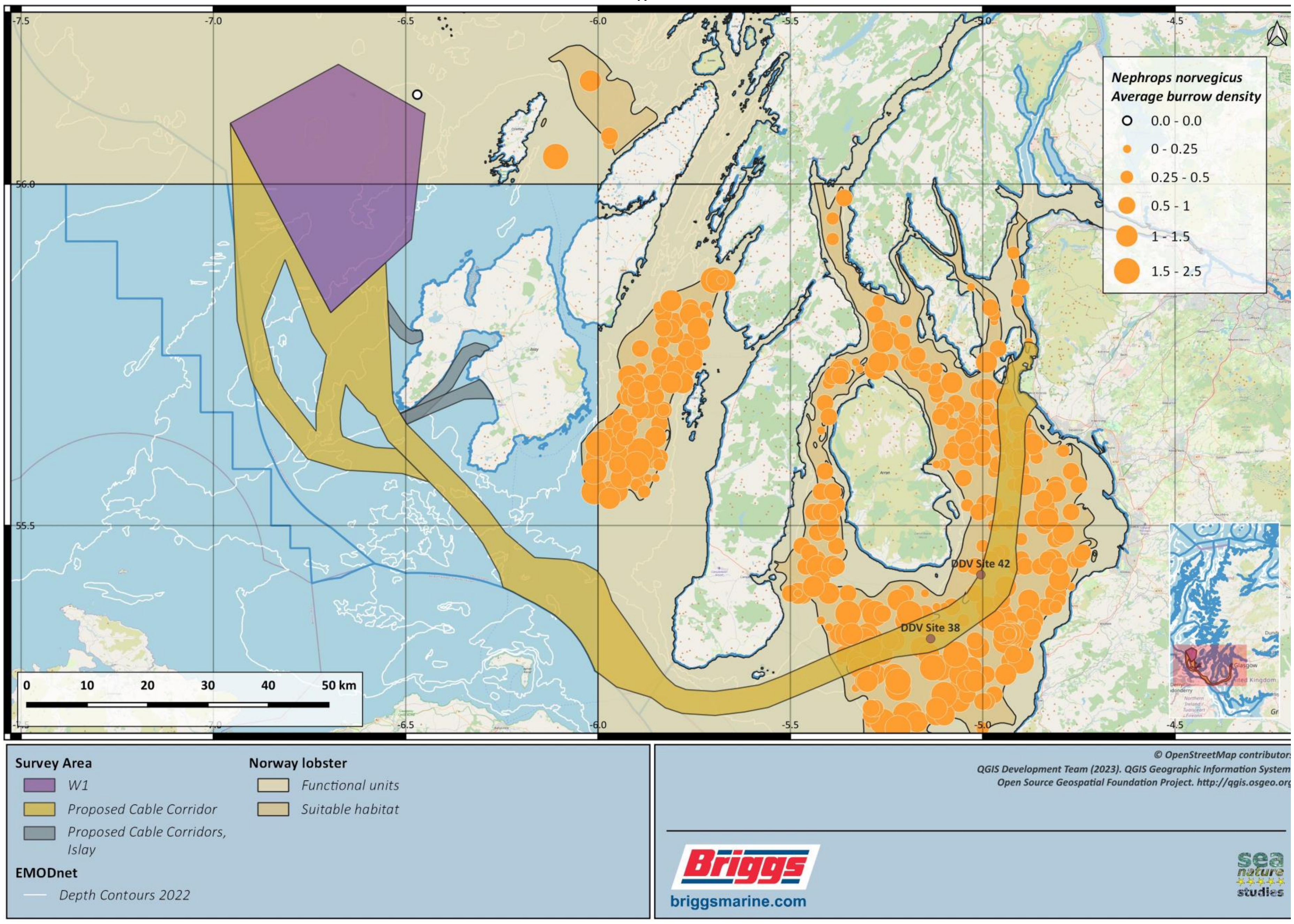
Scale	Absent	R = Rare	O = Occasional	F = Frequent	C = Common	A = Abundant	S = Super-abundant

***Note: The term SACFOR comes from the abbreviations applied to the scale categories.**

These two sites, DDV38 and DDV42, therefore have the potential to be expressions of the 'Sea-pens and burrowing megafauna communities' OSPAR listed threatened and/or declining habitat, or the 'burrowed mud' PMF (Figure 33A). Species distribution data for the Norway Lobster (*Nephrops norvegicus*) from underwater video survey to assess burrow densities from 2007 onwards are provided for context [Contains Scottish Government (Marine Scotland) information licensed under the Open Government Licence v3.0] (Figure 33B). The technical information states, '*Scottish underwater TV surveys to estimate Nephrops burrow distribution and abundance, from Nephrops Functional Units of significance to Scotland. Underwater TV footage is taken at specified stations within Functional Units. The underwater camera is mounted on a towed sledge and tow duration is 10 minutes. Records of Nephrops burrows, Nephrops and other benthic fauna is recorded onto DVD for analysis and review*'.



A



B

Figure 33 Burrowed mud and stony reef assessments of DDV data across the survey area (A); and historical Nephrops novegicus burrow density from Scottish Government spatial data (B)

3.5.2 Annex I Stony reef Assessment

To qualify as a 'stony reef' there should be a minimum elevation of 64 mm above the seafloor, a coverage of at least 10% cobbles and boulders and a minimum area extent of 25 m^2. However, if 'low' is scored in any of the categories a strong justification would be required to consider the reef as contributing to the Marine Natura site network of qualifying reefs in terms of the EU Habitats Directive (Irving, 2009).

Sixteen sites were described as having substrate of cobbles, boulders and/or bedrock and therefore were processed further and assessed for the presence of Annex I Reef (geogenic).

Of these sixteen sites, eight could be assessed for the resemblance of the substrate to 'Stony Reef'. The categories 'Not a reef', 'Low reef' and 'Medium reef' were applied within the survey area. Detailed examination indicated that the remaining eight sites lacked the features necessary against which an assessment using the Irving stony reef assessment methodology could be applied. Instead, those sites within this group, where evidence of bedrock was recorded, are commented on later in this section with reference to Duncan et al. (2022).

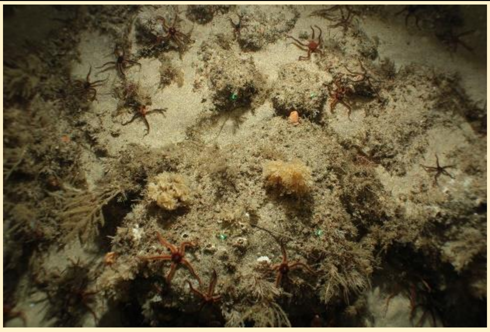
Stations DDV14, DDV34, DDV40 were described as cobbles and boulders on shelly sand/shelly sandy gravel with percentage composition of cobbles and boulder <10% and elevation of <64mm (DDV14) and 64mm-5m (DDV34 and DDV40), the combination of which assigns them the category 'Not a reef'. Along DDV14 incidental patches of cobbles and boulders, alternating with a sand habitat, were also observed, but their extent was<25m^2 and therefore not assessed for Annex I geogenic reef habitat.

Stations DDV9, DDV24 and a section of DDV13 were described as cobbles and boulders on shelly sand or shelly gravelly sand colonised with dense, at times, epifaunal assemblages. Their percentage composition of cobbles and boulder accounted for approximately 15% and the estimated elevation of 145mm, the combination of which assigns them the category 'Low reef'. The initial section of DDV13 was characterised by bedrock with cobbles and boulders forming reef. At the end of the reef feature a topographic drop from 43.2m to 46.3m is observed, so it is inferred that the height of the reef is approximately 3.1m. A full assessment of the extent and nature of the feature was not possible as SSS and bathymetry data were not available at the time of the assessment being carried out. The habitat was described as the EUNIS habitat 'Atlantic circalittoral rock' (MC12), which is suggested could correlate to Annex I reef (Duncan et al., 2022).

Station DDV28 was described as bedrock with cobbles and boulders occurring at a depth range of 33.3m to 35m which infers a reef feature heigh of approximately 1.7m. The reef feature observed at station DDV36 is characterised by cobbles and, later along the transect, small boulders. Epifauna colonised this substrate, sometimes in high density. The quality of the video and the angle of the camera makes it very difficult to accurately estimate the height of this reef features. Based on other survey sites within the area, the height of the feature at this site is estimated to fall within the lower end of the assessment criteria interval 64mm - 5m and an estimated percentage cover falling within the lower end of the range 40-95%. The combination of these characteristics assign the category of 'Medium reef' to this substrate.

Table 10 summarises the stony reef assessment and Figure 33 displays the stony reef distribution within the survey area.

Table 10 Annex I stony reef assessment

Stony Reef (Irving, 2009)			
Characteristics	Classification	Distribution	Representative Photograph
Composition: 40 % – 95 %	Medium	DDV28, DDV36	 DDV_STILL_2021_08_23_0695
Elevation: 64 mm – 5 m			
Epibiota cover: < 80 %			
Composition: 0 % – 10 %	Low	DDV9, DDV13, DDV24	 DDV_STILL_2021_08_21_0181
Elevation: < 64 mm			
Epibiota cover: < 80 %			
Composition: 10 % – 40 %	Not a reef	DDV14, DDV34, DDV40	 DDV_STILL_2021_08_21_0101
Elevation: Flat Seabed			
Epibiota cover: < 80 %			

At the remaining stations bedrock outcrop was evident and the stony reef assessment methodology could not be applied. Duncan et al. (2022) correlates Annex I stony reef to the EUNIS habitat classification. A full assessment including the extent of these features and the depths was not possible because SSS and bathymetry data were not available.

At station DDV33 the bedrock outcrop is formed by mixed consolidated sediment made of cobbles, pebbles, sand and shells. From the video, a topographic change of the seabed is visible. Elevation measurements could not be taken due to the camera angle and distance from the seabed.

Similar seabed characteristics were observed at station DDV29. Elevation was difficult to measure at this site as well. At the start of the video the water depth was approximately 30m and as the video progresses the seabed topography raises gradually, reaching a depth of approximately 26m. At this point the camera is pulled up to a shallower depth, from which the reef feature is still visible, but no measurements were collected as these would not be accurate. The video ends with coarse sediment formed of pebbles, cobbles and small boulders which are only visible briefly on the video, so these have not been assessed for stony reef.

Station DDV30 is characterised by alternating cobbles and boulders elevated from the seabed and covered by epifauna (Hydrozoa/Bryozoa including dead man fingers *Alcyonium digitatum*, sea urchin *Echinus esculentus*, Asteroidea, Actiniaria) which appeared as a dense cover, and bedrock. The bedrock outcrop appears to be characterised by a matrix of pebbles, cobbles and boulders and topographically raises vertically from a depth of 65.6m to a depth of 49.6m. The bedrock wall was also covered in epifauna composed of a similar assemblage of taxa. After another area of cobbles and boulders densely covered by epifauna, another steep topographical raise was seen from a depth of 49.6m to a depth of 42.8m. Similar seabed structure with alternating cobbles and boulders and bedrock was also observed at station DDV31. The bedrock raises topographically with the water depth ranging from approximately 62.0m to approximately 58.0m.

At station DDV23 bedrock outcrop was recorded at a depth of approximately 36m and when the seabed changes to pebbles the depth is recorded as approximately 39m. At station DDV13 bedrock with cobbles and boulders were densely covered by epifauna. At the point of the video where the seabed changes, the depth changes from 43.2m to 46.3m.

Station DDV22 was characterised by bedrock with incidental patches of sand with pebbles and cobbles visible in the gaps of the reef, suggesting that the reef feature is likely to be rock outcrop.

At station DDV27 bedrock outcrop alternates with cobbles, boulders and pebbles over sand. These patches on coarser sediment are considered incidental patches and therefore not further assessed. The depth range recorded varies from approximately 29m at the top of the bedrock to approximately 35m, where cobbles and boulders over sand patches occurred. After which the depth begins to rise on an outcrop of bedrock until at the end of the transect it is approximately 26m.

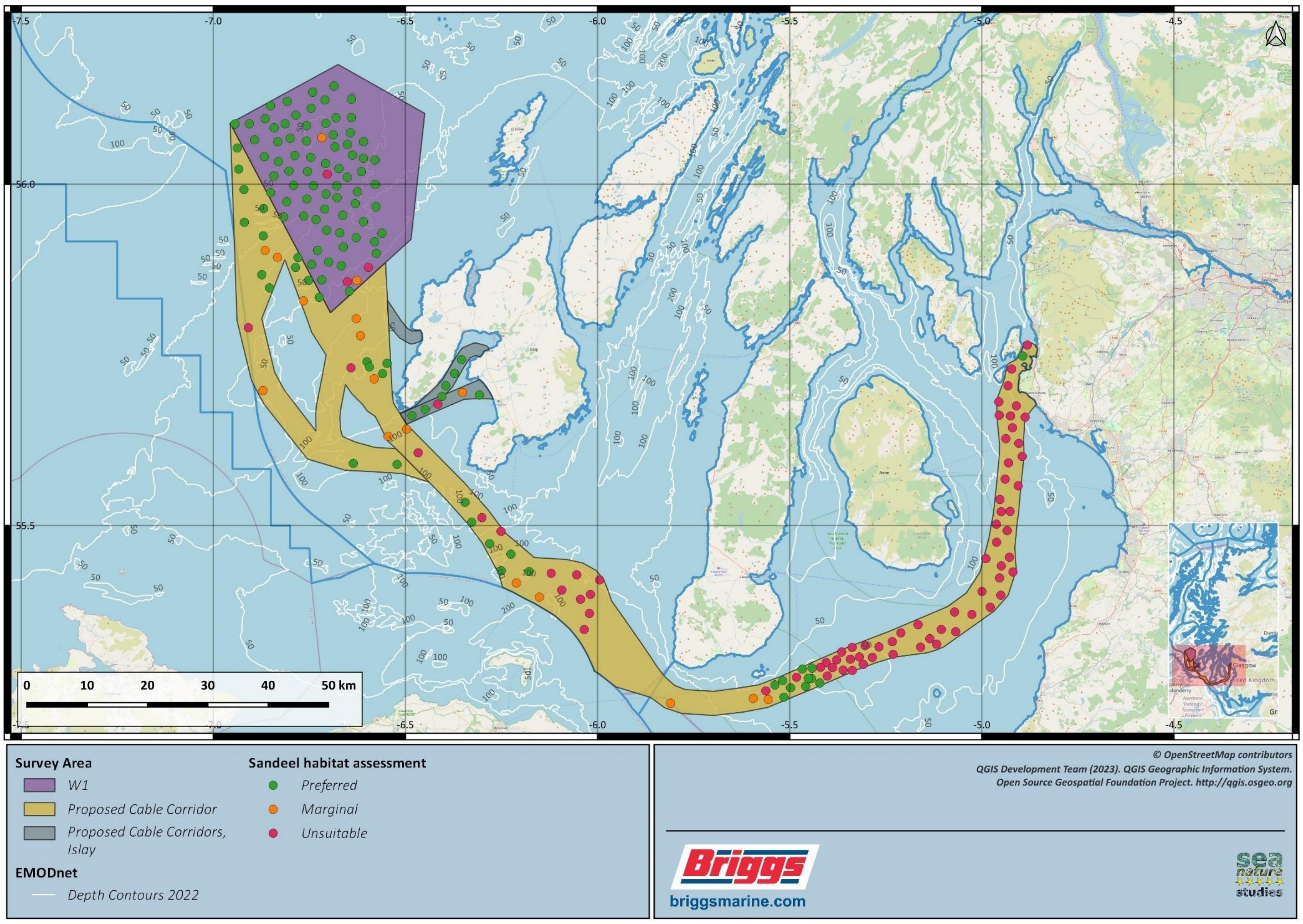
Stations DDV22, DDV23, DDV27, DDV29, DDV30, DDV31 were associated with the EUNIS habitats included in the Level2 ‘Atlantic circalittoral rock’ (MC12) (See Table 8; Figure 11). These habitats are indicated to correlate to subtype of Annex I reefs (Duncan et al., 2022).

3.5.3 Sandeel habitat assessment

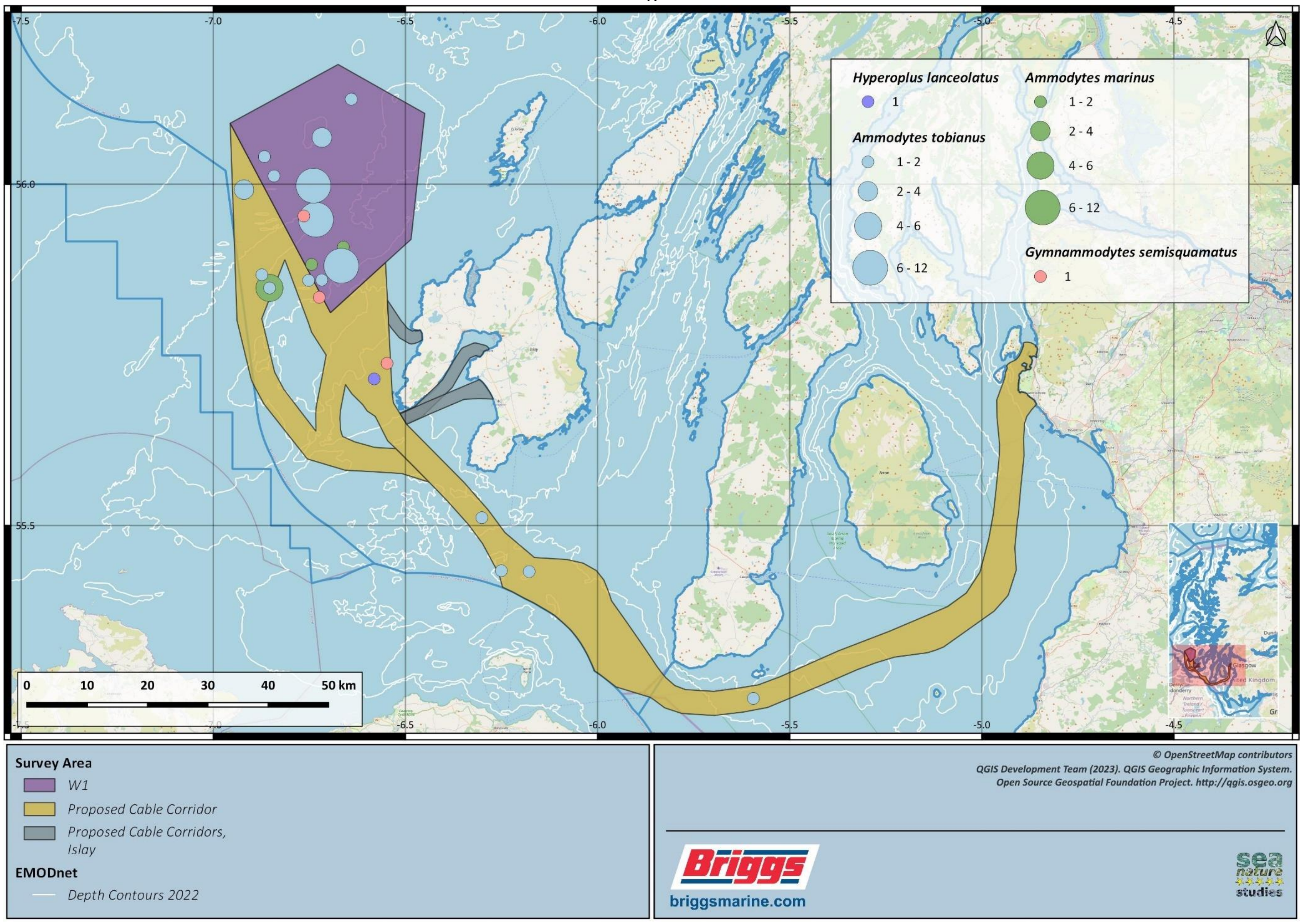
Of the 204 PSD samples acquired within the survey area, 113 sites indicated a sediment which would be categorized as ‘Preferred’ sand eel habitat; 17 sites indicated a sediment which would be ‘Marginal’ sand eel habitat; and, the remaining 74 sites indicated ‘Unsuitable’ sediment for sand eel habitats (Table 11; Figure 34).

Table 11 Sand eel habitat preference assessment

Folk (1954) Description	Sand Eel Preference (Latto et al., 2013)	Number of Stations
Sand (S), slightly gravelly sand ((g)S) and gravelly sand (gS)	Preferred	113
Sandy gravel (sG)	Marginal	17
All other sediment types	Unsuitable	74



A



B

Figure 34 Sand eel habitat assessment (A) and abundance distributions of four species of sand eel from 0.1m² grab data (B)

Across the survey area, sand eels were identified from video data analysis to family level (Ammodytidae) at sites DDV7 and DDV11. Sand eel recorded from grab samples included *Ammodytes marinus* at 3 sites (22, 56 and 236); *Ammodytes tobianus* at 16 sites (11, 14, 16, 49, 58, 78, 80, 86, 127, 158, 236, 237, 239, 247, 251 and DDV7); *Gymnammodytes semisquamatus* at three sites (76, 99 and 111); and, *Hyperoplus lanceolatus* was recorded at a single site (233) (Figure 34B).

3.5.4 Species of interest

Twelve adult individuals of *Arctica islandica*, a long living bivalve listed as PMF and in the OSPAR List of Threatened and /or declining species (OSPAR, 2022), were recorded from grab samples at sites 4, 10, 12, 18, 20, 27, 33, 44, 47, 61 and 260 (Figure 35). Nine juvenile individuals were also recoded from grab samples at sites 2, 36, 48, 253, 258 and 276.

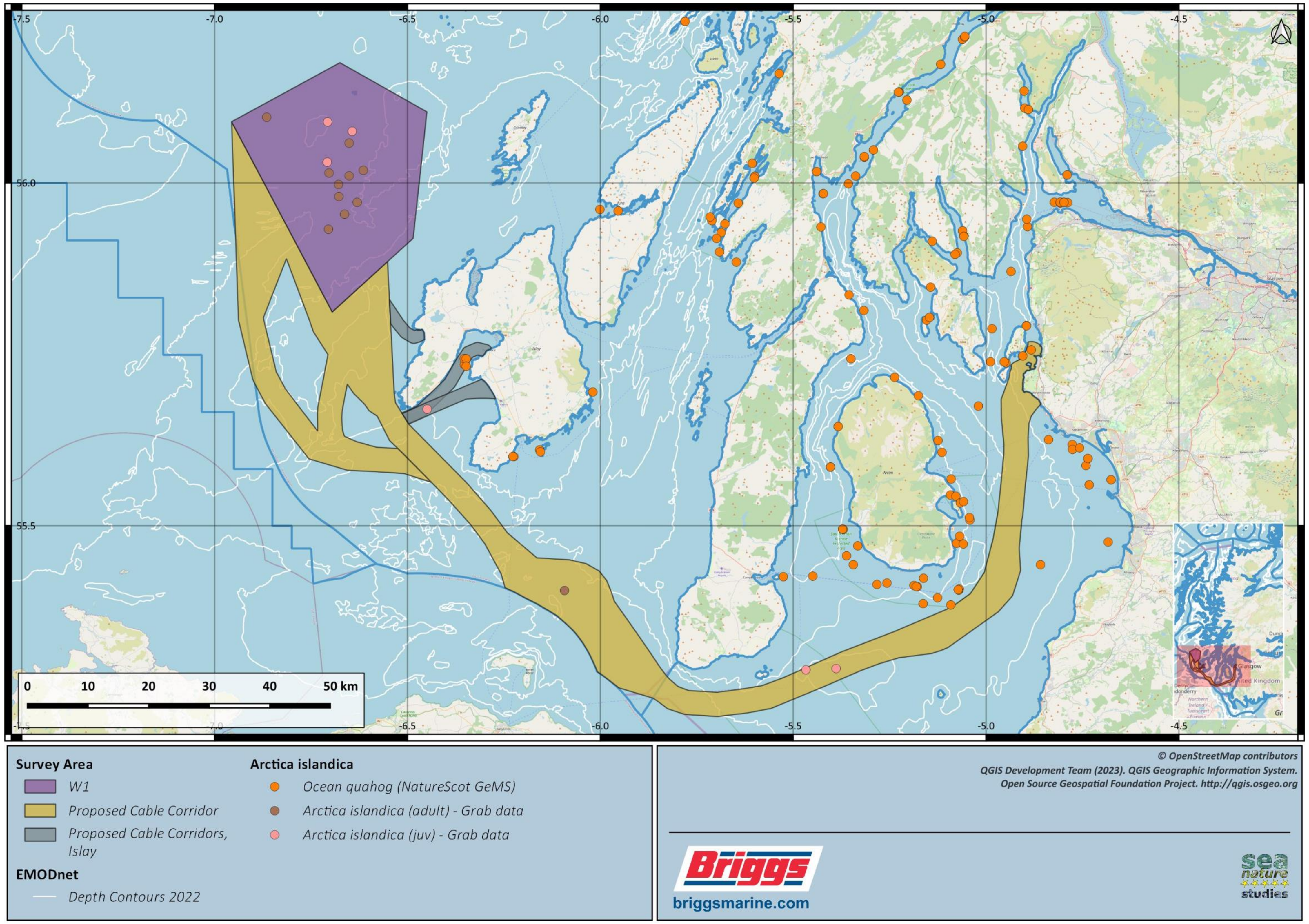


Figure 35 Ocean quahog, Arctica islandica data from across the survey area

Scottish Biodiversity List

Species from the Scottish Biodiversity List recorded in the grab samples included the bivalve, *Devonia perrieri*, recorded from site 205; the bryozoan, *Smittina crystallina*, recorded from site 256; the hydroid, *Polyplumaria flabellata*, from site 140; the hydroid *Tamarisca tamarisca* recorded at sites 39, 140, 153, 158, 161, 251, 253 and 259; and, the cup coral *Rolandia coralloides*, recorded from sites 133, 159, 272 and DDV35. Note, the Scottish Biodiversity List includes all soft corals in the Class, Octocorallia, hence the inclusion of *R. coralloides*.

Northern Ireland Priority Species List

Species from the Northern Ireland Priority Species list recorded in the grab samples included the hydroid *Lytocarpia myriophyllum*, recorded at sites 140 and 272; the hydroid *Tamarisca tamarisca* (sites provided above above); the hermit crab *Cestopagurus timidus*, recorded at site DDV39; the round crab *Atelecyclus rotundatus*, recorded at sites 138 and 161; the bivalve *Modiolus modiolus*, recorded at sites 99 and 138; the bivalve *Mimachlamys varia*, a juvenile of which was recorded at site 272; the bivalve *Arctica islandica* (reported on above); *Aequipecten opercularis* from sites 128, 138, 143, 154, 157, 158, 159, 216, 257, 259 and 260; the sand star *Astropecten irregularis*, a juvenile of which was recorded at station 23; the brittlestar, *Amphiura* (*Ophiopeltis*) *securigera* from sites 59, 137, 257, 271 and 275;and, the sea cucumbers *Leptosynapta bergensis* and *Labidoplax media*, which were recorded at sites 205 and 209, and sites 157, 158, 161, 258, 272 and 273, respectively.

Commercially important species

Other species which are commercially important in the area and which were recorded by grab sampling included:

- taxa belonging to the family Pectiniidae, the juvenile stage of which occurred at 39 sites. Of these, the king scallop *Pecten maximus* was recorded at 4 sites and the queen scallop *Aequipecten opercularis* was recorded at 5 sites. Adult individuals of the latter were recorded at 11 sites (see above);
- the greater sand eel *Hyperoplus lanceolatus*, which was recorded at one site only; and
- the blue mussel *Mytilus edulis* two individuals of which, one adult and one juvenile, were recorded at two sites.

3.6 Faecal indicators (FI)

The sediment at fifteen sites where the proposed cable corridor makes landfall were sampled for the analysis of bacterial faecal indicators (Figure 36).

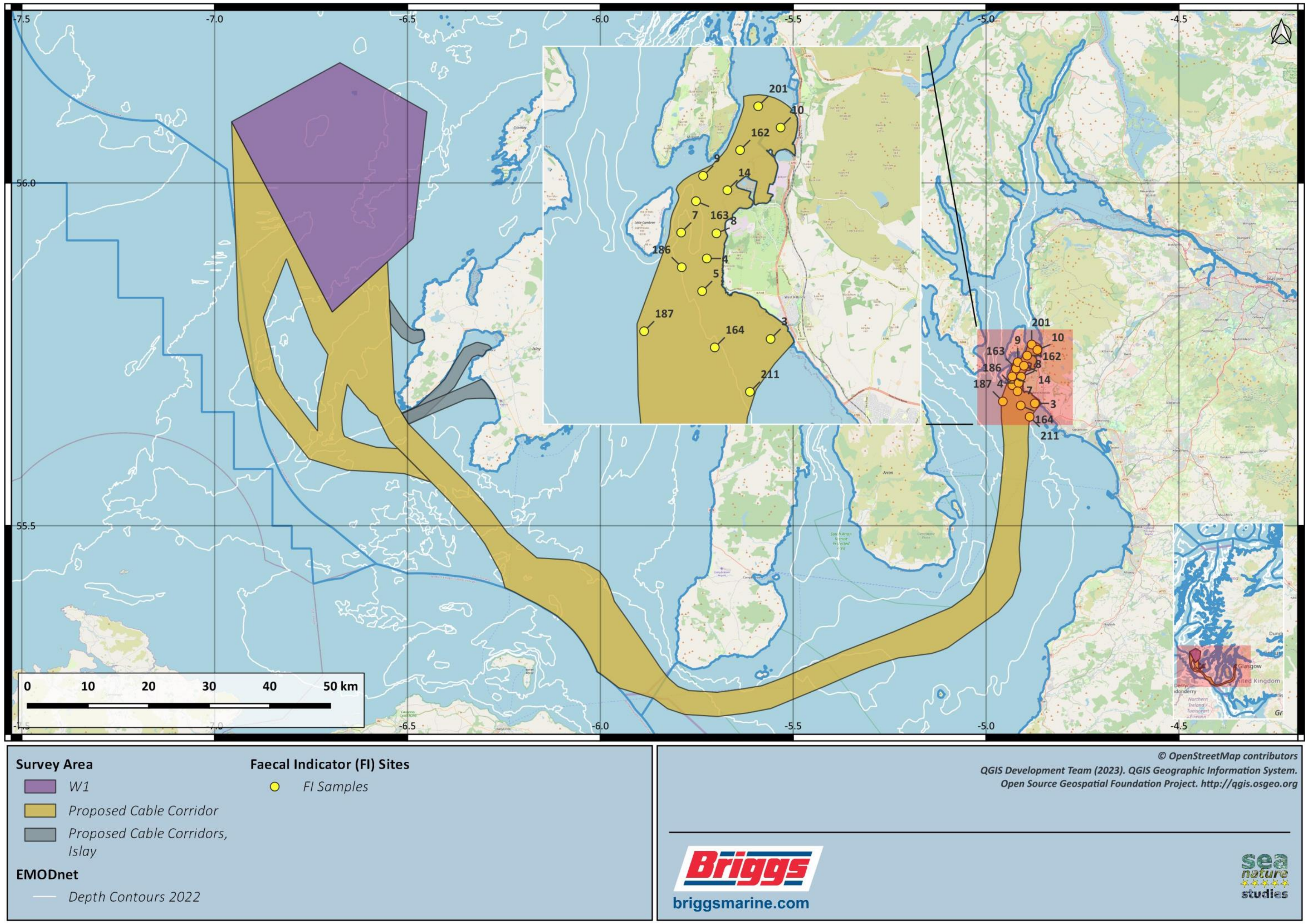


Figure 36 Sites sampled for the analysis of faecal indicators

Oakshire Environmental undertook the sediment testing for faecal indicator organisms and the full report is available in Appendix 2.

With two exceptions, no detectable concentrations of *Escherichia coli*, Enterococci or Total Coliforms were recorded. The exceptions were site 4 and site 162 were, in each case, one of the three samples analysed for these sites had detectable concentrations of Enterococci bacteria. However, the concentrations were very low therefore the results for all sites would have returned a classification of 'Excellent' under the Bathing Water Regulations. Therefore, the results from the microbial analysis indicated that the sampled sediment was not contaminated.

3.7 Contaminants

Samples for contaminants analyses were taken from 68 sites and were analysed by SOCOTEC a UKAS accredited laboratory (Figure 37). The two reports are available in Appendix 1.

Results were compared to the Clean Seas Environment Monitoring Programme (CSEMP) guideline levels where relevant. This is the mechanism through which the UK delivers its monitoring commitments as signatories to the OSPAR Convention and CSEMP feeds into the OSPAR Co-ordinated Environmental Monitoring Programme (CEMP).

Sediment quality standards used to assess the concentrations of metals, hydrocarbons and PCBs, included the Effects Range Low (ERL) concentrations, which are associated with biological effects (OSPAR, 2009; OSPAR 2014); and, the Marine Scotland Action Levels (ALs) AL1 and AL2 for the disposal of dredged material, which provide an indication of potential impact to biological communities (Marine Scotland, 2017).

Effects Range values were originally developed by the United States Environmental Protection Agency (EPA) as sediment quality guidelines to predict adverse biological effects on organisms (Long et al., 1995). Concentrations below the ERL rarely cause adverse effects in marine organisms; concentrations above the ERM, however, will often cause adverse effects in some marine organisms (OSPAR, 2009).

Marine Scotland Action Levels (AL) for the disposal of dredged material were used to aid the assessment of the possible ecological significance of the levels of contaminants recorded. Action Levels are non-statutory guidelines which form part of a wider body of evidence for assessment of disposal of dredged materials to sea. In general, concentrations of contaminants below Action Level 1 are of little concern with respect to possible effects on the marine environment. Concentrations above Action Level 2, however, suggest that the material is unsuitable for disposal at sea. Values between Levels 1 and 2 may prompt further investigatory work prior to disposal of the material to sea (note that for polyaromatic hydrocarbons (PAH) AL2 values are not published).

To assess the concentrations of Polybrominated Diphenyl Ethers (PBDEs) in sediment the Canadian Federal Environmental Quality Guidelines (FEQGs) were used (OSPAR 2020; Viñas *et al*., 2022). FEQGs are used to assess the status of both sediment and biota (fish and shellfish). Concentrations below the FEQGs should not cause any chronic effects on marine organisms. They were developed under the Canadian Environmental Protection Act from 1999, are available for individual PBDE congeners in sediment and biota and were derived from ecotoxicological testing (Environment Canada, 2013). FEQGs are described in detail in the OSPAR (2020) background document for sediment and biota. To enable comparison with the data generated from the survey samples the original non-normalised values were used as concentrations reported by SOCOTEC were also non-normalised (OSPAR, 2020).

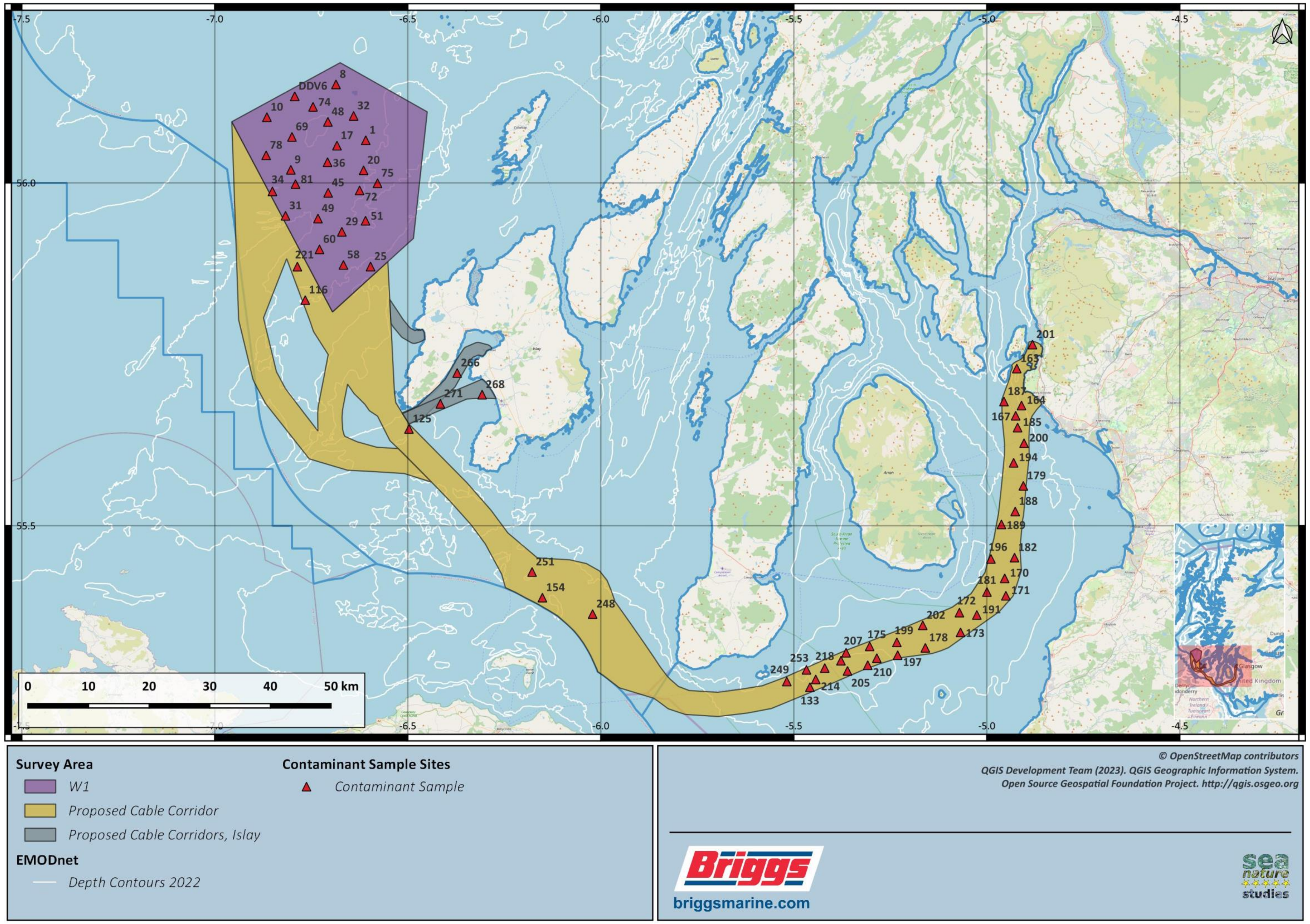


Figure 37 Contaminant sample sites

The polyaromatic hydrocarbons (PAH) EPA results are available in Table 12 and Table 13. Concentrations above the OSPAR CSEMP ERL thresholds were recorded for benzo[ghi]perylene at 14 sites (Table 12). Indeno[123,cd]pyrene and Phenanthrene ERL thresholds were each exceeded at one site (Table 12). Action level 1 was exceeded for multiple analytes across numerous sites (Table 12). As the results for benzo[ghi]perylene exceeded the ERL threshold more than any other contaminant measured the results have been mapped illustrating the gradient of increasing concentration from southwest to northeast at stations within the proposed cable corridor where it crosses the Firth of Clyde (Figure 38).

Table 12 Polycyclic Aromatic Hydrocarbons (PAH) in sediments (EPA), all values in µg/Kg (Dry Weight) – Part 1 (Clyde Sediments – Report MAR01135)

Analyte [µg/Kg]	Con163	Con164	Con167	Con170	Con171	Con172	Con173	Con175	Con176	Con178	Con179	Con181	Con182	Con185	Con187	Con188	Con189	Con191	Con194	Con196	Con197	ERL	AL1
Naphthalene	13.9	60.2	51.3	22.4	20.3	7.72	16.3	11.5	13.6	15	37.2	17.7	29.3	45	53.8	29.6	35.8	18.1	35.1	11.5	16.8	160	100
Acenaphthylene	1.78	20.7	17.1	5.65	4.38	1.73	3.19	2.26	2.03	2.76	8.6	3.91	7.03	14.6	21.4	7.33	9.28	3.66	9.05	2.4	3.02	–	100
Acenaphthene	2.25	20.4	18.7	3.83	3.59	1.35	2.97	2.27	2.22	2.46	6.95	3.12	4.23	11.8	23.5	6.21	7.22	3.35	6.43	1.68	2.66	–	100
Fluorene	3.9	35.3	31.5	10.9	8.86	3.37	7.45	5.99	6.03	6.18	17	7.53	14.4	22.4	34.4	14	17.7	7.98	16	4.16	7.88	–	100
Phenanthrene	19.9	235	184	52.1	45.6	18.3	37.5	28.3	29.2	34.5	92.3	41.7	69.8	142	201	76	87.7	44.3	83.5	23.7	38.1	240	100
Dibenzothiophene	1.58	16.3	13.6	6.16	4.79	1.96	4.18	2.98	3.32	3.63	9.29	4.4	7.26	11.5	15.1	7.52	8.91	4.28	8.38	2.69	4.24	–	–
Anthracene	5.93	79.3	52.1	10.8	9.09	3.76	7.38	5.33	4.96	6.69	20.3	9.21	15	38.8	60.6	16.9	19.5	9.1	18.8	5.28	6.72	85	100
Fluoranthene	27.2	381	287	67.2	58.4	22.9	47.5	32.6	31.8	42.1	129	56.6	91.9	235	326	103	126	55.3	123	31.2	43	600	100
Pyrene	29.7	416	318	68.9	60	24.7	47.5	33.2	31.2	42.2	131	57.8	95.6	251	373	108	129	55.3	129	32.6	41.4	665	100
Benzo[a]anthracene	16.3	220	164	43	35.3	15	28.2	18.8	19.3	24.5	76.8	35.5	59.1	137	190	68	78.4	32.5	75.7	20.4	24.9	261	100
Chrysene	17.1	236	173	49.9	42.2	17.2	33.2	24.3	24.5	31.1	90.4	41.5	69.6	148	208	75.1	91.1	40.7	88	23.5	32.1	384	100
Benzo[b]fluoranthene	21.7	266	233	96.1	82.1	33.4	64.6	43	42.7	55.9	162	82.9	136	211	294	140	182	74.3	160	45.8	59.5	–	100
Benzo[k]fluoranthene	13	156	134	48.8	35.6	16.6	28.8	18	19.7	28.9	88.1	40.5	71.3	108	133	61.9	77.2	32.9	78.5	21.1	23.3	–	100
Benzo[e]pyrene	21.5	240	204	83.8	70.4	29.7	55.1	35.7	35.8	47.6	143	71.7	116	186	258	117	148	63.7	137	40.5	47.4	–	–
Benzo[a]pyrene	21.3	277	216	62.1	50.8	21.4	39.9	26.3	25.2	34.4	114	54.5	83.8	182	278	95.9	116	46.7	113	30	34.5	430	100
Perylene	7.97	84	68	23.7	19	8.34	16.2	9.03	9.89	14.1	42.6	21.3	33.5	66.6	88.3	38.1	40.7	18.9	43	12.4	12	–	–
Indeno[123,cd]pyrene	20.6	228	205	102	85.5	36.4	65.8	44.3	42.9	56.4	168	90.1	143	198	268	142	179	79.6	168	50.9	58.4	240	–
Dibenzo[a,h]anthracene	3.16	44.4	39.2	15.9	12.3	6.28	9.81	6.45	6.84	8.63	26.3	15.1	20.9	37.3	51.9	21.1	33.5	13.8	23.6	7.25	10.6	–	10
Benzo[ghi]perylene	23.6	249	210	104	85.8	36.3	63.8	41.1	42.3	57.2	170	87.6	141	204	274	143	176	75.6	163	50.1	56.3	85	100

Analyte [µg/Kg]	Con199	Con200	Con201	Con202	Con204	Con205	Con207	Con210	ERL	AL1
Naphthalene	14.6	33.8	86.1	12.5	5.18	4.72	7.44	8.09	160	100
Acenaphthylene	2.89	10.7	23	2.44	<1	<1	1.09	1.06	–	100
Acenaphthene	2.49	8.93	27	1.82	<1	2.41	1.22	1.25	–	100
Fluorene	6.67	18.9	44.6	5.87	2.13	3.5	3.07	3.46	–	100
Phenanthrene	33.1	100	275	27	11.2	15.6	17	17.6	240	100
Dibenzothiophene	3.68	9.31	18.3	3.03	1.35	1.49	1.71	2.2	–	–
Anthracene	6.35	25.5	86	5.27	1.88	2.94	3.92	2.85	85	100
Fluoranthene	39.8	157	460	32.8	11.7	16	23.4	17.6	600	100
Pyrene	39.9	169	477	33.5	10.6	13.1	21.4	17.9	665	100
Benzo[a]anthracene	23.9	94.9	252	19.2	6.34	8.02	11.8	10.5	261	100
Chrysene	29.7	104	264	24.4	8.66	10.9	14.4	14.2	384	100
Benzo[b]fluoranthene	57.4	166	274	48	14.5	15.1	22.6	25.1	–	100
Benzo[k]fluoranthene	20.9	71.9	170	27.8	8.08	6.03	9.2	12.06	–	100
Benzo[e]pyrene	47.3	144	252	42.4	12.1	12.4	18.9	20.6	–	–
Benzo[a]pyrene	32.6	133	300	27.8	8.32	9.34	15.3	14.2	430	100
Perylene	13.1	47.5	91.7	11.3	3.51	4.01	6.28	5.21	–	–
Indeno[123,cd]pyrene	57.4	159	235	48	14.2	13.8	20.6	23.8	240	–
Dibenzo[a,h]anthracene	10.3	26.4	48.2	7.61	2.6	2.69	3.61	4.1	–	10
Benzo[ghi]perylene	55.3	158	242	49.9	13.5	13.6	21	23.5	85	100

Note: black normal text and green shading = quality standards not exceeded / black text and white background = no assessment / yellow shading = ERL exceeded / red text = Action Level 1 exceeded.

Table 13 Polycyclic Aromatic Hydrocarbons (PAH) in sediments (EPA), all values in µg/Kg (Dry Weight) – Part 2 (Islay Sediments – Report MAR01132)

Analyte [µg/Kg]	Con1	Con8	Con9	Con10	Con17	Con20	Con25	Con29	Con31	Con32	Con34	Con36	Con45	Con48	Con49	Con58	Con60	Con69	Con72	Con74	Con75	ERL	AL1
Naphthalene	<1	<1	<1	<1	<1	<1	1.10	<1	<1	<1	<1	<1	1.12	<1	<1	<1	<1	<1	<1	<1	<1	160	100
Acenaphthylene	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	–	100
Acenaphthene	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	–	100
Fluorene	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	–	100
Phenanthrene	1.71	1.80	<1	1.07	1.87	<1	1.85	<1	<1	1.54	<1	<1	2.32	<1	<1	<1	<1	<1	1.07	<1	<1	240	100
Dibenzothiophene	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	–	–
Anthracene	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	85	100
Fluoranthene	1.38	1.42	<1	1.19	1.94	<1	1.29	<1	<1	1.55	<1	<1	2.31	<1	1.08	<1	<1	<1	1.02	<1	<1	600	100
Pyrene	1.10	1.23	<1	<1	1.62	<1	1.20	<1	<1	1.22	<1	<1	1.86	<1	1.01	<1	<1	<1	<1	<1	<1	665	100
Benzo[a]anthracene	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	1.06	<1	<1	<1	<1	<1	<1	<1	<1	261	100
Chrysene	1.16	1.30	<1	<1	1.64	<1	1.26	<1	<1	1.00	<1	<1	1.93	<1	<1	<1	<1	<1	<1	<1	<1	384	100
Benzo[b]fluoranthene	2.04	1.96	<1	1.91	2.55	1.22	1.48	<1	<1	2.21	<1	1.32	2.72	<1	<1	<1	<1	<1	1.02	<1	<1	–	100
Benzo[k]fluoranthene	1.09	1.14	<1	<1	1.63	<1	<1	<1	<1	<1	<1	<1	1.76	<1	<1	<1	<1	<1	<1	<1	<1	–	100
Benzo[e]pyrene	1.57	1.81	<1	1.40	2.14	<1	1.35	<1	<1	1.73	<1	<1	2.33	<1	<1	<1	<1	<1	1.00	<1	<1	–	–
Benzo[a]pyrene	<1	<1	<1	<1	1.33	<1	<1	<1	<1	<1	<1	<1	1.50	<1	<1	<1	<1	<1	<1	<1	<1	430	100
Perylene	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	–	–
Indeno[123,cd]pyrene	1.98	1.97	<1	1.92	2.52	1.38	1.46	<1	<1	2.24	<1	1.36	2.92	<1	<1	<1	<1	<1	1.13	<1	<1	240	–
Dibenzo[a,h]anthracene	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	–	10
Benzo[ghi]perylene	1.70	1.88	<1	1.77	2.26	1.24	1.43	<1	<1	2.19	<1	1.29	2.63	<1	<1	<1	<1	<1	1.19	<1	<1	85	100

Analyte [µg/Kg]	Con78	Con81	Con116	Con125	Con133	Con154	Con214	Con218	Con221	Con248	Con249	Con251	Con253	Con266	Con268	Con271	ConDDV6	ERL	AL1
Naphthalene	<1	<1	<1	<1	<1	1.45	<1	1.38	<1	2.34	<1	<1	2.15	1.02	<1	2.01	<1	160	100
Acenaphthylene	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	–	100
Acenaphthene	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	–	100
Fluorene	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	–	100
Phenanthrene	<1	<1	<1	<1	1.11	3.37	<1	2.75	<1	4.72	1.51	1.73	3.96	<1	<1	4.07	<1	240	100
Dibenzothiophene	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	–	–
Anthracene	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	85	100
Fluoranthene	<1	<1	<1	<1	<1	2.11	<1	3.03	<1	3.71	1.35	1.34	3.80	<1	<1	3.69	<1	600	100
Pyrene	<1	<1	<1	<1	<1	1.85	<1	2.70	<1	3.18	1.29	1.20	3.43	<1	<1	3.19	<1	665	100
Benzo[a]anthracene	<1	<1	<1	<1	<1	1.06	<1	1.53	<1	1.83	<1	<1	1.95	<1	<1	1.82	<1	261	100
Chrysene	<1	<1	<1	<1	<1	1.97	<1	2.58	<1	3.40	1.21	1.24	3.13	<1	<1	3.26	<1	384	100
Benzo[b]fluoranthene	<1	<1	<1	<1	<1	2.38	<1	4.35	<1	3.90	1.83	1.84	4.08	1.06	<1	4.27	1.12	–	100
Benzo[k]fluoranthene	<1	<1	<1	<1	<1	1.27	<1	1.74	<1	2.30	<1	<1	2.32	<1	<1	1.76	<1	–	100
Benzo[e]pyrene	<1	<1	<1	<1	<1	2.23	<1	3.49	<1	3.56	1.55	1.54	3.94	<1	<1	3.59	<1	–	–
Benzo[a]pyrene	<1	<1	<1	<1	<1	1.32	<1	2.24	<1	2.38	<1	<1	2.41	<1	<1	2.30	<1	430	100
Perylene	<1	<1	<1	<1	<1	<1	<1	1.03	<1	<1	<1	<1	<1	<1	<1	<1	<1	–	–
Indeno[123,cd]pyrene	<1	1.05	<1	<1	<1	2.10	<1	4.20	<1	3.22	1.48	1.48	4.31	<1	<1	3.32	1.32	240	–
Dibenzo[a,h]anthracene	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	–	10
Benzo[ghi]perylene	<1	<1	<1	<1	<1	2.05	<1	4.16	<1	3.19	1.50	1.61	3.97	<1	<1	3.13	1.12	85	100

Note: black text and green shading = quality standards not exceeded / black text and white background = no assessment / yellow shading = ERL exceeded / red text = Action Level 1 exceeded.

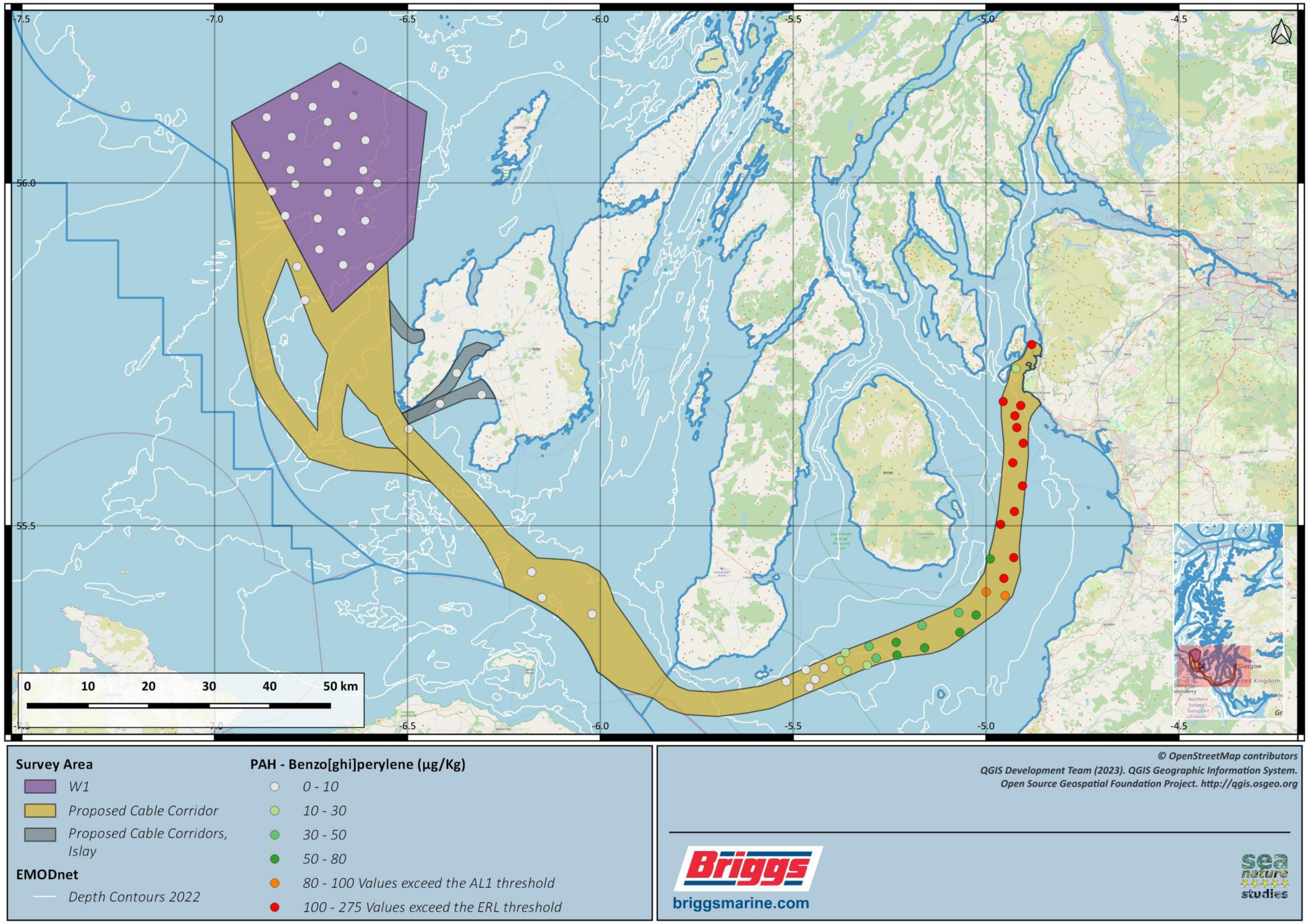


Figure 38 Benzo[ghi]perylene concentration and AL1 / ERL threshold exceedances

The PAH DTI results are provided in Table 14 to Table 17. No ERL or AL values are available, but the NPD / 4-6 ring PAH ratio indicates that apart from stations 74, 81, 133 and 266 all samples had values <1. Note that NPD is shorthand for, naphthalenes, phenanthrenes and dibenzothiophenes. The concentration of the sum of dibenzothiophenes have been mapped illustrating a gradient of increasing concentration at locations within the proposed cable corridor from southwest to northeast in the Firth of Clyde (Figure 39).

Table 14 Polycyclic Aromatic Hydrocarbons (PAH) in sediments (DTI) – Part 1 (Clyde Sediments – Report MAR01135)

Analyte [µg/Kg]	Con163	Con164	Con167	Con170	Con171	Con172	Con173	Con175	Con176	Con178	Con179	Con181	Con182	Con185	Con187	Con188	Con189	Con191	Con194	Con196	Con197
Naphthalene	13.9	60.2	51.3	22.4	20.3	7.7	16.3	11.5	13.6	15.0	37.2	17.7	29.3	45.0	53.8	29.6	35.8	18.1	35.1	11.5	16.8
C1 Naphthalenes	40.9	158	141	66.5	58.6	22.3	49.0	35.1	40.0	42.6	106	48.1	83.9	129	139	86.4	104	50.7	91.8	30.9	49.1
C2 Naphthalenes	41.6	202	179	78.7	65.1	25.3	57.9	46.0	44.0	47.6	117	56.3	96.3	155	171	95.4	116	58.6	114	32.7	55.9
C3 Naphthalenes	49.1	267	209	80.8	69.3	22.8	56.6	39.8	44.8	47.9	110	54.3	96.0	171	189	91.3	119	56.0	115	34.0	53.2
C4 Naphthalenes	38.6	140	106	34.5	32.4	12.5	25.0	18.6	18.6	19.7	49.3	26.6	44.0	86.2	105	45.3	57.9	26.1	51.9	19.3	24.4
Sum Naphthalenes	184	827	686	283	246	90.7	205	151	161	173	420	203	349	586	658	348	432	209	408	128	199
Phenanthrene / Anthracene	25.8	315	236	62.9	54.7	22.1	44.9	33.7	34.2	41.1	113	50.9	84.8	181	261	92.9	107	53.4	102	29.0	44.9
C1 178	32.6	263	202	73.7	63.8	27.7	52.9	39.2	43.0	47.8	128	62.2	100	178	223	103	119	59.7	120	34.5	55.2
C2 178	37.9	272	204	71.2	59.3	27.2	50.4	37.1	49.5	48.7	112	58.7	92.0	196	244	95.9	112	56.2	103	33.0	52.2
C3 178	30.8	190	156	50.8	43.7	20.2	38.8	26.7	27.3	33.1	82.6	43.7	65.8	137	154	65.5	87.8	43.1	83.9	24.6	35.3
Sum 178	127	1040	797	259	222	97.2	187	137	154	171	435	216	342	693	882	357	426	212	409	121	188
Dibenzothiophene	1.58	16.3	13.6	6.16	4.79	1.96	4.18	2.98	3.32	3.63	9.29	4.40	7.26	11.5	15.1	7.52	8.91	4.28	8.38	2.69	4.24
C1 Dibenzothiophenes	7.83	41.5	27.4	11.3	9.68	4.23	8.11	7.81	6.40	7.75	19.3	7.97	14.0	26.2	31.0	17.0	16.9	9.01	18.9	5.50	7.42
C2 Dibenzothiophenes	9.00	63.1	40.1	15.4	14.6	5.87	11.5	7.56	8.40	10.1	26.1	13.2	19.7	41.8	50.1	20.5	25.9	12.0	27.5	7.66	11.1
C3 Dibenzothiophenes	4.77	35.0	25.8	9.14	11.8	5.44	9.17	4.39	5.07	8.80	18.3	10.0	18.1	35.9	38.5	19.1	22.4	11.2	18.7	6.98	8.36
Sum Dibenzothiophenes	23.2	156	107	42.0	40.9	17.5	33.0	22.7	23.2	30.3	72.9	35.6	59.1	115	135	64.1	74.1	36.4	73.5	22.8	31.1
Fluoranthene / pyrene	56.9	797	605	136	118	47.6	95.0	65.8	63.0	84.4	260	114	187	487	699	210	255	111	252	63.7	84.5
C1 202	34.3	346	274	79.6	67.4	28.5	52.9	38.6	38.2	48.0	134	64.0	105	211	292	114	133	62.3	133	36.6	50.4
C2 202	32.6	283	207	76.3	78.1	28.4	57.6	40.7	43.0	49.9	132	69.3	109	193	239	107	136	62.0	123	38.7	54.6
C3 202	21.9	208	175	68.1	56.5	23.5	44.8	32.1	36.0	39.1	109	55.4	80.0	137	168	89	104	52.8	107	32.9	43.7
Sum 202	146	1630	1260	360	320	128	250	177	180	221	635	303	481	1029	1399	521	629	288	614	172	233
Benzoanthracene / Chrysene	33.3	456	337	92.9	77.5	32.2	61.5	43.0	43.8	55.6	167	77.0	129	284	398	143	169	73.3	164	43.9	57.0
C1 228	22.6	233	196	66.0	59.5	25.3	48.6	33.3	35.2	43.9	123	59.7	93.0	176	226	100	117	52.1	112	33.0	44.7
C2 228	21.5	221	219	72.8	59.3	27.0	50.8	36.9	41.8	43.6	151	67.8	98.0	202	224	88.2	108	59.0	133	29.9	50.6
Sum 228	77.5	910	753	232	196	84.5	161	113	121	143	441	204	320	662	847	331	394	184	408	107	152
Benzofluoranthenes / benzopyrenes	77.5	940	786	291	239	101	188	123	123	167	507	250	407	686	963	415	523	218	488	138	165
C1 252	36.1	372	318	127	111	46.9	85.8	59.3	64.3	73.4	216	113	183	289	402	189	219	101	211	62.6	78.1
C2 252	29.2	254	187	111	88.6	38.3	75.9	53.4	49.8	62.0	184	92.6	147	216	257	137	182	79.2	168	53.0	68.9
Sum 252	143	1570	1290	529	439	186	350	236	238	302	907	455	737	1190	1622	741	924	398	867	253	312
Dibenzoanthracene / Indenopyrene / Benzoperylene	47.3	521	454	222	184	79.0	139	91.9	92.0	122	364	193	305	439	595	306	390	169	355	108	125
C1 276	8.67	95.7	67.2	41.2	30.9	13.6	24.0	16.7	16.6	21.7	62.3	31.9	48.3	73.2	107	50.7	57.3	29.1	60.3	16.6	22.4
C2 276	4.93	34.3	48.4	25.5	26.6	12.6	19.0	13.4	13.3	15.2	42.6	28.7	38.0	48.0	64.3	38.2	49.0	22.6	46.1	14.6	18.3
Sum 276	60.9	651	570	288	241	105	182	122	122	159	469	254	391	560	766	395	496	221	461	139	166
Sum of all fractions	761	6780	5470	1990	1700	709	1370	959	999	1200	3380	1670	2680	4840	6310	2760	3380	1550	3240	944	1280
Sum of NPD fraction	334	2020	1590	584	508	205	425	310	338	374	927	454	751	1390	1670	769	932	458	890	272	418
NPD / 4-6 ring PAH ratio	0.78	0.42	0.41	0.41	0.42	0.41	0.45	0.48	0.51	0.45	0.38	0.37	0.39	0.41	0.36	0.39	0.38	0.42	0.38	0.41	0.48

Table 15 Polycyclic Aromatic Hydrocarbons (PAH) in sediments (DTI) – Part 2 Continued (Clyde Sediments – Report MAR01135)

Analyte [µg/Kg]	Con199	Con200	Con201	Con202	Con204	Con205	Con207	Con210
Naphthalene	14.6	33.8	86.1	12.5	5.18	4.72	7.44	8.09
C1 Naphthalenes	43.5	101	214	36.2	14.1	12.6	19.1	22.1
C2 Naphthalenes	49.1	118	268	43.3	16.6	14.3	22.8	25.0
C3 Naphthalenes	55.0	128	349	41.6	15.4	13.4	20.7	25.4
C4 Naphthalenes	21.9	63.3	189	22.4	6.63	6.32	9.66	11.7
Sum Naphthalenes	184	445	1110	156	58.0	51.3	79.7	92.3
Phenanthrene / Anthracene	39.4	125	361	32.3	13.1	18.6	20.9	20.5
C1 178	48.7	131	334	40.2	15.8	15.5	23.1	26.6
C2 178	43.7	124	360	39.8	15.2	13.8	21.8	24.4
C3 178	29.5	89.5	272	26.4	10.6	7.73	13.3	15.9
Sum 178	161	470	1330	139	54.7	55.7	79.1	87.4
Dibenzothiophene	3.68	9.31	18.3	3.03	1.35	1.49	1.71	2.20
C1 Dibenzothiophenes	6.17	17.4	54.3	6.86	2.42	2.93	3.74	3.56
C2 Dibenzothiophenes	9.67	28.5	67.8	8.58	2.79	2.49	4.83	5.67
C3 Dibenzothiophenes	8.19	20.2	53.3	7.82	2.34	1.95	3.45	3.80
Sum Dibenzothiophenes	27.7	75.5	194	26.3	8.90	8.85	13.7	15.2
Fluoranthene / pyrene	79.7	326	937	66.3	22.3	29.1	44.8	35.5
C1 202	46.5	160	391	38.9	13.6	14.4	22.0	22.9
C2 202	51.7	152	311	40.8	14.9	13.9	22.2	26.6
C3 202	42.0	111	260	34.9	13.3	12.0	20.7	21.7
Sum 202	220	749	1900	181	64.2	69.4	110	107
Benzoanthracene / Chrysene	53.7	199	517	43.5	15.0	19.0	26.1	24.7
C1 228	39.5	131	262	31.1	11.7	11.7	17.4	22.2
C2 228	43.7	116	295	38.4	12.6	10.9	19.0	23.8
Sum 228	137	445	1070	113	39.3	41.6	62.6	70.7
Benzofluoranthenes / benzopyrenes	158	515	996	146	42.9	42.8	65.9	72.0
C1 252	78.8	219	408	63.3	20.9	19.6	30.9	35.8
C2 252	58.6	182	270	53.9	18.1	14.8	25.2	29.0
Sum 252	296	916	1670	263	81.9	77.1	122	137
Dibenzoanthracene / Indenopyrene / Benzoperylene	123	344	526	105	30.3	30.1	45.2	51.4
C1 276	22.0	60.1	96.5	20.0	5.61	5.05	8.11	11.3
C2 276	17.9	41.0	48.1	12.6	3.91	4.07	5.74	6.51
Sum 276	163	445	670	138	39.9	39.2	59.0	69.2
Sum of all fractions	1190	3540	7940	1016	347	343	526	578
Sum of NPD fraction	373	990	2630	321	122	116	172	195
NPD / 4-6 ring PAH ratio	0.46	0.39	0.49	0.46	0.54	0.51	0.49	0.51

Table 16 Polycyclic Aromatic Hydrocarbons (PAH) in sediments (DTI) – Part 2 (Islay Sediments – Report MAR01132)

Analyte [µg/Kg]	Con1	Con8	Con9	Con10	Con17	Con20	Con25	Con29	Con31	Con32	Con34	Con36	Con45	Con48	Con49	Con51	Con58	Con60	Con69	Con72	Con74
Naphthalene	<1	<1	<1	<1	<1	<1	1.10	<1	<1	<1	<1	<1	1.12	<1	<1	<1	<1	<1	<1	<1	<1
C1 Naphthalenes	2.02	2.59	<1	1.42	2.37	1.22	2.40	<1	<1	2.17	<1	1.30	3.20	<1	<1	1.37	<1	<1	<1	1.37	1.08
C2 Naphthalenes	2.61	3.37	<1	2.68	3.56	3.76	2.62	<1	<1	3.15	<1	2.03	4.13	<1	<1	1.09	<1	<1	<1	2.28	1.52
C3 Naphthalenes	1.89	3.11	<1	1.44	2.51	1.22	2.36	<1	<1	2.04	<1	1.24	2.75	<1	<1	<1	<1	<1	<1	1.33	<1
C4 Naphthalenes	<1	1.27	<1	<1	1.13	<1	1.02	<1	<1	<1	<1	<1	1.21	<1	<1	<1	<1	<1	<1	<1	<1
Sum Naphthalenes	6.52	10.3	<5	5.54	9.57	6.20	9.51	<5	<5	7.37	<5	<5	12.4	<5	<5	<5	<5	<5	<5	<5	<5
Phenanthrene / Anthracene	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	2.32	<2	<2	<2	<2	<2	<2	<2	<2
C1 178	2.27	2.86	<1	1.58	2.72	1.28	2.65	<1	<1	2.16	<1	1.09	3.08	<1	<1	<1	<1	<1	<1	1.52	<1
C2 178	2.48	2.95	<1	1.67	3.01	1.28	2.67	<1	<1	2.56	<1	1.17	3.63	<1	<1	<1	<1	<1	<1	1.46	<1
C3 178	1.64	1.86	<1	<1	1.90	<1	1.21	<1	<1	1.85	<1	<1	1.64	<1	<1	<1	<1	<1	<1	<1	<1
Sum 178	8.09	9.47	<5	<5	9.50	<5	8.39	<5	<5	8.11	<5	<5	10.7	<5	<5	<5	<5	<5	<5	<5	<5
Dibenzothiophene	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
C1 Dibenzothiophenes	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
C2 Dibenzothiophenes	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
C3 Dibenzothiophenes	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Sum Dibenzothiophenes	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4
Fluoranthene / pyrene	2.48	2.65	<2	<2	3.56	<2	2.49	<2	<2	2.77	<2	<2	4.17	<2	2.09	<2	<2	<2	<2	<2	<2
C1 202	1.70	2.05	<1	1.31	2.26	1.07	1.81	<1	<1	1.78	<1	<1	2.58	<1	<1	<1	<1	<1	<1	1.17	<1
C2 202	1.88	2.26	<1	1.36	2.37	1.07	2.22	<1	<1	1.99	<1	1.05	2.74	<1	<1	<1	<1	<1	<1	1.21	<1
C3 202	1.62	1.81	<1	<1	2.22	<1	2.13	<1	<1	1.52	<1	<1	2.41	<1	<1	<1	<1	<1	<1	1.08	<1
Sum 202	7.68	8.77	<5	<5	10.4	<5	8.65	<5	<5	8.06	<5	<5	11.9	<5	<5	<5	<5	<5	<5	<5	<5
Benzoanthracene / Chrysene	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	2.99	<2	<2	<2	<2	<2	<2	<2	<2
C1 228	1.61	1.77	<1	1.27	1.85	1.05	1.62	<1	<1	1.62	<1	<1	2.19	<1	<1	<1	<1	<1	<1	<1	<1
C2 228	1.53	2.14	<1	1.26	1.90	1.17	1.64	<1	<1	1.54	<1	<1	2.26	<1	<1	<1	<1	<1	<1	<1	<1
Sum 228	4.31	5.21	<4	<4	5.39	<4	4.52	<4	<4	4.17	<4	<4	7.44	<4	<4	<4	<4	<4	<4	<4	<4
Benzofluoranthenes / benzopyrenes	4.70	4.92	<4	<4	7.65	<4	<4	<4	<4	<4	<4	<4	8.31	<4	<4	<4	<4	<4	<4	<4	<4
C1 252	2.74	3.05	<1	2.40	3.42	1.82	2.45	<1	<1	3.10	<1	1.67	3.77	<1	<1	<1	<1	<1	<1	1.59	1.04
C2 252	2.36	2.53	<1	2.13	2.78	1.48	2.05	<1	<1	2.87	<1	1.33	3.30	<1	<1	<1	<1	<1	<1	1.52	<1
Sum 252	9.80	10.5	<6	7.85	13.8	<6	7.33	<6	<6	9.91	<6	<6	15.4	<6	<6	<6	<6	<6	<6	<6	<6
Dibenzoanthracene / Indenopyrene / Benzoperylene	3.68	3.85	<3	3.69	4.78	<3	<3	<3	<3	4.43	<3	<3	5.56	<3	<3	<3	<3	<3	<3	<3	<3
C1 276	<1	<1	<1	<1	1.04	<1	<1	<1	<1	<1	<1	<1	1.21	<1	<1	<1	<1	<1	<1	<1	<1
C2 276	<1	<1	<1	<1	1.07	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Sum 276	<5	<5	<5	<5	6.89	<5	<5	<5	<5	<5	<5	<5	6.76	<5	<5	<5	<5	<5	<5	<5	<5
Sum of all fractions	40.1	48.1	<34	<34	55.6	<34	41.3	<34	<34	42.0	<34	<34	64.6	<34	<34	<34	<34	<34	<34	<34	<34
Sum of NPD fraction	14.6	19.8	<14	<14	19.1	8.77	17.9	<14	<14	15.5	<14	<14	23.1	<14	<14	<14	<14	<14	<14	<14	<14
NPD / 4-6 ring PAH ratio	0.57	0.70	-	0.55	0.52	0.76	0.77	-	-	0.58	-	0.85	0.56	-	-	-	-	-	-	0.76	2.48

Table 17 Polycyclic Aromatic Hydrocarbons (PAH) in sediments (DTI) – Part 2 Continued (Islay Sediments – Report MAR01132)

Analyte [µg/Kg]	Con75	Con78	Con81	Con116	Con125	Con133	Con154	Con214	Con218	Con221	Con248	Con249	Con251	Con253	Con266	Con268	Con271	ConDDV6
Naphthalene	<1	<1	<1	<1	<1	<1	1.45	<1	1.38	<1	2.34	<1	<1	2.15	1.02	<1	2.01	<1
C1 Naphthalenes	<1	<1	1.30	<1	<1	1.67	4.81	<1	3.77	<1	5.71	2.04	2.20	5.55	1.87	1.01	5.26	1.44
C2 Naphthalenes	1.26	<1	2.25	<1	<1	1.98	5.71	<1	4.30	<1	6.08	2.13	2.37	6.13	3.07	1.54	5.62	2.25
C3 Naphthalenes	<1	<1	1.06	<1	<1	1.81	4.21	<1	3.46	<1	5.27	1.73	1.79	5.29	1.21	<1	4.34	1.21
C4 Naphthalenes	<1	<1	<1	<1	<1	<1	1.80	<1	1.89	<1	2.31	<1	<1	2.72	<1	<1	1.91	<1
Sum Naphthalenes	<5	<5	<5	<5	<5	5.46	18.0	<5	14.8	<5	21.7	5.90	6.36	21.8	7.16	<5	19.1	<5
Phenanthrene / Anthracene	<2	<2	<2	<2	<2	<2	3.37	<2	2.75	<2	4.72	<2	<2	3.96	<2	<2	4.07	<2
C1 178	<1	<1	1.25	<1	<1	1.34	4.34	<1	3.93	<1	6.65	2.08	2.49	5.96	1.37	<1	5.51	1.39
C2 178	<1	<1	1.21	<1	<1	1.22	4.06	<1	3.91	<1	5.67	1.95	2.07	5.11	1.15	<1	5.01	1.20
C3 178	<1	<1	<1	<1	<1	<1	2.54	<1	2.27	<1	3.28	1.08	1.15	2.62	<1	<1	2.71	<1
Sum 178	<5	<5	<5	<5	<5	<5	14.3	<5	12.8	<5	20.3	6.61	7.44	17.7	<5	<5	17.3	<5
Dibenzothiophene	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
C1 Dibenzothiophenes	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	1.06	<1	<1	<1	<1
C2 Dibenzothiophenes	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	1.10	<1	<1	<1	<1
C3 Dibenzothiophenes	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Sum Dibenzothiophenes	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4
Fluoranthene / pyrene	<2	<2	<2	<2	<2	<2	3.96	<2	5.74	<2	6.89	2.64	2.54	7.23	<2	<2	6.88	<2
C1 202	<1	<1	<1	<1	<1	<1	2.77	<1	3.33	<1	4.45	1.70	1.69	4.63	<1	<1	4.18	<1
C2 202	<1	<1	1.04	<1	<1	<1	3.50	<1	3.68	<1	4.98	1.83	1.90	4.90	<1	<1	4.43	1.23
C3 202	<1	<1	<1	<1	<1	<1	3.17	<1	3.28	<1	4.05	1.57	1.64	4.06	<1	<1	3.97	1.02
Sum 202	<5	<5	<5	<5	<5	<5	13.4	<5	16.0	<5	20.4	7.75	7.76	20.8	<5	<5	19.5	<5
Benzoanthracene / Chrysene	<2	<2	<2	<2	<2	<2	3.03	<2	4.11	<2	5.22	<2	<2	5.08	<2	<2	5.08	<2
C1 228	<1	<1	<1	<1	<1	<1	2.71	<1	3.27	<1	3.77	1.55	1.51	4.16	<1	<1	3.68	<1
C2 228	<1	<1	<1	<1	<1	<1	2.71	<1	4.07	<1	3.60	1.60	1.28	4.16	<1	<1	2.99	<1
Sum 228	<4	<4	<4	<4	<4	<4	8.45	<4	11.4	<4	12.6	4.36	4.03	13.4	<4	<4	11.8	<4
Benzofluoranthenes / benzopyrenes	<4	<4	<4	<4	<4	<4	7.19	<4	11.8	<4	12.1	<4	<4	12.8	<4	<4	11.9	<4
C1 252	1.31	<1	1.36	<1	<1	1.32	3.59	<1	6.02	<1	6.07	2.55	2.45	6.30	1.42	<1	5.53	1.82
C2 252	1.09	<1	1.15	<1	<1	1.27	3.44	<1	4.80	<1	4.96	1.64	2.26	5.40	1.16	<1	<1	1.56
Sum 252	<6	<6	<6	<6	<6	<6	14.2	<6	22.6	<6	23.2	7.56	8.10	24.5	<6	<6	17.4	<6
Dibenzoanthracene / Indenopyrene / Benzoperylene	<3	<3	<3	<3	<3	<3	4.16	<3	8.36	<3	6.41	<3	3.10	8.28	<3	<3	6.45	<3
C1 276	<1	<1	<1	<1	<1	<1	<1	<1	1.50	<1	1.54	<1	<1	1.39	<1	<1	1.48	<1
C2 276	<1	<1	<1	<1	<1	<1	<1	<1	1.18	<1	1.33	<1	<1	1.57	<1	<1	1.18	<1
Sum 276	<5	<5	<5	<5	<5	<5	<5	<5	11.0	<5	9.28	<5	<5	11.2	<5	<5	9.11	<5
Sum of all fractions	<34	<34	<34	<34	<34	<34	72.5	<34	88.8	<34	107	35.2	36.8	112	<34	<34	94.2	<34
Sum of NPD fraction	<14	<14	<14	<14	<14	<14	32.3	<14	27.7	<14	42.0	<14	<14	41.7	<14	<14	36.4	<14
NPD / 4-6 ring PAH ratio	0.53	-	1.54	-	-	3.52	0.80	-	0.45	-	0.60	0.55	0.60	0.60	2.66	-	0.63	0.82

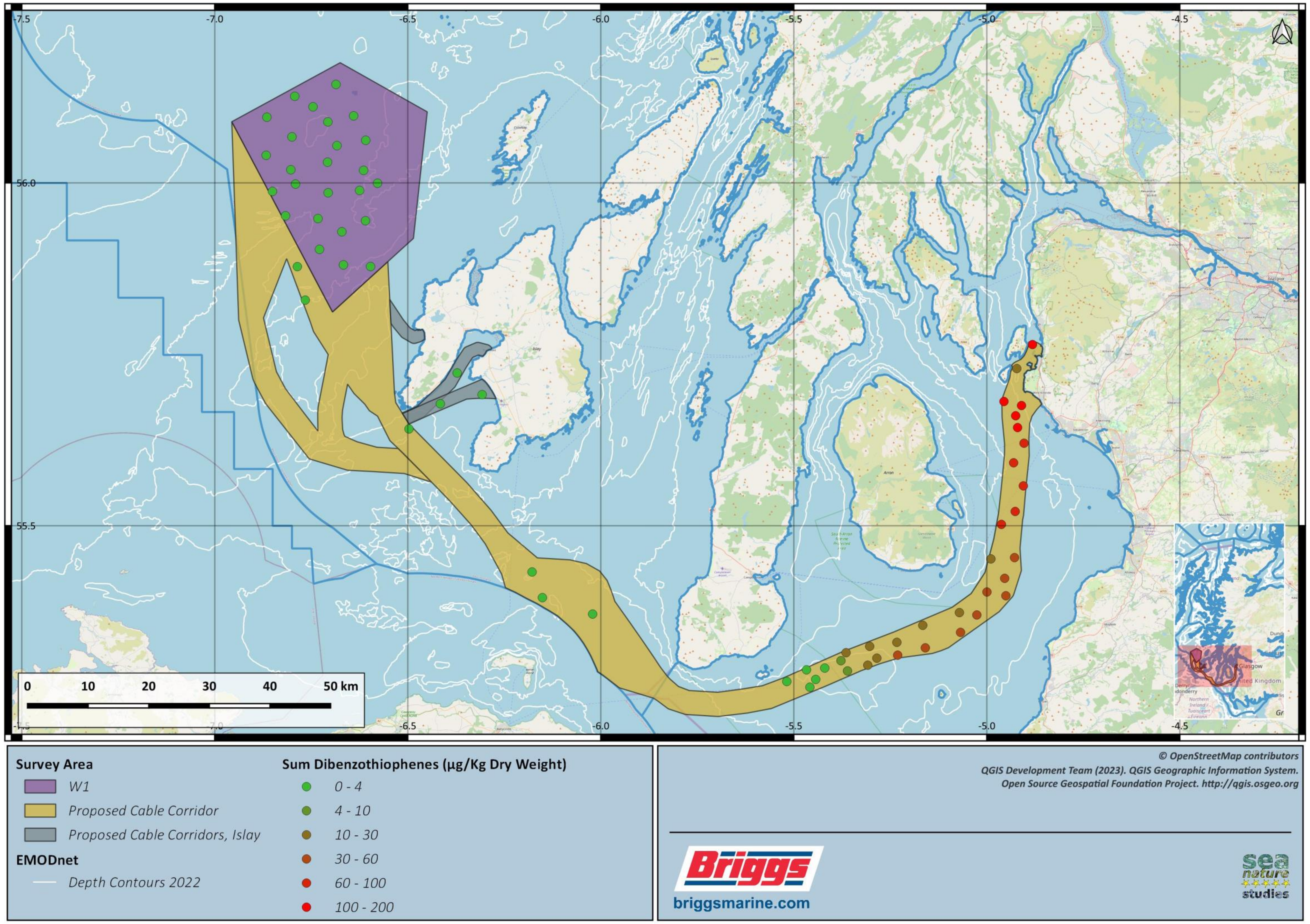


Figure 39 The sum of the Dibenzothiophene concentrations at locations across the area surveyed

Metal concentrations for Arsenic (As), Chromium (Cr), Copper (Cu), Mercury (Hg), Nickel (Ni), Lead (Pb) and Zinc (Zn) exceeded threshold values one or more times at 18 of the 29 sites reported by the SOCOTEC in MAR01135 (Table 18; Appendix 1). Exceedances for the 39 stations reported in the SOCOTEC in MAR01132 document were confined to 6 stations for As (Table 19; Appendix 1).

An example plot is provided to illustrate the gradient of increasing concentration at locations within the proposed cable corridor from southwest to northeast in the Firth of Clyde, for nickel (Figure 40).

Table 18 Metal concentrations in sediments (mg/kg) – Part 1 (Clyde Sediments – Report MAR01135)

Stations	As	Cd	Cr	Cu	Hg	Ni	Pb	Zn
Con163	5.6	0.08	9.8	7.4	0.04	6.8	11.3	34.3
Con164	11.1	0.19	53	24.2	0.24	46.1	42.4	109
Con167	11.2	0.18	60.8	27.6	0.23	50.5	51	136
Con170	7.3	0.16	41.4	19.5	0.1	31.9	34.8	100
Con171	5.8	0.16	33.4	15.2	0.07	26	28.2	81.1
Con172	5.3	0.12	20.8	11.7	0.05	17.2	14.9	46.8
Con173	6.3	0.15	33.5	16.4	0.09	25.8	27.5	83.4
Con175	5.8	0.15	23.8	11.7	0.06	18.9	18.2	58.3
Con176	5.5	0.14	22.4	10.8	0.05	17.3	16	52.8
Con178	6.3	0.13	27.1	13.7	0.06	21.5	21.8	69.2
Con179	9.1	0.13	55.7	25.8	0.15	44	52.8	147
Con181	6.5	0.15	37.9	18	0.08	28.5	30.9	93.9
Con182	8.4	0.11	47.8	21.8	0.1	37.4	43.8	119
Con185	9.4	0.16	62.7	28.8	0.22	51.2	51.1	139
Con187	10.9	0.14	70.1	32	0.32	50.8	63.3	155
Con188	8.9	0.13	54.1	24.7	0.14	42.1	47.8	134
Con189	10.6	0.15	54	25.3	0.12	40.8	51.7	143
Con191	7.4	0.13	34.7	15.4	0.07	27.1	28.9	87
Con194	10.6	0.12	51.2	24.8	0.13	41.6	49.8	136
Con196	5.5	0.07	23.1	10.5	0.05	16.9	17.8	50.5
Con197	5.8	0.12	27.7	14.1	0.04	22.1	21.7	69.6
Con199	5.7	0.1	24.8	14.1	0.03	20.5	19.9	66.2
Con200	9.4	0.11	45.4	21.4	0.13	37.5	40.3	102
Con201	11	0.21	55.9	21.6	0.2	43	41.8	113
Con202	9.7	0.09	24.6	11.7	0.03	18.9	20.3	55.9
Con204	5	0.11	14.4	10.5	<0.01	11.9	11.7	41.1
Con205	5.9	0.14	14.9	9	0.02	12.2	12.3	39.3
Con207	4.7	0.12	13.9	8.1	0.02	11.4	10.3	38.1
Con210	4.8	0.09	16.4	7.6	0.01	13	11	39.4
Minimum	4.7	0.07	9.8	7.4	0.01	6.8	10.3	34.3
Maximum	11.2	0.21	70.1	32	0.32	51.2	63.3	155
Median	6.5	0.13	33.5	15.4	0.075	26	28.2	83.4
Mean	7.57	0.13	36.39	17.36	0.10	28.72	30.80	87.58
Standard Deviation	2.26	0.03	17.24	7.14	0.08	13.66	15.91	38.97
ERL	8.2	1.2	81	34	0.15	21	47	150
Marine Scotland - AL1	20	0.4	50	30	0.25	30	50	130
Marine Scotland - AL2	70	4	370	300	1.5	150	400	600

Note: black text and green shading = quality standards not exceeded / red text = ERL exceeded / orange highlight = Action Level 1 exceeded.

Table 19 Metal concentrations in sediments (mg/kg) – Part 2 (Islay Sediments – Report MAR01132)

Stations	As	Cd	Cr	Cu	Hg	Ni	Pb	Zn
Con1	4.4	0.08	7.8	4.9	0.05	6.4	5.4	15.5
Con8	3.7	0.05	10.3	5.6	0.05	7.1	5	15.1
Con9	5.4	0.05	7.3	5.4	0.05	8.2	3.8	18.9
Con10	3.5	0.06	8.4	6	0.04	6.8	4.4	15.2
Con17	4.1	0.07	7.4	4.6	0.04	5.6	4.4	14.8
Con20	3.7	0.06	6.8	4.9	0.04	6.3	4.2	12.1
Con25	6	0.1	5.8	5.9	0.06	5.6	4.5	13.7
Con29	5.3	0.05	7.3	5	0.05	6.8	3.6	20.8
Con31	5.4	0.06	4.6	4.8	0.04	4.5	2.4	14.2
Con32	4.9	0.2	9	6	0.05	6.9	7.7	41.9
Con34	4.8	0.15	7	5.6	0.05	7.2	4.9	39
Con36	4.1	0.14	8.2	5.6	0.04	7.1	5	32.5
Con45	5.6	0.06	6.4	4.9	0.04	5.8	4.8	20.9
Con48	4.7	0.06	6.3	7.4	0.06	6	4.7	24.4
Con49	7.5	0.06	4.9	4.3	0.05	5	3	22.9
Con51	4.7	0.07	6.6	5	0.05	6.9	3.4	16.7
Con58	5.9	0.06	3.2	5.3	0.03	4.1	3.7	15.2
Con60	5.8	<0.04	5.4	4.7	0.03	5.7	3.1	10.1
Con69	3.9	<0.04	7.2	4.9	0.03	7	3.1	29
Con72	4.3	0.06	6.6	5.3	0.03	6.4	4.2	16.9
Con74	4.3	<0.04	7.1	5.3	0.03	6.5	3.6	11.9
Con75	4.9	0.04	6.3	4.6	0.03	6.2	4.3	37
Con78	3.2	<0.04	6.8	5.5	0.04	6.8	2.3	39.4
Con81	4.7	<0.04	7.2	4.6	0.03	7.1	4.4	21.1
Con116	4	0.06	3.3	4.8	0.03	4.8	2.9	11.4
Con125	7.5	0.07	3.1	4.6	0.02	5.4	4.9	10.5
Con133	8.8	<0.04	7	5.7	0.03	7.8	10	70.6
Con154	12	0.09	18.7	13.1	0.03	20.8	9.5	102
Con214	10.2	0.04	8	6.4	0.03	9.3	10.8	95.6
Con218	5.3	0.04	10.4	6.5	0.05	7.9	10.6	41.2
Con221	4.9	<0.04	4.9	5	0.03	5.4	2.7	23.2
Con248	4.5	<0.04	4.5	6.6	0.02	14.5	5.4	31.4
Con249	8	0.05	10.2	6.6	0.03	9.4	7.9	35.9
Con251	14.6	0.05	12.9	7.7	0.03	11.7	11.4	81.2
Con253	9.4	0.06	8.6	6.8	0.03	8.3	11.8	63.4
Con266	6.6	<0.04	9.6	5.9	0.03	5.6	6.1	50.8
Con268	4.1	<0.04	5.9	5.4	0.05	4.2	3.7	19.8
Con271	10.6	0.05	6.6	5.5	0.03	6.2	9.8	66.9
ConDDV6	4.1	0.05	9.1	3.9	0.03	7.3	4.9	29.5
Minimum	3.2	0.04	3.1	3.9	0.02	4.1	2.3	10.1
Maximum	14.6	0.2	18.7	13.1	0.06	20.8	11.8	102
Median	4.9	0.06	7	5.4	0.03	6.8	4.5	22.9
Mean	5.9	0.1	7.4	5.7	0.0	7.2	5.4	32.1
Standard Deviation	2.5	0.0	2.8	1.5	0.0	3.0	2.7	23.7
ERL	8.2	1.2	81	34	0.15	21	47	150
Marine Scotland - AL1	20	0.4	50	30	0.25	30	50	130
Marine Scotland - AL2	70	4	370	300	1.5	150	400	600

Note: black text and green shading = quality standards not exceeded / red text = ERL exceeded / orange highlight = Action Level 1 exceeded.

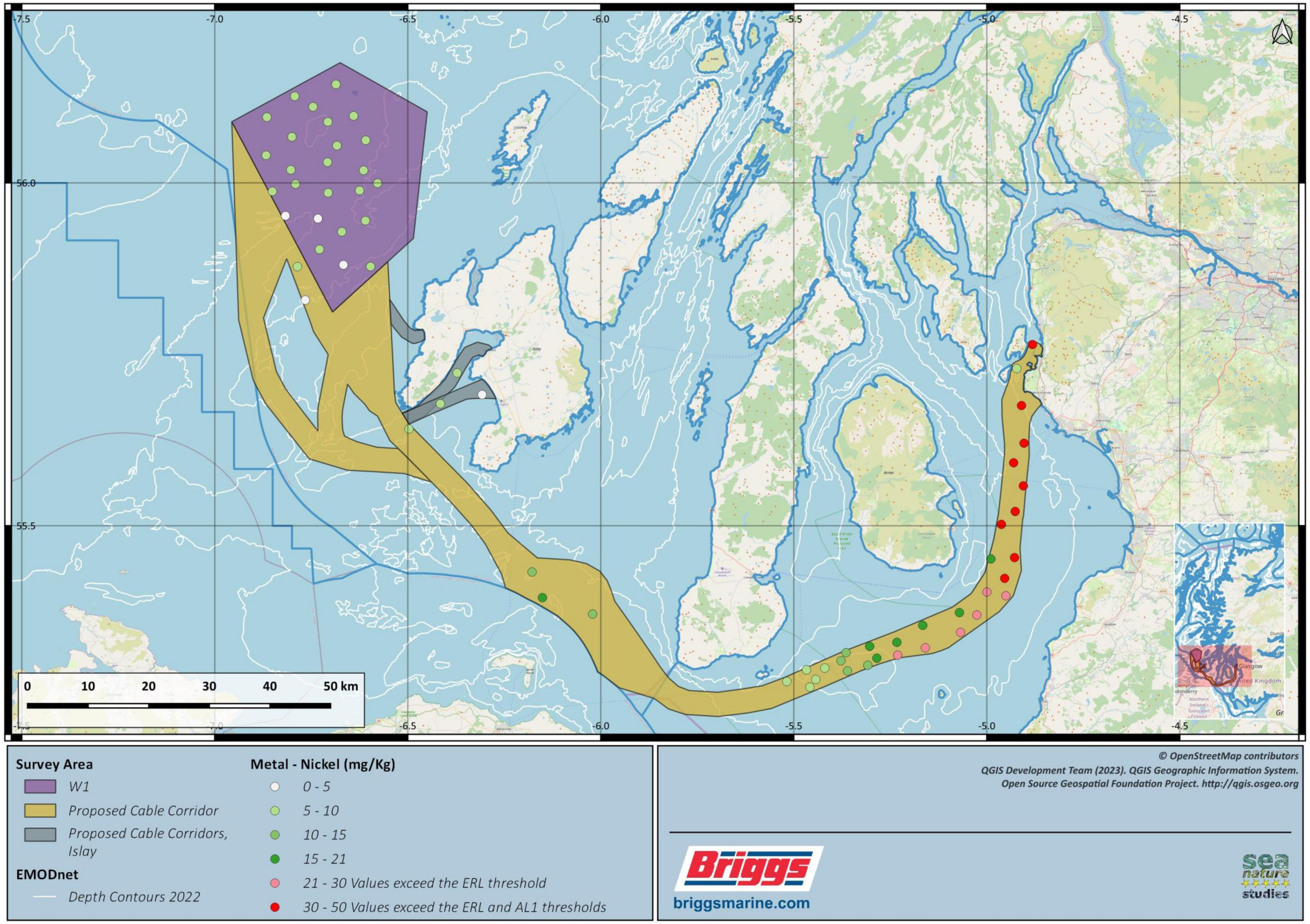


Figure 40 Nickel concentration and ERL / AL1 threshold exceedances

Polychlorinated biphenyl (PCB) concentrations at 68 sites are provided in Table 20 and Table 21. Total concentrations for all compounds by site did not exceed Action Level 1. OSPAR Environmental Assessment Criteria (EAC) where available for 7 of the compounds measured, none of which were found to occur in concentrations above these individual values.

Table 20 PCB concentrations (µg/Kg) – Part 1 (Clyde Sediments – Report MAR01135)

Station	PCB28	PCB52	PCB101	PCB118	PCB138	PCB153	PCB18	PCB105	PCB110	PCB128	PCB141	PCB149	PCB151	PCB156	PCB158	PCB170	PCB180	PCB183	PCB187	PCB194	PCB31	PCB44	PCB47	PCB49	PCB66	Total
Con163	0.31	0.30	0.44	0.63	0.90	0.89	0.10	0.28	0.37	0.09	<0.08	0.48	0.16	<0.08	0.09	0.22	0.42	<0.08	0.45	0.13	0.30	0.26	0.14	0.26	0.51	7.73
Con164	0.32	0.34	0.46	0.71	1.00	0.88	0.09	0.25	0.38	0.18	<0.08	0.51	0.14	<0.08	0.09	0.24	0.32	0.16	0.52	0.14	0.31	0.35	0.16	0.28	0.62	8.45
Con167	0.15	0.16	0.20	0.34	0.42	0.37	<0.08	0.12	0.17	<0.08	<0.08	0.25	<0.08	<0.08	<0.08	0.09	0.17	<0.08	0.20	<0.08	0.13	0.10	0.09	0.15	0.27	3.38
Con170	0.12	0.14	0.21	0.30	0.34	0.39	<0.08	0.11	0.12	<0.08	<0.08	0.19	<0.08	<0.08	<0.08	0.08	0.14	<0.08	0.27	<0.08	0.14	0.13	<0.08	0.12	0.25	3.05
Con171	0.10	0.11	0.15	0.22	0.32	0.26	<0.08	0.22	0.19	0.13	0.12	0.20	0.11	0.17	0.17	0.16	0.21	0.14	0.20	0.17	0.09	0.11	<0.08	0.09	0.20	3.84
Con172	0.11	0.13	0.15	0.24	0.25	0.32	<0.08	<0.08	0.10	<0.08	<0.08	0.20	<0.08	<0.08	<0.08	<0.08	0.11	<0.08	0.16	<0.08	0.11	0.08	<0.08	0.09	0.17	2.22
Con173	0.08	<0.08	0.08	0.15	0.13	0.14	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	0.08	0.66
Con175	<0.08	<0.08	<0.08	0.13	0.09	0.11	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	0.09	0.42
Con176	0.11	0.10	0.11	0.19	0.14	0.22	<0.08	<0.08	0.09	<0.08	<0.08	0.13	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	0.11	<0.08	0.12	0.08	<0.08	0.08	0.12	1.60
Con178	0.11	0.10	0.12	0.14	0.19	0.20	<0.08	<0.08	0.10	<0.08	<0.08	0.13	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	0.12	<0.08	<0.08	<0.08	0.16	1.37
Con179	0.22	0.25	0.32	0.61	0.49	0.77	<0.08	0.22	0.26	0.13	<0.08	0.35	0.10	<0.08	<0.08	0.16	0.25	0.11	0.38	0.11	0.23	0.23	0.10	0.20	0.44	5.93
Con181	0.14	0.16	0.20	0.28	0.40	0.41	<0.08	0.13	0.18	<0.08	<0.08	0.22	0.08	<0.08	<0.08	<0.08	0.18	<0.08	0.23	<0.08	0.12	0.11	<0.08	0.13	0.22	3.19
Con182	0.18	0.21	0.27	0.50	0.51	0.66	<0.08	0.23	0.22	0.09	<0.08	0.33	0.09	<0.08	<0.08	0.14	0.25	<0.08	0.28	<0.08	0.20	0.16	<0.08	0.17	0.37	4.86
Con185	0.32	0.36	0.46	0.68	0.96	0.93	0.09	0.29	0.36	0.17	<0.08	0.60	0.13	<0.08	<0.08	0.18	0.31	0.16	0.55	0.13	0.34	0.32	<0.08	0.30	0.61	8.25
Con187	0.80	0.74	0.91	1.27	1.33	1.34	0.22	0.59	0.80	0.27	0.19	1.13	0.34	0.10	0.21	0.42	0.86	0.22	0.94	0.30	0.75	0.61	0.23	0.64	1.52	16.73
Con188	0.24	0.28	0.35	0.55	0.63	0.56	<0.08	0.23	0.27	0.16	<0.08	0.37	0.15	<0.08	<0.08	0.16	0.33	0.13	0.35	0.10	0.25	0.21	0.12	0.23	0.47	6.14
Con189	0.26	0.30	0.40	0.60	0.66	0.72	<0.08	0.26	0.28	0.11	0.11	0.53	0.12	<0.08	<0.08	0.16	0.37	0.13	0.44	0.11	0.24	0.19	0.12	0.24	0.51	6.86
Con191	0.11	0.13	0.18	0.20	0.26	0.36	<0.08	0.11	0.11	<0.08	<0.08	0.18	<0.08	<0.08	<0.08	<0.08	0.09	<0.08	0.11	<0.08	0.12	0.11	<0.08	0.09	0.22	2.38
Con194	0.22	0.23	0.32	0.51	0.46	0.71	<0.08	0.21	0.25	0.09	<0.08	0.37	<0.08	<0.08	<0.08	0.17	0.33	0.08	0.36	0.08	0.20	0.20	<0.08	0.19	0.41	5.39
Con196	<0.08	0.10	0.12	0.19	0.28	0.21	<0.08	<0.08	0.10	<0.08	<0.08	0.12	<0.08	<0.08	<0.08	<0.08	0.12	<0.08	0.12	<0.08	<0.08	<0.08	<0.08	<0.08	0.14	1.50
Con197	0.09	<0.08	0.10	0.13	0.20	0.16	<0.08	<0.08	<0.08	<0.08	<0.08	0.09	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	0.10	<0.08	<0.08	<0.08	0.15	1.02
Con199	0.10	<0.08	0.10	0.18	0.15	0.13	<0.08	<0.08	<0.08	<0.08	<0.08	0.10	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	0.10	<0.08	0.09	0.09	<0.08	<0.08	0.15	1.19
Con200	0.20	0.23	0.34	0.49	0.64	0.79	<0.08	0.22	0.31	<0.08	<0.08	0.36	0.11	<0.08	<0.08	0.16	0.38	0.10	0.36	0.09	0.21	0.19	0.11	0.20	0.42	5.91
Con201	0.36	0.35	0.51	0.75	0.77	0.85	0.09	0.33	0.43	0.16	0.11	0.54	0.11	<0.08	<0.08	0.23	0.51	0.14	0.41	0.14	0.37	0.30	0.15	0.31	0.65	8.57
Con202	<0.08	<0.08	<0.08	0.10	<0.08	0.14	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	0.09	<0.08	0.08	<0.08	<0.08	<0.08	0.13	0.54
Con204	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	-
Con205	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	-
Con207	0.15	0.19	0.24	0.29	0.25	0.19	<0.08	0.21	0.27	0.17	0.13	0.21	0.19	<0.08	0.16	0.16	0.20	0.18	0.20	0.18	0.16	0.17	0.14	0.15	0.25	4.44
Con210	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	-
Minimum	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	
Maximum	0.80	0.74	0.91	1.27	1.33	1.34	0.22	0.59	0.80	0.27	0.19	1.13	0.34	0.17	0.21	0.42	0.86	0.22	0.94	0.30	0.75	0.61	0.23	0.64	1.52	
Median	0.15	0.21	0.23	0.30	0.40	0.38	0.09	0.22	0.25	0.15	0.12	0.25	0.12	0.14	0.16	0.16	0.25	0.14	0.28	0.13	0.16	0.18	0.13	0.19	0.25	-
Mean	0.21	0.23	0.28	0.40	0.47	0.49	0.12	0.24	0.26	0.15	0.13	0.33	0.14	0.14	0.14	0.18	0.29	0.14	0.31	0.14	0.21	0.20	0.14	0.21	0.35	
Standard Deviation	0.15	0.15	0.19	0.27	0.32	0.33	0.06	0.11	0.16	0.05	0.03	0.23	0.07	0.05	0.05	0.08	0.18	0.04	0.20	0.06	0.15	0.13	0.04	0.13	0.30	
OSPAR *EAC	1.7	2.7	3.0	0.6	7.9	40											12									
Marine Scotland AL1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	20
Marine Scotland AL2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	180

***Note: EAC** = Environmental Assessment Criteria

Table 21 PCB concentrations (µg/Kg) – Part 2 (Islay Sediments – Report MAR01132)

Station	PCB28	PCB52	PCB101	PCB118	PCB138	PCB153	PCB18	PCB105	PCB110	PCB128	PCB141	PCB149	PCB151	PCB156	PCB158	PCB170	PCB180	PCB183	PCB187	PCB194	PCB31	PCB44	PCB47	PCB49	PCB66	Total
Con1	0.17	0.19	0.19	0.23	0.2	0.16	0.09	0.18	0.22	0.23	0.17	0.2	0.24	0.12	0.18	0.13	0.19	0.14	0.16	0.17	0.18	0.24	0.2	0.18	0.23	4.59
Con8	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	
Con9	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	
Con10	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	
Con17	0.22	0.26	0.26	0.26	0.18	0.23	0.18	0.27	0.26	0.22	0.31	0.21	0.26	0.21	0.22	0.17	0.25	0.27	0.23	0.23	0.26	0.3	0.25	0.24	0.29	6.04
Con20	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	
Con25	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	
Con29	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	
Con31	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	
Con32	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	
Con34	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	
Con36	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	
Con45	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	
Con48	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	
Con49	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	
Con51	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	
Con58	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	
Con60	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	
Con69	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	
Con72	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	
Con74	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	
Con75	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	
Con78	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	
Con81	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	
Con116	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	
Con125	0.13	0.15	0.16	0.1	0.13	0.14	<0.08	0.14	0.15	0.08	0.2	0.14	0.16	0.15	0.13	0.13	0.18	0.18	0.17	0.12	0.14	0.18	0.14	0.15	0.18	3.53
Con133	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	
Con154	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	
Con214	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	
Con218	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	
Con221	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	
Con248	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	
Con249	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	
Con251	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	
Con253	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	
Con266	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	
Con268	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	
Con271	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	
ConDDV6	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	
Minimum	0.13	0.15	0.16	0.1	0.13	0.14	0.09	0.14	0.15	0.08	0.17	0.14	0.16	0.12	0.13	0.13	0.18	0.14	0.16	0.12	0.14	0.18	0.14	0.15	0.18	-
Maximum	0.22	0.26	0.26	0.26	0.2	0.23	0.18	0.27	0.26	0.23	0.31	0.21	0.26	0.21	0.22	0.17	0.25	0.27	0.23	0.23	0.26	0.3	0.25	0.24	0.29	
Median	0.17	0.19	0.19	0.23	0.18	0.16	0.135	0.18	0.22	0.22	0.2	0.2	0.24	0.15	0.18	0.13	0.19	0.18	0.17	0.17	0.18	0.24	0.2	0.18	0.23	
Mean	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	
Standard Deviation	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
OSPAR *EAC	1.7	2.7	3.0	0.6	7.9	40											12									
Marine Scotland AL1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	20
Marine Scotland AL2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	180

***Note: EAC = Environmental Assessment Criteria**

Organotin concentrations at the 68 sites sampled are provided in Table 22 and Table 23. Tributyltin (TBT) and Dibutyltin (DBT) values were all below the AL1 threshold value of 100µg/Kg.

Table 22 Organotin concentrations (µg/Kg) – Part 1 (Clyde Sediments – Report MAR01135)

Station	Dibutyltin (DBT)	Tributyltin (TBT)
Con163	<1	<1
Con164	<1	<1
Con167	<1	<1
Con170	<1	<1
Con171	<1	<1
Con172	<1	<1
Con173	<5	<5
Con175	<1	<1
Con176	<1	<1
Con178	<1	<1
Con179	<1	<1
Con181	<1	<1
Con182	<1	<1
Con185	<1	<1
Con187	<1	<1
Con188	<1	<1
Con189	<1	<1
Con191	<1	<1
Con194	<1	<1
Con196	<1	<1
Con197	<5	<5
Con199	<5	<5
Con200	<5	<5
Con201	10.4	<5
Con202	<5	<5
Con204	<1	<1
Con205	7.55	<5
Con207	<5	<5
Con210	<5	<5
Marine Scotland AL1	**100**	**100**
Marine Scotland AL2	**500**	**500**

Table 23 Organotin concentrations (µg/Kg) – Part 2 (Islay Sediments – Report MAR01132)

Station	Dibutyltin (DBT)	Tributyltin (TBT)
Con1	<1	<1
Con8	<1	<1
Con9	<1	<1
Con10	<1	<1
Con17	<1	<1
Con20	<1	<1
Con25	<1	<1
Con29	<1	<1
Con31	<1	<1
Con32	<1	<1
Con34	<1	<1
Con36	<1	<1
Con45	<1	<1
Con48	<1	<1
Con49	<1	<1
Con51	<1	<1
Con58	<1	<1
Con60	<1	<1
Con69	<1	<1
Con72	<1	<1
Con74	<1	<1
Con75	<1	<1
Con78	<1	<1
Con81	<1	<1
Con116	<1	<1
Con125	<1	<1
Con133	<1	<1
Con154	<1	<1
Con214	<1	<1
Con218	<1	<1
Con221	<1	<1
Con248	<1	<1
Con249	<1	<1
Con251	<1	<1
Con253	<1	<1
Con266	<1	<1
Con268	<1	<1
Con271	<1	<1
ConDDV6	<1	<1
Marine Scotland AL1	**100**	**100**
Marine Scotland AL2	**500**	**500**

Polybrominated diphenyl ethers (PBDEs) concentrations at the 68 sites are provided in Table 24 and Table 25. All reported concentrations are below the Federal Environmental Quality Guideline values (FEQGs) except for two analytes, BDE99 and BDE209, at nine sites.

At site 201 the BDE99 value was 1.44µg/kg and the FEQG is 0.4µg/kg. Site 201 was immediately east of Greater Cumbrae in the Fairlie Roads, the most northerly site in the Firth of Clyde (Figure 37). For BDE209 exceedances were noted at nine sites, all within the Firth of Clyde. Site 187, taken immediately south of Little Cumbrae, had the highest concentration of 54.3µg/kg. The FEQG for BDE209 is 19µg/kg.

Table 24 Polybrominated diphenyl ethers (PBDEs) in sediment (µg/kg dw) – Part 1 (Clyde Sediments – Report MAR01135)

Station	BDE17	BDE28	BDE47	BDE66	BDE100	BDE99	BDE85	BDE154	BDE153	BDE138	BDE183	BDE209
Con163	<0.01	<0.01	0.06	0.01	<0.01	0.07	<0.01	<0.01	0.01	<0.01	<0.01	3.96
Con164	0.03	0.01	0.18	0.02	0.03	0.14	<0.01	0.03	0.03	<0.01	0.02	33.3
Con167	0.01	0.02	0.18	0.02	0.02	0.15	<0.01	0.04	0.04	<0.01	0.02	36.1
Con170	0.01	0.02	0.09	0.02	0.02	0.08	<0.01	0.03	0.03	<0.01	0.01	12.1
Con171	<0.01	<0.01	0.07	0.01	<0.01	0.06	<0.01	0.02	0.02	<0.01	<0.01	9.69
Con172	<0.01	<0.01	0.04	<0.01	0.01	0.06	<0.01	0.04	0.08	<0.01	0.09	5.34
Con173	<0.01	<0.01	0.05	<0.01	<0.01	0.05	<0.01	0.02	0.01	<0.01	0.01	8.65
Con175	<0.01	0.01	0.04	0.01	0.02	0.03	<0.01	0.02	0.02	0.01	0.02	6.36
Con176	<0.01	<0.01	0.03	<0.01	<0.01	0.02	<0.01	0.02	0.01	<0.01	<0.01	7.09
Con178	<0.01	<0.01	0.04	<0.01	<0.01	0.04	<0.01	0.02	<0.01	<0.01	0.01	8.88
Con179	0.01	0.01	0.12	0.02	0.02	0.12	<0.01	0.05	0.04	<0.01	0.04	22.6
Con181	<0.01	<0.01	0.07	0.01	0.01	0.07	<0.01	0.03	0.02	<0.01	<0.01	11.4
Con182	<0.01	0.01	0.10	0.01	0.02	0.11	<0.01	0.04	0.04	<0.01	0.03	16.6
Con185	0.02	0.02	0.17	0.03	0.02	0.17	<0.01	0.04	0.05	<0.01	0.03	28.9
Con187	0.03	0.02	0.27	0.04	0.04	0.25	<0.01	0.06	0.08	<0.01	0.03	54.3
Con188	0.01	0.01	0.12	0.02	0.02	0.13	<0.01	0.03	0.05	<0.01	<0.01	18.9
Con189	0.01	0.02	0.14	0.03	0.02	0.15	<0.01	0.05	0.04	<0.01	0.03	22.6
Con191	<0.01	<0.01	0.06	<0.01	<0.01	0.06	<0.01	0.02	0.02	<0.01	<0.01	9.82
Con194	0.01	0.01	0.14	0.02	0.02	0.14	<0.01	0.04	0.04	<0.01	0.02	22.2
Con196	<0.01	<0.01	0.04	<0.01	<0.01	0.05	<0.01	0.01	0.01	<0.01	<0.01	6.14
Con197	<0.01	0.01	0.05	0.01	0.01	0.05	<0.01	0.03	0.03	0.01	0.02	10.0
Con199	<0.01	<0.01	0.04	<0.01	<0.01	0.03	<0.01	0.02	0.01	<0.01	0.01	9.26
Con200	<0.01	0.01	0.12	0.02	0.02	0.13	<0.01	0.04	0.04	<0.01	0.02	26.4
Con201	0.04	0.10	1.13	0.24	<0.01	1.44	<0.01	0.09	0.35	0.06	0.03	30.2
Con202	<0.01	<0.01	0.05	<0.01	<0.01	0.05	<0.01	0.02	0.01	<0.01	<0.01	6.49
Con204	<0.01	<0.01	0.02	<0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	4.16
Con205	<0.01	<0.01	0.03	<0.01	0.01	0.05	<0.01	0.06	0.09	<0.01	0.12	4.53
Con207	<0.01	<0.01	0.02	<0.01	<0.01	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	5.04
Con210	<0.01	<0.01	0.02	<0.01	<0.01	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	4.76
FEQG		44	39	39	0.4	0.4	0.4	440	440		5600	19

Table 25 Polybrominated diphenyl ethers (PBDEs) in sediment – Part 2 (Islay Sediments – Report MAR01132)

Station	BDE17	BDE28	BDE47	BDE66	BDE100	BDE99	BDE85	BDE154	BDE153	BDE138	BDE183	BDE209
Con1	<0.01	<0.01	0.02	<0.01	<0.01	0.02	<0.01	0.01	0.02	<0.01	0.03	0.51
Con8	<0.01	<0.01	0.03	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.49
Con9	<0.01	<0.01	0.03	<0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	1.00
Con10	<0.01	<0.01	0.03	<0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.31
Con17	<0.01	<0.01	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.55
Con20	<0.01	<0.01	0.02	<0.01	<0.01	0.02	<0.01	<0.01	0.01	<0.01	0.01	0.41
Con25	<0.01	<0.01	0.04	<0.01	<0.01	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	1.35
Con29	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.19
Con31	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.1
Con32	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.67
Con34	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.36
Con36	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.28
Con45	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	0.04	<0.01	<0.01	0.57
Con48	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.17
Con49	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.1
Con51	<0.01	<0.01	0.02	<0.01	<0.01	0.01	<0.01	0.01	0.02	<0.01	0.03	0.13
Con58	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.1
Con60	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.12
Con69	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.12
Con72	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.45
Con74	<0.01	<0.01	0.02	<0.01	<0.01	0.03	<0.01	0.03	0.05	<0.01	0.07	0.19
Con75	<0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.32
Con78	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.1
Con81	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.25
Con116	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.1
Con125	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.14
Con133	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.35
Con154	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	1.20
Con214	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.23
Con218	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	1.04
Con221	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.17
Con248	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	1.25
Con249	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.97
Con251	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.88
Con253	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	1.62
Con266	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.30
Con268	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.14
Con271	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	1.37
ConDDV6	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.31
FEQG		44	39	39	0.4	0.4	0.4	440	440		5600	19

Organochlorine pesticide (OCPs) concentrations for all stations sampled are provided in Table 26 and Table 27. Four of the eight compounds tested for have ERL thresholds against which the results can be assessed and these are dieldrin, dichlorodiphenyldichloroethylene (DDE), dichlorodiphenyltrichloroethane (DDT) and dichlorodiphenyldichloroethane (DDD). There are also AL1 values for dieldrin and DDT.

The results from the Clyde Sediments, provided in Report MAR01135, for dieldrin indicate that all but four of the 29 samples had recorded concentrations above both the ERL and AL1 value (Figure 41; Table 26; Appendix 1). The four samples with recorded values of <0.1 µg/Kg dry weight are below the limit of detection. These were sites 191, 202, 205 and 210. Sites 205 and 210 are adjacent sites off the Clyde Sea Sill in the Firth of Clyde whilst sites 191 and 202 are south of Arran (Figure 37; Figure 41). Conversely, the results from the Islay Sediments, Report MAR01132, indicate that 3 of the 39 samples, sites 1, 17 and 125, had values that exceeded the ERL and AL1 thresholds for dieldrin but all the other samples had a recorded value of <0.1 µg/Kg dry weight (Figure 41; Table 27; Appendix 1). Sites 1 and 17 are adjacent sites in W1 whilst site 125 is off the Rhinns of Islay in the proposed cable corridor (Figure 37; Figure 41).

All recorded values for DDE were below the available ERL of 2.2µg/Kg dry weight.

For DDT, site 163, east of Little Cumbrae in the Fairlie Roads had a concentration of 2.01µg/Kg dry weight exceeding the ERL of 1µg/Kg dry weight (Figure 42). Eleven sites exceeded the AL1 for DDT of 0.001µg/Kg dry weight. Eight of these sites were in the Firth of Clyde and the remaining three are the same as those identified for Dieldrin, sites 1, 17 and 125 (Figure 42; Table 27).

Ten sites exceeded the ERL threshold for DDD (Figure 43; Table 26). Again, the only offshore sites with concentrations above the limit of detection were 1, 17 and 125 but the values at these locations for DDD were all below the ERL threshold.

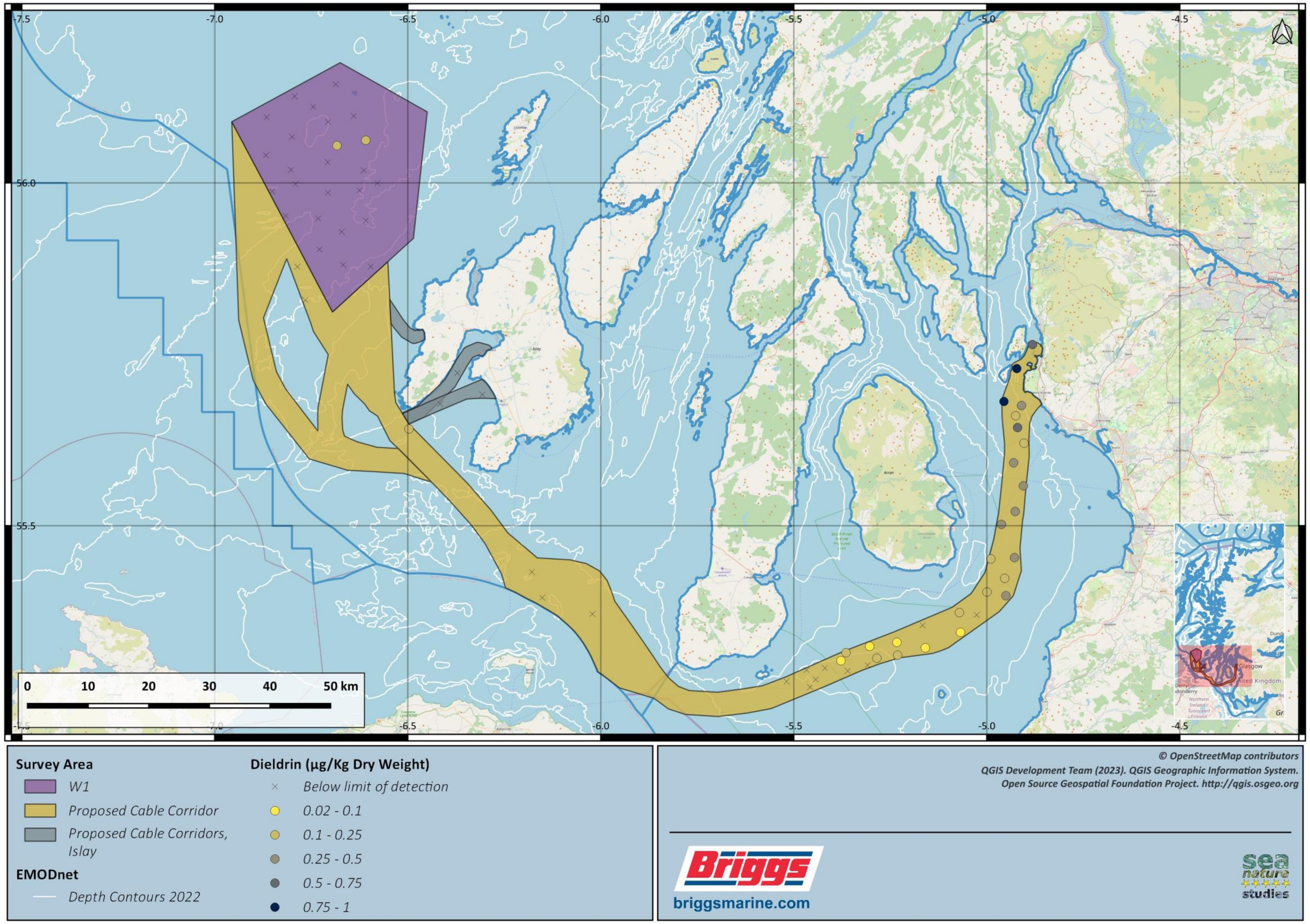


Figure 41 Dieldrin concentration (all values above the limit of detection exceed the ERL and AL1 thresholds)

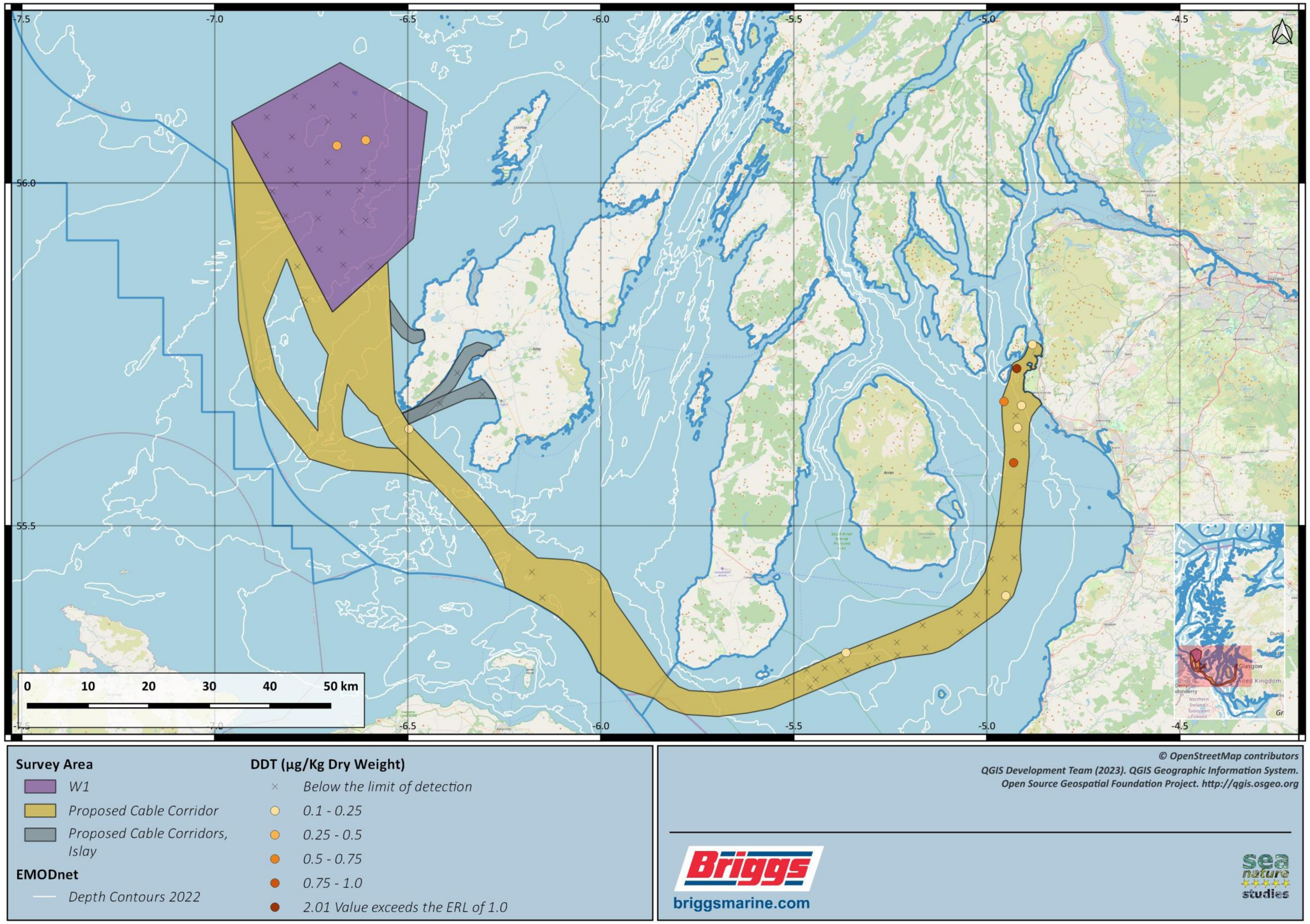


Figure 42 DDT concentration (all values above the limit of detection exceed the AL1 thresholds)

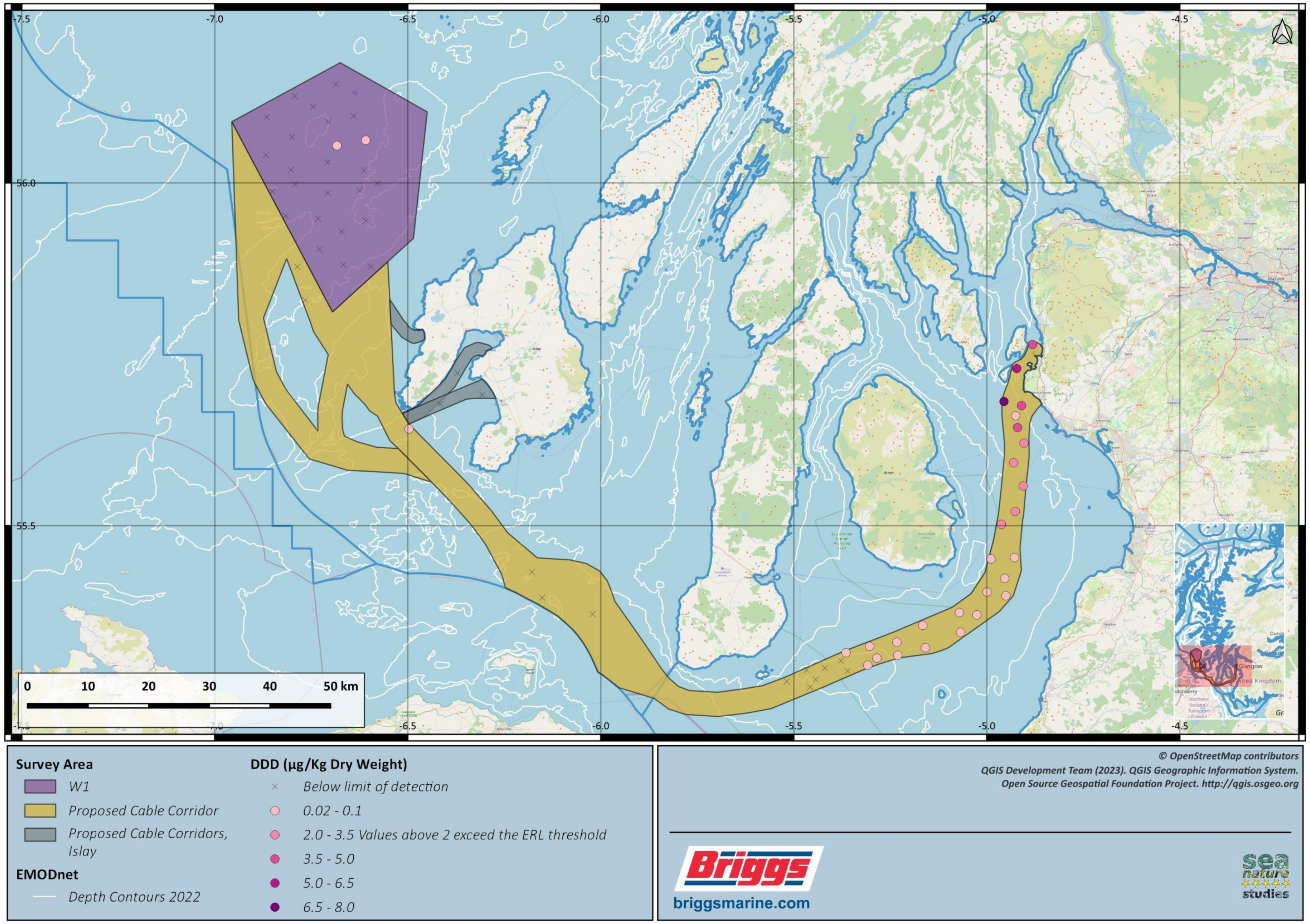


Figure 43 DDD concentration (all values above 2.0 exceed the ERL thresholds)

Table 26 Organochlorine pesticide (OCPs) in sediment (µg/Kg Dry Weight) – Part 1 (Clyde Sediments – Report MAR01135)

Station	AHCH	BHCH	GHCH	DIELDRIN	HCB	DDE	DDT	DDD
Con163	<0.1	<0.1	<0.1	**0.91**	<0.1	1.65	**2.01**	**5.45**
Con164	<0.1	<0.1	<0.1	**0.46**	<0.1	1.34	0.12	**4.49**
Con167	<0.1	<0.1	<0.1	**0.13**	<0.1	0.71	<0.1	1.49
Con170	<0.1	<0.1	<0.1	**0.15**	<0.1	0.59	<0.1	1.04
Con171	<0.1	<0.1	<0.1	**0.36**	<0.1	0.32	0.18	0.80
Con172	<0.1	<0.1	<0.1	**0.20**	<0.1	0.34	<0.1	0.80
Con173	<0.1	<0.1	<0.1	**0.04**	<0.1	0.15	<0.1	0.49
Con175	<0.1	<0.1	<0.1	**0.05**	<0.1	0.19	<0.1	0.29
Con176	<0.1	<0.1	<0.1	**0.17**	<0.1	0.36	<0.1	0.50
Con178	<0.1	<0.1	<0.1	**0.04**	<0.1	0.29	<0.1	0.68
Con179	<0.1	<0.1	<0.1	**0.41**	<0.1	0.95	<0.1	**2.29**
Con181	<0.1	<0.1	<0.1	**0.23**	<0.1	0.48	<0.1	1.52
Con182	<0.1	<0.1	<0.1	**0.36**	<0.1	0.78	<0.1	1.81
Con185	<0.1	<0.1	<0.1	**0.63**	<0.1	1.30	0.11	**3.86**
Con187	<0.1	<0.1	<0.1	**0.82**	0.16	1.52	0.68	**7.43**
Con188	<0.1	<0.1	<0.1	**0.29**	<0.1	0.98	<0.1	**2.22**
Con189	<0.1	<0.1	<0.1	**0.38**	0.13	1.09	<0.1	**2.83**
Con191	<0.1	<0.1	<0.1	<0.1	<0.1	0.38	<0.1	0.87
Con194	<0.1	<0.1	<0.1	**0.36**	0.12	0.95	0.88	**2.96**
Con196	<0.1	<0.1	<0.1	**0.12**	<0.1	0.31	<0.1	0.67
Con197	<0.1	<0.1	<0.1	**0.12**	<0.1	0.23	<0.1	0.52
Con199	<0.1	<0.1	<0.1	**0.08**	<0.1	0.28	<0.1	0.67
Con200	<0.1	<0.1	<0.1	**0.22**	0.10	1.10	<0.1	**2.61**
Con201	<0.1	<0.1	<0.1	**0.58**	0.13	1.24	0.25	**4.41**
Con202	<0.1	<0.1	<0.1	<0.1	<0.1	0.18	<0.1	0.55
Con204	<0.1	<0.1	<0.1	**0.10**	<0.1	<0.1	<0.1	<0.1
Con205	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Con207	<0.1	0.30	0.12	**0.24**	<0.1	0.22	0.13	0.49
Con210	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.25
NOAA ERL				**0.02**		**2.2**	**1**	**2**
AL1				0.005			0.001	

Table 27 Organochlorine pesticide (OCPs) in sediment (µg/Kg Dry Weight) – Part 2 (Islay Sediments – Report MAR01132)

Station	AHCH	BHCH	GHCH	DIELDRIN	HCB	DDE	DDT	DDD
Con1	<0.1	0.18	0.14	0.14	<0.1	0.19	0.47	0.34
Con8	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Con9	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Con10	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Con17	0.10	0.23	0.17	0.19	0.14	0.18	0.40	0.29
Con20	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Con25	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Con29	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Con31	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Con32	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Con34	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Con36	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Con45	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Con48	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Con49	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Con51	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Con58	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Con60	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Con69	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Con72	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Con74	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Con75	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Con78	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Con81	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Con116	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Con125	<0.1	0.26	0.12	0.11	<0.1	0.11	0.18	0.14
Con133	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Con154	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Con214	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Con218	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Con221	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Con248	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Con249	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Con251	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Con253	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Con266	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Con268	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Con271	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
ConDDV6	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
NOAA ERL				**0.02**		**2.2**	**1**	**2**
AL1				0.005			0.001	

Physical parameters are reported in Table 28 and Table 29.

Total organic carbon values ranged from 0.6% to 2.57% with 41 out of the 68 sites sampled having a value of 0.5% or less. The higher values were recorded from the Firth of Clyde (Figure 44).

Table 28 Physical parameters – Part 1 (Clyde Sediments – Report MAR01135)

Station	Total Moisture [%] @ 120°C	Total Solids [%]	TOC [% M/M]	Total Carbon [% M/M]
Con163	29.3	70.7	0.44	0.94
Con164	54.9	45.1	2.30	3.10
Con167	64.7	35.3	2.11	2.93
Con170	57.9	42.1	1.20	2.52
Con171	55.4	44.6	1.18	2.38
Con172	38.3	61.7	0.57	1.43
Con173	54.0	46.0	1.06	2.40
Con175	45.1	54.9	0.69	2.46
Con176	38.5	61.5	0.62	2.48
Con178	44.7	55.3	0.90	2.37
Con179	65.2	34.8	1.65	2.91
Con181	54.0	46.0	1.10	2.36
Con182	64.5	35.5	1.55	2.62
Con185	60.9	39.1	2.04	2.88
Con187	62.6	37.4	2.40	3.07
Con188	62.5	37.5	1.64	2.68
Con189	64.9	35.1	1.81	2.90
Con191	53.4	46.6	0.98	2.26
Con194	65.7	34.3	1.78	2.97
Con196	38.7	61.3	0.60	1.49
Con197	50.9	49.1	0.89	2.63
Con199	46.7	53.3	0.90	2.43
Con200	62.8	37.2	1.91	2.88
Con201	46.7	53.3	2.57	3.26
Con202	44.4	55.6	0.61	2.06
Con204	27.9	72.1	0.42	2.78
Con205	32.4	67.6	0.45	2.78
Con207	36.3	63.7	0.51	2.81
Con210	40.1	59.9	0.50	2.50
Minimum	**27.9**	**34.3**	**0.4**	**0.9**
Maximum	**65.7**	**72.1**	**2.6**	**3.3**
Median	**53.4**	**46.6**	**1.1**	**2.6**
Mean	**50.5**	**49.5**	**1.2**	**2.5**
Standard Deviation	**11.79**	**11.79**	**0.67**	**0.52**

Table 29 Physical parameters – Part 2 (Islay Sediments – Report MAR01132)

Station	Total Moisture [%] @ 120°C	Total Solids [%]	TOC [% M/M]	Total Carbon [% M/M]
Con1	23.6	76.4	0.19	3.19
Con8	23.3	76.7	0.17	1.86
Con9	21.0	79.0	0.09	1.29
Con10	21.0	79.0	0.21	2.12
Con17	23.9	76.1	0.21	3.39
Con20	29.4	70.6	0.15	2.63
Con25	17.8	82.2	0.26	6.32
Con29	27.8	72.2	0.12	2.95
Con31	23.4	76.6	0.07	2.35
Con32	29.8	70.2	0.29	4.05
Con34	20.4	79.6	0.10	1.98
Con36	27.4	72.6	0.12	2.59
Con45	28.3	71.7	0.20	3.91
Con48	21.0	79.0	0.07	1.16
Con49	21.5	78.5	0.09	3.07
Con51	22.1	77.9	0.13	3.71
Con58	20.9	79.1	0.16	5.83
Con60	24.8	75.2	0.13	3.27
Con69	19.9	80.1	0.10	1.34
Con72	25.7	74.3	0.15	2.94
Con74	26.7	73.3	0.12	1.29
Con75	30.2	69.8	0.20	3.55
Con78	21.4	78.6	0.06	0.92
Con81	21.1	78.9	0.17	2.19
Con116	15.4	84.6	0.31	7.65
Con125	15.7	84.3	0.38	8.05
Con133	31.4	68.6	0.20	2.98
Con154	17.1	82.9	0.24	3.16
Con214	31.0	69.0	0.93	2.10
Con218	29.3	70.7	0.25	2.93
Con221	24.1	75.9	0.17	3.57
Con248	20.3	79.7	0.87	9.03
Con249	23.5	76.5	0.21	3.46
Con251	19.0	81.0	0.28	4.12
Con253	37.1	62.9	0.24	3.30
Con266	26.2	73.8	0.11	1.38
Con268	26.9	73.1	0.11	1.82
Con271	18.4	81.6	0.42	8.44
ConDDV6	24.9	75.1	0.12	1.97
Minimum	15.4	62.9	0.1	0.9
Maximum	37.1	84.6	0.9	9.0
Median	23.5	76.5	0.2	3.0
Mean	23.9	76.1	0.2	3.4
Standard Deviation	4.8	4.8	0.2	2.0

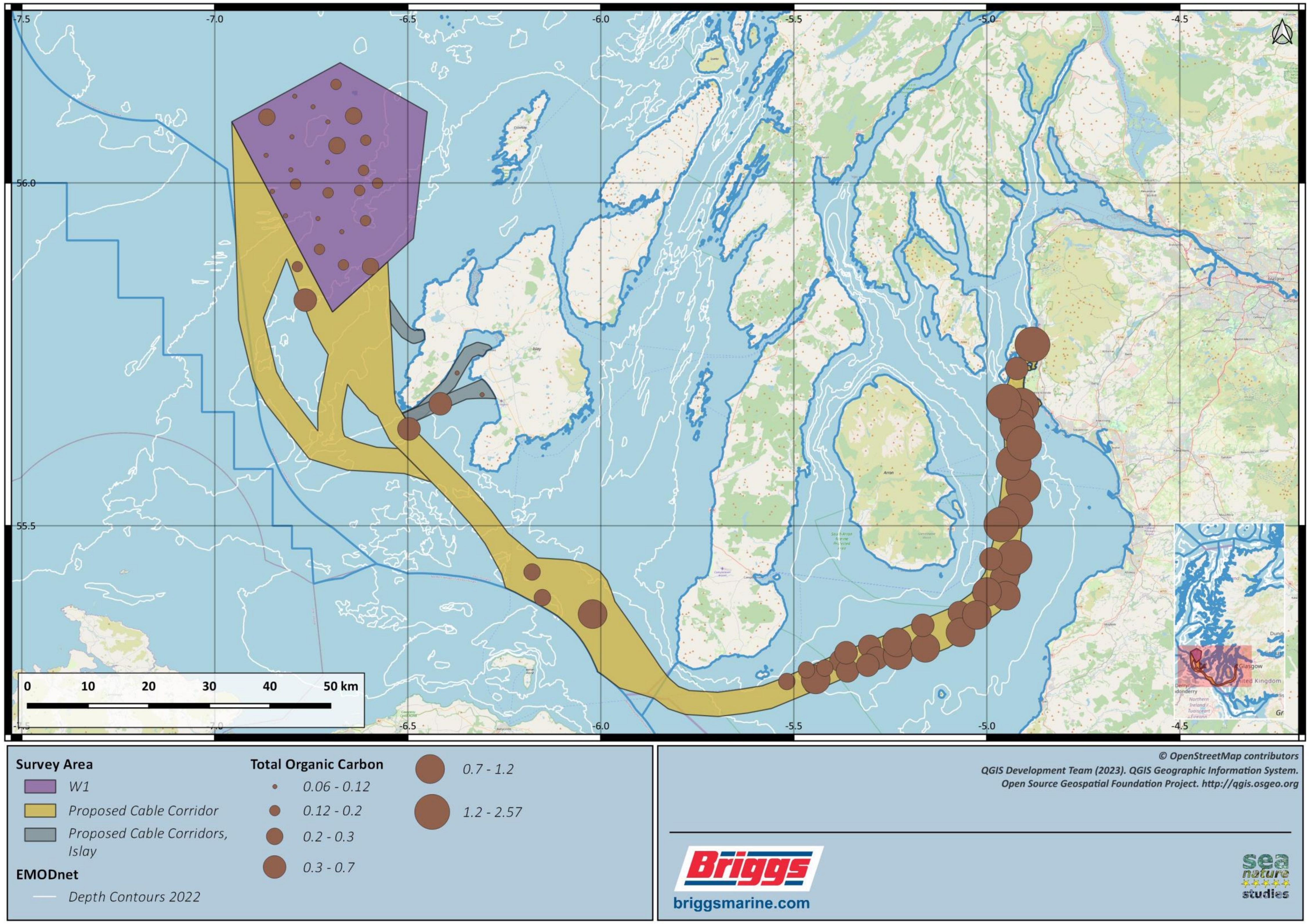


Figure 44 Total organic carbon from sites across the survey area

3.8 Incidental marine mammal sightings

A record was kept of any sightings of marine mammals which occurred during the survey operations (Table 30). As these sightings were opportunistic, they are not considered further in this report.

Table 30 Incidental marine mammal sightings

Sighting No.	Date	Time at start of encounter (UTC)	Time at end of encounter (UTC)	Were animals detected visually and/ or acoustically?	How were the animals first detected?	Observer's/ operator's name	Latitude (WGS 84)	Longitude (WGS 84)	Water depth (metres)	Species	Number
1	04/08/2021	18:37	18:45	Visually	Visually	Rayner Piper	55.66092	-6.52579	ND	Grey Seal (*Halichoerus grypus*)	1
2	07/08/2021	14:31	14:34	Visually	Visually	Rayner Piper	55.95235	-6.81654	100	Common dolphin (*Delphinus delphis*)	6
3	10/08/2021	14:30	14:35	Visually	Visually	Rayner Piper	56.04236	-6.78786	ND	Minke whale (*Balaenoptera acutorostrata*)	1
4	10/08/2021	14:30	14:34	Visually	Visually	Rayner Piper	56.04236	-6.78786	ND	Common dolphin (*D. delphis*)	4
5	10/08/2021	14:38	14:40	Visually	Visually	Rayner Piper	56.01951	-6.75742	ND	Minke whale (*B. acutorostrata*)	1
6	10/08/2021	15:59	14:03	Visually	Visually	Rayner Piper	56.01903	-6.75257	ND	Grey Seal (*H. grypus*)	1
7	10/08/2021	17:28	17:30	Visually	Visually	Rayner Piper	55.98877	-6.39542	ND	Common dolphin (*D. delphis*)	2
8	31/08/2021	16.38	17:00	Visually	Visually	Matt Crabb	55.70964	-6.3828	ND	Minke whale (*B. acutorostrata*) (3), Harbour porpoise (*Phocoena Phocoena*) (12)	see species
9	01/09/2021	07:15	07:18	Visually	Visually	Rayner Piper	SW Mull of Oa		ND	Bottlenose dolphin (*Tursiops tursiops*)	3
10	02/09/2021	07:25	07:30	Visually	Visually	Rayner Piper	SW Mull of Oa		ND	Bottlenose dolphin (*T. tursiops*)	1
11	03/09/2021	12:17	12:20	Visually	Visually	Rayner Piper	55.92256	-6.62804	ND	Minke whale (*B. acutorostrata*)	1
12	03/09/2021	15.45	13:50	Visually	Visually	Rayner Piper	55.94835	-6.6095	ND	Dolphin (indet)	10
13	04/09/2021	11:56	12:04	Visually	Visually	Rayner Piper	55.10289	-6.84366	ND	Minke whale (*B. acutorostrata*) - breaching!	1
14	07/09/2021	16:43	16:46	Visually	Visually	Rayner Piper	55.33547	-5.36677	ND	Common dolphin (*D. delphis*)	1
15	10/09/2021	14:27	14:28	Visually	Visually	Rayner Piper	55.50206	-4.96202	ND	Harbour porpoise (*P. phocoena*)	2

4 Discussion

4.1 Seabed sediments

The EUSeaMap 2023 illustrates the Marine Strategy Framework Directive Benthic Broad Habitat Types (MSFD BBHT) which, in terms of marine habitat classification, resolves down to EUNIS 2019 Level 3 providing predictive information on the physical structure of seabed habitats. The MSFD demands '*reliable full coverage habitat maps for assessment and monitoring of benthic habitats. MSFD Descriptor 6 considers Seafloor Integrity and requires quantitative reporting on the impacts of anthropogenic activities on benthic habitats*' (European Commission, 2023). Sediment type combined with biological zone forms the basis of the MSFD BBHT classification scheme. So, for example, much of the seabed in the W1 area is predicted to be BBHT Circalittoral sand.

A range of sediment types were identified from across the survey area consistent with the wide geographic spread of the area and the associated survey work. There was good agreement between the sedimentary habitat predicted in the EUSeaMap 2023 and the site-specific data generated from the survey work presented here. However, some finer scale detail was added from the particle size results. For example, between Islay and Kintyre survey results suggest that the predicted coarse sedimentary environment is actually patchier and more mixed in nature. Also, that the transition in the sedimentary environment from the Great Plateau into the Firth of Clyde is a more nuanced gradation than the picture presented by the predictive map.

The broad picture was clear with three areas distinguished from the percentages of gravel, sand and mud and the subsequent analysis. Sand dominated offshore in the W1 area; mud defined the sediments in the Firth of Clyde; and, more coarse and mixed sediments were sampled in the wide area between these two regions of the survey area.

The pattern of site relatedness generated from the multivariate analysis of the percentage fractional weight sediment data refined this broad picture identifying a more mosaiced structure with 5 large and two, much smaller, site groupings. This was well illustrated by both the MDS and the PCA ordinations, the latter identifying that 50% of the variation observed was strongly correlated with fine sand (125 µm). Sediment type is an important driver behind observed biological associations helping shape faunal communities. This structuring force can be clearly inferred, as was seen when the abundances of species such as *Nucula nitidosa*, the shiny nut clam, which tends to flourish in fine sand, were mapped onto the sediment data ordinations tracking those preferences.

The video analysis identified those elements of seabed substrate not sampled by the grab work such as bedrock, boulders and cobbles interspersed, particularly in areas of coarser sediment, from the southern edge of the W1 area to the Clyde Sea Sill. In addition, the importance of shell debris, as part of the gravel component, across the area was more visible.

4.2 Macrobenthic communities

Empirical data from grab surveys describing macrobenthic infaunal communities in the survey area and wider region is scarce. Historical work is largely focused on intertidal / coastal sites, conspicuous fauna, and deep-water survey related to the offshore oil and gas industry, the main exception being the Firth of Clyde (Wilding et al., 2005a and 2005b).

A baseline benthic report for the West Islay Tidal Energy Park (WITEP) published in 2012 described faunal communities from a site which, at its nearest point, was 6km from the south-west tip of the Rhinns on Islay (Lancaster et al., 2012). The proposed cable route from the W1 area of interest forks around the WITEP site passing, to the east, between that location and the coast of Islay. However, the nearest grab sample taken was in Laggan Bay, Islay and was outside the survey area for the current study.

Quantitative data showed that the infaunal invertebrate communities in the survey area were dominated by annelid worms both in terms of the number of taxa and the abundances recorded. Crustaceans, molluscs, echinoderms and other, more minor phyla, also contributed, to a greater or lesser extent, to the faunal communities sampled, though naturally not all groups were represented at each site. In general, the numbers of species, and the abundances in which they occurred were not unusual for the types of UK soft sediment habitat encountered.

In terms of biomass, a single large and long-lived species, *A. islandica*, found at multiple sites in the survey area, meant that molluscs were the dominant contributor. For similar reasons, echinoderms were the second largest contributor with respect to biomass due to the presence of large burrowing urchins, in particular *Echinocardium cordatum* and *Brissopsis lyrifera*.

Bryozoans dominated the colonial epifauna and, along with other epifaunal organisms, they are useful indicators of more mixed and coarse substrates, as an increase in habitat complexity and, the availability of attachment surfaces offered, for example, by the gravel components of the substrate provides a greater array of niches which organisms can inhabit. Thus, the average number of qualitative taxa recorded was greatest at the sites where the sediment was described as msG, gS, gmS, sG and G. The relationship was similar for quantitative data where the largest average number of taxa was from gmS, gS, msG, sG, G. Most epifaunal species are colonial animals and active filter feeders and can, in the right conditions, cover large areas.

Shannon-Wiener diversity (H') is commonly used in ecological studies. By combining species richness (number of taxa) and abundance the index gives high values where the numbers of individuals are evenly distributed across the species present (i.e. where no one species dominates the community). It is important to understand that species diversity is not synonymous with species richness. As Hurlbert (1971) states, '*gradients can exist along which increases in species diversity are accompanied by decreases in species richness*'. Thus, calculated diversity (H') can be 'good' (index value between 3 and 4) even where species richness is low as site 237 in the proposed cable corridor near the southwest boundary of the W1 option indicates. Here there were only 9 species recorded and 13 individuals but as those individuals are reasonably evenly spread then diversity H' is 'Good' at 3.09. Conversely at site 206, in the Firth of Clyde just east of the Clyde Sea Sill, there are 19 taxa, more than twice as many as site 237, but here there were 119 individuals less equitably spread, resulting in a 'Poor' H' of 1.93. Historically H' has been used in pollution monitoring studies with lower values tending to be found in more polluted conditions although its ability to detect community perturbations is largely limited to situations where gross shifts in community structure have occurred. In addition, it is recognised that an 'intermediate disturbance' can result in higher values of diversity than found in less disturbed conditions. Classical indices such as Shannon-Weiner diversity, Pielou's evenness and Simpson's dominance are useful descriptors of community structure but are less helpful if taken in isolation (Heip *et al*., 1998). Too describe whole communities it is more useful to consider diversity by ranking species.

Seven faunal groups A – G were identified by multivariate statistical analysis, and these are discussed here in the context of W1 and the two parts of the proposed cable corridor already commented on from the perspective of the physical sedimentary data.

W1

The multivariate statistical analysis clearly identified two faunal groups, 'E' and 'F', dominating W1, and not found elsewhere in the survey area. These were identified as the two well-known sandy, Level 5 biotopes, *Abra prismatica*, *Bathyporeia elegans* and polychaetes in circalittoral fine sand (SS.SSa.CFiSa.ApriBatPo; EUNIS Code MC5212); and, *Abra alba* and *Nucula nitidosa* in circalittoral muddy sand or slightly mixed sediment (SS.SSa.CMuSa.AalbNuc; EUNIS Code MC5214).

Slightly gravelly Sands dominate across W1 and were composed of moderately well sorted and moderately sorted fine and medium sands respectively. Although the discriminating species differ, there is clearly some overlap between the fauna that characterises these two biotopes. However, the amphipod that characterises group 'F' is not *B. elegans* but *B. tenuipes*, a species that tends to do well in finer and slightly muddier sediments as opposed to the medium sands dominating group 'E'. Furthermore, as has been noted, *Nucula nitidosa* favours fine sand habitats in the survey area and was identified by SIMPER as one of the characterising species for group 'F'.

Proposed Cable Corridor

From the W1 area to the Clyde Sea Sill the dominant faunal group, 'B', accounted for the largest number of sites and covered the widest geographic area. The dominant, very poorly sorted, sediment at these locations was gravelly Sand with a mean grain size of coarse sand. This group was consistent with the Level 4 biotope, 'Offshore circalittoral coarse sediment' (SS.SCS.OCS), the equivalent 2022 EUNIS level 4 habitat being '*Faunal communities in Atlantic offshore circalittoral coarse sediment*' (MD321). As the EUNIS and the Joint Nature Conservation Committee (JNCC) description notes this habitat classification will apply to large areas of the offshore continental shelf for which there is little or no quantitative data. In this context, it is interesting to note here that the Ross worm, *Sabellaria spinulosa* was one of the defining species characterising group 'B'. Given the right conditions this species can form biogenic reefs although no evidence for such structures was found from any of the sites sampled during the survey operations.

The dominant faunal groups characterising sites within the Firth of Clyde were 'A' and 'D'. Again, these were characteristic of the area and almost without exception did not occur anywhere else in the survey area (the exceptions being two sites belonging to group 'D' found in Loch Indaal, Islay). These groups were assigned to the level 4 and 5 biotopes respectively, 'Circalittoral fine mud' (SS.SMu.CFiMu; EUNIS Code MD621); and, '*Amphiura filiformis*, *Kurtiella bidentata* and *Abra nitida* in circalittoral sandy mud' (SS.SMu.CSaMu.AfilKurAnit; EUNIS Code MC6211).

Group ‘A’ sites where those deep-water sandy Mud and Mud habitats within the Firth of Clyde. As noted by Pye (1980), "*Deep sea-loch sites are subject, periodically, to low oxygen concentrations and the fauna is sparse*". Reflecting these challenging environmental conditions, it was seen that at twenty of the grab sites visited across a large area of the proposed cable corridor were marked as ‘ND’ for ‘No Data’ (Figure 24) as no living fauna was identified from the samples taken.

The polychaete *Dasybranchus* was identified as one of just two characterising species for group ‘A’. It has previously been identified as characteristic of the fine, deep water, sediments of the Firth of Clyde with both Kilbrannan Sound and Arran Deep at depths of 124m and 170m respectively, being channelled by the deep wavy burrows constructed by the species (Pye, 1980).

The sites in group ‘D’ describe part of the transition zone between the Great Plateau and the Firth of Clyde. A similar habitat is picked out by most of the remaining group ‘D’ sites at the end of the proposed cable corridor where the deep-water muds give way to the coarser sediments in the shallower waters near the coast and the entrance to the Fairlie Roads. These sites are predominantly very poorly sorted muddy Sands and slightly gravelly muddy sands. The EUNIS Level 5 biotope is ‘*Amphiura filiformis*, *Mysella bidentata* and *Abra nitida* in Atlantic circalittoral sandy mud’. Note the name of the small bivalve in the EUNIS biotope has not yet been updated to the accepted genus, *Kurtiella* (Gofas and Salas, 2008). *K. bidentata* can be found intertidally to depths of more than 100m on a variety of substrates though it has a preference for muddy sands. Subtidally it can be associated with the burrows of various ophiuroids and this biotope acknowledges this ecology. *K. bidentata* is considered to be commensal with *Acrocnida brachiata* and *Amphiura filiformis*, though it can live without any host (Ockelmann & Muus, 1978). One of the other characterising species for group ‘D’ was the brittlestar *Amphiura filiformis* so the choice of this biotope is consistent with the reported association between the two species.

Seven of the group ‘G’ sites were found scattered to the north and west of Islay the remainder were on the eastern edge of the Clyde Sea Sill between sites belonging to group ‘B’ and ‘D’. The sediments at these sites were moderately well sorted slightly gravelly Sands and the identified Level 5 biotope was ‘*Echinocyamus pusillus*, *Ophelia borealis* and *Abra prismatica* in circalittoral fine sand’ (SS.SSa.CFiSa.EpusOborApri; EUNIS Code MC5211). It is worth noting that one of the core records originally used to define this biotope came from a location SSE of Kintrye, not far from Sanda Island on the Clyde Sea Sill (very similar to four of the sites in group ‘G’) (JNCC 2022).

Reflecting the dominance of this particular sedimentary matrix, the sites in group ‘C’ off Islay were largely a form of the slightly gravelly Sand physical habitat but the mean grain size here was coarse sand rather than fine or medium sand and the discriminating species was therefore the small interstitial polychaetes, *Pisione remota*. This species is known for its preference for coarse sand habitats (Martins *et al*., 2012). The Level 4 habitat classification selected as representative for the group was an alternative expression of ‘Offshore circalittoral coarse sediment’ (SS.SCS.OCS; EUNIS, MD321).

The two solitary sites ‘X’ and ‘Y’ which did not group with any other sites were located in the deeper waters just off the Clyde Sea Sill, and in W1, respectively. As with group ‘A’ sites, site ‘X’ was allocated to the Level 4 habitat ‘Circalittoral sandy mud’ (SS.SMu.CSaMu; EUNIS Code MC621). The fact that the site separated out in the analysis from group ‘A’ is perhaps a consequence of the challenging conditions encountered here and the patchy distribution of the limited number of fauna which are able to exploit the available resources. Site ‘Y’, as with group ‘F’, best matched the biotope ‘*Abra alba* and *Nucula nitidosa* in circalittoral muddy sand or slightly mixed sediment’ (SS.SSa.CMuSa.AalbNuc; EUNIS Code MC5214). It’s notable that the site was somewhat isolated from group ‘F’ sites and on the eastern edge of the area within W1 that was surveyed.

It is worth noting here that as no geophysical data (e.g. multibeam and side-scan sonar) for the survey area was available the results from the analysis of the benthic macrofaunal samples could not be extrapolated beyond the point location data. Therefore, the nature of the large areas between the sites sampled remain s uncertain and uncharacterised. Predictive habitat maps cannot be used to reliably infill these areas. Once geophysical data is available this can be overlain and with careful interpretation the acoustic signatures can be used to infer a full habitat map, reducing the uncertainty (although in soft sediments hard demarcation lines as implied by polygon boundaries on maps, between different communities of animals, rarely exist).

4.3 Drop Down Video

A benthic baseline report for the West Islay Tidal Energy Park (WITEP) noted that the proposed development site off Islay was, ‘*predominantly made up of rocks and boulders, with an area of bedrock and boulders in the south east*’ (Lancaster et al., 2012). The authors identified the taxa as, ‘*typical of tide-swept rocky habitats in the circalittoral*’ and furthermore, noted that the area could only be sampled by DDV given the hard nature of the substrate in evidence at that location.

From video and particle size distribution data, sediments across the current survey area included sand and rippled sand, mud and mixed sediments which encompassed pebbles, cobbles and boulders in varying proportions. These areas of coarser sediment often appeared raised, and patches of bedrock outcrops were also observed. The sediment variability observed resulted in the description of six habitats and three biotopes. The following account indicates the JNCC descriptive term and code followed, in brackets, by the EUNIS code and its associated description and thereafter simply the EUNIS code).

The DDV sites within W1 were largely described by the Level 3 habitat ‘Circalittoral fine sand’, *SS.SSa.CFiSa* (MC52, ‘Atlantic circalittoral sand’). Sites within the proposed corridor cable corridor were characterised by a range of habitats. These included, ‘Circalittoral rock (and other hard substrata)’, *CR* (MC12, ‘Atlantic circalittoral rock’), with Level 5 and 6 biotopes including, ‘Echinoderms and crustose communities’, *CR.MCR.EcCr* (MC122, ‘Echinoderms and crustose communities on Atlantic circalittoral rock’); ‘*Flustra foliacea* on slightly scoured silty circalittoral rock’, *CR.MCR.EcCr.FaAlCr.Flu* (MC12241, ‘*Flustra foliacea* on slightly scoured silty Atlantic circalittoral rock’); and, ‘Faunal and algal crusts with *Spirobranchus triqueter* and sparse *Alcyonium digitatum* on exposed to moderately wave-exposed circalittoral rock’, *CR.MCR.EcCr.FaAlCr* (MC12245, ‘Faunal and algal crusts with *Pomatoceros triqueter* and sparse *Alcyonium digitatum* on exposed to moderately wave-exposed Atlantic circalittoral rock’). In addition, there was ‘Circalittoral fine sand’, *SS.SSa.CFiSa* (MC52, ‘Atlantic circalittoral sand’); ‘Circalittoral mixed sediment’, *SS.SMx.CMx* (MC42, ‘Atlantic circalittoral mixed sediment’; ‘Circalittoral coarse sediment’, *SS.SCS.CCS* (MC32, ‘Atlantic circalittoral coarse sediment'; and, 'Circalittoral fine mud', *SS.SMu.CFiMu* (MC62, 'Atlantic circalittoral mud'). This is supported by the predicted habitats described for the area by the EUSeaMap 2023 (Figure 4), as well as a previous study carried out to the west of Islay (Moore, 2014), to the south/south east of the proposed main array area and to the east of the most offshore section of the cable route. Moore (2014) describes the offshore area as rippled fine sand with limited fauna which included *Astropecten irregularis* and *Corystes cassivelaunus*; this area corresponds largely with the main array survey beyond the 50m depth contour, and was assigned the biotope 'Circalittoral fine sand' (*SS.SSa.CFiSa*), which is encompassed within the EUNIS '*Atlantic circalittoral sand*' (MC52) (EUNIS, 2022).

Habitats and biotopes including 'Circalittoral rock (and other hard substrata)', *CR* (EUNIS code MC12); 'Echinoderms and crustose communities', *CR.MCR.EcCr* (MC122); '*Flustra foliacea* on slightly scoured silty circalittoral rock', *CR.MCR.EcCr.FaAlCr.Flu* (MC12241); and, 'Faunal and algal crusts with *Spirobranchus triqueter* and sparse *Alcyonium digitatum* on exposed to moderately wave-exposed circalittoral rock', *CR.MCR.EcCr.FaAlCr* (MC12245) were described for the seabed area to the south east of the proposed W1 option. Whilst areas of 'Circalittoral mixed sediment', *SS.SMx.CMx* (MC42) and 'Circalittoral coarse sediment', *SS.SCS.CCS* (MC32) were also encountered along the proposed cable route. To the south east of the proposed W1 option survey area Moore (2014) describes a seabed of sand-scoured bedrock and dense cobbles and boulders often colonised by bryozoan turf (e.g. *Flustra foliacea*); anemones (e.g. *Urticina felina*); and, echinoderms (including *Echinus esculentus* and *Crossaster papposus*) to which the JNCC habitats and biotopes including 'Mixed faunal turf communities' (*CR.HCR.XFa*), '*Flustra foliacea* on slightly scoured silty circalittoral rock' (*CR.MCR.EcCr.FaAlCr.Flu*) were assigned. Patches of silty coarse sand were also recorded within the area and assigned the JNCC biotope 'Circalittoral coarse sediment' (*SS.SCS.CCS*) (Moore, 2014). These JNCC habitats and biotopes are the same or are encompassed within those described during the current survey. The section of the proposed cable approaching the landfall area was largely characterised by 'Circalittoral mixed sediment', *SS.SMx.CMx* (MC42) and 'Circalittoral fine mud', *SS.SMu.CFiMu* (MC62).

The different habitat types and distribution of sediment encountered during the current survey were predicted to occur within the area (Figure 4).

4.4 Habitat and species of conservation interest

Sixteen stations were described as having substrate of cobbles, boulders and/or bedrock and therefore these were assessed for the presence of Annex I Reef (geogenic). Of these, eight stations were assigned the overall assessment for the resemblance of the substrate to 'Stony Reef' with the categories 'Not a reef', 'Low reef' and 'Medium reef' applied within the survey area. The JNCC guidelines for identifying stony reef (Irving, 2009) state that '*when determining whether an area of seabed should be considered as Annex I stony reef, if a 'low' is scored in any of the characteristics (composition, elevation, extent or biota), then a strong justification would be required for this area to be considered as contributing to the Marine Natura site network of qualifying reefs in terms of the EU Habitats Directive*.'

Where bedrock was encountered, topographic drops were observed with heights often over 1m, as inferred by recorded changes in the depth. A full assessment of the extent and nature of the feature was not possible as SSS and bathymetry data were not available at the time of the assessment being carried out. The seabed habitat was described as the EUNIS habitat '*Atlantic circalittoral rock*' (MC12) or biotopes included within, which is suggested could correlate to Annex I reef (Duncan et al., 2022).

Following the observation of the Norway lobster (*Nephrops norvegicus*), its associated burrows and smaller faunal burrows, two drop-down video stations were further assessed for the presence of the OSPAR listed threatened and/or declining habitat '*Sea-pens and burrowing megafauna communities*'. Except for one individual of *Virgularia* sp. counted as 'Occasional' at station DDV38, no sea-pens were observed. Small faunal burrows (3 cm to 15 cm) were assessed as 'common' at both stations and larger burrows (>15 cm), likely made by the Norway lobster (*Nephrops norvegicus*), were assessed as 'common' at station DDV42 and 'abundant' at station DDV38. This data was consistent with the burrow density data from 2007 onwards provided by the Scottish Government (Figure 33B). With regards to Sea-pen and burrowing megafauna communities, the JNCC (2014) habitat guidelines indicates that, to be classified as a 'Sea-pen and burrowing megafauna community', the seabed must be 'heavily bioturbated by burrowing megafauna with burrows and mounds forming a prominent feature of the sediment surface'. The guidelines also indicate that, whilst sea-pens do not need to be present, burrows should occur with an abundance of at least 'frequent' on the SACFOR scale.

The presence of dense aggregations of suspension-feeders such as *O. fragilis* seen from DDV9, DDV31, and DDV34 is a good indication of an ecosystem with a very high primary production (Blanchet-Aurigny et al 2012). This is noteworthy as one of the sites DDV34 was in the Clyde Sea Sill MPA that was chosen in part because of the Clyde front that manifests there. DDV 31 sits with the amphidromic point and DDV9, just west of Islay, could be benefiting from the Islay front. However, brittlestar beds are not a Priority Marine Feature within Scotland. Hughes (1998) indicates they are a sub feature of several Annex I habitats including Reefs and Sandbanks which are slightly covered by seawater all the time. Where brittlestar beds are assessed to be a sub-feature within an SAC they would be subject to assessment. The beds observed in this survey are not within an SAC. The Nationally Important Marine Features (NIMF) list was a precursor to the UKBAP list and all the features on that list were assessed against BAP criteria at the UK level. Dense brittlestar beds (*SS.SMx.CMx.OphMx*) were on the NIMF list but did not feature on the UKBAP list. However, dense beds of brittlestars can occur in the UK BAP Priority habitat 'Tide-swept Channels' but the biotope OphMx was not listed as illustrative of this habitat. Note *O. fragilis* populations are considered to be stable over time persisting for years or even decades (Hughes 1998; Blanchet-Aurigny et al 2012). Fauna living beneath the canopy of *O. fragilis* feeding arms are understood to be resource-limited as the brittlestars monopolize the suspended food resources (George and Warwick 1985; Blanchet-Aurigny et al 2012).

Adult and juvenile individuals of the Ocean Quahog *Arctica islandica* were recorded at 17 grab sites. Eleven sites were records of adult specimens, 6 sites were records of juveniles. Thirteen of the specimens sampled were from sites within the W1 area, ten of which were adults accounting for all but 1 of the adults encountered. Six of the ten adult specimens within W1 were located at sites were the recorded biotope was '*Abra alba* and *Nucula nitidosa* in circalittoral muddy sand or slightly mixed sediment' (SS.SSa.CMuSa.AalbNuc; EUNIS Code MC5214). The Ocean Quahog *Arctica islandica*, which is included in the threatened and/or declining species list for OSPAR Regions II and III (OSPAR, 2023), can be found predominately in offshore sediments, buried or partially buried in sand and muddy sand to depths of 500 m (Tyler-Walters & Sabatini, 2017). OSPAR (2009) report that, '*there are no known existing management measures specifically addressing* A. islandica' and that existing measures are insufficient to halt the decline and recovery of endangered species. It is understood that locations which restrict fishing efforts particularly with regard to trawlers and beam trawlers, '*should be expected to have some protective effect on these species*' (OSPAR, 2009). To aid the recovery of the species it is recommended that known habitats for the species be monitored and sampled on an annual or bi-annual basis using, for example, box-cores; and, that any quahogs sampled in this way are examined on board and then returned to their habitat (OSPAR, 2009).

Across the survey area, sand eels (Ammodytidae) were identified from video data, whilst from grab data *Ammodytes marinus* and *Ammodytes tobianus* were identified at three and 16 stations respectively. In addition, *Gymnammodytes semisquamatus* was found at three sites and *Hyperoplus lanceolatus* was at a single site. *A. marinus*, *A. tobianus* are in the PMF list, whilst these two sand eels along with *H. lanceolatus* are included in the Northern Ireland Priority Species list. The sand eel habitat preference assessment identified 113 sites at which the sediment would be categorized as 'Preferred' for sand eels; 17 sites indicated a sediment which would be 'Marginal' sand eel habitat; and, the remaining 74 sites indicated 'Unsuitable' sediment for sand eel habitats. Of the 76 sites in W1, 72 were assessed as falling into the 'Preferred' sand eel habitat category. The picture was more mixed at sites within the proposed cable corridors but those sites located in the Firth of Clyde from the edge of the Clyde Sea Sill on, were uniformly assessed as 'Unsuitable' habitat for sand eels. *A. marinus* and *A. tobianus* are included in the Scottish Priority Marine Features list as well as the Northern Ireland Priority Species List. Low intensity spawning grounds for sand eels are present to the north of the survey area (Ellis et al., 2012).

Five species on the Scottish Biodiversity list and twelve species on the Northern Ireland Priority Species list were recorded from grab sample sites from the survey area and these were listed in the results.

4.4 Contaminants

The results for organotins and polychlorinated biphenyls (PCB's) were all below the available ERL and Action Level threshold values. OSPAR (2009) indicates that adverse effects on organisms are rarely observed when concentrations are below the ERL.

Metal concentrations exceeded both the AL1 and ERL threshold values one or more times at 24 of the 68 sites sampled. Adverse ecological effects cannot be ruled out at those sites where the ERL concentration was exceeded. As with other contaminants reported here the majority of those exceedences occurred at sites within the Firth of Clyde. An example plot was provided to illustrate the results. Of particular note was the gradient of increasing concentration from southwest to northeast along the proposed cable route corridor in the Firth of Clyde. It is important to remember that sediments are made up of various constituent parts and that metals will be naturally partitioned between these different parts or phase's such as the different mineral species and organic debris (Rosental et al., 1986). Luoma (1986) indicates organic carbon is known to inhibit the availability of trace metals lead, mercury, arsenic, zinc and possibly silver and copper to benthic organisms. However, Luoma (1986) also states that, 'no single component [of the sediment] dominates the partitioning of a metal; and that partitioning may change from place to place or time to time'.

Polycyclic Aromatic Hydrocarbon (PAH) concentrations above the OSPAR CSEMP ERL thresholds values were recorded at multiple sites. Action level (AL) 1 values were also exceeded for multiple analytes across numerous sites. As the results for benzo[ghi]perylene exceeded the ERL threshold more than any other contaminant measured the results have been mapped illustrating the gradient of increasing concentration from southwest to northeast along the proposed cable route corridor. It is important to note that at the locations concerned, adverse ecological effects cannot be ruled out.

The related PAH (DTI) results do not have ERL or AL values. Petroleum is a potential source of PAHs in the environment as it is rich in 1-3 ring compounds such as benzenes, naphthalenes and phenanthrenes (McDougall, 2000).

The NPD / 4-6 ring PAH ratio reflects the relative abundance of low molecular weight (LMW) and high molecular weight (HMW) PAHs in a sample. Generally, LMW PAHs are more abundant in petrogenic sources, which are derived from unburned or partially burned fossil fuels, such as oil spills, seepages, and industrial effluents. Though the relative proportions of these LMW PAH compounds does vary between crude oils and the refined products derived from them (McDougall, 2000). HMW PAHs are more abundant in pyrolytic sources, which are derived from high-temperature combustion of organic matter, such as biomass burning, vehicle emissions, and coal-fired power plants. Therefore, as a rule of thumb, a high NPD / 4-6 ring PAH ratio (> 1) may indicate a petrogenic origin, while a low NPD / 4-6 ring PAH ratio (< 1) may indicate a pyrolytic origin. However, it is important to understand that there is no universal threshold value that can distinguish between these two sources, as the ratio may vary depending on the type, age, and weathering of the PAHs, as well as the environmental conditions and the analytical methods used. That said all but 4 of the values recorded here were below 1 perhaps suggesting PAH's of pyrolytic origin. Those stations with values above 1 where 74 and 81, in the WI option area; 133 on the Clyde Sea Sill; and, 266 between Laggan Point and the Rhinns, Islay. Set against this interpretation are the recorded concentrations of dibenzothiophenes which have been used as organic markers of oil pollution (Friocourt, *et al*., 1982). High concentrations of dibenzothiophenes were recorded at stations within the proposed cable corridor in the Firth of Clyde however, those stations with NPD / 4-6 ring PAH ratio greater than 1 where all at locations where low ratios where found.

Polybrominated diphenyl ethers (PBDEs) concentrations were all below the Federal Environmental Quality Guideline values (FEQGs) except for two analytes, BDE209 and BDE99, at sites in the Firth of Clyde. Recorded concentrations below the FEQG should not cause any chronic effects on marine organisms but such effects cannot be ruled where values are above this threshold.

Frequent PBDE detections in the Clyde have been noted by Marine Scotland in their regional assessments of the status for PBDEs in sediment (2020). The most dominant PBDE in sediment is BDE209 exceeding the FEQG in the Irish Sea (Clyde and Solway) (Marine Scotland, 2020). Adverse effects on marine life are considered to still be possible in this area and, due to the persistence of PBDEs in the environment it is understood that concentrations in the affected sediments will only diminish slowly over the coming decades (Marine Scotland, 2020). BDE209 was the most common PBDE congener used in flame retardants hence, within the OSPAR Maritime Area, it is found to occur at the highest concentrations in sediments (>1 µg/kg dry weight) (OSPAR, 2017). Although BDE209 dominates in sediments it is rarely detected in biota (Marine Scotland, 2020).

It should be noted that OSPAR (2017) consider the lack of data for some of the individual PBDE congeners to be in most cases, indicative of a very low value that cannot be accurately measured. Furthermore, the broader picture in Scottish regional seas indicates that PBDE concentrations in sediment and biota are stable or decreasing in all areas (Marine Scotland, 2020). Nevertheless, Marine Scotland (2020) indicate that concentrations of even one PDBE compound above the FEQG is unacceptable.

It is important to note that organochlorine pesticide (OCPs) concentrations exceeded the available effects range low values at multiple sites for both dieldrin and DDD as well as at one location for DDT. This means that at these locations adverse ecological effects cannot be ruled out.

Total organic carbon (TOC) performs an important role in marine ecosystems providing a source of food for suspension and deposit feeders, which may in turn be preyed upon by predators higher up the food chain. This has led to the suggestion that variation in benthic communities can be influenced to some extent by the availability of organic carbon (Snelgrove and Butman, 1994). Though TOC includes labile, or bio-available material, and refractory material, organic matter that is considered resistant to biodegradation, and as a result it may correlate very poorly with impact in environmental impact assessments (Loh, 2005; Baltar et al 2021). Importantly, TOC does not in itself offer any discrimination or indication of quality, with respect to labile and refractory organic compounds (Danovaro *et al*., 2001).

Gunnarsson et al., (1999) note that sediment, "*total organic carbon (TOC) content is considered to be a primary food source for benthic invertebrates and a major factor influencing the partitioning and bioavailability of sediment-associated organic contaminants. Most studies report that both toxicity and uptake of sediment-associated contaminants by benthic organisms are inversely proportional to sediment TOC content*". Bioavailability, however, remains key, thus the bioaccumulation of organic contaminants in benthic infauna would depend on the nutritional quality of the sediment organic matter and the proportions of labile verses refractory material.

Organic contaminants can be strongly correlated with TOC. For example, polycyclic aromatic hydrocarbons (PAHs) are a group of hydrophobic organic contaminants which have low aqueous solubilities and, being lipophilic, they can bind strongly to organic matter in sediment (Khodadoust *et al*., 2005; Davies, 2004). But again, total bulk concentrations in sediments and their potential toxic effects on living organisms are dependent on the degree of bioavailability (Liber et al., 1996).

TOC can be a good indicator of benthic enrichment and the associated stress and reduction in species richness (Hyland *et al*., 2005). In the results present in this report note the high values of TOC in the Firth of Clyde and the low numbers of quantitative and qualitative taxa recorded there (Figure

20; Figure 21; Figure 44). As such TOC could be viewed as an important driver behind the pattern of benthic ecology encountered. That said the relationship may not be direct or causal given the correlation between this indicator and other co-varying stressors such as low dissolved oxygen, high ammonia and sulphide and the associated chemical contaminants (Hyland *et al*., 2005).

5 Conclusions

A full analysis of all data collected during the survey work undertaken in August and September 2021 has been presented and made available within the report the main points from which have been:

Physical sediment characteristic

- Through analysis and mapping of particle size data from locations within the survey area the report has provided detail on the physical structure of the seabed at those points in the survey area;
- This has been seen to corroborate the available predicted seabed habitat map, whilst indicating some areas where site data provides greater resolution;
- Sand was the dominant component in samples from W1, mud dominated those taken in the Firth of Clyde and at the sites between these areas within the proposed cable corridor sediments were coarser and more variable.

Biological sediment characteristics

- Macrobenthic communities associated with the sedimentary habitats sampled were identified by the analysis of grab data with DDV enabling descriptions of more rugged locations;
- W1 was dominated by two level 5 sandy biotopes '*Abra prismatica*, *Bathyporeia elegans* and polychaetes in circalittoral fine sand' and '*Abra alba* and *Nucula nitidosa* in circalittoral muddy sand or slightly mixed sediment';
- DDV data corroborated the presence of 'Circalittoral fine sand' in W1 as well as providing evidence of circalittoral rock, cobble and mixed sediment biotopes particularly from sites near the southern boundary;
- At sites between W1 and the Firth of Clyde in the proposed cable corridor the dominant faunal group was consistent with the level 4 biotope 'Offshore circalittoral coarse sediment' with circalittoral rock biotopes dominating DDV sites to the west and south of Islay in addition to the presence of mixed sediment habitats;
- Sites within the Firth of Clyde were assigned to the level 4 biotope 'Circalittoral fine mud' and in line with available historical data were relatively impoverished faunistically;
- DDV evidence from the Firth of Clyde was more limited but corroborated the mud habitats and provided evidence of mixed sedimentary habitats;
- Two level 5 biotopes from sites where the Clyde Sea Sill transitions to the deep water muds of the Firth of Clyde were '*Echinocyamus pusillus*, *Ophelia borealis* and *Abra prismatica* in circalittoral fine sand' and '*Amphiura filiformis*, *Kurtiella bidentata* and *Abra nitida* in Atlantic circalittoral sandy mud';
- DDV samples indicated the presence of the biotope '*Ophiothrix fragilis* and/or *Ophiocomina nigra* brittlestar beds on circalittoral mixed sediment' at two locations;

- An important limitation of the current study was the absence of acoustic geophysical data (multibeam and side-scan sonar) without which no full habitat maps could be inferred from the point data;

Habitats and species of conservation interest

- Eight locations were assessed for the presence of stony reef 2 of which were categorised as showing a medium resemblance to stoney reef, 3 a low resemblance and 3 were not reef;
- Using recent literature it was indicated that circalittoral rock habitat sites may correlate to Annex I reef;
- Potential burrowed mud habitat was identified at the two DDV sites south of Arran;
- *Arctica islandica* was found at points across the survey area but 77% were located in W1 and 60% of the adults living there were associated with the biotope '*Abra alba* and *Nucula nitidosa* in circalittoral muddy sand or slightly mixed sediment';
- With the exception of four sites, sedimentary data from sites in W1 identified it as 'Preferred' sand eel habitat whilst those in the Firth of Clyde clearly indicated the habitat found there was 'Unsuitable';
- Species on the Scottish Biodiversity list and the Northern Ireland Priority Species were identified and listed;
- There was no evidence for *Sabellaria spinulosa* reef in the available data but, it is worth noting with respect to possible future work effort, that high abundances of the species from grab sites within the proposed cable corridor were recorded and serve to highlight areas where conditions may be more optimal for the growth of these biogenic reef structures, in particular from:
  (1) within the Clyde Sea Sill MPA(NC)
  (2) the region between Islay and Kintyre where the amphidromic point is located and,
  (3) southwest of Islay, within the influence of the Islay front;

Faecal Indicators

- Microbial analysis indicated that all sampled sediment was not contaminated with 13 of the 15 sites sampled having no detectable concentrations;

Contaminants

- The concentrations of the contaminants tested for were reported and assessed with examples mapped highlighting in particular, issues related to the fine sediments within the Firth of Clyde, where elevated levels of a range of analytes including polyaromatic hydrocarbons, metals, polybrominated diphenyl ethers and organochlorine pesticides were recorded;
- It is recommended that further work is undertaken to clarify if, or to what extent the observed concentrations of contaminants and the associated exceedances may be driving the pattern of faunal associations seen within the Firth of Clyde.

Marine Mammal sightings

- Incidental sightings of marine mammals during survey operations were reported.

References:

Baltar, F., Alvarez-Salgado, X. A., Arístegui, J., Benner, R., Hansell, D. A., Herndl, G. J., & Lønborg, C. (2021). What Is Refractory Organic Matter in the Ocean? *Frontiers in Marine Science*, 8. https://www.frontiersin.org/articles/10.3389/fmars.2021.642637

Barne, J.H., Robson, C.F., Kaznowska, S.S., Doody, J.P., Davidson, N.C., & Buck, A.L., eds. 1997. *Coasts and seas of the United Kingdom. Region 14 South-west Scotland: Ballantrae to Mull*. Peterborough, Joint Nature Conservation Committee. (Coastal Directories Series)

Blanchet-Aurigny A.; Dubois, S. F.; Hily, C.; Rochette, S.; Le, Goaster E.; Guillou, M., 2012: Multi-decadal changes in two co-occurring ophiuroid populations. *Marine Ecology Progress Series* 460: 79-90.

Blott, S.J. and Pye, K. (2001) GRADISTAT: a grain size distribution and statistics package for the analysis of unconsolidated sediments. *Earth Surface Processes and Landforms* 26, 1237-1248.

BODC (2010). *Cumbraes Marine Consultation Areas, western Scotland*. Available at: https://www.bodc.ac.uk/resources/inventories/edmed/report/310/ (Accessed: 17 December 2023)

Commission of the European Community (CEC). 2013. *The Interpretation Manual of European Union Habitats - EUR28*. Brussels: European Commission DG Environment. Available at: https://circabc.europa.eu/ui/group/3f466d71-92a7-49eb-9c63-6cb0fadf29dc/library/37d9e6d9-b7de-42ce-b789-622e9741b68f/details

Cibic, T., Orlando-Bonaca, M. and Rubino, F. (2022). Editorial: New perspectives in benthic-pelagic coupling in marine and transitional coastal areas. *Front. Mar. Sci.* 9:1009078. doi: 10.3389/fmars.2022.1009078

Clarke K. R., Somerfield P. J. and Gorley R. N. (2008). Testing of null hypotheses in exploratory community analyses: similarity profiles and biota-environment linkage. *Journal of Experimental Marine Biology and Ecology* 366 56–69.

Clarke, K. R. and Warwick, R. M. (2001). *Change in marine communities: an approach to statistical analysis and interpretation*, *2nd edition*. PRIMER-E: Plymouth.

Connor, D.W. & Little, M. 1998. West Scotland (MNCR Sector 13). In: *Marine Nature Conservation Review. Benthic marine ecosystems of Great Britain and the north-east Atlantic*, ed. by K. Hiscock, 355-370. Peterborough, Joint Nature Conservation Committee (Coasts and seas of the United Kingdom. MNCR series)

DAERA-NI (2016). *Rathlin Marine Conservation Zone (MCZ) Site Summary Document*. ISBN 978-1-84807-690-7. Available at: https://www.daera-ni.gov.uk/publications/rathlin-mcz

Danovaro, R., Dell Anno, A., & Fabiano, M. (2001). Bioavailability of organic matter in the sediments of the Porcupine Abyssal Plain, northeastern Atlantic. *Marine Ecology Progress Series*, 220, 25–32. https://doi.org/10.3354/meps220025

Davis, I.M. (2004). Background/Reference Concentrations (BRCS) for the UK. Fisheries Research Services Contract Report No 05/04. 32pp.

Department of Agriculture, Environment and Rural Affairs (DAERA) (2023). List of Northern Ireland priority species 2023. Available at: https://www.daera-ni.gov.uk/publications/list-northern-ireland-priority-species-2023

Dauvin, J. C., Alizier, S., Rolet, C., Bakalem, A., Bellan, G., Gesteira, J. L. G., Grimes, S., de-la-Ossa-Carretero, J. A., & Del-Pilar-Ruso, Y. (2012). Response of different benthic indices to diverse human pressures. *Ecological Indicators*, 12(1), 143–153. https://doi.org/10.1016/j.ecolind.2011.03.019

Duncan, G., Pinder, J., Lillis, H. and Allen, H. (2022). *Method for creating version 8 of the UK Composite Map of Annex I Reefs*. Joint Nature Conservation Committee, Peterborough. Available at: https://data.jncc.gov.uk/data/992dfef7-3267-43db-b351-5927bf0621d4/r20220407-uk-reefs-v8-5-methods.pdf

Edwards A., Baxter, M. S., Ellett, D. J., Martin, J. H. A., Meldrum, D. T. and Griffiths, C. R. (1986). Clyde Sea hydrography. *Proceedings of the Royal Society of Edinburgh Section B Biological Sciences*; 90:67-83. doi:10.1017/S0269727000004887

Eleftheriou A, Basford DJ. The Macrobenthic Infauna of the Offshore Northern North Sea. *Journal of the Marine Biological Association of the United Kingdom*. 1989;69(1):123-143. doi:10.1017/S0025315400049158

Ellis, J.R., Milligan, S.P., Readdy, L., Taylor, N. & Brown, M.J. (2012). *Spawning and nursery grounds of selected fish species in UK waters*. (Science Series Technical Report No. 127). Centre for Environment, Fisheries and Aquaculture Science [Cefas]. https://www.cefas.co.uk/publications/techrep/techrep147.pdf

Environment Canada (2013). *Federal Environmental Quality Guidelines Polybrominated Diphenyl Ethers (PBDEs)*. http://www.ec.gc.ca/ese-ees/05DF7A37-60FF-403F-BB37-0CC697DBD9A3/FEQG_PBDE_EN.pdf

EUNIS (2022). *EUNIS marine habitat classification 2022 including crosswalks*. Available at: https://www.eea.europa.eu/data-and-maps/data/eunis-habitat-classification-1/eunis-marine-habitat-classification-review-2022/eunis-marine-habitat-classification-2022

Ferreira, J.G., Moore, H., Lencart e Silva, J., Nunes, J.P., Zhu, C.B., Service, M., McGonigle, C., Jordan, C., McLean, S., Boylan, P., Fox, B., Scott, R., Sousa, M.C., Dias, J.M. and Tirano, M.P. (2022). *Enhanced Application of the SMILE Ecosystem Model to Lough Foyle EASE*, Northern Ireland Agri-Food and Biosciences Institute (AFBI), Longline Environment Ltd, and Loughs Agency. Available online at: https://www.afbini.gov.uk/sites/afbini.gov.uk/files/publications/Ease%20Book_Web2%20.pdf

Folk, R.L., (1954). The distinction between grain size and mineral composition in sedimentary rock nomenclature. *Journal of Geology* 62 (4), 344-359.

Folk, R. L., & Ward, W. C. (1957). Brazos River bar [Texas]; a study in the significance of grain size parameters. *Journal of Sedimentary Research*, 27(1), 3–26. https://doi.org/10.1306/74d70646-2b21-11d7-8648000102c1865d

Friocourt, M.P., Berthou, F. and Picart, D. (1982). Dibenzothiophene derivatives as organic markers of oil pollution. *Tox. and Env. Chem.*, 5, 205-215

Garrison, T. (2009). *Oceanography: An Invitation to Marine Science*. Cengage Learning. 582 pages.

George, C.L.; Warwick, R.M. (1985). Annual macrofauna production in a hard-bottom reef community. *J. Mar. Biol. Ass. U.K.* 65: 713-735

Gofas, S., & Salas, C. (2008). A review of European '*Mysella*' species (Bivalvia, Montacutidae), with description of *Kurtiella* new genus. *Journal of Molluscan Studies*, 74(2), 119–135. https://doi.org/10.1093/mollus/eym053

Golding. N., Albrecht. J. & McBreen. F. (2020). *Refining criteria for defining areas with a 'low resemblance' to Annex I stony reef: Workshop Report*. JNCC Report No. 656, JNCC, Peterborough, ISSN 0963-8091.

Gray, J.S. and Elliott, M. (2009). *Ecology of Marine Sediments: from Science to Management*. 2nd ed. Oxford: Oxford University Press. ISBN 978-0-19-856902-2.

Gunnarsson, J. S., Granberg, M. E., Nilsson, H. C., Rosenberg, R. and Hellman, B. (1999). Influence of sediment-organic matter quality on growth and polychlorobiphenyl bioavailability in Echinodermata (Amphiura filiformis). *Environmental Toxicology and Chemistry*, 18: 1534–1543. doi: 10.1002/etc.5620180728

Gutow, L., Gusky, M., Beermann, J., Gimenez, L., Pesch, R., Bildstein, T., Heinicke, K., & Ebbe, B. (2022). Spotlight on coarse sediments: Comparative characterization of a poorly investigated seafloor biotope in the German Bight (SE North Sea). *Estuarine, Coastal and Shelf Science*, 275, 107996. https://doi.org/10.1016/j.ecss.2022.107996

Heip, C., Herman, P. and Soetaert, K. (1998). Indices of diversity and evenness. *Oceanis*. 24.

Hill, A. E. and Simpson, J. H. (1989). On the interaction of thermal and haline fronts: The Islay front revisited. *Estuarine and Coastal Shelf Science*:28, 495-505.

Hiscock, K (ed.) (1996). *Marine Nature Conservation Review: Rationale and methods*. Coasts and seas of the United Kingdom. MNCR series. Joint Nature Conservation Committee, Peterborough.

Huber, M. (2010). Compendium of bivalves: A full-color guide to 3,300 of the world's marine bivalves: a status on bivalvia after 250 years of research. ConchBooks, 901pp.

Hughes, D.J. (1998). *Subtidal brittlestar beds (volume IV). An overview of dynamics and sensitivity characteristics for conservation management of marine SACs*. Scottish Association for Marine Science (UK Marine SACs Project). 78 Pages.

Hurlbert, S. H. (1971). The Nonconcept of Species Diversity: A Critique and Alternative Parameters. *Ecology*, 52(4), 577–586. https://doi.org/10.2307/1934145

Hyland, J., Balthis, L., Karakassis, I., Magni, P., Petrov, A., Shine, J., Vestergaard, O. and Warwick, R.M. (2005). Organic carbon content of sediments as an indicator of stress in the marine benthos. *Marine Ecology Progress Series*, 295. 91 - 103.10.3354/meps295091

International Union for Conservation of Nature and Natural Resources [IUCN] (2022). The IUCN red list of threatened species. Version 2021-3. https://www.iucnredlist.org

Irving, R. (2009). *The identification of the main characteristics of stony reef habitats under the Habitats Directive: Summary report of an inter-agency workshop 26–27 March 2008*, JNCC Report No. 432, JNCC, Peterborough, ISSN 0963-8091.

Josefson, A.B. and Conley, D.J. (1997). Benthic response to a pelagic front. *Marine Ecology Progress Series*, 147, 49–62.

JNCC, 2014. *JNCC clarifications on the habitat definitions of two habitat FOCI*. Peterborough, UK.

JNCC (2019a). *Article 17 Habitats Directive Report 2019: Habitat Conservation Status Assessments* Available at: https://jncc.gov.uk/our-work/article-17-habitats-directive-report-2019-habitats/

JNCC (2019b). *Article 17 Habitats Directive Report 2019: Species Conservation Status Assessments* Available at: https://jncc.gov.uk/our-work/article-17-habitats-directive-report-2019-species/

JNCC (2018). *EUNIS marine classification, the Marine Habitat Classification for Britain and Ireland, and other marine habitats listed for conservation importance*. [Accessed: 22 December 2023]. Available at: https://hub.jncc.gov.uk/assets/62a16757-e0d1-4a29-a98e-948745804aec

JNCC (2022). *The Marine Habitat Classification for Britain and Ireland* Version 22.04. [Accessed: 22 December 2023]. Available from: https://mhc.jncc.gov.uk/

JNCC (2023). *1351* Harbour porpoise *Phocoena Phocoena*. [Accessed: 17 December 2023]. Available at: https://sac.jncc.gov.uk/species/S1351/

Kasai, A., Rippeth, T. P., & Simpson, J. H. (1999). Density and flow structure in the Clyde Sea front. *Continental Shelf Research*, 19(14), 1833–1848. https://doi.org/10.1016/S0278-4343(99)00042-4

Kaskela, A. M., Kotilainen, A. T., Alanen, U., Cooper, R., Green, S., Guinan, J., van Heteren, S., Kihlman, S., Van Lancker, V., & Stevenson, A. (2019). Picking up the pieces—harmonising and collating seabed substrate data for European maritime areas. *Geosciences*, 9(2), 84. DOI: https://doi.org/10.3390/geosciences9020084

Khodadoust, A. P., L. Lei, J. E. Antia, R. Bagchi, M. T. Suidan, AND H. H. Tabak (2005). Adsorption of polycyclic aromatic hydrocarbons in aged harbor sediments. M.K. Banks (ed.), *Journal of Environmental Engineering*. American Society of Civil Engineers (ASCE), Reston, VA, 131(3):403-409.

Lancaster, J., Walker, A., Rutherford, V. and Malcolm, F. (2012). *Islay Tidal Energy Project Benthic Baseline Report*. Report: 1014581 for DP Energy West Islay Tidal Energy Project. 144pp.

Latto P. L., Reach I.S., Alexander D., Armstrong S., Backstrom J., Beagley E., Murphy K., Piper R. and Seiderer L.J., 2013. *Screening Spatial Interactions between Marine Aggregate Application Areas and Sandeel Habitat*. A Method Statement produced for BMAPA.

Liber, K., Call, D. J., Markee, T. P., Schmude, K. L., Balcer, M. D., Whiteman, F. W. and Ankley, G. T. (1996), Effects of acid-volatile sulfide on zinc bioavailability and toxicity to benthic macroinvertebrates: A spiked-sediment field experiment. *Environmental Toxicology and Chemistry*, 15: 2113–2125. doi: 10.1002/etc.5620151207

Loh, P.S., 2005. *An assessment of the contribution of terrestrial organic matter to total organic matter in sediments in Scottish sea lochs*. PhD thesis, UHI Millenium Institute, 350 pp.

Long, E. R., D. D. MacDonald, S. L. Smith, and F. D. Calder. 1995. Incidence of adverse biological effects within ranges of chemical concentrations in marine and estuarine sediments. *Environmental Management* 19(1): 81-97.

Long, D. (2006). *BGS Detailed explanation of seabed sediment modified Folk classification*. MESH (Mapping European Seabed Habitats).

Louma, S. N. (1986). Biological availability of sediment-bound trace metals (IFREMER). *Actes de Colloques*, 4, 347-362pp

McDougall, J., (2000). *The significance of hydrocarbons in the surficial sediments from Atlantic Margin regions, Section 5.1 in Environmental Surveys of the Seafloor of the UK Atlantic Margin, Atlantic Frontier Environmental Network* [CD-ROM] ISBN 09538399-0-7.

Marine Scotland (2017). Pre-disposal Sampling Guidance Version 2 – November 2017. Scottish Government. 5pp.

Marine Scotland (2020). Concentration of PBDEs in biota and sediment. Available at: https://marine.gov.scot/sma/assessment/concentration-pbdes-biota-and-sediment

MarineScotland (2023). Marine Consultation Areas (SNH WMS). Available at: https://marine.gov.scot/maps/1812 (Accessed: 17 December 2023)

Mason, C. 2016. *NMBAQC's Best Practice Guidance. Particle Size Analysis (PSA) for Supporting Biological Analysis*. National Marine Biological AQC Coordinating Committee, 84pp, First published 2011, updated March 2022.

Martins, R., Martín, G. S., Rodrigues, A. M., & Quintino, V. (2012). On the diversity of the genus *Pisione* (Polychaeta, Pisionidae) along the Portuguese continental shelf, with a key to European species. *Zootaxa*, 3450(1), Article 1. https://doi.org/10.11646/zootaxa.3450.1.4

McIntyre, F., Fernandes, P. G., & Turrell, W. R. (2012). *Clyde Ecosystem Review*. Scottish Marine And Freshwater Science Volume 3 Number 3

Midgley, R.P. (1998). Circulation, mixing and renewal in the Clyde Sea. PhD Thesis, University of Bangor, 170pp.

Moore, C.G. (2014). *Biological analyses of underwater video from proposed marine protected areas, renewable energy sites and spoil grounds around Scotland*. Scottish Natural Heritage Commissioned Report No. 746

NatureScot. (2020a). *Scottish Biodiversity List*. Available at: https://www.nature.scot/doc/scottish-biodiversity-list

NatureScot. (2020b). *Priority Marine Features in Scotland's seas*. Available at: https://www.nature.scot/doc/priority-marine-features-scotlands-seas-habitats

NatureScot (2023a). *Clyde Sea Sill MPA(NC)*. Available at: https://sitelink.nature.scot/site/10414 (Accessed: 17 December 2023)

NatureScot (2023b). *South Arran MPA(NC)*. Available at: https://sitelink.nature.scot/site/10423 (Accessed: 17 December 2023)

NatureScot (2023c). *Ballochmartin Bay SSSI*. Available at: https://sitelink.nature.scot/site/132 (Accessed: 17 December 2023)

NatureScot (2023d). *Kames Bay SSSI*. Available at: https://sitelink.nature.scot/site/825 (Accessed: 17 December 2023)

NatureScot (2023e). *Southannan Sands SSSI*. Available at: https://sitelink.nature.scot/site/10261 (Accessed: 17 December 2023)

NatureScot (2023f). Sea of the Hebrides MPA(NC). Available at: https://sitelink.nature.scot/site/10474 (Accessed: 17 December 2023)

NatureScot (2023g). Inner Hebrides and the Minches SAC. Available at: https://sitelink.nature.scot/site/10508 (Accessed: 17 December 2023)

NatureScot (2023h). Bridgend Flats SSSI. Available at: https://sitelink.nature.scot/site/260 (Accessed: 17 December 2023)

Neill, S. P., Vögler, A., Goward-Brown, A. J., Baston, S., Lewis, M. J., Gillibrand, P. A., Waldman, S., & Woolf, D. K. (2017). The wave and tidal resource of Scotland. *Renewable Energy*, 114, 3–17. https://doi.org/10.1016/j.renene.2017.03.027

Northern Ireland Environment Agency (2014). *Northern Ireland Regional Seascape Character Assessment*. Research & Development Series No 14/01. ISSN 1751-7796 (online). 42pp.

Ockelmann, K. W. and Muus, K. (1978). The biology, ecology and behaviour of the Bivalve *Mysella bidentata* (Montagu), *Ophelia*, 17:1, 1-93, DOI: 10.1080/00785326.1978.10425474

OSPAR (2009). *Background Document on CEMP assessment criteria for the QSR 2010*. OSPAR Commission Monitoring and Assessment Series. ISBN 978-1-907390-08-1. Publication Number: 461/2009. Available online at: http://qsr2010.ospar.org/media/assessments/p00390_supplements/p00461_Background_Doc_CEMP_Assessmt_Criteria_Haz_Subs.pdf

OSPAR (2014). Levels and trends in marine contaminants and their biological effects – CEMP Assessment Report 2013.

OSPAR (2017). Trends in Concentrations of Polybrominated Diphenyl Ethers (PBDEs) in Sediments. Available at: https://oap.ospar.org/en/ospar-assessments/intermediate-assessment-2017/pressures-human-activities/contaminants/pbde-sediment/

OSPAR (2020). *Background document for Canadian Federal environmental Quality Guidelines (FEQGs) for Polybrominated Diphenyl Ethers (PBDEs) in sediment and biota*. OSPAR Commission publication 760/2020. https://www.ospar.org/documents?v=42746

Oslo and Paris Commission [OSPAR] (2023). OSPAR List of threatened and/or declining species and habitats. https://www.ospar.org/work-areas/bdc/species-habitats/list-of-threatened-declining-species-habitats

Pace, M. C., Bailey, D. M., Donnan, D. W., Narayanaswamy, B. E., Smith, H. J., Speirs, D. C., Turrell, W. R., and Heath, M. R. (2021). Modelling seabed sediment physical properties and organic matter content in the Firth of Clyde, *Earth Syst. Sci. Data*, 13, 5847–5866, https://doi.org/10.5194/essd-13-5847-2021

Parry, M.E.V. (2019). *Guidance on Assigning Benthic Biotopes using EUNIS or the Marine Habitat Classification of Britain and Ireland* (revised 2019), JNCC Report No. 546, JNCC, Peterborough, ISSN 0963-8091.

Petitgas, P. (Ed.) 2010. Life cycle spatial patterns of small pelagic fish in the Northeast Atlantic. *ICES Cooperative Research Report No. 306*. 93 pp.

Pye, M. I. A. (1980). *Studies of burrows in recent sublittoral fine sediments off the west coast of Scotland*. Thesis presented for the degree of PhD, Department of Geology, University of Glasgow, 293pp.

Rosental, R., Eagle, G. A., & Orren, M. J. (1986). Trace metal distribution in different chemical fractions of nearshore marine sediments. *Estuarine, Coastal and Shelf Science*, 22(3), 303–324. https://doi.org/10.1016/0272-7714(86)90045-4

Snelgrove, P.V.R. and Butman, C.A. (1994). Animal-sediment relationships revisited: cause vs. effect. *Oceanography and Marine Biology: an Annual Review*. 32: 111-177.

Simpson, J. H., Edelsten, D. J., Edwards, A., Morris, N. C. G., & Tett, P. B. (1979). The Islay front: Physical structure and phytoplankton distribution. *Estuarine and Coastal Marine Science*, 9(6), 713-726. https://doi.org/10.1016/S0302-3524(79)80005-5

Tyler-Walters, H., James, B., Carruthers, M. (eds.), Wilding, C., Durkin, O., Lacey, C., Philpott, E., Adams, L., Chaniotis, P.D., Wilkes, P.T.V., Seeley, R., Neilly, M., Dargie, J. & Crawford-Avis, O.T. (2016). *Descriptions of Scottish Priority Marine Features (PMFs)*. Scottish Natural Heritage Commissioned Report No. 406.

Tyler-Walters, H., & Sabatini, M. (2017). *Arctica islandica* Icelandic cyprine. In Tyler-Walters H. Marine Life Information Network: Biology and Sensitivity Key Information Reviews, [on-line]. Marine Biological Association of the United Kingdom. https://www.marlin.ac.uk/species/detail/1519

Viñas, L., Soerensen, A.L., and Fryer, R. (2022). *Status and Trends of Polybrominated Diphenyl Ethers (PBDEs) in Biota and Sediment*. In: OSPAR, 2023: The 2023 Quality Status Report for the North-East Atlantic. OSPAR Commission, London. Available at: https://oap.ospar.org/en/ospar-assessments/quality-status-reports/qsr-2023/indicator-assessments/status-and-trends-polybrominated-diphenyl-ethers-pbdes-biota-and

Wentworth, C. K. (1922). A scale of grade and class terms for clastic sediments. *The Journal of Geology*, 30(5), 377–392. https://doi.org/10.1086/622910

Wilding, T. A., Hughes, D. J. and Black, K. D. (2005a). *The benthic environment of the North and West of Scotland and the Northern and Western Isles: sources of information and overview*. Report 1 to METOC. Scottish Association for Marine Science, Oban, Scotland, PA37 1QA.

Wilding, T.A., J. Duncan, L.A. Nickell, D.J. Hughes, S. Gontarek, K.D. Black and M.D.J. Sayer. (2005b). Synthesis of Information on the Benthos of SEA 6 Clyde Sea Area. Report to the Department of Trade and Industry, Scottish Association for Marine Science, Oban, Scotland, PA37 1QA. Report No. 2988a

Wikipedia contributors. (2023, December 8). Front (oceanography). In *Wikipedia, The Free Encyclopedia*. Retrieved 13:46, December 13, 2023, from https://en.wikipedia.org/w/index.php?title=Front_(oceanography)&oldid=1188896564

Wilson, J., & Shelley, C. (1986). The Distribution of *Nucula Turgida* (Bivalvia: Protobranchia) From Dublin Bay, Ireland, and the Effect of Sediment Organic Content. *Journal of the Marine Biological Association of the United Kingdom*, 66, 119–130. https://doi.org/10.1017/S0025315400039692

WoRMS Editorial Board (2023). *World Register of Marine Species*. Available from https://www.marinespecies.org at VLIZ. Accessed 2023-12-31. doi:10.14284/170

Appendices

Appendix 1 *Contaminants report*

Appendix 2 *Faecal indicator organisms report*

Appendix 3 *Particle Size Analysis results*

Appendix 4 *Macrofaunal species x abundance data (Counts and Presence / Absence) (including macrofaunal QA report)*

Appendix 5 *Macrofaunal major group biomass*

Appendix 6 *Diversity indices from Primer (v7)*

Appendix 7 *Full SIMPER results*

Appendix 1

Contaminant reports

Certificate of Analysis

Issuing Laboratory SOCOTEC, Marine Department, Advanced Chemistry and Research, Etwall House, Bretby Business Park, Ashby Road, Burton-upon-Trent DE15 0YZ

SOCOTEC

Test Report ID	**MAR01135**	
Issue Version	1	
Customer	Briggs Marine Contractors Limited, Seaforth House, Seaforth Place, Burntisland, Fife, KY3 9AX	
Customer Reference	Clyde/Islay Sediments	
Date Sampled	10-Sep-21	
Date Received	15-Sep-21	
Date Reported	25-Oct-21	
Condition of samples	Frozen	Satisfactory

Authorised by: Marya Hubbard

Position: Laboratory Manager

Any additional opinions or interpretations found in this report, are outside the scope of UKAS accreditation.

Certificate of Analysis

Issuing Laboratory SOCOTEC, Marine Department, Advanced Chemistry and Research, Etwall House, Bretby Business Park, Ashby Road, Burton-upon-Trent DE15 0YZ

SOCOTEC

Test Report ID	**MAR01132**	
Issue Version	1	
Customer	Briggs Marine Contractors Limited, Seaforth House, Seaforth Place, Burntisland, Fife, KY3 9AX	
Customer Reference	Islay Sediments	
Date Sampled	03-06-Sep-2021	
Date Received	08-Sep-21	
Date Reported	19-Oct-21	
Condition of samples	Frozen	Satisfactory

Authorised by: Marya Hubbard

Position: Laboratory Manager

Any additional opinions or interpretations found in this report, are outside the scope of UKAS accreditation.

Appendix 2

Faecal indicator organisms report

OAKSHIRE
ENVIRONMENTAL

Report type	Sediment Contamination Test
Date	17 September 2021
Client Site address	Briggs Marine Contractors Limited Offshore, United Kingdom
Report prepared by Supervised by	Mr Louis Turner BSc (Hons) Mr Joseph Turner

Appendix 3

Particle Size Analysis results

Appendix 3.1 – Particle size analysis results (Part I)

Station	Sampled	Visual description pre-analysis	Folk (1954)	Statistics calculated using Folk and Ward (1957) formulae								Primary	d10	d50	d90
ID			classification	Mean		Sorting		Skewness		Kurtosis		Mode			
				(µm)	(description)	(phi)	(description)	(phi)	(description)	(phi)	(description)	(µm)	(µm)	(µm)	(µm)
1	28/08/2021	Sand	Sand	188.9	Fine Sand	0.613	Moderately Well Sorted	0.082	Symmetrical	1.379	Leptokurtic	213.4	117.3	189.3	316.2
2	29/08/2021	Sand with very few shell fragments	Slightly Gravelly Sand	186.4	Fine Sand	0.658	Moderately Well Sorted	-0.026	Symmetrical	1.364	Leptokurtic	213.4	106.3	182.8	329.2
3	29/08/2021	Sand with very few shell fragments	Slightly Gravelly Sand	210.3	Fine Sand	0.591	Moderately Well Sorted	0.002	Symmetrical	1.145	Leptokurtic	213.4	130.4	209.6	342.1
4	28/08/2021	Muddy sand with a few shell fragments	Slightly Gravelly Sand	261.1	Medium Sand	0.874	Moderately Sorted	0.136	Fine Skewed	1.565	Very Leptokurtic	301.8	133.4	261.4	480.8
5	30/08/2021	Sand with a few shell fragments	Slightly Gravelly Sand	173.1	Fine Sand	0.856	Moderately Sorted	0.254	Fine Skewed	2.365	Very Leptokurtic	150.9	96.5	172.9	279.8
6	30/08/2021	Sand with a few shell fragments	Slightly Gravelly Sand	215.8	Fine Sand	0.591	Moderately Well Sorted	0.058	Symmetrical	1.239	Leptokurtic	213.4	132.2	216.5	342.1
7	30/08/2021	Sand with a few shell fragments	Slightly Gravelly Sand	193.9	Fine Sand	0.947	Moderately Sorted	0.333	Very Fine Skewed	2.511	Very Leptokurtic	213.4	103.0	196.3	319.2
8	30/08/2021	Sand with a few shell fragments	Slightly Gravelly Sand	186.8	Fine Sand	0.847	Moderately Sorted	0.297	Fine Skewed	2.173	Very Leptokurtic	213.4	101.0	189.3	310.0
9	30/08/2021	Sand with a few shell fragments	Slightly Gravelly Sand	300.1	Medium Sand	0.554	Moderately Well Sorted	0.063	Symmetrical	1.037	Mesokurtic	301.8	185.2	302.2	474.6
10	30/08/2021	Sand with a few shell fragments	Slightly Gravelly Sand	192.7	Fine Sand	0.545	Moderately Well Sorted	0.061	Symmetrical	1.164	Leptokurtic	213.4	126.1	193.6	313.7
11	31/08/2021	Gravelly sand with shell fragments	Gravelly Sand	576.1	Coarse Sand	1.834	Poorly Sorted	-0.623	Very Coarse Skewed	1.718	Very Leptokurtic	301.8	182.2	323.9	4630.3
12	28/08/2021	Sand with a few shell fragments	Slightly Gravelly Sand	202.4	Fine Sand	0.963	Moderately Sorted	0.278	Fine Skewed	2.628	Very Leptokurtic	213.4	115.9	203.7	335.9
13	29/08/2021	Sand with a few shell fragments	Slightly Gravelly Sand	208.0	Fine Sand	0.767	Moderately Sorted	0.208	Fine Skewed	1.911	Very Leptokurtic	213.4	127.7	209.0	336.6
14	30/08/2021	Sand	Sand	284.6	Medium Sand	0.452	Well Sorted	0.012	Symmetrical	0.956	Mesokurtic	301.8	188.7	286.9	434.5
15	30/08/2021	Gravelly sand with shell fragments	Slightly Gravelly Sand	469.4	Medium Sand	1.150	Poorly Sorted	-0.036	Symmetrical	0.924	Mesokurtic	301.8	182.7	466.2	1396.2
16	29/08/2021	Sandy gravel with shell fragments	Sandy Gravel	1453.3	Very Coarse Sand	0.970	Moderately Sorted	0.140	Fine Skewed	1.064	Mesokurtic	1700.0	578.2	1519.8	3267.9
17	29/08/2021	Sand with shell fragments	Slightly Gravelly Sand	219.1	Fine Sand	0.894	Moderately Sorted	-0.100	Symmetrical	1.368	Leptokurtic	213.4	112.5	207.8	480.4
18	28/08/2021	Sand	Sand	195.0	Fine Sand	0.600	Moderately Well Sorted	0.163	Fine Skewed	1.432	Leptokurtic	213.4	126.4	197.2	314.0
19	28/08/2021	Sand with very few shell fragments	Slightly Gravelly Sand	200.0	Fine Sand	0.613	Moderately Well Sorted	-0.064	Symmetrical	1.269	Leptokurtic	213.4	126.9	196.9	342.9
20	28/08/2021	Sand	Sand	190.8	Fine Sand	0.651	Moderately Well Sorted	0.217	Fine Skewed	1.647	Very Leptokurtic	213.4	124.3	193.9	309.1
22	27/08/2021	Sand with very few shell fragments	Slightly Gravelly Sand	309.7	Medium Sand	0.698	Moderately Well Sorted	-0.097	Symmetrical	1.070	Mesokurtic	301.8	180.9	303.3	612.5
23	30/08/2021	Sand with very few shell fragments	Slightly Gravelly Sand	177.3	Fine Sand	0.806	Moderately Sorted	0.270	Fine Skewed	2.185	Very Leptokurtic	213.4	100.3	178.9	288.6
25	27/08/2021	Gravelly sand with shell fragments	Gravel	5863.6	Fine Gravel	2.078	Very Poorly Sorted	0.130	Fine Skewed	1.379	Leptokurtic	4800.0	415.0	5951.7	33529.7
26	28/08/2021	Sand with a few shell fragments	Slightly Gravelly Sand	240.3	Fine Sand	0.713	Moderately Sorted	-0.179	Coarse Skewed	1.118	Leptokurtic	213.4	135.9	228.9	484.0
27	28/08/2021	Sand with a few shell fragments	Slightly Gravelly Sand	215.2	Fine Sand	0.553	Moderately Well Sorted	0.055	Symmetrical	1.308	Leptokurtic	213.4	134.9	215.1	334.8
28	27/08/2021	Shell fragments with some sand	Slightly Gravelly Sand	523.2	Coarse Sand	0.726	Moderately Sorted	0.064	Symmetrical	0.917	Mesokurtic	603.6	270.2	534.1	948.9
29	28/08/2021	Sand	Sand	241.1	Fine Sand	0.478	Well Sorted	-0.091	Symmetrical	1.043	Mesokurtic	213.4	157.0	236.3	356.4
30	30/08/2021	Sand with a few shell fragments	Slightly Gravelly Sand	280.7	Medium Sand	0.584	Moderately Well Sorted	0.016	Symmetrical	1.072	Mesokurtic	301.8	171.9	279.6	465.1
31	29/08/2021	Sand	Sand	255.5	Medium Sand	0.462	Well Sorted	-0.030	Symmetrical	1.022	Mesokurtic	301.8	178.7	255.7	394.8
32	29/08/2021	Sand with very few shell fragments	Slightly Gravelly Sand	174.3	Fine Sand	1.104	Poorly Sorted	0.236	Fine Skewed	2.466	Very Leptokurtic	150.9	88.9	174.0	335.5
33	28/08/2021	Sand with very few shell fragments	Slightly Gravelly Sand	198.5	Fine Sand	0.673	Moderately Well Sorted	-0.078	Symmetrical	1.293	Leptokurtic	213.4	114.4	193.5	357.9
34	30/08/2021	Sand with very few shell fragments	Slightly Gravelly Sand	216.5	Fine Sand	0.565	Moderately Well Sorted	-0.050	Symmetrical	1.154	Leptokurtic	213.4	134.8	214.9	347.8
35	27/08/2021	Sand with shell fragments	Slightly Gravelly Sand	313.5	Medium Sand	0.716	Moderately Sorted	-0.016	Symmetrical	1.026	Mesokurtic	301.8	173.9	311.0	613.1
36	29/08/2021	Sand with shell fragments	Slightly Gravelly Sand	218.5	Fine Sand	0.828	Moderately Sorted	0.114	Fine Skewed	1.417	Leptokurtic	213.4	118.9	217.4	424.5
37	27/08/2021	Sand with shell fragments	Slightly Gravelly Sand	288.8	Medium Sand	0.676	Moderately Well Sorted	-0.104	Coarse Skewed	1.046	Mesokurtic	301.8	165.3	279.9	545.2
39	31/08/2021	Sandy gravel with shell fragments	Gravel	7682.6	Fine Gravel	1.502	Poorly Sorted	0.333	Very Fine Skewed	1.024	Mesokurtic	19200.0	1463.7	8973.9	21326.8
40	31/08/2021	Sand with lots of shell fragments	Gravelly Sand	535.0	Coarse Sand	0.955	Moderately Sorted	-0.287	Coarse Skewed	1.128	Leptokurtic	426.8	269.4	490.5	1529.2
41	27/08/2021	Sand with very few shell fragments	Slightly Gravelly Sand	273.9	Medium Sand	0.582	Moderately Well Sorted	-0.081	Symmetrical	1.125	Leptokurtic	301.8	175.8	268.7	465.5
42	27/08/2021	Sand with shell fragments	Slightly Gravelly Sand	573.3	Coarse Sand	0.900	Moderately Sorted	0.076	Symmetrical	0.981	Mesokurtic	853.6	261.4	604.0	1278.5
43	28/08/2021	Sand with a few shell fragments	Slightly Gravelly Sand	189.3	Fine Sand	0.995	Moderately Sorted	0.272	Fine Skewed	2.669	Very Leptokurtic	213.4	99.1	190.0	326.3
44	28/08/2021	Sand	Sand	212.4	Fine Sand	0.525	Moderately Well Sorted	0.036	Symmetrical	1.139	Leptokurtic	213.4	134.2	212.6	331.9
45	29/08/2021	Sand with a few shell fragments	Slightly Gravelly Sand	223.1	Fine Sand	1.095	Poorly Sorted	0.235	Fine Skewed	2.291	Very Leptokurtic	213.4	112.0	223.3	437.7
46	30/08/2021	Sand with very few shell fragments	Slightly Gravelly Sand	199.5	Fine Sand	0.953	Moderately Sorted	0.303	Very Fine Skewed	2.506	Very Leptokurtic	213.4	107.9	201.5	330.0
47	28/08/2021	Sand with very few shell fragments	Slightly Gravelly Sand	201.7	Fine Sand	1.087	Poorly Sorted	0.247	Fine Skewed	2.764	Very Leptokurtic	213.4	101.1	200.5	356.3
48	29/08/2021	Sand with very few shell fragments	Slightly Gravelly Sand	283.2	Medium Sand	0.527	Moderately Well Sorted	0.058	Symmetrical	1.074	Mesokurtic	301.8	182.0	284.4	450.6
49	28/08/2021	Sand with very few shell fragments	Slightly Gravelly Sand	296.9	Medium Sand	0.528	Moderately Well Sorted	-0.102	Coarse Skewed	1.014	Mesokurtic	301.8	190.4	293.7	478.5
50	28/08/2021	Sand with very few shell fragments	Slightly Gravelly Sand	189.1	Fine Sand	0.572	Moderately Well Sorted	0.119	Fine Skewed	1.308	Leptokurtic	213.4	123.2	191.6	309.1
51	27/08/2021	Sand with very few shell fragments	Slightly Gravelly Sand	274.1	Medium Sand	0.664	Moderately Well Sorted	-0.135	Coarse Skewed	1.125	Leptokurtic	213.4	154.2	263.0	502.5
52	29/08/2021	Sand with very few shell fragments	Slightly Gravelly Sand	276.7	Medium Sand	0.564	Moderately Well Sorted	0.098	Symmetrical	1.069	Mesokurtic	301.8	164.5	279.6	447.3
54	30/08/2021	Sand with a few shell fragments	Slightly Gravelly Sand	201.4	Fine Sand	0.925	Moderately Sorted	0.266	Fine Skewed	2.363	Very Leptokurtic	213.4	114.1	202.3	335.3
56	27/08/2021	Sand with a few shell fragments	Slightly Gravelly Sand	269.5	Medium Sand	0.574	Moderately Well Sorted	-0.085	Symmetrical	1.086	Mesokurtic	301.8	168.7	264.2	459.0
58	27/08/2021	Sand with a few shell fragments	Slightly Gravelly Sand	349.1	Medium Sand	0.636	Moderately Well Sorted	-0.110	Coarse Skewed	1.033	Mesokurtic	301.8	201.8	341.2	644.5
59	31/08/2021	Gravel and shell fragments with some muddy sand	Sandy Gravel	5118.7	Fine Gravel	2.008	Very Poorly Sorted	0.433	Very Fine Skewed	0.909	Mesokurtic	13600.0	471.0	7529.2	20846.0
60	27/08/2021	Sand with a few shell fragments	Slightly Gravelly Sand	255.3	Medium Sand	0.549	Moderately Well Sorted	-0.011	Symmetrical	1.067	Mesokurtic	301.8	152.1	253.7	430.5

Station	Sampled	Visual description pre-analysis	Folk (1954)	Statistics calculated using Folk and Ward (1957) formulae								Primary	d10	d50	d90
ID			classification	Mean		Sorting		Skewness		Kurtosis		Mode			
				(µm)	(description)	(phi)	(description)	(phi)	(description)	(phi)	(description)	(µm)	(µm)	(µm)	(µm)
61	29/08/2021	Muddy sand with a few shell fragments	Slightly Gravelly Muddy Sand	133.2	Fine Sand	1.837	Poorly Sorted	0.559	Very Fine Skewed	2.493	Very Leptokurtic	213.4	10.7	196.0	404.3
62	29/08/2021	Sand with a few shell fragments	Slightly Gravelly Sand	219.0	Fine Sand	0.622	Moderately Well Sorted	-0.025	Symmetrical	1.106	Mesokurtic	213.4	131.6	218.2	377.1
63	30/08/2021	Sand	Sand	193.6	Fine Sand	0.640	Moderately Well Sorted	0.173	Fine Skewed	1.458	Leptokurtic	213.4	118.8	195.2	316.1
64	30/08/2021	Sand with a few shell fragments	Slightly Gravelly Sand	217.4	Fine Sand	0.632	Moderately Well Sorted	0.065	Symmetrical	1.300	Leptokurtic	213.4	130.8	218.0	350.2
65	28/08/2021	Sand with a few shell fragments	Slightly Gravelly Sand	246.3	Fine Sand	0.831	Moderately Sorted	0.005	Symmetrical	1.416	Leptokurtic	213.4	131.2	239.3	487.1
66	29/08/2021	Sand with very few shell fragments	Slightly Gravelly Sand	220.9	Fine Sand	0.541	Moderately Well Sorted	-0.011	Symmetrical	1.166	Leptokurtic	213.4	137.0	220.0	343.8
67	29/08/2021	Sand with very few shell fragments	Slightly Gravelly Sand	302.8	Medium Sand	0.521	Moderately Well Sorted	0.095	Symmetrical	1.031	Mesokurtic	301.8	188.0	305.3	469.5
68	30/08/2021	Sand	Sand	304.9	Medium Sand	0.511	Moderately Well Sorted	-0.023	Symmetrical	0.948	Mesokurtic	301.8	192.5	304.7	477.4
69	30/08/2021	Sand with a few shell fragments	Slightly Gravelly Sand	218.4	Fine Sand	0.520	Moderately Well Sorted	-0.032	Symmetrical	1.057	Mesokurtic	213.4	136.7	218.1	340.4
70	30/08/2021	Sand	Sand	194.3	Fine Sand	0.744	Moderately Sorted	0.212	Fine Skewed	1.832	Very Leptokurtic	213.4	118.0	195.1	321.0
71	30/08/2021	Sand with a few shell fragments	Slightly Gravelly Sand	178.9	Fine Sand	0.877	Moderately Sorted	0.282	Fine Skewed	2.393	Very Leptokurtic	213.4	99.2	181.0	302.8
72	28/08/2021	Sand	Sand	204.9	Fine Sand	0.576	Moderately Well Sorted	0.095	Symmetrical	1.312	Leptokurtic	213.4	129.5	205.8	327.4
73	30/08/2021	Sand	Sand	201.0	Fine Sand	1.023	Poorly Sorted	0.327	Very Fine Skewed	2.582	Very Leptokurtic	213.4	98.1	203.7	333.7
74	30/08/2021	Sand	Sand	219.6	Fine Sand	0.601	Moderately Well Sorted	0.060	Symmetrical	1.293	Leptokurtic	213.4	133.3	220.0	347.2
75	28/08/2021	Sand	Sand	202.3	Fine Sand	0.838	Moderately Sorted	0.189	Fine Skewed	2.053	Very Leptokurtic	213.4	121.3	201.4	344.1
76	29/08/2021	Sand with shell fragments	Gravelly Sand	334.0	Medium Sand	1.503	Poorly Sorted	-0.547	Very Coarse Skewed	2.807	Very Leptokurtic	301.8	176.6	282.5	1832.8
77	29/08/2021	Sand with a few shell fragments	Slightly Gravelly Sand	210.7	Fine Sand	0.788	Moderately Sorted	0.017	Symmetrical	1.427	Leptokurtic	213.4	120.3	205.6	412.1
78	30/08/2021	Sand with a few shell fragments	Slightly Gravelly Sand	294.9	Medium Sand	0.475	Well Sorted	-0.031	Symmetrical	0.933	Mesokurtic	301.8	192.6	293.5	460.8
79	29/08/2021	Sand	Sand	286.6	Medium Sand	0.519	Moderately Well Sorted	-0.007	Symmetrical	0.980	Mesokurtic	301.8	184.1	285.4	460.7
80	29/08/2021	Sand with shell fragments	Slightly Gravelly Sand	312.2	Medium Sand	0.595	Moderately Well Sorted	0.031	Symmetrical	1.084	Mesokurtic	301.8	186.9	314.6	501.6
81	29/08/2021	Sand with shell fragments	Slightly Gravelly Sand	219.3	Fine Sand	0.567	Moderately Well Sorted	-0.045	Symmetrical	1.128	Leptokurtic	213.4	135.2	217.8	351.8
82	31/08/2021	Sand with shell fragments	Slightly Gravelly Sand	319.9	Medium Sand	0.650	Moderately Well Sorted	-0.196	Coarse Skewed	1.098	Mesokurtic	301.8	193.0	310.8	649.6
84	31/08/2021	Sandy gravel with shell fragments	Sandy Gravel	4108.5	Fine Gravel	2.315	Very Poorly Sorted	0.608	Very Fine Skewed	0.616	Very Platykurtic	19200.0	317.5	8793.9	19698.9
85	31/08/2021	Sandy gravel with shell fragments	Sandy Gravel	6023.3	Fine Gravel	2.570	Very Poorly Sorted	0.481	Very Fine Skewed	0.771	Platykurtic	38250.0	355.8	11401.1	37453.2
86	31/08/2021	Shell fragments with some sand	Slightly Gravelly Sand	480.8	Medium Sand	0.867	Moderately Sorted	-0.181	Coarse Skewed	0.956	Mesokurtic	426.8	250.4	449.2	1084.1
96	02/09/2021	Shell fragments with some sand	Sandy Gravel	2676.1	Very Fine Gravel	2.108	Very Poorly Sorted	0.178	Fine Skewed	0.563	Very Platykurtic	13600.0	363.3	3188.2	14738.3
99	02/09/2021	Shell fragments with some sand and sea weed	Slightly Gravelly Sand	518.8	Coarse Sand	0.837	Moderately Sorted	-0.218	Coarse Skewed	1.211	Leptokurtic	426.8	275.9	498.6	1118.1
100	02/09/2021	Shell fragments with some sand	Slightly Gravelly Sand	608.5	Coarse Sand	0.673	Moderately Well Sorted	-0.069	Symmetrical	1.156	Leptokurtic	603.6	363.5	613.1	998.4
103	01/09/2021	Shell fragments with some sand	Sandy Gravel	1956.5	Very Coarse Sand	0.852	Moderately Sorted	0.063	Symmetrical	1.112	Leptokurtic	2400.0	887.6	1981.9	3941.8
111	31/08/2021	Shell fragments with some sand	Gravelly Sand	906.8	Coarse Sand	1.177	Poorly Sorted	0.058	Symmetrical	0.813	Platykurtic	853.6	298.8	921.8	2499.1
115	30/08/2021	Sandy gravel	Gravel	5122.7	Fine Gravel	1.519	Poorly Sorted	0.367	Very Fine Skewed	1.212	Leptokurtic	9600.0	924.0	6379.7	15262.8
116	31/08/2021	Sandy gravel with shell fragments	Sandy Gravel	2611.3	Very Fine Gravel	2.565	Very Poorly Sorted	-0.093	Symmetrical	0.646	Very Platykurtic	301.8	283.9	2194.3	25879.2
121	01/09/2021	Sandy gravel with shell fragments	Gravel	5058.0	Fine Gravel	2.161	Very Poorly Sorted	0.475	Very Fine Skewed	1.343	Leptokurtic	9600.0	448.7	8583.9	24236.7
122	02/09/2021	Sandy gravel with shell fragments	Sandy Gravel	4671.2	Fine Gravel	2.346	Very Poorly Sorted	0.570	Very Fine Skewed	0.607	Very Platykurtic	13600.0	390.7	9910.5	24606.8
124	01/09/2021	Sandy gravel with shell fragments	Gravelly Sand	793.4	Coarse Sand	2.190	Very Poorly Sorted	-0.567	Very Coarse Skewed	1.770	Very Leptokurtic	426.8	195.5	436.4	8283.3
125	02/09/2021	Shell fragments with some sand	Sandy Gravel	1186.7	Very Coarse Sand	1.589	Poorly Sorted	-0.127	Coarse Skewed	0.773	Platykurtic	426.8	313.4	1094.3	5405.8
127	09/09/2021	Gravelly sandy mud with shell fragments	Muddy Gravel	486.4	Medium Sand	5.885	Extremely Poorly Sorted	0.327	Very Fine Skewed	0.573	Very Platykurtic	38250.0	1.1	1154.2	37696.6
128	09/09/2021	Gravelly muddy sand with shell fragments	Sandy Gravel	2236.0	Very Fine Gravel	2.731	Very Poorly Sorted	0.031	Symmetrical	0.626	Very Platykurtic	19200.0	195.1	2122.0	21565.7
129	09/09/2021	Gravelly muddy sand with shell fragments	Gravelly Muddy Sand	377.2	Medium Sand	3.558	Very Poorly Sorted	0.178	Fine Skewed	1.893	Very Leptokurtic	426.8	7.5	445.9	6951.5
130	09/09/2021	Gravelly muddy sand with shell fragments	Muddy Sandy Gravel	2034.1	Very Fine Gravel	3.304	Very Poorly Sorted	-0.031	Symmetrical	0.833	Platykurtic	26950.0	142.8	1359.6	26330.2
133	07/09/2021	Sand with some shell fragments	Slightly Gravelly Sand	357.2	Medium Sand	0.717	Moderately Sorted	-0.260	Coarse Skewed	1.021	Mesokurtic	301.8	201.6	329.1	749.4
137	09/09/2021	Gravelly sandy mud with shell fragments	Gravelly Muddy Sand	631.7	Coarse Sand	3.017	Very Poorly Sorted	0.027	Symmetrical	2.398	Very Leptokurtic	853.6	17.1	545.4	8323.0
138	09/09/2021	Gravelly sand with shell fragments	Gravelly Sand	639.3	Coarse Sand	1.703	Poorly Sorted	-0.375	Very Coarse Skewed	1.433	Leptokurtic	301.8	193.9	480.5	4123.7
140	01/09/2021	Gravelly sand with shell fragments	Gravelly Sand	1025.8	Very Coarse Sand	2.052	Very Poorly Sorted	-0.475	Very Coarse Skewed	1.295	Leptokurtic	426.8	268.9	674.1	10575.7
143	09/09/2021	Gravelly muddy sand with shell fragments	Muddy Sandy Gravel	713.6	Coarse Sand	4.810	Extremely Poorly Sorted	0.212	Fine Skewed	0.715	Platykurtic	26950.0	5.2	987.8	27792.8
147	09/09/2021	Gravelly sand with shell fragments	Gravelly Sand	898.2	Coarse Sand	1.610	Poorly Sorted	-0.410	Very Coarse Skewed	1.050	Mesokurtic	426.8	277.6	636.9	5141.6
148	01/09/2021	Mud	Mud	3.5	Very Fine Silt	2.300	Very Poorly Sorted	0.313	Very Fine Skewed	0.877	Platykurtic	9.4	0.3	5.1	21.2
152	01/09/2021	Sandy gravel with shell fragments	Sandy Gravel	2959.5	Very Fine Gravel	2.239	Very Poorly Sorted	0.351	Very Fine Skewed	0.689	Platykurtic	9600.0	369.6	4333.7	16652.2
153	01/09/2021	Sandy gravel with lots of shell fragments	Gravelly Sand	1480.3	Very Coarse Sand	2.056	Very Poorly Sorted	-0.559	Very Coarse Skewed	1.110	Mesokurtic	603.6	381.5	833.3	14531.0
154	09/09/2021	Gravelly sand with shell fragments	Sandy Gravel	1873.4	Very Coarse Sand	2.222	Very Poorly Sorted	-0.138	Coarse Skewed	0.887	Platykurtic	853.6	291.1	1562.0	13087.9
156	09/09/2021	Gravelly sand with shell fragments	Sandy Gravel	1510.2	Very Coarse Sand	2.414	Very Poorly Sorted	-0.272	Coarse Skewed	1.286	Leptokurtic	853.6	284.4	948.8	18093.1
157	09/09/2021	Gravelly muddy sand with shell fragments	Gravelly Muddy Sand	572.1	Coarse Sand	3.011	Very Poorly Sorted	0.103	Fine Skewed	2.152	Very Leptokurtic	603.6	13.0	534.0	6345.6
158	09/09/2021	Gravelly sand with shell fragments	Gravelly Sand	782.3	Coarse Sand	2.140	Very Poorly Sorted	-0.190	Coarse Skewed	1.193	Leptokurtic	426.8	162.1	586.8	6414.7
159	07/09/2021	Gravelly sand with shell fragments	Gravelly Sand	521.0	Coarse Sand	2.279	Very Poorly Sorted	-0.081	Symmetrical	2.108	Very Leptokurtic	301.8	118.8	437.5	4441.1
161	09/09/2021	Gravelly muddy sand with shell fragments	Gravelly Muddy Sand	705.7	Coarse Sand	2.874	Very Poorly Sorted	-0.061	Symmetrical	1.881	Very Leptokurtic	426.8	34.8	528.7	11303.3
162	11/09/2021	Sand	Sand	251.4	Medium Sand	0.860	Moderately Sorted	0.340	Very Fine Skewed	2.498	Very Leptokurtic	301.8	142.0	255.3	385.6

Station	Sampled	Visual description pre-analysis	Folk (1954)	Statistics calculated using Folk and Ward (1957) formulae								Primary	d10	d50	d90
ID			classification	Mean		Sorting		Skewness		Kurtosis		Mode			
				(µm)	(description)	(phi)	(description)	(phi)	(description)	(phi)	(description)	(µm)	(µm)	(µm)	(µm)
163	11/09/2021	Muddy sand with shell fragments	Slightly Gravelly Muddy Sand	84.4	Very Fine Sand	2.226	Very Poorly Sorted	0.730	Very Fine Skewed	1.314	Leptokurtic	213.4	5.6	179.1	312.6
164	11/09/2021	Sandy mud	Sandy Mud	17.2	Coarse Silt	2.359	Very Poorly Sorted	0.140	Fine Skewed	1.000	Mesokurtic	75.4	1.9	18.0	107.7
165	11/09/2021	Mud	Mud	8.6	Medium Silt	2.262	Very Poorly Sorted	0.132	Fine Skewed	1.263	Leptokurtic	9.4	0.8	9.1	52.0
166	11/09/2021	Mud	Mud	6.7	Fine Silt	2.152	Very Poorly Sorted	0.193	Fine Skewed	1.265	Leptokurtic	9.4	0.6	7.6	36.1
167	11/09/2021	Sandy mud	Sandy Mud	12.6	Medium Silt	2.334	Very Poorly Sorted	0.088	Symmetrical	1.145	Leptokurtic	9.4	1.3	12.4	83.2
168	08/09/2021	Mud	Mud	4.6	Fine Silt	2.134	Very Poorly Sorted	0.297	Fine Skewed	1.173	Leptokurtic	9.4	0.4	6.1	23.7
169	08/09/2021	Mud	Sandy Mud	10.3	Medium Silt	2.803	Very Poorly Sorted	0.027	Symmetrical	1.132	Leptokurtic	9.4	0.7	9.9	138.5
170	08/09/2021	Mud	Mud	7.0	Fine Silt	2.279	Very Poorly Sorted	0.256	Fine Skewed	1.074	Mesokurtic	9.4	0.6	8.5	38.7
171	26/08/2021	Mud	Mud	8.3	Medium Silt	2.327	Very Poorly Sorted	0.250	Fine Skewed	1.032	Mesokurtic	37.7	0.6	10.0	46.9
172	26/08/2021	Sandy mud	Sandy Mud	17.8	Coarse Silt	3.050	Very Poorly Sorted	0.050	Symmetrical	0.879	Platykurtic	213.4	0.9	16.6	215.7
173	26/08/2021	Mud	Mud	10.4	Medium Silt	2.342	Very Poorly Sorted	0.212	Fine Skewed	1.032	Mesokurtic	37.7	0.8	11.7	59.4
174	08/09/2021	Mud	Sandy Mud	10.5	Medium Silt	2.582	Very Poorly Sorted	0.269	Fine Skewed	0.915	Mesokurtic	53.3	0.6	13.5	73.2
175	08/09/2021	Mud	Sandy Mud	19.2	Coarse Silt	2.476	Very Poorly Sorted	0.418	Very Fine Skewed	0.924	Mesokurtic	75.4	1.3	28.7	105.4
176	08/09/2021	Sandy mud	Sandy Mud	24.0	Coarse Silt	2.562	Very Poorly Sorted	0.504	Very Fine Skewed	0.971	Mesokurtic	75.4	1.4	41.8	127.0
177	08/09/2021	Mud	Sandy Mud	16.8	Coarse Silt	2.533	Very Poorly Sorted	0.445	Very Fine Skewed	0.918	Mesokurtic	75.4	1.0	26.8	92.8
178	26/08/2021	Mud	Sandy Mud	9.9	Medium Silt	2.601	Very Poorly Sorted	0.214	Fine Skewed	0.959	Mesokurtic	53.3	0.6	11.9	73.3
179	11/09/2021	Mud	Mud	6.9	Fine Silt	2.048	Very Poorly Sorted	0.223	Fine Skewed	1.354	Leptokurtic	9.4	0.7	8.1	32.9
180	26/08/2021	Mud	Sandy Mud	11.4	Medium Silt	2.471	Very Poorly Sorted	0.333	Very Fine Skewed	0.954	Mesokurtic	53.3	0.7	15.5	66.9
181	08/09/2021	Mud	Mud	8.3	Medium Silt	2.485	Very Poorly Sorted	0.234	Fine Skewed	0.992	Mesokurtic	37.7	0.5	10.2	54.9
182	08/09/2021	Mud	Mud	4.8	Fine Silt	2.277	Very Poorly Sorted	0.263	Fine Skewed	1.028	Mesokurtic	9.4	0.4	6.2	28.6
183	11/09/2021	Mud	Mud	4.6	Fine Silt	2.202	Very Poorly Sorted	0.276	Fine Skewed	1.147	Leptokurtic	9.4	0.4	6.1	25.8
184	11/09/2021	Mud	Mud	7.9	Medium Silt	2.161	Very Poorly Sorted	0.171	Fine Skewed	1.248	Leptokurtic	9.4	0.8	8.6	42.4
185	11/09/2021	Mud	Mud	8.3	Medium Silt	2.342	Very Poorly Sorted	0.129	Fine Skewed	1.149	Leptokurtic	9.4	0.7	8.8	54.8
186	11/09/2021	Mud	Sandy Mud	34.4	Very Coarse Silt	2.270	Very Poorly Sorted	0.553	Very Fine Skewed	0.998	Mesokurtic	106.7	2.9	60.9	149.4
187	11/09/2021	Mud	Sandy Mud	9.8	Medium Silt	2.402	Very Poorly Sorted	0.107	Fine Skewed	1.147	Leptokurtic	9.4	0.8	10.2	70.2
188	08/09/2021	Mud	Mud	4.8	Fine Silt	2.187	Very Poorly Sorted	0.261	Fine Skewed	1.136	Leptokurtic	9.4	0.5	6.2	26.6
189	08/09/2021	Mud	Mud	4.9	Fine Silt	2.122	Very Poorly Sorted	0.279	Fine Skewed	1.171	Leptokurtic	9.4	0.5	6.3	25.1
190	08/09/2021	Mud	Mud	5.1	Fine Silt	2.084	Very Poorly Sorted	0.296	Fine Skewed	1.199	Leptokurtic	9.4	0.5	6.5	24.5
191	26/08/2021	Mud	Sandy Mud	12.1	Medium Silt	2.483	Very Poorly Sorted	0.339	Very Fine Skewed	0.992	Mesokurtic	37.7	0.8	16.9	71.8
192	26/08/2021	Mud	Sandy Mud	10.2	Medium Silt	2.504	Very Poorly Sorted	0.268	Fine Skewed	0.945	Mesokurtic	53.3	0.7	12.9	65.3
193	08/09/2021	Mud	Mud	6.5	Fine Silt	2.206	Very Poorly Sorted	0.249	Fine Skewed	1.137	Leptokurtic	9.4	0.6	7.8	35.0
194	11/09/2021	Mud	Mud	6.2	Fine Silt	2.079	Very Poorly Sorted	0.242	Fine Skewed	1.261	Leptokurtic	9.4	0.6	7.4	31.0
195	26/08/2021	Mud	Mud	7.9	Medium Silt	2.340	Very Poorly Sorted	0.231	Fine Skewed	1.025	Mesokurtic	37.7	0.6	9.4	46.5
196	08/09/2021	Mud	Sandy Mud	17.3	Coarse Silt	3.143	Very Poorly Sorted	0.079	Symmetrical	0.883	Platykurtic	213.4	0.7	17.2	223.8
197	08/09/2021	Mud	Sandy Mud	12.4	Medium Silt	2.562	Very Poorly Sorted	0.282	Fine Skewed	0.930	Mesokurtic	53.3	0.8	16.0	81.5
198	08/09/2021	Mud	Mud	5.1	Fine Silt	2.323	Very Poorly Sorted	0.227	Fine Skewed	1.132	Leptokurtic	9.4	0.4	6.4	32.4
199	08/09/2021	Mud	Sandy Mud	11.6	Medium Silt	2.504	Very Poorly Sorted	0.231	Fine Skewed	0.961	Mesokurtic	53.3	0.8	13.6	75.8
200	11/09/2021	Mud	Mud	7.0	Fine Silt	2.239	Very Poorly Sorted	0.193	Fine Skewed	1.204	Leptokurtic	9.4	0.6	8.1	39.9
201	11/09/2021	Sandy mud	Sandy Mud	29.0	Coarse Silt	2.334	Very Poorly Sorted	0.452	Very Fine Skewed	0.954	Mesokurtic	75.4	2.6	45.6	140.8
202	26/08/2021	Gravelly muddy sand with shell fragments	Gravelly Muddy Sand	196.0	Fine Sand	4.046	Extremely Poorly Sorted	0.223	Fine Skewed	0.973	Mesokurtic	213.4	3.9	300.3	4525.6
203	07/09/2021	Muddy sand	Muddy Sand	35.1	Very Coarse Silt	2.267	Very Poorly Sorted	0.592	Very Fine Skewed	1.122	Leptokurtic	106.7	2.7	62.9	146.9
204	07/09/2021	Muddy sand	Muddy Sand	52.6	Very Coarse Silt	2.261	Very Poorly Sorted	0.669	Very Fine Skewed	1.354	Leptokurtic	150.9	3.8	104.5	209.8
205	07/09/2021	Muddy sand	Muddy Sand	53.7	Very Coarse Silt	2.220	Very Poorly Sorted	0.679	Very Fine Skewed	1.535	Very Leptokurtic	150.9	3.7	105.7	203.4
206	08/09/2021	Muddy sand	Muddy Sand	37.6	Very Coarse Silt	2.395	Very Poorly Sorted	0.645	Very Fine Skewed	1.140	Leptokurtic	106.7	2.3	73.8	159.0
207	07/09/2021	Muddy sand	Muddy Sand	51.4	Very Coarse Silt	2.143	Very Poorly Sorted	0.633	Very Fine Skewed	1.617	Very Leptokurtic	106.7	4.0	91.9	175.8
208	08/09/2021	Muddy sand	Sandy Mud	25.8	Coarse Silt	2.512	Very Poorly Sorted	0.558	Very Fine Skewed	0.967	Mesokurtic	75.4	1.5	47.0	124.3
209	07/09/2021	Muddy sand	Muddy Sand	61.4	Very Coarse Silt	1.924	Poorly Sorted	0.605	Very Fine Skewed	1.918	Very Leptokurtic	106.7	5.1	96.1	177.7
210	08/09/2021	Muddy sand	Sandy Mud	28.1	Coarse Silt	2.523	Very Poorly Sorted	0.541	Very Fine Skewed	0.946	Mesokurtic	106.7	1.7	50.9	145.1
211	11/09/2021	Sandy mud	Muddy Sand	42.0	Very Coarse Silt	2.079	Very Poorly Sorted	0.587	Very Fine Skewed	0.972	Mesokurtic	106.7	4.2	73.4	157.3
213	07/09/2021	Muddy sand with shell fragments	Slightly Gravelly Sand	310.1	Medium Sand	1.099	Poorly Sorted	0.185	Fine Skewed	2.048	Very Leptokurtic	301.8	153.8	302.4	631.1
214	07/09/2021	Sand with shell fragments	Slightly Gravelly Sand	312.5	Medium Sand	0.608	Moderately Well Sorted	-0.210	Coarse Skewed	1.131	Leptokurtic	301.8	194.9	302.1	592.9
215	07/09/2021	Muddy sand with a few shell fragments	Slightly Gravelly Muddy Sand	179.0	Fine Sand	1.341	Poorly Sorted	0.282	Fine Skewed	2.902	Very Leptokurtic	213.4	45.3	181.0	384.6
216	07/09/2021	Muddy sand with one large shell and shell fragments	Slightly Gravelly Muddy Sand	221.4	Fine Sand	1.486	Poorly Sorted	0.251	Fine Skewed	2.375	Very Leptokurtic	213.4	31.6	219.8	523.3
217	30/08/2021	Sand with a few shell fragments	Slightly Gravelly Sand	250.6	Medium Sand	0.522	Moderately Well Sorted	0.005	Symmetrical	1.073	Mesokurtic	213.4	153.4	250.5	408.5
218	07/09/2021	Muddy sand with a few shell fragments	Slightly Gravelly Muddy Sand	234.7	Fine Sand	1.419	Poorly Sorted	0.242	Fine Skewed	2.559	Very Leptokurtic	213.4	51.9	230.1	523.9
219	30/08/2021	Muddy sand with a few shell fragments	Slightly Gravelly Sand	195.7	Fine Sand	1.032	Poorly Sorted	0.300	Fine Skewed	2.757	Very Leptokurtic	213.4	100.0	196.7	330.2

Station	Sampled	Visual description pre-analysis	Folk (1954)	Statistics calculated using Folk and Ward (1957) formulae								Primary	d10	d50	d90
ID			classification	Mean		Sorting		Skewness		Kurtosis		Mode			
				(µm)	(description)	(phi)	(description)	(phi)	(description)	(phi)	(description)	(µm)	(µm)	(µm)	(µm)
220	31/08/2021	Sand with a few shell fragments	Slightly Gravelly Sand	303.6	Medium Sand	0.673	Moderately Well Sorted	-0.109	Coarse Skewed	1.115	Leptokurtic	301.8	181.9	297.1	583.7
221	31/08/2021	Sand with a few shell fragments	Slightly Gravelly Sand	279.0	Medium Sand	0.700	Moderately Well Sorted	-0.163	Coarse Skewed	1.266	Leptokurtic	301.8	158.4	268.1	538.1
232	02/09/2021	Shell fragments with some sand	Slightly Gravelly Sand	645.3	Coarse Sand	0.609	Moderately Well Sorted	0.061	Symmetrical	1.064	Mesokurtic	853.6	378.2	666.2	1074.8
233	02/09/2021	Shell fragments and gravel with some sand	Sandy Gravel	2573.8	Very Fine Gravel	1.749	Poorly Sorted	-0.043	Symmetrical	0.697	Platykurtic	853.6	565.5	2509.6	12327.7
236	01/09/2021	Shell fragments with some sand	Slightly Gravelly Sand	373.4	Medium Sand	0.672	Moderately Well Sorted	-0.126	Coarse Skewed	1.031	Mesokurtic	301.8	207.7	359.6	701.2
237	31/08/2021	Sand with very few shell fragments	Slightly Gravelly Sand	325.9	Medium Sand	0.644	Moderately Well Sorted	-0.017	Symmetrical	1.007	Mesokurtic	301.8	188.0	325.2	603.2
239	30/08/2021	Sand with shell fragments	Slightly Gravelly Sand	520.3	Coarse Sand	0.817	Moderately Sorted	-0.034	Symmetrical	0.927	Mesokurtic	426.8	262.8	516.0	1069.6
240	30/08/2021	Sand with very few shell fragments	Slightly Gravelly Sand	242.6	Fine Sand	0.473	Well Sorted	-0.107	Coarse Skewed	1.062	Mesokurtic	213.4	161.9	237.4	356.8
241	30/08/2021	Sand	Sand	254.9	Medium Sand	0.464	Well Sorted	-0.026	Symmetrical	1.012	Mesokurtic	213.4	177.9	254.9	394.1
247	07/09/2021	Muddy sandy gravel with lots of shell fragments	Sandy Gravel	2539.2	Very Fine Gravel	1.999	Poorly Sorted	-0.010	Symmetrical	0.854	Platykurtic	853.6	465.2	2418.4	15162.0
248	09/09/2021	Gravelly sandy mud with shell fragments	Gravelly Mud	56.7	Very Coarse Silt	4.473	Extremely Poorly Sorted	0.129	Fine Skewed	0.855	Platykurtic	853.6	0.8	82.7	2862.0
249	07/09/2021	Muddy sandy gravel with shell fragments	Gravelly Sand	795.6	Coarse Sand	3.076	Very Poorly Sorted	-0.379	Very Coarse Skewed	2.165	Very Leptokurtic	301.8	103.2	357.1	23786.4
250	07/09/2021	Gravelly muddy sand with shell fragments	Gravelly Muddy Sand	251.6	Medium Sand	3.470	Very Poorly Sorted	0.278	Fine Skewed	1.710	Very Leptokurtic	426.8	6.5	410.6	5733.0
251	09/09/2021	Gravelly sand with shell fragments	Gravelly Sand	753.6	Coarse Sand	1.930	Poorly Sorted	-0.353	Very Coarse Skewed	1.597	Very Leptokurtic	426.8	193.6	531.4	7613.4
252	07/09/2021	Gravelly sand with shells and shell fragments	Gravelly Muddy Sand	338.0	Medium Sand	2.784	Very Poorly Sorted	0.210	Fine Skewed	2.217	Very Leptokurtic	426.8	12.2	403.7	4112.9
253	07/09/2021	Muddy sand with shells and shell fragments	Gravelly Sand	286.3	Medium Sand	1.748	Poorly Sorted	0.026	Symmetrical	3.325	Extremely Leptokurtic	301.8	92.1	276.9	696.0
254	07/09/2021	Sand with a few shell fragments	Slightly Gravelly Sand	293.2	Medium Sand	0.682	Moderately Well Sorted	-0.091	Symmetrical	1.353	Leptokurtic	301.8	180.4	286.3	542.5
256	07/09/2021	Gravelly sand with shells and shell fragments	Gravelly Sand	707.5	Coarse Sand	1.953	Poorly Sorted	-0.163	Coarse Skewed	1.007	Mesokurtic	301.8	166.8	586.0	4415.1
257	07/09/2021	Gravelly sand with shells and shell fragments	Sandy Gravel	1296.7	Very Coarse Sand	2.123	Very Poorly Sorted	-0.272	Coarse Skewed	1.225	Leptokurtic	853.6	311.8	948.4	7470.8
258	07/09/2021	Muddy sand with a few shell fragments	Slightly Gravelly Muddy Sand	85.0	Very Fine Sand	2.029	Very Poorly Sorted	0.600	Very Fine Skewed	2.171	Very Leptokurtic	150.9	6.8	144.7	296.8
259	09/09/2021	Gravelly sand with shell fragments	Gravelly Sand	477.2	Medium Sand	1.735	Poorly Sorted	-0.393	Very Coarse Skewed	1.647	Very Leptokurtic	301.8	157.2	329.6	3210.5
260	09/09/2021	Gravelly muddy sand with shell fragments	Gravelly Muddy Sand	456.8	Medium Sand	2.500	Very Poorly Sorted	0.124	Fine Skewed	2.204	Very Leptokurtic	853.6	30.5	474.9	3489.5
266	02/09/2021	Sand with a few shell fragments	Slightly Gravelly Sand	186.6	Fine Sand	0.868	Moderately Sorted	-0.100	Coarse Skewed	1.618	Very Leptokurtic	213.4	95.7	181.7	407.3
267	02/09/2021	Muddy sand with shells and shell fragments	Gravelly Sand	281.3	Medium Sand	1.912	Poorly Sorted	-0.545	Very Coarse Skewed	2.339	Very Leptokurtic	150.9	98.0	202.4	3614.7
268	02/09/2021	Sand with a few shell fragments	Slightly Gravelly Sand	151.1	Fine Sand	0.554	Moderately Well Sorted	-0.122	Coarse Skewed	1.254	Leptokurtic	150.9	95.9	150.0	240.3
269	02/09/2021	Muddy sand with a few shell fragments	Slightly Gravelly Sand	142.4	Fine Sand	0.716	Moderately Sorted	0.066	Symmetrical	1.476	Leptokurtic	150.9	88.0	140.4	243.6
271	02/09/2021	Gravelly muddy sand with shell fragments	Muddy Sandy Gravel	895.3	Coarse Sand	5.007	Extremely Poorly Sorted	0.248	Fine Skewed	0.700	Platykurtic	38250.0	5.5	1385.2	38326.7
272	02/09/2021	Gravelly muddy sand with shell fragments	Gravelly Sand	545.3	Coarse Sand	2.429	Very Poorly Sorted	-0.239	Coarse Skewed	1.919	Very Leptokurtic	301.8	105.5	347.4	5177.2
273	02/09/2021	Gravelly muddy sand with shell fragments	Sandy Gravel	4745.1	Fine Gravel	2.726	Very Poorly Sorted	0.178	Fine Skewed	0.803	Platykurtic	38250.0	275.3	5247.0	38151.2
275	02/09/2021	Sand with shell fragments	Slightly Gravelly Sand	158.3	Fine Sand	0.844	Moderately Sorted	-0.213	Coarse Skewed	1.881	Very Leptokurtic	150.9	93.6	155.6	417.3
276	02/09/2021	Sand with shell fragments	Gravelly Sand	519.8	Coarse Sand	1.798	Poorly Sorted	-0.373	Very Coarse Skewed	1.260	Leptokurtic	301.8	152.7	366.3	3735.4
DDV7	29/08/2021	Sand with a few shell fragments	Gravelly Sand	428.7	Medium Sand	1.020	Poorly Sorted	-0.464	Very Coarse Skewed	1.562	Very Leptokurtic	301.8	221.4	364.7	1556.8
DDV35	07/09/2021	Muddy sand with shell fragments	Gravelly Sand	719.5	Coarse Sand	2.133	Very Poorly Sorted	-0.043	Symmetrical	1.710	Very Leptokurtic	426.8	171.0	578.7	3914.9
DDV37	08/09/2021	Muddy sand with shells and shell fragments	Gravelly Muddy Sand	382.4	Medium Sand	3.924	Very Poorly Sorted	0.092	Symmetrical	1.810	Very Leptokurtic	301.8	6.7	394.1	11012.6
DDV38	26/08/2021	Mud	Sandy Mud	12.5	Medium Silt	2.350	Very Poorly Sorted	0.257	Fine Skewed	0.984	Mesokurtic	53.3	1.0	14.9	70.6
DDV39	09/09/2021	Muddy sand with shells and shell fragments	Gravelly Muddy Sand	243.8	Fine Sand	3.158	Very Poorly Sorted	0.421	Very Fine Skewed	1.967	Very Leptokurtic	603.6	7.0	492.7	3147.0
DDV41	02/09/2021	Shell fragments with some sand	Slightly Gravelly Sand	635.6	Coarse Sand	0.550	Moderately Well Sorted	0.155	Fine Skewed	0.978	Mesokurtic	853.6	378.3	661.2	969.5
DDV43	07/09/2021	Sand with a few shell fragments	Slightly Gravelly Sand	315.2	Medium Sand	0.572	Moderately Well Sorted	-0.186	Coarse Skewed	1.198	Leptokurtic	301.8	199.7	306.5	554.4

Appendix 3.2 – Particle size analysis results (Part II)

Station	Gravel	Sand	Mud	V Coarse Gravel	Coarse Gravel	Medium Gravel	Fine Gravel	V Fine Gravel	V Coarse Sand	Coarse Sand	Medium Sand	Fine Sand	V Fine Sand	V Coarse Silt	Coarse Silt	Medium Silt	Fine Silt	V Fine Silt	Clay
ID	(>2 mm)	(63-2000 µm)	(<63 µm)	(32-64 mm)	(16-32 mm)	(8-16 mm)	(4-8 mm)	(2-4 mm)	(1-2 mm)	(500-1000 µm)	(250-500 µm)	(125-250 µm)	(63-125 µm)	(31-63 µm)	(16-31 µm)	(8-16 µm)	(4-8 µm)	(2-4 µm)	(<2 µm)
	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)
1	0.0	95.4	4.6	0.0	0.0	0.0	0.0	0.0	0.0	1.4	17.4	70.1	6.4	0.7	0.7	0.9	0.7	0.4	1.1
2	0.1	95.5	4.4	0.0	0.0	0.1	0.0	0.1	0.1	2.6	16.8	66.5	9.5	0.8	0.6	0.8	0.7	0.4	1.1
3	0.2	97.0	2.8	0.0	0.0	0.0	0.1	0.1	0.1	1.8	27.8	63.0	4.3	0.5	0.4	0.4	0.4	0.2	0.9
4	0.7	94.2	5.1	0.0	0.0	0.3	0.1	0.4	0.5	6.9	45.6	38.5	2.7	0.9	0.9	1.1	0.9	0.4	0.9
5	0.0	93.2	6.8	0.0	0.0	0.0	0.0	0.0	0.1	1.4	11.3	71.0	9.4	1.1	1.2	1.6	1.1	0.5	1.3
6	0.2	96.2	3.7	0.0	0.0	0.0	0.1	0.1	0.1	1.6	31.2	60.0	3.2	0.5	0.5	0.7	0.6	0.3	1.0
7	0.1	92.8	7.0	0.0	0.0	0.0	0.1	0.1	0.1	0.9	21.1	65.2	5.5	1.0	1.1	1.6	1.4	0.7	1.3
8	0.1	93.5	6.4	0.0	0.0	0.0	0.0	0.0	0.1	1.3	17.4	67.4	7.4	1.0	1.0	1.4	1.2	0.6	1.1
9	0.0	98.5	1.5	0.0	0.0	0.0	0.0	0.0	0.1	5.9	65.3	26.1	1.1	0.2	0.2	0.2	0.1	0.1	0.6
10	0.0	96.2	3.7	0.0	0.0	0.0	0.0	0.0	0.1	1.9	17.9	70.8	5.5	0.6	0.7	0.7	0.5	0.3	1.0
11	18.2	80.6	1.2	0.0	0.0	4.7	7.4	6.0	0.7	9.3	41.4	28.5	0.7	0.2	0.2	0.2	0.1	0.1	0.5
12	0.2	93.1	6.7	0.0	0.0	0.0	0.1	0.1	0.1	2.4	22.9	63.7	4.0	0.9	1.1	1.5	1.3	0.6	1.3
13	0.5	94.3	5.3	0.0	0.0	0.1	0.2	0.1	0.1	1.8	26.0	63.0	3.4	0.8	1.2	1.1	0.7	0.4	1.1
14	0.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.3	66.6	31.5	0.6	0.0	0.0	0.0	0.0	0.0	0.0
15	3.9	93.6	2.5	0.0	0.0	0.2	1.2	2.5	13.1	30.3	30.0	18.9	1.3	0.4	0.4	0.5	0.4	0.2	0.6
16	32.4	65.8	1.8	0.0	0.0	0.7	3.9	27.7	40.1	20.3	4.3	0.8	0.3	0.3	0.4	0.5	0.3	0.1	0.2
17	2.4	92.9	4.7	0.0	0.0	0.7	1.0	0.7	0.9	5.7	25.2	54.0	7.1	0.9	0.8	1.0	0.7	0.3	0.9
18	0.0	95.3	4.7	0.0	0.0	0.0	0.0	0.0	0.0	1.8	18.7	70.5	4.4	0.7	0.7	1.0	0.8	0.4	1.1
19	0.2	96.9	2.8	0.0	0.0	0.0	0.1	0.1	0.1	2.6	20.6	67.7	5.9	0.5	0.4	0.4	0.4	0.2	0.9
20	0.0	94.9	5.1	0.0	0.0	0.0	0.0	0.0	0.0	1.5	17.1	71.3	4.9	0.7	0.8	1.0	0.9	0.5	1.2
22	0.8	97.9	1.3	0.0	0.0	0.0	0.1	0.7	1.4	13.4	52.0	30.2	1.0	0.2	0.2	0.2	0.1	0.1	0.5
23	0.3	93.4	6.2	0.0	0.0	0.0	0.2	0.2	0.1	1.1	12.6	71.2	8.4	1.0	0.9	1.3	1.1	0.6	1.3
25	81.6	17.9	0.5	11.6	5.8	23.0	25.1	16.0	3.7	2.9	8.0	3.2	0.2	0.1	0.1	0.1	0.1	0.0	0.1
26	0.5	97.0	2.5	0.0	0.0	0.5	0.0	0.0	0.0	8.5	32.4	53.3	2.8	0.4	0.4	0.4	0.4	0.2	0.8
27	0.0	96.1	3.9	0.0	0.0	0.0	0.0	0.0	0.1	2.3	28.3	63.5	2.0	0.5	0.5	0.8	0.7	0.4	1.1
28	0.9	98.5	0.6	0.0	0.0	0.0	0.1	0.7	5.6	48.3	38.8	5.6	0.3	0.1	0.1	0.1	0.1	0.0	0.3
29	0.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.2	41.0	56.3	0.5	0.0	0.0	0.0	0.0	0.0	0.0
30	0.1	98.3	1.6	0.0	0.0	0.0	0.0	0.0	0.1	5.7	55.8	35.3	1.3	0.2	0.2	0.2	0.2	0.1	0.6
31	0.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.5	50.0	47.4	0.1	0.0	0.0	0.0	0.0	0.0	0.0
32	0.1	92.0	7.9	0.0	0.0	0.0	0.0	0.0	0.1	2.6	17.2	59.9	12.3	1.4	1.2	1.7	1.5	0.7	1.4
33	0.1	96.0	4.0	0.0	0.0	0.0	0.0	0.1	0.1	3.9	20.5	63.7	7.7	0.7	0.5	0.7	0.7	0.3	1.0
34	0.0	96.9	3.0	0.0	0.0	0.0	0.0	0.0	0.1	2.5	29.1	62.8	2.4	0.4	0.4	0.5	0.5	0.3	1.0
35	0.3	97.9	1.8	0.0	0.0	0.0	0.0	0.2	0.2	16.2	51.9	28.0	1.6	0.3	0.3	0.3	0.2	0.1	0.6
36	1.2	93.6	5.2	0.0	0.8	0.0	0.2	0.2	0.2	3.7	32.2	52.0	5.5	0.8	0.8	1.1	0.9	0.5	1.1
37	0.1	98.6	1.3	0.0	0.0	0.0	0.0	0.1	0.3	11.6	47.8	37.7	1.1	0.2	0.2	0.2	0.1	0.1	0.6
39	86.9	12.9	0.2	0.0	31.5	23.2	22.2	9.9	5.9	3.7	2.4	0.8	0.1	0.0	0.0	0.1	0.0	0.0	0.0
40	6.7	92.6	0.7	0.0	0.0	0.0	1.1	5.5	10.0	31.9	45.7	4.8	0.3	0.1	0.1	0.1	0.1	0.0	0.3
41	0.0	98.7	1.3	0.0	0.0	0.0	0.0	0.0	0.1	6.7	50.5	40.8	0.6	0.2	0.2	0.1	0.1	0.1	0.6
42	2.6	96.6	0.8	0.0	0.0	0.0	0.4	2.2	14.3	43.3	31.7	7.0	0.4	0.1	0.1	0.1	0.1	0.0	0.3
43	0.3	92.4	7.2	0.0	0.0	0.0	0.2	0.1	0.1	1.9	17.3	66.8	6.2	1.0	1.1	1.6	1.4	0.7	1.3
44	0.0	96.9	3.1	0.0	0.0	0.0	0.0	0.0	0.0	1.8	27.7	64.8	2.6	0.5	0.4	0.5	0.5	0.3	1.0
45	1.2	91.6	7.3	0.0	0.0	0.5	0.3	0.3	0.5	4.4	33.1	49.9	3.7	1.0	1.5	1.7	1.3	0.6	1.1
46	0.2	93.1	6.7	0.0	0.0	0.0	0.1	0.1	0.1	1.5	23.3	63.1	5.1	0.9	1.0	1.5	1.3	0.7	1.3
47	0.3	92.2	7.4	0.0	0.0	0.0	0.2	0.1	0.1	3.6	21.7	61.8	5.0	1.0	1.1	1.7	1.6	0.8	1.3
48	0.1	98.3	1.6	0.0	0.0	0.0	0.0	0.1	0.1	3.8	61.4	31.9	1.2	0.2	0.2	0.2	0.2	0.1	0.6
49	0.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	7.3	61.5	30.8	0.4	0.0	0.0	0.0	0.0	0.0	0.0
50	0.2	95.4	4.4	0.0	0.0	0.0	0.0	0.1	0.1	1.4	16.5	71.6	5.8	0.7	0.6	0.8	0.8	0.4	1.1
51	0.1	98.3	1.6	0.0	0.0	0.0	0.0	0.0	0.1	10.0	44.2	42.6	1.5	0.3	0.2	0.2	0.2	0.1	0.6
52	0.1	98.2	1.7	0.0	0.0	0.0	0.0	0.0	0.1	3.2	59.0	33.5	2.3	0.3	0.2	0.2	0.2	0.1	0.7
54	0.4	93.0	6.6	0.0	0.0	0.1	0.1	0.1	0.2	1.4	23.9	63.1	4.4	1.0	1.3	1.6	1.1	0.5	1.1
56	0.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	6.2	49.1	43.5	1.1	0.0	0.0	0.0	0.0	0.0	0.0
58	0.3	99.7	0.0	0.0	0.0	0.0	0.0	0.2	1.0	18.2	59.8	20.4	0.4	0.0	0.0	0.0	0.0	0.0	0.0
59	74.4	24.7	1.0	0.0	19.7	29.1	11.9	13.7	9.7	5.3	7.2	2.1	0.3	0.1	0.2	0.3	0.2	0.1	0.1

Station ID	Gravel (>2 mm) (%)	Sand (63-2000 µm) (%)	Mud (<63 µm) (%)	V Coarse Gravel (32-64 mm) (%)	Coarse Gravel (16-32 mm) (%)	Medium Gravel (8-16 mm) (%)	Fine Gravel (4-8 mm) (%)	V Fine Gravel (2-4 mm) (%)	V Coarse Sand (1-2 mm) (%)	Coarse Sand (500-1000 µm) (%)	Medium Sand (250-500 µm) (%)	Fine Sand (125-250 µm) (%)	V Fine Sand (63-125 µm) (%)	V Coarse Silt (31-63 µm) (%)	Coarse Silt (16-31 µm) (%)	Medium Silt (8-16 µm) (%)	Fine Silt (4-8 µm) (%)	V Fine Silt (2-4 µm) (%)	Clay (<2 µm) (%)
60	0.0	98.0	1.9	0.0	0.0	0.0	0.0	0.0	0.1	4.3	47.1	44.8	1.8	0.3	0.3	0.3	0.2	0.1	0.7
61	0.6	81.5	17.9	0.0	0.0	0.0	0.5	0.1	0.3	4.3	25.6	45.6	5.7	2.4	3.1	4.4	3.6	1.8	2.6
62	0.4	97.5	2.1	0.0	0.0	0.0	0.1	0.2	0.3	3.0	32.2	57.3	4.8	0.4	0.3	0.3	0.2	0.1	0.8
63	0.0	95.0	5.0	0.0	0.0	0.0	0.0	0.0	0.0	1.1	20.1	68.2	5.8	0.8	0.8	1.0	0.9	0.4	1.0
64	0.2	95.5	4.3	0.0	0.0	0.0	0.1	0.1	0.1	2.0	32.1	57.9	3.3	0.6	0.7	0.9	0.7	0.4	1.0
65	0.2	95.2	4.7	0.0	0.0	0.0	0.0	0.2	0.4	8.4	37.0	46.0	3.3	0.7	0.8	1.0	0.8	0.4	1.0
66	0.2	96.6	3.3	0.0	0.0	0.0	0.1	0.1	0.1	1.7	32.2	60.5	2.1	0.5	0.6	0.6	0.5	0.2	0.9
67	0.1	98.8	1.1	0.0	0.0	0.0	0.0	0.1	0.1	4.8	68.7	23.8	1.4	0.2	0.1	0.1	0.1	0.1	0.6
68	0.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.5	66.3	26.8	0.4	0.0	0.0	0.0	0.0	0.0	0.0
69	0.1	97.7	2.2	0.0	0.0	0.0	0.0	0.1	0.1	1.6	31.7	61.6	2.7	0.4	0.3	0.3	0.2	0.2	0.9
70	0.0	94.5	5.5	0.0	0.0	0.0	0.0	0.0	0.0	1.6	19.9	67.7	5.3	0.8	0.9	1.2	0.9	0.5	1.2
71	0.1	93.3	6.7	0.0	0.0	0.0	0.1	0.0	0.1	2.1	13.5	69.7	7.9	1.0	1.1	1.5	1.2	0.6	1.3
72	0.0	95.8	4.2	0.0	0.0	0.0	0.0	0.0	0.0	1.6	24.0	66.8	3.4	0.6	0.6	0.8	0.8	0.4	1.1
73	0.0	91.8	8.2	0.0	0.0	0.0	0.0	0.0	0.0	1.4	25.7	60.5	4.3	1.2	1.7	2.1	1.4	0.6	1.2
74	0.0	96.0	4.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0	33.1	58.2	2.8	0.5	0.6	0.8	0.7	0.4	1.0
75	0.0	94.4	5.6	0.0	0.0	0.0	0.0	0.0	0.0	2.1	23.4	64.2	4.8	0.7	0.7	1.2	1.2	0.6	1.2
76	9.9	88.9	1.3	0.0	5.1	2.3	1.7	0.8	1.4	8.5	40.9	37.1	1.0	0.2	0.2	0.2	0.1	0.1	0.5
77	0.2	94.9	4.9	0.0	0.0	0.0	0.0	0.1	0.2	5.2	25.1	58.9	5.6	0.8	0.8	1.1	0.8	0.4	1.0
78	0.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	4.6	65.1	30.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
79	0.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.1	59.9	34.3	0.6	0.0	0.0	0.0	0.0	0.0	0.0
80	0.0	98.7	1.2	0.0	0.0	0.0	0.0	0.0	0.1	9.9	63.7	23.8	1.1	0.2	0.2	0.2	0.1	0.1	0.5
81	0.4	96.9	2.7	0.0	0.0	0.3	0.1	0.1	0.1	2.0	31.4	60.7	2.8	0.4	0.4	0.5	0.4	0.2	0.9
82	0.5	99.5	0.0	0.0	0.0	0.0	0.0	0.5	1.6	13.8	56.5	27.2	0.3	0.0	0.0	0.0	0.0	0.0	0.0
84	69.0	30.4	0.5	0.0	26.2	27.7	9.5	5.7	4.0	8.4	13.9	3.9	0.2	0.1	0.1	0.1	0.1	0.0	0.1
85	74.7	24.9	0.5	18.6	26.0	16.1	9.3	4.6	3.4	7.2	10.9	3.2	0.2	0.1	0.1	0.1	0.1	0.0	0.1
86	2.0	96.9	1.1	0.0	0.0	0.0	0.3	1.7	9.4	30.9	47.7	8.3	0.5	0.2	0.2	0.2	0.1	0.0	0.4
96	56.1	43.4	0.6	0.0	4.6	32.8	9.7	8.9	7.5	17.1	16.7	1.9	0.2	0.1	0.1	0.1	0.1	0.1	0.2
99	4.9	94.2	0.9	0.0	0.0	1.6	0.4	2.9	6.2	38.7	45.1	3.8	0.5	0.2	0.2	0.1	0.1	0.0	0.3
100	3.3	96.6	0.1	0.0	0.0	0.0	0.7	2.6	6.6	58.6	30.5	0.8	0.1	0.0	0.0	0.0	0.0	0.0	0.0
103	49.4	50.5	0.1	0.0	0.0	0.4	9.0	40.0	38.3	10.0	2.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
111	19.2	80.3	0.5	0.0	0.0	0.0	1.2	18.0	27.1	28.4	19.7	4.8	0.3	0.1	0.1	0.1	0.1	0.0	0.2
115	81.8	17.7	0.6	0.0	8.5	30.4	30.2	12.7	7.4	5.9	2.9	1.3	0.2	0.1	0.1	0.2	0.1	0.0	0.1
116	51.5	48.0	0.4	0.0	22.6	7.2	10.9	10.8	11.8	12.3	18.0	5.9	0.2	0.1	0.1	0.1	0.0	0.0	0.2
121	81.1	18.4	0.5	0.0	23.5	29.9	21.5	6.2	1.3	5.6	10.4	0.9	0.1	0.1	0.1	0.1	0.1	0.0	0.1
122	71.6	28.1	0.4	0.0	26.6	31.2	10.2	3.5	1.1	10.6	15.1	1.2	0.1	0.1	0.1	0.1	0.1	0.0	0.1
124	23.2	73.2	3.6	0.0	5.5	4.7	7.1	5.9	1.6	16.1	43.5	10.5	1.4	0.5	0.6	0.9	0.7	0.3	0.6
125	35.8	63.6	0.7	0.0	0.0	4.3	11.9	19.6	15.9	21.7	22.9	2.8	0.2	0.1	0.1	0.1	0.1	0.0	0.2
127	45.4	8.4	46.2	19.3	15.2	3.2	3.2	4.6	5.9	0.0	0.0	0.0	2.6	3.8	7.0	9.1	7.9	5.3	13.1
128	50.5	45.4	4.2	0.0	23.6	16.2	5.3	5.4	3.9	15.4	16.5	8.0	1.5	0.6	0.6	1.0	0.9	0.5	0.6
129	20.4	61.2	18.4	0.0	0.0	8.0	7.9	4.5	3.6	20.9	24.9	8.0	3.8	2.3	2.5	3.3	3.6	2.4	4.2
130	47.4	45.4	7.2	0.0	29.8	8.5	4.7	4.4	4.9	18.9	13.5	6.2	1.9	1.0	0.9	1.5	1.5	0.9	1.4
133	1.5	98.5	0.0	0.0	0.0	0.0	0.6	1.0	1.1	20.7	54.0	22.2	0.4	0.0	0.0	0.0	0.0	0.0	0.0
137	20.9	65.8	13.4	0.0	3.9	6.5	5.8	4.7	4.0	28.7	22.3	7.6	3.2	1.8	1.9	3.0	2.9	1.6	2.3
138	17.2	79.5	3.3	0.0	0.0	4.9	5.3	7.0	5.8	24.9	35.0	12.4	1.3	0.5	0.5	0.7	0.6	0.3	0.6
140	23.6	73.8	2.6	0.0	7.1	5.0	5.5	6.1	10.5	28.4	30.2	4.3	0.5	0.3	0.5	0.7	0.5	0.2	0.4
143	44.4	33.1	22.5	0.0	27.3	6.9	5.4	4.7	5.4	11.7	5.6	5.3	5.1	3.2	2.8	3.9	4.4	3.1	5.0
147	22.8	75.7	1.5	0.0	0.0	3.4	10.2	9.2	6.3	33.3	31.0	4.4	0.7	0.2	0.3	0.3	0.2	0.1	0.3
148	0.0	0.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.3	13.3	21.4	18.6	12.0	31.4
152	60.1	36.4	3.5	0.0	11.3	20.7	19.8	8.3	2.3	18.8	12.5	2.0	0.7	0.4	0.5	0.9	0.8	0.3	0.5
153	28.7	70.1	1.3	0.0	8.6	8.4	5.1	6.6	12.3	37.5	18.7	1.2	0.4	0.2	0.2	0.3	0.2	0.1	0.3
154	46.1	50.8	3.2	0.0	7.9	13.3	15.1	9.8	12.2	23.4	10.1	4.2	0.8	0.4	0.6	0.8	0.6	0.3	0.4
156	32.5	62.5	5.0	0.0	11.7	5.2	7.5	8.1	14.7	32.2	12.0	2.4	1.1	0.7	0.7	1.1	1.1	0.5	1.0
157	20.9	64.8	14.3	0.0	0.0	7.4	8.1	5.4	4.8	27.2	22.5	6.8	3.5	1.9	1.8	3.0	3.1	1.8	2.9
158	23.5	71.3	5.2	0.0	0.0	7.6	7.5	8.4	9.2	23.0	25.8	11.5	1.9	0.7	0.8	1.2	1.1	0.5	0.8
159	15.0	77.4	7.6	0.0	2.7	4.1	3.6	4.5	5.8	23.7	29.3	15.8	2.7	1.1	1.0	1.6	1.6	1.0	1.3

Station	Gravel	Sand	Mud	V Coarse Gravel	Coarse Gravel	Medium Gravel	Fine Gravel	V Fine Gravel	V Coarse Sand	Coarse Sand	Medium Sand	Fine Sand	V Fine Sand	V Coarse Silt	Coarse Silt	Medium Silt	Fine Silt	V Fine Silt	Clay
ID	(>2 mm)	(63-2000 µm)	(<63 µm)	(32-64 mm)	(16-32 mm)	(8-16 mm)	(4-8 mm)	(2-4 mm)	(1-2 mm)	(500-1000 µm)	(250-500 µm)	(125-250 µm)	(63-125 µm)	(31-63 µm)	(16-31 µm)	(8-16 µm)	(4-8 µm)	(2-4 µm)	(<2 µm)
	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)
161	22.1	66.7	11.2	0.0	3.0	10.1	3.1	5.8	5.9	24.2	24.7	9.3	2.5	1.4	1.6	2.5	2.4	1.3	1.9
162	0.0	93.7	6.3	0.0	0.0	0.0	0.0	0.0	0.0	1.2	51.1	39.8	1.5	1.0	1.2	1.5	1.2	0.5	1.0
163	0.7	72.6	26.8	0.0	0.0	0.2	0.4	0.1	0.1	0.9	19.1	44.5	8.0	4.9	4.1	5.3	5.0	3.1	4.5
164	0.0	23.0	77.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	1.3	5.2	16.2	16.0	13.8	16.1	13.6	7.3	10.3
165	0.0	7.8	92.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0	5.8	10.5	15.0	21.7	18.9	10.0	16.0
166	0.0	3.9	96.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	3.6	8.3	14.3	22.8	21.0	11.6	18.3
167	0.0	14.6	85.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	4.4	9.8	13.8	15.1	19.6	16.0	8.2	12.6
168	0.0	1.0	99.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	4.8	12.4	23.3	22.6	12.9	23.0
169	0.0	17.2	82.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6	11.0	5.6	9.1	12.9	16.5	16.1	9.9	18.2
170	0.0	1.4	98.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.4	14.1	17.5	19.3	17.7	10.5	19.5
171	0.0	4.5	95.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	4.4	17.3	16.8	17.9	15.9	9.5	18.2
172	0.0	29.8	70.2	0.0	0.0	0.0	0.0	0.0	0.0	0.8	6.0	15.0	8.0	11.1	9.9	12.2	13.0	8.6	15.3
173	0.0	8.6	91.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	7.6	19.7	14.8	17.0	15.2	8.8	15.8
174	0.0	13.9	86.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.5	12.4	20.3	13.2	12.5	12.7	9.0	18.5
175	0.0	29.2	70.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.8	24.4	19.4	10.3	10.8	10.6	6.9	12.8
176	0.0	37.0	63.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6	9.7	26.7	19.3	9.2	8.0	8.3	6.1	12.1
177	0.0	25.1	74.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.8	22.3	22.2	10.9	9.8	10.0	7.3	14.7
178	0.0	13.1	86.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.6	10.5	17.9	13.6	13.7	13.7	9.3	18.6
179	0.0	3.9	96.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	3.7	6.8	15.1	25.5	21.3	10.6	16.8
180	0.0	11.5	88.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.8	10.7	23.7	14.6	12.9	12.0	8.2	17.0
181	0.0	7.0	93.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.2	4.9	17.6	16.0	15.3	14.8	9.6	19.5
182	0.0	0.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.0	15.1	20.1	19.5	12.6	24.8
183	0.0	1.5	98.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.5	6.1	11.5	22.5	21.7	12.9	23.9
184	0.0	5.1	94.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.1	4.0	10.3	15.5	22.4	19.7	10.6	16.4
185	0.0	8.1	91.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.1	6.0	11.7	13.5	20.5	18.0	10.8	17.5
186	0.0	49.3	50.7	0.0	0.0	0.0	0.0	0.0	0.0	1.2	2.1	11.1	35.0	14.8	7.5	8.3	7.8	4.8	7.5
187	0.0	11.6	88.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	3.3	8.2	12.4	14.4	19.0	17.1	9.7	15.8
188	0.0	2.1	97.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.1	5.0	13.2	22.0	21.5	12.8	23.4
189	0.0	1.0	99.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	5.3	13.1	23.2	22.2	12.8	22.3
190	0.0	1.0	99.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	4.6	14.4	23.8	22.4	12.5	21.2
191	0.0	12.6	87.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	2.5	10.0	23.9	15.0	12.4	11.7	8.1	16.3
192	0.0	10.9	89.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.9	9.9	21.9	13.6	13.6	13.3	8.8	17.9
193	0.0	2.3	97.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	2.2	10.1	16.4	21.2	19.4	11.0	19.6
194	0.0	2.7	97.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.7	7.1	14.6	23.9	21.5	11.6	18.7
195	0.0	4.3	95.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.3	16.2	16.5	17.8	16.2	10.1	19.0
196	0.0	29.3	70.7	0.0	0.0	0.0	0.0	0.0	0.0	1.1	6.5	14.3	7.4	11.2	10.9	11.7	11.8	8.2	16.8
197	0.0	17.4	82.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.1	15.3	20.5	12.4	12.1	12.4	8.5	16.7
198	0.0	3.3	96.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.3	7.1	13.0	20.6	20.0	12.2	23.7
199	0.0	15.1	84.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.5	13.6	19.1	13.1	13.9	13.7	8.8	16.3
200	0.0	4.6	95.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.9	3.7	9.9	15.0	21.5	19.6	10.9	18.5
201	0.0	41.2	58.8	0.0	0.0	0.0	0.0	0.0	0.0	0.7	2.1	9.6	28.8	16.3	9.3	10.2	9.3	5.5	8.2
202	21.2	50.3	28.5	0.0	0.0	6.2	5.4	9.6	13.7	7.9	10.3	13.2	5.3	4.6	4.2	4.7	5.0	3.5	6.6
203	0.0	50.4	49.6	0.0	0.0	0.0	0.0	0.0	0.0	0.4	1.7	12.7	35.6	17.5	6.7	6.3	6.6	4.5	8.1
204	0.0	68.1	31.9	0.0	0.0	0.0	0.0	0.0	0.0	0.7	3.8	35.4	28.2	7.0	3.9	5.2	5.6	3.8	6.4
205	0.0	69.6	30.4	0.0	0.0	0.0	0.0	0.0	0.0	0.4	3.5	36.1	29.7	6.9	3.7	4.4	5.1	3.9	6.4
206	0.0	57.3	42.7	0.0	0.0	0.0	0.0	0.0	0.0	0.2	1.2	19.3	36.7	12.8	5.1	5.3	5.9	4.5	9.1
207	0.0	66.4	33.6	0.0	0.0	0.0	0.0	0.0	0.0	0.4	2.6	26.5	36.8	10.3	4.0	4.5	4.9	3.5	6.3
208	0.0	40.6	59.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.7	30.9	18.2	8.5	7.4	7.9	5.8	11.6
209	0.0	70.2	29.8	0.0	0.0	0.0	0.0	0.0	0.0	0.6	2.7	28.2	38.7	10.2	3.4	3.7	4.0	3.1	5.4
210	0.0	44.2	55.8	0.0	0.0	0.0	0.0	0.0	0.0	0.6	1.4	11.8	30.3	16.0	7.4	7.7	8.1	5.8	10.9
211	0.0	56.6	43.4	0.0	0.0	0.0	0.0	0.0	0.0	0.1	3.4	15.4	37.7	10.7	7.6	8.7	7.1	3.9	5.5
213	0.2	93.9	5.9	0.0	0.0	0.0	0.1	0.1	0.2	16.7	50.2	25.2	1.6	0.7	0.9	1.4	1.2	0.6	1.0
214	0.4	99.6	0.0	0.0	0.0	0.0	0.1	0.3	0.3	12.9	58.2	27.7	0.5	0.0	0.0	0.0	0.0	0.0	0.0
215	0.1	89.1	10.8	0.0	0.0	0.0	0.0	0.1	0.1	4.7	18.0	56.8	9.6	1.5	1.4	2.3	2.2	1.2	2.1
216	0.8	87.6	11.6	0.7	0.0	0.0	0.0	0.1	0.1	9.9	28.7	43.5	5.3	1.6	1.6	2.6	2.5	1.3	2.0

Station ID	Gravel (>2 mm) (%)	Sand (63-2000 µm) (%)	Mud (<63 µm) (%)	V Coarse Gravel (32-64 mm) (%)	Coarse Gravel (16-32 mm) (%)	Medium Gravel (8-16 mm) (%)	Fine Gravel (4-8 mm) (%)	V Fine Gravel (2-4 mm) (%)	V Coarse Sand (1-2 mm) (%)	Coarse Sand (500-1000 µm) (%)	Medium Sand (250-500 µm) (%)	Fine Sand (125-250 µm) (%)	V Fine Sand (63-125 µm) (%)	V Coarse Silt (31-63 µm) (%)	Coarse Silt (16-31 µm) (%)	Medium Silt (8-16 µm) (%)	Fine Silt (4-8 µm) (%)	V Fine Silt (2-4 µm) (%)	Clay (<2 µm) (%)
217	0.0	97.7	2.3	0.0	0.0	0.0	0.0	0.0	0.0	3.0	47.1	46.2	1.3	0.3	0.3	0.4	0.3	0.2	0.8
218	0.0	89.6	10.4	0.0	0.0	0.0	0.0	0.0	0.1	10.9	31.9	42.6	4.1	1.3	1.4	2.3	2.2	1.1	1.9
219	0.1	92.1	7.8	0.0	0.0	0.0	0.0	0.1	0.1	1.8	21.1	64.4	4.7	1.1	1.3	1.8	1.5	0.7	1.4
220	0.1	98.4	1.4	0.0	0.0	0.0	0.0	0.1	0.8	12.4	53.6	30.9	0.7	0.2	0.2	0.2	0.1	0.1	0.6
221	1.0	97.3	1.7	0.0	0.0	0.2	0.0	0.8	1.2	9.0	45.1	40.4	1.6	0.3	0.2	0.3	0.2	0.1	0.6
232	1.1	98.7	0.2	0.0	0.0	0.0	0.0	1.1	10.4	63.4	24.0	0.9	0.1	0.1	0.1	0.0	0.0	0.0	0.0
233	54.8	45.0	0.2	0.0	6.2	16.9	17.3	14.3	15.2	23.7	5.9	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.1
236	0.2	99.8	0.0	0.0	0.0	0.0	0.0	0.2	0.8	23.3	57.5	17.8	0.3	0.0	0.0	0.0	0.0	0.0	0.0
237	0.0	99.1	0.9	0.0	0.0	0.0	0.0	0.0	0.0	16.6	57.2	24.5	0.8	0.1	0.1	0.1	0.1	0.0	0.5
239	1.3	97.5	1.2	0.0	0.0	0.0	0.1	1.2	10.1	40.4	40.8	5.9	0.3	0.1	0.2	0.2	0.2	0.1	0.4
240	0.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.6	40.9	56.2	0.3	0.0	0.0	0.0	0.0	0.0	0.0
241	0.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0	50.2	47.8	0.1	0.0	0.0	0.0	0.0	0.0	0.0
247	54.7	41.9	3.4	1.8	7.1	11.8	15.5	18.6	11.6	22.6	6.3	0.8	0.5	0.4	0.6	1.0	0.7	0.3	0.4
248	11.8	40.2	47.9	0.0	2.4	3.0	2.7	3.7	4.7	14.4	9.8	6.3	5.1	4.7	5.5	7.7	8.4	6.0	15.6
249	22.2	70.4	7.5	0.0	12.9	3.4	2.7	3.1	1.9	11.2	36.1	17.0	4.1	1.3	1.0	1.4	1.5	0.8	1.4
250	16.1	62.9	21.0	0.0	0.0	6.6	5.7	3.8	4.8	21.5	23.7	8.7	4.2	2.9	2.8	4.1	4.4	2.7	4.1
251	19.7	76.1	4.3	0.0	2.3	7.2	4.8	5.3	6.1	26.7	33.0	8.8	1.4	0.6	0.6	1.0	0.9	0.4	0.7
252	14.1	70.6	15.3	0.0	2.1	2.8	5.3	3.9	3.7	22.2	30.0	9.3	5.4	2.5	1.9	2.5	2.7	2.0	3.8
253	5.5	85.5	9.0	0.0	1.5	2.5	0.9	0.6	0.4	11.5	40.7	30.3	2.6	1.1	1.3	2.1	1.9	1.0	1.6
254	1.1	95.9	3.0	0.0	0.0	0.2	0.4	0.5	0.4	9.9	53.4	30.8	1.4	0.4	0.5	0.6	0.5	0.3	0.8
256	23.1	72.2	4.7	0.0	1.0	3.6	6.5	12.0	11.1	20.0	24.4	14.9	1.8	0.7	0.7	1.1	1.0	0.5	0.7
257	35.9	59.6	4.5	3.7	1.7	3.4	13.9	13.3	11.2	32.6	12.7	2.2	0.8	0.6	0.8	1.3	0.9	0.4	0.6
258	0.1	77.7	22.2	0.0	0.0	0.0	0.1	0.0	0.1	2.5	10.7	47.8	16.5	3.8	2.9	4.5	4.4	2.7	3.9
259	14.8	80.3	4.8	0.0	0.0	1.4	6.0	7.4	4.5	11.5	40.4	21.9	2.0	0.8	0.7	1.1	0.9	0.5	0.8
260	14.0	74.3	11.7	0.0	0.2	5.9	3.0	5.0	5.4	28.6	24.5	12.0	3.8	1.7	1.5	2.4	2.4	1.5	2.3
266	0.7	94.6	4.7	0.0	0.0	0.0	0.4	0.4	1.0	5.7	15.5	58.4	13.9	1.4	0.8	0.8	0.5	0.3	1.0
267	13.2	83.1	3.7	0.0	4.9	1.2	3.3	3.8	2.5	4.4	16.6	44.4	15.2	0.8	0.5	0.6	0.5	0.3	1.0
268	0.0	97.2	2.7	0.0	0.0	0.0	0.0	0.0	0.2	1.8	5.5	65.8	23.9	0.8	0.3	0.2	0.2	0.2	1.0
269	0.0	94.1	5.8	0.0	0.0	0.0	0.0	0.0	0.0	0.7	7.9	53.3	32.2	1.5	1.2	1.0	0.7	0.4	1.1
271	45.4	30.9	23.7	21.2	10.7	3.3	3.5	6.7	8.0	11.7	3.3	3.4	4.5	3.8	3.5	4.2	4.0	2.7	5.4
272	18.8	73.2	8.0	0.0	0.0	7.0	5.2	6.7	5.0	11.7	34.6	18.9	2.9	1.1	1.1	1.9	1.8	0.8	1.3
273	61.2	36.2	2.5	20.6	7.4	14.9	11.3	7.0	13.7	11.1	4.5	4.9	2.1	0.4	0.4	0.6	0.5	0.2	0.4
275	2.0	94.2	3.8	0.0	0.0	0.0	0.6	1.4	1.4	5.4	5.7	59.8	21.9	1.0	0.6	0.6	0.5	0.3	0.9
276	16.1	79.3	4.6	0.0	0.6	2.8	6.0	6.7	6.6	17.8	29.1	23.8	2.0	0.7	0.7	1.0	0.9	0.5	0.9
DDV7	7.9	92.1	0.0	0.0	0.0	0.1	2.4	5.4	5.2	14.6	57.6	14.2	0.5	0.0	0.0	0.0	0.0	0.0	0.0
DDV35	19.5	73.7	6.8	0.0	0.0	3.2	6.5	9.8	9.1	27.6	28.1	7.4	1.6	0.9	1.0	1.7	1.4	0.7	1.0
DDV37	22.5	59.3	18.2	0.0	4.4	9.9	4.4	3.8	3.5	17.0	21.7	14.8	2.4	1.4	2.0	3.8	3.8	2.7	4.4
DDV38	0.0	12.8	87.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.6	11.2	22.1	14.0	14.7	13.7	8.2	14.3
DDV39	12.2	68.6	19.2	0.0	0.3	5.6	3.0	3.3	4.6	32.5	20.6	6.6	4.3	2.6	2.4	3.5	3.8	2.5	4.3
DDV41	0.3	99.6	0.1	0.0	0.0	0.0	0.0	0.3	6.4	68.5	23.7	0.9	0.1	0.0	0.0	0.0	0.0	0.0	0.0
DDV43	0.3	99.7	0.0	0.0	0.0	0.1	0.1	0.1	0.1	11.6	63.3	24.1	0.6	0.0	0.0	0.0	0.0	0.0	0.0

Appendix 3.3 – Particle size analysis results (Part III)

Station	Percentages of the distribution in each 'half-phi' size interval, expressed in µm (sieving for >1mm fraction, laser diffraction for <1mm fraction)																				
ID	>63000	45000	31500	22400	16000	11200	8000	5600	4000	2800	2000	1400	1000	710	500	355	250	180	125	90	63
		to 63000	to 45000	to 31500	to 22400	to 16000	to 11200	to 8000	to 5600	to 4000	to 2800	to 2000	to 1400	to 1000	to 710	to 500	to 355	to 250	to 180	to 125	to 90
1	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	1.4	4.3	13.1	38.8	31.4	5.6	0.9
2	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.5	2.1	4.7	12.1	33.6	32.9	8.4	1.1
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.1	0.1	0.1	0.1	1.7	5.8	22.0	39.5	23.5	3.7	0.6
4	0.0	0.0	0.0	0.0	0.0	0.2	0.1	0.0	0.1	0.1	0.2	0.2	0.3	2.2	4.7	17.1	28.5	27.0	11.5	2.1	0.7
5	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	0.0	1.4	2.8	8.6	34.9	36.1	8.3	1.1
6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	1.6	5.6	25.5	40.7	19.4	2.6	0.6
7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.1	0.0	0.1	0.0	0.9	3.7	17.4	39.8	25.4	4.6	1.0
8	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	0.0	1.3	3.2	14.3	38.8	28.5	6.1	1.3
9	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	0.7	5.2	26.3	39.0	21.6	4.5	0.9	0.3
10	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	0.4	1.5	2.7	15.2	40.7	30.2	4.9	0.6
11	0.0	0.0	0.0	0.0	0.0	2.2	2.6	2.5	5.0	4.5	1.5	0.5	0.2	2.6	6.7	15.2	26.2	22.4	6.1	0.5	0.2
12	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	0.5	2.0	4.6	18.3	41.3	22.5	3.1	0.9
13	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.1	0.1	0.1	0.1	0.1	0.0	1.8	4.6	21.4	41.9	21.1	2.7	0.7
14	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	1.3	21.5	45.2	27.1	4.3	0.6	0.0
15	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.7	0.4	0.6	1.9	6.1	7.0	16.0	14.3	13.6	16.4	14.0	4.9	1.0	0.3
16	0.0	0.0	0.0	0.0	0.0	0.3	0.4	1.2	2.8	9.4	18.3	22.9	17.2	13.7	6.6	3.1	1.2	0.5	0.3	0.2	0.1
17	0.0	0.0	0.0	0.0	0.0	0.7	0.0	0.5	0.4	0.4	0.4	0.4	0.5	1.8	3.9	9.0	16.2	29.6	24.4	6.0	1.1
18	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	1.7	2.8	15.9	43.2	27.3	3.6	0.8
19	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.1	0.0	0.0	2.6	5.8	14.9	38.3	29.4	5.2	0.7
20	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	1.5	3.1	14.1	42.8	28.5	4.1	0.8
22	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.2	0.5	0.7	0.7	3.8	9.5	20.5	31.6	24.0	6.2	0.6	0.3
23	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.0	1.1	2.5	10.1	37.1	34.1	7.3	1.1
25	0.0	0.0	12.1	4.3	1.1	11.3	11.8	11.5	13.5	10.3	5.7	2.8	0.9	1.1	1.8	3.4	4.5	2.6	0.6	0.2	0.1
26	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	2.2	6.3	11.0	21.4	34.1	19.2	2.5	0.4
27	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	0.4	1.9	3.8	24.5	44.7	18.8	1.4	0.6
28	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.6	1.7	3.9	23.4	24.8	23.2	15.6	5.0	0.6	0.2	0.1
29	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	1.0	1.2	8.0	33.0	41.9	14.4	0.5	0.0
30	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	1.2	4.5	19.6	36.2	27.7	7.7	1.0	0.3
31	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	1.2	1.3	11.0	39.1	38.7	8.7	0.1	0.0
32	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	0.4	2.1	5.6	11.6	28.7	31.1	10.5	1.9
33	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	0.9	3.0	6.2	14.3	34.4	29.3	6.7	1.0
34	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	0.2	2.3	6.3	22.9	41.7	21.1	1.9	0.5
35	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	4.8	11.4	22.4	29.5	21.1	6.9	1.3	0.4
36	0.0	0.0	0.0	0.0	0.8	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.8	2.9	10.4	21.9	31.5	20.6	4.5	1.0
37	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.2	3.4	8.2	17.5	30.3	28.3	9.4	0.8	0.3
39	0.0	0.0	0.0	6.3	25.2	9.3	13.9	12.3	9.9	6.0	3.9	3.5	2.3	2.3	1.3	1.3	1.2	0.6	0.2	0.1	0.0
40	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.9	2.3	3.3	4.4	5.6	13.8	18.1	26.0	19.7	4.4	0.4	0.2	0.0
41	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	2.0	4.7	15.3	35.2	32.5	8.2	0.3	0.3
42	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.6	1.6	4.9	9.4	24.6	18.7	17.4	14.3	5.8	1.2	0.3	0.1
43	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.1	0.1	0.1	0.1	0.0	1.9	4.7	12.7	38.2	28.6	5.1	1.1
44	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	1.8	3.9	23.8	43.9	20.9	2.0	0.6
45	0.0	0.0	0.0	0.0	0.0	0.3	0.2	0.2	0.2	0.1	0.2	0.2	0.2	1.2	3.2	10.3	22.8	33.2	16.7	3.0	0.7
46	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.1	0.1	0.0	1.5	4.4	19.0	39.9	23.2	4.1	1.0
47	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.1	0.0	0.1	0.1	0.7	2.9	6.1	15.7	38.0	23.9	3.9	1.1
48	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.1	1.2	2.6	20.1	41.3	26.9	4.9	0.9	0.3
49	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	2.1	5.2	20.9	40.6	26.8	3.9	0.4	0.0
50	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	1.4	3.2	13.3	41.4	30.2	4.9	0.9
51	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	2.9	7.1	14.8	29.4	31.2	11.4	1.1	0.4
52	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.9	2.3	20.4	38.6	26.0	7.5	1.8	0.5
54	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.1	0.1	0.1	0.2	0.0	1.4	5.1	18.8	39.4	23.7	3.6	0.8
56	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	4.3	15.0	34.2	33.2	10.3	0.8	0.3
58	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.4	0.6	5.3	12.9	27.2	32.6	17.4	3.0	0.4	0.0
59	0.0	0.0	0.0	7.4	12.4	17.3	11.8	6.8	5.0	7.7	6.0	5.8	3.8	3.0	2.4	3.5	3.7	1.7	0.5	0.2	0.1
60	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	1.5	2.7	13.0	34.1	33.7	11.1	1.3	0.4

Station	Percentages of the distribution in each 'half-phi' size interval, expressed in µm (sieving for >1mm fraction, laser diffraction for <1mm fraction)																				
ID	>63000	45000	31500	22400	16000	11200	8000	5600	4000	2800	2000	1400	1000	710	500	355	250	180	125	90	63
		to 63000	to 45000	to 31500	to 22400	to 16000	to 11200	to 8000	to 5600	to 4000	to 2800	to 2000	to 1400	to 1000	to 710	to 500	to 355	to 250	to 180	to 125	to 90
61	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.2	0.0	0.1	0.1	0.2	1.1	3.2	7.9	17.7	27.4	18.2	4.5	1.2
62	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.9	2.0	7.8	24.3	36.2	21.1	4.1	0.6
63	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	1.1	3.6	16.4	40.4	27.8	4.9	0.8
64	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.0	0.1	0.1	0.1	2.0	6.9	25.2	39.3	18.7	2.7	0.6
65	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.3	2.4	6.0	12.6	24.4	31.3	14.7	2.6	0.7
66	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.1	0.1	0.0	1.7	5.9	26.3	42.9	17.6	1.6	0.5
67	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	0.6	4.2	27.6	41.1	19.8	3.9	1.2	0.3
68	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	0.7	5.8	26.4	39.9	22.8	4.0	0.4	0.0
69	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	1.6	5.3	26.4	41.8	19.8	2.2	0.5
70	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	1.6	3.9	16.0	39.8	27.9	4.5	0.8
71	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.6	1.5	3.1	10.4	36.8	32.9	6.9	1.1
72	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	1.6	3.9	20.1	43.5	23.3	2.7	0.7
73	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	1.4	5.2	20.5	38.8	21.6	3.6	0.7
74	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	0.2	1.8	6.6	26.5	40.5	17.7	2.2	0.5
75	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	2.1	6.6	16.8	39.3	24.8	4.0	0.8
76	0.0	0.0	0.0	0.0	5.1	0.0	2.3	1.1	0.6	0.5	0.3	0.6	0.8	4.5	3.9	10.7	30.3	29.3	7.8	0.6	0.4
77	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	1.2	3.9	8.1	17.0	34.4	24.5	4.7	0.9
78	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	1.0	3.6	22.3	42.7	26.8	3.4	0.0	0.0
79	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	1.3	3.8	20.6	39.4	28.2	6.1	0.4	0.3
80	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	1.7	8.2	27.8	35.9	19.3	4.5	0.9	0.2
81	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.1	0.0	0.0	0.0	0.1	0.0	1.9	7.2	24.2	40.5	20.1	2.3	0.5
82	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.4	0.7	0.9	6.0	7.8	20.8	35.8	23.5	3.7	0.3	0.0
84	0.0	0.0	0.0	0.0	26.2	13.9	13.8	5.8	3.7	3.3	2.3	2.1	1.9	4.5	3.9	6.2	7.7	3.5	0.5	0.1	0.1
85	0.0	0.0	19.4	12.9	12.3	5.7	10.4	5.9	3.5	2.5	2.1	1.8	1.6	4.0	3.3	4.8	6.1	2.8	0.4	0.1	0.0
86	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.5	1.3	3.5	5.9	15.6	15.3	24.7	23.0	7.6	0.7	0.3	0.1
96	0.0	0.0	0.0	0.0	4.6	23.5	9.3	5.3	4.5	4.5	4.4	4.0	3.5	8.3	8.8	10.1	6.6	1.6	0.3	0.1	0.0
99	0.0	0.0	0.0	0.0	0.0	0.0	1.6	0.0	0.4	1.2	1.7	2.8	3.4	15.9	22.8	27.9	17.2	3.4	0.4	0.3	0.1
100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.6	1.0	1.6	3.0	3.6	27.2	31.4	23.4	7.1	0.5	0.3	0.1	0.0
103	0.0	0.0	0.0	0.0	0.0	0.0	0.4	1.8	7.1	16.3	23.7	24.4	13.9	6.8	3.2	1.5	0.6	0.1	0.0	0.0	0.0
111	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.9	4.1	13.9	14.9	12.2	15.7	12.7	11.1	8.6	3.9	0.9	0.2	0.1
115	0.0	0.0	0.0	0.0	8.5	11.6	18.8	17.5	12.7	7.7	5.0	4.2	3.1	3.8	2.2	1.6	1.3	0.9	0.4	0.1	0.1
116	0.0	0.0	0.0	17.3	5.3	2.3	5.0	5.1	5.8	5.2	5.6	7.0	4.8	6.4	5.8	8.4	9.6	5.1	0.8	0.1	0.1
121	0.0	0.0	0.0	13.0	10.5	13.3	16.7	12.9	8.6	4.3	1.9	0.9	0.4	1.8	3.8	6.2	4.2	0.8	0.1	0.1	0.0
122	0.0	0.0	0.0	13.8	12.8	18.9	12.3	6.5	3.7	2.5	1.0	0.6	0.5	3.6	7.0	9.5	5.6	1.0	0.2	0.1	0.0
124	0.0	0.0	0.0	5.5	0.0	2.1	2.6	3.5	3.5	4.0	1.9	1.0	0.7	5.0	11.1	23.2	20.4	7.8	2.7	1.0	0.4
125	0.0	0.0	0.0	0.0	0.0	0.5	3.8	5.0	6.9	9.4	10.2	9.7	6.3	10.6	11.1	13.2	9.7	2.5	0.3	0.1	0.1
127	0.0	0.0	20.1	8.8	5.4	0.9	2.3	1.4	1.8	2.3	2.3	2.9	2.9	0.0	0.0	0.0	0.0	0.0	0.0	0.7	1.9
128	0.0	0.0	0.0	8.3	15.4	11.0	5.2	3.4	1.9	2.7	2.6	2.1	1.8	7.2	8.3	9.1	7.5	5.1	2.9	1.1	0.4
129	0.0	0.0	0.0	0.0	0.0	2.7	5.4	5.0	2.9	2.1	2.4	2.0	1.6	9.1	11.8	15.3	9.5	4.2	3.7	2.1	1.7
130	0.0	0.0	0.0	19.0	10.8	4.6	4.0	2.2	2.5	2.1	2.3	2.3	2.5	9.5	9.4	8.1	5.5	3.8	2.3	1.2	0.7
133	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.3	0.5	0.5	0.6	0.5	8.8	11.9	19.5	34.6	20.3	1.9	0.4	0.0
137	0.0	0.0	0.0	1.6	2.3	3.1	3.4	2.3	3.5	2.8	1.9	1.9	2.1	14.4	14.2	13.1	9.3	4.7	2.8	1.9	1.3
138	0.0	0.0	0.0	0.0	0.0	2.2	2.7	2.6	2.7	3.6	3.4	3.2	2.6	11.8	13.2	17.3	17.6	9.6	2.8	0.9	0.4
140	0.0	0.0	0.0	7.1	0.0	2.5	2.5	3.3	2.2	2.7	3.3	4.7	5.8	14.0	14.5	17.5	12.6	3.6	0.7	0.3	0.2
143	0.0	0.0	0.0	27.2	0.1	3.1	3.8	2.7	2.7	2.3	2.4	2.7	2.7	5.8	5.9	3.5	2.0	2.4	3.0	2.9	2.1
147	0.0	0.0	0.0	0.0	0.0	2.3	1.1	5.3	4.8	5.4	3.8	3.3	3.0	15.4	17.9	19.5	11.5	3.3	1.1	0.5	0.2
148	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	0.0	0.0	0.0	0.0
152	0.0	0.0	0.0	0.0	11.3	8.5	12.2	12.1	7.7	5.3	3.0	1.6	0.8	6.5	12.3	10.0	2.5	1.2	0.8	0.4	0.3
153	0.0	0.0	0.0	8.6	0.0	5.1	3.2	2.5	2.6	2.7	3.9	5.7	6.6	17.2	20.3	14.8	3.9	0.7	0.5	0.2	0.1
154	0.0	0.0	0.0	7.9	0.0	3.8	9.5	7.6	7.4	5.2	4.5	5.7	6.5	14.2	9.2	6.0	4.1	2.8	1.4	0.5	0.3
156	0.0	0.0	0.0	7.0	4.7	2.2	3.0	4.3	3.2	3.7	4.4	6.4	8.3	18.5	13.7	8.1	3.9	1.5	0.9	0.6	0.5
157	0.0	0.0	0.0	0.0	0.0	1.1	6.3	4.0	4.1	3.0	2.4	2.4	2.4	11.9	15.3	15.2	7.3	3.5	3.3	2.1	1.3
158	0.0	0.0	0.0	0.0	0.0	1.9	5.7	3.9	3.6	3.8	4.6	5.0	4.2	10.7	12.3	14.6	11.2	7.6	3.9	1.2	0.7
159	0.0	0.0	0.0	0.0	2.7	1.0	3.1	2.0	1.6	2.1	2.4	2.9	2.9	11.7	12.1	14.1	15.3	11.0	4.8	1.8	0.9
161	0.0	0.0	0.0	0.0	3.0	7.2	3.0	1.5	1.6	2.8	3.0	3.1	2.8	10.5	13.7	14.8	9.9	5.9	3.5	1.6	0.9
162	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	1.2	11.7	39.5	33.9	5.9	1.0	0.6

Station	Percentages of the distribution in each 'half-phi' size interval, expressed in µm (sieving for >1mm fraction, laser diffraction for <1mm fraction)																				
ID	>63000	45000	31500	22400	16000	11200	8000	5600	4000	2800	2000	1400	1000	710	500	355	250	180	125	90	63
		to 63000	to 45000	to 31500	to 22400	to 16000	to 11200	to 8000	to 5600	to 4000	to 2800	to 2000	to 1400	to 1000	to 710	to 500	to 355	to 250	to 180	to 125	to 90
163	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.4	0.1	0.0	0.1	0.1	0.0	0.0	0.9	2.4	16.7	30.4	14.1	4.2	3.7
164	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	0.3	0.7	0.6	1.7	3.6	7.4	8.8
165	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	0.5	1.6	2.6	3.2
166	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	0.0	0.3	1.8	1.9
167	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	0.4	2.1	2.3	4.2	5.5
168	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	0.0	0.0	0.0	1.0
169	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	0.6	5.7	5.3	2.6	3.0
170	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	0.0	0.0	0.0	1.4
171	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	0.0	0.1	1.6	2.8
172	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	0.8	2.2	3.8	7.5	7.5	4.3	3.7
173	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	0.3	0.7	2.2	5.4
174	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	1.3	3.9	8.5
175	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	0.9	3.9	10.6	13.8
176	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	0.6	3.1	6.6	11.9	14.7
177	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	0.7	2.0	8.4	13.9
178	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	0.3	2.4	3.7	6.8
179	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	0.0	0.3	1.9	1.7
180	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	0.2	0.7	2.8	7.9
181	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	2.0	1.1	3.7
182	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	0.0	0.0	0.0	0.0
183	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	0.0	0.0	0.5	0.9
184	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	1.0	1.6	2.4
185	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	0.6	1.4	2.4	3.6
186	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	1.1	0.9	1.2	2.7	8.3	18.1	16.9
187	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	1.2	2.1	3.5	4.7
188	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	0.0	0.0	0.1	2.0
189	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	0.0	0.0	0.0	1.0
190	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	0.0	0.0	0.0	1.0
191	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	0.8	1.7	3.5	6.5
192	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	0.8	3.0	7.0
193	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	0.0	0.1	1.1	1.1
194	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	0.0	0.0	0.8	1.9
195	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	0.0	0.0	0.9	3.4
196	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	1.1	2.0	4.5	7.4	6.8	3.8	3.6
197	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	0.0	2.1	5.6	9.7
198	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	0.0	0.0	0.9	2.4
199	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	0.3	1.1	4.5	9.1
200	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	0.8	1.4	2.3
201	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	0.7	1.1	1.0	2.6	7.0	14.0	14.8
202	0.0	0.0	0.0	0.0	0.0	4.4	1.8	1.2	4.2	4.5	5.1	7.0	6.7	4.7	3.2	4.6	5.7	7.2	6.0	3.0	2.3
203	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	0.4	1.2	0.5	2.5	10.2	18.1	17.5
204	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	0.7	1.7	2.0	10.8	24.5	19.6	8.6
205	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	0.4	1.9	1.6	10.3	25.7	20.8	8.9
206	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	0.2	0.8	0.4	4.0	15.4	21.4	15.3
207	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	0.4	1.2	1.3	6.7	19.9	23.0	13.8
208	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	0.9	8.8	15.0	15.9
209	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	0.6	1.7	1.0	6.8	21.4	24.4	14.3
210	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	0.3	0.3	0.6	0.8	2.9	9.0	15.8	14.5
211	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	1.6	1.8	2.0	13.4	23.5	14.2
213	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	6.1	10.7	18.6	31.6	21.0	4.2	1.1	0.5
214	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.2	0.2	5.6	7.3	18.3	39.9	25.3	2.4	0.5	0.0
215	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	1.4	3.3	6.8	11.2	29.2	27.6	7.7	1.9
216	0.0	0.0	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	3.0	7.0	11.1	17.6	27.9	15.6	4.0	1.3
217	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	1.3	1.7	11.9	35.2	35.4	10.8	0.9	0.3
218	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	3.3	7.6	11.8	20.1	29.5	13.0	3.1	1.1
219	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	0.0	1.7	4.8	16.3	38.8	25.5	3.9	0.8

Station	Percentages of the distribution in each 'half-phi' size interval, expressed in µm (sieving for >1mm fraction, laser diffraction for <1mm fraction)																				
ID	>63000	45000	31500	22400	16000	11200	8000	5600	4000	2800	2000	1400	1000	710	500	355	250	180	125	90	63
		to 63000	to 45000	to 31500	to 22400	to 16000	to 11200	to 8000	to 5600	to 4000	to 2800	to 2000	to 1400	to 1000	to 710	to 500	to 355	to 250	to 180	to 125	to 90
220	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.3	0.6	4.9	7.4	19.6	34.1	25.1	5.8	0.5	0.3
221	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.2	0.5	0.6	0.6	3.5	5.5	14.0	31.1	30.6	9.8	1.2	0.4
232	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.9	3.4	7.1	33.3	30.1	18.7	5.2	0.6	0.3	0.0	0.0
233	0.0	0.0	0.0	0.0	6.2	5.2	11.7	8.5	8.8	7.2	7.1	8.1	7.1	13.4	10.3	4.9	0.9	0.2	0.1	0.0	0.0
236	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.3	0.6	8.6	14.6	27.0	30.5	15.3	2.6	0.3	0.0
237	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	4.3	12.3	25.8	31.4	19.6	4.9	0.6	0.2
239	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.4	0.8	3.1	7.0	20.5	19.9	22.8	18.0	5.3	0.6	0.2	0.1
240	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	0.9	1.7	7.5	33.4	43.2	13.0	0.3	0.0
241	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	0.9	1.1	11.7	38.5	38.6	9.2	0.1	0.0
247	0.0	0.0	1.9	0.0	7.0	7.4	4.3	5.9	9.6	10.2	8.4	6.3	5.3	12.7	9.9	4.8	1.5	0.5	0.3	0.3	0.3
248	0.0	0.0	0.0	2.4	0.0	1.8	1.2	1.0	1.6	2.0	1.7	2.1	2.5	7.5	6.9	5.9	3.9	3.2	3.1	2.5	2.6
249	0.0	0.0	0.0	12.1	0.8	1.6	1.8	1.8	0.9	1.6	1.5	1.1	0.8	4.4	6.8	15.1	21.0	11.3	5.7	2.9	1.3
250	0.0	0.0	0.0	0.0	0.0	2.2	4.4	3.7	2.0	2.1	1.7	2.2	2.6	9.3	12.2	13.4	10.3	5.4	3.3	2.2	2.0
251	0.0	0.0	0.0	0.0	2.3	2.6	4.6	3.4	1.4	2.4	3.0	3.2	2.9	12.6	14.1	19.0	14.0	6.1	2.7	1.0	0.5
252	0.0	0.0	0.0	1.2	0.9	0.2	2.5	2.8	2.5	2.2	1.6	1.8	2.0	10.4	11.7	16.2	13.8	5.8	3.5	3.3	2.1
253	0.0	0.0	0.0	1.0	0.5	1.5	1.0	0.5	0.4	0.3	0.3	0.2	0.2	3.7	7.8	13.3	27.4	24.0	6.3	1.8	0.8
254	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.2	0.2	0.3	0.2	0.2	0.2	4.0	5.8	15.7	37.7	26.8	4.0	1.0	0.4
256	0.0	0.0	0.0	0.0	1.0	1.8	1.8	2.9	3.7	5.3	6.7	6.2	4.9	10.9	9.1	10.6	13.8	10.7	4.2	1.3	0.5
257	0.0	0.0	3.8	1.5	0.0	1.1	2.3	6.6	7.4	6.8	6.4	5.6	5.6	18.5	14.2	8.7	4.0	1.5	0.7	0.4	0.4
258	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.1	0.6	2.0	3.7	7.1	21.0	26.9	12.7	3.8
259	0.0	0.0	0.0	0.0	0.0	0.0	1.4	3.1	2.9	4.2	3.2	2.7	1.8	5.1	6.4	13.8	26.6	17.2	4.7	1.4	0.6
260	0.0	0.0	0.0	0.0	0.2	2.7	3.1	1.1	1.9	2.5	2.5	2.7	2.7	14.3	14.2	13.6	10.9	7.4	4.6	2.4	1.4
266	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.3	0.1	0.2	0.4	0.7	2.8	2.8	4.3	11.2	29.3	29.1	11.1	2.8
267	0.0	0.0	0.0	4.9	0.0	0.3	0.9	1.4	1.9	2.1	1.7	1.5	1.0	2.1	2.2	4.1	12.6	21.8	22.6	12.7	2.5
268	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.4	1.4	2.6	2.9	21.4	44.4	21.8	2.1
269	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	0.7	1.7	6.3	17.5	35.7	28.0	4.2
271	0.0	0.0	22.2	8.9	0.9	1.4	1.8	1.1	2.4	2.8	3.9	4.5	3.5	7.6	4.2	2.1	1.2	1.3	2.1	2.2	2.3
272	0.0	0.0	0.0	0.0	0.0	1.4	5.5	2.4	2.8	3.2	3.4	3.1	2.0	5.0	6.7	13.4	21.2	14.1	4.9	1.9	1.0
273	0.0	0.0	21.6	0.0	6.4	4.5	10.4	6.1	5.3	3.3	3.7	6.4	7.2	6.9	4.3	2.6	1.9	2.0	2.8	1.6	0.5
275	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.3	0.7	0.7	0.7	0.7	3.1	2.3	2.3	3.4	21.4	38.4	18.8	3.1
276	0.0	0.0	0.0	0.0	0.6	2.2	0.6	2.2	3.9	3.2	3.5	3.8	2.8	9.1	8.6	10.6	18.5	17.9	5.8	1.5	0.5
DDV7	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.8	1.6	2.5	2.9	3.0	2.2	6.4	8.2	24.5	33.1	13.4	0.9	0.5	0.0
DDV35	0.0	0.0	0.0	0.0	0.0	0.7	2.4	2.7	3.8	5.0	4.7	5.1	4.0	13.0	14.6	15.8	12.2	5.6	1.8	1.0	0.6
DDV37	0.0	0.0	0.0	0.7	3.7	5.4	4.6	2.1	2.3	1.9	1.9	1.9	1.7	8.2	8.8	10.2	11.4	9.6	5.2	1.7	0.7
DDV38	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	0.2	1.4	3.3	7.9
DDV39	0.0	0.0	0.0	0.0	0.3	4.0	1.6	1.6	1.4	1.6	1.7	2.0	2.7	15.2	17.4	14.2	6.4	3.4	3.3	2.5	1.7
DDV41	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	1.3	5.1	37.3	31.3	18.4	5.3	0.6	0.3	0.1	0.0
DDV43	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.1	5.0	6.6	20.3	43.1	22.7	1.4	0.6	0.0

Appendix 3.4 – Particle size analysis results (Part IV)

Station	Percentages of the distribution in each 'half-phi' size interval, expressed in µm (sieving for >1mm fraction, laser diffraction for <1mm fraction)																				
ID	44.19	31.25	22.097	15.625	11.049	7.813	5.524	3.906	2.762	1.953	1.381	0.977	0.691	0.488	0.345	0.244	0.173	0.122	0.086	0.061	0.043	0.01
	to 63	to 44.19	to 31.25	to 22.097	to 15.625	to 11.049	to 7.813	to 5.524	to 3.906	to 2.762	to 1.953	to 1.381	to 0.977	to 0.691	to 0.488	to 0.345	to 0.244	to 0.173	to 0.122	to 0.086	to 0.061	to 0.043
1	0.4	0.3	0.3	0.4	0.5	0.5	0.4	0.3	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0
2	0.5	0.3	0.3	0.3	0.4	0.4	0.4	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0
3	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0
4	0.5	0.5	0.5	0.5	0.6	0.5	0.5	0.4	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0
5	0.6	0.5	0.6	0.7	0.8	0.8	0.7	0.5	0.3	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0
6	0.3	0.2	0.2	0.3	0.4	0.4	0.3	0.3	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0
7	0.5	0.5	0.5	0.6	0.8	0.8	0.8	0.6	0.4	0.3	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0
8	0.6	0.5	0.5	0.5	0.7	0.7	0.7	0.5	0.3	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0
9	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0
10	0.4	0.3	0.3	0.3	0.3	0.3	0.3	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0
11	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0
12	0.4	0.5	0.5	0.6	0.7	0.8	0.7	0.6	0.4	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0
13	0.3	0.5	0.6	0.7	0.6	0.5	0.4	0.3	0.2	0.1	0.1	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0
14	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	0.0	0.0	0.0	0.0	0.0
15	0.2	0.2	0.2	0.2	0.3	0.3	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0
16	0.1	0.2	0.2	0.2	0.3	0.2	0.2	0.1	0.1	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
17	0.5	0.4	0.4	0.4	0.5	0.5	0.4	0.3	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0
18	0.4	0.3	0.3	0.4	0.5	0.5	0.4	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0
19	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0
20	0.3	0.4	0.4	0.4	0.5	0.5	0.5	0.4	0.3	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0
22	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0
23	0.5	0.5	0.4	0.5	0.6	0.7	0.6	0.5	0.3	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0
25	0.0	0.0	0.0	0.0	0.1	0.1	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
26	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0
27	0.2	0.2	0.2	0.3	0.4	0.4	0.4	0.3	0.2	0.2	0.1	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0
28	0.1	0.1	0.1	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	0.0	0.0
29	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	0.0	0.0	0.0	0.0	0.0
30	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0
31	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	0.0	0.0	0.0	0.0	0.0
32	0.8	0.6	0.6	0.6	0.8	0.9	0.8	0.7	0.4	0.3	0.3	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.0	0.0	0.0	0.0
33	0.5	0.2	0.3	0.3	0.3	0.4	0.4	0.3	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0
34	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0
35	0.2	0.2	0.1	0.1	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0
36	0.5	0.4	0.4	0.4	0.5	0.6	0.5	0.4	0.3	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0
37	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0
39	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	0.0	0.0	0.0	0.0	0.0
40	0.1	0.1	0.1	0.1	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	0.0
41	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0
42	0.1	0.1	0.1	0.1	0.1	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
43	0.5	0.5	0.5	0.6	0.8	0.8	0.8	0.6	0.4	0.3	0.3	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0
44	0.3	0.2	0.2	0.2	0.2	0.3	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0
45	0.4	0.6	0.7	0.8	0.9	0.8	0.7	0.6	0.4	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0
46	0.5	0.4	0.5	0.6	0.7	0.8	0.7	0.6	0.4	0.3	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0
47	0.4	0.6	0.5	0.6	0.8	0.9	0.9	0.7	0.5	0.3	0.3	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0
48	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0
49	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	0.0	0.0	0.0	0.0	0.0
50	0.4	0.3	0.3	0.3	0.4	0.4	0.4	0.4	0.3	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0
51	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0
52	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0
54	0.4	0.5	0.6	0.7	0.8	0.8	0.6	0.5	0.3	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0
56	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	0.0	0.0	0.0	0.0	0.0
58	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	0.0	0.0	0.0	0.0	0.0
59	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	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
60	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0

Station	Percentages of the distribution in each 'half-phi' size interval, expressed in µm (sieving for >1mm fraction, laser diffraction for <1mm fraction)																					
ID	44.19	31.25	22.097	15.625	11.049	7.813	5.524	3.906	2.762	1.953	1.381	0.977	0.691	0.488	0.345	0.244	0.173	0.122	0.086	0.061	0.043	0.01
	to 63	to 44.19	to 31.25	to 22.097	to 15.625	to 11.049	to 7.813	to 5.524	to 3.906	to 2.762	to 1.953	to 1.381	to 0.977	to 0.691	to 0.488	to 0.345	to 0.244	to 0.173	to 0.122	to 0.086	to 0.061	to 0.043
61	1.1	1.3	1.4	1.7	2.2	2.3	2.0	1.6	1.1	0.7	0.5	0.4	0.3	0.3	0.3	0.2	0.2	0.2	0.1	0.0	0.0	0.0
62	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0
63	0.4	0.4	0.4	0.4	0.5	0.5	0.5	0.4	0.3	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0
64	0.3	0.3	0.3	0.4	0.5	0.4	0.4	0.3	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0
65	0.4	0.4	0.4	0.4	0.5	0.5	0.4	0.4	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0
66	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0
67	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0
68	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	0.0	0.0	0.0	0.0	0.0
69	0.2	0.1	0.1	0.1	0.1	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0
70	0.4	0.4	0.4	0.5	0.6	0.6	0.5	0.4	0.3	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0
71	0.5	0.5	0.5	0.6	0.7	0.8	0.7	0.5	0.3	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0
72	0.3	0.3	0.3	0.3	0.4	0.4	0.4	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0
73	0.5	0.7	0.8	0.9	1.1	1.0	0.8	0.6	0.4	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0
74	0.3	0.3	0.3	0.3	0.4	0.4	0.4	0.3	0.2	0.2	0.1	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0
75	0.3	0.4	0.3	0.4	0.5	0.6	0.6	0.5	0.4	0.3	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0
76	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0
77	0.4	0.4	0.4	0.4	0.5	0.5	0.5	0.3	0.2	0.2	0.1	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0
78	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	0.0	0.0	0.0	0.0	0.0
79	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	0.0	0.0	0.0	0.0	0.0
80	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0
81	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0
82	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	0.0	0.0	0.0	0.0	0.0
84	0.0	0.0	0.0	0.1	0.1	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
85	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	0.0	0.0	0.0	0.0	0.0
86	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
96	0.0	0.0	0.0	0.0	0.1	0.1	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
99	0.1	0.1	0.1	0.1	0.1	0.1	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
100	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	0.0	0.0	0.0	0.0	0.0
103	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	0.0	0.0	0.0	0.0	0.0
111	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	0.0	0.0	0.0	0.0	0.0
115	0.0	0.0	0.1	0.1	0.1	0.1	0.1	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
116	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	0.0	0.0	0.0	0.0	0.0
121	0.0	0.0	0.1	0.1	0.1	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
122	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	0.0	0.0	0.0	0.0	0.0
124	0.2	0.3	0.3	0.3	0.5	0.5	0.4	0.3	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0
125	0.1	0.1	0.1	0.1	0.1	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
127	1.6	2.2	3.1	3.9	4.7	4.5	4.2	3.7	2.9	2.4	2.1	1.9	1.7	1.7	1.8	1.6	1.1	0.7	0.4	0.1	0.0	0.0
128	0.3	0.3	0.3	0.4	0.5	0.5	0.5	0.4	0.3	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0
129	1.3	1.0	1.2	1.3	1.6	1.7	1.8	1.8	1.4	1.0	0.8	0.6	0.5	0.5	0.5	0.4	0.4	0.3	0.2	0.1	0.0	0.0
130	0.6	0.4	0.4	0.5	0.7	0.8	0.8	0.7	0.5	0.4	0.3	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.0	0.0	0.0
133	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	0.0	0.0	0.0	0.0	0.0
137	0.9	0.9	0.9	1.0	1.4	1.6	1.6	1.3	1.0	0.6	0.4	0.3	0.3	0.3	0.3	0.2	0.2	0.1	0.1	0.0	0.0	0.0
138	0.3	0.2	0.3	0.3	0.4	0.4	0.3	0.3	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
140	0.1	0.2	0.2	0.3	0.4	0.3	0.3	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
143	1.6	1.6	1.4	1.4	1.9	2.1	2.2	2.2	1.8	1.3	1.0	0.8	0.6	0.6	0.5	0.5	0.4	0.3	0.2	0.1	0.0	0.0
147	0.1	0.1	0.1	0.1	0.2	0.1	0.1	0.1	0.1	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
148	0.1	3.2	5.8	7.5	10.5	10.8	10.0	8.6	6.7	5.3	4.5	4.1	4.0	4.2	4.2	3.8	2.9	2.0	1.2	0.4	0.1	0.0
152	0.2	0.2	0.2	0.3	0.5	0.5	0.4	0.3	0.2	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
153	0.1	0.1	0.1	0.1	0.2	0.1	0.1	0.1	0.1	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
154	0.2	0.2	0.3	0.3	0.4	0.4	0.4	0.3	0.2	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
156	0.4	0.3	0.3	0.3	0.6	0.6	0.6	0.5	0.3	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0
157	0.9	1.0	0.9	0.9	1.4	1.6	1.6	1.4	1.1	0.7	0.5	0.4	0.4	0.3	0.3	0.3	0.2	0.2	0.1	0.0	0.0	0.0
158	0.4	0.3	0.4	0.4	0.6	0.6	0.6	0.5	0.3	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0
159	0.6	0.5	0.5	0.5	0.7	0.9	0.8	0.7	0.6	0.4	0.3	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0
161	0.7	0.7	0.7	0.8	1.2	1.3	1.3	1.1	0.8	0.5	0.4	0.3	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.0	0.0	0.0
162	0.5	0.5	0.5	0.6	0.8	0.7	0.7	0.5	0.3	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0

Station	Percentages of the distribution in each 'half-phi' size interval, expressed in µm (sieving for >1mm fraction, laser diffraction for <1mm fraction)																				
ID	44.19	31.25	22.097	15.625	11.049	7.813	5.524	3.906	2.762	1.953	1.381	0.977	0.691	0.488	0.345	0.244	0.173	0.122	0.086	0.061	0.043	0.01
	to 63	to 44.19	to 31.25	to 22.097	to 15.625	to 11.049	to 7.813	to 5.524	to 3.906	to 2.762	to 1.953	to 1.381	to 0.977	to 0.691	to 0.488	to 0.345	to 0.244	to 0.173	to 0.122	to 0.086	to 0.061	to 0.043
163	2.6	2.2	2.0	2.1	2.5	2.7	2.7	2.3	1.8	1.3	0.9	0.7	0.5	0.5	0.5	0.4	0.4	0.3	0.2	0.1	0.0	0.0
164	8.1	7.9	6.9	6.9	7.9	8.1	7.4	6.1	4.4	2.9	1.9	1.4	1.3	1.2	1.2	1.1	0.9	0.7	0.4	0.2	0.0	0.0
165	4.2	6.3	6.9	8.1	10.5	11.2	10.4	8.5	6.0	4.0	2.7	2.1	1.9	2.0	2.0	1.9	1.5	1.0	0.6	0.2	0.0	0.0
166	3.1	5.2	6.2	8.0	10.9	11.9	11.4	9.6	6.9	4.6	3.2	2.5	2.2	2.2	2.3	2.1	1.6	1.1	0.7	0.3	0.0	0.0
167	6.4	7.5	7.2	7.9	9.7	9.9	8.9	7.1	5.0	3.2	2.2	1.7	1.5	1.5	1.5	1.4	1.1	0.8	0.5	0.2	0.0	0.0
168	1.4	3.5	5.2	7.1	10.8	12.4	12.2	10.4	7.7	5.2	3.7	2.9	2.7	2.9	2.9	2.7	2.1	1.6	0.9	0.4	0.0	0.0
169	3.1	6.0	6.8	6.1	7.9	8.6	8.5	7.6	5.8	4.1	3.1	2.5	2.2	2.2	2.2	2.1	1.6	1.2	0.7	0.3	0.0	0.0
170	5.2	8.9	9.2	8.3	9.4	9.9	9.5	8.2	6.2	4.3	3.1	2.5	2.3	2.4	2.4	2.2	1.8	1.4	0.9	0.4	0.0	0.0
171	6.7	10.6	8.9	7.9	8.8	9.1	8.6	7.3	5.5	3.9	3.0	2.5	2.3	2.2	2.2	2.0	1.6	1.2	0.8	0.3	0.0	0.0
172	5.2	5.9	5.2	4.8	5.9	6.4	6.7	6.3	5.0	3.6	2.7	2.1	1.8	1.8	1.9	1.8	1.4	1.0	0.6	0.2	0.0	0.0
173	9.4	10.3	7.7	7.1	8.3	8.7	8.2	7.0	5.2	3.6	2.7	2.1	2.0	1.9	1.9	1.8	1.4	1.1	0.7	0.3	0.0	0.0
174	10.8	9.5	7.2	5.9	6.2	6.3	6.5	6.2	5.1	3.9	3.1	2.5	2.2	2.2	2.3	2.1	1.7	1.2	0.7	0.3	0.0	0.0
175	11.4	8.0	5.5	4.8	5.3	5.5	5.5	5.1	4.0	2.9	2.3	1.8	1.6	1.5	1.5	1.4	1.1	0.8	0.5	0.2	0.0	0.0
176	11.8	7.5	5.2	4.0	4.0	4.0	4.2	4.1	3.4	2.7	2.2	1.8	1.5	1.4	1.4	1.3	1.1	0.8	0.5	0.2	0.0	0.0
177	12.8	9.4	6.1	4.8	4.9	4.9	5.1	4.9	4.1	3.2	2.6	2.1	1.8	1.8	1.7	1.6	1.3	1.0	0.6	0.2	0.0	0.0
178	9.2	8.8	7.3	6.3	6.8	6.9	7.0	6.6	5.3	4.0	3.1	2.5	2.2	2.2	2.3	2.2	1.7	1.3	0.8	0.3	0.0	0.0
179	2.1	4.6	6.2	8.8	12.3	13.1	11.9	9.4	6.5	4.2	2.8	2.2	2.0	2.1	2.1	2.0	1.5	1.1	0.7	0.3	0.0	0.0
180	12.2	11.6	8.1	6.4	6.5	6.4	6.3	5.8	4.7	3.6	2.8	2.3	2.1	2.1	2.1	1.9	1.5	1.1	0.7	0.3	0.0	0.0
181	8.0	9.6	9.1	7.0	7.6	7.8	7.8	7.1	5.5	4.1	3.2	2.6	2.2	2.3	2.5	2.4	1.9	1.3	0.8	0.3	0.0	0.0
182	0.6	7.3	7.9	7.2	9.7	10.3	10.3	9.2	7.2	5.4	4.1	3.3	2.9	3.1	3.3	3.0	2.3	1.6	0.9	0.3	0.0	0.0
183	1.6	4.4	4.5	7.0	10.6	11.9	11.7	10.1	7.6	5.3	3.9	3.1	2.9	3.0	3.1	2.9	2.2	1.6	0.9	0.4	0.0	0.0
184	4.1	6.2	7.0	8.5	10.8	11.5	10.8	8.9	6.4	4.2	2.9	2.2	2.0	2.0	2.0	1.9	1.5	1.1	0.7	0.3	0.0	0.0
185	5.0	6.6	6.6	6.9	9.9	10.5	9.7	8.3	6.3	4.5	3.3	2.5	2.1	2.1	2.1	2.0	1.5	1.1	0.6	0.2	0.0	0.0
186	9.2	5.5	3.9	3.6	4.1	4.2	4.2	3.7	2.8	2.0	1.5	1.1	1.0	0.9	0.8	0.8	0.6	0.5	0.3	0.1	0.0	0.0
187	5.5	6.9	6.9	7.5	9.3	9.8	9.3	7.9	5.8	3.9	2.7	2.1	1.9	1.9	2.0	1.9	1.4	1.0	0.6	0.2	0.0	0.0
188	1.2	3.7	6.3	6.9	10.3	11.7	11.5	10.0	7.5	5.3	4.0	3.2	2.9	2.9	2.9	2.6	2.1	1.5	0.9	0.4	0.0	0.0
189	1.8	3.5	5.7	7.4	10.9	12.3	12.0	10.3	7.6	5.3	3.8	2.9	2.5	2.8	3.0	2.8	2.1	1.4	0.8	0.3	0.0	0.0
190	1.8	2.7	6.3	8.2	11.2	12.5	12.1	10.3	7.5	5.0	3.5	2.7	2.5	2.6	2.8	2.6	2.0	1.4	0.8	0.3	0.0	0.0
191	11.7	12.3	8.5	6.5	6.3	6.1	6.1	5.6	4.6	3.5	2.8	2.3	2.0	1.9	1.9	1.8	1.5	1.1	0.7	0.3	0.0	0.0
192	11.0	10.9	7.4	6.2	6.7	6.9	6.9	6.4	5.0	3.8	3.0	2.5	2.2	2.2	2.2	2.0	1.6	1.2	0.7	0.3	0.0	0.0
193	2.9	7.2	8.1	8.3	10.3	10.9	10.5	8.9	6.6	4.5	3.2	2.5	2.3	2.4	2.5	2.3	1.8	1.3	0.8	0.3	0.0	0.0
194	2.2	4.9	6.3	8.2	11.4	12.4	11.7	9.7	7.0	4.6	3.2	2.5	2.3	2.3	2.4	2.2	1.7	1.2	0.7	0.3	0.0	0.0
195	6.7	9.5	8.5	7.9	8.9	8.9	8.6	7.6	5.8	4.3	3.3	2.6	2.3	2.3	2.3	2.2	1.7	1.2	0.7	0.3	0.0	0.0
196	5.0	6.2	5.7	5.2	5.9	5.8	6.0	5.8	4.6	3.6	2.9	2.3	2.0	2.0	2.2	2.0	1.5	1.0	0.6	0.2	0.0	0.0
197	11.2	9.4	6.9	5.5	6.0	6.2	6.4	6.0	4.8	3.6	2.9	2.3	2.0	2.0	2.0	1.9	1.5	1.1	0.7	0.3	0.0	0.0
198	2.8	4.3	5.6	7.4	9.8	10.8	10.6	9.4	7.1	5.1	3.9	3.2	2.9	3.0	3.0	2.7	2.1	1.6	0.9	0.4	0.0	0.0
199	10.2	8.9	7.0	6.2	6.8	7.1	7.1	6.5	5.1	3.7	2.7	2.2	1.9	1.9	2.0	1.9	1.5	1.1	0.7	0.3	0.0	0.0
200	3.5	6.4	7.0	8.0	10.4	11.1	10.6	9.0	6.5	4.4	3.1	2.4	2.2	2.3	2.4	2.2	1.7	1.2	0.7	0.3	0.0	0.0
201	9.6	6.7	4.9	4.4	5.0	5.2	5.0	4.3	3.3	2.3	1.6	1.2	1.0	0.9	0.9	0.9	0.7	0.5	0.3	0.1	0.0	0.0
202	2.3	2.3	2.2	2.0	2.3	2.4	2.5	2.5	2.0	1.5	1.2	0.9	0.8	0.8	0.8	0.7	0.6	0.4	0.2	0.1	0.0	0.0
203	11.3	6.2	3.7	3.0	3.1	3.2	3.4	3.2	2.6	1.9	1.5	1.3	1.1	0.9	0.9	0.8	0.7	0.5	0.3	0.1	0.0	0.0
204	4.4	2.6	1.9	2.0	2.4	2.8	2.9	2.7	2.2	1.6	1.2	1.0	0.8	0.8	0.7	0.6	0.5	0.4	0.3	0.1	0.0	0.0
205	4.3	2.6	1.9	1.8	2.1	2.3	2.6	2.6	2.2	1.7	1.3	1.0	0.9	0.7	0.7	0.6	0.5	0.4	0.2	0.1	0.0	0.0
206	8.5	4.2	2.7	2.4	2.5	2.8	3.0	2.9	2.5	2.0	1.6	1.4	1.2	1.1	1.0	0.9	0.7	0.6	0.4	0.1	0.0	0.0
207	6.7	3.6	2.2	1.9	2.1	2.4	2.5	2.4	2.0	1.5	1.2	1.0	0.9	0.8	0.7	0.6	0.5	0.4	0.2	0.1	0.0	0.0
208	11.4	6.8	4.9	3.7	3.6	3.7	4.0	3.9	3.3	2.5	2.0	1.7	1.4	1.4	1.3	1.2	1.0	0.8	0.5	0.2	0.0	0.0
209	6.8	3.4	1.9	1.6	1.8	2.0	2.1	2.0	1.7	1.4	1.1	0.9	0.7	0.7	0.6	0.5	0.4	0.3	0.2	0.1	0.0	0.0
210	9.8	6.3	4.0	3.4	3.7	3.9	4.1	4.0	3.3	2.5	2.0	1.6	1.4	1.3	1.2	1.1	0.9	0.7	0.5	0.2	0.0	0.0
211	6.0	4.7	3.8	3.8	4.4	4.3	3.9	3.2	2.3	1.6	1.1	0.8	0.7	0.6	0.6	0.5	0.4	0.3	0.2	0.1	0.0	0.0
213	0.4	0.4	0.4	0.5	0.7	0.7	0.7	0.6	0.4	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0
214	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	0.0	0.0	0.0	0.0	0.0
215	0.9	0.7	0.7	0.8	1.1	1.2	1.2	1.1	0.7	0.5	0.4	0.4	0.3	0.2	0.2	0.2	0.2	0.1	0.1	0.0	0.0	0.0
216	0.8	0.8	0.8	0.9	1.3	1.3	1.3	1.2	0.8	0.5	0.4	0.4	0.3	0.2	0.2	0.2	0.1	0.1	0.1	0.0	0.0	0.0
217	0.2	0.1	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0
218	0.7	0.6	0.7	0.8	1.1	1.2	1.2	1.0	0.7	0.5	0.4	0.3	0.3	0.2	0.2	0.2	0.1	0.1	0.1	0.0	0.0	0.0
219	0.5	0.6	0.6	0.7	0.9	0.9	0.8	0.7	0.4	0.3	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.0	0.0	0.0	0.0

Station	Percentages of the distribution in each 'half-phi' size interval, expressed in µm (sieving for >1mm fraction, laser diffraction for <1mm fraction)																				
ID	44.19	31.25	22.097	15.625	11.049	7.813	5.524	3.906	2.762	1.953	1.381	0.977	0.691	0.488	0.345	0.244	0.173	0.122	0.086	0.061	0.043	0.01
	to 63	to 44.19	to 31.25	to 22.097	to 15.625	to 11.049	to 7.813	to 5.524	to 3.906	to 2.762	to 1.953	to 1.381	to 0.977	to 0.691	to 0.488	to 0.345	to 0.244	to 0.173	to 0.122	to 0.086	to 0.061	to 0.043
220	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0
221	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0
232	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	0.0	0.0	0.0	0.0	0.0
233	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	0.0	0.0	0.0	0.0	0.0
236	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	0.0	0.0	0.0	0.0	0.0
237	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0
239	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
240	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	0.0	0.0	0.0	0.0	0.0
241	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	0.0	0.0	0.0	0.0	0.0
247	0.2	0.2	0.2	0.3	0.5	0.5	0.4	0.3	0.2	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
248	2.2	2.5	2.6	2.9	3.7	4.0	4.3	4.2	3.3	2.7	2.5	2.2	1.9	2.0	2.1	2.0	1.4	0.9	0.5	0.2	0.0	0.0
249	0.7	0.6	0.5	0.5	0.7	0.7	0.8	0.7	0.5	0.3	0.3	0.3	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0
250	1.6	1.3	1.4	1.4	1.9	2.1	2.3	2.1	1.6	1.1	0.8	0.6	0.5	0.5	0.5	0.4	0.3	0.2	0.2	0.1	0.0	0.0
251	0.3	0.3	0.3	0.4	0.5	0.5	0.5	0.4	0.3	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0
252	1.4	1.2	1.0	1.0	1.2	1.3	1.4	1.3	1.1	0.9	0.7	0.6	0.5	0.5	0.4	0.3	0.3	0.2	0.1	0.1	0.0	0.0
253	0.6	0.6	0.6	0.7	1.0	1.1	1.0	0.9	0.6	0.4	0.3	0.3	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0
254	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0
256	0.3	0.3	0.3	0.4	0.6	0.6	0.6	0.5	0.3	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0
257	0.2	0.3	0.3	0.4	0.6	0.6	0.5	0.4	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0
258	2.2	1.6	1.4	1.6	2.1	2.4	2.4	2.1	1.6	1.1	0.8	0.6	0.5	0.5	0.4	0.4	0.3	0.2	0.2	0.1	0.0	0.0
259	0.3	0.5	0.4	0.4	0.5	0.6	0.5	0.4	0.3	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0
260	0.9	0.7	0.7	0.8	1.1	1.3	1.3	1.1	0.9	0.6	0.4	0.3	0.3	0.3	0.2	0.2	0.2	0.1	0.1	0.0	0.0	0.0
266	0.9	0.5	0.4	0.4	0.4	0.4	0.3	0.2	0.2	0.1	0.1	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0
267	0.5	0.3	0.2	0.3	0.3	0.3	0.3	0.2	0.2	0.1	0.1	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0
268	0.6	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0
269	0.9	0.6	0.6	0.6	0.6	0.5	0.4	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0
271	2.1	1.8	1.8	1.8	2.1	2.1	2.1	1.9	1.5	1.2	1.0	0.9	0.8	0.7	0.6	0.5	0.4	0.3	0.2	0.1	0.0	0.0
272	0.6	0.5	0.5	0.6	0.9	1.0	1.0	0.8	0.5	0.3	0.3	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0
273	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.2	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
275	0.6	0.3	0.3	0.3	0.3	0.3	0.3	0.2	0.1	0.1	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0
276	0.3	0.4	0.3	0.4	0.5	0.5	0.5	0.4	0.3	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0
DDV7	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	0.0	0.0	0.0	0.0	0.0
DDV35	0.4	0.5	0.4	0.6	0.8	0.9	0.8	0.6	0.5	0.3	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0
DDV37	0.6	0.9	0.9	1.1	1.9	1.9	1.9	1.8	1.5	1.2	0.9	0.7	0.5	0.5	0.5	0.5	0.4	0.3	0.2	0.1	0.0	0.0
DDV38	11.7	10.4	7.5	6.5	7.2	7.5	7.3	6.4	4.8	3.4	2.5	2.0	1.8	1.7	1.7	1.6	1.3	1.0	0.6	0.2	0.0	0.0
DDV39	1.4	1.2	1.2	1.2	1.7	1.8	2.0	1.9	1.5	1.1	0.8	0.7	0.5	0.5	0.5	0.4	0.4	0.3	0.2	0.1	0.0	0.0
DDV41	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	0.0	0.0	0.0	0.0	0.0
DDV43	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	0.0	0.0	0.0	0.0	0.0

Appendix 4

Macrofaunal species x abundance data (Counts and Presence / Absence)

(including macrofaunal QA report)

AphiaID	MCS Code	Taxa ID	St_001	St_002	St_003	St_004	St_005	St_006	St_007	St_008	St_009	St_010	St_011	St_012	St_013	St_014	St_015	St_016	St_017	St_018	St_019	St_020	St_022	St_023	St_025	St_026	St_027
		Qualitative taxa																									
7	A5000	***Chromista***																									
111958	A5020	***Astrorhizidae***																									
11	A5025	***Ciliophora***																									
1692	A5050	***Folliculinidae***	P	P							P				P	P		P		P	P		P				P
2	C0000	***Animalia***	P	P						P	P	P			P	P					P		P				
558	C0001	***Porifera***																									
131729	C0010	***Clathrina***																									
131715	C0053	***Leucosolenia***																									
131723	C0133	***Sycon***																									
132037	C0455	***Stelligera***																									
132026	C0475	***Cliona***																									
131888	C1315	***Raspailia***																									
132575	C626	***Ciocalypta penicillus***																									
1603	D0158	***Tubulariidae***					P											P									
1599	D0171	***Corynidae***																							P		
16352	D0216	***Filifera***																									
117093	D0218	***Eudendrium***																									
117185	D0241	***Neoturris***																									
1594	D0246	***Bougainvilliidae***	P																								
117434	D0287	***Merona cornucopiae***																P									
117970	D0306	***Modeeria rotunda***								P																	
117736	D0335	***Lovenella clausa***		P					P					P	P					P	P						
117804	D0343	***Phialella quadrata***																									
117402	D0348	***Calycella syringa***																									
117702	D0386	***Lafoea dumosa***																									
117103	D0390	***Halecium***													P												
117870	D0409	***Abietinaria abietina***																									
117871	D0410	***Abietinaria filicula***																									
117228	D0413	***Diphasia***											P														
117890	D0424	***Hydrallmania falcata***																					P	P			
117233	D0427	***Sertularella***																									
117234	D0433	***Sertularia***																									
117930	D0440	***Tamarisca tamarisca***																									
1341823	D0445	***Amphisbetia distans***																									
117631	D0452	***Halopteris catharina***																									
117195	D0462	***Nemertesia***																									
117824	D0469	***Plumularia setacea***																									
117197	D0470	***Polyplumaria***																									
117827	D0471	***Polyplumaria flabellata***																									
117274	D0477	***Aglaophenia acacia***																									
117285	D0483	***Aglaophenia tubulifera***																									
117302	D0486	***Lytocarpia myriophyllum***																									
1606	D0491	***Campanulariidae***					P																P				
117367	D0502	***Clytia gracilis***																									
117368	D0503	***Clytia hemisphaerica***																									
291834	D0593	***Rolandia coralloides***																									
125333	D0597	***Alcyonium digitatum***																									
111799	K0015	***Loxosomella***																									
111834	K0030	***Loxosomella murmanica***																P									
111796	K0045	***Pedicellina***																									
111795	K0050	***Barentsia***																									
131038	P1361	***Salmacina dysteri***																									
989	P1362	***Spirorbinae***				P																					
1130	S1276	***Decapoda***																									
101	W0088	***Gastropoda***																									
246140	W0743	***Tritia***																									
1762	W1243	***Nudibranchia***																									
111706	Y0008	***Crisidia cornuta***	P	P	P		P	P		P		P	P		P		P	P			P	P	P	P	P	P	P
111032	Y0013	***Crisia***		P				P					P			P						P	P		P	P	
111748	Y0022	***Stomatoporina incurvata***																									
111054	Y0027	***Tubulipora***																									
471893	Y0039	***Microeciella suborbicularis***																									
111739	Y0041	***Plagioecia patina***																									
111721	Y0042	***Plagioecia sarniensis***																									
111683	Y0054	***Entalophoroecia deflexa***																									
146845	Y0064	***Patinella verrucaria***																									
111730	Y0066	***Disporella hispida***																							P		
111594	Y0074	***Alcyonidium albidum***																									
111597	Y0076	***Alcyonidium diaphanum***																							P		
111602	Y0079	***Alcyonidium mamillatum***																									
468026	Y0080	***Alcyonidioides mytili***																									
111604	Y0081	***Alcyonidium parasiticum***																									
111011	Y0091	***Nolella***																									
111631	Y0096	***Anguinella palmata***																									
110797	Y0126	***Penetrantiidae***																									
111669	Y0131	***Vesicularia spinosa***									P												P				
111659	Y0135	***Amathia lendigera***														P											
110839	Y0153	***Aetea***																									
110976	Y0160	***Scruparia***																									
111361	Y0165	***Eucratea loricata***																P								P	
111355	Y0178	***Electra pilosa***											P					P							P		
111358	Y0180	***Pyripora catenularia***																									
111367	Y0187	***Flustra foliacea***	P														P			P							
111374	Y0194	***Securiflustra securifrons***																							P	P	
111369	Y0196	***Hincksina flustroides***																									
111396	Y0204	***Cellopora dumerilii***																									
111397	Y0205	***Cellopora lineata***																									
111184	Y0208	***Alderina imbellis***																									
111186	Y0222	***Amphiblestrum auritum***																									
111187	Y0223	***Amphiblestrum flemingii***																									
110731	Y0239	***Bugulidae***																									
833990	Y0241	***Bugulina avicularia***											P					P								P	
834002	Y0243	***Bugulina flabellata***																							P		

Islay Macrofaunal External Quality Assurance Report

Report produced for Briggs Marine
by Eco Marine Consultants Ltd

October 2022

Appendix 5

Macrofaunal major group biomass

Group	St_001	St_002	St_003	St_004	St_005	St_006	St_007	St_008	St_009	St_010	St_011	St_012	St_013	St_014	St_015	St_016	St_017	St_018	St_019	St_020	St_022	St_023	St_025	St_026	St_027	St_028	St_029	St_030	St_031	St_032	St_033
Annelida	0.1003	0.1377	0.266	0.2924	0.5998	0.717	0.6313	0.1529	0.0652	0.2069	0.1801	0.7068	0.1581	0.1325	0.8896	1.7423	0.3936	0.1961	0.1742	0.1528	0.0128	0.3667	0.2331	0.1121	0.2729	0.021	0.1226	0.417	0.1729	0.5082	0.0672
Crustacea	0.0125	0.0172	0.0106	0.0154	0.052	0.0206	0.0502	0.0067	0.0129	0.0068	0.0011	0.0234	0.0034	0.0039	0.0365	0.0494	0.0194	0.1106	0.0136	0.012	0.0448	0.0137	0.2215	0.0041	0.0021		0.0039	0.016	0.0082	0.0307	0.0111
Mollusca	0.9717	0.3807	0.0392	231.0631	0.4221	0.214	3.0146	1.5854	0.2823	120.3145	0.6449	246.3969	0.4885	0.1326	0.0028	0.1218	4.5473	140.3624	0.1604	174.13	0.0294	0.4336	15.5729	0.0476	172.5356	0.0131	0.0421	0.0523	0.622	0.3612	65.322
Echinodermata	0.2262	0.5923	0.054	0.2754	0.0391	0.1982	1.2881	0.7864	1.7962	0.255	0.0269	2.9962	0.0192	0.0308	0.0324	0.0835	0.0213	0.186	0.0587	6.125		0.3106	0.0209	3.972				0.1366	0.0006	0.2105	0.1571
Others	0.0029	0.0061	0.0004	0.2166	0.007	0.0517	0.0556	0.0027		0.0047	0.3928	0.0606	0.0066	1.1473	0.0045	3.6147	0.0721	0.0131		0.007	2.0896	0.012	0.0091	0.0001	0.2439	0.0001	0.2771	0.0296	0.0019	0.0044	0.0034
Total Biomass	**1.3136**	**1.134**	**0.3702**	**231.8629**	**1.12**	**1.2015**	**5.0398**	**2.5341**	**2.1566**	**120.7879**	**1.2458**	**249.9839**	**0.6358**	**1.4471**	**0.9658**	**5.6117**	**5.0537**	**140.8682**	**0.4069**	**180.4268**	**2.1766**	**1.1366**	**16.0575**	**4.1359**	**173.0545**	**0.0342**	**0.4457**	**0.6515**	**0.8056**	**1.115**	**65.5608**

Group	St_034	St_035	St_036	St_037	St_039	St_040	St_041	St_042	St_043	St_044	St_045	St_046	St_047	St_048	St_049	St_050	St_051	St_052	St_054	St_056	St_058	St_059	St_060	St_061	St_062	St_063	St_064	St_065	St_066	St_067	St_068
Annelida	0.2872	0.0317	0.5662	0.1123	0.0872	0.1087	0.1457	0.1868	0.1265	0.1322	1.6309	0.2284	0.4778	0.2263	0.234	0.0586	0.0639	0.0797	0.4118	0.1336	0.1115	0.0989	0.115	0.6382	0.1642	0.8147	0.0623	0.5254	0.5516	0.0982	0.212
Crustacea	0.0048	0.072	0.0201	0.0169	0.0472		0.0077	0.0024	0.0079	0.0035	0.1269	0.0044	0.1125	0.0064	0.0001	0.004	0.01	0.0321	0.05	0.0017		0.1927		0.0047	0.0176	0.0183	0.0025	0.0035	0.0001	0.0039	0.0035
Mollusca		0.3939	1.0068	1.6336	0.0118	0.1224	0.3353	9.3999	0.1615	134	0.8016	0.0262	117.1127	0.2218	0.1268	4.9767	0.2427	0.0984	0.168	0.6216	0.033	3.6399	0.221	44.3768	0.1665	0.7548	1.1178	0.8367	0.2595	1.1533	0.6806
Echinodermata	54.0936	0.0074	0.0889		0.0909	0.0001		0.0214		13.3463	18.948	0.9272	1.1735	0.089	0.7402	0.634	0.0045	12.7646	0.012	0.0195		0.0213	4.732	0.1392	0.0037	1.2077	0.4181	0.9581		0.0444	0.4413
Others	0.0185	0.0649	0.1929		0.0069	0.0001		0.0042	0.4949		0.0193	0.0736	0.0304		12.4389	0.0068			0.0001	1.5124	14.4489	0.1023		0.2569	0.0092	0.1529		0.0642	0.0171		0.0011
Total Biomass	**54.4041**	**0.5679**	**2.4749**	**1.7628**	**0.244**	**0.2313**	**0.4887**	**9.6147**	**0.7908**	**147.282**	**21.5267**	**1.2578**	**118.9069**	**0.5435**	**13.54**	**5.6801**	**0.3211**	**12.9748**	**0.6419**	**2.2888**	**14.5934**	**4.0551**	**5.068**	**45.3958**	**0.4612**	**2.9484**	**1.6007**	**2.3879**	**0.8283**	**1.2998**	**1.3385**

Group	St_069	St_070	St_071	St_072	St_073	St_074	St_075	St_076	St_077	St_078	St_079	St_080	St_081	St_082	St_084	St_085	St_086	St_096	St_099	St_100	St_103	St_111	St_115	St_116	St_121	St_122	St_124	St_125	St_127	St_128	St_129
Annelida	0.2497	0.0836	0.6172	0.277	0.593	0.0714	0.148	0.165	0.1932	0.1682	0.1736	0.0798	0.2131	0.2937	1.0235	0.2607	0.0326	0.142	0.0424		0.0624	1.2617	0.6196	0.0736	0.1175	0.1068	1.0158	0.0224	0.3336	0.1922	0.4722
Crustacea	0.0218	0.0147	0.0104	0.006	0.0389	0.0082	0.005	0.0198	0.2806	0.0068	0.0044	0.0219	0.0049	0.1066	0.0863	0.0975		0.0883	0.0286		0.0022		0.3548	0.0141	0.006	0.0032	0.0809	0.0039	0.0002	0.6376	0.0973
Mollusca	0.0341	0.4008	0.6929	0.4484	0.5096	0.1972	0.9706	0.0592	0.8071	0.0009	0.1917	0.433	8.1015	0.4365	0.6182	0.778	0.0333	1.5865	2.72		0.0015	0.006	0.3039	0.0227	0.3183	0.149	40.2155		0.1402	5.7556	1.3287
Echinodermata	1.1451	0.0184	0.0742	0.0025	0.2835	0.1671	0.004		0.6471	0.0138	27.4885	0.4835	0.064	0.0066	0.0114	0.0404		0.0025					0.0213	0.0001	0.0229		0.8087			0.0262	0.2572
Others	0.0074	0.0057	0.011	0.246	0.0327	0.0059	0.0002	1.1153	0.0046	1.3963		9.556	0.0147	0.0001	0.0153	0.2336	9.9743	0.0201	1.1899			0.0063	0.0019		0.1197	0.0149	0.1036		0.8231	0.0827	0.0244
Total Biomass	**1.4581**	**0.5232**	**1.4057**	**0.9799**	**1.4577**	**0.4498**	**1.1278**	**1.3593**	**1.9326**	**3.586**	**27.8582**	**10.5742**	**8.3982**	**0.8435**	**1.7547**	**1.4102**	**10.0402**	**1.8394**	**3.9809**	**0**	**0.0661**	**1.274**	**1.3015**	**0.1105**	**0.5844**	**0.2739**	**42.2245**	**0.0263**	**1.2971**	**6.6943**	**2.1798**

Group	St_130	St_133	St_137	St_138	St_140	St_143	St_147	St_148	St_152	St_153	St_154	St_156	St_157	St_158	St_159	St_161	St_162	St_163	St_164	St_165	St_166	St_167	St_168	St_169	St_170	St_171	St_172	St_173	St_174	St_175	St_176
Annelida	0.1541	0.122	1.0105	5.3108	1.1845	0.2516	0.2306	0.2604	0.2509	0.161	0.3508	0.2821	0.5011	0.7282	0.7039	0.5678	0.157	0.6542	2.4772	1.1117	0.0339	0.0255	0.0537	1.3085	4.3423	0.0149	0.96	0.002	0.113	1.7796	0.299
Crustacea	0.085	0.006	1.092	8.1717	0.0148	0.0142	0.0239	0.0107	0.9486	0.0453	0.0242	0.0005	0.4552	0.0056	0.5731	0.6987	0.0047	0.0008	0.2832												
Mollusca	0.551	0.1999	26.9096	38.2114	2.0885	1.2708	0.9826	0.3897	2.9736	0.1261	1.1485	6.627	3.3978	12.9286	1.2333	5.2215	2.4651	1.2105	0.0008		0.0174	0.0834		0.0036			0.1917			0.0019	
Echinodermata	25.2643	0.0476	0.4843	0.1235	0.0416	0.9619	0.007	0.0803	0.4944	2.7292	0.0217	0.1185	0.2017	12.0796	0.4391	12.3931	17.719	13.345	0.1713					0.128			0.2631			0.0001	
Others	0.4589	0.0152	0.1144	0.0791	0.0331	0.0622	0.015	0.1234	0.6044	0.0133	0.0272	0.0024	0.0322	1.6225	0.05	0.0502	0.0235	0.0045												0.005	
Total Biomass	**26.5133**	**0.3907**	**29.6108**	**51.8965**	**3.3625**	**2.5607**	**1.2591**	**0.8645**	**5.2719**	**3.0749**	**1.5724**	**7.0305**	**4.588**	**27.3645**	**2.9994**	**18.9313**	**20.3693**	**15.215**	**2.9325**	**1.1117**	**0.0493**	**0.1089**	**0.0537**	**1.4401**	**4.3423**	**0.0149**	**1.4148**	**0.002**	**0.113**	**1.7866**	**0.299**

Group	St_177	St_178	St_179	St_180	St_181	St_182	St_183	St_184	St_185	St_186	St_187	St_188	St_189	St_190	St_191	St_192	St_193	St_194	St_195	St_196	St_197	St_198	St_199	St_200	St_201	St_202	St_203	St_204	St_205	St_206	St_207
Annelida	0.0013	0.0495		0.1631	0.0399	0.263			0.402	1.0108	0.0084		0.0096	0.0001	0.0001			0.0214	1.9678	3.8561		0.1593	0.1103	1.232	1.1986	2.5498	0.9197	1.2331	1.422	1.6012	1.3233
Crustacea		0.0025						0.0018									0.3701			0.0007						0.6035		0.003	0.0159	0.0042	0.0874
Mollusca	0.0073									7.5754								0.0585		0.1783					3.6415	2.9585	0.1185	8.887	8.4186	25.1668	15.5081
Echinodermata										0.5224		0.2001	0.1							0.004				0.0009	49.6806	0.3356		11.4301	12.6515	0.0543	5.1159
Others										0.2411															0.0068	0.254	0.0008	0.2659	0.0213	0.2141	0.1039
Total Biomass	**0.0086**	**0.052**	**0**	**0.1631**	**0.0399**	**0.263**	**0**	**0.0018**	**0.402**	**9.3497**	**0.0084**	**0.2001**	**0.1096**	**0.0001**	**0.0001**	**0**	**0.3701**	**0.0799**	**1.9678**	**4.0391**	**0**	**0.1593**	**0.1103**	**1.2329**	**54.5275**	**6.7014**	**1.039**	**21.8191**	**22.5293**	**27.0406**	**22.1366**

Group	St_208	St_209	St_210	St_211	St_213	St_214	St_215	St_216	St_217	St_218	St_219	St_220	St_221	St_232	St_233	St_236	St_237	St_239	St_240	St_241	St_247	St_248	St_249	St_250	St_251	St_252	St_253	St_254	St_256	St_257	St_258
Annelida	0.1169	1.7909	2.4266	1.4315	0.2117	0.1001	0.133	2.8989	0.2136	1.817	0.3986	0.2287	0.2545	0.0006	0.0374	0.1002	0.2113	0.5808	0.323	0.1083	0.3553	1.6385	0.3353	0.3512	0.1944	0.119	0.5174	0.0761	0.2308	0.3487	0.7123
Crustacea		1.5084	0.1434			0.0105	0.0045	0.0739	0.0219	0.0086	0.0918	0.0059	0.001	0.0033		0.0043			0.0072	0.0104	0.0395	0.0453	0.3795	0.0408	0.0062	0.0001	0.8371	0.0001	0.0644	0.1545	0.0078
Mollusca	0.0015	1.6001		4.4024	1.6028	0.5804	0.596	3.3986	5.6511	1.255	0.0568	0.1398	0.0202	0.0022		0.0479	0.4006	5.1417	0.0391	0.128	60.3732	4.3741	0.6058	0.4069	0.0861	0.1311	0.5746	0.2484	0.1966	0.4029	6.0437
Echinodermata	0.0054	0.3864		0.5571	0.2963	0.0236	5.123	12.937	45.1753	7.0205	0.0445	0.002	0.2113			0.0058		20.1304		0.426	0.1123	0.1705	0.2696	0.0657	0.0052	0.0498	0.0444	0.0405	0.0137	0.1576	17.5145
Others		0.1622		0.0828	0.0796	0.0006	0.1327	0.0401	0.0117	0.0473	0.0153	0.0036		0.0001	25.8615	4.6197	3.1947	9.7532	0.0144		3.7479	0.323	0.0233	0.0424	0.3442	0.2281	0.0451		0.0019	0.0185	0.089
Total Biomass	**0.1238**	**5.448**	**2.57**	**6.4738**	**2.1904**	**0.7152**	**5.9892**	**19.3485**	**51.0736**	**10.1484**	**0.607**	**0.38**	**0.487**	**0.0062**	**25.8989**	**4.7779**	**3.8066**	**35.6061**	**0.3837**	**0.6727**	**64.6282**	**6.5514**	**1.6135**	**0.907**	**0.6361**	**0.5281**	**2.0186**	**0.3651**	**0.5074**	**1.0822**	**24.3673**

Group	St_259	St_260	St_266	St_267	St_268	St_269	St_271	St_272	St_273	St_275	St_276	DDV7	DDV35	DDV37	DDV38	DDV39	DDV41	DDV43
Annelida	0.3151	1.7135	0.1457	0.1068	0.1536	0.0761	0.3654	0.3459	0.4706	0.1044	0.3949	0.2913	0.5753	2.2399	0.0433	1.5215	0.0066	0.1281
Crustacea	0.134	0.2308	0.0242	0.0088	0.0028	0.0001	0.0291	1.0788	0.0094	0.0182	0.0314		0.1035	0.0224		0.2121	0.0058	0.007
Mollusca	8.0302	66.2858	0.9538	1.0529	0.0054	0.5737	0.4122	11.99	0.2275	0.2771	8.6917	0.0275	22.449	4.1336		22.9672		0.0356
Echinodermata	0.1122	0.1002	1.5098	0.2744	0.0119	16.1058	0.0117	0.1274	0.1634	0.4405	0.0064	0.0221	0.1604	0.5158		0.4869		
Others	0.0964	0.2551	0.0455	0.052			0.0259	0.135	0.0601	0.0574	0.0093	3.4121	0.0918	0.4205		0.0653	0.0001	
Total Biomass	**8.6879**	**68.5854**	**2.679**	**1.4949**	**0.1737**	**16.7557**	**0.8443**	**13.6771**	**0.931**	**0.8976**	**9.1337**	**3.753**	**23.38**	**7.3322**	**0.0433**	**25.253**	**0.0125**	**0.1707**

Appendix 6

Diversity indices from Primer (v7)

	S	N	d	J'	Lambda	H'(log2)
St_001	20	29	5.64	0.96	0.06	4.16
St_002	29	86	6.29	0.85	0.09	4.14
St_003	16	41	4.04	0.85	0.14	3.38
St_004	25	64	5.77	0.84	0.12	3.89
St_005	36	75	8.11	0.91	0.05	4.73
St_006	25	47	6.23	0.94	0.06	4.35
St_007	28	46	7.05	0.96	0.05	4.60
St_008	26	48	6.46	0.92	0.07	4.33
St_009	13	27	3.64	0.93	0.11	3.43
St_010	30	74	6.74	0.88	0.07	4.34
St_011	15	23	4.47	0.91	0.12	3.56
St_012	32	77	7.14	0.90	0.06	4.49
St_013	16	51	3.82	0.77	0.20	3.09
St_014	10	25	2.80	0.93	0.14	3.08
St_015	20	73	4.43	0.84	0.12	3.61
St_016	39	275	6.77	0.80	0.08	4.25
St_017	44	108	9.18	0.87	0.06	4.75
St_018	27	51	6.61	0.91	0.06	4.35
St_019	16	31	4.37	0.91	0.10	3.66
St_020	23	37	6.09	0.88	0.10	4.00
St_022	7	13	2.34	0.97	0.16	2.72
St_023	32	97	6.78	0.83	0.09	4.16
St_025	28	49	6.94	0.91	0.07	4.36
St_026	10	30	2.65	0.83	0.20	2.76
St_027	18	45	4.47	0.90	0.10	3.74
St_028	7	8	2.89	0.98	0.16	2.75
St_029	10	22	2.91	0.82	0.22	2.71
St_030	13	37	3.32	0.90	0.12	3.34
St_031	8	16	2.52	0.79	0.29	2.38
St_032	37	93	7.94	0.89	0.06	4.66
St_033	16	29	4.45	0.95	0.08	3.80
St_034	17	43	4.25	0.86	0.13	3.51
St_035	16	24	4.72	0.93	0.09	3.74
St_036	30	61	7.05	0.89	0.08	4.37
St_037	11	34	2.84	0.83	0.18	2.87
St_039	28	49	6.94	0.95	0.05	4.55
St_040	19	65	4.31	0.81	0.13	3.45
St_041	12	22	3.56	0.93	0.12	3.33
St_042	19	29	5.35	0.95	0.07	4.03
St_043	28	71	6.33	0.86	0.09	4.13
St_044	14	36	3.63	0.85	0.16	3.22
St_045	34	104	7.11	0.82	0.09	4.18
St_046	24	57	5.69	0.89	0.08	4.08
St_047	29	70	6.59	0.89	0.07	4.31
St_048	24	53	5.79	0.88	0.09	4.05
St_049	12	32	3.17	0.85	0.17	3.05
St_050	19	30	5.29	0.95	0.07	4.04
St_051	10	29	2.67	0.79	0.23	2.63
St_052	19	43	4.79	0.88	0.10	3.74
St_054	23	34	6.24	0.95	0.06	4.29
St_056	13	22	3.88	0.92	0.12	3.39

	S	N	d	J'	Lambda	H'(log2)
St_058	6	18	1.73	0.84	0.28	2.17
St_059	45	142	8.88	0.86	0.05	4.74
St_060	6	11	2.09	0.93	0.21	2.41
St_061	30	66	6.92	0.87	0.09	4.25
St_062	13	46	3.13	0.85	0.15	3.13
St_063	30	57	7.17	0.95	0.05	4.66
St_064	17	36	4.46	0.90	0.10	3.69
St_065	28	75	6.25	0.85	0.10	4.07
St_066	17	30	4.70	0.91	0.10	3.73
St_067	11	31	2.91	0.93	0.13	3.21
St_068	12	17	3.88	0.94	0.11	3.38
St_069	15	26	4.30	0.92	0.10	3.61
St_070	30	80	6.62	0.88	0.07	4.34
St_071	24	62	5.57	0.89	0.08	4.06
St_072	20	37	5.26	0.85	0.13	3.68
St_073	32	71	7.27	0.90	0.06	4.51
St_074	19	50	4.60	0.89	0.10	3.77
St_075	14	38	3.57	0.86	0.14	3.27
St_076	11	21	3.28	0.82	0.22	2.84
St_077	34	58	8.13	0.94	0.05	4.78
St_078	9	18	2.77	0.94	0.14	2.97
St_079	15	26	4.30	0.93	0.10	3.63
St_080	16	39	4.09	0.87	0.12	3.47
St_081	17	44	4.23	0.92	0.09	3.74
St_082	14	30	3.82	0.84	0.16	3.20
St_084	35	74	7.90	0.95	0.04	4.88
St_085	42	131	8.41	0.82	0.08	4.44
St_086	16	23	4.78	0.94	0.09	3.76
St_096	39	249	6.89	0.36	0.60	1.92
St_099	35	61	8.27	0.95	0.04	4.86
St_103	6	18	1.73	0.76	0.32	1.97
St_111	19	48	4.65	0.84	0.13	3.56
St_115	25	52	6.07	0.95	0.05	4.42
St_116	7	10	2.61	0.94	0.18	2.65
St_121	34	113	6.98	0.64	0.30	3.23
St_122	31	90	6.67	0.65	0.29	3.22
St_124	88	474	14.12	0.81	0.06	5.24
St_125	7	8	2.89	0.98	0.16	2.75
St_127	27	109	5.54	0.71	0.21	3.38
St_128	61	171	11.67	0.86	0.05	5.13
St_129	49	125	9.94	0.88	0.06	4.92
St_130	46	107	9.63	0.90	0.05	4.97
St_133	24	350	3.93	0.50	0.28	2.31
St_137	90	433	14.66	0.86	0.03	5.56
St_138	86	321	14.73	0.91	0.03	5.83
St_140	71	806	10.46	0.50	0.33	3.05
St_143	43	104	9.04	0.84	0.08	4.56
St_147	59	131	11.90	0.92	0.03	5.44
St_148	35	69	8.03	0.90	0.06	4.61
St_152	56	189	10.49	0.80	0.09	4.64
St_153	39	123	7.90	0.78	0.13	4.11

	S	N	d	J'	Lambda	H'(log2)
St_154	52	156	10.10	0.87	0.05	4.94
St_156	38	105	7.95	0.78	0.13	4.12
St_157	62	147	12.22	0.91	0.03	5.42
St_158	47	109	9.81	0.91	0.04	5.07
St_159	87	444	14.11	0.73	0.12	4.67
St_161	107	365	17.97	0.84	0.05	5.66
St_162	29	62	6.78	0.91	0.06	4.40
St_163	32	190	5.91	0.74	0.14	3.70
St_164	6	7	2.57	0.98	0.18	2.52
St_165	2	3	0.91	0.92	0.56	0.92
St_166	3	3	1.82	1.00	0.33	1.58
St_167	2	2	1.44	1.00	0.50	1.00
St_169	4	4	2.16	1.00	0.25	2.00
St_170	2	2	1.44	1.00	0.50	1.00
St_172	8	13	2.73	0.88	0.21	2.65
St_175	2	2	1.44	1.00	0.50	1.00
St_176	2	2	1.44	1.00	0.50	1.00
St_177	3	3	1.82	1.00	0.33	1.58
St_180	3	3	1.82	1.00	0.33	1.58
St_186	19	105	3.87	0.73	0.18	3.11
St_195	3	3	1.82	1.00	0.33	1.58
St_196	8	20	2.34	0.74	0.34	2.22
St_198	3	3	1.82	1.00	0.33	1.58
St_199	2	2	1.44	1.00	0.50	1.00
St_200	2	2	1.44	1.00	0.50	1.00
St_201	21	145	4.02	0.74	0.15	3.27
St_202	30	75	6.72	0.81	0.11	3.99
St_203	13	27	3.64	0.87	0.15	3.21
St_204	50	288	8.65	0.61	0.21	3.47
St_205	50	236	8.97	0.66	0.18	3.73
St_206	19	119	3.77	0.45	0.51	1.93
St_207	24	62	5.57	0.73	0.20	3.35
St_208	3	3	1.82	1.00	0.33	1.58
St_209	36	89	7.80	0.82	0.11	4.24
St_210	4	7	1.54	0.92	0.31	1.84
St_211	22	61	5.11	0.83	0.11	3.72
St_213	22	66	5.01	0.92	0.07	4.10
St_214	17	61	3.89	0.84	0.13	3.44
St_215	32	63	7.48	0.88	0.08	4.41
St_216	65	229	11.78	0.84	0.05	5.07
St_217	22	41	5.65	0.88	0.11	3.92
St_218	36	122	7.29	0.77	0.12	3.96
St_219	20	30	5.59	0.93	0.08	4.03
St_220	16	35	4.22	0.91	0.10	3.66
St_221	12	20	3.67	0.84	0.20	3.02
St_232	4	8	1.44	0.88	0.34	1.75
St_233	7	24	1.89	0.75	0.34	2.10
St_236	9	22	2.59	0.78	0.26	2.46
St_237	9	13	3.12	0.97	0.12	3.09
St_239	19	68	4.27	0.73	0.24	3.08
St_240	16	34	4.25	0.85	0.16	3.39

	S	N	d	J'	Lambda	H'(log2)
St_241	8	21	2.30	0.77	0.28	2.30
St_247	72	325	12.28	0.80	0.06	4.96
St_248	64	167	12.31	0.90	0.03	5.42
St_249	65	247	11.62	0.83	0.06	5.01
St_250	71	243	12.74	0.88	0.03	5.44
St_251	43	91	9.31	0.92	0.04	4.98
St_252	27	64	6.25	0.86	0.09	4.10
St_253	80	371	13.35	0.80	0.06	5.03
St_254	17	36	4.46	0.88	0.11	3.61
St_256	57	117	11.76	0.94	0.03	5.48
St_257	61	206	11.26	0.85	0.05	5.06
St_258	42	177	7.92	0.80	0.10	4.30
St_259	73	340	12.35	0.78	0.09	4.81
St_260	60	187	11.28	0.85	0.06	5.00
St_266	34	115	6.95	0.83	0.09	4.23
St_267	27	38	7.15	0.96	0.05	4.55
St_268	11	14	3.79	0.96	0.11	3.32
St_269	10	74	2.09	0.64	0.32	2.14
St_271	50	116	10.31	0.94	0.03	5.29
St_272	96	357	16.16	0.89	0.03	5.86
St_273	45	125	9.11	0.89	0.05	4.86
St_275	43	68	9.95	0.95	0.04	5.13
St_276	50	89	10.92	0.92	0.04	5.18
DDV7	9	16	2.89	0.83	0.23	2.65
DDV35	75	675	11.36	0.67	0.14	4.20
DDV37	58	193	10.83	0.82	0.08	4.83
DDV38	2	2	1.44	1.00	0.50	1.00
DDV39	93	412	15.28	0.81	0.06	5.27
DDV41	4	11	1.25	0.81	0.39	1.62
DDV43	8	15	2.58	0.93	0.16	2.79

Appendix 7

Full SIMPER results

	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Group A Average similarity: 17.11 *Biotope - SS.SMu.CFiMu Circalittoral fine mud (MD621)*					
Dasybranchus	0.55	7.68	0.52	44.92	44.92
Nephtys incisa	0.38	4.75	0.37	27.77	72.69
Group B Average similarity: 26.43 *Biotope - SS.SCS.OCS Offshore circalittoral coarse sediment (MD321)*					
Aonides paucibranchiata	1.91	1.55	1.29	5.86	5.86
Polycirrus	1.64	1.37	1.24	5.16	11.03
Nemertea	1.50	1.18	1.18	4.45	15.48
Verruca stroemia	2.64	1.05	0.75	3.97	19.44
Sabellaria spinulosa	2.23	1.01	0.74	3.81	23.26
Serpulidae	1.65	1.00	0.95	3.78	27.03
Leptochiton asellus	1.87	0.89	0.73	3.37	30.40
Glycera lapidum	1.16	0.85	0.90	3.23	33.63
Nematoda	1.44	0.81	0.81	3.05	36.68
Harmothoe impar	1.16	0.80	0.81	3.02	39.70
Modiolula phaseolina	1.80	0.79	0.66	3.00	42.70
Timoclea ovata	1.45	0.77	0.81	2.93	45.63
Spirobranchus triqueter	1.35	0.75	0.73	2.83	48.46
Balanus crenatus	2.03	0.73	0.37	2.78	51.24
Echinocyamus pusillus	1.07	0.67	0.77	2.53	53.77
Amphipholis squamata	1.46	0.65	0.76	2.48	56.24
Laonice irinae	0.98	0.56	0.72	2.14	58.38
Lysidice unicornis	1.08	0.55	0.64	2.09	60.47
Hiatella arctica	1.10	0.43	0.56	1.63	62.10
Steromphala tumida	0.84	0.41	0.53	1.56	63.65
Hydroides norvegica	1.00	0.39	0.57	1.47	65.12
Dendrodoa grossularia	1.37	0.39	0.47	1.46	66.58
Mediomastus fragilis	0.78	0.38	0.56	1.45	68.02
Lumbrineris cingulata	0.91	0.38	0.56	1.44	69.46
Dipolydora caulleryi	0.75	0.32	0.57	1.20	70.66
Group C Average similarity: 20.33 *Biotope - SS.SCS.OCS Offshore circalittoral coarse sediment (MD321)*					
Pisione remota	1.53	8.71	1.42	42.85	42.85
Nematoda	1.05	4.19	0.59	20.63	63.48
Glycera lapidum	0.82	1.63	0.44	8.03	71.50
Group D Average similarity: 22.60 Biotope - *SS.SMu.CSaMu.AfilKurAnit Amphiura filiformis*, *Kurtiella bidentata* and *Abra nitida* in circalittoral sandy mud (MC6211)					
Abra nitida	2.21	3.21	0.88	14.21	14.21
Kurtiella bidentata	3.15	2.49	0.74	11.02	25.23
Spiophanes kroyeri	1.05	1.52	0.82	6.71	31.94
Nucula nitidosa	1.55	1.41	0.80	6.25	38.19
Amphiura filiformis	2.18	1.11	0.53	4.92	43.11
Abra alba	0.93	0.92	0.52	4.08	47.19
Dasybranchus	0.86	0.89	0.46	3.94	51.13
Phoronis	0.86	0.83	0.80	3.68	54.81
Cylichna cylindracea	0.96	0.80	0.59	3.55	58.36
Turritellinella tricarinata	1.33	0.69	0.30	3.07	61.44
Phaxas pellucidus	0.90	0.59	0.52	2.59	64.03
Pholoe baltica (sensu Petersen)	0.80	0.55	0.46	2.42	66.45
Thyasira flexuosa	0.56	0.50	0.46	2.22	68.67
Scalibregma inflatum	0.93	0.40	0.26	1.79	70.46
Group E Average similarity: 36.86 *Biotope - SS.SSa.CFiSa.ApriBatPo Abra prismatica, Bathyporeia elegans* and polychaetes in circalittoral fine sand					
Bathyporeia elegans	1.90	7.46	1.83	20.24	20.24
Lumbrineris cingulata	1.80	5.74	1.15	15.56	35.80
Abra prismatica	1.54	5.64	1.42	15.30	51.10
Spiophanes bombyx	1.31	4.51	1.43	12.24	63.34
Nephtys cirrosa	0.69	1.76	0.61	4.77	68.11
Sthenelais limicola	0.64	1.51	0.60	4.10	72.22

Group F Average similarity: 37.51 *Biotope* - *SS.SSa.CMuSa.AalbNuc Abra alba* and *Nucula nitidosa* in circalittoral muddy sand or slightly mixed sediment (MC5214)					
Abra prismatica	1.81	3.37	1.66	8.98	8.98
Lumbrineris cingulata	2.18	3.25	1.20	8.65	17.64
Bathyporeia tenuipes	1.60	3.12	1.60	8.33	25.96
Magelona filiformis	1.70	2.95	1.59	7.86	33.82
Edwardsiidae	1.52	2.86	1.99	7.62	41.44
Nucula nitidosa	1.38	2.56	1.32	6.83	48.26
Spiophanes bombyx	1.48	2.36	1.41	6.29	54.55
Chaetozone christiei	1.65	2.31	0.96	6.15	60.70
Sthenelais limicola	0.94	1.44	0.96	3.84	64.54
Owenia	0.82	1.14	0.79	3.04	67.58
Cylichna cylindracea	0.80	0.99	0.71	2.63	70.21
Group G Average similarity: 24.79 *Biotope* - SS.SSa.CFiSa.EpusOborApri *Echinocyamus pusillus*, *Ophelia borealis* and *Abra prismatica* in circalittoral fine sand (MC5211)					
Abra prismatica	1.57	3.75	0.89	15.14	15.14
Polycirrus	0.98	3.07	0.69	12.40	27.54
Asbjornsenia pygmaea	0.91	2.94	0.73	11.84	39.38
Echinocyamus pusillus	0.94	2.82	0.93	11.36	50.73
Ophelia borealis	1.21	2.20	0.55	8.86	59.59
Nephtys cirrosa	0.58	1.81	0.58	7.32	66.91
Sthenelais limicola	0.69	1.66	0.57	6.69	73.59
Group X Less than 2 samples in group *Biotope - SS.SMu.CSaMu Circalittoral sandy mud (MC621)*					
Group Y Less than 2 samples in group *Biotope* - *SS.SSa.CMuSa.AalbNuc Abra alba* and *Nucula nitidosa* in circalittoral muddy sand or slightly mixed sediment (MC5214)					

ScottishPower
Renewables