Awel y Môr Offshore Wind Farm

Category 6: Environmental Statement

Volume 4, Annex 5.2: Benthic Ecology Subtidal Characterisation (Offshore ECC)

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Fugro – WPM2 – ECR East A and B – Benthic Ecology Monitoring Report

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Awel y Môr Offshore Windfarm Ltd

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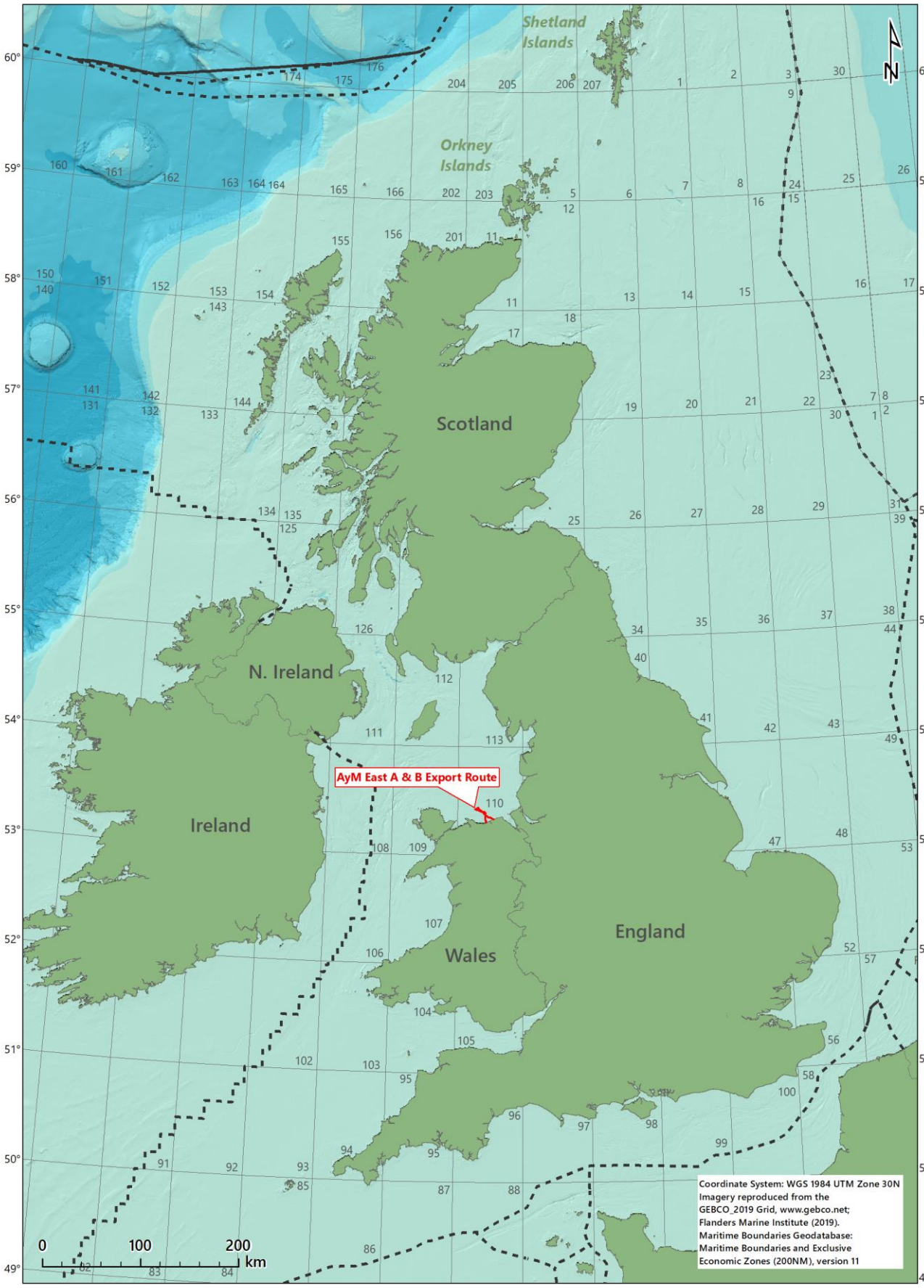

Executive Summary

Introduction

On the instruction of Awel y Môr Offshore Windfarm Ltd, Fugro performed a geophysical and environmental site investigation at the proposed Awel y Môr Offshore Windfarm (OWF) site, located 10.6 km off the north coast of Wales. The proposed OWF development will consist of the main array and three export cable routes, East A and B and West C.

Environmental operations were conducted onboard the MV Mersey Guardian during the survey period 16 to 30 August 2020. This report details the results of the benthic characterisation survey for the proposed East A and B export cable routes.

Survey Strategy

A total of 25 grab sampling stations were selected across the survey area. Five of these grab sampling stations were selected following consultation with Natural Resources Wales (NRW) to increase the sampling spatial coverage. At each proposed station, one macrofaunal sample and one particle size distribution (PSD) subsample were to be acquired. Of these 25 stations, 10 were selected for additional sampling for sediment chemistry. At 20 of the stations, and along three proposed transects, video and stills data were to be acquired.

Macrofaunal and PSD grab samples were successfully acquired from twenty of the proposed stations and chemistry sampling was successfully undertaken at eight stations. Video and still photographic data were successfully acquired along all twenty proposed drop-down video (DDV) locations and along all three proposed transects. Additional parallel transects, positioned 50 m north and 50 m south of the original location, were undertaken at three stations and along three transects to further investigate potentially sensitive habitats.

Sediment Characteristics

The sediments at most stations within the survey area mainly comprised sand, with varying proportions of gravel, and little or no fines (mud). Three of the stations had predominantly gravel sediments. When the mean particle size was expressed using the Wentworth classification, sediments were described as medium sand to medium pebble.

Sediment Chemistry

Total 2 to 6 ring polycyclic aromatic hydrocarbon (PAH) concentrations were broadly comparable to the median concentration recorded during the Strategic Environmental Assessment (SEA6 area) Irish Sea surveys. All individual PAH concentrations were below their respective effects range low (ERLs).

All metals concentrations were less than their respective Cefas guideline action levels (AL1 and AL2) and OSPAR ERL values.

Macrofauna

The number of infaunal and solitary epifaunal taxa recorded from the grab samples varied along the route. Three statistically significantly different communities, characterised by differing infaunal taxa, were identified from multivariate statistical analysis. Variations in macrofaunal community were linked to variations in sediment composition, which could, in turn, be linked to variations in wave/tidal exposure.

Seabed Habitats and Biotopes

One habitat, three biotope complexes and two biotopes were defined within the survey area. Four of these six habitat types were associated with predominantly sand sediments, one with gravelly sediment and one with mixed sediments (muddy sand with shell, gravel, pebbles, cobbles and boulders).

Areas of cobbles and boulders were further assessed for possible resemblance to stony reef habitats. Eleven stations and nine transects were classified as 'Low resemblance to stony reef', and an additional nine stations and eight transects were classified as 'no resemblance to stony reef'.

A possible sand eel (Ammodytidae) was recorded from video data at one station; sand eels are listed as a UK Biodiversity Action Plan (UK BAP) important (priority) species for the protection of the UK's biological resources.

No other Annex I habitats or Annex II species, Oslo and Paris Commission (OSPAR) threatened and/or declining species and habitats or UK BAP priority habitats and species were observed within the survey area.

Document Arrangement

Volume 1	WPM1 & WPM2 Array Area & ECR Acquisition/Operations Report - Mersey Guardian
Volume 2	Fugro – WPM1- Main Array - Environmental Features Report
Volume 3	Fugro – WPM2 - ECR West C – Environmental Features Report
Volume 4	Fugro – WPM2 - ECR East A&B - Environmental Features Report
Volume 5	Fugro – WPM1 – Main Array – Benthic Ecology Monitoring Report
Volume 6	Fugro – WPM2 - ECR West C - Benthic Ecology Monitoring Report
Volume 7	**Fugro – WPM2 – ECR East A and B – Benthic Ecology Monitoring Report**

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Abbreviations

AFDW	Ash free dry weight
AL1/AL2	Action Level 1 or 2
ANOSIM	Analysis of similarity
BGS	British Geological Survey
BSL	Below sea level
Cefas	Centre for Environment, Fisheries and Aquaculture Science
CEMP	Coordinated Environmental Monitoring Programme
CM	Central meridian
CS	Chemistry sample
DCM	Dichloromethane
DDV	Drop-down video
EC	European Commission
ED50	European Datum 1950
EEA	European Environment Agency
EMODnet	European Marine Observation Data Network
EOL	End of line
EPSG	European Petroleum Survey Group
ERL	Effects range low
EUNIS	European Nature Information System
FA	Faunal sample A
FOCI	Feature of Conservation Interest
GC	Gas chromatography
GC-MS	Gas chromatography – mass spectrometry
HC	Hydrocarbon sample
HM	Heavy metals
ICP-MS	Inductively coupled plasma-mass spectrometry
ICP-OES	Inductively coupled plasma-optical emission spectrometry
JNCC	Joint Nature Conservation Committee
LAT	Lowest Astronomical Tide
MBES	Multibeam echosounder
MCZ	Marine Conservation Zone
MPA	Marine Protected Area
MRV	Minimum reporting value
MV	Motor vessel
NF	No fix
NMBAQC	National Marine Biological Association Quality Control
nMDS	Non-metric multi-dimensional scaling
NPD	Naphthalenes, phenanthrenes/anthracenes and dibenzothiophenes
NRW	Natural Resources Wales
NS	No sample
OSPAR	Oslo and Paris Commission
OWF	Offshore wind farm
P	Present
PAH	Polycyclic aromatic hydrocarbon
PC	Principle component
PCA	Principle component analysis

PRIMER	Plymouth Routines in Multivariate Ecological Research
PSA	Particle size analysis
PSD	Particle size distribution
RSD	Relative standard deviation
SAC	Special Area of Conservation
SACFOR	Superabundant, abundant, common, frequent, occasional and rare (semi-quantitative abundance scale)
SD	Standard deviation
SEA	Strategic Environmental Assessment
SOL	Start of line
SPA	Special protected area
SSS	Side scan sonar
US EPA	United States Environmental Protection Agency
US EPA 16	United States Environmental Protection Agency's 16 priority PAH pollutants
UTC	Coordinated Universal Time
UTM	Universal Transverse Mercator
WGS84	World Geodetic System 1984
WoRMS	World Register of Marine Species
WP	Waypoint

1. Introduction

1.1 General Project Description

On the instruction of Awel y Môr Offshore Windfarm Ltd, Fugro performed a geophysical and environmental site investigation at the proposed Awel y Môr Offshore Wind Farm (OWF) site. The proposed OWF development will consist of the Main Array and three export cable routes; East A and B and West C.

The Awel y Môr OWF, which covers an area of approximately 136 km^2, is located 10.6 km off the north coast of Wales in the Irish Sea, directly west of the existing Gwynt y Môr OWF. Water depths range between approximately 20 m and 40 m Lowest Astronomical Tide (LAT). The East A and B cable route corridors run a length of approximately 19.9 km, connecting the Awel y Môr OWF main array to the landfall locations on the north Wales coast.

Environmental operations were conducted onboard the MV Mersey Guardian during the survey period 16 to 30 August 2020. The environmental site investigation survey included a habitat assessment and a benthic characterisation survey. This report details the results of the benthic characterisation survey for the proposed East A and B export cable route.

Appendix A outlines the guidelines for use of this report.

1.2 Scope of Work

1.2.1 Geophysical Survey

The aim of the geophysical survey was to provide ultra high resolution seismic, multibeam echo sounder (MBES), side scan sonar (SSS), sub-bottom profiler, and magnetometer geophysical data acquisition to characterise the main array and to identify any features of conservation interest.

1.2.2 Environmental Survey

The purpose of the environmental survey was to provide a robust baseline characterisation of the proposed Awel y Môr OWF site and to supplement the existing benthic ecology data that exists across the area of interest. The survey was required to establish whether any sensitive habitats are present in the area, specifically habitats listed under Annex I of the European Commission (EC) Habitats Directive, such as *Sabellaria spinulosa* reefs and stony reefs. In addition, grab samples were collected to establish physical and biological properties of the sediment at key locations for characterisation purposes.

The original results pertaining to the identification of seabed habitats and biotopes of potential conservation interest are presented in the environmental features report (Volume 4).

1.3 Environmental Legislation

Council Directive 92/43/EEC on the Conservation of natural habitats and of wild fauna and flora, commonly known as the EC Habitats Directive, was adopted in 1992, with the main aim of promoting maintenance of biodiversity at a European level. Member states are required to take measures to ensure that protection is afforded to habitats and species of European importance, and that these features are restored to a 'favourable conservation status'. These habitats and species are listed under Annexes I and II of the Directive and may be selected as features for which Natura 2000 protected areas, namely Special Areas of Conservation (SACs) and Special Protected Areas (SPAs), may be designated. These together contribute to a European ecological network of protected sites. The Annexes include species and habitats identified by the Oslo-Paris Commission (OSPAR) and detailed on the OSPAR list of threatened and/or declining species and habitats (OSPAR, 2008). The environmental site investigation was undertaken, in part, to satisfy the Habitats Directive requirement of surveillance for Annex I habitats, based on which SACs may be designated. 'Areas of search' for Annex I habitats have been determined by the Joint Nature Conservation Committee (JNCC) and indicate regions where these habitats are most likely to be encountered; Annex I habitats of relevance for the offshore wind farm industry include subtidal reefs (biogenic, or geogenic) and sandbanks slightly covered by seawater all the time.

This benthic monitoring report assesses the occurrence of relevant OSPAR listed threatened and/or declining species and habitats and EC Habitats Directive Annex I habitats within the survey area.

1.4 Regional Habitats, Species and Protected Areas

The proposed Awel y Môr East A and B export cable route is located approximately 6 km east of the Menai Strait and Conwy Bay SAC. The SAC covers an area of 265 km^2, designated for the protection of the subtidal Annex I habitats 'Sandbanks which are slightly covered by sea water all the time' and 'Reefs' (JNCC, 2019a; JNCC, 2019b). The proposed export cable route is located approximately 5 km to the north-west of the Dee Estuary SAC, which is designated for the protection of the Annex I habitats 'Mudflats and sandflats not covered by seawater at low tide', '*Salicornia* and other annuals colonising mud and sand' and 'Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*)' and 'Reefs'.

The proposed export cable route is also located approximately 35 km south-west of the Fylde Marine Conservation Zone (MCZ), which covers an area of 260 km^2, designated for the protection of 'subtidal sediments'.

Based on the European Marine Observation and Data Network (EMODnet) seabed habitats map (EMODnet, 2020), the proposed Awel y Môr East A and B export cable route lies in an area likely to comprise the following European Nature Information System (EUNIS) habitats:

- 'Circalittoral coarse sediment' (A5.14);
- 'Circalittoral fine sand' (A5.25);

- 'Circalittoral muddy sand' (A5.26).

Historic data from a benthic characterisation survey of the Gwynt y Môr OWF (Centre for Marine and Coastal Studies [CMACS], 2005) recorded five Joint Nature Conservation Committee (JNCC) biotope complexes in the vicinity of the East A and B survey area. Table 1.1 presents these biotope complexes along with the equivalent EUNIS classification.

Table 1.1: Gwynt y Môr OWF habitat classifications, East A and B

JNCC (2015) Classification	Equivalent EUNIS Classification (EEA, 2019)
SS.SCS.CCS.MedLumVen (*Mediomastus fragilis*, *Lumbrineris* spp. and venerid bivalves in circalittoral coarse sand or gravel)	*Mediomastus fragilis*, *Lumbrineris* spp. and venerid bivalves in circalittoral coarse sand or gravel (A5.142)
SS.SCS.ICS.MoeVen (*Moerella* spp. with venerid bivalves in infralittoral gravelly sand)	*Moerella* spp. with venerid bivalves in infralittoral gravelly sand (A5.133)
SS.SSa.IfiSa.NcirBat (*Nepthtys cirrosa* and *Bathyporeia* spp. in infralittoral sand)	*Nephtys cirrosa* and *Bathyporeia* spp. in infralittoral sand (A5.233)
SS.SSa.IMuSa.FfabMag (*Fabulina fabula* and *Magelona mirabilis* with venerid bivalves and amphipods in infralittoral compacted fine muddy sand)	*Fabulina fabula* and *Magelona mirabilis* with venerid bivalves and amphipods in infralittoral compacted fine muddy sand (A5.242)
SS.SCS.ICS.SLan (Dense *Lanice conchilega* and other polychaetes in tide-swept infralittoral sand and mixed gravelly sand)	Dense *Lanice conchilega* and other polychaetes in tide-swept infralittoral sand and mixed gravelly sand (A5.137)
Notes JNCC = Joint Nature Conservation Committee EUNIS = European Nature Information System EEA = European Environment Agency	

Table 1.2 lists the nearby protected areas relevant to the proposed Awel y Môr East A and B cable route survey area, summarising the sensitive habitats and species for which they were designated to protect. Figure 1.1 spatially displays the protected areas of relevance to the benthic subtidal and intertidal ecology in relation to the East A and B cable route survey area.

Table 1.2: Summary of nearby protected areas, East A and B

Protected Area	Status	Distance* [km]	Direction*	Protected Habitats/Species
Menai Strait and Conwy Bay	Special Area of Conservation	6	W	EC Habitats Directive Annex I 'Sandbanks which are slightly covered by sea water all the time', 'Mudflats and sandflats not covered by seawater at low tide' and 'Reefs'
Dee Estuary	Special Area of Conservation	5	SE	EC Habitats Directive Annex I; 'Mudflats and sandflats not covered by seawater at low tide', '*Salicornia* and other annuals colonising mud and sand' and 'Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*)' and 'Reefs'
Fylde	Marine Conservation Zone	35	NE	Subtidal sands and sediments
Notes * = Distance and direction from the closest sampling station within the East A and B export cable route survey area				

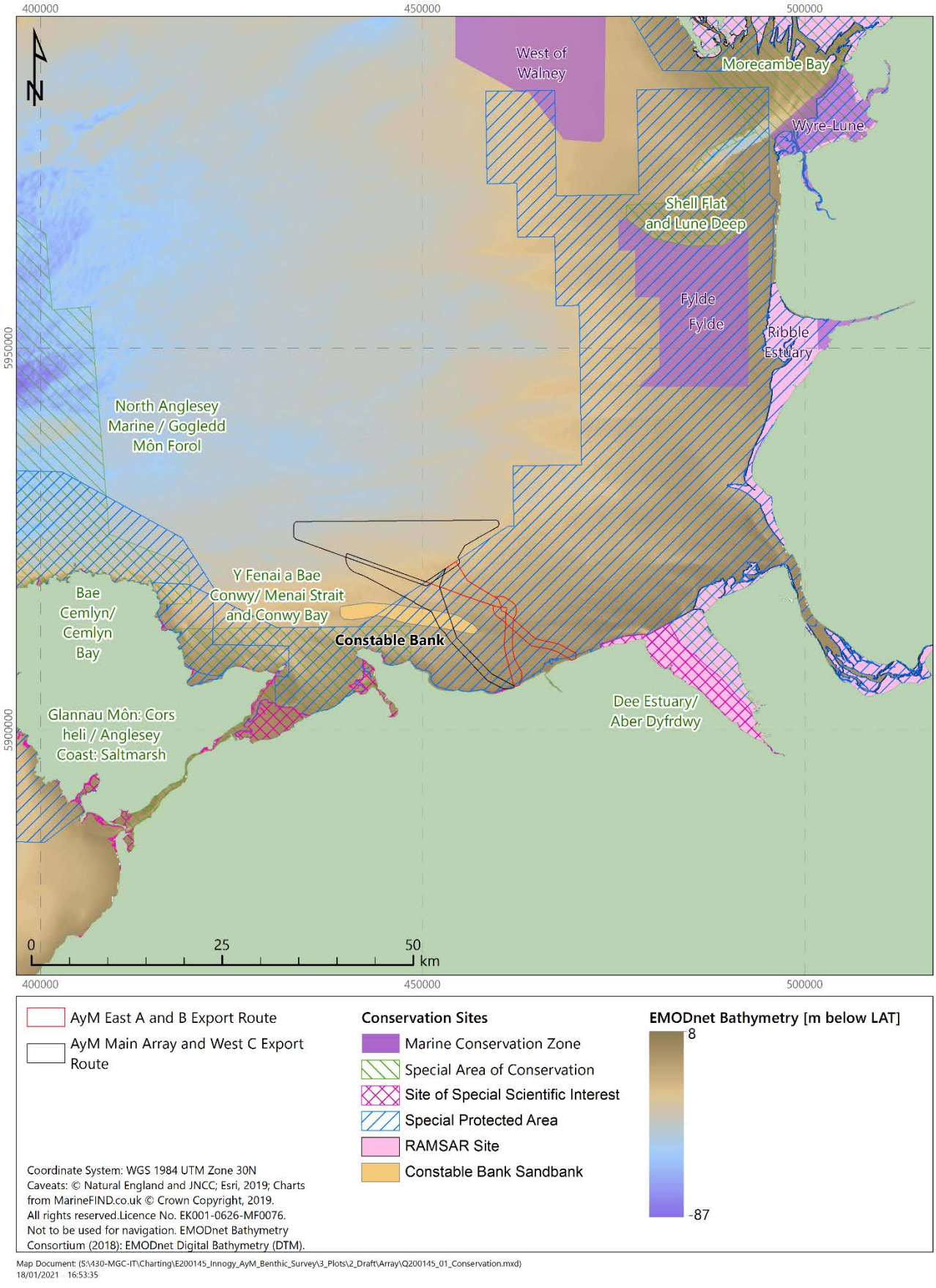


Figure 1.1: Protected areas relevant to the survey area

1.5 Environmental Quality Standards for Sediment Chemical Concentrations

Selected data have been compared to the OSPAR effects range low (ERL) concentrations (OSPAR, 2014), where available. The ERL thresholds represent the low point (10th percentile) and are therefore indicative of concentrations below which adverse effects rarely occur (OSPAR, 2009; 2014).

The Centre for Environment, Fisheries and Aquaculture Science (Cefas) Guideline Action Levels for the disposal of dredged material are non-statutory guidelines for assessment of disposal of dredged materials to sea, against which reported contaminants concentrations were compared to. In general, concentrations below Cefas Action Level 1 (AL1) are of no concern, whilst concentrations above Action Level 2 (AL2) indicate that dredged material is unsuitable for disposal at sea. Values between AL1 and AL2 may require further investigatory work prior to a disposal decision (Cefas, 2003).

A Strategic Environmental Assessment (SEA) review of the contaminant status of the Irish Sea (SEA6 area) was published in 2005 (Cefas, 2005). Comparative data, specifically for polycyclic aromatic hydrocarbons (PAHs) from site 715 (Liverpool Bay) was utilised due to its spatial proximity to the current survey area. The PAH concentrations from the SEA6 survey are median concentrations of 10 PAHs in sediment samples collected between 1999 and 2002, and, although not directly comparable to total 2 to 6 ring PAH values derived for the current survey, allow the data to be placed into a regional context.

1.6 Coordinate Reference System

All coordinates detailed in this report are referenced to World Geodetic System 1984 (WGS84) Universal Transverse Mercator (UTM) projection Zone 30N central meridian (CM) 3° West. Table 1.3 provided the detailed geodetic and projection parameters.

Table 1.3: Project geodetic and projection parameters, East A and B

Global Positioning System Geodetic Parameters	
Datum:	World Geodetic System 1984 (WGS84)
Spheroid:	World Geodetic System 1984
Semi major axis:	a = 6 378 137.000 m
Reciprocal flattening:	1/f = 298.257 223 563
Project Projection Parameters	
Grid Projection:	Universal Transverse Mercator (UTM)
UTM Zone:	30N (EPSG: 32630)
Central Meridian:	3° 00′ 00″ West
Latitude of Origin:	00° 00′ 00″ North
False Easting:	500 000 m
False Northing:	0 m
Scale factor on Central Meridian:	0.9996
Units:	Metre

2. Survey Strategy

Historic data from a benthic characterisation survey of the Gwynt y Môr OWF (CMACS, 2005) and SSS data acquired in 2020 were reviewed by Fugro in order to propose environmental survey locations within the proposed Awel y Môr OWF and export cable routes. Particular emphasis was placed on locating areas of potential conservation value (e.g. Annex I listed habitats), on boundaries between areas of differing sonic reflectivity and areas characteristic of the general background conditions of the site.

A total of 25 sampling stations were selected to ground-truth the different sediment types observed from the geophysical data, and to also provide spatial coverage across the survey area. Five of these grab sampling stations were selected following consultation with Natural Resources Wales. At each grab sampling station one macrofaunal sample was acquired, with one particle size distribution (PSD) subsampled from the same sample. A subset of 10 grab stations were selected for additional sampling for chemistry analysis, with second grab samples taken at these stations and subsampled for the required analyses.

At 20 of the stations, drop-down video data were to be acquired along transects of approximately 50 m length, centred on each station. At two stations, the orientation of the transects was predetermined to investigate boundaries of differing sonic reflectivity.

Three camera transects were selected to investigate features of potential conservation interest, denoted 'Areas of focus'.

Tables 2.1 and 2.2 provide the coordinates, data to be acquired and rationale for each proposed survey location. Figure 2.1 spatially displays the proposed survey locations overlaid on the SSS mosaic.

Table 2.1: Proposed sampling stations, East A and B

Geodetic Parameters: ED50, UTM Zone 31N, CM 3°E [m]				
Station	Easting	Northing	Rationale	Data and Sample Acquisition
E_ST01	451 799.0	5 919 623.0	Station in an area of mobile sediments. Representative sediments, selected for spatial coverage	Video and stills FA, PSD
E_ST02	453 642.0	5 920 349.0	Station in an area of mobile sediments and high reflectivity	Video and stills FA, PSD
E_ST03	454 474.0	5 920 986.0	Station in an area of mobile sediments and high/medium reflectivity	Video and stills FA, PSD
E_ST04	454 452.0	5 919 439.0	Station in an area of mobile sediments. Representative sediments selected for spatial coverage	Video and stills FA, PSD, CS
E_ST05	454 663.0	5 918 507.0	Station in an area of differing reflectivity. The orientation of the drop-down video was predetermined (E_ST05)	Video and stills FA, PSD
E_ST06	456 064.0	5 918 822.0	Station in an area of high reflectivity	Video and stills FA, PSD

Geodetic Parameters: ED50, UTM Zone 31N, CM 3°E [m]				
Station	Easting	Northing	Rationale	Data and Sample Acquisition
E_ST07	457 533.0	5 918 010.0	Station in an area of relatively flat seabed. Representative sediments, selected for spatial coverage	Video and stills FA, PSD, CS
E_ST08	458 022.0	5 917 194.0	Station in an area of high reflectivity	Video and stills FA, PSD
E_ST09	459 249.0	5 917 026.0	Station in an area of relatively flat seabed. Representative sediments, selected for spatial coverage	Video and stills FA, PSD
E_ST10	460 182.0	5 916 479.0	Station in an area of high reflectivity	Video and stills FA, PSD
E_ST11	461 591.0	5 916 076.0	Station in an area of mixed reflectivity. Representative sediments, selected for spatial coverage	Video and stills FA, PSD, CS
E_ST12	461 619.0	5 914 549.0	Station beside a boundary of differing reflectivity. The orientation of the drop-down video was predetermined (E_ST12)	Video and stills FA, PSD
E_ST13	463 070.0	5 913 062.0	Station in an area of mobile sediments. Representative sediments, selected for spatial coverage	Video and stills FA, PSD, CS
E_ST14	465 088.0	5 911 426.0	Station in an area of mobile sediments. Representative sediments, selected for spatial coverage	Video and stills FA, PSD
E_ST15	466 809.0	5 911 094.0	Station in an area of mobile sediments. Representative sediments, selected for spatial coverage	Video and stills FA, PSD, CS
E_ST16	468 560.0	5 910 710.0	Station in an area of mobile sediments. Representative sediments, selected for spatial coverage	Video and stills FA, PSD, CS
E_ST17	461 152.0	5 912 372.0	Station in an area of mobile sediments with high reflectivity	Video and stills FA, PSD, CS
E_ST18	461 333.0	5 910 367.0	Station in an area of mobile sediments. Representative sediments, selected for spatial coverage	Video and stills FA, PSD
E_ST19	461 611.0	5 908 691.0	Station in an area of mobile sediments with high reflectivity. Representative sediments, selected for spatial coverage	Video and stills FA, PSD
E_ST20	461 932.0	5 907 559.0	Station in an area of relatively featureless seabed. Representative sediments, selected for spatial coverage	Video and stills FA, PSD, CS
E_ST21	459 968.0	5 915 162.0	Station selected for spatial coverage*	FA, PSD
E_ST22	464 054.0	5 912 295.0	Station selected for spatial coverage*	FA, PSD, CS
E_ST23	461 356.0	5 913 509.0	Station selected for spatial coverage*	FA, PSD
E_ST24	460 912.0	5 914 637.0	Station selected for spatial coverage*	FA, PSD
E_ST25	460 934.0	5 911 314.0	Station selected for spatial coverage*	FA, PSD, CS

Notes
FA = Fauna sample
PSD = Particle size distribution subsample
CS = Chemistry sample
* = Stations selected by Natural Resources Wales

Table 2.2: Proposed/predetermined drop-down video stations and camera transects, East A and B

Geodetic Parameters: ED50, UTM Zone 31N, CM 3°E [m]					
Transect		Easting	Northing	Rationale	Data Acquisition
E_ST05	SOL	454 607.0	5 918 510.0	Transect in an area of differing reflectivity	Video and stills
	EOL	454 722.0	5 918 499.0		
E_ST12	SOL	461 578.0	5 914 538.0	Transect across the boundary of two sediment types	Video and stills
	EOL	461 663.0	5 914 560.0		
E_TR01	SOL	455 384.0	5 919 288.0	Transect in an area of differing reflectivity	Video and stills
	EOL	455 474.0	5 919 278.0		
E_TR02	SOL	455 339.0	5 918 037.0	Transect in an area of differing reflectivity	Video and stills
	EOL	455 432.0	5 918 078.0		
E_TR03	SOL	455 623.0	5 919 046.0	Transect in an area of differing reflectivity	Video and stills
	EOL	455 726.0	5 919 059.0		
Notes SOL = Start of line EOL = End of line					

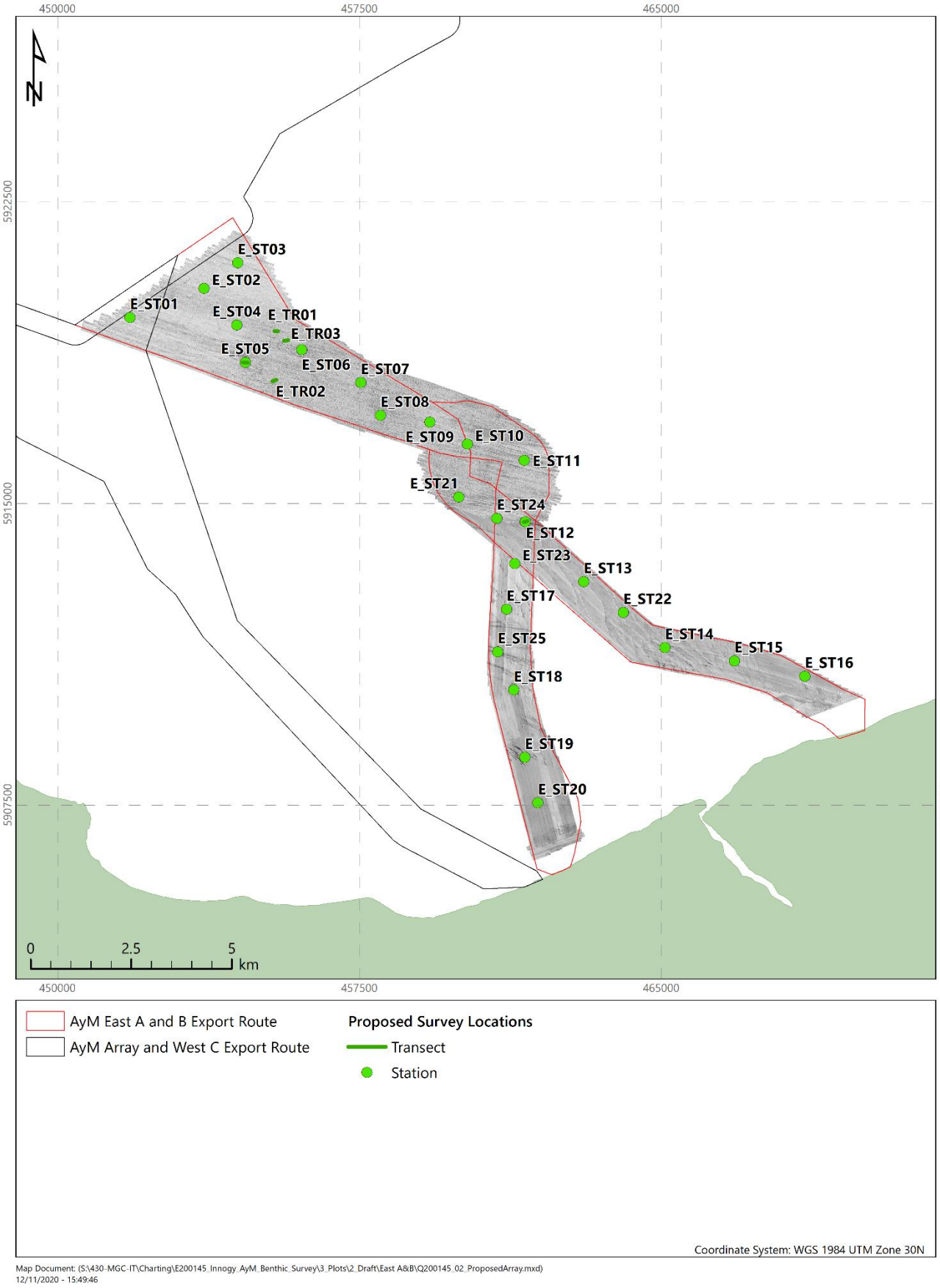


Figure 2.1: Proposed environmental survey locations, East A and B

3. Methods

3.1 Survey Methods

3.1.1 Seabed Photography

Seabed photography was acquired using a ROV Tech subsea camera system mounted within a purpose-built camera frame, which included a pressure housing filled with freshwater. The purpose of the freshwater housing was to provide a column of clear water between the seabed and the camera to facilitate the capture of good quality stills in highly turbid waters. The system consisted of one high resolution video camera, a still image camera, and two high intensity LED lighting strips at the side of the frame. Two lasers were set up 10 cm apart to provide a scale.

Seabed video was displayed on a computer monitor and recorded directly onto the computer hard drive. A video overlay was used to overlay a navigation string from an online positioning system using a vessel offset for position, including the time, date and location. The survey location and station number were also displayed (manually updated). The stills camera imagery was visible on a second window of the computer. Video was viewed in real time via an umbilical, assisting in the control of the camera in the water.

3.1.2 Sediment Sampling

Seabed samples were acquired using a 0.1 m^2 Hamon grab for macrofauna and PSD and a 0.1 m^2 Day grab for chemistry sampling. Manual position fixes were recorded when the grab reached the seabed. Positioning was provided by a vessel offset from the vessel reference point.

Further details on survey methodology are available within Appendix B.

3.2 Analytical Methods

Brief analytical methodologies are described in the following subsections. Further descriptions of the analytical methodologies are detailed in Appendix B.

3.2.1 Sediment Characteristics

Sediment samples were analysed for their PSD using a combination of two techniques; sieve analysis for all material retained by a 1.0 mm sieve followed by laser diffraction analysis of the finer material. The PSD parameters include the descriptive statistics derived in Gradistat (Blott, 2010), based on the Folk and Ward (1957) method. The sediment descriptions are based on the Wentworth (1922) scale and the British Geological Survey (BGS) modified Folk classification (Long, 2006).

3.2.2 Sediment Hydrocarbons

The sediment samples were analysed for PAHs, specifically the United States Environmental Protection Agency's 16 priority PAH pollutants (US EPA 16 PAHs) and alkylated PAHs.

Samples were extracted by ultrasonication of wet sediments with mixed solvents. The sample extracts were then cleaned up using absorption column chromatography. Aromatic hydrocarbons were analysed by gas chromatography-mass spectrometry (GC-MS).

The distributions and concentrations of 2 to 6 ring PAHs within the samples were determined by GC-MS. Standard solutions containing an appropriate range and concentration of aromatic hydrocarbons were run to calibrate the instrument and acquire response factors for quantification purposes. Individual aromatic compounds were quantified using a series of deuterated internal standards. The total 2 to 6 ring PAH value for each sediment sample was calculated by summing the concentrations of individual aromatic compounds.

3.2.3 Sediment Metals

The sediment samples were analysed using an aqua regia digest technique. This provides a strong partial digest, releasing into solution metals associated with the fines fraction within the sediments (but does not extract all trace elements associated with the coarse fraction). The concentrations of metals released by an aqua regia digest are typically considered indicative of those influencing biological interactions, as the released metals are not incorporated into the mineral matrix and are therefore potentially available for biological uptake.

The sediment samples underwent an aqua regia digest followed by multi-element analysis by inductively coupled plasma-mass spectrometry (ICP-MS) (arsenic, cadmium, chromium, copper, lead, mercury, nickel, tin and zinc) or by inductively coupled plasma-optical emission spectrometry (ICP-OES) (aluminium and barium).

3.2.4 Sediment Macrofauna

Macrofaunal samples were processed on a sieve mesh of 1 mm, with retained taxa identified and enumerated using a combination of stereo and compound microscopy.

Biomass (phylum level) was determined for infaunal invertebrates from grab samples; biomass was not determined for epifauna.

3.3 Data Analysis

Summary statistics (minimum, maximum, mean, median, standard deviation) for all reported datasets were derived in Excel.

3.3.1 Sediment Particle Size Distribution Statistics

Table 3.1 summarises the sediment PSD statistics that were calculated using Gradistat V8 (Blott, 2010).

Table 3.1: Sediment particle size distribution statistics

Statistic	Definition
Mean	A measure of central tendency: sum of values, divided by number of observations
Median	A measure of central tendency: central value
Modality	A measure of the number of peaks in the frequency distribution
Sorting	A measure of the grain size range and magnitude of their spread around the mean
Skewness	A measure of the degree of symmetry

3.3.2 Sediment Macrofauna

3.3.2.1 Data Rationalisation

Prior to analysis, the macrofaunal dataset was rationalised. Damaged taxa were removed, and indeterminable taxa were merged to avoid spurious enhancement of the species list. Juvenile species were removed, as they represent an ephemeral stage and are, therefore, not considered part of the permanent benthic community. Meiofauna, fish, algae, eggs and foraminifera were also removed for this reason. Sessile colonial epifauna was recorded as present, and assessed separately from the enumerated fauna, which comprised infaunal and solitary epifaunal taxa.

3.3.2.2 Univariate Analysis

Table 3.2 summarises the univariate statistics derived from Plymouth Routines in Multivariate Ecological Research (PRIMER) version 7 (v7).

Table 3.2: Macrofaunal univariate statistics

Statistic	Definition
Number of taxa (S)	Count of taxa
Abundance (N)	Count of individuals
Shannon-Wiener index of diversity ($H'log_2$)	A measure of the number of taxa in a sample and the distribution of abundance across these taxa; results were assessed in line with the threshold values in Dauvin et al. (2012): ■ High diversity ($H'log_2 > 4.00$); ■ Good diversity ($3.00 < H'log_2 < 4.00$); ■ Moderate diversity ($2.00 < H'log_2 < 3.00$); ■ Poor diversity ($1.00 < H'log_2 < 2.00$); ■ Bad diversity ($H'log_2 < 1.00$)
Pielou's index of evenness (J)	A measure of how evenly distributed the individuals are among the different species;
Complement of the Simpsons index of dominance (1-λ)	A measure of evenness in which its lowest value corresponds to assemblages with individuals evenly distributed across taxa, whilst its highest value corresponds to those in which the total abundance is dominated by one or very few of the taxa present

3.3.2.3 Multivariate Analysis

Various multivariate statistical techniques were applied to the macrofauna and sediment characteristics data to investigate patterns of similarity in PRIMER v7. These included:

- Data transformation to reduce skewness of data, for optimal performance of multivariate analysis (fourth root for PSD);
- Hierarchical clustering analysis (subsequently referred to as 'Cluster' analysis) to group samples based on the nearest neighbour sorting of a matrix of sample similarities using Bray Curtis similarity (for biological datasets) or Euclidean distance measure (for environmental datasets);
- Non-metric multidimensional scaling (nMDS) ordination of Bray Curtis and Euclidean Distance similarity/distance matrices;
- Similarity profiling ('SIMPROF' algorithm), to identify statistically significant clusters; in ecological terms the statistical relevance of similarity profile testing is assessed in line with the recommendation of Clarke et al. (2008), thus defining coarser grouping can be appropriate if the resulting groups are supersets of the similarity profile clusters;
- Similarity percentage analysis ('Simper' algorithm), to gauge the distinctiveness of each of the multivariate groups;
- Analysis of similarity ('ANOSIM' algorithm), to investigate significant differences between a priori defined groups;
- Principal component analysis (PCA), to identify spatial patterns and relationships between variables;
- Biological and environmental testing ('BIOENV' algorithm), to indicate relationships between physical and biological variables.

3.3.2.4 Biomass Analysis

Biomass was assessed for infaunal invertebrates from grab samples; biomass was not determined for epifauna.

The macrofaunal blotted wet weight biomass dataset was converted to ash free dry weight (AFDW) by applying the appropriate standard corrections, as outlined in Eleftheriou and Basford (1989). Table 3.3 summarises the corrections applied.

Table 3.3: Macrofaunal standard biomass corrections by phyla

Phyla	Standard Biomass Correction [%]
Annelida	15.5
Arthropoda	22.5
Mollusca	8.5
Echinodermata	8.0
Other Taxa	15.5
Notes Standard biomass corrections to convert blotted wet weight to ash free dry weight, from Eleftheriou & Basford (1989)	

3.3.3 Seabed Habitats and Biotopes

A habitat assessment was completed by Fugro detailing the analysis of completed transects (Fugro, 2020a). This will be summarised and refined with consideration of grab sample analysis.

3.3.3.1 Seabed Habitat Classification

To assess the habitats present within the survey area, detailed analysis of video and still photographic data was undertaken, noting the locations of any observed changes in sediment type and/or associated faunal community.

Taxa were recorded to the lowest possible taxonomic level. It should be noted that many species cannot be identified from photographic data alone and, as such, higher taxonomic levels were used.

Descriptions of the substrate composition, corresponding to sediment changes, were undertaken to support the 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 as the latter differentiates between pebbles, cobbles and boulders. The Folk (1954) sediment classification was reclassified into four categories, namely 'coarse sediment', 'mixed sediment', 'mud and sandy mud' and 'sand and muddy sand' (Long, 2006). Further 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). These categories are defined by the proportions of mud (the 'fines' fraction), sand and gravel. For example, a description of 'muddy sand' defines sediments that have sand as the principle component (50 % to 90 %) with a secondary component of mud (10 % to 50 %) and < 5 % gravel (Kaskela et al., 2019). The EMODnet Geology Consortium further revised these categories to include an additional category 'Rock and Boulders' (Kaskela et al., 2019), which includes the Wentworth (1922) categories 'boulders' and 'cobbles'. The presence of shell fragments and evident anthropogenic features were also noted.

Table 3.4 presents a summary of the sediment particle sizes and corresponding classifications.

Table 3.4: Sediment particle size and classification terms

<table>
<tr><th>Particle Size</th><th>Wentworth (1922)</th><th>Folk (1954)</th><th colspan="4">Folk, 5 Classes (Kaskela et al., 2019)</th></tr>
<tr><td>> 256 mm</td><td>Boulder</td><td rowspan="6">Gravel</td><td colspan="4">Rock & Boulders</td></tr>
<tr><td>64 mm to 256 mm</td><td>Cobble</td></tr>
<tr><td>32 mm to < 64 mm</td><td rowspan="4">Pebbles</td><td rowspan="9">Coarse sediment:
(Gravel ≥ 80 %,
or
Gravel ≥ 5 % and
Sand ≥ 90 %)</td><td rowspan="10">Mixed sediment:
(Mud ≥ 10 % to 95 %
Sand < 90 %
Gravel ≥ 5%)</td><td rowspan="10">Mud to sandy mud*:
(Mud 10 % to 100 %
Sand < 90 %
Gravel < 5 %)</td><td rowspan="10">Sand:
(Mud < 10 %
Sand ≥ 90 %
Gravel < 5%)</td></tr>
<tr><td>16 mm to < 32 mm</td></tr>
<tr><td>8 mm to < 16 mm</td></tr>
<tr><td>4 mm to < 8 mm</td></tr>
<tr><td>2 mm to < 4 mm</td><td>Granules</td></tr>
<tr><td>1 mm to < 2 mm</td><td>Very coarse sand</td><td rowspan="5">Sand</td></tr>
<tr><td>0.5 mm to < 1 mm</td><td>Coarse sand</td></tr>
<tr><td>0.25 mm to < 0.5 mm</td><td>Medium sand</td></tr>
<tr><td>0.125 mm to < 0.25 mm</td><td>Fine sand</td></tr>
<tr><td>62.5 µm to 0.125 mm</td><td>Very fine sand</td></tr>
<tr><td>> 4 µm to 62.5 µm</td><td>Silt</td><td rowspan="2">Mud</td><td rowspan="2">-</td></tr>
<tr><td>> 1 µm to 4 µm</td><td>Clay</td></tr>
<tr><td colspan="7">Notes
* = Mud to sandy mud includes:
Mud (Mud ≥ 90 %, Sand <10 %, Gravel < 5%);
Sandy mud (Mud 50 % to 90 %, Sand 10 % to 50 %, Gravel < 5%);
Muddy sand (Mud 10 % to 50 %, Sand 50 % to 90 %, Gravel < 5%) (Kaskela et al., 2019)</td></tr>
</table>

Habitats within the survey area have been classified in accordance with the hierarchical EUNIS habitat classification (European Environment Agency [EEA], 2019), which has compiled habitat information from across Europe into a single database. Table 3.5 summarises the EUNIS hierarchy, with an example of the coding system. The equivalent classification from 'The Marine Habitat Classification for Britain and Ireland – Version 15.03' (JNCC, 2015) was also noted. The JNCC classification formed the basis of the marine section of the EUNIS habitat classification scheme (Davies & Moss, 2004), resulting in broad similarities, although there are some structural differences and habitat types. These classification systems are designed to incorporate small scale temporal variations (e.g. seasonal) into the biotope/habitat categories. However, biological communities and marine environments can be highly dynamic and temporally variable, therefore the biotopes and habitats identified by the current assessment are representative of the survey area at the time of sampling only.

Table 3.5: EUNIS biotope classification hierarchy example (EEA, 2019)

Level	Example Classification Name	Example Classification Code
1. Environment	Marine habitats	A
2. Broad habitat types	Sublittoral sediments	A5
3. Main habitats	Sublittoral sand	A5.2
4. Biotope complexes	Circalittoral muddy sand	A5.26
5 & 6. Biotopes and sub-biotopes	*Amphiura brachiata* with *Astropecten irregularis* and other echinoderms in circalittoral muddy sand	A5.262
Notes EUNIS = European Nature Information System European Environment Agency = EEA		

Classifications were assigned to each habitat type observed within the video and stills photography. Additional information from grab sampling, such as sediment particle size and macrofaunal communities, was used where applicable. Although, theoretically, a biotope can be assigned to any sized area of seabed, for the purposes of this assessment the commonly accepted minimum habitat size of 25 m^2 was adopted. For distinct areas of mixed habitats/biotopes (e.g. rock interspersed with coarse sediment) where the overall area was at least 25 m^2, biotope mosaics were considered (Parry, 2019).

3.3.3.2 Sensitive Habitats and Species Assessments

Following an initial review of video and photography data the presence of any sensitive habitat and species were assessed. Criteria set out by Irving (2009) and refined by Golding et al. (2020) were used to assess potential stony reefs in the survey area.

Refer to Appendix B for more detailed explanations.

4. Results

4.1 Field Operations

4.1.1 Bathymetry and Seabed Features

The water depth across the survey area generally increased towards the north-west, ranging between 2.8 m above LAT to 23.8 m below LAT. Most of the seabed within the survey area has been characterised by a relatively low SSS reflectivity, with numerous megaripples and sand waves. Areas of more homogeneous, medium reflectivity were also present within both the East A and B routes, as well as isolated patches of relatively higher reflectivity.

Seafloor sediments were found by the environmental camera transects and grab samples to mostly comprise sand, with varying proportions of gravel. Based on these findings, the lower reflectivity areas have been characterised as sand, the medium reflectivity areas as gravelly sand and the higher reflectivity areas as sandy gravel. During the survey operations it was observed that the sand waves were actively mobile and were migrating significantly in the time between adjacent geophysical survey lines (Fugro, 2020b).

4.1.2 Seabed Photography

Video and stills photographic data were successfully acquired at all twenty proposed stations and along all three proposed transects. Due to poor visibility on transects E_TR02 and E_TR03, these transects were re-run as transect E_TR02 (2) and E_TR03 (2). Due to tidal conditions, the direction of the vessel was changed during data acquisition at stations E_ST16 and E_ST20. Waypoints indicating the point of change in direction have therefore been presented (Table 4.1).

Due to the potential presence of the Annex I ‘stony reef’ habitat, additional parallel transects positioned 50 m north and 50 m south of the original location were undertaken at stations E_ST05, E_ST06, E_ST08 and transects E_TR01, E_TR02 and E_TR03.

Figure 4.1 spatially displays the completed survey locations overlaid on bathymetric data.

Table 4.1: Completed transects, East A and B

Geodetic Parameters: ED50, UTM Zone 31N, CM 3°E [m]						
Transect		Easting	Northing	Depth [m BSL]	Length [m]	Data Acquisition
Drop-down Stations						
E_ST01	SOL	451 777.5	5 919 639.6	24	51	3 min 14 sec 5 stills
	EOL	451 820.4	5 919 611.7	24		
E_ST02	SOL	453 617.3	5 920 359.4	24	54	3 min 34 sec 5 stills
	EOL	453 669.5	5 920 345.4	24		
E_ST03	SOL	454 452.1	5 921 001.3	22	51	3 min 9 sec 5 stills
	EOL	454 501.8	5 920 988.6	22		
E_ST04	SOL	454 429.3	5 919 458.9	23	54	2 min 47 sec 5 stills
	EOL	454 476.7	5 919 433.0	23		
E_ST05	SOL	454 592.3	5 918 518.7	18	251	11 min 50 sec 19 stills
	EOL	454 842.8	5 918 510.4	18		
E_ST06	SOL	456 040.5	5 918 840.9	16	172	9 min 31 sec 17 stills
	EOL	456 212.9	5 918 835.8	16		
E_ST07	SOL	457 529.8	5 918 038.8	15	41	4 min 27 sec 7 stills
	EOL	457 562.2	5 918 014.0	15		
E_ST08	SOL	458 082.1	5 917 188.6	14	142	7 min 33 sec 17 stills
	EOL	457 965.5	5 917 269.9	14		
E_ST09	SOL	459 278.2	5 917 022.8	17	54	2 min 35 sec 5 stills
	EOL	459 224.7	5 917 028.2	17		
E_ST10	SOL	460 219.2	5 916 473.4	15	65	3 min 3 sec 6 stills
	EOL	460 155.7	5 916 485.7	15		
E_ST11	SOL	461 621.4	5 916 070.2	16	60	3 min 3 sec 5 stills
	EOL	461 563.4	5 916 084.2	16		
E_ST12	SOL	461 678.9	5 914 555.3	15	126	5 min 9 sec 9 stills
	EOL	461 555.9	5 914 528.4	15		
E_ST13	SOL	463 100.5	5 913 060.4	11	57	3 min 0 sec 5 stills
	EOL	463 048.3	5 913 083.8	11		
E_ST14	SOL	465 116.5	5 911 421.6	9	53	3 min 27 sec 5 stills
	EOL	465 066.6	5 911 438.5	9		

Geodetic Parameters: ED50, UTM Zone 31N, CM 3°E [m]						
Transect		Easting	Northing	Depth [m BSL]	Length [m]	Data Acquisition
E_ST15	SOL	466 836.5	5 911 100.7	8	67	3 min 52 sec 5 stills
	EOL	466 770.9	5 911 087.2	8		
E_ST16	SOL	468 591.8	5 910 705.4	9	104*	11 min 22 sec 5 stills
	WP	468 559.6	5 910 734.4	9		
	WP	468 550.1	5 910 729.3	9		
	WP	468 546.2	5 910 709.3	9		
	WP	468 557.5	5 910 720.8	9		
	EOL	468 545.2	5 910 714.4	9		
E_ST17	SOL	461 125.2	5 912 363.0	7	56	4 min 53 sec 6 stills
	EOL	461 171.8	5 912 393.8	7		
E_ST18	SOL	461 306.0	5 910 359.9	8	64	5 min 50 sec 5 stills
	EOL	461 356.7	5 910 399.1	8		
E_ST19	SOL	461 581.7	5 908 687.1	9	65	4 min 51 sec 5 stills
	EOL	461 635.6	5 908 722.9	9		
E_ST20	SOL	461 902.0	5 907 552.1	9	108*	10 min 29 sec 6 stills
	WP	461 941.0	5 907 582.1	9		
	WP	461 925.7	5 907 551.1	9		
	EOL	461 926.8	5 907 563.3	9		
Additional Transects						
E_ST05 S	SOL	454 729.0	5 918 454.7	17	132	5 min 42 sec 9 stills
	EOL	454 597.0	5 918 460.3	17		
E_ST05 N	SOL	454 743.8	5 918 547.6	17	144	7 min 43 sec 10 stills
	EOL	454 601.0	5 918 564.8	17		
E_ST06 S	SOL	456 130.6	5 918 773.1	16	107	4 min 43 sec 10 stills
	EOL	456 023.4	5 918 769.3	16		
E_ST06 N	SOL	456 122.4	5 918 881.2	16	95	4 min 23 sec 8 stills
	EOL	456 027.9	5 918 886.1	16		
E_ST08 S	SOL	458 055.0	5 917 136.5	14	76	4 min 41 sec 7 stills
	EOL	457 980.8	5 917 152.7	14		
E_ST08 N	SOL	458 089.0	5 917 229.9	14	89	4 min 31 sec 8 stills
	EOL	458 006.3	5 917 256.8	14		

Geodetic Parameters: ED50, UTM Zone 31N, CM 3°E [m]						
Transect		Easting	Northing	Depth [m BSL]	Length [m]	Data Acquisition
E_TR01	SOL	455 364.1	5 919 293.0	21	138	7 min 12 sec 14 stills
	EOL	455 501.3	5 919 280.8	21		
E_TR01 S	SOL	455 484.9	5 919 220.0	20	114	5 min 54 sec 8 stills
	EOL	455 371.8	5 919 237.4	20		
E_TR01 N	SOL	455 491.9	5 919 323.8	20	109	4 min 40 sec 7 stills
	EOL	455 383.5	5 919 333.9	20		
E_TR02 (2)	SOL	455 328.9	5 918 036.5	14	124	7 min 16 sec 10 stills
	EOL	455 443.1	5 918 084.1	14		
E_TR02 S	SOL	455 354.5	5 917 997.3	15	109	4 min 45 sec 12 stills
	EOL	455 457.0	5 918 035.5	15		
E_TR02 N	SOL	455 307.0	5 918 089.1	15	122	4 min 45 sec 9 stills
	EOL	455 420.5	5 918 134.9	15		
E_TR03 (2)	SOL	455 611.0	5 919 045.3	16	122	8 min 55 sec 10 stills
	EOL	455 728.0	5 919 071.3	16		
E_TR03 S	SOL	455 745.4	5 919 003.9	18	124	6 min 56 sec 11 stills
	EOL	455 621.7	5 918 991.8	18		
E_TR03 N	SOL	455 732.5	5 919 112.0	18	120	6 min 58 sec 11 stills
	EOL	455 613.9	5 919 092.2	18		

Notes
Coordinates taken from manual fixes.
BSL = Below sea level
SOL = Start of line
EOL = End of line
WP = Waypoint
* = Direction of transect changed during data acquisition, the total distance is therefore calculated as the distance travelled rather than the distance between the recorded SOL and EOL

4.1.3 Seabed Sampling

A complete suite of grab samples (one macrofauna with one PSD sub-sample) was retained at 20 of the 25 proposed stations. Macrofauna and PSD sub-samples were not successfully acquired from stations E_ST05, E_ST06, E_ST08, E_ST10 and E_ST17. This was due to the presence of coarse substrate, including cobbles and boulders, at these stations. A complete suite of chemistry samples was proposed at ten stations and retained at eight stations. Chemistry samples were not successfully acquired at stations E_ST07, E_ST11, E_ST17, E_ST22

and E_ST25 (Table 4.2), due to the presence of coarse substrate. As such, additional chemistry samples were collected at stations E_ST09, E_ST18 and E_ST23.

Table 4.2: Completed sediment sampling stations, East A and B

Geodetic Parameters: ED50, UTM Zone 31N, CM 3°E [m]				
Station	Easting	Northing	Depth [m BSL]	Sample Acquisition
E_ST01	451 792.6	5 919 630.8	27	FA, PSD
E_ST02	453 639.6	5 920 354.6	28	FA, PSD
E_ST03	454 478.3	5 920 997.2	25	FA, PSD
E_ST04	454 462.5	5 919 456.4	27	FA, PSD, CS
E_ST07	457 534.8	5 918 016.6	20	FA, PSD
E_ST09	459 244.4	5 917 033.1	17	FA, PSD, CS
E_ST11	461 594.8	5 916 086.7	15	FA, PSD
E_ST12	461 623.1	5 914 550.7	13	FA, PSD
E_ST13	463 076.2	5 913 047.1	10	FA, PSD, CS
E_ST14	465 084.2	5 911 434.1	6	FA, PSD
E_ST15	466 808.3	5 911 101.3	6	FA, PSD, CS
E_ST16	468 569.3	5 910 715.2	6	FA, PSD, CS
E_ST18	461 608.7	5 908 686.6	7	FA, PSD, CS
E_ST19	461 926.1	5 907 560.3	9	FA, PSD,
E_ST20	459 981.6	5 915 163.2	9	FA, PSD, CS
E_ST21	464 039.1	5 912 301.8	13	FA, PSD
E_ST22	461 359.6	5 913 498.7	8	FA, PSD
E_ST23	460 899.7	5 914 634.2	10	FA, PSD, CS
E_ST24	460 932.3	5 911 318.3	12	FA, PSD
E_ST25	451 792.6	5 919 630.8	9	FA, PSD

Notes
BSL = Below sea level
PSD = Particle size distribution subsample
FA = Faunal sample
CS = Chemistry sample

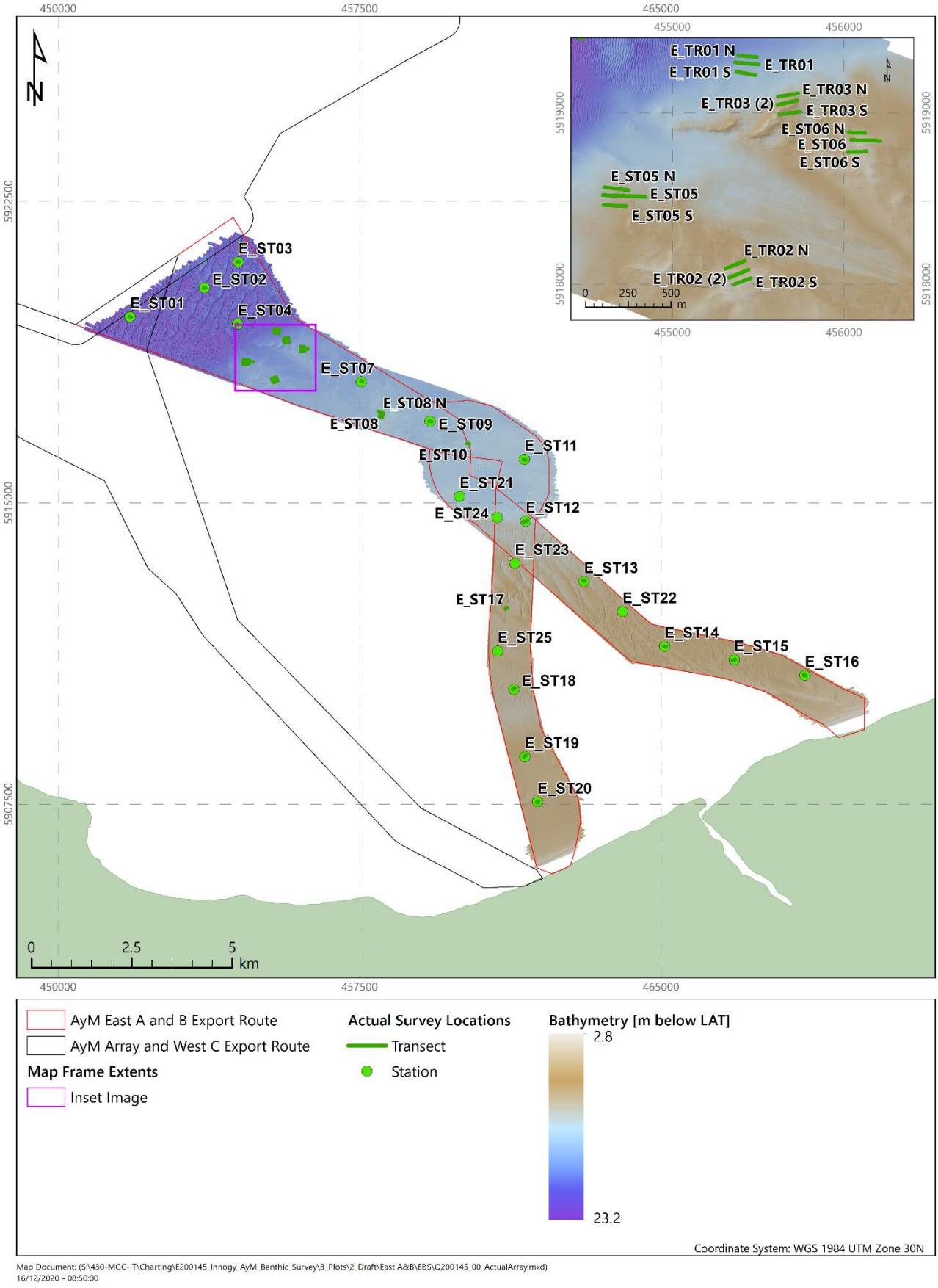


Figure 4.1: Completed survey locations overlaid on bathymetry, East A and B

4.2 Sediment Characterisation

4.2.1.1 Univariate Analysis

Table 4.3 presents a summary of sediment composition and Table 4.4 provides more detailed granulometric data. Appendix B provides full details of the analytical techniques employed and Appendix D displays the histograms of particle size class for each station.

When fractional composition was considered, sand was the dominant fraction of the sediment at the majority of stations, with the exception of stations E_ST07,E_ST21, E_ST22 and E_ST25 where gravel was the dominant fraction (Table 4.3 and Figure 4.2). Mud content was low at all stations except for stations E_ST11 and E_ST12. The Folk descriptions classify sediment by the relative proportion of sediment fractions (gravel, sand and fines). When the BGS modified Folk description was considered, eleven stations were described as sand, one as gravelly sand, two as gravelly muddy sand, five as sandy gravel and one as gravel.

Table 4.4 presents particle size statistics (Folk & Ward) for each station. The modality (or modal distribution) describes the number of peaks within the particle size frequency distribution. Within the current survey, unimodal distributions were observed at twelve out of the twenty stations, with bimodal distributions recorded at four stations and polymodal distributions observed at four stations.

The mean particle size (µm) ranged from 194 µm at station E_ST12 to 11 555 µm at station E_ST07 (mean 2116 m). Figure 4.3 presents the mean particle size (µm) spatially across the survey area and showed that generally higher mean particle size was associated with the sediments towards the centre of the route.

The Wentworth description, assigned from mean particle size, categorised 11 out of the 20 stations sampled as medium sand. Station E_ST12 was categorised as fine sand, stations E_ST03 and E_ST19 were categorised as coarse sand, stations E_ST11 and E_ST24 were categorised as very coarse sand, station E_ST12 was categorised as granule, stations E_ST21 and E_ST22 were categorised as fine pebble and stations E_ST07 and E_ST25 were categorised as medium pebble.

The sorting coefficient of particle size indicates the degree of spread of individual size classes about the mean and provides the basis of a sorting index, in which low values indicate sediments to be fairly homogeneous (well sorted) while high values suggest a relatively large scatter of particle sizes about the mean (poorly sorted). Across the survey area four stations were described as well sorted, six stations described as moderately well sorted, one station as moderately sorted, one station as poorly sorted, seven stations as very poorly sorted and one station as extremely poorly sorted.

Skewness indicates the tendency of particle size classes to be skewed about the mean, either towards finer sediment (negatively skewed) or coarser sediment (positively skewed). Skewness ranged from -0.95 µm (very fine skewed) at station E_ST07 to 0.60 µm at station E_ST24 (very coarse skewed), with most stations being described as symmetrical.

Table 4.3: Summary of sediment characteristics, East A and B

Station	Fractional Composition			Fines		Folk Description (BGS modified)
	Gravel [%]	Sand [%]	Fines [%]	Silt [%]	Clay [%]	
E_ST01	3.85	96.15	0.00	0.00	0.00	Sand
E_ST02	11.87	86.42	1.70	1.47	0.23	Gravelly sand
E_ST03	2.50	97.50	0.00	0.00	0.00	Sand
E_ST04	0.44	99.56	0.00	0.00	0.00	Sand
E_ST07	77.11	20.61	2.28	1.65	0.63	Sandy gravel
E_ST09	48.58	51.42	0.00	0.00	0.00	Sandy gravel
E_ST11	29.17	59.51	11.32	7.95	3.37	Gravelly muddy sand
E_ST12	16.65	54.18	29.17	18.89	10.28	Gravelly muddy sand
E_ST13	0.00	100.00	0.00	0.00	0.00	Sand
E_ST14	0.03	99.97	0.00	0.00	0.00	Sand
E_ST15	1.12	98.88	0.00	0.00	0.00	Sand
E_ST16	1.00	99.00	0.00	0.00	0.00	Sand
E_ST18	0.16	99.84	0.00	0.00	0.00	Sand
E_ST19	4.00	96.00	0.00	0.00	0.00	Sand
E_ST20	0.43	99.57	0.00	0.00	0.00	Sand
E_ST21	68.95	30.67	0.38	0.30	0.08	Sandy gravel
E_ST22	59.24	40.76	0.00	0.00	0.00	Sandy gravel
E_ST23	1.43	98.57	0.00	0.00	0.00	Sand
E_ST24	39.29	60.47	0.24	0.20	0.04	Sandy gravel
E_ST25	80.15	19.67	0.18	0.16	0.02	Gravel
Minimum	**0.00**	**19.67**	**0.00**	**0.00**	**0.00**	-
Maximum	**80.15**	**100.00**	**29.17**	**18.89**	**10.28**	
Median	**3.92**	**96.08**	**0.00**	**0.00**	**0.00**	
Mean	**22.30**	**75.44**	**2.26**	**1.53**	**0.73**	
SD	**28.93**	**29.82**	**6.83**	**4.46**	**2.37**	
RSD [%]	**130**	**40**	**301**	**291**	**323**	

Notes

TOM = Total organic matter
TOC = Total organic carbon
Fines = silt and clay content
Silt = +4.0 to +8.0 ø units or 3.9 µm to 62.5 µm
Clay = +8.0 to +10.0 ø units or 0.98 µm to 3.9 µm
BGS = British Geological Survey
SD = Standard deviation
RSD = Relative standard deviation

Table 4.4: Summary of particle size distribution, East A and B

Station	Modality	D10 [µm]	Median [µm]*	D90 [µm]	Mean Particle Size			Sorting Coefficient		Skewness	
					[µm]*	[phi]*	Wentworth (1922) Description	[µm]*	Description†	[µm]*	Description†
E_ST01	Unimodal	301	472	803	479	1.06	Medium sand	1.48	Moderately well sorted	0.15	Coarse skewed
E_ST02	Bimodal	183	417	6587	428	1.22	Medium sand	2.86	Poorly sorted	0.29	Coarse skewed
E_ST03	Unimodal	368	576	911	575	0.80	Coarse sand	1.42	Moderately well sorted	-0.02	Symmetrical
E_ST04	Unimodal	294	442	662	447	1.16	Medium sand	1.35	Well sorted	0.01	Symmetrical
E_ST07	Unimodal	422	45088	58923	11555	-3.53	Medium pebble	6.98	Very poorly sorted	-0.89	Very fine skewed
E_ST09	Polymodal	353	1426	25246	2294	-1.20	Granule	5.44	Very poorly sorted	0.33	Very coarse skewed
E_ST11	Polymodal	41	522	20587	1073	-0.10	Very coarse sand	9.30	Very poorly sorted	0.25	Coarse skewed
E_ST12	Polymodal	4	427	6698	194	2.37	Fine sand	16.21	Extremely poorly sorted	-0.32	Very fine skewed
E_ST13	Unimodal	230	345	503	347	1.53	Medium sand	1.38	Well sorted	0.02	Symmetrical
E_ST14	Unimodal	256	375	563	369	1.44	Medium sand	1.37	Well sorted	-0.04	Symmetrical
E_ST15	Unimodal	223	330	486	336	1.57	Medium sand	1.36	Well sorted	0.07	Symmetrical
E_ST16	Unimodal	190	300	478	301	1.73	Medium sand	1.44	Moderately well sorted	0.04	Symmetrical
E_ST18	Unimodal	220	349	554	350	1.51	Medium sand	1.41	Moderately well sorted	0.02	Symmetrical
E_ST19	Unimodal	231	554	1298	542	0.88	Coarse sand	1.97	Moderately sorted	0.01	Symmetrical
E_ST20	Unimodal	190	313	509	312	1.68	Medium sand	1.48	Moderately well sorted	0.03	Symmetrical
E_ST21	Bimodal	356	10937	27788	5028	-2.33	Fine pebble	5.59	Very poorly sorted	-0.58	Very fine skewed
E_ST22	Bimodal	275	16335	35812	5460	-2.45	Fine pebble	6.88	Very poorly sorted	-0.68	Very fine skewed
E_ST23	Unimodal	233	370	613	372	1.43	Medium sand	1.44	Moderately well sorted	0.01	Symmetrical
E_ST24	Polymodal	277	629	17626	1343	-0.43	Very coarse sand	4.85	Very poorly sorted	0.60	Very coarse skewed
E_ST25	Bimodal	1151	22512	35725	10521	-3.40	Medium pebble	4.02	Very poorly sorted	-0.75	Very fine skewed
Minimum	-	**4**	**300**	**478**	**194**	**-3.53**	-	**1.35**	-	**-0.89**	-
Maximum		**1151**	**45088**	**58923**	**11555**	**2.37**		**16.21**		**0.60**	
Median		**244**	**457**	**1104**	**463**	**1.11**		**1.73**		**0.01**	
Mean		**290**	**5136**	**12119**	**2116**	**0.25**		**3.91**		**-0.07**	
SD		**226**	**11247**	**16751**	**3403**	**1.83**		**3.78**		**0.38**	
RSD		**78**	**219**	**138**	**161**	**-**		**97**		**-**	

Notes
SD = Standard deviation RSD = Relative standard deviation D10 [µm] = 10th percentile of particle size D90 [µm] = 90th percentile of particle size
* = Folk & Ward (1957) method (Gradistat statistics) † = Sorting and skewness based on geometric Folk & Ward (1957) graphical measures (Gradistat statistics)

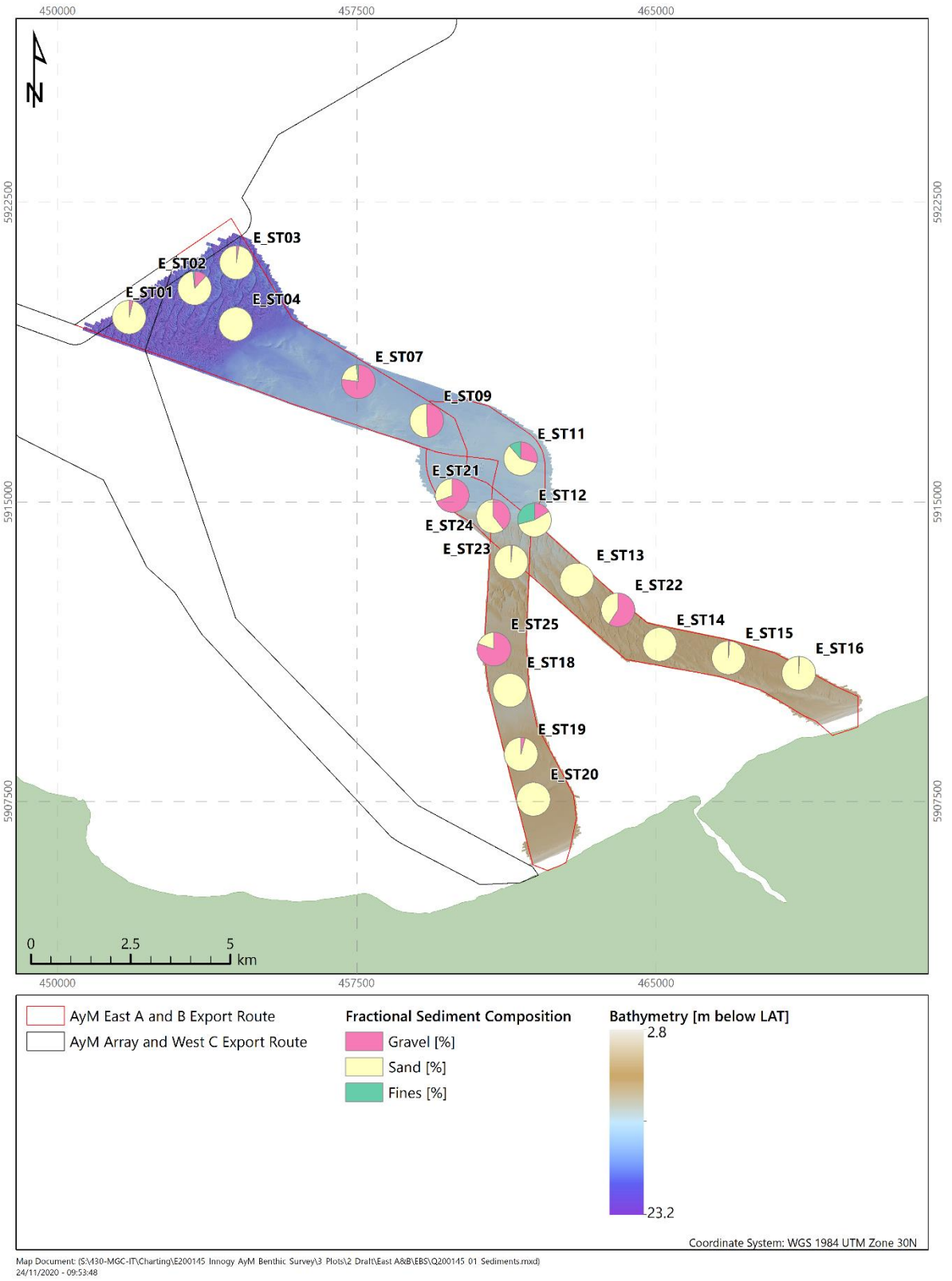


Figure 4.2: Sediment fractional composition overlaid on bathymetry, East A and B

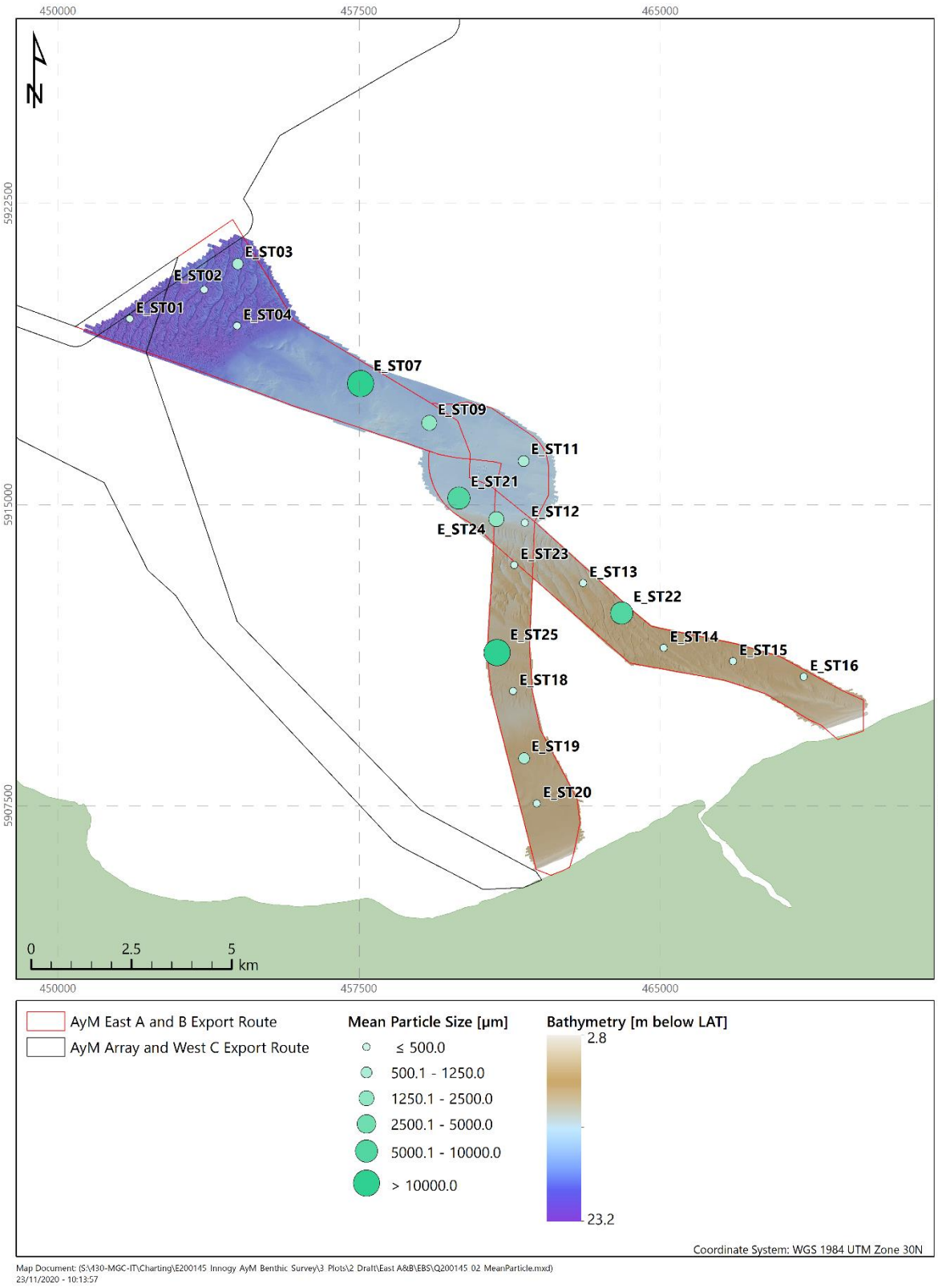


Figure 4.3: Sediment mean particle size (µm) overlaid on bathymetry, East A and B

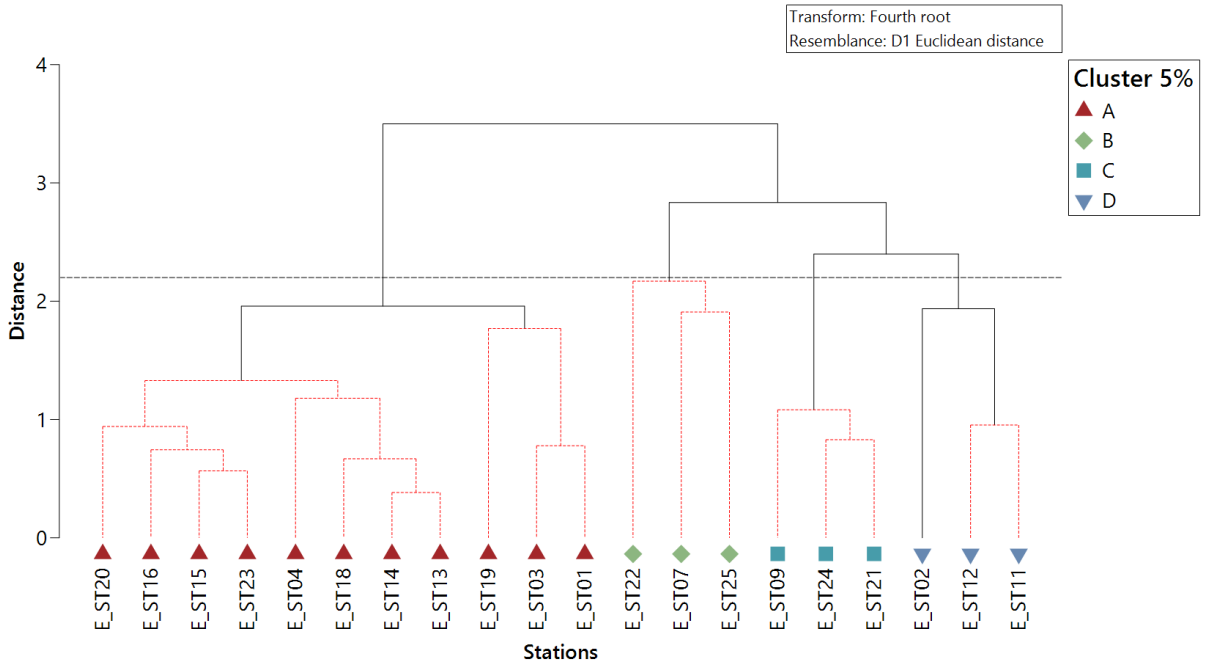
4.2.1.2 Investigation of Granular Similarities

4.2.1.2.1 Cluster Analysis

In PRIMER, the 'Cluster' algorithm was used to group samples according to their similarity. Figure 4.4 presents the dendrogram for fourth root transformed sample data. The 'SIMPROF' algorithm was used to identify statistically significant (P = 0.05) differences between samples, with significant splits depicted as black lines and non-significant splits as red lines. Statistically significant splits may not be ecologically significant (Clarke et al., 2008), with ecological significance considered in subsequent sections of this report.

The 'SIMPROF' analysis (P ≤ 0.05) identified five clusters and one ungrouped station. When fractional data were examined this appeared to have over-differentiated the stations, so, a slice was positioned on the dendrogram (Euclidean distance of 2.2) to differentiate four larger, statistically significant clusters:

- Cluster A comprised eleven stations grouped together with an average squared distance of 1.28;
- Cluster B comprised three stations grouped together with an average squared distance of 2.17;
- Cluster C comprised three stations grouped together with an average squared distance of 0.51;
- Cluster D comprised three stations grouped together with an average squared distance of 1.43



Notes
Slice at 2.2 Euclidean distance

Figure 4.4: Dendrogram of hierarchical clustering of sediment characteristics data, East A and B

Table 4.5 summarises the mean physical characteristics of the sediment clusters identified in the multivariate analysis. Figure 4.5 spatially presents the sediment clusters identified in multivariate analysis overlaid on the SSS mosaic. Sand is the common fraction between clusters A and D, with the stations in cluster D containing more gravel (mean 19.23 %) than cluster A (mean 1.36 %). Clusters B and C are similar; cluster B has the highest mean gravel content of all the clusters (72.17 %), followed by cluster C (mean 52.27 %). Cluster C has a higher sand fraction compared to cluster B.

Table 4.5: Summary of physical characteristics of sediment groups identified in multivariate analysis, East A and B

Sediment Group	Stations	Depth* [m]	Mean Particle Size* [µm]	Fractional Composition [%]			Folk Description (BGS modified)†
				Gravel*	Sand*	Fines*	
A [▲]	E_ST01, E_ST03, E_ST04, E_ST13- 16 E_ST18-20 E_ST23	14 ± 8.49	403 ± 94	1.36 ± 1.46	98.64 ±1.46	0.00 ±0.00	Sand
B [♦]	E_ST07, E_ST22, E_ST25,	19 ± 8.54	9179 ± 3262	72.17 ± 11.29	27.01 ±11.91	0.82 ±1.27	Sandy gravel to gravel
C [■]	E_ST09, E_ST21, E_ST24,	11 ± 4.93	2888 ± 1913	52.27 ± 15.17	47.52 ± 15.27	0.21 ±0.91	Sandy gravel
D [▼]	E_ST02, E_ST11, E_ST12,	19 ± 8.14	565 ± 455	19.23 ± 8.93	66.70 ± 17.28	14.07 ± 13.9	Gravelly sand to gravelly muddy sand

Notes
* = Mean ± standard deviation within each sediment group
† = Range of Folk descriptions (BGS modified) within each group

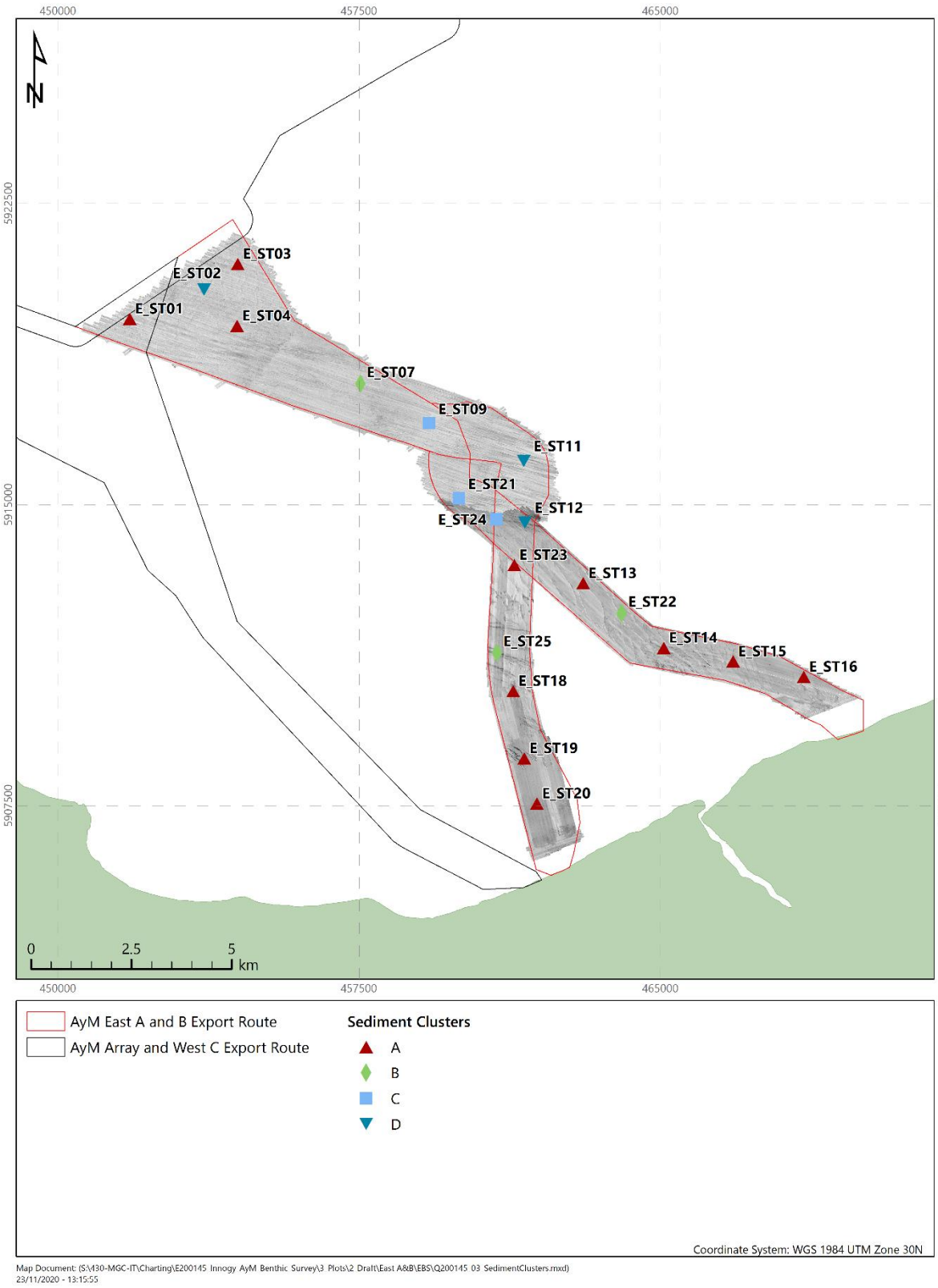


Figure 4.5: Sediment groups identified in multivariate analysis overlaid on a side scan sonar mosaic, East A and B

4.2.1.2.2 Principal Components Analysis (PCA)

Figure 4.6 presents a PCA ordination plot of the percentage of the sediment that comprised each area sediment fraction used to identify the sediment fractions driving the variability of the sediment composition across the survey. The first two components accounted for 86.6 % of the variation, with the percentage of medium sand contributing the highest degree of variation along PC1 and the percentage of coarse sand contributing the highest degree of variation along PC2. The PCA analysis supports the results of the cluster analysis and demonstrates that the main differences between the clusters are due to differences in the relative proportions of sand and coarser sediment fractions.

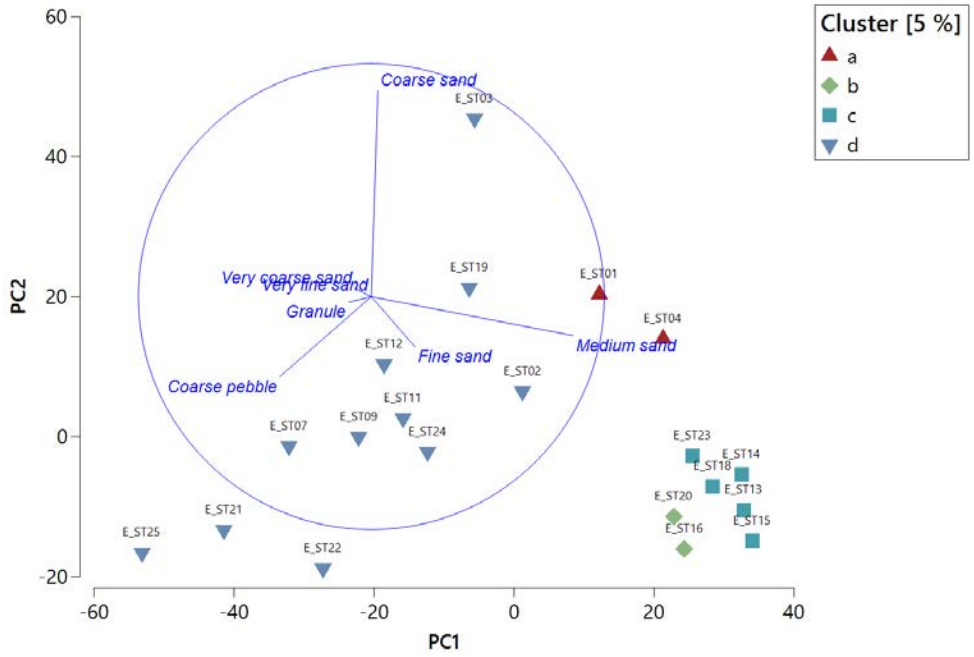


Figure 4.6: PCA ordination of particle sizes (µm)/fractional composition (%), East A and B

4.3 Sediment Hydrocarbons

4.3.1.1 Sediment Aromatic Hydrocarbon Content

The distribution and concentration of aromatic compounds in seabed sediments were analysed by GC-MS. The aromatic compounds quantified were the naphthalenes (2 ring aromatics), 3 to 6 ring PAHs and the dibenzothiophenes (sulphur containing heteroaromatics). Table 4.6 summarises the total concentrations of aromatic hydrocarbons, including the US EPA 16 PAH and naphthalenes, phenanthrenes/anthracenes and dibenzothiophenes (NPD).

Appendix E.1. presents the US EPA 16 PAH concentrations across the East A and B survey area with the individual aromatic hydrocarbons and their alkyl homologue concentrations presented in Appendix E.2, including threshold values where available.

Total 2 to 6 ring PAHs, total US EPA 16 PAHs and total NPDs are calculated as the sum of individual PAHs, some of which were less than the minimum reporting value (MRV). Consequently, the total concentration is assigned as a less than value. However, the concentrations of the individual PAHs that were less than the MRV are unlikely to significantly influence the total concentrations. Therefore, for the purposes of this report, total 2 to 6 ring PAH concentrations, total US EPA 16 PAH concentrations and total NPDs are treated as absolute values to provide comparison between stations and with regional datasets.

Total 2 to 6 ring PAH concentrations ranged from < 0.099 µg/g at station E_ST13 to 0.172 µg/g at station E_ST04 with a mean of 0.0420 µg/g. Total 2 to 6 ring PAH concentrations were lower than the median concentration reported from the SEA6 Irish Sea surveys (0.0237 µg/g; Cefas, 2005) at all stations, except for stations E_ST04, E_ST16 and E_ST20.

Total US EPA 16 PAH concentrations ranged from < 3.5 ng/g at station E_ST13 to 49.6 ng/g at station E_ST04 with a mean of 13.5 ng/g. All individual PAH concentrations were below their respective ERL values (Appendix E.1).

The proportion of petrogenically derived NPD to total 2 to 6 ring PAH material ranged from < 21 % at station E_ST15 to 40 % at station E_ST04 with a mean of 27.2 %.

Table 4.6: Summary of sediment aromatic hydrocarbon analysis, East A and B

Station	Total 2 to 6 Ring PAH*	Total US EPA 16 PAH†	NPD	
			Total*	[%]
E_ST04	0.172	49.6	0.0686	40
E_ST09	< 0.0133	< 4.3	< 0.0038	< 29
E_ST13	< 0.099	< 3.5	< 0.0022	< 22
E_ST15	< 0.0110	< 4.0	< 0.0023	< 21
E_ST16	0.0457	< 16.6	0.0121	26
E_ST18	< 0.0197	< 7.4	< 0.0044	< 22
E_ST20	0.0536	< 18.9	0.0169	32
E_ST23	< 0.0107	< 3.8	< 0.0028	< 26
Minimum	**< 0.099**	**< 3.5**	**< 0.0022**	**< 21**
Maximum	**0.172**	**49.6**	**0.0686**	**40**
Median	**0.0165**	**5.8**	**0.0041**	**26**
Mean	**0.0420**	**13.5**	**0.0141**	**27**
SD	**0.0552**	**15.8**	**0.0226**	**6.4**
RSD [%]	**131**	**117**	**160**	**23**
(Irish Sea) (Cefas, 2005)‡				
Mean	**0.0237**	-	-	-

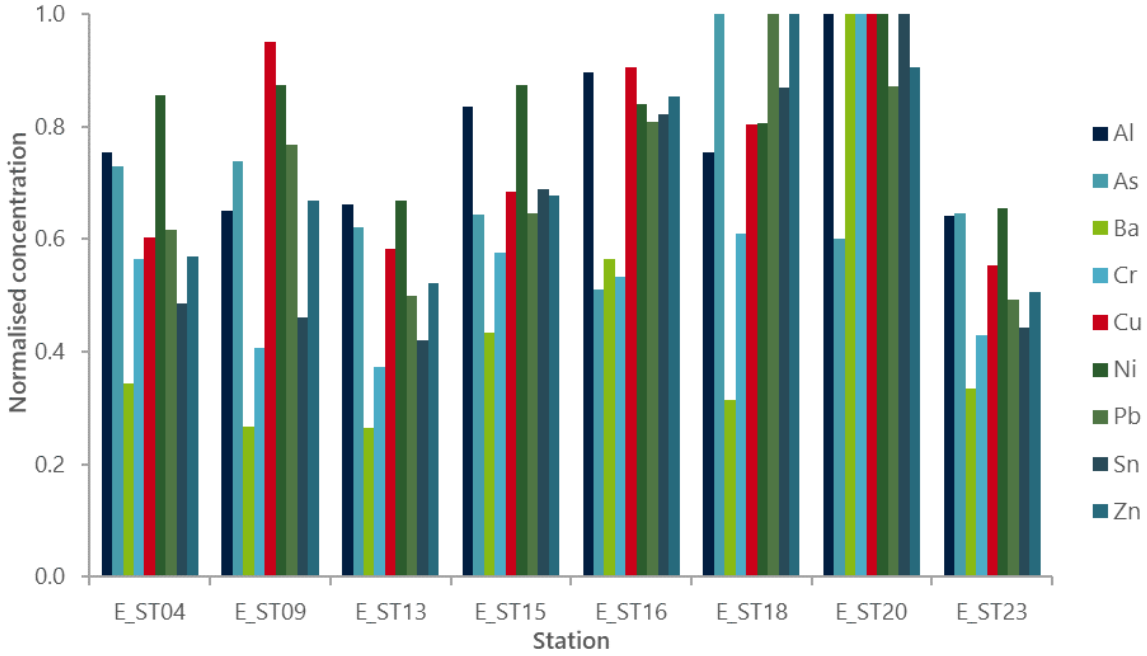
Notes
For the summary statistics, less than values have been considered as absolute values
Total 2 to 6 ring PAH = Total 2 to 6 ring polycyclic aromatic hydrocarbons (PAH), including alkyl homologues
Total US EPA 16 PAH = Total United States Environmental Protection Agency's 16 (US EPA PAH) polycyclic aromatic hydrocarbons
Total NPD = Total naphthalene, phenanthrene/anthracene and dibenzothiophene
NPD [%] = Percentage of total 2 to 6 ring PAH concentration comprised of NPD
RSD = Relative standard deviation
SD = Standard deviation
* = Concentrations expressed as µg/g of dry sediment
† = Concentrations expressed as ng/g of dry sediment
‡ = Value taken from site 715 (Liverpool Bay) from the Strategic Environmental Assessment 6 (SEA6) review of the Irish Sea (Cefas, 2005)

4.4 Sediment Metals

Table 4.7 summarises the concentrations of the extractable metals in the sediment samples from an aqua regia digest.

All metals concentrations were less than their respective Cefas guideline action levels (AL1 and AL2) and OSPAR ERL values.

The overall trend in individual metals concentrations is presented Figure 4.7, and is assessed by comparing the maximum normalised elemental concentrations. Normalising the elemental data for the sediment samples to the highest concentration for each element, the highest concentrations of most metals was observed at station E_ST20. Slightly higher metals concentrations can be found at those stations closer to land.



Notes

Al = Aluminium As = Arsenic Ba = Barium Cr = Chromium Cu = Copper
Ni = Nickel Pb = Lead Sn = Tin Zn = Zinc

Figure 4.7: Relative (maximum normalised) elemental concentrations in sediments, East A and B

Table 4.7: Summary of sediment metals analysis, East A and B

Station	Al	As	Ba	Cd	Cr	Cu	Hg	Ni	Pb	Sn	Zn
E_ST04	2250	8.31	7.90	< 0.0800	8.19	1.20	< 0.0400	4.30	5.01	0.224	14.3
E_ST09	1940	8.42	6.12	< 0.0800	5.88	1.89	< 0.0400	4.39	6.23	0.213	16.8
E_ST13	1970	7.07	6.06	< 0.0800	5.40	1.16	< 0.0400	3.36	4.05	0.194	13.1
E_ST15	2490	7.34	9.97	< 0.0800	8.36	1.36	< 0.0400	4.40	5.25	0.318	17.0
E_ST16	2670	5.82	13.0	< 0.0800	7.73	1.80	< 0.0400	4.22	6.57	0.380	21.4
E_ST18	2250	11.4	7.24	< 0.0800	8.85	1.60	< 0.0400	4.05	8.12	0.402	25.1
E_ST20	2980	6.84	23.0	< 0.0800	14.5	1.99	< 0.0400	5.03	7.08	0.462	22.7
E_ST23	1910	7.36	7.70	< 0.0800	6.22	1.10	< 0.0400	3.29	4.00	0.205	12.7
Minimum	**1910**	**5.82**	**6.06**	**< 0.0800**	**5.40**	**1.10**	**< 0.0400**	**3.29**	**4.00**	**0.194**	**12.7**
Maximum	**2980**	**11.4**	**23.0**	**< 0.0800**	**14.5**	**1.99**	**< 0.0400**	**5.03**	**8.12**	**0.462**	**25.1**
Median	**2250**	**7.35**	**7.80**	**-**	**7.96**	**1.48**	**-**	**4.26**	**5.74**	**0.271**	**16.9**
Mean	**2310**	**7.82**	**10.1**	**-**	**8.14**	**1.51**	**-**	**4.13**	**5.79**	**0.300**	**17.9**
SD	**384**	**1.66**	**5.68**	**-**	**2.86**	**0.354**	**-**	**0.572**	**1.46**	**0.105**	**4.66**
RSD [%]	**17**	**21**	**56**	**-**	**35**	**23**	**-**	**14**	**25**	**35**	**26**
Cefas Guideline Action Levels											
AL1	**-**	**20**	**-**	**0.4**	**40**	**40**	**0.3**	**20**	**50**	**-**	**130**
AL2	**-**	**100**	**-**	**5**	**400**	**400**	**3**	**200**	**500**	**-**	**800**
CEMP Assessment Criteria (OSPAR, 2014)											
ERL	**-**	**-**	**-**	**1.20**	**81.0**	**34.0**	**0.150**	**-**	**47.0**	**-**	**150**

Notes

Concentrations expressed in µg/g dry sediment

Al = Aluminium; As = Arsenic; Ba = Barium; Cd = Cadmium; Cr = Chromium; Cu = Copper

Hg = Mercury; Ni = Nickel; Pb = Lead; Sn = Tin; Zn = Zinc

RSD = Relative standard deviation; Cefas = Centre for Environment, Fisheries and Aquaculture Science

AL1 = Action level 1; AL2 = Action level 2

CEMP = Coordinated Environmental Monitoring Programme; OSPAR = Oslo and Paris Commission

ERL = Effects range low

Key:	Below ERL	Above ERL

4.5 Sediment Macrofauna

4.5.1 Infaunal and Solitary Epifauna

4.5.1.1 Phyletic Composition

Appendix F provides a full list of taxa identified and enumerated (individuals per 0.1 m^2) from the survey area.

A total of 149 taxa and 1290 individuals were identified within grab samples from the survey area. Of these taxa, 40 were recorded as juveniles, pelagic, colonial or solitary epifauna. To represent the permanent macrofaunal community and to avoid spurious enhancement of the species list, the dataset was rationalised and these taxa were removed prior to statistical analysis (Appendix F). Records of several indeterminable specimens were also merged with those of identifiable taxa.

Table 4.8 summarises the abundance of taxonomic groups identified within the rationalised dataset across the survey area and Figures 4.8 and 4.9 display the data graphically.

The rationalised data comprised 109 benthic taxa, of which 53 (48.6 %) were annelids, 27 (24.8 %) were arthropods, 18 (16.5 %) molluscs, 5 (4.6 %) echinoderms and 6 (5.5 %) were other phyla (specifically Cnidaria and Sipuncula). A total of 1205 individuals were identified in the rationalised data, of which 537 (44.6 %) were annelids, 276 (22.9 %) were arthropods, 180 (14.9 %) were molluscs, 14 (1.2 %) were echinoderms and 198 (16.4 %) were other phyla (Table 4.8).

Table 4.8: Taxonomic groups of macrofauna, East A and B

Taxonomic Group	Number of Taxa	Composition of Taxa [%]	Abundance	Composition of Individuals [%]
Annelida	53	48.6	537	44.6
Arthropoda	27	24.8	276	22.9
Mollusca	18	16.5	180	14.9
Echinodermata	5	4.6	14	1.2
Other phyla	6	5.5	198	16.4
Total	**109**	**100**	**1205**	**100**

Notes
Macrofaunal samples were processed through a 0.1 mm sieve
Other phyla include: Cnidaria, Nemertea, Sipuncula, Platyhelminthes and Phoronida

Figures 4.8 and 4.9 illustrate the phyletic composition of taxa and individuals for each station (per 0.1 m^2), respectively, facilitating spatial comparison and highlighting the broad similarities/differences in faunal community across the survey area.

Annelids occurred at all of the stations sampled, where they generally comprised the highest proportion of the taxa identified. The remaining groups were more patchily distributed;

arthropods were absent from stations E_ST04, E_ST23 and E_ST25, molluscs were absent from stations E_ST03, E_ST09, E_ST14 and E_ST19 and members of other phyla were absent from stations E_ST12, E_ST14, E_ST15 and E_ST23. Echinoderms were only recorded from 9 of the 20 stations sampled. The relative contributions of the groups to macrofaunal abundance varied across the survey area. Annelids were the most abundant taxa at the majority of stations, but arthropods, molluscs and other phyla each dominated at two or more stations.

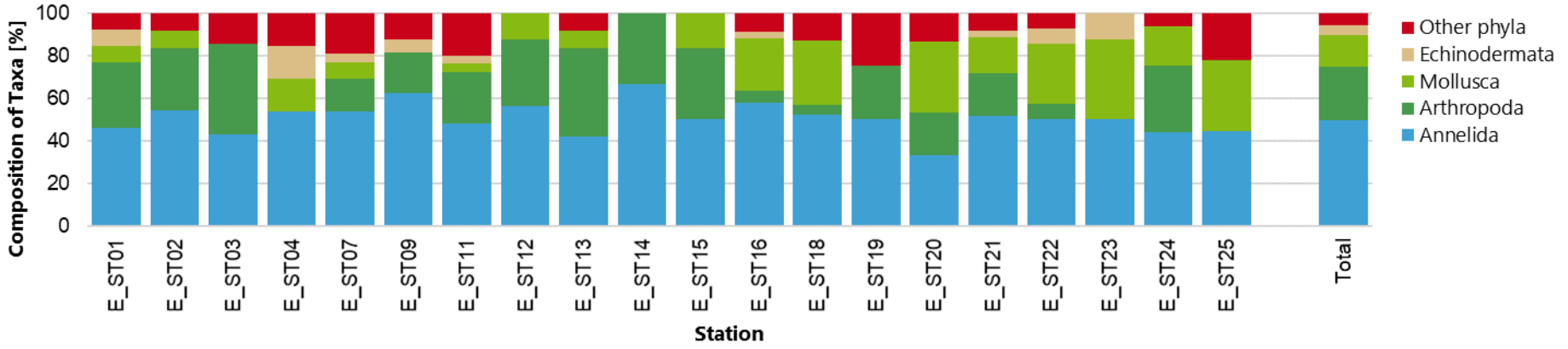


Figure 4.8: Phyletic composition of macrofaunal taxa, East A and B

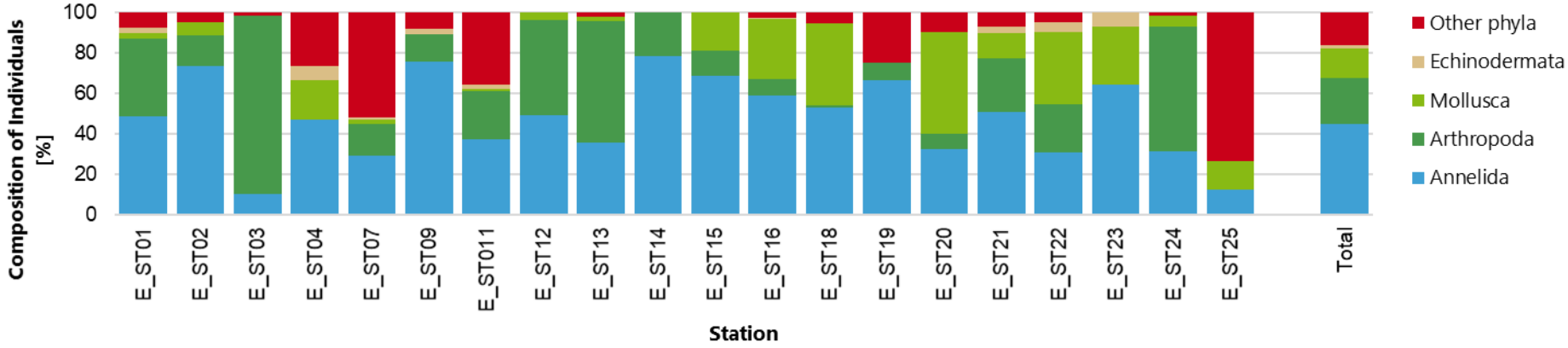


Figure 4.9: Phyletic composition of macrofauna individuals, East A and B

4.5.1.2 Community Statistics

Table 4.9 presents the number of taxa and individuals identified within the rationalised dataset from each station along with several commonly used diversity and evenness statistics. Figures 4.10 and 4.11 spatially present the number of taxa and individuals across the survey area.

The number of taxa per station (0.1 m^2) ranged from 4 at station E_ST19 to 33 at station E_ST16 with a mean of 16. The number of individuals per station (0.1 m^2) ranged from 12 at station E_ST19 to 148 at station E_ST16 with a mean of 60. There was no clear spatial pattern in the number of taxa or individuals per station (Figures 4.10 and 4.11, respectively)

Diversity was highly variable across the survey area. The Shannon-Wiener diversity ($H'Log_2$) index ranged from1.57 at station E_ST03 to 4.69 at station E_ST21 with a mean of 3.07. When the Shannon-Wiener index was considered in the context of the diversity thresholds suggested by Dauvin et al. (2012; Table 3.2) diversity could be inferred to range from poor to high, with the majority of stations (11 of the 20 stations sampled) featuring good diversity.

The Pielou's evenness index (J) is a measure of the distribution of individuals between taxa. The index ranged from 0.558 at station E_ST03 to 0.937 at station E_ST21, with a mean of 0.810. All stations exhibited moderate to high evenness (J > 0.500). Simpsons index of dominance (1 – λ) largely mirrored the Pielou's evenness index.

Table 4.9: Macrofaunal community statistics (0.1 m^2) , East A and B

Station	Numbers		Diversity	Evenness	
	Taxa	Individuals	Shannon-Wiener ($H'Log_2$)	Pielou (J)	Simpson (1 – λ)
E_ST01	13	39	3.23	0.872	0.881
E_ST02	24	79	3.65	0.795	0.852
E_ST03	7	58	1.57	0.558	0.546
E_ST04	13	30	3.42	0.923	0.922
E_ST07	26	96	3.42	0.727	0.810
E_ST09	16	37	3.70	0.926	0.935
E_ST11	27	139	3.56	0.749	0.866
E_ST12	16	53	3.13	0.782	0.837
E_ST13	12	45	3.08	0.860	0.869
E_ST14	6	23	2.02	0.780	0.719
E_ST15	6	16	2.08	0.804	0.733
E_ST16	33	148	4.05	0.803	0.915
E_ST18	23	134	3.35	0.742	0.851
E_ST19	4	12	1.83	0.913	0.758
E_ST20	15	40	3.38	0.864	0.890
E_ST21	32	55	4.69	0.937	0.968

Station	Numbers		Diversity	Evenness	
	Taxa	Individuals	Shannon-Wiener ($H'Log_2$)	Pielou (J)	Simpson (1 – λ)
E_ST22	16	43	3.46	0.865	0.900
E_ST23	8	14	2.75	0.918	0.890
E_ST24	16	71	2.82	0.706	0.750
E_ST25	9	72	2.15	0.680	0.683
Minimum	4	12	1.57	0.558	0.546
Maximum	33	148	4.69	0.937	0.968
Median	16	49	3.29	0.803	0.859
Mean	16	60	3.07	0.810	0.829
SD	9	41	0.80	0.099	0.103

Notes
SD = Standard deviation

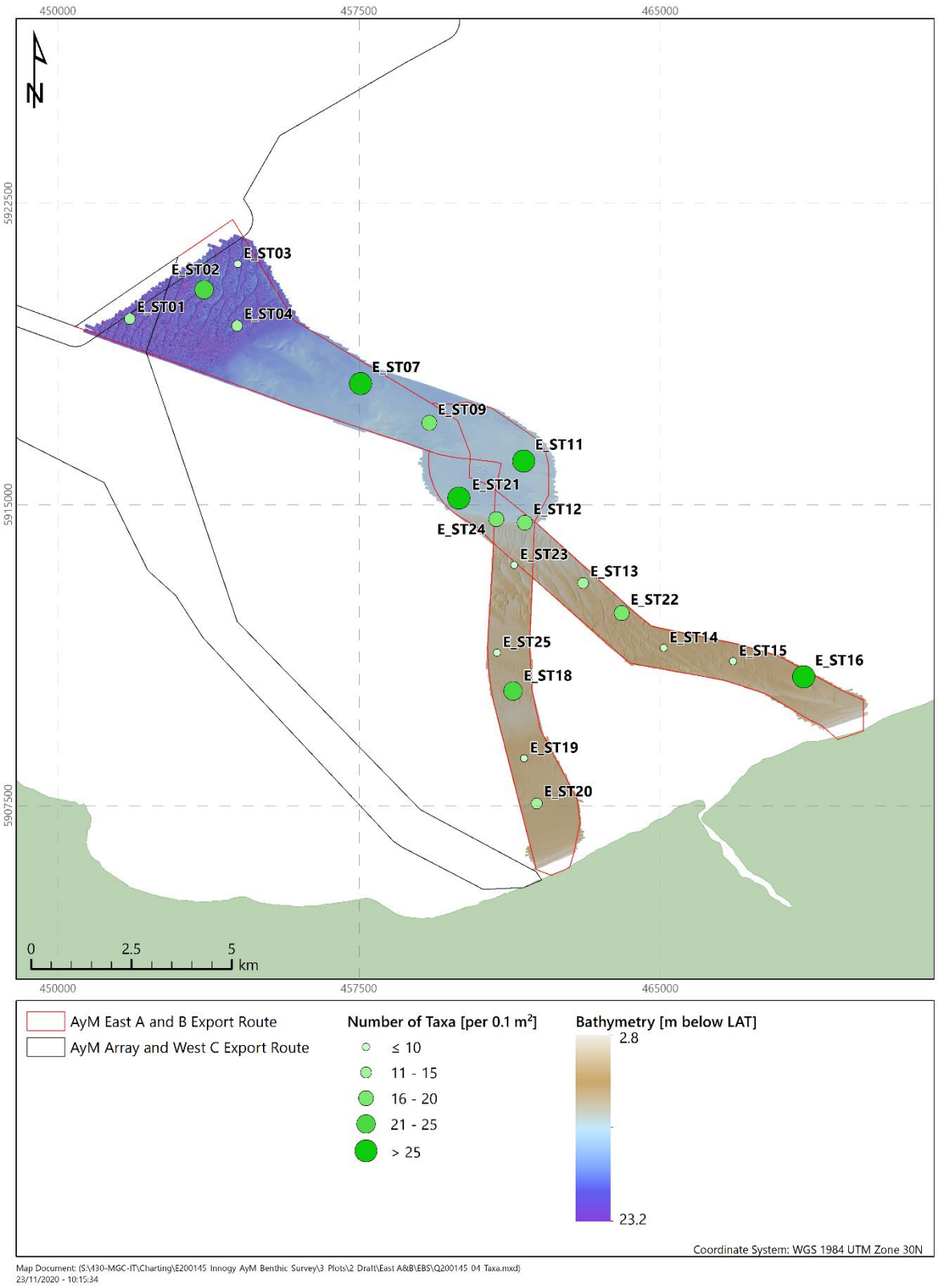


Figure 4.10: Number of macrofaunal taxa per station (0.1 m²) overlaid on bathymetry, East A and B

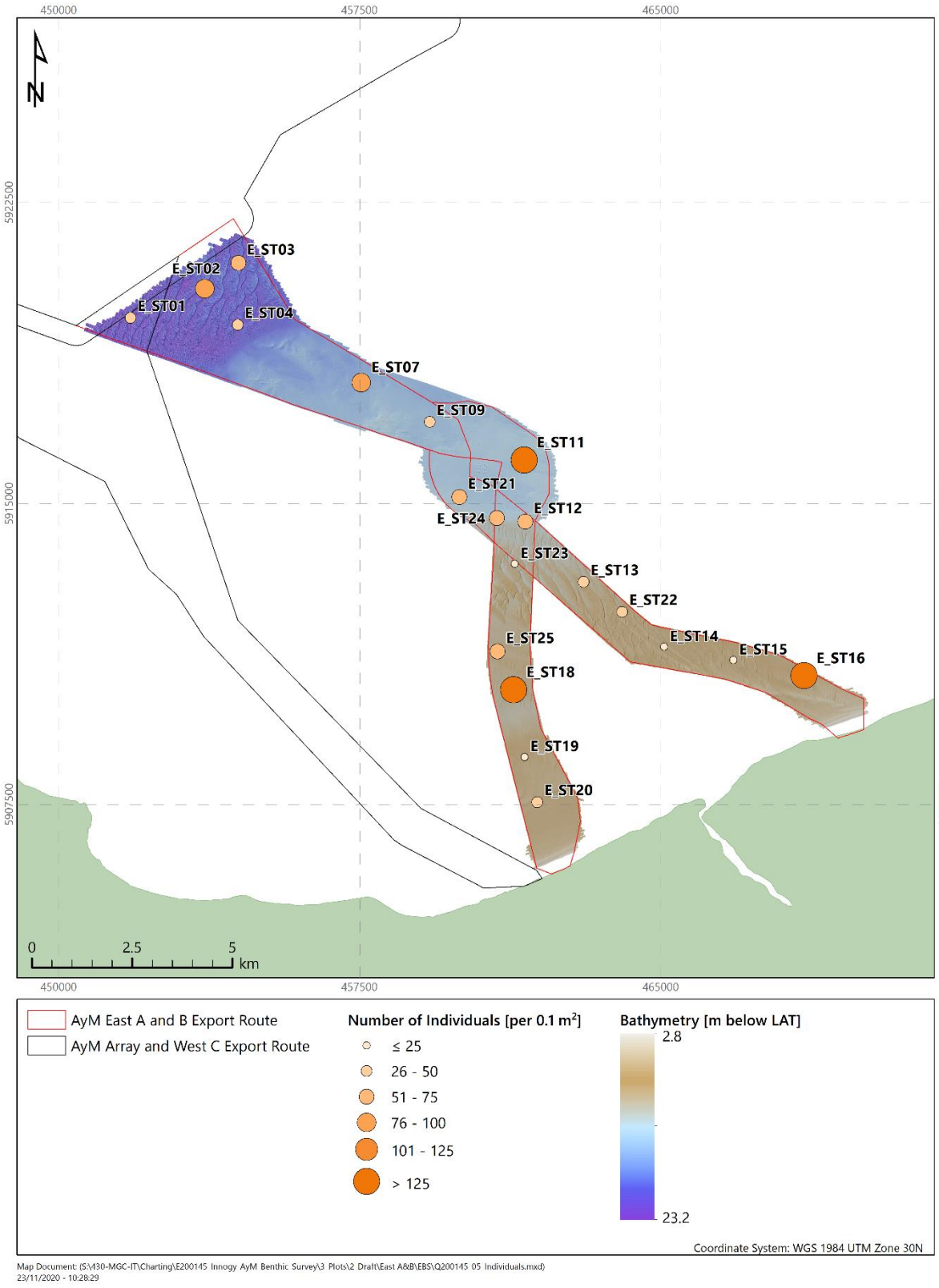


Figure 4.11: Number of macrofaunal individuals per station (0.1 m^2) overlaid on bathymetry, East A and B

4.5.1.3 Investigation of Faunal Similarities

4.5.1.3.1 Cluster Analysis

In PRIMER, the 'Cluster' algorithm was used to group stations according to their faunal similarity, analyses were initially undertaken on both untransformed and square root transformed data, with the former selected for presentation in the report, due to the very low abundances of dominant taxa at certain stations being excessively down-weighted following data transformation.

Figure 4.12 presents the hierarchical agglomerative cluster dendrogram for untransformed station data. The 'SIMPROF' algorithm was used to identify statistically significant (P = 0.05) differences between stations, with significant splits depicted as black lines and non-significant splits as red lines. Statistically significant splits may not be ecologically significant (Clarke et al., 2008), with ecological significance considered in subsequent sections of this report.

There was a generally low degree of similarity across the survey area, with untransformed interstation similarities that ranged from 0.0 % to 66.7 %. The dendrogram indicated that stations could be grouped as three statistically significant clusters:

- Cluster A comprised seven stations which grouped together with a mean similarity of 25.2 %;
- Cluster B comprised eight stations which grouped together with a mean similarity of 30.6 %;
- Cluster C comprised t five stations which grouped together with a mean similarity of 19.8 %.

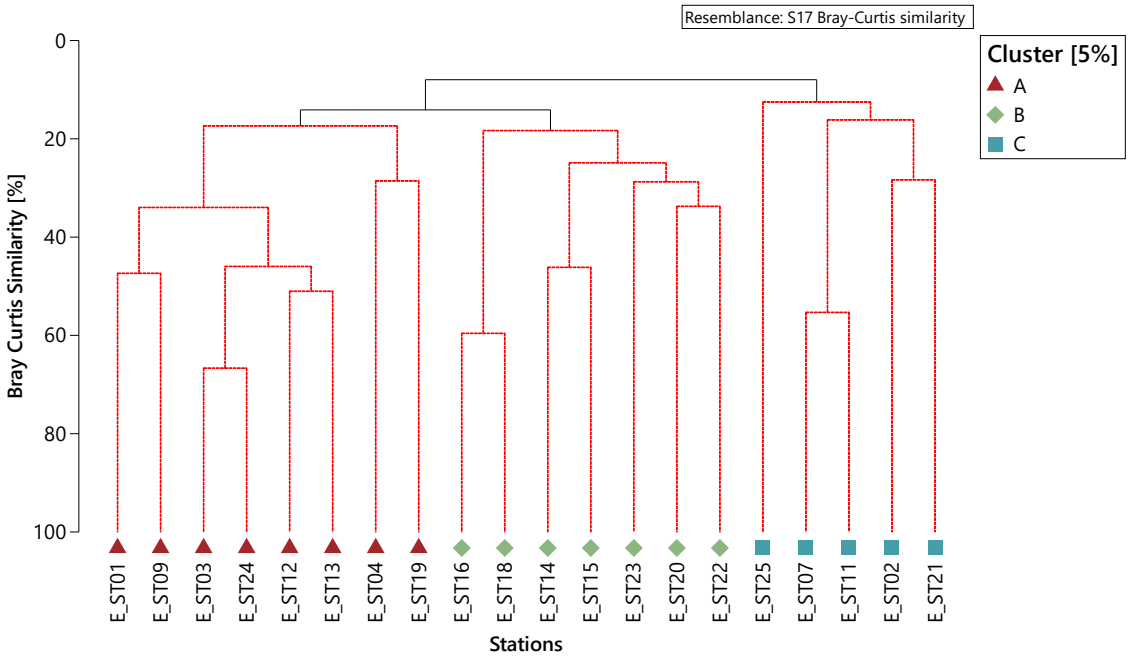


Figure 4.12: Dendrogram of hierarchical clustering of macrofaunal station (0.1 m^2) abundance data, East A and B

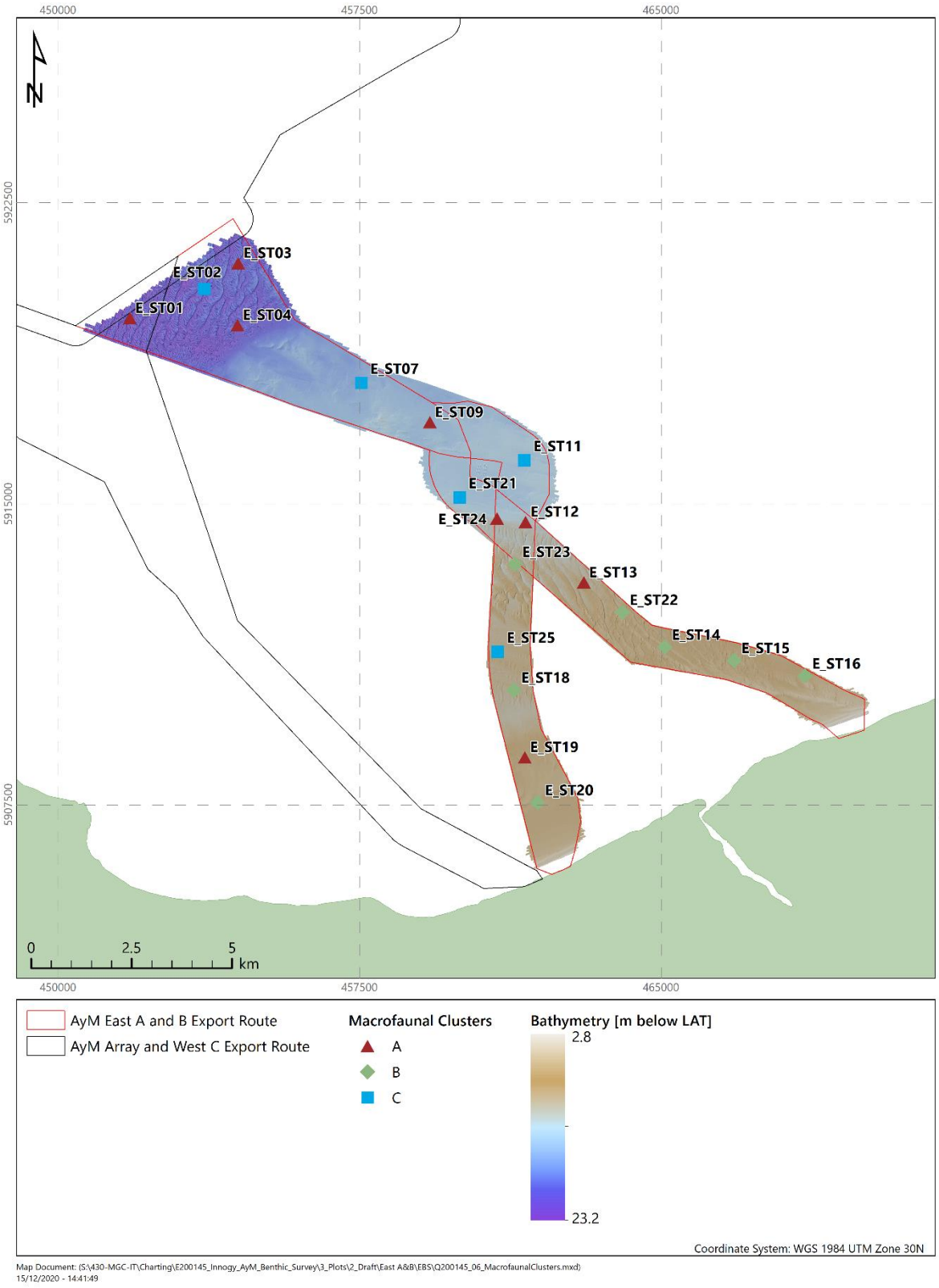


Figure 4.13: Macrofaunal clusters per station (0.1 m^2) overlaid on bathymetry, East A and B

4.5.1.3.2 Similarity Percentage Analysis

SIMPER (Similarity percentage) analysis was used to highlight the differences between the characterising taxa of the clusters and ungrouped stations.

Table 4.10 summarises the top 10 most abundant taxa within each cluster. Group average similarity within the clusters ranged from 19.8 % (cluster C) to 30.6 % (cluster A) and group average dissimilarity between the clusters ranged from 85.9 % (between clusters A and B) to 92.7 % (between clusters B and C).

The top 10 most abundant taxa for clusters contributed between 57.8 % (cluster C) and 82.0 % (cluster B) of the individuals present within their respective groupings (Table 4.10). The most abundant characterising taxa within cluster A comprised the amphipod crustacean *Bathyporeia guilliamsoniana* (and the closely related *Bathyporeia elegans*) and the polychaetes *Nephtys cirrosa* and *Spiophanes bombyx*. Cluster B was characterised by a moderate abundance of the polychaete *Magelona johnstoni,* along with the bivalves molluscs *Kurtiella bidentata* and *Fabulina fabula* and the polychaete *Lagis koreni*. Cluster C was dominated by the horseshoe worm *Phoronis* sp. accompanied by anemones (Actiniaria), the polychaete *Poecilochaetus serpens* and nemerteans.

Figures 4.14 to 4.16 highlight the differences in abundance and distribution of key taxa across the survey area. A spatial pattern was observed in the abundance of *M. johnstoni*, whereby this was present in the nearshore survey area and absent further from the shore (Figure 4.16). Both *B. guilliamsoniana* (Figure 4.14) and *P. serpens* (Figure 4.15) were recorded at highest abundance towards the middle of the surveyed route and at its offshore extreme, adjacent to the main array.

The relationship between macrofauna communities and physical and chemical determinants will be discussed further in Section 5.

Table 4.10: Top 10 most abundant macrofaunal taxa within each grouping, East A and B

Cluster A	Ind [0.1 m²]	Cum [%]	Cluster B	Ind [0.1 m²]	Cum [%]
Bathyporeia guilliamsoniana	13	31.0	*Magelona johnstoni*	12	22.9
Nephtys cirrosa	5	41.5	*Kurtiella bidentata*	8	39.2
Bathyporeia elegans	4	51.6	*Lagis koreni*	7	52.5
Spiophanes bombyx	4	60.3	*Fabulina fabula*	4	59.4
NEMERTEA	2	64.4	*Glycera tridactyla*	3	64.6
Spio goniocephala	2	68.2	*Spiophanes bombyx*	3	69.6
Diastylis bradyi	2	71.6	*Bathyporeia guilliamsoniana*	2	73.8
Scoloplos armiger	1	74.5	*Abra alba*	2	77.6
Ophelia borealis	1	76.6	NEMERTEA	1	80.1
Chaetozone christiei	1	77.7	*Nephtys cirrosa*	1	82.0

Cluster C	Ind [0.1 m²]	Cum [%]
Phoronis	16	17.7
ACTINIARIA	9	28.1
Poecilochaetus serpens	7	35.8
NEMERTEA	7	43.3
Urothoe elegans	4	47.8
Lagis koreni	2	50.1
Kurtiella bidentata	2	52.2
Polycirrus	2	54.2
Scoloplos armiger	2	56.0
Eteone longa	2	57.8

Notes
Ind = Number of individuals of each taxon within the station (0.1 m²)
Cum = Cumulative percentage of the individuals of each taxon relative to the total number of individuals recorded within the station (0.1 m²)

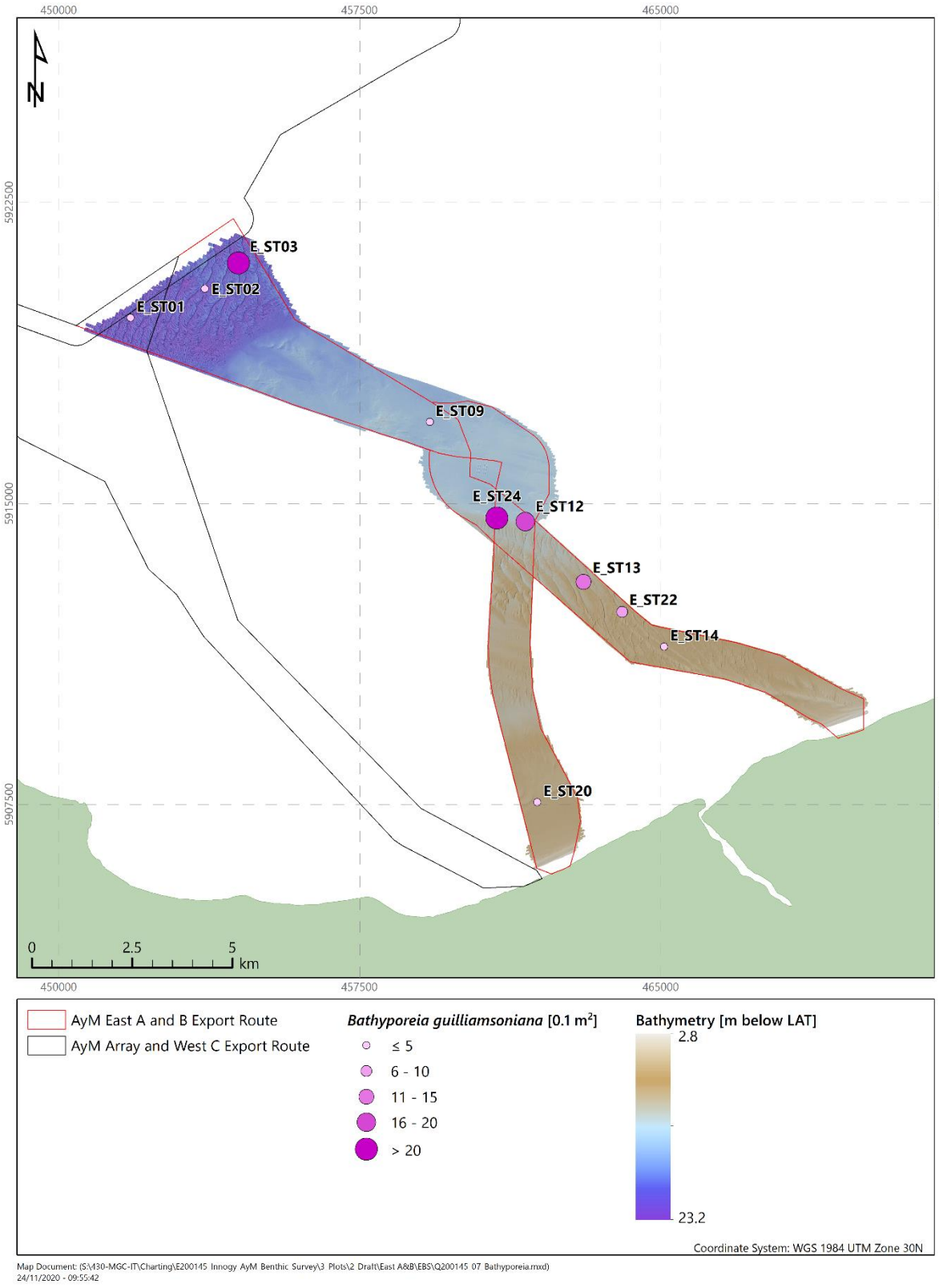


Figure 4.14: *Bathyporeia guilliamsoniana* abundance overlaid on macrofaunal community groupings and a bathymetric mosaic, East A and B

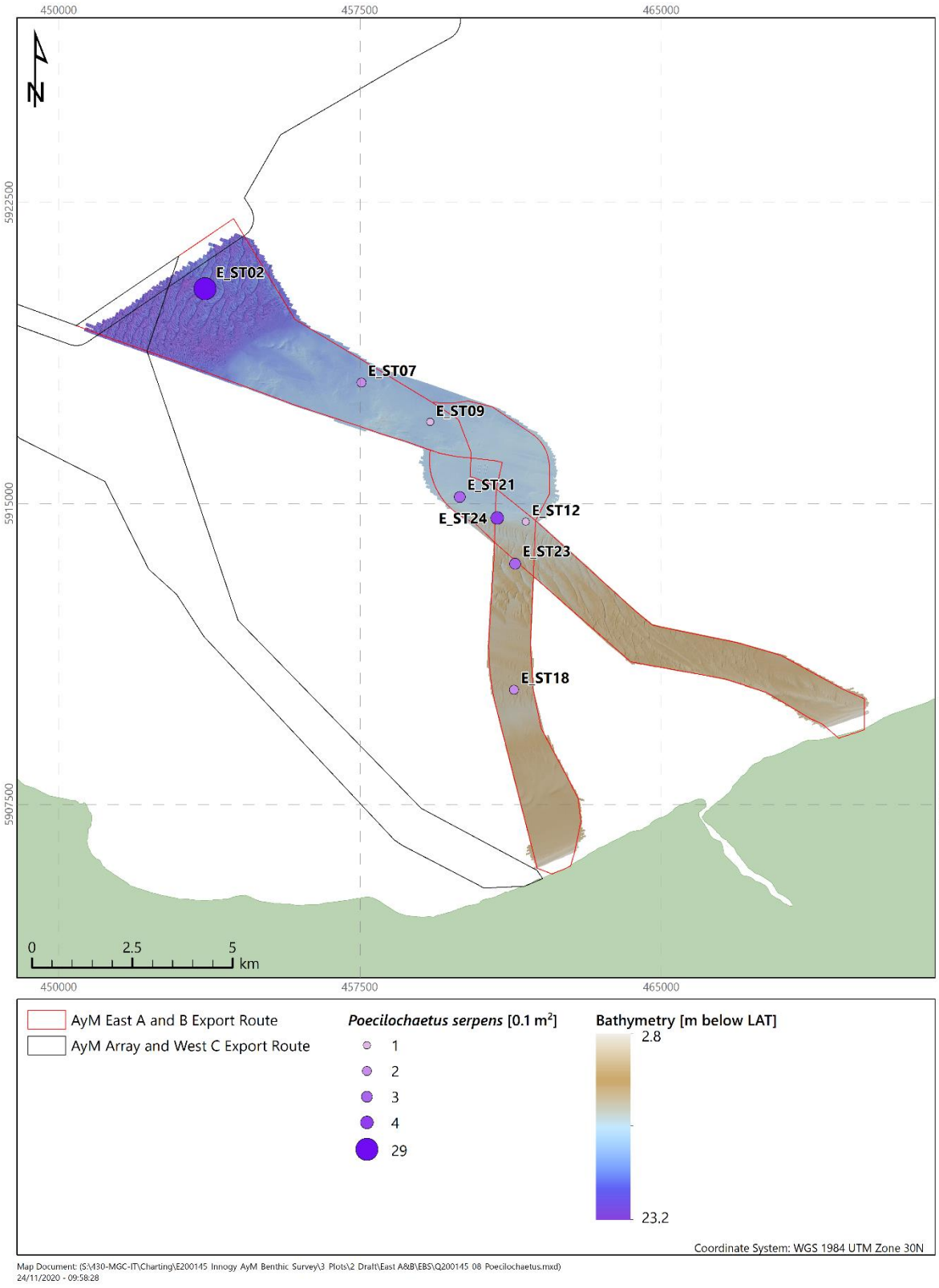


Figure 4.15: *Poecilochaetus serpens* abundance overlaid on macrofaunal community groupings and a bathymetric mosaic, East A and B

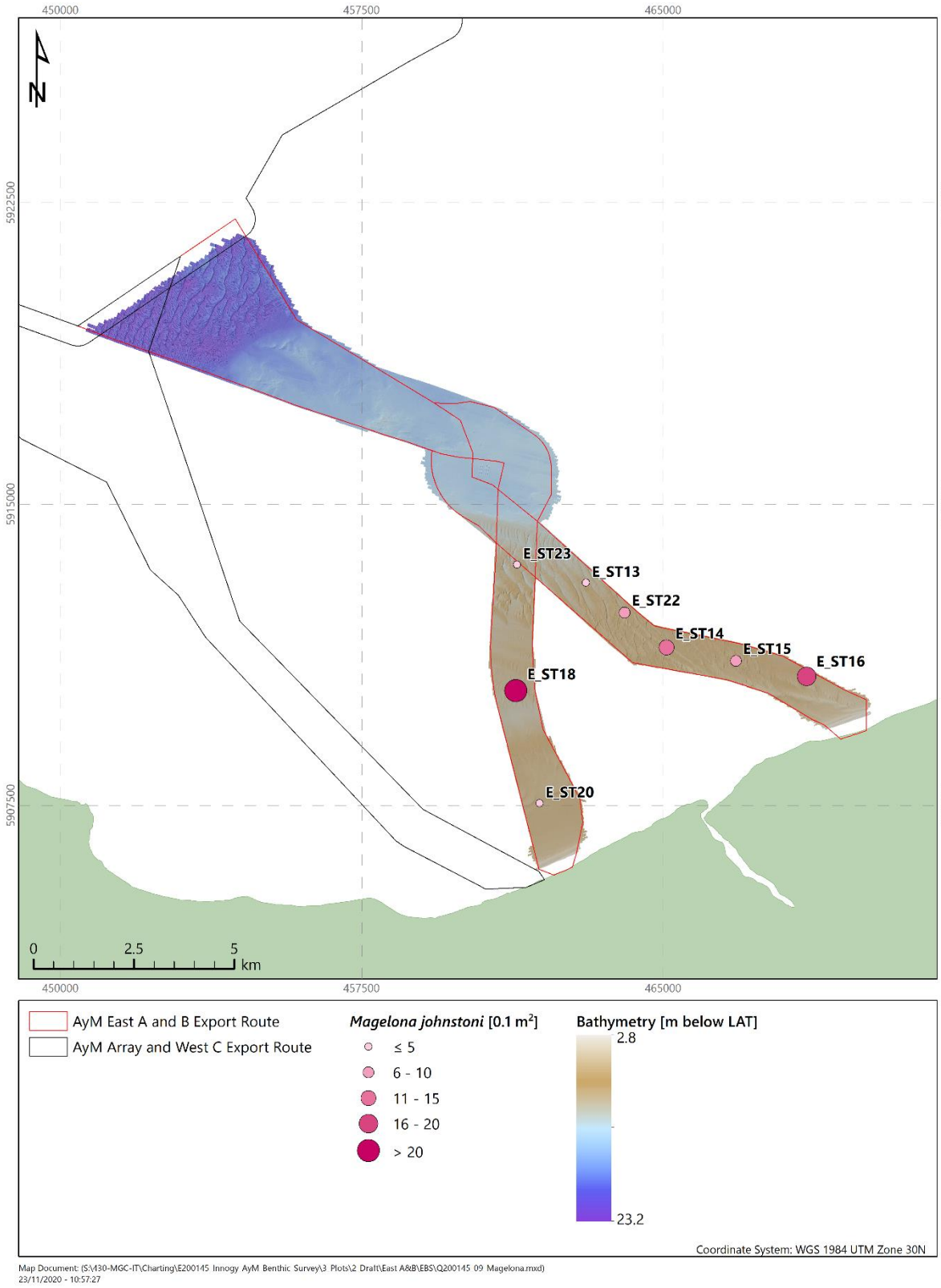


Figure 4.16: *Magelona johnstoni* abundance overlaid on macrofaunal community groupings and a bathymetric mosaic, East A and B

4.5.1.4 Biomass

Table 4.11 summarises the total macrofaunal biomass and phyletic composition of the biomass by station across the survey area. Biomass is expressed as AFDW in g/0.1 m^2 grab sample. Figure 4.18 spatially presents the total macrofaunal biomass across the survey area, whilst Figure 4.17 presents the phyletic composition of the biomass graphically.

Total biomass per station ranged between 0.012 g (station E_ST19) and 5.673 g (station E_ST11); total biomass did not demonstrate any clear spatial distribution across the survey area (Figure 4.18). Overall, arthropods comprised 31.6 % of the biomass across the survey area, followed by echinoderms (26.5 %), molluscs (19.6 %) and annelids (17.1 %). Members of other phyla contributed very little to the overall biomass, accounting for just 5.2 % of the total.

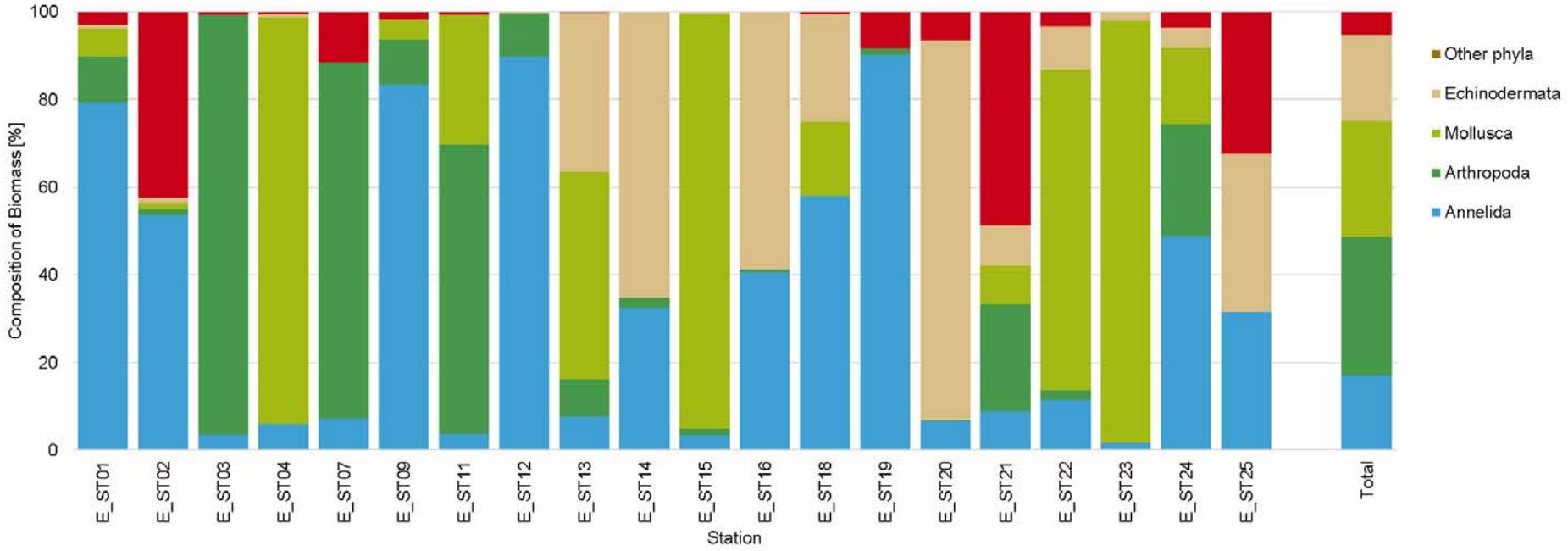
There was variation between the stations with arthropods dominating the proportion of biomass at stations E_ST03, E_ST07 and E_ST11. Echinoderms contributed to the majority of the biomass at stations E_ST04, E_ST13, E_ST15, E_ST22 and E_ST23. Molluscs dominated the proportion of biomass at stations E_ST14, E_ST16, E_ST20 and E_ST25. Annelids dominated the proportion of biomass at the remaining seven stations.

Table 4.11: Phyletic composition of macrofaunal biomass, East A and B

Station	Biomass*					
	Annelida	Arthropoda	Echinodermata	Mollusca	Other Phyla	Total
E_ST01	0.039	0.005	0.003	0.000	0.002	**0.050**
E_ST02	0.091	0.003	0.002	0.002	0.072	**0.170**
E_ST03	0.007	0.185	-	-	0.001	**0.194**
E_ST04	0.068	-	1.067	0.009	0.005	**1.150**
E_ST07	0.132	1.496	0.000	0.002	0.212	**1.842**
E_ST09	0.057	0.007	0.003	-	0.001	**0.069**
E_ST11	0.207	3.751	1.681	0.000	0.033	**5.673**
E_ST12	0.127	0.014	-	0.000	-	**0.141**
E_ST13	0.039	0.044	0.243	0.186	0.000	**0.512**
E_ST14	0.101	0.007	-	0.203	-	**0.311**
E_ST15	0.016	0.006	0.438	0.002	-	**0.462**
E_ST16	1.191	0.014	0.004	1.715	0.001	**2.925**
E_ST18	0.768	0.000	0.225	0.325	0.006	**1.323**
E_ST19	0.011	0.000	-	-	0.001	**0.012**
E_ST20	0.074	0.003	-	0.977	0.073	**1.126**
E_ST21	0.093	0.255	0.091	0.096	0.508	**1.043**
E_ST22	0.032	0.006	0.208	0.028	0.010	**0.284**
E_ST23	0.015	-	0.888	0.018	-	**0.922**
E_ST24	0.035	0.018	0.013	0.003	0.003	**0.073**

Station	Biomass*					
	Annelida	Arthropoda	Echinodermata	Mollusca	Other Phyla	Total
E_ST25	0.035	-	-	0.040	0.036	**0.112**
Minimum	**0.007**	-	-	-	-	**0.012**
Maximum	**1.191**	**3.751**	**1.681**	**1.715**	**0.508**	**5.673**
Median	**0.063**	**0.007**	**0.003**	**0.006**	**0.002**	**0.387**
Mean	**0.157**	**0.291**	**0.243**	**0.180**	**0.048**	**0.920**
SD	**0.294**	**0.880**	**0.454**	**0.425**	**0.119**	**1.343**

Notes
* = Biomass expressed as ash free dry weight in g/0.1 m^2 grab sample
- = Absent from sample



Notes
Biomass expressed as ash free dry weight in g/0.1 m^2 grab sample

Figure 4.17: Phyletic composition of biomass, East A and B

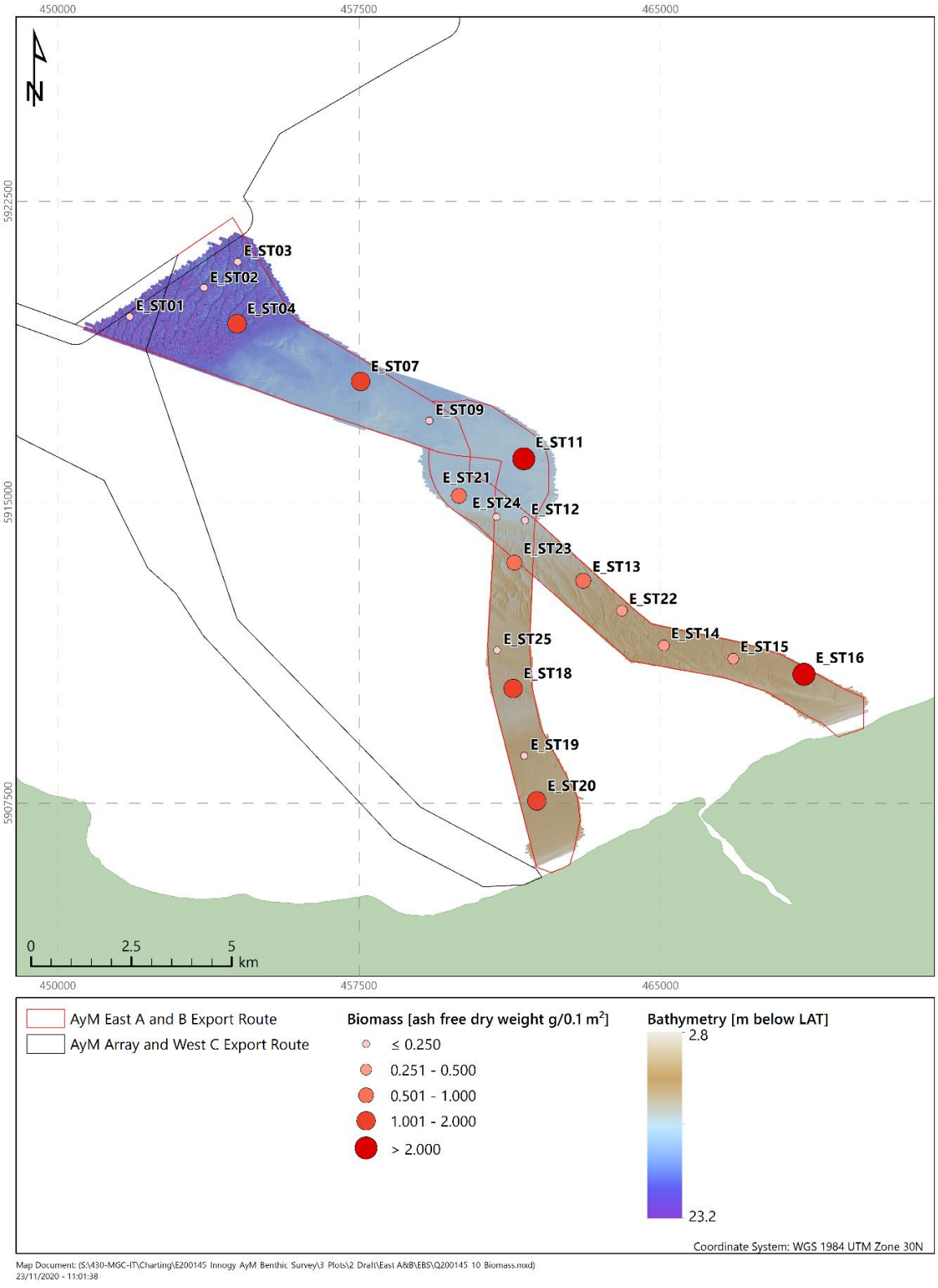


Figure 4.18: Total biomass overlaid on bathymetry, East A and B

4.5.2 Colonial Epifauna

4.5.2.1 Phyletic Composition

Table 4.12 summarises the epifaunal taxonomic groups identified across the survey area and Colonial epifauna (both individuals and taxa) was very low across the survey area. Bryozoans accounted for 61.5 % of the total taxa and hydrozoans accounted for the remaining 38.5 %.

Table 4.12: Taxonomic groups of colonial epifauna, East A and B

Taxonomic Group	Number of Taxa	Composition of Taxa [%]
Bryozoan	8	61.5
Hydrozoan	5	38.5
Total	**13**	**100**
Notes Macrofaunal samples were processed through a 0.5 mm sieve		

4.5.2.2 Community Statistics

Table 4.13 presents the number of colonial epifaunal taxa and individuals identified from each station and Figure 4.19 spatially presents these data across the survey area. Epifaunal were not present in samples from seven station (E_ST13 to E_ST15, E_ST19, E_ST20, E_ST22 and E_ST23). Where present, the number of epifaunal taxa ranged from 1 (station E_ST24) to 8 (station E_ST02). There appeared to be an increased number of epifaunal taxa in the central and offshore parts of the surveyed route, compared to nearshore areas (Figure 4.19).

Table 4.13: Number of colonial epifaunal taxa (0.1 m^2), East A and B

Station	Number of Taxa
E_ST01	2
E_ST02	8
E_ST03	2
E_ST04	2
E_ST07	5
E_ST09	3
E_ST11	7
E_ST12	2
E_ST13	-
E_ST14	-
E_ST15	-
E_ST16	3
E_ST18	2
E_ST19	-

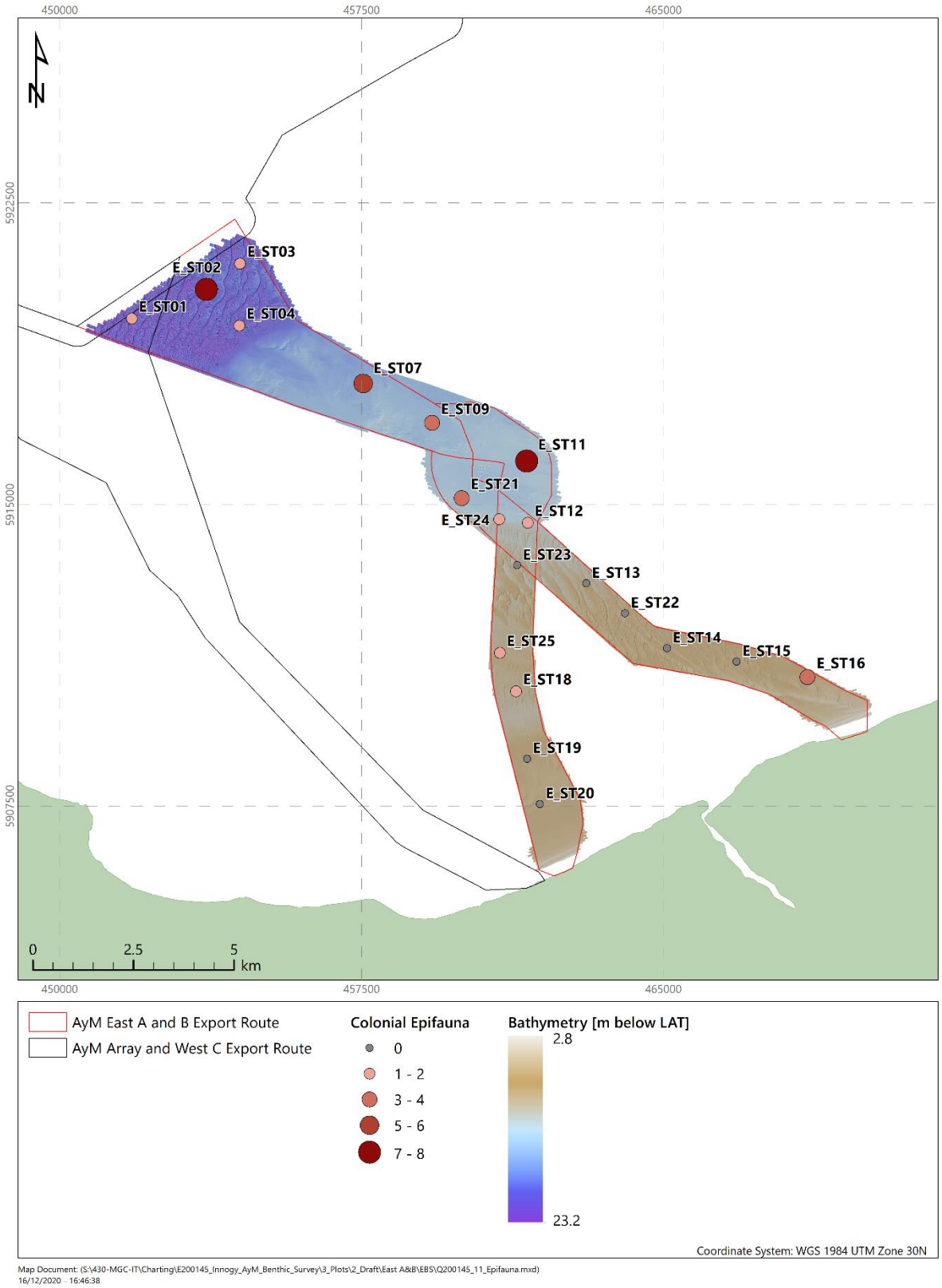
Station	Number of Taxa
E_ST20	-
E_ST21	3
E_ST22	-
E_ST23	-
E_ST24	1
E_ST25	2
Minimum	**0**
Maximum	**8**
Median	**2**
Mean	**3**
SD	**2.1**
Notes SD = Standard deviation	

4.5.2.3 Characteristic Taxa

Table 4.14 summarises the characteristic epifaunal taxa identified from grab samples across the survey area; Only the eight taxa that occurred in 10.0 % or more of samples are displayed. Appendix F presents the full epifaunal dataset. The bryozoan *Alcyonidium parasiticum* was ranked the most dominant colonial epifauna species across the survey area with a frequency of occurrence 35.0 %, followed by hydrozoans of the family Campanulariidae and the bryozoan *Conopeum reticulum,* with frequencies of 30.0 %. The remaining dominant epifaunal taxa, occurring at between 10.0 % and 25.0 % of the stations, comprised the bryozoan *Scrupocellaria scruposa* and four hydroids.

Table 4.14: Most frequently occurring colonial epifaunal taxa, East A and B

Taxon	Frequency Rank	Frequency [%]
Alcyonidium parasiticum	1	35.0
Campanulariidae	2	30.0
Conopeum reticulum	2	30.0
Tubulariidae	3	25.0
Bougainvilliidae	4	20.0
Hydrallmania falcata	4	20.0
Phialella quadrata	5	15.0
Scrupocellaria scruposa	6	10.0
Notes Frequency rank is calculated based on frequency (e.g. percentage of stations from which each taxon was recorded)		



Notes

Colonial epifauna expressed as number of taxa per 0.1 m^2 grab sample

Figure 4.19: Number of present epifaunal taxa per station, overlaid on bathymetry, East A and B

4.6 Seabed Habitats and Biotopes

4.6.1 Biotope Classifications

The physical and biological characteristics of the multivariate groups apparent within the macrofaunal community (Section 4.5.1.3) were considered in conjunction with the photographic data for habitat classification. Soft sediment habitats are often defined on the sediment type and infaunal community composition. Therefore, soft sediments within the survey area have been predominantly classified using data from grab samples (specifically the PSD and macrofaunal data), with the photographic data analysis providing additional habitat information. Habitats comprising hard substrates, where grab sampling was not achieved, have been classified using photographic data only.

The seabed sediments observed across much of the survey area ranged from muddy sand to rippled sand with shell. This sediment type has been broadly classified within the EUNIS habitat 'Sublittoral sand' (A5.2), with this further subdivided into the biotope complex 'Infralittoral muddy sand' (A5.24) at four stations, the biotope '*Nephtys cirrosa* and *Bathyporeia* spp. in infralittoral sand' (A5.233) at eight stations and the biotope '*Fabulina fabula* and *Magelona mirabilis* with venerid bivalves and amphipods in infralittoral compacted fine muddy sands' (A5.242) at six stations. The classification of stations/transects where only seabed photographic data were acquired has only been achieved at habitat or biotope complex level (i.e. stations/transects defined as 'Sublittoral sand' and 'Infralittoral muddy sand'). Where grab samples were acquired, they provided additional quantitative information regarding sediment type and macrofaunal community, facilitating further refinement.

Gravelly sand and sandy gravel sediment were identified at five stations and these have been classified as the 'Infralittoral coarse sediment' (A5.13) biotope complex. Occasional patches of pebbles, cobbles and boulders were observed within sand habitats, but more extensive areas comprising these materials were also observed in association with higher SSS reflectivity. These areas have been classified as the EUNIS biotope complex 'Infralittoral mixed sediments' (A5.43) and were recorded from eight stations, along three transects and part of one further transect.

Table 4.15 summarises the hierarchy of the assigned EUNIS classifications (EEA, 2019), and equivalent JNCC (2015) classifications. Figure 4.20 spatially presents the distribution of the biotopes defined across the survey area.

Table 4.16 summarises the physical and biological parameters characteristic of the biotopes assigned, along with example photographs. Appendix C.3 provides further example photographs. Sections 4.6.1.1 to 4.6.1.6 provide detailed descriptions of each habitat/biotope defined.

Table 4.15: Habitat classifications, East A and B

EUNIS Habitat Classification (EEA, 2019)					Equivalent JNCC (2015) Classification
Environment Level 1	Broad Habitat Level 2	Habitat Level 3	Biotope Complex Level 4	Biotope Level 5	
A Marine	A5 Sublittoral sediment	A5.1 Sublittoral coarse sediment	**A5.13 Infralittoral coarse sediment**	-	SS.SCS.ICS Infralittoral coarse sediment
		A5.2 Sublittoral sand	-	-	SS.SSa Sublittoral sands and muddy sands
			A5.23 Infralittoral fine sand	**A5.233 *Nephtys cirrosa* and *Bathyporeia* spp. in infralittoral sand**	SS.SSa.IFiSa.NcirBat *Nephtys cirrosa* and *Bathyporeia* spp. in infralittoral sand
			A5.24 Infralittoral muddy sand	-	SS.SSa.IMuSa Infralittoral muddy sand
				A5.242 *Fabulina fabula* and *Magelona mirabilis* with venerid bivalves and amphipods in infralittoral compacted fine muddy sands	SS.SSa.IMuSa.FfabMag *Fabulina fabula* and *Magelona mirabilis* with venerid bivalves and amphipods in infralittoral compacted fine muddy sand
		A5.4 Sublittoral mixed sediment	**A5.43 Infralittoral mixed sediments**	-	SS.SMx.IMx Infralittoral mixed sediment

Notes
EUNIS = European Nature Information System
EEA = European Environment Agency
JNCC = Joint Nature Conservation Committee
Bold highlighted classifications are defined in this report.

4.6.1.1 Infralittoral Coarse Sediment (A5.13)

The EUNIS biotope complex 'Infralittoral coarse sediment' (A5.13) is described as moderately exposed habitats with coarse sand, gravelly sand, shingle and gravel in the infralittoral, which are subject to disturbance by tidal steams and wave action. This biotope complex is present on the open coast or in tide-swept marine inlets and characterised by a robust fauna of infaunal polychaetes, cumacean crustacea and venerid bivalves (EEA, 2019).

This biotope complex was identified from stations grouped within cluster C of the multivariate analysis of macrofaunal data (stations E_ST02, E_ST07, E_ST11, E_ST21 and

E_ST25; Figure 4.20). This biotope complex was widely distributed across the survey area, although absent from stations closest to shore; it occurred in water depths of between 9 m BSL and 28 m BSL.

The stations were located in areas of predominantly low SSS reflectivity, but with evidence of sediment movement (sand waves and megaripples). Sediment characteristics from grab samples were variable, with Folk descriptions of gravel, sandy gravel, gravelly sand or gravelly, muddy sand (Table 4.3). Sand was the dominant sediment fraction from three of the five stations within this biotope complex, but gravel was the dominant fraction at two stations, with the other three stations containing at least a moderate proportion of gravel material (more than 11.87 %). A generally low, but again variable, mud fraction was also present (0.18 % to 11.32 %).

The infauna identified from this biotope was typical of coarse sands and gravels, being dominated by *Phoronis* sp., accompanied by *P. serpens* and nemerteans and epifaunal anemones (Actiniaria) had colonised the coarser materials present (Table 4.10). This biotope had the most diverse colonial epifaunal community recorded from grab samples, with between 2 and 8 taxa recorded per station (Table 4.13); the bryozoans *A. parasiticum* and *C. reticulum* were the most frequently recorded colonial epifauna in this biotope.

Larger epifauna associated with this biotope, as observed from seabed photographic data, included starfish (Asteroidea), hermit crabs (Paguridae), brittlestars (Ophiuroidea), dragonets (*Callionymus* sp.) and faunal turf (Hydrozoa/Bryozoa).

4.6.1.2 Sublittoral Sand (A5.2)

The EUNIS habitat 'Sublittoral sand' (A5.2) is defined as clean medium to fine sands or non-cohesive slightly muddy sands on open coasts, offshore or in estuaries and marine inlets. Such habitats may be subject to wave action or tidal currents, which restrict the silt and clay content to less than 15 %. This habitat is characterised by a range of taxa including polychaetes, bivalve molluscs and amphipod crustacea (EEA, 2019).

From photographic data, this habitat was defined along Transect E_TR01 and a 28 m length of transect E_TR03 (2) (in addition to those immediately north and south, specifically transects E_TR01 N, E_TR01 S and E_TR03 N; Figure 4.20). These transects were located in the north-west of the survey area in water depths of 16 m BSL to 21 m BSL.

These transects were associated with seabed of variable SSS reflectivity and sediments were seen to comprise sand with shell fragments, with occasional cobbles and boulders (Table 4.16). As no grab samples were obtained from these areas, there are no quantitative data available regarding sediment composition and infaunal community; as such these areas can only be defined to habitat level within the EUNIS (2019) hierarchy.

The free-living epifauna on these transects included brittlestars (Ophiuroidea, including *Ophiura albida*), starfish (*Asterias rubens* and *Astropecten irregularis*), hermit crabs (Paguridae). The only attached epifauna evident from photographic data was soft coral

(*Alcyonium digitatum*) and anemones (*Metridium* sp.), which was seen attached to the occasional boulders present within this habitat.

4.6.1.3 *Nephtys cirrosa* and *Bathyporeia* spp. in Infralittoral Sand (A5.233)

The EUNIS biotope '*Nephtys cirrosa* and *Bathyporeia* spp. in infralittoral sand' (A5.233) is defined as well-sorted medium and fine sands inhabited by *N. cirrosa* and *Bathyporeia* spp., which occur in the shallow sublittoral to at least 30 m depth. This biotope occurs in sediments subject to physical disturbance, generally as a result of wave action (and occasionally strong tidal streams). Magelonid polychaetes may be frequent in this biotope in more sheltered, less tide-swept areas. The faunal diversity of this biotope is considerably reduced compared to less disturbed biotopes (such as uA5.242) and for the most part consists of the more actively-swimming amphipods (EEA, 2019).

This biotope categorises the infaunal and epifaunal community recorded from stations within cluster A of the multivariate analysis of macrofauna data (stations E_ST01, E_ST03, E_ST04, E_ST09, E_ST12, E_ST13, E_ST19 and E_ST24 (Figure 4.20). These stations were distributed patchily throughout the surveyed route, occurring from a nearshore area (station E_ST19), near the middle of the route (stations E_ST12 and E_ST12) and towards the offshore end of the route adjacent to the main array (stations E_ST01, E_ST03, E_ST04). Due to its wide spatial distribution, this biotope was identified from a range of water depths (9 m BSL to 27 m BSL.

This biotope was recorded in association with areas of sediment movement evident from the SSS data. Sediment composition was variable with five stations described by the Folk description of sand, two described as sandy gravel and one as gravelly, muddy sand.

Infaunal analysis showed that the cluster A stations were dominated by the amphipod *B. guilliamsoniana* and that *N. cirrosa* was the second most abundant taxon reported. Other prominent infauna in this cluster were *B. elegans* and *S. bombyx*.

The free-living epifauna identified from photographic transects included brittlestars (Ophiuroidea) and starfish (*A. rubens*). Attached epifauna included occasional soft corals (*A. digitatum*), faunal turf (Hydrozoa/Bryozoa) and bryozoans (*Alcyonidium diaphanum*).

4.6.1.4 Infralittoral Muddy Sand (A5.24)

'Infralittoral muddy sand' (A5.24) is described as non-cohesive muddy sand in the infralittoral zone (from the extreme lower shore to the more stable circalittoral zone at about 15 m to 20 m depth). The habitat supports a variety of animal-dominated communities, particularly polychaetes, bivalves and the urchin *Echinocardium cordatum* (EEA, 2019).

From photographic data, this biotope complex was recorded from station E_ST05 (in addition to those immediately north and south, specifically stations E_ST05N and E_ST05S) and station E_ST17 (Figure 4.20). These stations were located towards the centre and at the offshore end of the survey area in water depths of 7 m BSL to 18 m BSL.

The stations were associated with areas of high/mottled SSS reflectivity and seabed photographic data identified sediments comprising muddy sand with shell fragments, with occasional patches of pebbles, cobbles and boulders. No grab samples were obtained from these stations, so quantitative PSD and macrofaunal data are not available.

The free-living epifauna in this biotope included brittlestars (Ophiuroidea, including *Ophiura ophiura* and *O. albida*), starfish (*A. rubens* and *A. irregularis*), crabs (Brachyura including *Necora puber*) and burrowing anemones (Ceriantharia). Where cobbles or boulders were present, attached epifauna included anemone (*Metridium* sp.), soft coral (*Alcyonium digitatum*), barnacles (Cirripedia) and faunal turf (Hydrozoa/Bryozoa).

4.6.1.5 *Fabulina fabula* and *Magelona mirabilis* with Venerid Bivalves and Amphipods in Infralittoral Compacted Fine Muddy Sands (A5.242)

The biotope '*Fabulina fabula* and *Magelona mirabilis* with venerid bivalves and amphipods in infralittoral compacted fine muddy sands' (A5.242) occurs in stable, fine, compacted sands and slightly muddy sands in the infralittoral and littoral fringe. This biotope may be characterised by a prevalence of *Fabulina fabula* and *Magelona mirabilis* or other species of Magelona (e.g. *M. filiformis*). Other taxa, including the amphipod *Bathyporeia* spp. and polychaetes such as *Spiophanes bombyx* are also commonly recorded. The community is relatively stable in its species composition, however, numbers of Magelona and *F. fabula* tend to fluctuate (EEA, 2019).

This biotope categorises the infaunal and epifaunal community grouped within cluster B of the multivariate analysis of macrofaunal data (stations E_ST14 to E_ST16, E_ST18, E_ST20, E_ST22 and E_ST23). The biotope was restricted in distribution to nearshore sections of the surveyed route, occurring in water depths of 6 m BSL to 10 m BSL (Figure 4.20).

This biotope was recorded in association with areas of low to moderate reflectivity evident from the SSS data. There is a possible physical mismatch at stations representative of this biotope within the East A and B survey area. The biotope description states that it occurs in 'stable, fine, compacted sands and slightly muddy sands' (EEA, 2019). Within macrofaunal cluster B, sediment characteristics were generally consistent, described as moderately well to well sorted, and with a graphical mean particle size of medium sand, although station E_ST22 had a coarser sediment, described as very poorly sorted, sandy gravel. These stations had no mud content.

Infaunal analysis of the stations sampled within this biotope identified *M. mirabilis* as the dominant taxon, along with the bivalves *K. bidentata* and *F. fabula* and the polychaete *L. koreni* (Table 4.10).

The epifauna identified from seabed video data only contained brittlestars (Ophiuroidea, including *Ophiura ophiura*).

4.6.1.6 Infralittoral Mixed Sediment (A5.43)

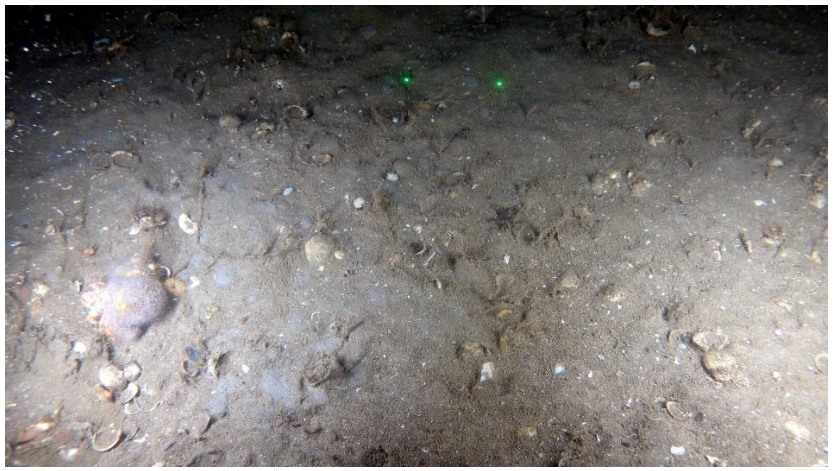
'Infralittoral mixed sediment' (A5.43) is described as shallow mixed (heterogeneous) sediments in fully marine or near fully marine conditions, supporting various animal-dominated communities, with relatively low proportions of seaweeds. This habitat may include well mixed muddy gravelly sands or very poorly sorted mosaics of shell, cobbles and pebbles embedded in mud, sand or gravel. Due to the quite variable nature of the sediment type, a widely variable array of communities may be found (EEA, 2019).

From photographic data, this biotope complex was observed at stations E_ST06, ST08 and E_ST10, transect E_TR03 and the majority of transect E_TR02 (2) (and at additional transects immediately north and south of these, specifically transects E_ST06N, E_ST06 S, E_ST08 N, E_ST08 S, E_TR02 N, E_TR02 S, E_TR03 S; Figure 4.20). It also occurred sporadically at station E_ST05 and the stations north and south of this (E_ST05 N and E_ST05 S), where patches of cobbles and boulders were seen within 'Infralittoral muddy sand' (A5.24) due to its only occasional occurrence in this area it has not been mapped on Figure 4.20. 'Infralittoral mixed sediment' (A5.43) occurred at stations/transects located in the central area and towards the offshore end of the surveyed route in water depths of 14 m BSL to 18 m BSL.

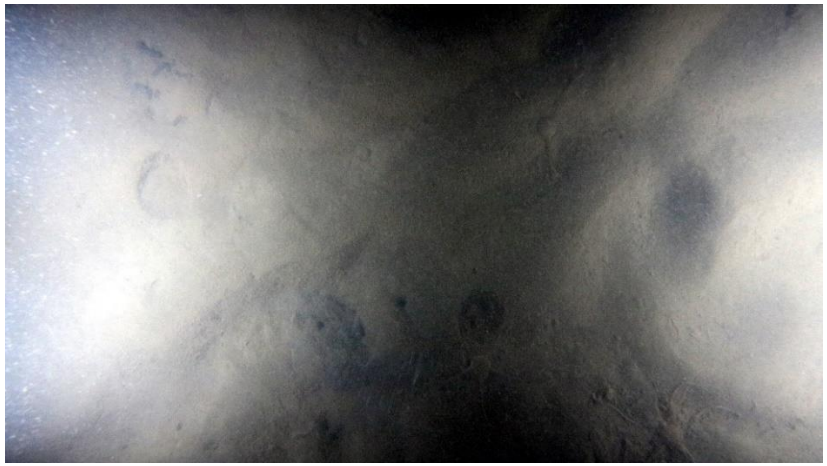
This biotope was reported from areas where higher SSS reflectivity was observed. The biotope was not successfully grab sampled, but seabed photographic data identified sediments of sand with shell fragments and a varying proportion of pebbles, cobbles and boulders (Table 4.16).

The free-living epifauna in this biotope included brittlestars (Ophiuroidea, including *O. albida*), starfish (Asteroidea including A. rubens), crabs (Brachyura, including *N. puber*), hermit crabs (Paguridae), burrowing anemones (Ceriantharia, including *C. lloydii)* and whelk (Buccinidae). Hard substrata were colonised by anemones (*Metridium* sp. and *Sagartia* sp.), soft coral (*A. digitatum*) and faunal turf (Hydrozoa/Bryozoa; Table 4.16).

Table 4.16: Summary of EUNIS habitat classifications, East A and B

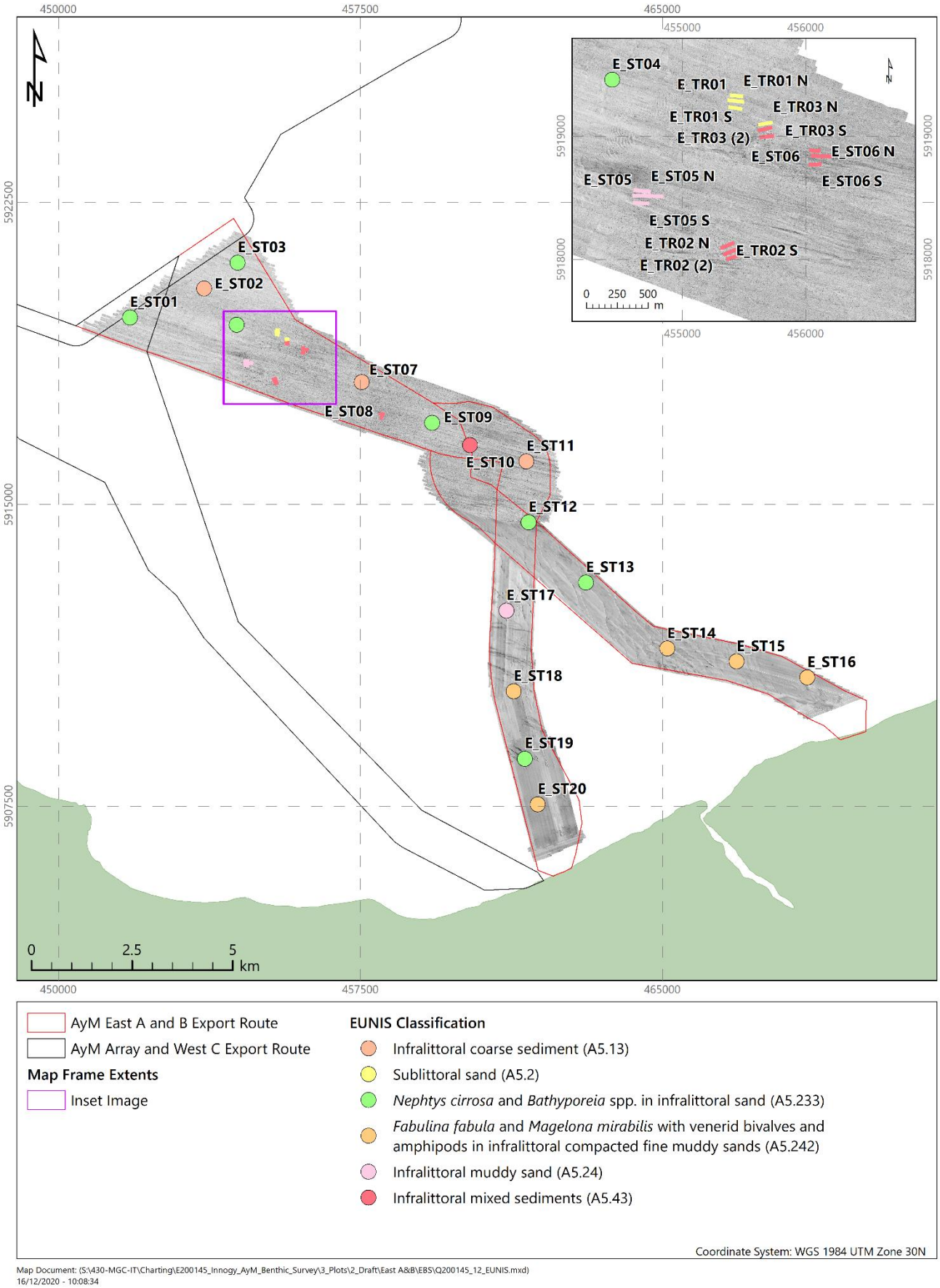
EUNIS Habitat Classification (EEA, 2019)	Distribution	Physical Characteristics	Biological Characteristics	Example Photograph
A5.1 Infralittoral coarse sediment	Cluster C (■)*†: Stations E_ST02, E_ST07, E_ST11, E_ST21 and E_ST25	Mean gravel*: 53.45 %	Mean number of infaunal taxa*: 24 per 0.1 m^2	
		Mean sand*: 43.38 %	Mean number of infaunal individuals*: 88 per 0.1 m^2	
		Mean mud*: 3.17 %	Characteristic infaunal taxa*: *Phoronis* sp., *Poecilochaetus serpens*, Nemertea and Actiniaria	
		Description†: Sand with varying proportion of shell and shell fragments	Characteristic epifaunal taxa†: Starfish (Asteroidea), hermit crab (Paguridae), brittlestars (Ophiuroidea), dragonet (*Callionymus* sp.) and faunal turf (Hydrozoa / Bryozoa)	
		Bathymetry: 9 m to 28 m BSL	Mean Biomass*: 1.768 g	

EUNIS Habitat Classification (EEA, 2019)	Distribution	Physical Characteristics	Biological Characteristics	Example Photograph
A5.23 Sublittoral sand	Transects†: E_TR01, E_TR01 N, E_TR01 S, E_TR03 (2) and E_TR03 N	Description†: 'Sand with shell and shell fragments'	Characteristic epifaunal taxa†: Brittlestars (Ophiuroidea, including *Ophiura albida*), starfish (*Asterias rubens* and *Astropecten irregularis*), hermit crabs (Paguridae) and soft coral (*Alcyonium digitatum*)	
		Bathymetry: 16 m to 21 m BSL		
A5.233 *Nephtys cirrosa* and *Bathyporeia* spp. in infralittoral sand	Cluster A (▲)*†: Stations E_ST01, E_ST03, E_ST04, E_ST09, E_ST12, E_ST13, E_ST19 and E_ST24	Mean gravel*: 14.41 %	Mean number of taxa*: 12 per 0.1 m^2	
		Mean sand*: 81.91 %	Mean number of individuals*: 43 per 0.1 m^2	
		Mean mud*: 3.68 %	Characteristic infaunal taxa*: *Bathyporeia guilliamsoniana*, *Nephtys cirrosa* and *Bathyporeia elegans*	
		Description†: 'Rippled sand with shell and shell fragments'	Characteristic epifaunal taxa†: Brittlestars (Ophiuroidea), starfish (*Asterias rubens*), soft coral (*Alcyonium digitatum*) and faunal turf (Hydrozoa/Bryozoa)	
		Bathymetry: 9 m to 27 m BSL	Mean Biomass*: 0.275	

EUNIS Habitat Classification (EEA, 2019)	Distribution	Physical Characteristics	Biological Characteristics	Example Photograph
A5.24 Infralittoral muddy sand	Stations †: E_ST05, E_ST05N, E_ST05S and E_ST17	Description†: 'Muddy sand with shell fragments. Patches of pebbles, cobbles and boulders'	Characteristic epifaunal taxa†: Starfish (Asteroidea inc. *Asterias rubens*), brittlestars (Ophiuroidea inc. *Ophiura albida*)	
		Bathymetry: 7 m to 18 m BSL		
A5.242 *Fabulina fabula* and *Magelona mirabilis* with venerid bivalves and amphipods in infralittoral compacted fine muddy sands	Cluster B (◆)*†: Stations E_ST14 to E_ST16, E_ST18, E_ST20, E_ST22 and E_ST23	Mean gravel*: 9.06 %	Mean number of infaunal taxa*: 15 per 0.1 m^2	
		Mean sand*: 90.94 %	Mean number of infaunal individuals*: 60 per 0.1 m^2	
		Mean mud*: 0.00 %	Characteristic infaunal taxa*: *Magelona johnstoni*, *Kurtiella bidentata*, *Fabulina fabula* and *Lagis koreni*	
		Description†: Sand	Characteristic epifaunal taxa†: Brittlestars (Ophiuroidea)	
		Bathymetry: 6 m to 10 m BSL	Mean Biomass*: 1.050	

EUNIS Habitat Classification (EEA, 2019)	Distribution	Physical Characteristics	Biological Characteristics	Example Photograph
A5.43 Infralittoral mixed sediment	Stations†: E_ST05, E_ST05 N, E_ST05 S, E_ST06, E_ST06N, E_ST06 S, E_ST08, E_ST08 N, E_ST08 S, E_ST10 and E_ST12 Transects†: E_TR02 (2), E_TR02 N, E_TR02 S, E_TR03 (2) and E_TR03 S	Description†: 'Sand with shell fragments and a varying proportion of cobbles and boulders' Bathymetry: 14 m to 16 m BSL	Characteristic epifaunal taxa†: Anemones (Actiniaria), burrowing anemones (Ceriantharia, inc. *Cerianthus lloydii*), starfish (*Asterias rubens*), brittlestars (Ophiuroidea), sponges (Porifera), hermit crab (Paguridae), dragonet (*Callionymus* sp.) and faunal turf (Hydrozoa/Bryozoa).	

Notes
Biomass expressed as ash free dry weight in g/0.1 m^2 grab sample
EUNIS = European Nature Information System
EEA = European Environment Agency
LAT = Lowest Astronomical Tide
* = Data from grab analysis. Mean values generated for sample/station data within multivariate grouping of macrofaunal community
† = Data from photographic analysis



Notes

EUNIS = European Nature Information System

EEA -= European Environment Agency

Figure 4.20: Completed environmental stations/transects and EUNIS habitat classifications (EEA, 2019), East A and B

4.6.2 Potential Sensitive Habitats and Species

4.6.2.1 Stony Reef

Areas of cobbles and boulders were observed at stations E_ST05, E_ST06 S, E_ST08, E_ST10 and E_ST12 and at the stations positioned immediately north and south of these (namely E_ST05 N, E_ST05 S, E_ST06, E_ST06 N, E_ST08 N and E_ST08 S). They were also observed along transects E_TR01, E_TR02 (2), E_TR03 (2) and the additional transects to the north and south of these (namely E_TR01 N, E_TR01 S, E_TR02 N, E_TR02 S, E_TR03 N and E_TR03S). All of these stations/transects were further assessed for possible resemblance to stony reef habitats.

The video and photographic data revealed areas of potential reef with the composition of cobbles and boulders in the range of 10 % to 40 % (Low) at stations E_ST06, E_ST08, E_ST08 N and E_ST08 S and transect E_TR02 S. The elevation was recorded in the range of 64 mm to 5 m (Medium) at stations E_ST06, E_ST08, E_ST08 N and E_ST08 S; however, it was at the lower end of this range. All cobbles showed evidence of scour, with dead barnacles and barnacle scars present across these stations and transects. Only one key reef species (*A. digitatum*) as described in Goulding et al. (2020) was present across the assessed areas. Scour tolerant species including the anemones *Urticina* sp. along with the bryozoan *Flustra foliacea* as well as the presence of sand ripples at some stations suggest that the area is highly dynamic and subject to disturbance. Therefore, it is unlikely that the present reef is stable. The areas assessed appear distinct from the surrounding seabed and the coarse material forming the reef was matrix-supported, indicating that the cobbles and boulders of the reef were not touching and were surrounded by sand. Because of this, these areas have been classified as 'Low resemblance to stony reef'.

At nine stations (E_ST05, E_ST05 S, E_ST05 N, E_ST06 N, E_ST06 S, E_ST06 N, E_ST08 S, E_ST10, E_ST12) and along eight transects (E_TR01, E_TR01 N, E_TR01 S, E_TR02 (2), E_TR02 N, E_TR03 (2), E_TR03 S and E_TR03 N) the percentage cover of cobbles and boulders were less than 10 % and therefore classified as 'no resemblance to stony reef'. These areas were characterised as sand with areas of gravel and occasional cobbles and boulders.

Table 4.17 shows examples of the potential stony reef assessed and Figures 4.21 to 4.23 show the occurrence of stony reef at station E_ST05, transect E_TR02, station E_ST06 and station E_ST08 respectively.

Table 4.17: Potential stony reef assessment, East A and B

Transect	Assessment Criteria		Representative Image	
E_ST06	Composition	Low		
	Elevation	Medium		
	Extent	> 25 m²		
	Biota	< 80 %	E_ST06_10 456 112.6 mE 5 918 813.7 mN	E_ST06_15 456 170.5 mE 5 918 825.7 mN
	Overall assessment: Low resemblance to stony reef			
E_ST08	Composition	Low		
	Elevation	Medium		
	Extent	> 25 m²		
	Biota	< 80 %	E_ST08_02 458 071.7 mE 5 917 186.9 mN	E_ST08_10 457 996.1 mE 5 917 215.5 mN
	Overall assessment: Low resemblance to stony reef			
E_ST08 N	Composition	Low		
	Elevation	Medium		
	Extent	> 25 m²		
	Biota	< 80 %	E_ST08 N_02 458 063.1 mE 5 917 237.5mN	E_ST08 N_05 458 032.6 mE 5 917 243.4 mN
	Overall assessment: Low resemblance to stony reef			
E_ST08 S	Composition	Low		
	Elevation	Medium		
	Extent	> 25 m²		
	Biota	< 80 %	E_ST08 S_02 458 031.6 mE 5 917 143.1 mN	E_ST08 S_04 458 010.6mE 5 917 144.6 mN
	Overall assessment: Low resemblance to stony reef			
E_TR02 S	Composition	Low		
	Elevation	Low		
	Extent	> 25 m²		
	Biota	< 80 %	E_TR02 S_08 455 423.1 mE 5 918 022.7 mN	E_TR02 S_12 455 454.8 mE 5 918 033.6 mN
	Overall assessment: Low resemblance to stony reef			

4.6.2.2 Other Potentially Sensitive Habitats and Species

The seabed within the survey area was classified as the EUNIS habitats 'Infralittoral coarse sediment' (A5.13), 'Sublittoral sand' (A5.2), 'Infralittoral fine sand' (A5.23), '*Nephtys cirrosa* and *Bathyporeia* spp. in infralittoral sand' (A5.233), 'Infralittoral muddy sand' (A5.24), '*Fabulina fabula* and *Magelona mirabilis* with venerid bivalves and amphipods in infralittoral compacted fine muddy sands' (A5.242) and 'Infralittoral mixed sediment' (A5.43). These habitats are encompassed within 'Subtidal sands and gravels', a priority habitat within UK waters.

A possible sand eel (Ammodytidae) was recorded from video data at station E_ST16. The sand eel (Ammodytidae) is listed in the UK BAP List as an important (priority) species for the protection of the UK's biological resources.

No other Annex I habitats or Annex II species, OSPAR threatened and/or declining species and habitats or UK Biodiversity Action Plan priority habitats and species observed within the survey area.

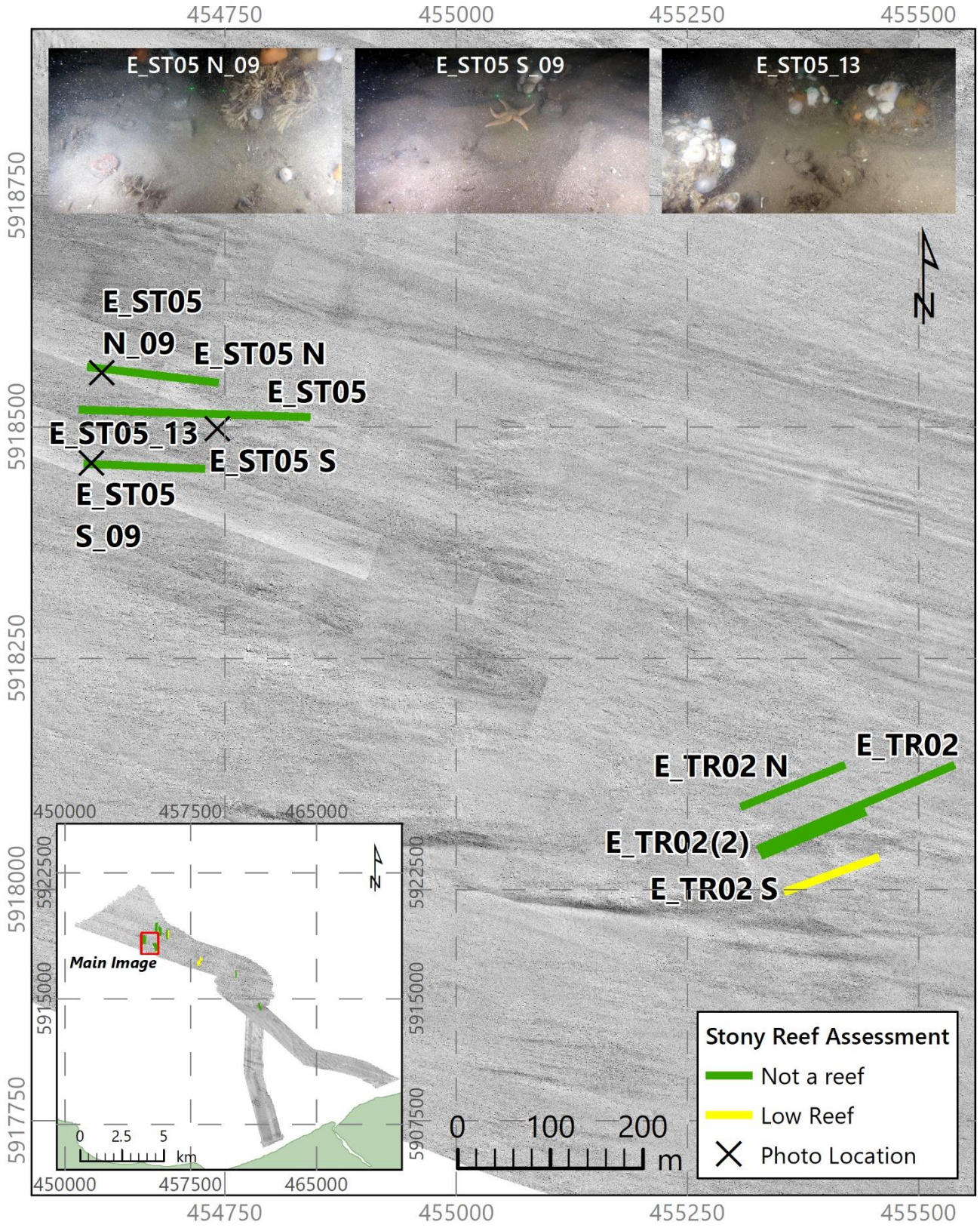


Figure 4.21: Potential stony reef assessment, E_ST05 and E_TR02, East A and B

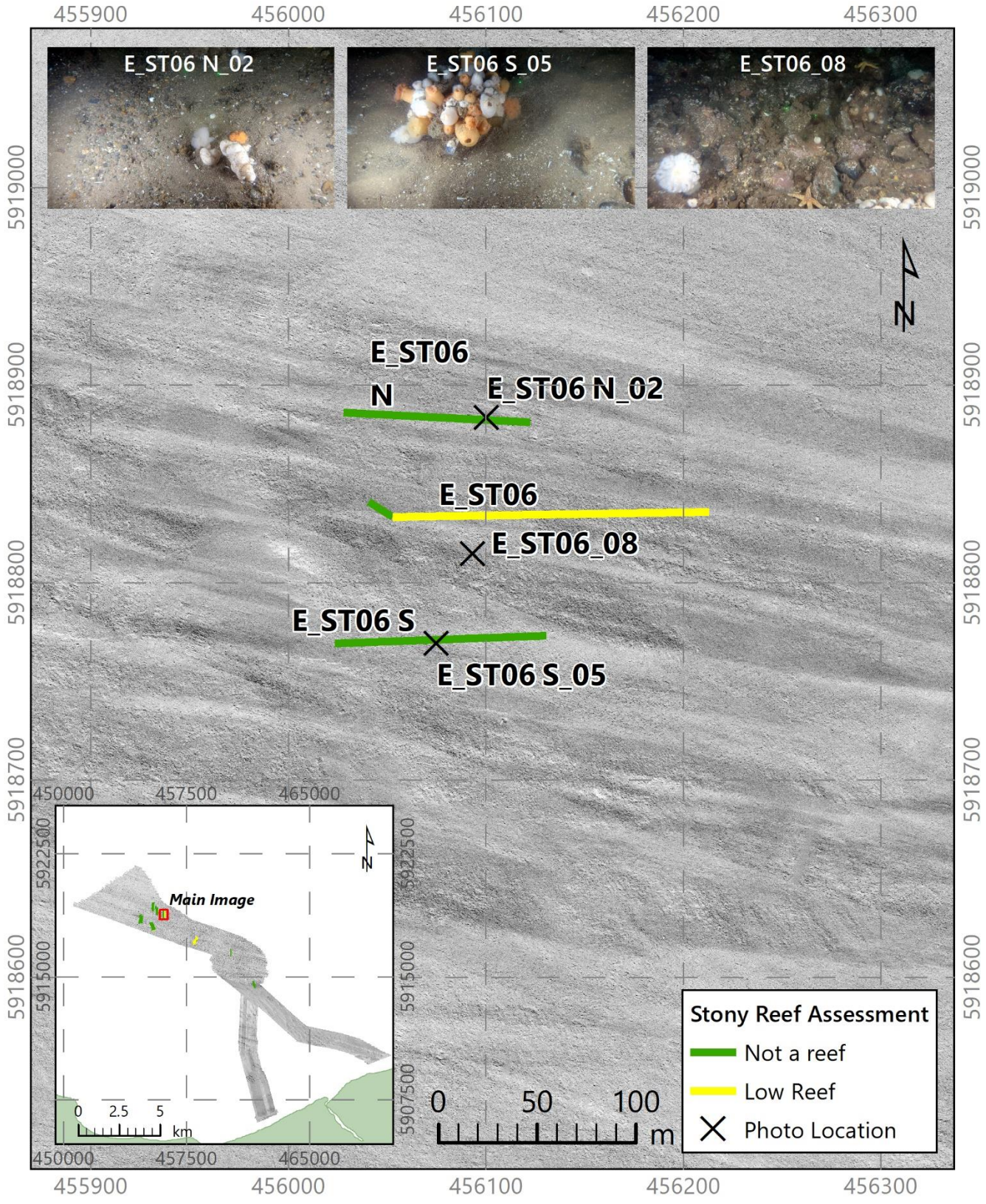


Figure 4.22: Potential stony reef assessment, E_ST06, East A and B

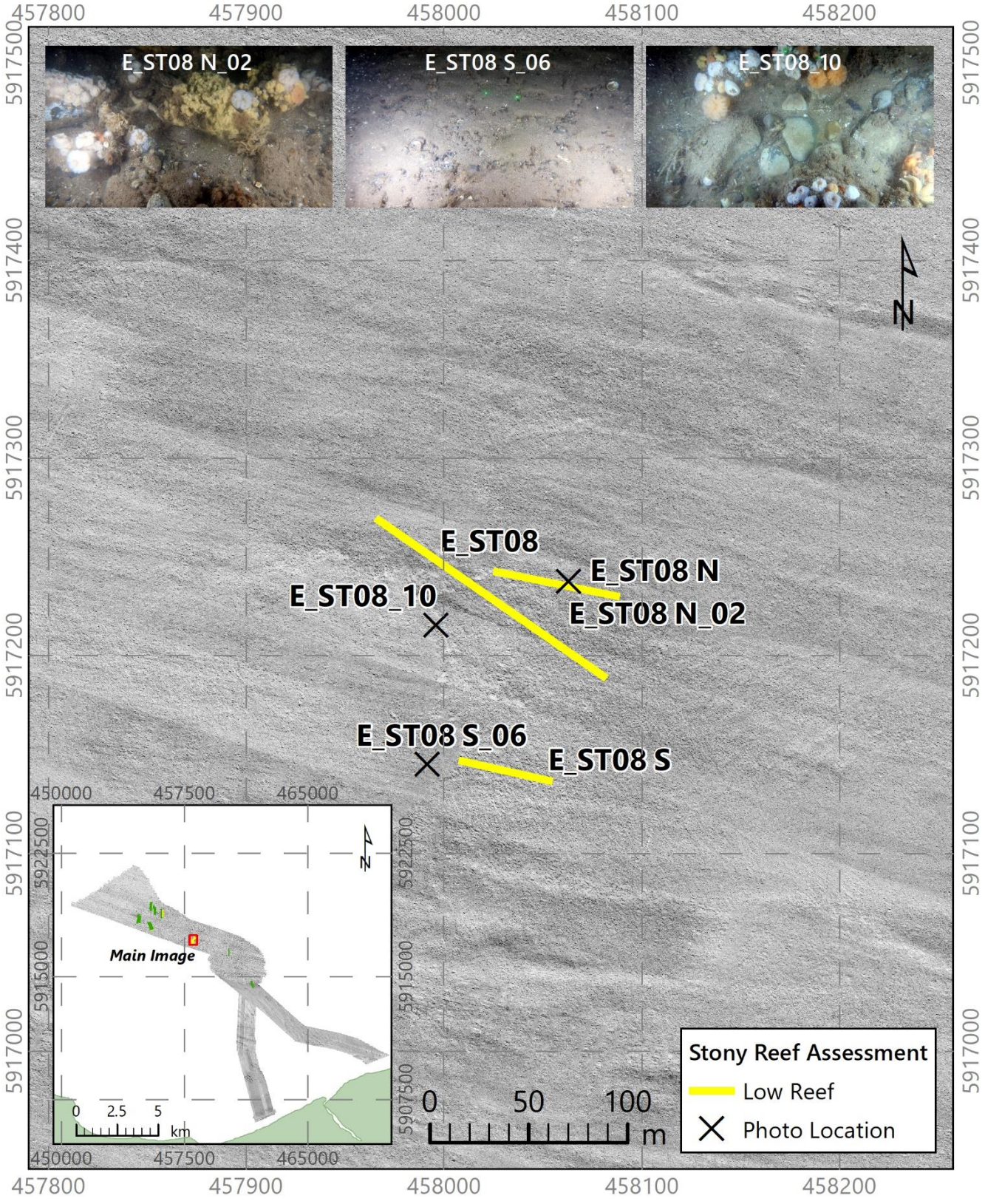


Figure 4.23: Potential stony reef assessment, E_ST08, East A and B

5. Discussion

5.1 Sediment Characterisation

The general physical and chemical characteristics of sediment particles have a significant effect on how other chemical components and biological species interact with seabed sediments. For example, the silt/clay fraction is known to adsorb petroleum hydrocarbons/heavy metals from seawater and through this pathway, these chemicals become incorporated into the sediment system (Meyers & Quinn, 1973). Granulometry data can therefore be critical when interpreting chemical and biological data obtained in this type of benthic study. In addition, since waste discharges (such as drill cuttings) often possess significantly different physical characteristics from the natural sediments present in the area, such data may also provide some information on the spread of discharged material.

With regard to macrofaunal communities, the species distributions and community structure can be greatly influenced by the nature of the sediment, which represents the effects of a complex set of hydrological factors, such as water movement, turbulence and suspended load, at one particular point in time. Some animals have a behavioural preference for sediment of a particular grain size (Meadows, 1964; Gray, 1981), while this factor and organic matter content are closely associated with other properties of the sediment such as density, porosity, permeability, oxygenation and bacterial count (Buchanan, 1984), all of which affect animal functions such as locomotion, attachment, tube construction and feeding. Specifically, the proportion of fine (silt/clay) material often influences the distribution of macrofaunal communities.

The sediments within the survey area demonstrated high interstation variability in mean diameter (µm) and gravel and fines content, with a moderate interstation variability of sand content (Tables 4.3 and 4.4). Sediment descriptions using the Folk description (1954) categorised the seabed along the length of the export cable route surveyed as predominantly sand or sandy gravel (16 stations), with two stations described as gravelly muddy sand, one station described as gravelly sand and one as gravel. This was supported by the geophysical interpretation of the sediments.

A spatial pattern in the sediment type was apparent along the cable route whereby predominantly sand sediments were identified from the nearshore legs of the route and from the offshore area (adjacent to the main array). Sediments with higher gravel content were identified from three stations towards the middle of the route (stations E_ST07, E_ST09 and E_ST21), in water depths of 13 m BSL to 20 m BSL, and from two shallower stations (stations E_ST22 and E_ST25), in water depths of 8 m BSL to 9 m BSL. Stations E_ST11 and E_ST12, located towards the centre of the route in water depths of 13 m BSL to 15 m BSL, comprised predominantly sand sediments, but with moderate proportions of both mud and gravel.

Multivariate cluster analysis reinforced these results, with four statistically significant clusters identified. Principle component analysis refined these results and demonstrated that the factors driving the differentiation of the clusters were the proportions of medium sand, coarse sand and coarse pebble sediment.

5.2 Sediment Chemistry

5.2.1 Sediment Hydrocarbons

5.2.1.1 Aromatic Hydrocarbons

PAHs are widely spread in the environment (Butler et al., 1984) with natural sources occurring primarily through synthesis by plants (Neff, 1979; Sims & Overcash, 1983), related to natural seeps of petroleum (NRC, 1983; Kennicutt et al., 1988) and to formation during natural forest and prairie fires (Youngblood & Blumer, 1975; Wakeham et al., 1979). By far the greatest proportion of PAHs released into the environment are formed during fossil fuel combustion and anthropogenic forest and agricultural fires (Edwards, 1983; Sims & Overcash, 1983; Haritash & Kaushik, 2009). PAHs primarily enter marine sediments from atmospheric and riverine inputs; accumulation on the surface tends to adsorb to suspended inorganic and organic particulate matter, ultimately settling on the seabed where they accumulate to relatively high concentrations (Latimer & Zheng, 2003; Culotta et al., 2006).

Monitoring of aromatic hydrocarbon type and content is important due to the particularly toxic nature (mutagenic/carcinogenic) of several PAHs, particularly the heavier weight PAHs. The US EPA has identified 16 priority PAHs to be monitored (Keith, 2015) and the Coordinated Environmental Monitoring Programme (CEMP) specifies 9 PAHs of specific concern (OSPAR, 2014), which primarily reflect inputs from anthropogenic combustion sources.

Total 2 to 6 ring PAH concentrations were higher than the median concentration recorded from the SEA6 (Cefas, 2005) Irish Sea surveys (0.0237 µg/g) at three stations (E_ST04, E_ST16 and E_ST20), of which two (E_ST16 and E_ST20) were closest to land.

The individual US EPA 16 PAH concentrations were all below the CEMP ERL values, and therefore are unlikely to have any adverse effects on the macrofaunal community (Appendix E.1).

The source of the PAHs may be determined by investigation of the relative proportions of individual PAH concentrations (Neff, 1979; Budzinski et al., 1997; Yunker et al., 2002) as well as examining the overall distributions of parent and alkylated PAHs present. Pyrogenically (or pyrolytic) derived PAHs signatures (i.e. forest fires, etc.) are dominated by higher molecular weight compounds (mainly 4 to 6 ring) and are predominantly unsubstituted. In contrast, PAH formed during the slow geological maturation of petroleum, are dominated by alkylated, low molecular weight (mainly 1 to 3 ring) compounds (Neff, 1979; Stogiannidis & Laane, 2015). The proportion of petrogenically derived NPD to total aromatic

material present in these sediments (mean 27 %; Table 4.6) indicated a predominantly pyrolytic source for the aromatic compounds in the sediments.

5.2.2 Sediment Metals

5.2.2.1 Heavy and Trace Metals

Metals and metalloids occur naturally in the marine environment and are widely distributed in both dissolved and sedimentary forms. Some are essential to marine life while others have no biological function and therefore are toxic to numerous organisms at certain levels (Paez-Osuna & Ruiz-Fernandez, 1995; Boening, 1999). Metals can enter the environment via natural methods such as riverine transport, coastal discharges, geological weathering and atmospheric fallout (Brady et al., 2015). Other routes into marine sediments are from anthropogenic activities such as direct discharges from industrial activities.

Trace metal contaminants in the marine environment tend to form associations with the non-residual phases of mineral matter, such as iron and manganese oxides and hydroxides, metal sulphides, clays, organics and carbonates (Warren & Zimmerman, 1993; Dang et al., 2015; Wang et al., 2015). Non-residual trace metals are associated with more reactive and available sediment components through processes such as adsorption onto mineral surfaces and organic complexation. Metals associated with these more reactive phases are prone to various environmental interactions and transformations (physical, chemical and biological) potentially increasing their mobility and biological availability (Tessier et al., 1979; Warren & Zimmerman, 1993; Du Laing et al., 2009). Residual trace metals are defined as those that are part of the crystal structure of the component minerals and are generally unavailable to organisms (de Orte et al., 2018). Therefore, in monitoring trace metal contamination of the marine environment, it is important to distinguish the more mobile non-residual trace metals from the residual metals held tightly in the sediment lattice Chester & Voutsinou, 1981), which are of comparatively lesser environmental significance because of their low reactivity and availability.

In this study, an analytical procedure involving the digestion of sediment in aqua regia was employed to analyse the elemental content of the sediments. The aqua regia digest releases for analysis the 'non-residual' heavy metals, which are not incorporated in the mineral matrix and are therefore potentially available for biological uptake.

The bioavailable total metals concentrations in the sediments were all below their respective Cefas action levels and the CEMP ERLs indicating that these metals are unlikely to have an adverse effect on the macrofaunal communities present.

5.3 Macrofaunal Communities

Seabed sediments provide support, protection and the food source for many macrofaunal species. The sediment macrofauna, most of which are infaunal (living within the sediment), are therefore particularly vulnerable to external influences that alter the sediments' physical, chemical or biological nature. Such infaunal animals are largely sedentary and are thus

unable to avoid unfavourable conditions. Each species has its own response and degree of sensitivity to changes in the physical and/or chemical environment and consequently the species composition and their relative abundance in a particular location provides a reflection of the health and condition of the immediate environment, both current and historical. The recognition that aquatic contaminant inputs may alter sediment characteristics, together with the relative ease of obtaining quantitative samples from specific locations, has led to the widespread use of infaunal communities in monitoring the impact of disturbances to the marine environment over a long period of time.

The infaunal communities within the survey areas showed variation in terms of phyletic individuals' composition, the number of taxa and the number of individuals present at each station. Annelids contributed the highest number of taxa at all stations except two, where the majority of taxa were arthropods. Whilst annelids were present at every station, arthropods, molluscs, echinoderms and other phyla showed variability in terms of presence and absence. The dominant phyla in terms of the number of individuals showed a greater variation, varying between annelids, arthropods, molluscs and other phyla.

The variation in the number of taxa and number of individuals was reflected in the in the diversity indices (Shannon-Wiener (H'Log2)), evenness (expressed as both Pielou's (J) and the complement of Simpson's Index (λ)), all of which also showed high levels of variation across the survey area. The variation in the number of taxa and individuals did not appear to show any spatial patterns, nor any clear association with sediment type.

The multivariate cluster analysis of infauna identified six statistically significant clusters and two ungrouped stations. Each of the infaunal clusters were dominated by different key taxa, as well as differing numbers of taxa and individuals. The infaunal groups identified showed no clear spatial pattern in their distribution.

The BIOENV algorithm in the PRIMER BEST routine was an additional technique used to identify the environmental variables that correlated significantly with the patterns outlined in community structures. BIOENV was run for a single and a combination of two and three variables. The single variable correlating with the patterns in the macrofaunal community was medium sand ($P \leq 0.05$; rho = 0.365), as described on the Wentworth (1922) scale. The two combined variables correlating with patterns in the macrofaunal community were coarse sand and the medium sand ($P \leq 0.05$; rho = 0398.). When more than two variables were combined, the best correlation with patterns in the macrofaunal community were seen due to the combined influence of fine pebble, coarse sand and medium sand fractions ($P \leq 0.05$; rho = 0.418). The results suggested that variation in macrofaunal communities was being driven by variations sediment type. BIOENV correlations run for chemical results with the patterns in the macrofaunal community provided no significant variable results (> 5 %).

Stations within infaunal cluster A were dominated by fauna typical of the mobile sand sediments that were present at these stations. The cluster was dominated by the amphipod *B. guilliamsoniana,* with the closely related *B. elegans* also present in moderate abundance;

both *Bathyporeia* species are epistrate feeders, who feed by scraping off the algae/microbes present on sand grains. The psammophilous (sand-inhabiting) polychaete *N. cirrosa* was also prominent in this biotope. These species show preference for medium to coarse sands in wave exposed habitats and, by extension, any sediments subject to hydrodynamic disturbance (Tillin & Garrard, 2019).

Sediments associated with infaunal cluster B were found to typically comprise well sorted, medium sand. The cluster B community was associated with nearshore sections of the route and was colonised by a range of taxa often associated with more sheltered, shallow water environments, namely the polychaetes *M. johnstoni* and *L. koreni* and the bivalves *K. bidentata* and *F. fabula*.

Cluster C comprised stations of variable sediment composition, with Folk descriptions that included gravel, sandy gravel, gravelly sand and gravelly, muddy sand. The presence of coarser materials at these stations appeared to modify the benthic community in relation to the other, predominantly sandy, stations sampled. The dominant infaunal and solitary epifaunal taxa within cluster C comprised *Phoronis* sp., *P. serpens*, nemerteans and anemones (Actiniaria); colonial epifauna (principally *A. parasiticum* and *C. reticulum*) was more frequently recorded within this cluster than at other stations.

Biomass analysis of the infauna showed a high level of variation between stations across the survey area, likely due to the variation in phyletic composition identified. The overall biomass was highest within infauna cluster C (Table 4.16), with arthropods providing the highest contribution due to the abundance of the large-bodied mud lobster *Upogebia deltaura*. Cluster B (stations E_ST16 and E_ST18) had the second highest biomass of the clusters, due to the occasional presence of larger-bodied echinoderms (the urchin *Echinocardium cordatum* and brittlestars *O. ophiura* and *Acrocnida brachiata*).

Solitary epifauna were identified across two phyla; Bryozoa and Hydrozoa. As previously mentioned, the frequency of occurrence of colonial epifauna was highest within cluster C, due of the availability of coarse sediments for colonisation. Macrofaunal cluster C also had the highest diversity of colonial epifauna, with all but one of the epifaunal taxa recorded across the survey area as a whole being reported from this community. Due to their more limited supply of suitable attachment substrata, the remaining clusters had fewer colonial epifauna taxa than cluster C. Colonial epifauna was absent from two of the eight cluster A stations and from five of the seven cluster B stations.

5.4 Seabed Habitats and Biotopes

When seabed photographic data, particle size data and macrofaunal data were considered using the EUNIS classification; one habitat, three biotope complexes and two biotopes were assigned to the transects and stations surveyed. The classifications were refined from the habitat classifications reported in the ECR East A and B - Environmental Features Report (Volume 4 of this series), with the inclusion of quantitative PSD and macrofaunal data (from grab samples) typically allowing lower level classification.

The majority of stations and transects surveyed identified predominantly sand sediments, with these being defined within the habitat 'Sublittoral sand' (A5.2) and the biotope complex 'Infralittoral muddy sand' (A5.24). Where quantitative sample data were available, and communities appeared to match those identified from published data (EEA, 2019; JNCC, 2015), classifications were further refined, with the biotope '*Nephtys cirrosa* and *Bathyporeia* spp. in infralittoral sand' (A5.233) defined at eight stations and the biotope '*Fabulina fabula* and *Magelona mirabilis* with venerid bivalves and amphipods in infralittoral compacted fine muddy sands' (A5.242) at eight stations. It appeared probable that the differentiation of sediment composition, and as a result faunal community, within sand habitat types was related to the degree of tidal and/or wave exposure of the areas sampled. Geophysical (SSS and MBES) data acquired across the survey area identified areas of sand waves and megaripples, suggesting seabed sediment mobility. Of the two biotopes defined, '*Nephtys cirrosa* and *Bathyporeia* spp. in infralittoral sand' is always associated with mobile sediments, with its relatively robust and mobile characteristic fauna tolerant of physical disturbance (as identified within cluster A of multivariate analysis of macrofaunal data). '*Fabulina fabula* and *Magelona mirabilis* with venerid bivalves and amphipods in infralittoral compacted fine muddy sands' (A5.242) is associated with more stable sediments and was restricted to nearshore areas, where there was less evidence of sediment mobility from the geophysical data. This biotope corresponded to cluster B in the multivariate analysis of macrofaunal data, which was shown to be dominated by sedentary infaunal taxa.

Isolated patches of coarser sediments (gravel, pebbles, cobble and boulders) were identified within predominantly sand habitats, but more extensive areas of gravelly sand or predominantly gravel habitat were identified from five stations. These were defined as the 'Infralittoral coarse sediment' (A5.13) biotope complex and were found to be colonised by a statistically significantly different community to the sand areas. This community (cluster C in the multivariate analysis) included epifaunal anemones (Actiniaria) which require hard attachment substrata, along with infaunal taxa (such as *Phoronis* sp. and *P. serpens*) with an affinity for coarser sand and gravel sediments.

Within the survey area eight stations and five transects were classified as the biotope complex 'Infralittoral mixed sediment' (A5.43). These stations/transects could only be characterised from seabed video data, as no grab samples were acquired. Sediments primarily comprised sand with shell fragments and a varying proportion of cobbles and boulders. The epifauna assemblages present at these stations and transects were typical of mixed sediments. Due to the sediment composition, a stony reef assessment was undertaken at stations/transects within this biotope complex.

With the exception of the biotope '*Fabulina fabula* and *Magelona mirabilis* with venerid bivalves and amphipods in infralittoral compacted fine muddy sands' (A5.242), which was clearly restricted in distribution to nearshore areas, the habitat types defined did not demonstrate a clear spatial distribution; these were instead patchily distributed throughout the central and offshore areas of the route. This patchy distribution was probably the result of

sediment mobility, with less densely populated and diverse sand communities associated with sand wave/megaripple crests and more densely populated and diverse communities associated with the stable coarse and mixed sediments of sand wave/megaripple troughs (Koop et al., 2019).

Based on the assessments performed in the ECR East A and B – Environmental Features Report (Volume 4 of this series) and the observations during this report, several sensitive habitats/species have the potential to occur within the survey area.

Eleven stations and nine transects were classified as 'Low resemblance to stony reef'. When determining whether an area of the seabed should be considered as Annex I stony reef, if a 'low' is scored in any of the four 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 EC Habitats Directive (Irving, 2009). An additional nine stations and eight transects were classified as 'no resemblance to stony reef', these areas were characterised as sand with areas of gravel and occasional cobbles and boulders.

A possible sand eel (Ammodytidae) was recorded from video at station E_ST16. The sand eel (Ammodytidae) is listed in the UK BAP List as an important (priority) species for the protection of the UK's biological resources.

The sediments observed throughout the survey area were identified as comprising the broadscale priority habitat 'subtidal sands and gravels'. However, this habitat is widely distributed and represented elsewhere in the UK Marine Protected Area (MPA) network

No other Annex I habitats or Annex II species, OSPAR threatened and/or declining species and habitats or UK Biodiversity Action Plan priority habitats and species observed within the survey area.

6. Conclusions

The aim of this report has been to evaluate the existing physical, chemical and biological components in the marine environment within the Awel y Mor East A and B export cable route. A review of the environmental data in context with other cited studies from the region and estimated sediment effects threshold values (Cefas, 2005; OSPAR, 2014) was also undertaken. Based on the overall assessment of the survey area, the following key conclusions can be stated:

The sediments within the survey area mainly comprised sand, with varying proportions of gravel, and little to no fines (mud). Predominantly sand sediments were identified in nearshore areas, while in the central areas of the route and towards its offshore end sediment were more variable, comprising sands, predominantly gravel sediments and mixed sediments (sand with pebbles, cobbles and boulders). The sediment types observed were typical of this part of the Irish Sea.

Total 2 to 6 ring PAH concentrations were broadly comparable to the median concentration reported from the SEA6 Irish Sea surveys. All individual PAH concentrations were below their respective ERL values.

All metals concentrations were less than their respective Cefas guideline action levels (AL1 and AL2) and OSPAR ERL values.

The number of infaunal and solitary epifaunal taxa recorded from the grab samples varied along the route. Following multivariate statistical analysis, three separate benthic communities were differentiated. One of these was dominated by the polychaete *M. johnstoni* and was associated with nearshore stable sand areas, one was characterised by the amphipod *B. guilliamsoniana* and polychaete *N. cirrosa* and was associated with more mobile sand sediments. A more diverse community, dominated by *Phoronis* sp., was associated with coarser, gravelly sediments. Colonial epifauna was most frequently recorded from the gravel sediment community, which was also shown to have the largest infaunal biomass.

Six habitat types were defined within the survey area; habitats were classified at either habitat, biotope complex or biotope level. Five transects were classified as 'Sublittoral sand' (A5.2), four stations as 'Infralittoral muddy sand' (A5.24), eight stations as '*Nephtys cirrosa* and *Bathyporeia* spp. in infralittoral sand' (A5.233) and six stations as '*Fabulina fabula* and *Magelona mirabilis* with venerid bivalves and amphipods in infralittoral compacted fine muddy sands' (A5.242). A further five stations were classified as 'Infralittoral coarse sediment' (A5.13) and eight stations defined as 'Infralittoral mixed sediments' (A5.43).

The UK priority habitat 'subtidal sands and gravels' was likely to be present within survey area, however this habitat is widely distributed within UK waters and is included within UK MPA networks. Eleven stations and nine transects were classified as 'Low resemblance to stony reef', and an additional nine stations and eight transects were classified as 'no

resemblance to stony reef'. These areas were all matrix-supported and were a component part of the mixed sediment seabed types recorded within the region. A possible UK BAP Listed important (priority) sand eel (Ammodytidae) was recorded from video at one station.

No other Annex I habitats or Annex II species, OSPAR threatened and/or declining species and habitats or UK Biodiversity Action Plan priority habitats and species were observed within the survey area.

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Appendices

Appendix A

Guidelines on Use of Report

This report (the "Report") was prepared as part of the services (the "Services") provided by Fugro GB Marine Limited ("Fugro") for its client (the "Client") under terms of the relevant contract between the two parties (the "Contract"). The Services were performed by Fugro based on requirements of the Client set out in the Contract or otherwise made known by the Client to Fugro at the time.

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Appendix B

Methodologies

B.1 Survey Methods

B.1.1 Sediment Grab Sampling

Seabed samples were acquired using a 0.1 m^2 Hamon grab for macrofauna and particle size distribution (PSD) and a 0.1 m^2 Day grab for chemistry sampling.

Operational procedures for grab sampling were as follows:

- The 0.1 m^2 Day grab or 0.1 m^2 Hamon grab was prepared for operations prior to arrival on station. Positioning was provided by a vessel offset from the vessel reference point. The Bridge communicated to the deck via a VHF radio when the vessel was steady and on location, and the grab was deployed from the starboard A-frame;
- When the deck crew operating the winch observed that the grab had reached the seabed (evidenced through a distinct slackening of the wire rope and snatch block), a positional fix was taken;
- On recovery to the deck, the sample was inspected and judged acceptable or otherwise (see below for rejection criteria);
- Once accepted, the grab sample was retained for faunal and PSD analysis (Hamon grab) and one grab sample was retained and sub-sampled for chemistry analysis (Day grab);
- Deck logs were completed for each sample acquired (including no samples) with date, time, sample number, fix number, sediment type, odour (i.e. H_2S) and bioturbation or debris noted.

Samples were considered unacceptable in the following instances:

- Evidence of sediment washout caused through improperly closed grab jaws or inspection hatch;
- Sediment sample taken on an angle, where the grab jaws have not been parallel to the seabed when the grab fired;
- Disruption of the sample through striking the side of the vessel;
- Sample represented less than approximately 7 cm bite depth for the 0.1 m^2 Day grab or less than 5 L for the Hamon grab;
- Sample was more than 30 m from the target location.

B.1.2 Chemical Sample Processing

- Hydrocarbon (HC) sub-samples were collected using a metal scoop to a nominal depth of 2 cm. Sub-samples collected were HCA1 and HCA2. The sub-samples were preserved in glass jars at approximately −20 °C;
- Heavy metal (HM) sub-samples were collected using a plastic scoop to a nominal depth of 2 cm. Sub-samples collected were HMA1 and HMA2. The sub-samples were preserved in polythene bags at approximately −20 °C.

B.1.3 Macrofauna and Particle Size Distribution (PSD) Sample Processing

Macrofauna and PSD sub-samples were processed as follows:

- Samples were processed in their entirety, by opening the grab to drop the sample into a container. All supernatant water was processed along with the sediment;
- A PSD sub-sample was collected prior to sieving of the sample and placed in a polythene bag and stored at approximately −20 °C;
- The remaining sample was transferred to a 1 mm mesh sieve and transferred to the hand sieving table and sediment washed out;
- Once sieved samples were transferred to containers and fixed in 10 % buffered formal saline. The sample containers were then sealed, hazard labelled and stored securely on deck.

B.2 Laboratory Analysis for Sediment Samples

B.2.1 Particle Size Analysis (PSA)

Dry Sieve Analysis

Particle size distribution (PSD) analysis was undertaken in accordance with Fugro GB Marine Limited (FGBML) in-house methods based on the National Marine Biological Association Quality Control scheme's (NMBAQC) best practice guidance document – Particle Size Analysis (PSA) for Supporting Biological Analysis, and BS1377: Parts 1: 2016 and 2: 1990.

Representative material > 1 mm was split from the bulk sub-sample and oven dried before sieving through a series of sieves with apertures corresponding to 0.5 phi intervals between 63 mm and 1 mm as described by the Wentworth scale (Wentworth, 1922). The weight of the sediment fraction retained on each mesh was subsequently measured and recorded.

Laser Diffraction

PSD analysis was undertaken in accordance with FGBML in-house methods based on the NMBAQC scheme's best practice guidance document – PSA for Supporting Biological Analysis, and BS ISO 13320: 2009.

Representative material < 1 mm was removed from the bulk sub-sample for laser analysis, a minimum of three triplicate analyses (mixed samples) or one triplicate analyses (sands) were analysed using the laser sizer at 0.5 phi intervals between < 1 mm to < 0.98 µm. Laser diffraction was carried out using a Malvern Mastersizer 2000 with a Hydro 2000G dispersion unit.

Sample Analysis Outputs and Deliverables

Sieve and laser data are merged and entered into GRADISTAT to derive statistics including mass and percentage retained within each size fraction, mean and median grain size, bulk sediment classes (percentage gravel, sand and silt/clay), skewness, sorting coefficients and Folk classification.

B.2.2 Hydrocarbon Analysis in Sediments

Hydrocarbon analysis of sediments was carried out by FGBML.

B.2.3 General Precautions

To effectively eliminate all possible sources of hydrocarbon contamination from the analysis the following precautionary measures were taken prior to sample work-up:

- All solvents were purchased as high purity grade. Each batch was checked for purity by concentrating approximately 400 mL down to a small volume (< 1 mL) and analysing by gas chromatography (GC);
- All water used was distilled through an all glass still and dichloromethane extracted to minimise contamination from plasticisers;

- All glassware was cleaned using an acid/base machine wash. The glassware was rinsed with acetone then finally with dichloromethane prior to use;
- Procedural blanks, replicate analyses and laboratory reference material were run with each batch.

Ultrasonication Extraction for Hydrocarbons in Sediment

Sediment samples were thawed, homogenised and accurately weighed into a 250 mL conical flask. A solution containing an appropriate amount of the following internal standards was added to each sample using a microsyringe.

Aromatic Standards
D_8 Naphthalene
D_{10} Acenaphthene
D_{10} Phenanthrene
D_{10} Pyrene
D_{12} Chrysene
D_{12} Perylene

Methanol (50 mL) and solvent were mixed with the sediment. Dichloromethane (DCM) (60 mL) was then added and the sample mixed again. The flasks were then capped with solvent cleaned aluminium foil and ultrasonicated for 30 minutes.

After being allowed to settle the solvent was decanted through a GF-C filter paper into a 1 litre separating funnel. The extract was then partitioned with 100 mL of DCM extracted distilled water and the DCM layer run-off into a clean 500 mL round-bottomed flask. The ultrasonic extraction was repeated a further two times using 50 mL DCM and 15 minutes of ultrasonication. Each time the filtered extract was partitioned with the remaining methanol/water in the separating funnel. The DCM extracts were bulked and reduced in volume to approximately 2 mL using a rotary evaporator, then further reduced to approximately 1 mL under a gentle stream of nitrogen prior to clean-up.

Correction factors for wet/dry sediments were obtained by drying a sub-sample of the homogenised sediment to constant weight at 105 °C.

Clean-up of Extracts by Column Chromatography

Removal of polar material, including lipids was carried out using a silica gel column. The silica gel used was 70 to 230 mesh which was heated at 400 °C for at least 4 hours to remove impurities and residual moisture and then stored at 200 °C prior to use. The sample extract was added to the silica gel column, containing 5 g of adsorbent and eluted with 35 mL of DCM/pentane (1:2). The eluant was reduced in volume using the evaporator to approximately 2 mL, with activated copper powder (for removal of free sulphur), before being further reduced under a gentle stream of nitrogen to an appropriate volume and analysed by gas chromatography-mass spectrometry (GC-MS).

	Gas Chromatography-Mass Spectrometry [GC-MS]
Instrument	HP 7890 Series GC with autoinjector and 5977A MSD
Column	(5 %phenyl)-methylpolysiloxane bonded fused silica, 60 m, 0.32 µm film thickness 0.25 mm internal diameter
Carrier Gas	Hydrogen (constant flow 1.4 mL/min)
Injector	Splitless, 280 °C, split flow 40 mL/min, vent time 1.5 min (1 µL injection)
Oven Temperature Programme	60 °C – 1 min 60 °C to 180 °C at 11 °C/min 180 °C to 260 °C at 6 °C/min 260 °C to 320 °C at 6 °C/min 330 °C – 7 min
Source/Detector Temperature	230 °C
Electron Energy	70 eV
Selected Ion Monitoring (SIM)	9 groups - 6 ions per group
Dwell Time (per ion)	0.035 second

A full range of polycyclic aromatic hydrocarbon (PAH) and alkylated PAHs were quantified as specified by Department of Trade and Industry (DTI) regulations (DTI, 1993).

Calibration was undertaken using a range of PAH standard solutions, a number of alkylated PAH, dibenzothiophene and a range of suitable internal standards. Individual response factors were calculated for each of the compounds present in the calibration solution. Response factors for the non-calibrated alkylated PAHs were taken to be equivalent to closely related compounds. The MRV of individual and alkylated PAHs is 0.1 ng/g.

B.2.4 Metals Analysis

Sediment samples were dried at 40 °C and then sieved to the required size fraction (2000 µm). Samples were subjected to an aqua regia microwave digestion. This acid mixture allows a partial dissolution of metals, predominately releasing those associated with the sediment fines. The resulting digests were then analysed by inductively coupled plasma–mass spectrometry (ICP-MS) for arsenic, cadmium, chromium, copper, lead, mercury, nickel, tin and zinc; and inductively coupled plasma–optical emission spectrometry (ICP-OES) for aluminium and barium.

B.2.5 Macrofaunal Analysis

Macrofauna analysis was carried out by FGBML benthic laboratories which are members of the NMBAQC scheme of external quality assurance.

On return to the laboratory, the samples were removed from formalin and washed through 0.1 mm mesh sieves. The material retained was then processed to remove fauna. The animals were separated by hand from the retained sediment by using a combination of stereo

microscopes for the fine sediments and in white trays for any coarser material. Processed sediment is stored in Phenoxetol (2 %) or returned to the original formalin.

Following extraction, the animals were identified and enumerated by specialist taxonomists. Identification was to species level where possible. Specimens which, due to their immaturity, damage incurred during processing or lack of suitable taxonomic literature, cannot be identified to species level are identified at higher taxonomic levels as appropriate. After identification, samples were stored in 70 % industrial denatured alcohol or a mixture of 70 % ethanol/1 % propylene glycol/29 % water. A minimum of 10 % of samples within the project were re-analysed (for extraction, species identification, enumeration and data entry) as per NMBAQC quality control guidelines (Worsfold, 2010). For biomass, identified macrofauna were blot dried and weighed at species/phyla level then returned to storage container.

Species abundances were entered on file in a spreadsheet package or the Unicorn database, both of which store and sort entries into taxonomic order and provide output files for numerical analysis. Nomenclature follows that given on the World Register of Marine Species (WoRMS Editorial Board, 2020). The taxonomic order is based on Species Directory codes (Howson & Picton, 1997) to give an idea of 'evolutionary rank'. Once all the entries had been checked, the resulting quantitative data were subjected to various statistical techniques to investigate community structure.

Prior to statistical analysis, the macrofaunal abundance data was manipulated to avoid spurious enhancement of community statistics. This included the removal of records of damaged, pelagic and juvenile taxa.

B.3 Statistical Analysis

B.3.1 Univariate and Multivariate Analysis of Macrofauna Data

Univariate analysis is used to extracts features of communities which are not the function of specific taxa, i.e. these methods are species independent. They are not sensitive to spatio-temporal variations in species composition, so that assemblages with no species in common can theoretically have equal diversities. Univariate analyses were calculated using the Plymouth Routines in Multivariate Ecological Research (PRIMER) version (v)7 Diverse procedure and included number of individuals (N) and taxa (S), employing the Shannon-Wiener index ($HLog_2$) and evenness employing the Pielou's index (J).

Pielou's Equitability (J)

Pielou's index of evenness (also referred to as equitability) expresses how evenly distributed the individuals are among the different taxa. In general, the higher the evenness, the more balanced the sample is, as it indicates that the individuals are evenly distributed between the taxa recorded. It is expressed as:

$$J' = \frac{H'}{\text{Log } S}$$

Where:

H' = Shannon-Wiener Index;
S = total number of species.

Shannon-Wiener Diversity ($H'Log_2$)

The Shannon-Wiener index of diversity incorporates richness and evenness as it expresses the number of species within a sample and the distribution of abundance across these species. In mathematical information theory, which is the context in which the Shannon-Wiener formula was originally devised, the Shannon-Wiener index of diversity measures the information content of a code in which one can write infinite messages. Analogously, the use of the Shannon-Wiener index of diversity as a measure of the diversity of a community, assumes that indefinitely samples can be taken from the community without depleting it. It is expressed as:

$$H' = -\sum_i P_i \text{ Log}(P_i)$$

Where:

Pi = proportion of the ith species.

B.3.2 Multivariate Analysis

In the initial stage, multivariate analysis may involve transformation of data. For sediment analysis, transformation reduce the skewness allowing optimal performance of the

multivariate analysis. For macrofaunal analysis, transformation is applied where the fauna is numerically dominated by a few species which may mask the underlying community composition. Transformation reduces the influence of those more dominant species, with transformation ranging in severity from no transformation to the reduction of all data to presence absence only. If no transformation is applied to the data, greater emphasis is given to the most common species; a square root transformation allows the intermediate abundance species to play a role; a fourth root transformation results in a down-weighting of the dominant species, taking into much greater account the lowest abundant species, an allowing the underlying community composition to be assessed. An alternative transformation, with very similar effect to the fourth root, is the log transform log(1+y). The latter transformations are effectively equivalent in focusing attention on patterns within the whole community, mixing contribution from both common and rare species (Clarke & Warwick, 2001).

Similarity Matrices

This analysis divides sites into groupings based on a measure of similarity or distance, depending on the nature of the data. For biological data, similarity based on the Bray-Curtis matrix is recommended, and for environmental data the Euclidean distance is recommended (Clarke & Warwick, 2001). The similarity/distance compares all samples with all other samples, producing a matrix.

Hierarchical Agglomerative Clustering (CLUSTER) and Similarity Profile Testing (SIMPROF)

The hierarchical agglomerative clustering (CLUSTER) programme uses the similarity matrix to successively fuse samples into larger and larger groups according to their level of similarity. The results are displayed by means of a tree-like dendrogram with similarity (or distance) displayed on one axis and samples on the other. Similarity profile (SIMPROF) test was also performed in conjunction to cluster analysis. The test is a permutation of the null hypothesis that a set of specified samples, which are not a priori divided into groups, do not differ from each other in multivariate structure and looks for statistically significant evidence of "true" clusters in samples i.e. if the different sample groupings interpreted from the cluster analysis are significantly different. The results are displayed by colour convention on the dendrogram: samples connected by red lines constitute a significant group in statistical terms and cannot be separated. Conversely, samples connected by black lines, and therefore statistically different, may be interpreted as being ecologically not significantly different. The SIMPROF output was therefore always considered in terms of statistical and ecological significance, in line with Clarke et al. (2008) who indicate that, creating coarser groupings is entirely appropriate, provided that the resulting clusters are always supersets of the SIMPROF groups.

Non-metric Multidimensional Scaling

Non-metric multidimensional scaling (nMDS) uses the similarity matrix to ordinate samples in a two-dimensional plane. This attempts to construct a map of the samples in which the more similar/close two samples are, the nearer they are on the map. The extent to which these

relations can be adequately represented in a two-dimensional map is expressed as the stress coefficient statistic or stress value. Stress values above 0.3 indicate near arbitrary points and the ordination should be considered unreliable. Stress values between 0.2 and 0.3 are poor representations of the data. Stress < 0.2 can show meaningful ordinations, while stress < 0.1 shows a good ordination of the data, with no real prospect of misleading interpretation. The combination of clustering and ordination analysis is a very effective way of checking the adequacy and mutual consistency of both representations (Clarke & Warwick, 2001).

Similarity Percentages Analysis (SIMPER)

This analysis can be applied to the data to gauge the faunal distinctiveness of each multivariate cluster, as identified by the clustering analysis. Similarity percentages analysis (SIMPER) provides a ranked list of taxa which contributes most to the similarity within clusters and the dissimilarity between clusters.

Principal Component Analysis (PCA)

The principal component analysis (PCA) identifies multidimensional patterns in datasets; once these multidimensional patterns have been found the data are compressed by reducing the number of dimensions without loss of information. The results of a PCA are graphically represented by the principal component (PC) axes, which are linear combinations of the values for each variable and represent the perpendicular distance in a multidimensional space along which the variance is maximised. The degree to which a 2D PCA succeeds in representing the full multidimensional information is in the percentage of the total variation expressed by the first two PCs. In general, a picture which accounts for as much as 70 % to 75 % of the original variation is likely to describe the overall structure rather well (Clarke & Warwick, 2001).

Appendix C

Logs

C.1 Survey Log

Geodetic Parameters: WGS84 UTM Zone 30N, CM 3°W [m]											
Date	Time [UTC]	Transect/ Station	Type	Sample Rep/ Still No.	Fix No.	Water Depth [m BSL]	Proposed Location		Actual Location		Offset [m]	Notes
							Easting	Northing	Easting	Northing		
26/08/2020	11:50	E_ST18	HG	NS	506	7	461 333.0	5 910 367.0	461 355.8	5 910 364.2	22.9	2 L
26/08/2020	12:00	E_ST18	HG	FA/PSD	507	7	461 333.0	5 910 367.0	461 335.4	5 910 362.7	5.0	
26/08/2020	12:25	E_ST17	HG	NS	508	7	461 152.0	5 912 372.0	461 165.2	5 912 379.7	15.3	1 L
26/08/2020	12:31	E_ST17	HG	NS	509	7	461 152.0	5 912 372.0	461 166.4	5 912 382.1	17.6	Cobble in jaw
26/08/2020	12:34	E_ST17	HG	NS	510	7	461 152.0	5 912 372.0	461 165.5	5 912 369.1	13.8	Cobble in jaw Station abandoned
26/08/2020	12:49	E_ST14	HG	FA/PSD	511	6	465 088.0	5 911 426.0	465 084.2	5 911 434.1	8.9	
26/08/2020	12:57	E_ST15	HG	FA/PSD	512	6	466 809.0	5 911 094.0	466 808.3	5 911 101.3	7.3	
26/08/2020	13:06	E_ST16	HG	FA/PSD	513	6	468 560.0	5 910 710.0	468 569.3	5 910 715.2	10.7	
26/08/2020	13:31	E_ST13	HG	FA/PSD	514	10	463 070.0	5 913 062.0	463 076.2	5 913 047.1	16.1	
26/08/2020	13:44	E_ST12	HG	FA/PSD	515	13	461 619.0	5 914 549.0	461 623.1	5 914 550.7	4.5	
26/08/2020	13:53	E_ST11	HG	FA/PSD	516	15	461 591.0	5 916 076.0	461 594.8	5 916 086.7	11.3	
26/08/2020	14:04	E_ST10	HG	NS	517	15	460 182.0	5 916 479.0	460 186.8	5 916 490.5	12.4	Cobble in jaw
26/08/2020	14:08	E_ST10	HG	NS	518	15	460 182.0	5 916 479.0	460 178.8	5 916 476.2	4.2	Grab empty
26/08/2020	14:11	E_ST10	HG	NS	519	15	460 182.0	5 916 479.0	460 194.0	5 916 472.0	13.9	Cobble in jaw
26/08/2020	14:15	E_ST10	HG	NS	520	15	460 182.0	5 916 479.0	460 194.7	5 916 475.5	13.2	Cobble in jaw Station abandoned
26/08/2020	14:24	E_ST09	HG	FA/PSD	521	17	459 249.0	5 917 026.0	459 244.4	5 917 033.1	8.5	
26/08/2020	14:33	E_ST08	HG	NS	522	16	458 022.0	5 917 194.0	458 030.6	5 917 203.0	12.5	< 1 L
26/08/2020	14:38	E_ST08	HG	NS	523	16	458 022.0	5 917 194.0	458 015.3	5 917 198.5	8.1	Potential scraping off rock

Geodetic Parameters: WGS84 UTM Zone 30N, CM 3°W [m]												
Date	Time [UTC]	Transect/ Station	Type	Sample Rep/ Still No.	Fix No.	Water Depth [m BSL]	Proposed Location		Actual Location		Offset [m]	Notes
							Easting	Northing	Easting	Northing		
26/08/2020	14:43	E_ST08	HG	NS	524	16	458 022.0	5 917 194.0	458 021.0	5 917 195.2	1.5	Hard ground, < 1 L Station abandoned
26/08/2020	14:51	E_ST07	HG	FA/PSD	525	20	457 533.0	5 918 010.0	457 534.8	5 918 016.6	6.8	
26/08/2020	15:02	E_ST06	HG	NS	526	18	456 064.0	5 918 822.0	456 064.9	5 918 829.0	7.1	< 2 L
26/08/2020	15:07	E_ST06	HG	NS	527	18	456 064.0	5 918 822.0	456 065.1	5 918 827.2	5.4	Cobble in jaw
26/08/2020	15:12	E_ST06	HG	NS	528	18	456 064.0	5 918 822.0	456 074.0	5 918 838.9	19.6	< 2 L Station abandoned
26/08/2020	15:21	E_ST05	HG	NS	529	21	454 663.0	5 918 507.0	454 670.8	5 918 525.7	20.3	Not triggered
26/08/2020	15:24	E_ST05	HG	NS	530	21	454 663.0	5 918 507.0	454 672.4	5 918 500.1	11.7	2 L Pebbles and sand
26/08/2020	15:29	E_ST05	HG	NS	531	21	454 663.0	5 918 507.0	454 660.4	5 918 510.2	4.1	Cobble in jaw
26/08/2020	15:33	E_ST05	HG	NS	532	21	454 663.0	5 918 507.0	454 673.0	5 918 501.5	11.4	< 1 L. Station abandoned
26/08/2020	15:41	E_ST04	HG	FA/PSD	533	27	454 452.0	5 919 439.0	454 462.5	5 919 456.4	20.3	
26/08/2020	15:51	E_ST03	HG	FA/PSD	534	25	454 474.0	5 920 986.0	454 478.3	5 920 997.2	12.0	
26/08/2020	15:59	E_ST02	HG	FA/PSD	535	28	453 642.0	5 920 349.0	453 639.6	5 920 354.6	6.0	
26/08/2020	16:10	E_ST01	HG	FA/PSD	536	27	451 799.0	5 919 623.0	451 792.6	5 919 630.8	10.1	
26/08/2020	16:59	E_ST19	HG	FA/PSD	537	9	461 611.0	5 908 691.0	461 608.7	5 908 686.6	4.9	
26/08/2020	17:05	E_ST20	HG	FA/PSD	538	9	461 932.0	5 907 559.0	461 926.1	5 907 560.3	6.1	
27/08/2020	09:16	E_ST01	Video	SOL	541	24	451 799.0	5 919 623.0	451 777.5	5 919 639.6	27.1	
27/08/2020	09:16	E_ST01	Still	E_ST01_01	542	24	451 799.0	5 919 623.0	451 782.6	5 919 637.6	22.0	
27/08/2020	09:17	E_ST01	Still	E_ST01_02	543	24	451 799.0	5 919 623.0	451 794.7	5 919 626.9	5.8	
27/08/2020	09:18	E_ST01	Still	E_ST01_03	544	24	451 799.0	5 919 623.0	451 804.4	5 919 619.6	6.4	

Geodetic Parameters: WGS84 UTM Zone 30N, CM 3°W [m]											
Date	Time [UTC]	Transect/ Station	Type	Sample Rep/ Still No.	Fix No.	Water Depth [m BSL]	Proposed Location		Actual Location		Offset [m]	Notes
							Easting	Northing	Easting	Northing		
27/08/2020	09:18	E_ST01	Still	E_ST01_04	545	24	451 799.0	5 919 623.0	451 808.8	5 919 616.0	12.0	
27/08/2020	09:19	E_ST01	Still	E_ST01_05	546	24	451 799.0	5 919 623.0	451 817.3	5 919 613.5	20.7	
27/08/2020	09:19	E_ST01	Video	EOL	547	24	451 799.0	5 919 623.0	451 820.4	5 919 611.7	24.2	
27/08/2020	09:29	E_ST02	Video	SOL	548	24	453 642.0	5 920 349.0	453 617.3	5 920 359.4	26.8	
27/08/2020	09:29	E_ST02	Still	E_ST02_01	549	24	453 642.0	5 920 349.0	453 621.0	5 920 359.6	23.5	
27/08/2020	09:29	E_ST02	Still	E_ST02_02	550	24	453 642.0	5 920 349.0	453 633.3	5 920 360.9	14.8	
27/08/2020	09:30	E_ST02	Still	E_ST02_03	551	24	453 642.0	5 920 349.0	453 643.5	5 920 357.4	8.6	
27/08/2020	09:31	E_ST02	Still	E_ST02_04	552	24	453 642.0	5 920 349.0	453 651.9	5 920 352.7	10.5	
27/08/2020	09:31	E_ST02	Still	E_ST02_05	553	24	453 642.0	5 920 349.0	453 661.9	5 920 346.8	20.0	
27/08/2020	09:32	E_ST02	Video	EOL	554	24	453 642.0	5 920 349.0	453 669.5	5 920 345.4	27.7	
27/08/2020	09:39	E_ST03	Video	SOL	555	22	454 474.0	5 920 986.0	454 452.1	5 921 001.3	26.7	
27/08/2020	09:39	E_ST03	Still	E_ST03_01	556	22	454 474.0	5 920 986.0	454 456.0	5 920 999.3	22.3	
27/08/2020	09:39	E_ST03	Still	E_ST03_02	557	22	454 474.0	5 920 986.0	454 465.6	5 920 994.9	12.3	
27/08/2020	09:40	E_ST03	Still	E_ST03_03	558	22	454 474.0	5 920 986.0	454 476.3	5 920 989.4	4.1	
27/08/2020	09:40	E_ST03	Still	E_ST03_04	559	22	454 474.0	5 920 986.0	454 485.7	5 920 986.5	11.7	
27/08/2020	09:41	E_ST03	Still	E_ST03_05	560	22	454 474.0	5 920 986.0	454 495.4	5 920 986.7	21.4	
27/08/2020	09:41	E_ST03	Video	EOL	561	22	454 474.0	5 920 986.0	454 501.8	5 920 988.6	27.9	
27/08/2020	09:49	E_ST04	Video	SOL	562	23	454 452.0	5 919 439.0	454 429.3	5 919 458.9	30.2	
27/08/2020	09:50	E_ST04	Still	E_ST04_01	563	23	454 452.0	5 919 439.0	454 440.3	5 919 453.4	18.6	
27/08/2020	09:50	E_ST04	Still	E_ST04_02	564	23	454 452.0	5 919 439.0	454 446.4	5 919 448.7	11.2	
27/08/2020	09:51	E_ST04	Still	E_ST04_03	565	23	454 452.0	5 919 439.0	454 459.2	5 919 441.2	7.5	

Geodetic Parameters: WGS84 UTM Zone 30N, CM 3°W [m]												
Date	Time [UTC]	Transect/ Station	Type	Sample Rep/ Still No.	Fix No.	Water Depth [m BSL]	Proposed Location		Actual Location		Offset [m]	Notes
							Easting	Northing	Easting	Northing		
27/08/2020	09:51	E_ST04	Still	E_ST04_04	566	23	454 452.0	5 919 439.0	454 466.0	5 919 439.1	14.0	
27/08/2020	09:52	E_ST04	Still	E_ST04_05	567	23	454 452.0	5 919 439.0	454 472.5	5 919 435.6	20.7	
27/08/2020	09:52	E_ST04	Video	EOL	568	23	454 452.0	5 919 439.0	454 476.7	5 919 433.0	25.4	
27/08/2020	09:59	E_TR01	Video	SOL	569	21	455 384.0	5 919 288.0	455 364.1	5 919 293.0	20.5	
27/08/2020	09:59	E_TR01	Still	E_TR01_01	570	21	-	-	455 373.0	5 919 291.2	-	
27/08/2020	10:00	E_TR01	Still	E_TR01_02	571	21	-	-	455 388.7	5 919 282.9	-	
27/08/2020	10:00	E_TR01	Still	E_TR01_03	572	21	-	-	455 403.3	5 919 290.3	-	
27/08/2020	10:00	E_TR01	Still	E_TR01_04	573	21	-	-	455 402.1	5 919 293.5	-	
27/08/2020	10:00	E_TR01	Still	E_TR01_05	574	21	-	-	455 406.1	5 919 297.0	-	
27/08/2020	10:01	E_TR01	Still	E_TR01_06	575	21	-	-	455 418.1	5 919 294.0	-	
27/08/2020	10:01	E_TR01	Still	E_TR01_07	576	21	-	-	455 422.6	5 919 286.5	-	
27/08/2020	10:02	E_TR01	Still	E_TR01_08	577	21	-	-	455 435.5	5 919 287.1	-	
27/08/2020	10:02	E_TR01	Still	E_TR01_09	578	21	-	-	455 442.9	5 919 283.8	-	
27/08/2020	10:03	E_TR01	Still	E_TR01_10	579	21	-	-	455 453.0	5 919 284.9	-	
27/08/2020	10:03	E_TR01	Still	E_TR01_11	580	21	-	-	455 461.7	5 919 280.5	-	
27/08/2020	10:04	E_TR01	Still	E_TR01_12	581	21	-	-	455 471.2	5 919 278.7	-	
27/08/2020	10:04	E_TR01	Still	E_TR01_13	582	21	-	-	455 478.3	5 919 278.1	-	
27/08/2020	10:05	E_TR01	Still	E_TR01_14	583	21	-	-	455 497.5	5 919 288.2	-	
27/08/2020	10:05	E_TR01	Video	EOL	584	21	455 474.0	5 919 278.0	455 501.3	5 919 280.8	27.5	
27/08/2020	10:13	E_TR03	Video	SOL	585	17	455 623.0	5 919 046.0	455 608.9	5 919 042.2	14.6	
27/08/2020	10:14	E_TR03	Still	E_TR03_01	586	17	-	-	455 611.6	5 919 044.5	-	

Geodetic Parameters: WGS84 UTM Zone 30N, CM 3°W [m]												
Date	Time [UTC]	Transect/ Station	Type	Sample Rep/ Still No.	Fix No.	Water Depth [m BSL]	Proposed Location		Actual Location		Offset [m]	Notes
							Easting	Northing	Easting	Northing		
27/08/2020	10:14	E_TR03	Still	E_TR03_02	587	17	-	-	455 623.9	5 919 052.3	-	
27/08/2020	10:15	E_TR03	Still	E_TR03_03	588	17	-	-	455 634.9	5 919 055.2	-	
27/08/2020	10:15	E_TR03	Still	E_TR03_04	589	17	-	-	455 648.0	5 919 059.3	-	
27/08/2020	10:16	E_TR03	Still	E_TR03_05	590	17	-	-	455 653.0	5 919 049.5	-	
27/08/2020	10:16	E_TR03	Still	E_TR03_06	591	17	-	-	455 661.5	5 919 049.2	-	
27/08/2020	10:17	E_TR03	Still	E_TR03_07	592	17	-	-	455 666.3	5 919 051.9	-	
27/08/2020	10:17	E_TR03	Still	E_TR03_08	593	17	-	-	455 674.1	5 919 052.4	-	
27/08/2020	10:17	E_TR03	Still	E_TR03_09	594	17	-	-	455 677.0	5 919 051.2	-	
27/08/2020	10:18	E_TR03	Still	E_TR03_10	596	17	-	-	455 699.3	5 919 055.6	-	
27/08/2020	10:18	E_TR03	Still	E_TR03_11	597	17	-	-	455 706.4	5 919 054.2	-	
27/08/2020	10:19	E_TR03	Still	E_TR03_12	598	17	-	-	455 720.1	5 919 058.2	-	
27/08/2020	10:19	E_TR03	Still	E_TR03_13	599	17	-	-	455 731.0	5 919 063.6	-	
27/08/2020	10:20	E_TR03	Still	E_TR03_14	600	17	-	-	455 735.4	5 919 060.4	-	
27/08/2020	10:20	E_TR03	Video	EOL	601	17	455 726.0	5 919 059.0	455 737.5	5 919 058.3	11.5	
27/08/2020	10:30	E_ST06	Video	SOL	602	16	456 064.0	5 918 822.0	456 040.5	5 918 840.8	30.1	
27/08/2020	10:31	E_ST06	Still	E_ST06_01	603	16	456 064.0	5 918 822.0	456 046.1	5 918 838.7	24.5	
27/08/2020	10:31	E_ST06	Still	E_ST06_02	604	16	456 064.0	5 918 822.0	456 052.7	5 918 833.3	16.0	
27/08/2020	10:32	E_ST06	Still	E_ST06_03	605	16	456 064.0	5 918 822.0	456 059.1	5 918 824.3	5.5	
27/08/2020	10:32	E_ST06	Still	E_ST06_04	606	16	456 064.0	5 918 822.0	456 075.1	5 918 820.3	11.3	
27/08/2020	10:32	E_ST06	Still	E_ST06_05	NF	16	456 064.0	5 918 822.0	456 076.0	5 918 819.0	12.4	
27/08/2020	10:33	E_ST06	Still	E_ST06_06	607	16	456 064.0	5 918 822.0	456 079.6	5 918 816.6	16.5	

Geodetic Parameters: WGS84 UTM Zone 30N, CM 3°W [m]												
Date	Time [UTC]	Transect/ Station	Type	Sample Rep/ Still No.	Fix No.	Water Depth [m BSL]	Proposed Location		Actual Location		Offset [m]	Notes
							Easting	Northing	Easting	Northing		
27/08/2020	10:33	E_ST06	Still	E_ST06_07	608	16	456 064.0	5 918 822.0	456 084.6	5 918 815.6	21.6	
27/08/2020	10:34	E_ST06	Still	E_ST06_08	609	16	456 064.0	5 918 822.0	456 093.3	5 918 814.6	30.2	
27/08/2020	10:34	E_ST06	Still	E_ST06_09	610	16	456 064.0	5 918 822.0	456 100.1	5 918 812.7	37.3	
27/08/2020	10:35	E_ST06	Still	E_ST06_10	611	16	456 064.0	5 918 822.0	456 112.6	5 918 813.7	49.3	
27/08/2020	10:35	E_ST06	Still	E_ST06_11	612	16	456 064.0	5 918 822.0	456 124.2	5 918 813.0	60.9	
27/08/2020	10:36	E_ST06	Still	E_ST06_12	613	16	456 064.0	5 918 822.0	456 136.6	5 918 815.1	72.9	
27/08/2020	10:36	E_ST06	Still	E_ST06_13	614	16	456 064.0	5 918 822.0	456 146.9	5 918 823.6	82.9	
27/08/2020	10:37	E_ST06	Still	E_ST06_14	615	16	456 064.0	5 918 822.0	456 158.6	5 918 823.8	94.6	
27/08/2020	10:38	E_ST06	Still	E_ST06_15	616	16	456 064.0	5 918 822.0	456 170.5	5 918 825.7	106.6	
27/08/2020	10:38	E_ST06	Still	E_ST06_16	617	16	456 064.0	5 918 822.0	456 189.1	5 918 829.7	125.3	
27/08/2020	10:39	E_ST06	Still	E_ST06_17	618	16	456 064.0	5 918 822.0	456 204.6	5 918 832.7	141.0	
27/08/2020	10:39	E_ST06	Video	EOL	619	16	456 064.0	5 918 822.0	456 212.9	5 918 835.8	149.5	
27/08/2020	10:50	E_ST05	Video	SOL	620	18	454 607.0	5 918 510.0	454 592.3	5 918 518.7	17.1	
27/08/2020	10:50	E_ST05	Still	E_ST05_01	621	18	-	-	454 596.1	5 918 514.9	-	
27/08/2020	10:51	E_ST05	Still	E_ST05_02	622	18	-	-	454 607.5	5 918 506.9	-	
27/08/2020	10:51	E_ST05	Still	E_ST05_03	623	18	-	-	454 611.2	5 918 506.9	-	
27/08/2020	10:51	E_ST05	Still	E_ST05_04	624	18	-	-	454 617.1	5 918 509.8	-	
27/08/2020	10:52	E_ST05	Still	E_ST05_05	625	18	-	-	454 633.1	5 918 510.1	-	
27/08/2020	10:53	E_ST05	Still	E_ST05_06	626	18	-	-	454 649.4	5 918 504.9	-	
27/08/2020	10:54	E_ST05	Still	E_ST05_07	627	18	-	-	454 669.9	5 918 509.4	-	
27/08/2020	10:54	E_ST05	Still	E_ST05_08	628	18	-	-	454 687.3	5 918 512.1	-	

Geodetic Parameters: WGS84 UTM Zone 30N, CM 3°W [m]												
Date	Time [UTC]	Transect/ Station	Type	Sample Rep/ Still No.	Fix No.	Water Depth [m BSL]	Proposed Location		Actual Location		Offset [m]	Notes
							Easting	Northing	Easting	Northing		
27/08/2020	10:55	E_ST05	Still	E_ST05_09	629	18	-	-	454 694.0	5 918 501.5	-	
27/08/2020	10:55	E_ST05	Still	E_ST05_10	630	18	-	-	454 707.5	5 918 497.9	-	
27/08/2020	10:56	E_ST05	Still	E_ST05_11	631	18	-	-	454 721.0	5 918 500.8	-	
27/08/2020	10:57	E_ST05	Still	E_ST05_12	632	18	-	-	454 736.7	5 918 498.7	-	
27/08/2020	10:57	E_ST05	Still	E_ST05_13	633	18	-	-	454 742.6	5 918 497.9	-	
27/08/2020	10:57	E_ST05	Still	E_ST05_14	634	18	-	-	454 753.5	5 918 501.3	-	
27/08/2020	10:58	E_ST05	Still	E_ST05_15	635	18	-	-	454 761.6	5 918 494.8	-	
27/08/2020	10:59	E_ST05	Still	E_ST05_16	636	18	-	-	454 781.3	5 918 493.1	-	
27/08/2020	11:00	E_ST05	Still	E_ST05_17	637	18	-	-	454 799.5	5 918 497.4	-	
27/08/2020	11:01	E_ST05	Still	E_ST05_18	638	18	-	-	454 818.3	5 918 504.9	-	
27/08/2020	11:01	E_ST05	Still	E_ST05_19	639	18	-	-	454 839.4	5 918 510.8	-	
27/08/2020	11:02	E_ST05	Video	EOL	640	18	454 722.0	5 918 499.0	454 842.8	5 918 510.4	121.3	
27/08/2020	11:12	E_TR02	Video	SOL	641	15	455 339.0	5 918 037.0	455 325.6	5 918 043.6	15.0	
27/08/2020	11:13	E_TR02	Still	E_TR02_01	642	15	-	-	455 342.0	5 918 042.6	-	
27/08/2020	11:13	E_TR02	Still	E_TR02_02	643	15	-	-	455 355.5	5 918 050.4	-	
27/08/2020	11:14	E_TR02	Still	E_TR02_03	644	15	-	-	455 363.0	5 918 056.7	-	
27/08/2020	11:14	E_TR02	Still	E_TR02_04	645	15	-	-	455 376.7	5 918 062.2	-	
27/08/2020	11:14	E_TR02	Still	E_TR02_05	646	15	-	-	455 384.3	5 918 067.0	-	
27/08/2020	11:15	E_TR02	Still	E_TR02_06	647	15	-	-	455 391.9	5 918 068.8	-	
27/08/2020	11:15	E_TR02	Still	E_TR02_07	648	15	-	-	455 395.7	5 918 069.4	-	
27/08/2020	11:15	E_TR02	Still	E_TR02_08	649	15	-	-	455 403.6	5 918 073.7	-	

Geodetic Parameters: WGS84 UTM Zone 30N, CM 3°W [m]												
Date	Time [UTC]	Transect/ Station	Type	Sample Rep/ Still No.	Fix No.	Water Depth [m BSL]	Proposed Location		Actual Location		Offset [m]	Notes
							Easting	Northing	Easting	Northing		
27/08/2020	11:16	E_TR02	Still	E_TR02_09	650	15	-	-	455 414.3	5 918 074.0	-	
27/08/2020	11:16	E_TR02	Still	E_TR02_10	651	15	-	-	455 435.1	5 918 068.7	-	
27/08/2020	11:17	E_TR02	Still	E_TR02_11	652	15	-	-	455 445.7	5 918 071.4	-	
27/08/2020	11:17	E_TR02	Still	E_TR02_12	653	15	-	-	455 455.0	5 918 074.5	-	
27/08/2020	11:18	E_TR02	Still	E_TR02_13	654	15	-	-	455 462.7	5 918 088.6	-	
27/08/2020	11:18	E_TR02	Still	E_TR02_14	655	15	-	-	455 466.7	5 918 100.3	-	
27/08/2020	11:19	E_TR02	Still	E_TR02_15	656	15	-	-	455 500.3	5 918 109.0	-	
27/08/2020	11:20	E_TR02	Still	E_TR02_16	657	15	-	-	455 509.1	5 918 119.3	-	
27/08/2020	11:20	E_TR02	Still	E_TR02_17	658	15	-	-	455 515.4	5 918 124.4	-	
27/08/2020	11:21	E_TR02	Still	E_TR02_18	659	15	-	-	455 523.3	5 918 131.0	-	
27/08/2020	11:21	E_TR02	Still	E_TR02_19	660	15	-	-	455 529.6	5 918 133.8	-	
27/08/2020	11:21	E_TR02	Video	EOL	661	15	455 432.0	5 918 078.0	455 538.9	5 918 134.9	121.1	
27/08/2020	11:46	E_ST07	Video	SOL	662	15	457 533.0	5 918 010.0	457 529.8	5 918 038.8	28.9	
27/08/2020	11:46	E_ST07	Still	E_ST07_01	663	15	457 533.0	5 918 010.0	457 521.8	5 918 032.3	24.9	
27/08/2020	11:47	E_ST07	Still	E_ST07_02	664	15	457 533.0	5 918 010.0	457 530.4	5 918 020.5	10.8	
27/08/2020	11:48	E_ST07	Still	E_ST07_03	665	15	457 533.0	5 918 010.0	457 543.1	5 918 018.8	13.4	
27/08/2020	11:48	E_ST07	Still	E_ST07_04	666	15	457 533.0	5 918 010.0	457 547.3	5 918 017.3	16.1	
27/08/2020	11:48	E_ST07	Still	E_ST07_05	667	15	457 533.0	5 918 010.0	457 553.8	5 918 014.3	21.2	
27/08/2020	11:49	E_ST07	Still	E_ST07_06	668	15	457 533.0	5 918 010.0	457 557.7	5 918 013.8	25.0	
27/08/2020	11:49	E_ST07	Still	E_ST07_07	669	15	457 533.0	5 918 010.0	457 558.2	5 918 013.7	25.5	
27/08/2020	11:49	E_ST07	Video	EOL	670	15	457 533.0	5 918 010.0	457 562.2	5 918 014.0	29.5	

Geodetic Parameters: WGS84 UTM Zone 30N, CM 3°W [m]												
Date	Time [UTC]	Transect/ Station	Type	Sample Rep/ Still No.	Fix No.	Water Depth [m BSL]	Proposed Location		Actual Location		Offset [m]	Notes
							Easting	Northing	Easting	Northing		
27/08/2020	12:03	E_TR02 S	Video	SOL	671	15	-	-	455 354.5	5 917 997.3	-	
27/08/2020	12:03	E_TR02 S	Still	E_TR02 S_01	672	15	-	-	455 357.4	5 917 999.6	-	
27/08/2020	12:04	E_TR02 S	Still	E_TR02 S_02	673	15	-	-	455 365.8	5 918 007.3	-	
27/08/2020	12:04	E_TR02 S	Still	E_TR02 S_03	674	15	-	-	455 383.0	5 918 011.4	-	
27/08/2020	12:05	E_TR02 S	Still	E_TR02 S_04	675	15	-	-	455 391.4	5 918 011.4	-	
27/08/2020	12:05	E_TR02 S	Still	E_TR02 S_05	676	15	-	-	455 400.2	5 918 014.9	-	
27/08/2020	12:05	E_TR02 S	Still	E_TR02 S_06	677	15	-	-	455 405.0	5 918 017.0	-	
27/08/2020	12:06	E_TR02 S	Still	E_TR02 S_07	678	15	-	-	455 416.0	5 918 020.5	-	
27/08/2020	12:06	E_TR02 S	Still	E_TR02 S_08	679	15	-	-	455 423.1	5 918 022.7	-	
27/08/2020	12:06	E_TR02 S	Still	E_TR02 S_09	680	15	-	-	455 429.5	5 918 026.8	-	
27/08/2020	12:07	E_TR02 S	Still	E_TR02 S_10	681	15	-	-	455 440.8	5 918 029.4	-	
27/08/2020	12:07	E_TR02 S	Still	E_TR02 S_11	682	15	-	-	455 449.9	5 918 032.3	-	
27/08/2020	12:08	E_TR02 S	Still	E_TR02 S_12	683	15	-	-	455 454.8	5 918 033.6	-	
27/08/2020	12:08	E_TR02 S	Video	EOL	684	15	-	-	455 457.0	5 918 035.5	-	
27/08/2020	12:20	E_TR02 N	Video	SOL	685	15	-	-	455 307.0	5 918 089.1	-	
27/08/2020	12:20	E_TR02 N	Still	E_TR02 N_01	686	15	-	-	455 314.4	5 918 093.5	-	
27/08/2020	12:21	E_TR02 N	Still	E_TR02 N_02	687	15	-	-	455 329.6	5 918 095.3	-	
27/08/2020	12:21	E_TR02 N	Still	E_TR02 N_03	688	15	-	-	455 342.9	5 918 102.1	-	
27/08/2020	12:22	E_TR02 N	Still	E_TR02 N_04	689	15	-	-	455 358.9	5 918 115.6	-	
27/08/2020	12:23	E_TR02 N	Still	E_TR02 N_05	690	15	-	-	455 374.8	5 918 118.2	-	
27/08/2020	12:23	E_TR02 N	Still	E_TR02 N_06	691	15	-	-	455 378.1	5 918 118.7	-	

Geodetic Parameters: WGS84 UTM Zone 30N, CM 3°W [m]												
Date	Time [UTC]	Transect/ Station	Type	Sample Rep/ Still No.	Fix No.	Water Depth [m BSL]	Proposed Location		Actual Location		Offset [m]	Notes
							Easting	Northing	Easting	Northing		
27/08/2020	12:24	E_TR02 N	Still	E_TR02 N_07	692	15	-	-	455 390.6	5 918 121.1	-	
27/08/2020	12:24	E_TR02 N	Still	E_TR02 N_08	693	15	-	-	455 398.5	5 918 123.2	-	
27/08/2020	12:25	E_TR02 N	Still	E_TR02 N_09	694	15	-	-	455 415.1	5 918 132.0	-	
27/08/2020	12:25	E_TR02 N	Video	EOL	695	15	-	-	455 420.5	5 918 134.9	-	
27/08/2020	12:33	E_ST05 S	Video	SOL	696	17	-	-	454 729.0	5 918 454.7	-	
27/08/2020	12:34	E_ST05 S	Still	E_ST05 S_01	697	17	-	-	454 716.1	5 918 452.0	-	
27/08/2020	12:34	E_ST05 S	Still	E_ST05 S_02	698	17	-	-	454 702.3	5 918 453.6	-	
27/08/2020	12:35	E_ST05 S	Still	E_ST05 S_03	699	17	-	-	454 688.3	5 918 453.2	-	
27/08/2020	12:36	E_ST05 S	Still	E_ST05 S_04	700	17	-	-	454 670.1	5 918 456.5	-	
27/08/2020	12:36	E_ST05 S	Still	E_ST05 S_05	701	17	-	-	454 657.6	5 918 460.2	-	
27/08/2020	12:37	E_ST05 S	Still	E_ST05 S_06	702	17	-	-	454 643.1	5 918 462.2	-	
27/08/2020	12:37	E_ST05 S	Still	E_ST05 S_07	703	17	-	-	454 628.8	5 918 461.5	-	
27/08/2020	12:38	E_ST05 S	Still	E_ST05 S_08	704	17	-	-	454 616.4	5 918 462.7	-	
27/08/2020	12:38	E_ST05 S	Still	E_ST05 S_09	705	17	-	-	454 606.4	5 918 460.7	-	
27/08/2020	12:39	E_ST05 S	Video	EOL	706	17	-	-	454 597.0	5 918 460.3	-	
27/08/2020	12:47	E_ST05 N	Video	SOL	707	17	-	-	454 743.8	5 918 547.6	-	
27/08/2020	12:48	E_ST05 N	Still	E_ST05 N_01	708	17	-	-	454 727.3	5 918 551.6	-	
27/08/2020	12:48	E_ST05 N	Still	E_ST05 N_02	709	17	-	-	454 712.7	5 918 546.9	-	
27/08/2020	12:49	E_ST05 N	Still	E_ST05 N_03	710	17	-	-	454 696.1	5 918 546.8	-	
27/08/2020	12:50	E_ST05 N	Still	E_ST05 N_04	711	17	-	-	454 681.6	5 918 551.4	-	
27/08/2020	12:50	E_ST05 N	Still	E_ST05 N_05	712	17	-	-	454 667.8	5 918 560.0	-	

Geodetic Parameters: WGS84 UTM Zone 30N, CM 3°W [m]												
Date	Time [UTC]	Transect/ Station	Type	Sample Rep/ Still No.	Fix No.	Water Depth [m BSL]	Proposed Location		Actual Location		Offset [m]	Notes
							Easting	Northing	Easting	Northing		
27/08/2020	12:51	E_ST05 N	Still	E_ST05 N_06	713	17	-	-	454 654.3	5 918 558.2	-	
27/08/2020	12:52	E_ST05 N	Still	E_ST05 N_07	714	17	-	-	454 641.6	5 918 554.1	-	
27/08/2020	12:52	E_ST05 N	Still	E_ST05 N_08	715	17	-	-	454 628.5	5 918 556.0	-	
27/08/2020	12:53	E_ST05 N	Still	E_ST05 N_09	716	17	-	-	454 617.6	5 918 558.4	-	
27/08/2020	12:53	E_ST05 N	Still	E_ST05 N_10	717	17	-	-	454 607.6	5 918 562.4	-	
27/08/2020	12:54	E_ST05 N	Video	EOL	718	17	-	-	454 601.0	5 918 564.8	-	
27/08/2020	13:07	E_TR01 S	Video	SOL	719	20	-	-	455 484.9	5 919 220.0	-	
27/08/2020	13:08	E_TR01 S	Still	E_TR01 S_01	720	20	-	-	455 469.8	5 919 219.3	-	
27/08/2020	13:08	E_TR01 S	Still	E_TR01 S_02	721	20	-	-	455 459.1	5 919 225.7	-	
27/08/2020	13:09	E_TR01 S	Still	E_TR01 S_03	722	20	-	-	455 441.1	5 919 232.2	-	
27/08/2020	13:09	E_TR01 S	Still	E_TR01 S_04	723	20	-	-	455 432.2	5 919 232.9	-	
27/08/2020	13:10	E_TR01 S	Still	E_TR01 S_05	724	20	-	-	455 427.0	5 919 235.6	-	
27/08/2020	13:11	E_TR01 S	Still	E_TR01 S_06	725	20	-	-	455 406.6	5 919 243.4	-	
27/08/2020	13:11	E_TR01 S	Still	E_TR01 S_07	726	20	-	-	455 394.3	5 919 234.5	-	
27/08/2020	13:12	E_TR01 S	Still	E_TR01 S_08	727	20	-	-	455 377.1	5 919 236.8	-	
27/08/2020	13:12	E_TR01 S	Video	EOL	728	20	-	-	455 371.8	5 919 237.4	-	
27/08/2020	13:20	E_TR01 N	Video	SOL	729	20	-	-	455 491.9	5 919 323.8	-	
27/08/2020	13:20	E_TR01 N	Still	E_TR01 N_01	730	20	-	-	455 475.4	5 919 326.4	-	
27/08/2020	13:21	E_TR01 N	Still	E_TR01 N_02	731	20	-	-	455 460.5	5 919 322.0	-	
27/08/2020	13:22	E_TR01 N	Still	E_TR01 N_03	732	20	-	-	455 446.9	5 919 331.2	-	
27/08/2020	13:22	E_TR01 N	Still	E_TR01 N_04	733	20	-	-	455 431.7	5 919 338.6	-	

Geodetic Parameters: WGS84 UTM Zone 30N, CM 3°W [m]												
Date	Time [UTC]	Transect/ Station	Type	Sample Rep/ Still No.	Fix No.	Water Depth [m BSL]	Proposed Location		Actual Location		Offset [m]	Notes
							Easting	Northing	Easting	Northing		
27/08/2020	13:23	E_TR01 N	Still	E_TR01 N_05	734	20	-	-	455 413.3	5 919 337.4	-	
27/08/2020	13:24	E_TR01 N	Still	E_TR01 N_06	735	20	-	-	455 394.7	5 919 338.7	-	
27/08/2020	13:24	E_TR01 N	Still	E_TR01 N_07	736	20	-	-	455 387.9	5 919 334.5	-	
27/08/2020	13:24	E_TR01 N	Video	EOL	737	20	-	-	455 383.5	5 919 333.9	-	
27/08/2020	13:32	E_TR03 S	Video	SOL	738	18	-	-	455 745.4	5 919 003.9	-	
27/08/2020	13:33	E_TR03 S	Still	E_TR03 S_01	739	18	-	-	455 738.3	5 919 001.6	-	
27/08/2020	13:33	E_TR03 S	Still	E_TR03 S_02	740	18	-	-	455 721.0	5 918 995.2	-	
27/08/2020	13:34	E_TR03 S	Still	E_TR03 S_03	741	18	-	-	455 713.9	5 918 994.3	-	
27/08/2020	13:34	E_TR03 S	Still	E_TR03 S_04	742	18	-	-	455 708.0	5 918 998.5	-	
27/08/2020	13:35	E_TR03 S	Still	E_TR03 S_05	743	18	-	-	455 690.8	5 919 003.1	-	
27/08/2020	13:36	E_TR03 S	Still	E_TR03 S_06	744	18	-	-	455 676.9	5 918 999.2	-	
27/08/2020	13:36	E_TR03 S	Still	E_TR03 S_07	745	18	-	-	455 668.7	5 919 001.2	-	
27/08/2020	13:37	E_TR03 S	Still	E_TR03 S_08	746	18	-	-	455 652.4	5 918 999.2	-	
27/08/2020	13:38	E_TR03 S	Still	E_TR03 S_09	747	18	-	-	455 647.8	5 918 998.2	-	
27/08/2020	13:38	E_TR03 S	Still	E_TR03 S_10	748	18	-	-	455 636.6	5 918 996.3	-	
27/08/2020	13:39	E_TR03 S	Still	E_TR03 S_11	749	18	-	-	455 624.1	5 918 992.6	-	
27/08/2020	13:39	E_TR03 S	Video	EOL	750	18	-	-	455 621.7	5 918 991.8	-	
27/08/2020	13:48	E_TR03 N	Video	SOL	751	18	-	-	455 732.5	5 919 112.0	-	
27/08/2020	13:49	E_TR03 N	Still	E_TR03 N_01	752	18	-	-	455 723.4	5 919 107.6	-	
27/08/2020	13:49	E_TR03 N	Still	E_TR03 N_02	753	18	-	-	455 712.2	5 919 107.3	-	
27/08/2020	13:50	E_TR03 N	Still	E_TR03 N_03	754	18	-	-	455 707.1	5 919 108.9	-	

Geodetic Parameters: WGS84 UTM Zone 30N, CM 3°W [m]												
Date	Time [UTC]	Transect/ Station	Type	Sample Rep/ Still No.	Fix No.	Water Depth [m BSL]	Proposed Location		Actual Location		Offset [m]	Notes
							Easting	Northing	Easting	Northing		
27/08/2020	13:50	E_TR03 N	Still	E_TR03 N_04	755	18	-	-	455 699.5	5 919 106.1	-	
27/08/2020	13:51	E_TR03 N	Still	E_TR03 N_05	756	18	-	-	455 687.4	5 919 105.6	-	
27/08/2020	13:52	E_TR03 N	Still	E_TR03 N_06	757	18	-	-	455 671.5	5 919 102.9	-	
27/08/2020	13:52	E_TR03 N	Still	E_TR03 N_07	758	18	-	-	455 661.1	5 919 100.5	-	
27/08/2020	13:53	E_TR03 N	Still	E_TR03 N_08	759	18	-	-	455 646.3	5 919 097.1	-	
27/08/2020	13:53	E_TR03 N	Still	E_TR03 N_09	760	18	-	-	455 633.2	5 919 095.7	-	
27/08/2020	13:54	E_TR03 N	Still	E_TR03 N_10	761	18	-	-	455 622.9	5 919 097.0	-	
27/08/2020	13:54	E_TR03 N	Still	E_TR03 N_11	762	18	-	-	455 617.9	5 919 093.8	-	
27/08/2020	13:55	E_TR03 N	Video	EOL	763	18	-	-	455 613.9	5 919 092.2	-	
27/08/2020	14:03	E_ST06 S	Video	SOL	764	16	-	-	456 130.6	5 918 773.1	-	
27/08/2020	14:04	E_ST06 S	Still	E_ST06 S_01	765	16	-	-	456 122.8	5 918 773.3	-	
27/08/2020	14:04	E_ST06 S	Still	E_ST06 S_02	766	16	-	-	456 109.7	5 918 774.5	-	
27/08/2020	14:05	E_ST06 S	Still	E_ST06 S_03	767	16	-	-	456 097.7	5 918 774.4	-	
27/08/2020	14:05	E_ST06 S	Still	E_ST06 S_04	768	16	-	-	456 084.5	5 918 772.1	-	
27/08/2020	14:06	E_ST06 S	Still	E_ST06 S_05	769	16	-	-	456 075.0	5 918 769.3	-	
27/08/2020	14:06	E_ST06 S	Still	E_ST06 S_06	770	16	-	-	456 066.2	5 918 772.9	-	
27/08/2020	14:07	E_ST06 S	Still	E_ST06 S_07	771	16	-	-	456 055.4	5 918 773.8	-	
27/08/2020	14:07	E_ST06 S	Still	E_ST06 S_08	772	16	-	-	456 045.2	5 918 771.7	-	
27/08/2020	14:07	E_ST06 S	Still	E_ST06 S_09	773	16	-	-	456 035.3	5 918 771.5	-	
27/08/2020	14:08	E_ST06 S	Still	E_ST06 S_10	774	16	-	-	456 028.0	5 918 768.0	-	
27/08/2020	14:08	E_ST06 S	Video	EOL	775	16	-	-	456 023.4	5 918 769.3	-	

Geodetic Parameters: WGS84 UTM Zone 30N, CM 3°W [m]												
Date	Time [UTC]	Transect/ Station	Type	Sample Rep/ Still No.	Fix No.	Water Depth [m BSL]	Proposed Location		Actual Location		Offset [m]	Notes
							Easting	Northing	Easting	Northing		
27/08/2020	14:15	E_ST06 N	Video	SOL	776	16	-	-	456 122.4	5 918 881.2	-	
27/08/2020	14:15	E_ST06 N	Still	E_ST06 N_01	777	16	-	-	456 117.0	5 918 882.8	-	
27/08/2020	14:16	E_ST06 N	Still	E_ST06 N_02	778	16	-	-	456 100.2	5 918 883.6	-	
27/08/2020	14:17	E_ST06 N	Still	E_ST06 N_03	779	16	-	-	456 085.3	5 918 885.3	-	
27/08/2020	14:17	E_ST06 N	Still	E_ST06 N_04	780	16	-	-	456 073.3	5 918 882.7	-	
27/08/2020	14:18	E_ST06 N	Still	E_ST06 N_05	781	16	-	-	456 059.2	5 918 878.0	-	
27/08/2020	14:19	E_ST06 N	Still	E_ST06 N_06	782	16	-	-	456 051.3	5 918 881.1	-	
27/08/2020	14:19	E_ST06 N	Still	E_ST06 N_07	783	16	-	-	456 037.8	5 918 884.6	-	
27/08/2020	14:19	E_ST06 N	Still	E_ST06 N_08	784	16	-	-	456 032.2	5 918 887.2	-	
27/08/2020	14:19	E_ST06 N	Video	EOL	785	16	-	-	456 027.9	5 918 886.1	-	
27/08/2020	14:31	E_ST08	Video	SOL	786	14	458 022.0	5 917 194.0	458 082.1	5 917 188.6	60.3	
27/08/2020	14:31	E_ST08	Still	E_ST08_01	787	14	458 022.0	5 917 194.0	458 078.3	5 917 186.6	56.8	
27/08/2020	14:31	E_ST08	Still	E_ST08_02	788	14	458 022.0	5 917 194.0	458 071.7	5 917 186.9	50.2	
27/08/2020	14:32	E_ST08	Still	E_ST08_03	789	14	458 022.0	5 917 194.0	458 055.3	5 917 186.5	34.1	
27/08/2020	14:32	E_ST08	Still	E_ST08_04	790	14	458 022.0	5 917 194.0	458 047.5	5 917 190.8	25.7	
27/08/2020	14:33	E_ST08	Still	E_ST08_05	791	14	458 022.0	5 917 194.0	458 035.3	5 917 193.5	13.3	
27/08/2020	14:33	E_ST08	Still	E_ST08_06	792	14	458 022.0	5 917 194.0	458 031.0	5 917 195.6	9.1	
27/08/2020	14:34	E_ST08	Still	E_ST08_07	793	14	458 022.0	5 917 194.0	458 021.2	5 917 200.3	6.3	
27/08/2020	14:34	E_ST08	Still	E_ST08_08	794	14	458 022.0	5 917 194.0	458 015.3	5 917 202.1	10.4	
27/08/2020	14:35	E_ST08	Still	E_ST08_09	795	14	458 022.0	5 917 194.0	458 001.6	5 917 210.8	26.5	
27/08/2020	14:35	E_ST08	Still	E_ST08_10	796	14	458 022.0	5 917 194.0	457 996.1	5 917 215.5	33.6	

Geodetic Parameters: WGS84 UTM Zone 30N, CM 3°W [m]												
Date	Time [UTC]	Transect/ Station	Type	Sample Rep/ Still No.	Fix No.	Water Depth [m BSL]	Proposed Location		Actual Location		Offset [m]	Notes
							Easting	Northing	Easting	Northing		
27/08/2020	14:36	E_ST08	Still	E_ST08_11	797	14	458 022.0	5 917 194.0	457 990.8	5 917 224.5	43.6	
27/08/2020	14:36	E_ST08	Still	E_ST08_12	798	14	458 022.0	5 917 194.0	457 986.1	5 917 229.6	50.5	
27/08/2020	14:36	E_ST08	Still	E_ST08_13	799	14	458 022.0	5 917 194.0	457 982.0	5 917 234.3	56.8	
27/08/2020	14:37	E_ST08	Still	E_ST08_14	800	14	458 022.0	5 917 194.0	457 977.0	5 917 244.1	67.3	
27/08/2020	14:37	E_ST08	Still	E_ST08_15	801	14	458 022.0	5 917 194.0	457 972.6	5 917 249.7	74.4	
27/08/2020	14:38	E_ST08	Still	E_ST08_16	802	14	458 022.0	5 917 194.0	457 968.9	5 917 261.2	85.7	
27/08/2020	14:38	E_ST08	Still	E_ST08_17	803	14	458 022.0	5 917 194.0	457 967.0	5 917 268.5	92.7	
27/08/2020	14:38	E_ST08	Video	EOL	804	14	458 022.0	5 917 194.0	457 965.5	5 917 269.9	94.6	
27/08/2020	14:46	E_ST08 S	Video	SOL	805	14	-	-	458 055.0	5 917 136.5	-	
27/08/2020	14:47	E_ST08 S	Still	E_ST08 S_01	806	14	-	-	458 038.2	5 917 145.8	-	
27/08/2020	14:47	E_ST08 S	Still	E_ST08 S_02	807	14	-	-	458 031.6	5 917 143.1	-	
27/08/2020	14:48	E_ST08 S	Still	E_ST08 S_03	808	14	-	-	458 022.4	5 917 144.8	-	
27/08/2020	14:49	E_ST08 S	Still	E_ST08 S_04	809	14	-	-	458 010.6	5 917 144.6	-	
27/08/2020	14:49	E_ST08 S	Still	E_ST08 S_05	810	14	-	-	458 004.1	5 917 146.7	-	
27/08/2020	14:50	E_ST08 S	Still	E_ST08 S_06	811	14	-	-	457 991.8	5 917 145.1	-	
27/08/2020	14:50	E_ST08 S	Still	E_ST08 S_07	812	14	-	-	457 982.9	5 917 149.7	-	
27/08/2020	14:50	E_ST08 S	Video	EOL	813	14	-	-	457 980.8	5 917 152.7	-	
27/08/2020	14:58	E_ST08 N	Video	SOL	814	14	-	-	458 089.0	5 917 229.9	-	
27/08/2020	14:58	E_ST08 N	Still	E_ST08 N_01	815	14	-	-	458 078.7	5 917 235.8	-	
27/08/2020	14:59	E_ST08 N	Still	E_ST08 N_02	816	14	-	-	458 063.1	5 917 237.5	-	
27/08/2020	14:59	E_ST08 N	Still	E_ST08 N_03	817	14	-	-	458 054.3	5 917 243.5	-	

Geodetic Parameters: WGS84 UTM Zone 30N, CM 3°W [m]												
Date	Time [UTC]	Transect/ Station	Type	Sample Rep/ Still No.	Fix No.	Water Depth [m BSL]	Proposed Location		Actual Location		Offset [m]	Notes
							Easting	Northing	Easting	Northing		
27/08/2020	15:00	E_ST08 N	Still	E_ST08 N_04	818	14	-	-	458 043.5	5 917 240.0	-	
27/08/2020	15:00	E_ST08 N	Still	E_ST08 N_05	819	14	-	-	458 032.6	5 917 243.4	-	
27/08/2020	15:01	E_ST08 N	Still	E_ST08 N_06	820	14	-	-	458 020.7	5 917 243.0	-	
27/08/2020	15:02	E_ST08 N	Still	E_ST08 N_07	821	14	-	-	458 013.1	5 917 248.6	-	
27/08/2020	15:02	E_ST08 N	Still	E_ST08 N_08	822	14	-	-	458 008.4	5 917 254.6	-	
27/08/2020	15:02	E_ST08 N	Video	EOL	823	14	-	-	458 006.3	5 917 256.8	-	
27/08/2020	15:12	E_ST09	Video	SOL	824	17	459 249.0	5 917 026.0	459 278.2	5 917 022.8	29.4	
27/08/2020	15:12	E_ST09	Still	E_ST09_01	825	17	459 249.0	5 917 026.0	459 269.8	5 917 024.8	20.8	
27/08/2020	15:13	E_ST09	Still	E_ST09_02	826	17	459 249.0	5 917 026.0	459 257.4	5 917 023.4	8.8	
27/08/2020	15:13	E_ST09	Still	E_ST09_03	827	17	459 249.0	5 917 026.0	459 246.9	5 917 024.7	2.5	
27/08/2020	15:14	E_ST09	Still	E_ST09_04	828	17	459 249.0	5 917 026.0	459 237.7	5 917 027.2	11.4	
27/08/2020	15:14	E_ST09	Still	E_ST09_05	829	17	459 249.0	5 917 026.0	459 227.6	5 917 027.9	21.5	
27/08/2020	15:14	E_ST09	Video	EOL	830	17	459 249.0	5 917 026.0	459 224.6	5 917 028.1	24.4	
27/08/2020	15:22	E_ST10	Video	SOL	831	15	460 182.0	5 916 479.0	460 219.2	5 916 473.4	37.6	
27/08/2020	15:22	E_ST10	Still	E_ST10_01	832	15	460 182.0	5 916 479.0	460 213.6	5 916 472.9	32.1	
27/08/2020	15:22	E_ST10	Still	E_ST10_02	833	15	460 182.0	5 916 479.0	460 202.0	5 916 471.5	21.4	
27/08/2020	15:23	E_ST10	Still	E_ST10_03	834	15	460 182.0	5 916 479.0	460 187.6	5 916 476.6	6.1	
27/08/2020	15:24	E_ST10	Still	E_ST10_04	835	15	460 182.0	5 916 479.0	460 177.6	5 916 480.6	4.6	
27/08/2020	15:24	E_ST10	Still	E_ST10_05	836	15	460 182.0	5 916 479.0	460 169.0	5 916 481.6	13.3	
27/08/2020	15:24	E_ST10	Still	E_ST10_06	837	15	460 182.0	5 916 479.0	460 160.9	5 916 483.9	21.7	
27/08/2020	15:25	E_ST10	Video	EOL	838	15	460 182.0	5 916 479.0	460 155.7	5 916 485.7	27.2	

Geodetic Parameters: WGS84 UTM Zone 30N, CM 3°W [m]												
Date	Time [UTC]	Transect/ Station	Type	Sample Rep/ Still No.	Fix No.	Water Depth [m BSL]	Proposed Location		Actual Location		Offset [m]	Notes
							Easting	Northing	Easting	Northing		
27/08/2020	15:34	E_ST11	Video	SOL	839	16	461 591.0	5 916 076.0	461 621.4	5 916 070.2	30.9	
27/08/2020	15:34	E_ST11	Still	E_ST11_01	840	16	461 591.0	5 916 076.0	461 613.5	5 916 066.8	24.3	
27/08/2020	15:34	E_ST11	Still	E_ST11_02	841	16	461 591.0	5 916 076.0	461 605.4	5 916 071.4	15.1	
27/08/2020	15:35	E_ST11	Still	E_ST11_03	842	16	461 591.0	5 916 076.0	461 590.5	5 916 074.3	1.8	
27/08/2020	15:35	E_ST11	Still	E_ST11_04	843	16	461 591.0	5 916 076.0	461 581.3	5 916 077.2	9.8	
27/08/2020	15:36	E_ST11	Still	E_ST11_05	844	16	461 591.0	5 916 076.0	461 571.3	5 916 080.1	20.1	
27/08/2020	15:36	E_ST11	Video	EOL	845	16	461 591.0	5 916 076.0	461 563.4	5 916 084.2	28.8	
27/08/2020	15:44	E_ST12	Video	SOL	846	15	461 619.0	5 914 549.0	461 678.9	5 914 555.3	60.3	
27/08/2020	15:44	E_ST12	Still	E_ST12_01	847	15	461 619.0	5 914 549.0	461 672.4	5 914 556.4	53.9	
27/08/2020	15:45	E_ST12	Still	E_ST12_02	848	15	461 619.0	5 914 549.0	461 656.9	5 914 554.4	38.2	
27/08/2020	15:46	E_ST12	Still	E_ST12_03	849	15	461 619.0	5 914 549.0	461 642.8	5 914 554.8	24.5	
27/08/2020	15:46	E_ST12	Still	E_ST12_04	850	15	461 619.0	5 914 549.0	461 632.4	5 914 553.4	14.1	
27/08/2020	15:47	E_ST12	Still	E_ST12_05	851	15	461 619.0	5 914 549.0	461 620.3	5 914 545.0	4.2	
27/08/2020	15:47	E_ST12	Still	E_ST12_06	852	15	461 619.0	5 914 549.0	461 603.4	5 914 541.3	17.4	
27/08/2020	15:48	E_ST12	Still	E_ST12_07	853	15	461 619.0	5 914 549.0	461 587.0	5 914 539.7	33.3	
27/08/2020	15:48	E_ST12	Still	E_ST12_08	854	15	461 619.0	5 914 549.0	461 574.9	5 914 535.5	46.1	
27/08/2020	15:49	E_ST12	Still	E_ST12_09	855	15	461 619.0	5 914 549.0	461 560.1	5 914 529.6	62.0	
27/08/2020	15:49	E_ST12	Video	EOL	856	15	461 619.0	5 914 549.0	461 555.9	5 914 528.4	66.4	
27/08/2020	15:59	E_ST13	Video	SOL	857	11	463 070.0	5 913 062.0	463 100.5	5 913 060.4	30.5	
27/08/2020	16:00	E_ST13	Still	E_ST13_01	858	11	463 070.0	5 913 062.0	463 086.8	5 913 066.4	17.3	
27/08/2020	16:01	E_ST13	Still	E_ST13_02	859	11	463 070.0	5 913 062.0	463 077.5	5 913 072.0	12.4	

Geodetic Parameters: WGS84 UTM Zone 30N, CM 3°W [m]												
Date	Time [UTC]	Transect/ Station	Type	Sample Rep/ Still No.	Fix No.	Water Depth [m BSL]	Proposed Location		Actual Location		Offset [m]	Notes
							Easting	Northing	Easting	Northing		
27/08/2020	16:01	E_ST13	Still	E_ST13_03	860	11	463 070.0	5 913 062.0	463 066.6	5 913 075.3	13.7	
27/08/2020	16:02	E_ST13	Still	E_ST13_04	861	11	463 070.0	5 913 062.0	463 059.6	5 913 077.5	18.7	
27/08/2020	16:02	E_ST13	Still	E_ST13_05	862	11	463 070.0	5 913 062.0	463 053.9	5 913 080.8	24.8	
27/08/2020	16:02	E_ST13	Video	EOL	863	11	463 070.0	5 913 062.0	463 048.3	5 913 083.8	30.7	
27/08/2020	16:14	E_ST14	Video	SOL	864	9	465 088.0	5 911 426.0	465 116.5	5 911 421.6	28.8	
27/08/2020	16:15	E_ST14	Still	E_ST14_01	865	9	465 088.0	5 911 426.0	465 110.1	5 911 431.0	22.6	
27/08/2020	16:15	E_ST14	Still	E_ST14_02	866	9	465 088.0	5 911 426.0	465 097.9	5 911 437.1	14.9	
27/08/2020	16:16	E_ST14	Still	E_ST14_03	867	9	465 088.0	5 911 426.0	465 089.2	5 911 441.9	15.9	
27/08/2020	16:16	E_ST14	Still	E_ST14_04	868	9	465 088.0	5 911 426.0	465 082.5	5 911 439.7	14.8	
27/08/2020	16:17	E_ST14	Still	E_ST14_05	869	9	465 088.0	5 911 426.0	465 072.5	5 911 437.9	19.6	
27/08/2020	16:17	E_ST14	Video	EOL	870	9	465 088.0	5 911 426.0	465 066.6	5 911 438.4	24.8	
27/08/2020	16:26	E_ST15	Video	SOL	871	8	466 809.0	5 911 094.0	466 836.5	5 911 100.7	28.3	
27/08/2020	16:26	E_ST15	Still	E_ST15_01	872	8	466 809.0	5 911 094.0	466 824.3	5 911 102.8	17.6	
27/08/2020	16:27	E_ST15	Still	E_ST15_02	873	8	466 809.0	5 911 094.0	466 810.6	5 911 103.1	9.3	
27/08/2020	16:28	E_ST15	Still	E_ST15_03	874	8	466 809.0	5 911 094.0	466 794.0	5 911 096.6	15.2	
27/08/2020	16:28	E_ST15	Still	E_ST15_04	875	8	466 809.0	5 911 094.0	466 784.1	5 911 094.9	24.9	
27/08/2020	16:29	E_ST15	Still	E_ST15_05	876	8	466 809.0	5 911 094.0	466 771.4	5 911 088.2	38.0	
27/08/2020	16:29	E_ST15	Video	EOL	877	8	466 809.0	5 911 094.0	466 770.9	5 911 087.2	38.7	
27/08/2020	16:38	E_ST16	Video	SOL	878	9	468 560.0	5 910 710.0	468 591.8	5 910 705.4	32.1	
27/08/2020	16:38	E_ST16	Still	E_ST16_01	879	9	468 560.0	5 910 710.0	468 582.3	5 910 715.3	22.9	
27/08/2020	16:39	E_ST16	Still	E_ST16_02	880	9	468 560.0	5 910 710.0	468 559.6	5 910 734.4	24.4	

Geodetic Parameters: WGS84 UTM Zone 30N, CM 3°W [m]												
Date	Time [UTC]	Transect/ Station	Type	Sample Rep/ Still No.	Fix No.	Water Depth [m BSL]	Proposed Location		Actual Location		Offset [m]	Notes
							Easting	Northing	Easting	Northing		
27/08/2020	16:40	E_ST16	Still	E_ST16_03	881	9	468 560.0	5 910 710.0	468 550.1	5 910 729.3	21.7	Vessel turned after this point
27/08/2020	16:44	E_ST16	Still	E_ST16_04	882	9	468 560.0	5 910 710.0	468 546.2	5 910 709.3	13.8	Vessel turned after this point
27/08/2020	16:48	E_ST16	Still	E_ST16_05	883	9	468 560.0	5 910 710.0	468 557.5	5 910 720.8	11.1	
27/08/2020	16:49	E_ST16	Video	EOL	884	9	468 560.0	5 910 710.0	468 545.2	5 910 714.4	15.4	
29/08/2020	11:35	E_ST25	HG	NS	885	9	460 934.0	5 911 314.0	460 920.6	5 911 303.5	17.1	Cobble in jaw
29/08/2020	11:40	E_ST25	HG	NS	886	9	460 934.0	5 911 314.0	460 927.4	5 911 319.5	8.5	< 2 L
29/08/2020	11:44	E_ST25	HG	FA/PSD	887	9	460 934.0	5 911 314.0	460 932.3	5 911 318.3	4.6	
29/08/2020	12:01	E_ST22	HG	NS	888	8	464 054.0	5 912 295.0	464 049.5	5 912 304.0	10.1	< 2 L
29/08/2020	12:05	E_ST22	HG	NS	889	8	464 054.0	5 912 295.0	464 047.4	5 912 297.9	7.2	Cobble in jaw
29/08/2020	12:11	E_ST22	HG	FA/PSD	890	8	464 054.0	5 912 295.0	464 039.1	5 912 301.8	16.3	
29/08/2020	12:24	E_ST23	HG	NS	891	10	461 356.0	5 913 509.0	461 349.1	5 913 519.7	12.7	
29/08/2020	12:28	E_ST23	HG	FA/PSD	892	10	461 356.0	5 913 509.0	461 359.6	5 913 498.7	10.9	
29/08/2020	12:40	E_ST24	HG	NS	893	12	460 912.0	5 914 637.0	460 916.4	5 914 640.4	5.6	2 L
29/08/2020	12:46	E_ST24	HG	FA/PSD	894	12	460 912.0	5 914 637.0	460 899.7	5 914 634.2	12.6	
29/08/2020	12:55	E_ST21	HG	NS	895	13	459 968.0	5 915 162.0	459 954.5	5 915 161.5	13.5	< 2 L
29/08/2020	13:00	E_ST21	HG	NS	896	13	459 968.0	5 915 162.0	459 972.0	5 915 163.5	4.3	< 2 L
29/08/2020	13:08	E_ST21	HG	FA/PSD	897	13	459 968.0	5 915 162.0	459 981.6	5 915 163.2	13.6	4 L sample accepted due to coarse ground
29/08/2020	14:33	E_ST04	DG	NS	898	22	454 452.0	5 919 439.0	454 453.8	5 919 443.2	4.6	Pebbles in jaw
29/08/2020	14:38	E_ST04	DG	CS	899	22	454 452.0	5 919 439.0	454 464.6	5 919 433.9	13.6	

Geodetic Parameters: WGS84 UTM Zone 30N, CM 3°W [m]												
Date	Time [UTC]	Transect/ Station	Type	Sample Rep/ Still No.	Fix No.	Water Depth [m BSL]	Proposed Location		Actual Location		Offset [m]	Notes
							Easting	Northing	Easting	Northing		
29/08/2020	14:59	E_ST09	DG	NS	900	14	459 249.0	5 917 026.0	459 251.0	5 917 026.8	2.1	Shells in jaw. < 1 L
29/08/2020	15:04	E_ST09	DG	CS	901	14	459 249.0	5 917 026.0	459 263.2	5 917 017.5	16.6	
29/08/2020	15:15	E_ST11	DG	NS	902	12	461 591.0	5 916 076.0	461 601.3	5 916 083.9	13.0	Pebbles in jaw
29/08/2020	15:20	E_ST11	DG	NS	903	12	461 591.0	5 916 076.0	461 605.4	5 916 065.6	17.8	3 cm bite depth
29/08/2020	15:24	E_ST11	DG	NS	904	12	461 591.0	5 916 076.0	461 599.8	5 916 064.2	14.7	2 cm bite depth Station abandoned
29/08/2020	15:32	E_ST24	DG	NS	905	10	460 912.0	5 914 637.0	460 924.7	5 914 635.3	12.8	Pebbles in jaw
29/08/2020	15:37	E_ST24	DG	NS	906	10	460 912.0	5 914 637.0	460 916.8	5 914 622.3	15.4	Pebbles in jaw
29/08/2020	15:41	E_ST24	DG	NS	907	10	460 912.0	5 914 637.0	460 909.3	5 914 634.1	4.0	Pebbles in jaw Station abandoned
29/08/2020	15:48	E_ST23	DG	CS	908	9	461 356.0	5 913 509.0	461 365.5	5 913 497.8	14.7	
29/08/2020	15:56	E_ST13	DG	CS	909	7	463 070.0	5 913 062.0	463 073.5	5 913 058.5	4.9	
29/08/2020	16:11	E_ST18	DG	CS	910	8	461 333.0	5 910 367.0	461 342.0	5 910 369.5	9.3	6 cm bite depth accepted due to sediment type
29/08/2020	16:18	E_ST18	DG	NS	911	8	461 333.0	5 910 367.0	461 345.5	5 910 366.7	12.5	Pebbles in jaw
29/08/2020	16:22	E_ST18	DG	NS	912	8	461 333.0	5 910 367.0	461 340.2	5 910 352.9	15.9	5 cm bite depth
30/08/2020	08:48	E_ST20	DG	CS	922	9	461 932.0	5 907 559.0	461 920.1	5 907 567.5	14.6	
30/08/2020	09:15	E_ST16	DG	CS	923	9	468 560.0	5 910 710.0	468 552.3	5 910 709.7	7.7	
30/08/2020	09:25	E_ST15	DG	CS	924	9	466 809.0	5 911 094.0	466 812.0	5 911 103.0	9.5	
30/08/2020	09:48	E_ST19	Video	SOL	925	9	461 611.0	5 908 691.0	461 581.7	5 908 687.0	29.6	Low visibility
30/08/2020	09:49	E_ST19	Still	E_ST19_01	926	9	461 611.0	5 908 691.0	461 591.3	5 908 682.4	21.5	
30/08/2020	09:50	E_ST19	Still	E_ST19_02	927	9	461 611.0	5 908 691.0	461 606.3	5 908 679.5	12.4	

Geodetic Parameters: WGS84 UTM Zone 30N, CM 3°W [m]												
Date	Time [UTC]	Transect/ Station	Type	Sample Rep/ Still No.	Fix No.	Water Depth [m BSL]	Proposed Location		Actual Location		Offset [m]	Notes
							Easting	Northing	Easting	Northing		
30/08/2020	09:50	E_ST19	Still	E_ST19_03	928	9	461 611.0	5 908 691.0	461 610.9	5 908 684.6	6.4	
30/08/2020	09:51	E_ST19	Still	E_ST19_04	930	9	461 611.0	5 908 691.0	461 625.8	5 908 709.8	23.9	
30/08/2020	09:52	E_ST19	Still	E_ST19_05	931	9	461 611.0	5 908 691.0	461 626.9	5 908 716.3	29.9	
30/08/2020	09:52	E_ST19	Video	EOL	932	9	461 611.0	5 908 691.0	461 635.6	5 908 722.9	40.3	
30/08/2020	10:01	E_ST20	Video	SOL	933	9	461 932.0	5 907 559.0	461 902.0	5 907 552.1	30.8	Low visibility
30/08/2020	10:02	E_ST20	Still	E_ST20_01	934	9	461 932.0	5 907 559.0	461 923.9	5 907 548.2	13.5	
30/08/2020	10:03	E_ST20	Still	E_ST20_02	935	9	461 932.0	5 907 559.0	461 923.4	5 907 555.0	9.5	
30/08/2020	10:05	E_ST20	Still	E_ST20_03	936	9	461 932.0	5 907 559.0	461 939.8	5 907 579.0	21.4	
30/08/2020	10:05	E_ST20	Still	E_ST20_04	937	9	461 932.0	5 907 559.0	461 941.0	5 907 582.1	24.8	
30/08/2020	10:10	E_ST20	Still	E_ST20_05	938	9	461 932.0	5 907 559.0	461 925.7	5 907 551.1	10.1	
30/08/2020	10:11	E_ST20	Still	E_ST20_06	NF	9	461 932.0	5 907 559.0	461 926.8	5 907 563.3	10.1	
30/08/2020	10:11	E_ST20	Video	EOL	NF	9	461 932.0	5 907 559.0	461 926.8	5 907 563.3	10.1	
30/08/2020	13:34	E_ST17	Video	SOL	1035	7	461 152.0	5 912 372.0	461 125.2	5 912 363.0	28.3	
30/08/2020	13:35	E_ST17	Still	E_ST17_01	1036	7	461 152.0	5 912 372.0	461 132.5	5 912 363.8	21.1	
30/08/2020	13:35	E_ST17	Still	E_ST17_02	1037	7	461 152.0	5 912 372.0	461 141.2	5 912 366.2	12.3	
30/08/2020	13:36	E_ST17	Still	E_ST17_03	1038	7	461 152.0	5 912 372.0	461 146.0	5 912 373.9	6.3	
30/08/2020	13:37	E_ST17	Still	E_ST17_04	1039	7	461 152.0	5 912 372.0	461 157.4	5 912 376.0	6.7	
30/08/2020	13:37	E_ST17	Still	E_ST17_05	1040	7	461 152.0	5 912 372.0	461 165.4	5 912 379.4	15.3	
30/08/2020	13:38	E_ST17	Still	E_ST17_06	1041	7	461 152.0	5 912 372.0	461 170.9	5 912 384.9	22.9	
30/08/2020	13:38	E_ST17	Video	EOL	1042	7	461 152.0	5 912 372.0	461 171.8	5 912 393.8	29.4	
30/08/2020	13:50	E_ST18	Video	SOL	1043	8	461 333.0	5 910 367.0	461 306.0	5 910 359.9	27.9	Low visibility

Geodetic Parameters: WGS84 UTM Zone 30N, CM 3°W [m]												
Date	Time [UTC]	Transect/ Station	Type	Sample Rep/ Still No.	Fix No.	Water Depth [m BSL]	Proposed Location		Actual Location		Offset [m]	Notes
							Easting	Northing	Easting	Northing		
30/08/2020	13:51	E_ST18	Still	E_ST18_01	1044	8	461 333.0	5 910 367.0	461 312.3	5 910 361.2	21.5	
30/08/2020	13:51	E_ST18	Still	E_ST18_02	1045	8	461 333.0	5 910 367.0	461 323.1	5 910 364.2	10.3	
30/08/2020	13:52	E_ST18	Still	E_ST18_03	1046	8	461 333.0	5 910 367.0	461 337.9	5 910 371.2	6.5	
30/08/2020	13:53	E_ST18	Still	E_ST18_04	1047	8	461 333.0	5 910 367.0	461 341.7	5 910 383.1	18.3	
30/08/2020	13:55	E_ST18	Still	E_ST18_05	1049	8	461 333.0	5 910 367.0	461 358.5	5 910 392.6	36.1	
30/08/2020	13:56	E_ST18	Video	EOL	1050	8	461 333.0	5 910 367.0	461 356.7	5 910 399.1	39.9	
30/08/2020	14:28	E_TR02(2)	Video	SOL	1051	14	455 339.0	5 918 037.0	455 328.9	5 918 036.5	10.1	
30/08/2020	14:28	E_TR02(2)	Still	E_TR02(2) 01	1052	14	-	-	455 336.7	5 918 042.0	-	
30/08/2020	14:29	E_TR02(2)	Still	E_TR02(2) 02	1053	14	-	-	455 344.3	5 918 042.7	-	
30/08/2020	14:29	E_TR02(2)	Still	E_TR02(2) 03	1054	14	-	-	455 356.9	5 918 041.1	-	
30/08/2020	14:30	E_TR02(2)	Still	E_TR02(2) 04	1055	14	-	-	455 365.4	5 918 046.0	-	
30/08/2020	14:31	E_TR02(2)	Still	E_TR02(2) 05	1056	14	-	-	455 378.5	5 918 063.5	-	
30/08/2020	14:31	E_TR02(2)	Still	E_TR02(2) 06	1057	14	-	-	455 389.9	5 918 062.8	-	
30/08/2020	14:32	E_TR02(2)	Still	E_TR02(2) 07	1058	14	-	-	455 401.0	5 918 058.4	-	
30/08/2020	14:33	E_TR02(2)	Still	E_TR02(2) 08	1059	14	-	-	455 414.6	5 918 060.5	-	
30/08/2020	14:34	E_TR02(2)	Still	E_TR02(2) 09	1060	14	-	-	455 421.8	5 918 070.8	-	
30/08/2020	14:34	E_TR02(2)	Still	E_TR02(2) 10	1061	14	-	-	455 432.0	5 918 080.5	-	
30/08/2020	14:35	E_TR02(2)	Video	EOL	1062	14	455 432.0	5 918 078.0	455 443.1	5 918 084.1	12.6	
30/08/2020	14:44	E_TR03(2)	Video	SOL	1063	16	455 623.0	5 919 046.0	455 611.0	5 919 045.3	12.0	
30/08/2020	14:44	E_TR03(2)	Still	E_TR03(2) 01	1064	16	-	-	455 615.1	5 919 044.4	-	
30/08/2020	14:45	E_TR03(2)	Still	E_TR03(2) 02	1065	16	-	-	455 626.5	5 919 047.7	-	

Geodetic Parameters: WGS84 UTM Zone 30N, CM 3°W [m]												
Date	Time [UTC]	Transect/ Station	Type	Sample Rep/ Still No.	Fix No.	Water Depth [m BSL]	Proposed Location		Actual Location		Offset [m]	Notes
							Easting	Northing	Easting	Northing		
30/08/2020	14:45	E_TR03(2)	Still	E_TR03(2) 03	1066	16	-	-	455 639.2	5 919 055.2	-	
30/08/2020	14:46	E_TR03(2)	Still	E_TR03(2) 04	1067	16	-	-	455 655.4	5 919 054.4	-	
30/08/2020	14:47	E_TR03(2)	Still	E_TR03(2) 05	1068	16	-	-	455 668.1	5 919 051.5	-	
30/08/2020	14:48	E_TR03(2)	Still	E_TR03(2) 06	1069	16	-	-	455 684.2	5 919 056.2	-	
30/08/2020	14:49	E_TR03(2)	Still	E_TR03(2) 07	1070	16	-	-	455 710.4	5 919 060.9	-	
30/08/2020	14:50	E_TR03(2)	Still	E_TR03(2) 08	1071	16	-	-	455 716.7	5 919 057.1	-	
30/08/2020	14:50	E_TR03(2)	Still	E_TR03(2) 09	1072	16	-	-	455 720.8	5 919 060.4	-	
30/08/2020	14:51	E_TR03(2)	Still	E_TR03(2) 10	1073	16	-	-	455 724.3	5 919 069.2	-	
30/08/2020	14:52	E_TR03(2)	Video	EOL	1074	16	455 726.0	5 919 059.0	455 727.6	5 919 071.3	12.4	

Notes
UTC = Coordinated Universal Time
BSL = Below sea level
SOL = Start of line
EOL = End of line
FA = Fauna sample
PSD = Particle size distribution sub-sample
CS = Chemistry sample
NF = No fix
HG = Hamon grab
DG = Day grab

C.2 Grab Log

Date	Time [UTC]	Station	Sample	Fix No.	Sample Volume [L]	Sediment Description (including stratigraphy)		Comments (fauna, smell, bioturbation, debris)
						Sediment Type	Sediment Description	
26/08/2020	12:00	E_ST18	FA/PSD	507	6	gS	Coarse sand	-
26/08/2020	12:34	E_ST17	NS	510	-	-	-	-
26/08/2020	12:49	E_ST14	FA/PSD	511	6	S	Fine sand	-
26/08/2020	12:57	E_ST15	FA/PSD	512	5	S	Fine sand	-
26/08/2020	13:06	E_ST16	FA/PSD	513	5	S	Fine sand	-
26/08/2020	13:31	E_ST13	FA/PSD	514	6	S	Fine sand	-
26/08/2020	13:44	E_ST12	FA/PSD	515	6	(g)mS	Muddy fine sand	-
26/08/2020	13:53	E_ST11	FA/PSD	516	9	(g)mS	Muddy fine sand	-
26/08/2020	14:15	E_ST10	NS	520	-	-	-	-
26/08/2020	14:24	E_ST09	FA/PSD	521	5	gS	Coarse sand	-
26/08/2020	14:43	E_ST08	NS	524	-		-	-
26/08/2020	14:51	E_ST07	FA/PSD	525	5	gS	Gravelly sand	-
26/08/2020	15:12	E_ST06	NS	528	-	-	-	-
26/08/2020	15:33	E_ST05	NS	532	-	-	-	-
26/08/2020	15:41	E_ST04	FA/PSD	533	6	S	Fine sand	-
26/08/2020	15:51	E_ST03	FA/PSD	534	6	S	Fine sand	-
26/08/2020	15:59	E_ST02	FA/PSD	535	5	gS	Fine sand with shells	-
26/08/2020	16:10	E_ST01	FA/PSD	536	6	S	Fine sand	-
26/08/2020	16:59	E_ST19	FA/PSD	537	6	gS	Coarse sand	-
26/08/2020	17:05	E_ST20	FA/PSD	538	5	S	Fine sand	-

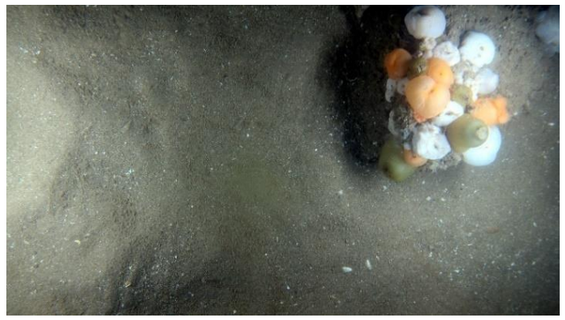
Date	Time [UTC]	Station	Sample	Fix No.	Sample Volume [L]	Sediment Description (including stratigraphy)		Comments (fauna, smell, bioturbation, debris)
						Sediment Type	Sediment Description	
29/08/2020	11:44	E_ST25	FA/PSD	887	5	sG	Sandy gravel	-
29/08/2020	12:11	E_ST22	FA/PSD	890	5	gS	Fine sand with gravel	-
29/08/2020	12:28	E_ST23	FA/PSD	892	5	S	Fine sand	-
29/08/2020	12:46	E_ST24	FA/PSD	894	6	S	Fine sand	-
29/08/2020	13:08	E_ST21	FA/PSD	897	4	sG	Sandy gravel	-
29/08/2020	14:38	E_ST04	CS	899	7*	S	Fine sand	-
29/08/2020	15:04	E_ST09	CS	901	8*	gS	Coarse sand	-
29/08/2020	15:24	E_ST11	NS	904	-	-	-	-
29/08/2020	15:41	E_ST24	NS	907	-	-	-	-
29/08/2020	15:48	E_ST23	CS	908	7*	S	Fine sand	-
29/08/2020	15:56	E_ST13	CS	909	7*	S	Fine sand	-
29/08/2020	16:11	E_ST18	CS	910	6*	S	Fine sand	-
30/08/2020	08:48	E_ST20	CS	922	7*	S	Fine sand	-
30/08/2020	09:15	E_ST16	CS	923	8*	S	Fine sand	-
30/08/2020	09:25	E_ST15	CS	924	7*	S	Fine sand	-

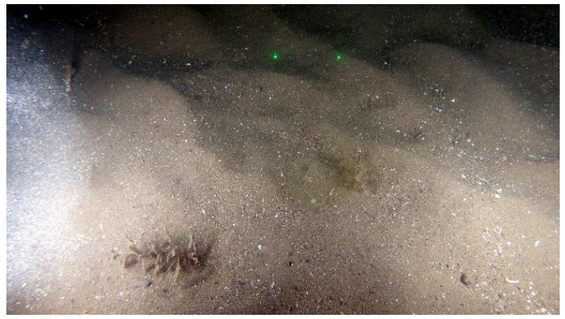
Notes
UTC = Coordinated Universal Time
FA = Faunal sample
PSD = Particle size distribution sub-sample
CS = Chemistry sample
NS = No sample
* = Sample depth [cm]

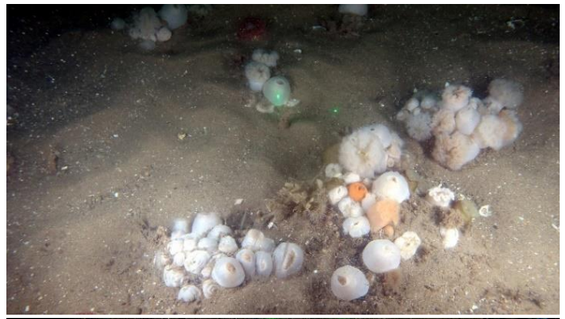
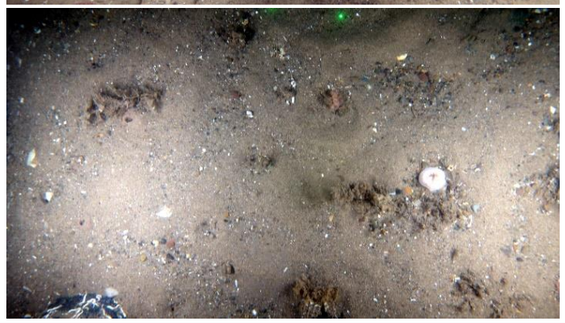
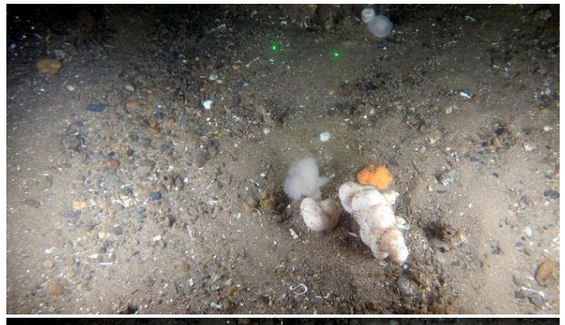
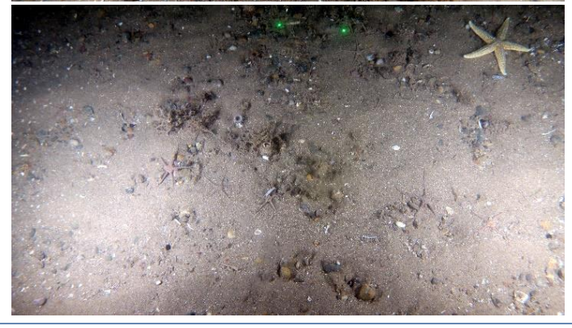
C.3 Video and Photographic Log

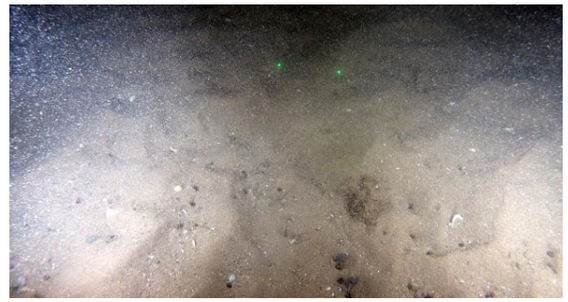
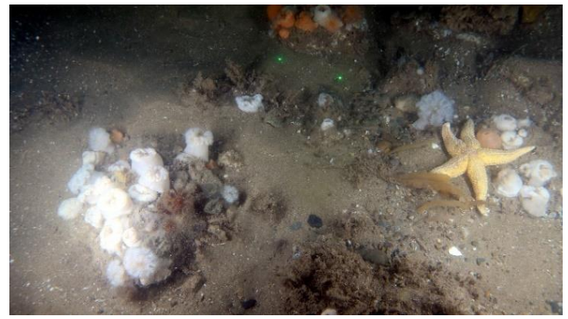
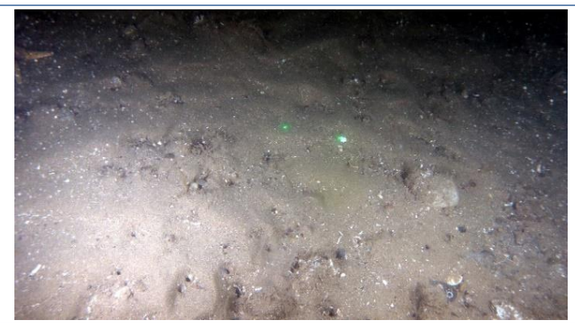
Geodetic Parameters: WGS84, UTM Zone 30N, CM 3°W							
Station/Transect		Easting	Northing	Sediment Description	Fauna/Bioturbation/Debris	Abundance [SACFOR]	Representative Image
E_ST01	SOL	451 777.5	5 919 639.6	Rippled sand with shell and shell fragments	Brittlestars (Ophiuroidea) Faunal turf (Hydrozoa/Bryozoa) Faunal tubes	P R P	
	EOL	451 820.4	5 919 611.7				
E_ST02	SOL	453 617.3	5 920 359.4	Sand with varying proportion of shell and shell fragments	Dragonet (*Callionymus* sp.) Brittlestars (Ophiuroidea) Ray (Rajidae) Red gurnard (*Chelidonichthys cuculus*) Starfish (*Asterias rubens*) Hermit crab (Paguridae) Hermit crab (*Pagurus bernhardus*) Hydroid (*Hydractinia echinata*) Faunal turf (Hydrozoa/Bryozoa)	O P F F O F O P R	
	EOL	453 669.5	5 920 345.4				
E_ST03	SOL	454 452.1	5 921 001.3	Rippled sand with shell and shell fragments	Faunal turf (Hydrozoa / Bryozoa)	R	
	EOL	454 501.8	5 920 988.6				
E_ST04	SOL	454 429.3	5 919 458.9	Rippled sand	Starfish (Asteroidea) Faunal holes/burrows Faunal tubes present	O P P	
	EOL	454 476.7	5 919 433.0				

Geodetic Parameters: WGS84, UTM Zone 30N, CM 3°W							
Station/Transect		**Easting**	**Northing**	**Sediment Description**	**Fauna/Bioturbation/Debris**	**Abundance [SACFOR]**	**Representative Image**
E_ST05	SOL	454 592.3	5 918 518.7	Sand with shell fragments, cobbles and small boulders	Brittlestars (Ophiuroidea) Brittlestars (*Ophiura albida*) Faunal turf (Hydrozoa/Bryozoa) Hydroids (*Nemertesia antennina*) Hydroids (*Hydrallmania falcata*) Anemones (Actiniaria) Anemones (Ceriantharia) Anemones (*Urticina* sp.) Starfish (Asteroidea) Starfish (*Asterias rubens*) Starfish (*Astropecten irregularis*) Catshark (*Scyliorhinus* sp.) Dragonet (*Callionymus* sp.) Faunal burrows Fauna associated with hard substrata: Anemones (*Metridium* sp.) Soft coral (*Alcyonium digitatum*) Sponge (*Ciocalypta penicillus*) Sponge (*Haliclona oculata*) Barnacles (Cirripedia) Bryozoan (*Flustra foliacea*)	P P O F O P P O O F O F O P C/A R R R P R	
	EOL	454 842.8	5 918 510.4				
E_ST05 N	SOL	454 743.8	5 918 547.6	Sand with shell fragments and varying proportions of pebbles, cobbles and boulders	Anemones (Actiniaria) Anemones (*Urticina* sp.) Anemones (Ceriantharia) Starfish (*Asterias rubens*) Brittlestars (Ophiurodea) Faunal turf (Hydrozoa/Bryozoa) Crab (*Necora puber*) Lobster (*Homarus gammarus*) Dragonet (*Callionymus* sp.) Sponge (*Ciocalypta penicillus*) Flatfish (Pleuronectiformes) Faunal holes/burrows Fauna associated with hard substrata: Anemones (Actiniaria) Anemones (*Metridium* sp.) Soft coral (*Alcyonium digitatum*) Bryozoan (*Flustra foliacea*) Sponges (Porifera) Sea squirts (Ascidiacea) Faunal turf (Hydrozoa/Bryozoa)	P F P F P O F F F F P P P C/A R R R R P O	
	EOL	454 601.0	5 918 564.8				

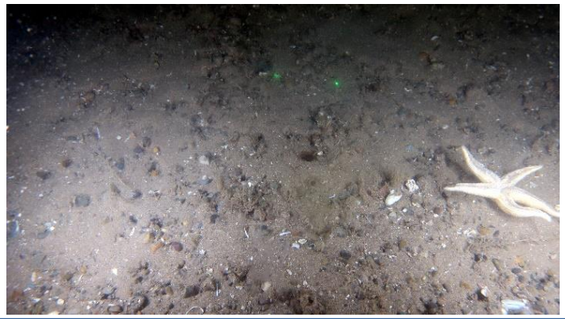
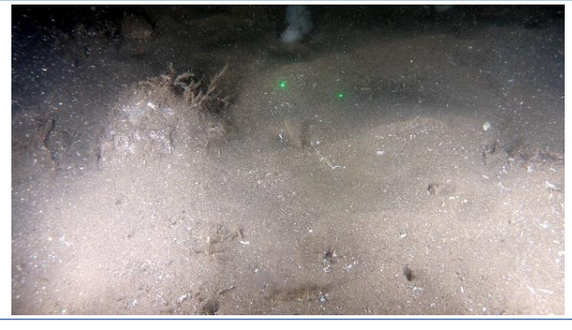
Geodetic Parameters: WGS84, UTM Zone 30N, CM 3°W							
Station/Transect		Easting	Northing	Sediment Description	Fauna/Bioturbation/Debris	Abundance [SACFOR]	Representative Image
E_ST05 S	SOL	454 729.0	5 918 454.7	Sand with shell fragments and occasional pebbles, cobbles	Starfish (Asteroidea) Starfish (*Asterias rubens*) Brittlestars (Ophiuroidea) Brittlestars (*Ophiura albida*) Anemones (Actiniaria) Anemones (*Urticina* sp.) Faunal turf (Hydrozoa/Bryozoa) Hydroids (*Hydrallmania falcata*) Sponge (*Ciocalypta penicillus*) Bryozoan (*Flustra foliacea*) Dragonet (*Callionymus* sp.) Flatfish (Pleuronectiformes) gadoid fish (Gadidae) Faunal holes/burrows Fauna associated with hard substrata Anemones (Actiniaria) Anemone (*Metridium* sp.) Soft coral (*Alcyonium digitatum*) Barnacles (Cirripedia) Faunal turf (Hydrozoa / Bryozoa)	P F P P P O O R R R P F P P P C/A R P O	
	EOL	454 597.0	5 918 460.3				
E_ST06	SOL	456 040.5	5 918 840.8	Gravelly sand with pebbles, cobbles and small boulders	Anemones (Actiniaria) Anemones (*Urticina* sp.) Anemones (Ceriantharia) Anemones (*Cerianthus lloydii*) Starfish (Asteroidea) Starfish (*Asterias rubens*) Brittlestars (Ophiuroidea) Brittlestars (*Ophiura albida*) Dragonet (*Callionymus* sp.) Crab (Brachyura) Crab (*Necora puber*) Whelk (Buccinidae) Fauna associated with hard substrata: Anemones (*Metridium* sp.) Soft coral (*Alcyonium digitatum*) Barnacles (Cirripedia) Polychaetes (*Spirobranchus* sp.) Faunal turf (Hydrozoa/Bryozoa)	P O P F P F P P F P O O C R P P O	
	EOL	456 129.9	5 918 814.2				

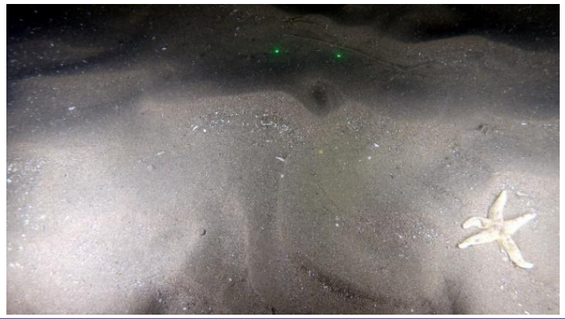
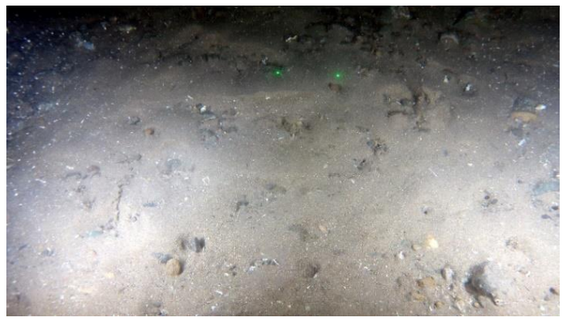
Geodetic Parameters: WGS84, UTM Zone 30N, CM 3°W							
Station/Transect		Easting	Northing	Sediment Description	Fauna/Bioturbation/Debris	Abundance [SACFOR]	Representative Image
E_ST06	SOL	456 129.9	5 918 814.2	Sand with shell fragments Occasional cobbles	Anemones (Ceriantharia) Starfish (*Asterias rubens*) Brittlestars (Ophiuroidea) Brittlestars (*Ophiura albida*) Fauna associated with hard substrata: Anemones (Actiniaria) Anemones (*Metridium* sp.)	C F P P P O	
	EOL	456 137.2	5 918 814.8				
	SOL	456 137.2	5 918 814.8	Gravelly sand with pebbles, cobbles and small boulders	Anemones (Actiniaria) Anemones (*Metridium* sp.) Anemones (Ceriantharia) Anemones (*Cerianthus lloydii*) Starfish (Asteroidea) Starfish (*Asterias rubens*)	P F P P P F	-
	EOL	456 141.6	5 918 819.1				
	SOL	456 141.6	5 918 819.1	Sand with shell fragments Occasional cobbles and small boulders	Brittlestars (Ophiuroidea) Brittlestars (*Ophiura albida*) Sand mason (*Lanice conchilega*) Faunal turf (Hydrozoa/Bryozoa) Hydroids (*Hydrallmania falcata*) Fauna associated with hard substrata: Anemones (Actiniaria) Anemones (*Metridium* sp.) Soft coral (*Alcyonium digitatum*) Starfish (*Asterias rubens*)	P P P O R P O R F	
	EOL	456 151.9	5 918 825.6				
	SOL	456 151.9	5 918 825.6	Gravelly sand with pebbles, cobbles and boulders	Anemones (Actiniaria) Anemones (*Metridium* sp.) Anemones (Ceriantharia) Anemones (*Cerianthus lloydii*) Soft coral (*Alcyonium digitatum*) Starfish (Asteroidea) Starfish (*Asterias rubens*) Brittlestars (Ophiuroidea) Polychaetes (*Spirobranchus* sp.) Bryozoan (*Flustra foliacea*) Faunal turf (Hydrozoa/Bryozoa)	P O P P F - C P F P P R O	
	EOL	456 212.9	5 918 835.8				

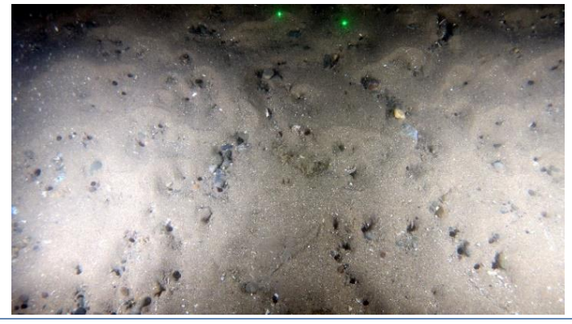
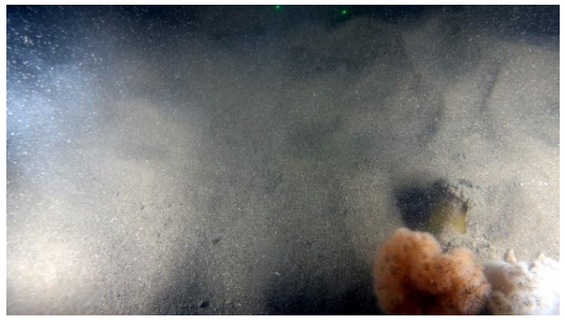
Geodetic Parameters: WGS84, UTM Zone 30N, CM 3°W							
Station/Transect		Easting	Northing	Sediment Description	Fauna/Bioturbation/Debris	Abundance [SACFOR]	Representative Image
E_ST06_S	SOL	456 130.6	5 918 773.1	Sand with shell fragments, cobbles and small boulders	Starfish (*Asterias rubens*) Brittlestars (Ophiuroidea) Anemones (*Urticina* sp.) Faunal turf (Hydrozoa/Bryozoa) Dragonet (*Callionymus* sp.) Faunal tubes Fauna associated with hard substrata: Anemones (*Metridium* sp.) Soft coral (*Alcyonium digitatum*), Sea urchins (*Psammechinus miliiaris*) Polychaete tubes (*Spirobranchus* sp.) Barnacles (Cirripedia) Bryozoan (*Flustra foliacea*) Faunal turf (Hydrozoa/Bryozoa)	F P O O O P C – A R P P P R O	
	EOL	456 023.4	5 918 769.3				
E_ST06_N	SOL	456 122.4	5 91 8 881.2	Gravelly sand with varying proportions of pebbles, cobbles and small boulders	Starfish (Asteroidea) Starfish (*Asterias rubens*) Soft coral (*Alcyonium digitatum*) Brittlestars (Ophiuroidea) Brittlestars (*Ophiura albida*) Anemones (Actiniaria) Anemones (*Metridium* sp.) Anemones (*Urticina* sp.), Anemones (Ceriantharia) Dragonet (*Callionymus* sp.) Hermit crab (Paguridae) Polychaete tubes (*Spirobranchus* sp.) Crab *(Ebalia* sp.) Topshell (*Calliostoma zizyphinum*) Bryozoan (*Flustra foliacea*) Barnacles (Cirripedia) Faunal turf (Hydrozoa/Bryozoa) Faunal tubes Faunal holes/burrows	O F O P P P C O P O O P P P R P O P P	
	EOL	456 027.9	5 918 886.1				

Geodetic Parameters: WGS84, UTM Zone 30N, CM 3°W							
Station/Transect		Easting	Northing	Sediment Description	Fauna/Bioturbation/Debris	Abundance [SACFOR]	Representative Image
E_ST07	SOL	457 529.8	5 918 038.8	Sand with shell fragments Occasional pebbles and cobbles	Anemones (Actiniaria) Starfish (*Asterias rubens*) Bryozoan (*Flustra foliacea*) Faunal turf (Hydrozoa/Bryozoa) Flatfish (Pleuronectiformes) Dragonet (*Callionymus* sp.) Faunal holes/burrows Fauna associated with hard substrata: Anemones (Actiniaria) Anemones (*Metridium* sp.) Soft coral (*Alcyonium digitatum*)	P F R R F O P P F R	
	EOL	457 562.2	5 918 014.0				
E_ST08	SOL	458 082.1	5 917 188.6	Gravelly sand with pebbles, cobbles and small boulders	Starfish (Asteroidea) Starfish (*Asterias rubens*) Soft coral (*Alcyonium digitatum*) Sponges (Porifera) Anemones (Actiniaria) Anemones (*Metridium* sp.) Anemones (*Urticina* sp.) Anemones (Ceriantharia) Dragonet (*Callionymus* sp.) Goby (Gobiidae) Unidentified fish (Pisces) Crab (*Necora puber*) Hermit crab (*Pagurus bernhardus*) Hydroids (*Hydractinia echinata*) Polychaete tubes (*Spirobranchus* sp.) Bryozoan (*Flustra foliacea*) Bryozoan (*Alcyonidium diaphanum*) Barnacles (Cirripedia) Hydroids (*Nemertesia antennina*) Faunal turf (Hydrozoa/Bryozoa) Faunal tubes Faunal holes/burrows	O F O R O F O P O P P O O P P R R P F O P P	
	EOL	457 994.8	5 917 217.9				
	SOL	457 994.8	5 917 217.9	Sand with shell fragments Occasional pebbles and cobbles	Anemones (Ceriantharia) Dragonet (*Callionymus* sp.) Bryozoan (*Alcyonidium diaphanum*) Faunal turf (Hydrozoa/Bryozoa) Faunal tubes Faunal holes/burrows Fauna associated with hard substrata: Anemones (*Metridium* sp.) Starfish (*Asterias rubens*)	P O R O P P F - C F	
	EOL	457 987.8	5 917 227.1				

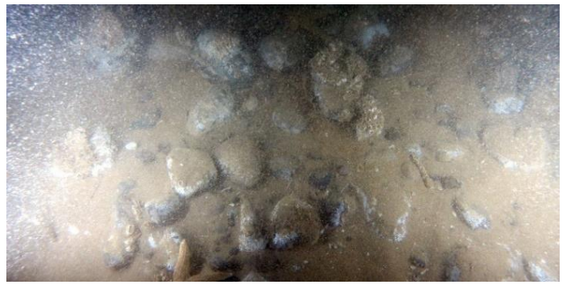
Geodetic Parameters: WGS84, UTM Zone 30N, CM 3°W							
Station/Transect		**Easting**	**Northing**	**Sediment Description**	**Fauna/Bioturbation/Debris**	**Abundance [SACFOR]**	**Representative Image**
E_ST08	SOL	457 987.8	5 917 227.1	Gravelly sand with pebbles, cobbles and small boulders	Starfish (Asteroidea) Starfish (*Asterias rubens*) Soft coral (*Alcyonium digitatum*) Sponges (Porifera) Anemones (Actiniaria) Anemones (*Metridium* sp.) Anemones (*Sagartia* sp.) Anemones (*Urticina* sp.) Anemones (Ceriantharia) Polychaete tubes (*Spirobranchus* sp.) Bryozoan (*Flustra foliacea*) Bryozoan (*Alcyonidium diaphanum*) Barnacles (Cirripedia) Hydroids (*Nemertesia antennina*) Faunal turf (Hydrozoa/Bryozoa) Faunal tubes Faunal holes/burrows	O F R R P C – A P O P p R R P F O P P	
	EOL	457 970.3	5 917 257.6				
	SOL	457 970.3	5 917 257.6	Sand	Faunal turf (Hydrozoa/Bryozoa)	R	
	EOL	457 965.5	5 917 269.9				
E_ST08_S	SOL	458 055.0	5 917 136.5	Sand with varying proportions of gravel, cobbles and small boulders	Starfish (*Asterias rubens*) Soft coral (*Alcyonium digitatum*) Sponges (Porifera) Anemones (Actiniaria) Anemones (*Metridium* sp.) Anemones (*Urticina* sp.) Crab (*Necora puber*) Bryozoan (*Alcyonidium diaphanum*) Faunal turf (Hydrozoa/Bryozoa) Faunal holes/burrows	F O R P C – A O O R O P	
	EOL	458 007.4	5 917 147.1				

Geodetic Parameters: WGS84, UTM Zone 30N, CM 3°W							
Station/Transect		Easting	Northing	Sediment Description	Fauna/Bioturbation/Debris	Abundance [SACFOR]	Representative Image
E_ST08_S	SOL	458 007.4	5 917 147.1	Gravelly sand Occasional cobbles and small boulders	Starfish (*Asterias rubens*) Anemones (Ceriantharia) Bryozoan (*Flustra foliacea*) Red gurnard (*Chelidonichthys cuculus*) Faunal turf (Hydrozoa/Bryozoa) Fauna associated with hard substrata: Soft coral (*Alcyonium digitatum*)	O P R F R R	
	EOL	457 980.8	5 917 152.7				
E_ST08_N	SOL	458 089.0	5 917 229.9	Gravelly sand with gravel, cobbles and small boulders	Starfish (Asteroidea) Starfish (*Asterias rubens*) Sponges (Porifera) Anemones (Actiniaria) Anemones (*Metridium* sp.) Anemones (Ceriantharia) Bryozoan (*Flustra foliacea*) Faunal turf (Hydrozoa/Bryozoa) Faunal tubes Faunal holes/burrows	O F R P C – A P R O P P	
	EOL	458 024.9	5 917 242.9				
	SOL	458 024.9	5 917 242.9	Gravelly sand. Patch of cobbles and small boulders	Starfish (Asteroidea) Starfish (*Asterias rubens*) Anemones (*Urticina* sp.) Anemones (Ceriantharia) Faunal turf (Hydrozoa/Bryozoa) Faunal tubes Faunal holes/burrows Fauna associated with hard substrata: Anemones (*Metridium* sp.) Bryozoan (*Flustra foliacea*) Sponges (Porifera) Barnacles (Cirripedia)	O F O P R P P C R R P	
	EOL	458 012.3	5 917 250.2				
	SOL	458 012.3	5 917 250.2	Sand with shell fragments Occasional cobbles	Faunal turf (Hydrozoa/Bryozoa) Faunal tubes Faunal holes/burrows Fauna associated with hard substrata: Barnacles (Cirripedia) Faunal turf (Hydrozoa/Bryozoa)	R P P P O	
	EOL	458 006.3	5 917 256.8				

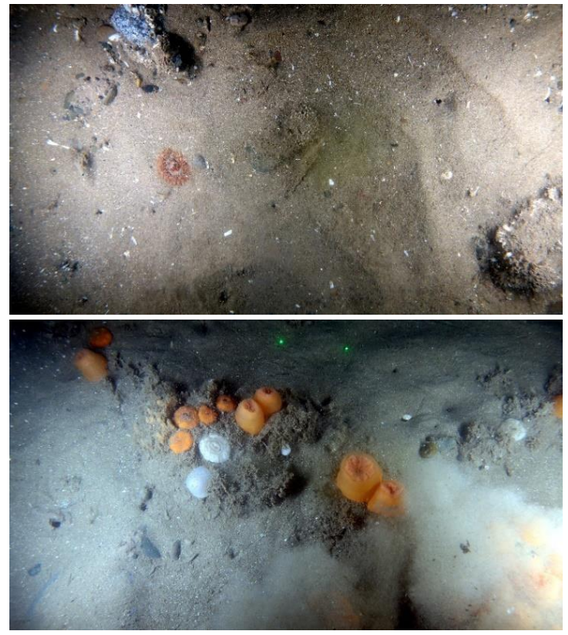
Geodetic Parameters: WGS84, UTM Zone 30N, CM 3°W							
Station/Transect		Easting	Northing	Sediment Description	Fauna/Bioturbation/Debris	Abundance [SACFOR]	Representative Image
E_ST09	SOL	459 278.2	5 917 022.8	Sand with shell fragments	Starfish (*Asterias rubens*) Sand mason (*Lanice conchilega*) Soft coral (*Alcyonium digitatum*) Bryozoan (*Alcyonidium diaphanum*)	O P R R	
	EOL	459 224.6	5 917 028.1				
E_ST10	SOL	460 219.2	5 916 473.4	Gravelly sand with occasional cobbles	Starfish (Asteroidea) Starfish (*Asterias rubens*) Soft coral (*Alcyonium digitatum*) Anemones (*Metridium* sp.) Anemones (*Sagartia* sp.) Anemones (*Urticina* sp.), Anemones (Ceriantharia) Sea urchins (*Psammechinus miliaris*) Sea snail (Gastropoda) possible horse mussel (*Modiolus modiolus*) Polychaete tubes (*Spirobranchus* sp.) Bryozoan (*Flustra foliacea*) Faunal turf (Hydrozoa/Bryozoa) Faunal tubes Faunal holes/burrows	P C R C P F P P P O-R P O C P	
	EOL	460 155.7	5 916 485.7				
E_ST11	SOL	461 621.4	5 916 070.2	Sand with pebbles, cobbles and small boulders	Starfish (Asteroidea) Starfish (*Asterias rubens*) Anemones (*Metridium* sp.) Anemones (*Urticina* sp.) Sea snail (Gastropoda) Dragonet (*Callionymus* sp.) Hermit crab (Paguridae) Hydroids (*Hydrallmania falcata*) Faunal turf (Hydrozoa Bryozoa). Faunal holes/burrows	O O O O P P O R O P	
	EOL	461 594.0	5 916 072.3				

Geodetic Parameters: WGS84, UTM Zone 30N, CM 3°W							
Station/Transect		Easting	Northing	Sediment Description	Fauna/Bioturbation/Debris	Abundance [SACFOR]	Representative Image
E_ST11	SOL	461 594.0	5 916 072.3	Sand with shell fragments and pebbles	Starfish (*Asterias rubens*) Hermit crab (Paguridae) Hermit crab (*Pagurus bernhardus*) Hydroids (*Hydractinia echinata*) Faunal turf (Hydrozoa/Bryozoa) Faunal holes/burrows	O O O P R P	
	EOL	461 563.4	5 916 084.2				
E_ST12	SOL	461 678.9	5 914 555.3	Sand	Anemone (*Metridium* sp.) Starfish (*Asterias rubens*) Faunal turf (Hydrozoa/Bryozoa) Faunal holes/burrows	F O R P	
	EOL	461 682.1	5 914 560.0				
	SOL	461 682.1	5 914 560.0	Sand with shell fragments, pebbles and cobbles	Anemone (Actiniaria) Anemone (*Metridium* sp.) Anemone (*Urticina* sp.) Starfish (*Asterias rubens*) Hermit crab (Paguridae) Hermit crab (*Pagurus bernhardus*) Barnacles (Cirripedia) Whelk (*Buccinum undatum*) Faunal turf (Hydrozoa/Bryozoa) Soft coral (*Alcyonium digitatum*) Crab (Brachyura) Gadoid fish (Gadidae) Dragonet (*Callionymus* sp.) Catshark (*Scyliorhinus* sp.) Faunal holes/burrows	O C – A O F F O P O F R P P O F P	
	EOL	461 555.9	5 914 528.4				
E_ST13	SOL	463 100.5	5 913 060.4	Sand	Brittlestars (Ophiuroidea) Brittlestars (*Ophiura ophiura*) Flatfish (Pleuronectiformes) Goby (Gobiidae)	P P P P	
	EOL	463 048.3	5 913 083.8				

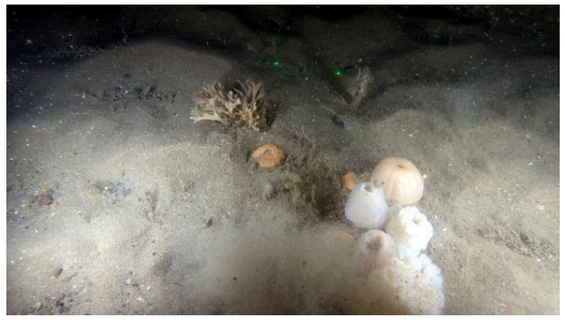
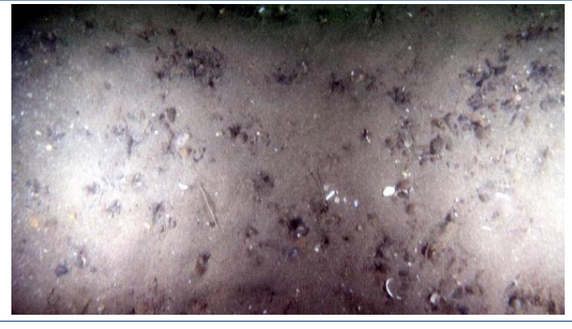
Geodetic Parameters: WGS84, UTM Zone 30N, CM 3°W							
Station/Transect		Easting	Northing	Sediment Description	Fauna/Bioturbation/Debris	Abundance [SACFOR]	Representative Image
E_ST14	SOL	465 116.5	5 911 421.6	Sand	Brittlestars (Ophiuroidea) Sandeel (Ammodytidae) Uidentified fish (Pisces)	P P P	
	EOL	465 066.6	5 911 438.4				
E_ST15	SOL	466 836.5	5 911 100.7	Sand	Brittlestars (Ophiuroidea) Brittlestars (*Ophiura ophiura*) Sand mason (*Lanice conchilega*) Starfish (*Astropecten irregularis*) Faunal holes/burrows	P P P O P	
	EOL	466 770.9	5 911 087.2				
E_ST16	SOL	468 591.8	5 910 705.4	Sand	Brittlestars (Ophiuroidea) Brittlestars (*Ophiura ophiura*) Flatfish (Pleuronectiformes) Possible sandeel (Ammodytidae) Faunal holes/burrows	P P P P P P	
	EOL	468 545.2	5 910 714.4				
E_ST17	SOL	461 131.5	5 912 363.8	Sand with cobbles	Starfish (*Asterias rubens*) Bryozoan (*Flustra foliacea*) Brittlestars (Ophiuroidea) Anemone (*Metridium* sp.) Sea urchin (*Psammechinus miliaris*)	F R P O P	
	EOL	461 144.0	5 912 374.3				

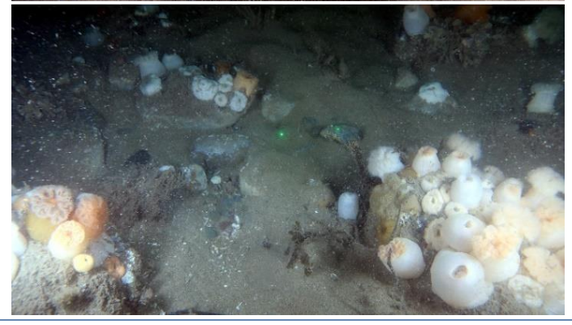
Geodetic Parameters: WGS84, UTM Zone 30N, CM 3°W							
Station/Transect		Easting	Northing	Sediment Description	Fauna/Bioturbation/Debris	Abundance [SACFOR]	Representative Image
E_ST17	SOL	461 144.0	5 912 374.3	Sand. Patch of isolated cobbles	Starfish (*Asterias rubens*) Fauna associated with hard substrata: Barnacles (Cirripedia) Anemone (*Metridium* sp.)	O P O	
	EOL	461 171.8	5 912 393.8				
E_ST18	SOL	461 306.0	5 910 359.9	Sand	Brittlestars (Ophiuroidea) Brittlestars (*Ophiura ophiura*) Starfish (*Asterias rubens*) Faunal burrows	P C O P	
	EOL	461 356.7	5 910 399.1				
E_ST19	SOL	461 581.7	5 908 687.0	Sand	Brittlestars (Ophiuroidea) Starfish (Asteroidea) Starfish (*Asterias rubens*) Crab (Brachyura) Faunal holes/burrows	P O O P P	
	EOL	461 635.6	5 908 722.9				
E_ST20	SOL	461 902.0	5 907 552.1	Sand	Brittlestars (Ophiuroidea) Faunal holes/burrows	P P	
	EOL	461 926.8	5 907 563.3				

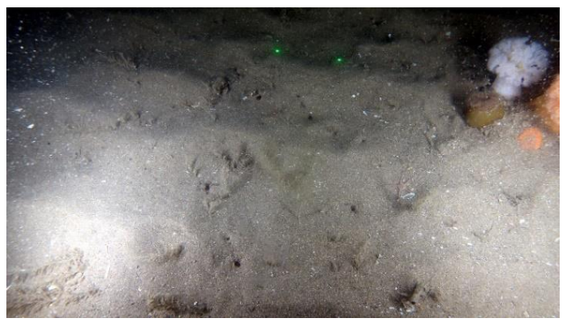
Geodetic Parameters: WGS84, UTM Zone 30N, CM 3°W							
Station/Transect		Easting	Northing	Sediment Description	Fauna/Bioturbation/Debris	Abundance [SACFOR]	Representative Image
E_TR01	SOL	455 364.1	5 919 293.0	Sand with shell fragments, cobbles and small boulders	Starfish (Asteroidea) Starfish (*Asterias rubens*) Brittlestars (Ophiuroidea) Brittlestars (*Ophiura albida*) Bryozoan (*Flustra foliacea*) Sea squirts (Ascidiacea) Barnacles (Cirripedia) Faunal turf (Hydrozoa/Bryozoa) Sponge (*Suberites* sp.) Dragonet (*Callionymus* sp.) Gadoid fish (Gadidae) Fauna associated with hard substrata: Anemones (*Metridium* sp.) Anemones (Actiniaria) Faunal turf (Hydrozoa/Bryozoa)	O F P P R P P O R P O C P O	
	EOL	455 501.3	5 919 280.8				
E_TR01_S	SOL	455 484.9	5 919 220.0	Sand with shell fragments Occasional patches of pebbles, cobbles and small boulders	Starfish (*Asterias rubens*) Starfish (*Astropecten irregularis*) Brittlestars (Ophiuroidea) Brittlestars (*Ophiura albida*) Thornback ray (*Raja clavata*) Fauna associated with hard substrata: Anemones (*Metridium* sp.) Barnacles (Cirripedia) Faunal turf (Hydrozoa/Bryozoa)	F O P P F C P R	
	EOL	455 371.8	5 919 237.4				
E_TR01_N	SOL	455 491.9	5 919 323.8	Sand with shell fragments Occasional cobbles and small boulders	Starfish (Asteroidea) Starfish (*Asterias rubens*) Brittlestars (Ophiuroidea) Anemones (Actiniaria) Bryozoan (*Flustra foliacea*) Dragonet (*Callionymus* sp.) Faunal turf (Hydrozoa/Bryozoa) Fauna associated with hard substrata: Anemones (*Metridium* sp.) Soft coral (*Alcyonium digitatum*)	O O P P R P O O R	
	EOL	455 383.5	5 919 333.9				

Geodetic Parameters: WGS84, UTM Zone 30N, CM 3°W							
Station/Transect		**Easting**	**Northing**	**Sediment Description**	**Fauna/Bioturbation/Debris**	**Abundance [SACFOR]**	**Representative Image**
E_TR02	SOL	455 325.6	5 918 043.6	Sand with shell fragments and varying proportions of pebbles, cobbles and boulders	Starfish (*Asterias rubens*) Brittlestars (Ophiuroidea) Brittlestars (*Ophiura albida*) Anemones (Actiniaria) Anemones (*Urticina* sp.) Faunal turf (Hydrozoa/Bryozoa) Dragonet (*Callionymus* sp.) Bryozoan (*Flustra foliacea*) Faunal turf (Hydrozoa Bryozoa) Faunal tubes Faunal holes/burrows Fauna associated with hard substrata: Anemones (Actiniaria) Anemones (*Metridium* sp.) Soft coral (*Alcyonium digitatum*) Barnacles (Cirripedia) Crab (Brachyura) Sponge (Porifera) Faunal turf (Hydrozoa/Bryozoa)	F P P P O O O R R P P P C – A R P P R O	
	EOL	455 538.9	5 918 134.9				
E_TR02_S	SOL	455 354.5	5 917 997.3	Sand with varying proportions of gravel. Pebbles, cobbles and small boulders	Anemones (Actiniaria) Anemones (*Metridium* sp.) Anemones (*Urticina* sp.) Soft coral (*Alcyonium digitatum*) Crab (Brachyura) Crab (*Cancer pagurus*) Starfish (*Asterias rubens*) Sponge (Porifera) Bryozoan (*Flustra foliacea*) Barnacles (Cirripedia) Anemones (Ceriantharia) Faunal turf (Hydrozoa/Bryozoa)	P C – A O R P F F R R P P O	
	EOL	455 393.5	5 918 012.4				
E_TR02_S	SOL	455 393.5	5 918 012.4	Sand with shell fragments, cobbles and small boulders	Starfish (*Asterias rubens*) Faunal turf (Hydrozoa/Bryozoa) Anemones (Ceriantharia) Sand mason (*Lanice conchilega*) Fauna associated with hard substrata: Anemones (Actiniaria) Anemones (*Metridium* sp.) Soft coral (*Alcyonium digitatum*) Sponge (*Cliona celata*) Bryozoan (*Flustra foliacea*) Sponges (*Haliclona oculata*) Faunal turf (Hydrozoa/Bryozoa)	F O P P C - A R R R R O	
	EOL	455 457.0	5 918 035.5				

Geodetic Parameters: WGS84, UTM Zone 30N, CM 3°W							
Station/Transect		Easting	Northing	Sediment Description	Fauna/Bioturbation/Debris	Abundance [SACFOR]	Representative Image
E_TR02_N	SOL	455 307.0	5 918 089.1	Sand with shell fragments and occasional pebbles, cobbles	Starfish (Asteroidea) Starfish (*Asterias rubens*) Brittlestars (Ophiuroidea) Brittlestars (*Ophiura albida*), Anemones (Actiniaria) Anemones (*Urticina* sp.) Sponge (*Ciocalypta penicillus*) Faunal turf (Hydrozoa/Bryozoa) Bryozoan (*Flustra foliacea*) Dragonet (*Callionymus* sp.) Flatfish (Pleuronectiformes) Gadoid fish (Gadidae) Faunal holes/burrows Fauna associated with hard substrata: Anemones (Actiniaria) Anemones (*Metridium* sp.) Soft coral (*Alcyonium digitatum*) Barnacles (Cirripedia) Faunal turf (Hydrozoa/Bryozoa)	O O P P O O R O R O O P P P F R P O	
	EOL	455 420.5	5 918 134.9				
E_TR02 (2)	SOL	455 328.9	5 918 036.5	Sand with shell fragments and a varying proportion of cobbles and boulders	Anemones (Actiniaria) Anemones (*Metridium* sp.) Anemones (Ceriantharia) Anemones (*Urticina* sp.) Starfish (*Asterias rubens*) Bryozoan (*Flustra foliacea*) Britttlestars (Opiuroidea) Brittlestars (*Ophiura albida*) Faunal turf (Hydrozoa/Bryozoa) Dragonet (*Callionymus* sp.) Sponge (Porifera) Hydroid (*Nemertesia antennina*) Goby (Gobiidae) Unidentified fish (Pisces) Faunal tubes (Sabellidae) Faunal holes/burrows	P C P O F R P P F – C P R R P P P P	e 
	EOL	455 443.1	5 918 084.1				

Geodetic Parameters: WGS84, UTM Zone 30N, CM 3°W							
Station/Transect		Easting	Northing	Sediment Description	Fauna/Bioturbation/Debris	Abundance [SACFOR]	Representative Image
E_TR03	SOL	455 608.9	5 919 042.2	Sand with shell fragments, cobbles and small boulders	Starfish (Asteroidea) Starfish (*Asterias rubens*) Brittlestars (Ophiuroidea) Brittlestars (*Ophiura albida*) Anemones (*Urticina* sp.) Anemones (Ceriantharia) Faunal turf (Hydrozoa/Bryozoa) Goby (Gobiidae) Crab (Brachyura) Faunal holes/burrows Fauna associated with hard substrata: Anemones (Actiniaria) Anemones (*Metridium* sp.) Bryozoan (*Flustra foliacea*) Sponge (Porifera) Sponge (*Ciocalypta penicillus*) Sponge (*Haliclona oculata*) Barnacles (Cirripedia) Faunal turf (Hydrozoa/Bryozoa)	O F P P O P O P P P P F – C R R R R P O	
	EOL	455 737.5	5 919 058.3				
E_TR03 (2)	SOL	455 611.0	5 919 045.3	Sand with shell fragments, cobbles and boulders	Anemones (*Metridium* sp.) Starfish (*Asterias rubens*) Faunal turf (Hydrozoa/Bryozoa) Bryozoan (*Flustra foliacea*) Faunal tubes	C – A F F R P	
	EOL	455 623.2	5 919 045.7				
	SOL	455 623.2	5 919 045.7	Sand with shell fragments and occasional cobbles	Faunal turf (Hydrozoa/Bryozoa) Anemones (*Metridium* sp.) Bryozoan (*Alcyonidium diaphanum*) Starfish (*Asterias rubens*) Faunal burrows	F R R F P	
	EOL	455 650.8	5 919 049.9				

Geodetic Parameters: WGS84, UTM Zone 30N, CM 3°W							
Station/Transect		**Easting**	**Northing**	**Sediment Description**	**Fauna/Bioturbation/Debris**	**Abundance [SACFOR]**	**Representative Image**
E_TR03 (2)	SOL	455 650.8	5 919 049.9	Sand with shell fragments, cobbles and boulders	Anemones (*Metridium* sp.) Anemone (*Urticina* sp.) Starfish (Asterias rubens) Faunal turf (Hydrozoa/Bryozoa) Bryozoan (Flustra foliacea) Brittlestar (Ophiuroidea) Faunal burrows	C – A O F F – C R P P	
E_TR03 (2)	SOL	455 714.1	5 919 059.6	Rippled sand with shell fragments and occasional cobbles	Anemones (*Metridium* sp.) Starfish (*Asterias rubens*) Faunal turf (Hydrozoa/Bryozoa)	R F R	
	EOL	455 727.6	5 919 071.3				
E_TR03_S	SOL	455 745.4	5 919 003.9	Sand with shell fragments, cobbles and boulders	Starfish (*Asterias rubens*) Brittlestars (Ophiuroidea) Hydroids (*Nemertesia antennina*) Goby (Gobiidae) Dragonet (*Callionymus* sp.) Faunal tubes Faunal holes/burrows	F P O P O P P	
	EOL	455 621.7	5 918 991.8		Fauna associated with hard substrata: Anemones (*Urticina* sp.) Anemones (*Metridium* sp.) Soft coral (*Alcyonium digitatum*) Bryozoan (*Flustra foliacea*) Topshell (*Calliostoma zizyphinum*) Barnacles (Cirripedia) Faunal turf (Hydrozoa/Bryozoa)	 O C – A R R P P R	

Geodetic Parameters: WGS84, UTM Zone 30N, CM 3°W							
Station/Transect		Easting	Northing	Sediment Description	Fauna/Bioturbation/Debris	Abundance [SACFOR]	Representative Image
E_TR03_N	SOL	455 732.5	5 919 112.0	Sand with shell fragments Occasional cobbles and small boulders	Starfish (Asteroidea) Starfish (*Asterias rubens*) Brittlestars (Ophiuroidea) Brittlestars (*Ophiura albida*) Anemones (*Urticina* sp.) Anemones (*Sargartia* sp.) Anemones (Ceriantharia) Hydroids (*Nemertesia antennina*) Faunal turf (Hydrozoa/Bryozoa) Goby (Gobiidae) Dragonet (*Callionymus* sp.) Catshark (*Scyliorhinus canicula*) Faunal holes/burrows Fauna associated with hard substrata: Anemones (*Metridium* sp.) Soft coral (*Alcyonium digitatum*) Bryozoan (*Flustra foliacea*) Faunal turf (Hydrozoa/Bryozoa)	O F P P O P P F O P O F P C – A R R O	
	EOL	455 613.9	5 919 092.2				

Notes
SACFOR = Semi-quantitative abundance scale from Superabundant, Abundant, Common, Frequent, Occasional to Rare
P = Present
SOL = Start of line
EOL = End of line
Laser distance (green) = 10 cm

C.4 Stony Reef Assessment

Geodetic Parameters: WGS84 UTM Zone 30N, CM 3°W [m]									
Date	Station/ Transect	Time [UTC]	Video Coordinates		Length [m]	Sediment Description	Stony Reef Characteristic			Overall Assessment
			Easting [m]	Northing [m]			Composition [% Cover Cobbles and Boulders]	Elevation	Biota [Epibiota % Cover]	
27/08/2020	E_ST05	10:50:03	454 592.3	5 918 518.7	251	Sand with shell fragments, cobbles and small boulders	< 10	< 64 mm	< 80	Not a reef
		11:01:48	454 842.8	5 918 510.4						
27/08/2020	E_ST05 N	12:47:27	454 743.8	5 918 547.6	144	Sand with shell fragments and varying proportions of pebbles, cobbles and boulders	< 10	< 64 mm	< 80	Not a reef
		12:54:12	454 601	5 918 564.8						
27/08/2020	E_ST05 S	12:33:40	454 729.0	5 918 454.7	132	Sand with shell fragments and occasional pebbles, cobbles	< 10	< 64 mm	< 80	Not a reef
		12:39:18	454 597.0	5 918 460.3						
27/08/2020	E_ST06	10:30:35	456 040.5	5 918 840.8	14	Gravelly sand with pebbles, cobbles and small boulders	< 10	Flat seabed	< 80	Not a reef
		10:31:38	456 052.7	5 918 833.3						
		10:31:38	456 052.7	5 918 833.3	160	Gravelly sand with pebbles, cobbles and small boulders	10 – 40	64 mm – 5 m	< 80	Low
		10:39:46	456 212.9	5 918 835.8						
27/08/2020	E_ST06 N	14:15:41	456 122.4	5 918 881.2	95	Gravelly sand with varying proportions of pebbles, cobbles and small boulders	< 10	< 64 mm	< 80	Not a reef
		14:19:59	456 027.9	5 918 886.1						
27/08/2020	E_ST06 S	14:03:46	456 130.6	5 918 773.1	107	Sand with shell fragments, cobbles and small boulders	< 10	< 64 mm	< 80	Not a reef
		14:08:24	456 023.4	5 918 769.3						
27/08/2020	E_ST08	14:31:13	458 082.1	5 917 188.6	142	Gravelly sand with pebbles, cobbles and small boulders	10 – 40	64 mm – 5 m	< 80	Low
		14:38:52	457 965.5	5 917 269.9						
27/08/2020	E_ST08 N	14:58:20	458 089.0	5 917 229.9	65	Gravelly sand with gravel, cobbles and small boulders	10 – 40	64 mm – 5 m	< 80	Low
		15:01:17	458 024.9	5 917 242.9						
		15:01:17	458 024.9	5 917 242.9	15	Gravelly sand. Patch of cobbles and small boulders	< 10	< 64 mm	< 80	Not a reef
		15:02:05	458 012.3	5 917 250.2						
27/08/2020	E_ST08 S	14:46:38	458 055.0	5 917 136.5	49	Sand with varying proportions of gravel, cobbles and small boulders	10 – 40	64 mm – 5 m	< 80	Low
		14:49:15	458 007.2	5917147.8						
		14:49:16	458 007.2	5917147.8	27	Gravelly sand. Occasional cobbles and small boulders	< 10	Flat seabed	< 80	Not a reef
		14:50:47	457 980.8	5 917 152.7						
27/08/2020	E_ST010	15:22:08	460 219.2	5 916 473.4	65	Gravelly sand with occasional cobbles	< 10	Flat seabed	< 80	Not a reef
		15:25:05	460 155.7	5 916 485.7						
27/08/2020	E_ST012	15:44:46	461 678.9	5 914 555.3		Sand with shell fragments, pebbles and cobbles	< 10	Flat seabed	< 80	Not a reef
		15:49:46	461 555.9	5 914 528.4						
27/08/2020	E_TR01	09:59:23	455 364.1	5 919 293.0	138	Sand with shell fragments, cobbles and small boulders	< 10	Flat seabed	< 80	Not a reef
		10:05:24	455 501.3	5 919 280.8						
27/08/2020	E_TR01 N	13:20:06	455 491.9	5 919 323.8	109	Sand with shell fragments. Occasional cobbles and small boulders	< 10	Flat seabed	< 80	Not a reef
		13:24:48	455 383.5	5 919 333.9						

Geodetic Parameters: WGS84 UTM Zone 30N, CM 3°W [m]									
Date	Station/ Transect	Time [UTC]	Video Coordinates		Length [m]	Sediment Description	Stony Reef Characteristic			Overall Assessment
			Easting [m]	Northing [m]			Composition [% Cover Cobbles and Boulders]	Elevation	Biota [Epibiota % Cover]	
27/08/2020	E_TR01 S	13:07:04	455 484.9	5 919 220.0	114	Sand with shell fragments. Occasional patches of pebbles, cobbles and small boulders	< 10	Flat seabed	< 80	Not a reef
		13:12:40	455 371.8	5 919 237.4						
30/08/2020	E_TR02(2)	14:28:05	455 328.9	5 918 036.5	124	Sand with shell fragments and a varying proportion of cobbles and boulders	< 10	Flat seabed	< 80	Not a reef
		14:35:21	455 443.1	5 918 084.1						
27/08/2020	E_TR02	11:12:20	455 325.6	5 918 043.6	232	Sand with shell fragments and varying proportions of pebbles, cobbles and boulders	< 10	Flat seabed	< 80	Not a reef
		11:21:51	455 538.9	5 918 134.9						
27/08/2020	E_TR02 N	12:20:34	455 307.0	5 918 089.1	122	Sand with shell fragments and varying proportions of pebbles, cobbles and boulders	< 10	Flat seabed	< 80	Not a reef
		12:25:22	455 420.5	5 918 134.9						
27/08/2020	E_TR02 S	12:03:49	455 354.5	5 917 997.3	109	Sand with varying proportions of cobbles and small boulders	10 – 40	< 64 mm	< 80	Low
		12:08:16	455 457.0	5 918 035.5						
27/08/2020	E_TR03	10:13:52	455 608.9	5 919 042.2	130	Sand with shell fragments, cobbles and small boulders	< 10	Flat seabed	< 80	Not a reef
		10:20:13	455 737.5	5 919 058.3						
30/08/2020	E_TR03(2)	14:44:13	455 611.0	5 919 045.3	119	Sand with shell fragments and a varying proportion of cobbles and boulders	< 10	Flat seabed	< 80	Not a reef
		14:52:04	455 727.6	5 919 071.3						
27/08/2020	E_TR03 N	13:48:58	455 732.5	5 919 112.0	120	Sand with shell fragments. Occasional cobbles and small boulders	< 10	Flat seabed	< 80	Not a reef
		16:55:09	455 613.9	5 919 092.2						
27/08/2020	E_TR03 S	13:32:52	455 745.4	5 919 003.9	124	Sand with shell fragments, cobbles and boulders	< 10	Flat seabed	< 80	Not a reef
		13:39:28	455 621.7	5 918 991.8						
Key:	Low reef				Medium reef		Not a Reef			

Appendix D

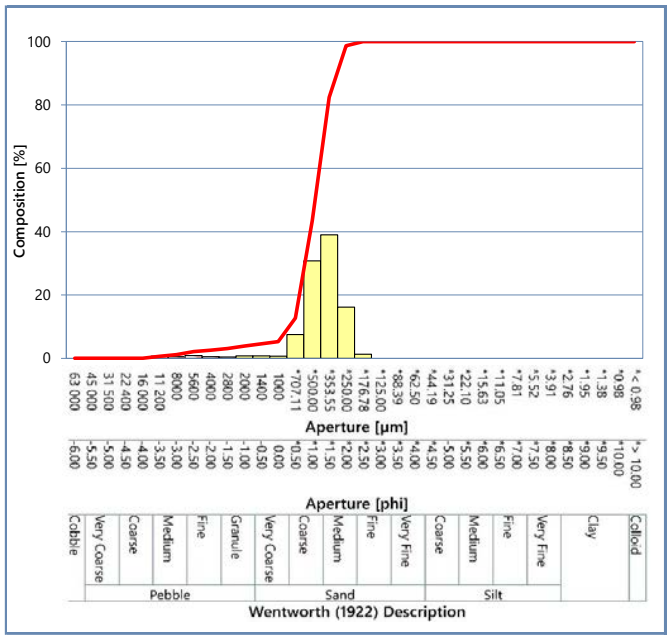
Sediment Particle Size and Grab Sample Photographs

STATION: E_ST01

FRACTIONAL DATA

Aperture [µm]	Aperture [phi]	Fractional [%]	Cumulative [%]
63 000	-6.00	0.00	0.00
45 000	-5.50	0.00	0.00
31 500	-5.00	0.00	0.00
22 400	-4.50	0.00	0.00
16 000	-4.00	0.00	0.00
11 200	-3.50	0.68	0.68
8000	-3.00	0.53	1.21
5600	-2.50	0.90	2.10
4000	-2.00	0.51	2.61
2800	-1.50	0.48	3.08
2000	-1.00	0.76	3.85
1400	-0.50	0.75	4.60
1000	0.00	0.67	5.27
*707.11	*0.50	7.48	12.74
*500.00	*1.00	30.74	43.48
*353.55	*1.50	38.97	82.45
*250.00	*2.00	16.20	98.65
*176.78	*2.50	1.35	100.00
*125.00	*3.00	0.00	100.00
*88.39	*3.50	0.00	100.00
*62.50	*4.00	0.00	100.00
*44.19	*4.50	0.00	100.00
*31.25	*5.00	0.00	100.00
*22.10	*5.50	0.00	100.00
*15.63	*6.00	0.00	100.00
*11.05	*6.50	0.00	100.00
*7.81	*7.00	0.00	100.00
*5.52	*7.50	0.00	100.00
*3.91	*8.00	0.00	100.00
*2.76	*8.50	0.00	100.00
*1.95	*9.00	0.00	100.00
*1.38	*9.50	0.00	100.00
*0.98	*10.00	0.00	100.00
*< 0.98	*> 10.00	0.00	100.00
Total		**100.00**	-

PARTICLE SIZE DISTRIBUTION



SUMMARY STATISTICS

Mode 1 [µm]†	427	Medium sand
Mode 2 [µm]†	-	-
Mode 3 [µm]†	-	-
Median [µm]†	472	Medium sand
Median [phi]†	1.08	
Mean [µm]†‡	479	Medium sand
Mean [phi]†‡	1.06	
Sorting [µm]‡	1.48	Moderately well sorted
Sorting [phi]‡	0.56	
Skewness [µm]‡	0.15	Coarse skewed
Skewness [phi]‡	-0.15	
Gravel [%]#	3.85	Sand
Sand [%]#	96.15	
Fines [%]#	0.00	

Notes

Particle Size Distribution by Dry Sieving (63 000 µm - 1000 µm) and Laser Diffraction* (< 1000 µm - < 0.98 µm) at 0.5 phi Intervals

* = Determinand not included in UKAS Accreditation

† = Particle size expressed in accordance with Wentworth (1922) scale

‡ = Statistics calculated using Folk and Ward (1957) method

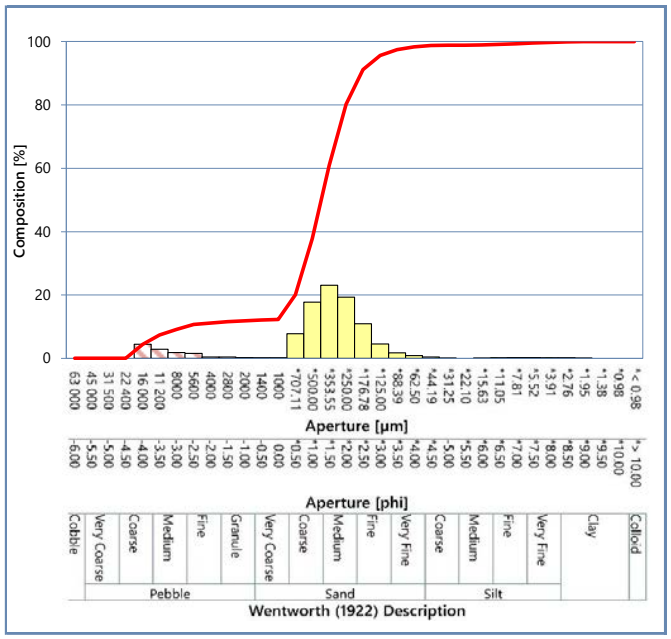
= Description based on BGS modified Folk classification (Long, 2006)

STATION: E_ST02

FRACTIONAL DATA

Aperture [µm]	Aperture [phi]	Fractional [%]	Cumulative [%]
63 000	-6.00	0.00	0.00
45 000	-5.50	0.00	0.00
31 500	-5.00	0.00	0.00
22 400	-4.50	0.00	0.00
16 000	-4.00	4.45	4.45
11 200	-3.50	2.90	7.36
8000	-3.00	1.79	9.14
5600	-2.50	1.57	10.71
4000	-2.00	0.45	11.16
2800	-1.50	0.45	11.61
2000	-1.00	0.26	11.87
1400	-0.50	0.19	12.07
1000	0.00	0.21	12.27
*707.11	*0.50	7.80	20.07
*500.00	*1.00	17.76	37.83
*353.55	*1.50	23.11	60.94
*250.00	*2.00	19.30	80.24
*176.78	*2.50	10.89	91.13
*125.00	*3.00	4.52	95.66
*88.39	*3.50	1.77	97.43
*62.50	*4.00	0.87	98.30
*44.19	*4.50	0.43	98.73
*31.25	*5.00	0.12	98.84
*22.10	*5.50	0.00	98.84
*15.63	*6.00	0.06	98.90
*11.05	*6.50	0.19	99.09
*7.81	*7.00	0.23	99.32
*5.52	*7.50	0.23	99.55
*3.91	*8.00	0.21	99.77
*2.76	*8.50	0.17	99.94
*1.95	*9.00	0.06	100.00
*1.38	*9.50	0.00	100.00
*0.98	*10.00	0.00	100.00
*< 0.98	*> 10.00	0.00	100.00
Total		**100.00**	-

PARTICLE SIZE DISTRIBUTION



SUMMARY STATISTICS

Mode 1 [µm]†	427	Medium sand
Mode 2 [µm]†	19200	Coarse pebble
Mode 3 [µm]†	-	-
Median [µm]†	417	Medium sand
Median [phi]†	1.26	
Mean [µm]†‡	428	Medium sand
Mean [phi]†‡	1.22	
Sorting [µm]‡	2.86	Poorly sorted
Sorting [phi]‡	1.52	
Skewness [µm]‡	0.29	Coarse skewed
Skewness [phi]‡	-0.29	
Gravel [%]#	11.87	Gravelly sand
Sand [%]#	86.42	
Fines [%]#	1.70	

Notes

Particle Size Distribution by Dry Sieving (63 000 µm - 1000 µm) and Laser Diffraction* (< 1000 µm - < 0.98 µm) at 0.5 phi Intervals

* = Determinand not included in UKAS Accreditation

† = Particle size expressed in accordance with Wentworth (1922) scale

‡ = Statistics calculated using Folk and Ward (1957) method

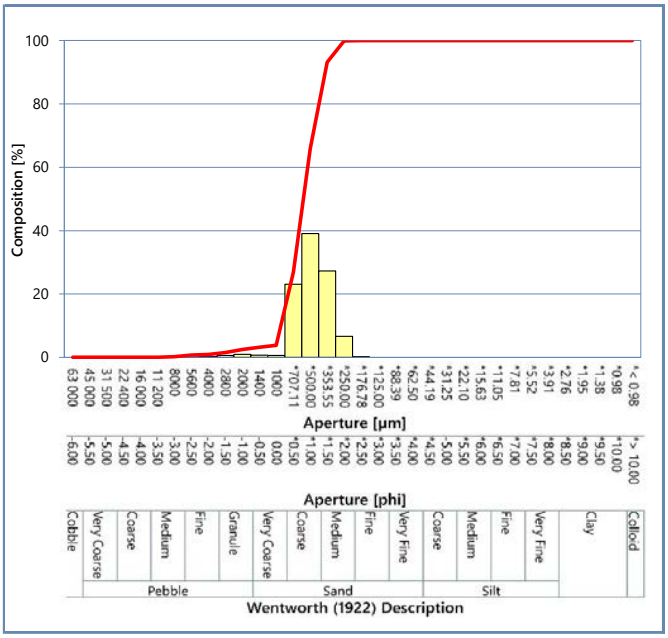
= Description based on BGS modified Folk classification (Long, 2006)

STATION: E_ST03

FRACTIONAL DATA

Aperture [µm]	Aperture [phi]	Fractional [%]	Cumulative [%]
63 000	-6.00	0.00	0.00
45 000	-5.50	0.00	0.00
31 500	-5.00	0.00	0.00
22 400	-4.50	0.00	0.00
16 000	-4.00	0.00	0.00
11 200	-3.50	0.00	0.00
8000	-3.00	0.19	0.19
5600	-2.50	0.53	0.72
4000	-2.00	0.19	0.91
2800	-1.50	0.62	1.53
2000	-1.00	0.98	2.50
1400	-0.50	0.68	3.18
1000	0.00	0.58	3.76
*707.11	*0.50	23.10	26.86
*500.00	*1.00	39.11	65.96
*353.55	*1.50	27.24	93.20
*250.00	*2.00	6.66	99.86
*176.78	*2.50	0.14	100.00
*125.00	*3.00	0.00	100.00
*88.39	*3.50	0.00	100.00
*62.50	*4.00	0.00	100.00
*44.19	*4.50	0.00	100.00
*31.25	*5.00	0.00	100.00
*22.10	*5.50	0.00	100.00
*15.63	*6.00	0.00	100.00
*11.05	*6.50	0.00	100.00
*7.81	*7.00	0.00	100.00
*5.52	*7.50	0.00	100.00
*3.91	*8.00	0.00	100.00
*2.76	*8.50	0.00	100.00
*1.95	*9.00	0.00	100.00
*1.38	*9.50	0.00	100.00
*0.98	*10.00	0.00	100.00
*< 0.98	*> 10.00	0.00	100.00
Total		**100.00**	-

PARTICLE SIZE DISTRIBUTION



SUMMARY STATISTICS

Mode 1 [µm]†	604	Coarse sand
Mode 2 [µm]†	-	-
Mode 3 [µm]†	-	-
Median [µm]†	576	Coarse sand
Median [phi]†	0.80	
Mean [µm]†‡	575	Coarse sand
Mean [phi]†‡	0.80	
Sorting [µm]‡	1.42	Moderately well sorted
Sorting [phi]‡	0.51	
Skewness [µm]‡	-0.02	Symmetrical
Skewness [phi]‡	0.02	
Gravel [%]#	2.50	Sand
Sand [%]#	97.50	
Fines [%]#	0.00	

Notes

Particle Size Distribution by Dry Sieving (63 000 µm - 1000 µm) and Laser Diffraction* (< 1000 µm - < 0.98 µm) at 0.5 phi Intervals

* = Determinand not included in UKAS Accreditation

† = Particle size expressed in accordance with Wentworth (1922) scale

‡ = Statistics calculated using Folk and Ward (1957) method

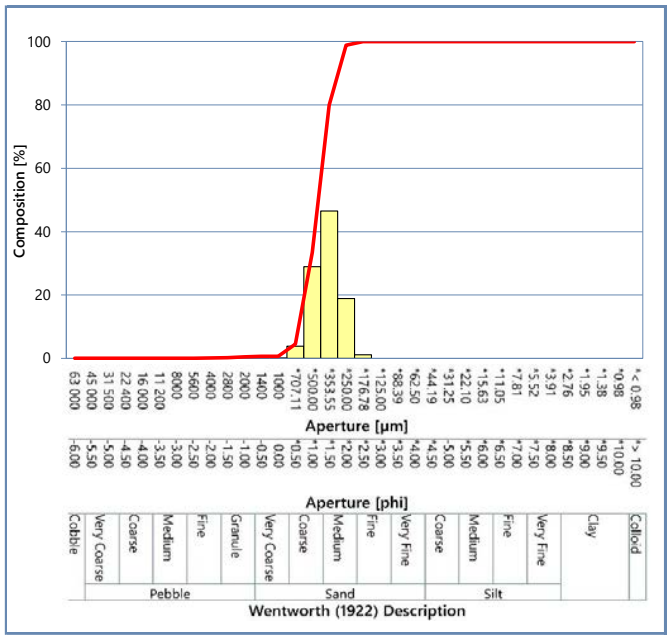
= Description based on BGS modified Folk classification (Long, 2006)

STATION: E_ST04

FRACTIONAL DATA

Aperture [µm]	Aperture [phi]	Fractional [%]	Cumulative [%]
63 000	-6.00	0.00	0.00
45 000	-5.50	0.00	0.00
31 500	-5.00	0.00	0.00
22 400	-4.50	0.00	0.00
16 000	-4.00	0.00	0.00
11 200	-3.50	0.00	0.00
8000	-3.00	0.00	0.00
5600	-2.50	0.00	0.00
4000	-2.00	0.16	0.16
2800	-1.50	0.10	0.26
2000	-1.00	0.19	0.44
1400	-0.50	0.17	0.62
1000	0.00	0.06	0.68
*707.11	*0.50	3.82	4.51
*500.00	*1.00	28.97	33.47
*353.55	*1.50	46.49	79.96
*250.00	*2.00	18.88	98.84
*176.78	*2.50	1.16	100.00
*125.00	*3.00	0.00	100.00
*88.39	*3.50	0.00	100.00
*62.50	*4.00	0.00	100.00
*44.19	*4.50	0.00	100.00
*31.25	*5.00	0.00	100.00
*22.10	*5.50	0.00	100.00
*15.63	*6.00	0.00	100.00
*11.05	*6.50	0.00	100.00
*7.81	*7.00	0.00	100.00
*5.52	*7.50	0.00	100.00
*3.91	*8.00	0.00	100.00
*2.76	*8.50	0.00	100.00
*1.95	*9.00	0.00	100.00
*1.38	*9.50	0.00	100.00
*0.98	*10.00	0.00	100.00
*< 0.98	*> 10.00	0.00	100.00
Total		**100.00**	-

PARTICLE SIZE DISTRIBUTION



SUMMARY STATISTICS

Mode 1 [µm]†	427	Medium sand
Mode 2 [µm]†	-	-
Mode 3 [µm]†	-	-
Median [µm]†	442	Medium sand
Median [phi]†	1.18	
Mean [µm]†‡	447	Medium sand
Mean [phi]†‡	1.16	
Sorting [µm]‡	1.35	Well sorted
Sorting [phi]‡	0.44	
Skewness [µm]‡	0.01	Symmetrical
Skewness [phi]‡	-0.01	
Gravel [%]#	0.44	Sand
Sand [%]#	99.56	
Fines [%]#	0.00	

Notes

Particle Size Distribution by Dry Sieving (63 000 µm - 1000 µm) and Laser Diffraction* (< 1000 µm - < 0.98 µm) at 0.5 phi Intervals

* = Determinand not included in UKAS Accreditation

† = Particle size expressed in accordance with Wentworth (1922) scale

‡ = Statistics calculated using Folk and Ward (1957) method

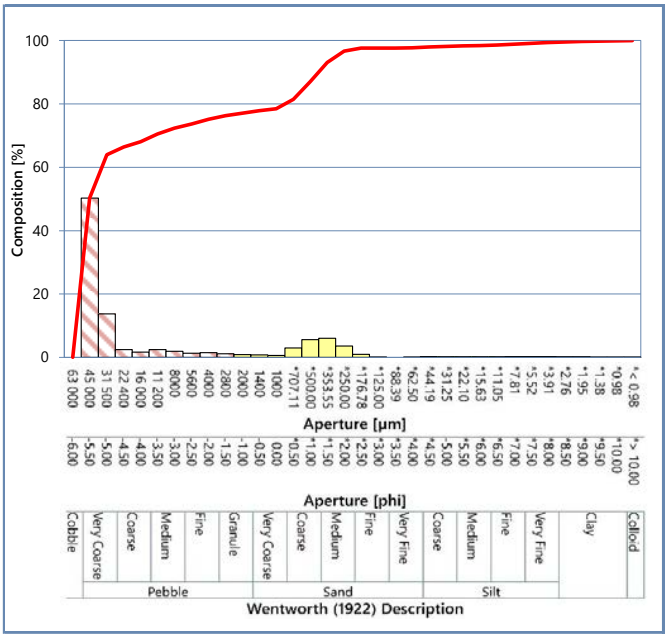
= Description based on BGS modified Folk classification (Long, 2006)

STATION: E_ST07

FRACTIONAL DATA

Aperture [µm]	Aperture [phi]	Fractional [%]	Cumulative [%]
63 000	-6.00	0.00	0.00
45 000	-5.50	50.29	50.29
31 500	-5.00	13.69	63.98
22 400	-4.50	2.44	66.43
16 000	-4.00	1.62	68.04
11 200	-3.50	2.44	70.48
8000	-3.00	1.90	72.38
5600	-2.50	1.33	73.71
4000	-2.00	1.44	75.15
2800	-1.50	1.11	76.26
2000	-1.00	0.84	77.11
1400	-0.50	0.74	77.85
1000	0.00	0.63	78.48
*707.11	*0.50	2.99	81.47
*500.00	*1.00	5.60	87.07
*353.55	*1.50	6.02	93.09
*250.00	*2.00	3.57	96.65
*176.78	*2.50	0.93	97.58
*125.00	*3.00	0.02	97.61
*88.39	*3.50	0.00	97.61
*62.50	*4.00	0.11	97.72
*44.19	*4.50	0.25	97.97
*31.25	*5.00	0.20	98.17
*22.10	*5.50	0.13	98.30
*15.63	*6.00	0.14	98.44
*11.05	*6.50	0.19	98.63
*7.81	*7.00	0.24	98.87
*5.52	*7.50	0.26	99.12
*3.91	*8.00	0.24	99.37
*2.76	*8.50	0.21	99.57
*1.95	*9.00	0.15	99.73
*1.38	*9.50	0.11	99.83
*0.98	*10.00	0.07	99.91
*< 0.98	*> 10.00	0.09	100.00
Total		**100.00**	-

PARTICLE SIZE DISTRIBUTION



SUMMARY STATISTICS

Mode 1 [µm]†	54000	Very coarse pebble
Mode 2 [µm]†	-	-
Mode 3 [µm]†	-	-
Median [µm]†	45088	Very coarse pebble
Median [phi]†	-5.49	
Mean [µm]†‡	11555	Medium pebble
Mean [phi]†‡	-3.53	
Sorting [µm]‡	6.98	Very poorly sorted
Sorting [phi]‡	2.80	
Skewness [µm]‡	-0.89	Very fine skewed
Skewness [phi]‡	0.89	
Gravel [%]#	77.11	Sandy gravel
Sand [%]#	20.61	
Fines [%]#	2.28	

Notes

Particle Size Distribution by Dry Sieving (63 000 µm - 1000 µm) and Laser Diffraction* (< 1000 µm - < 0.98 µm) at 0.5 phi Intervals

* = Determinand not included in UKAS Accreditation

† = Particle size expressed in accordance with Wentworth (1922) scale

‡ = Statistics calculated using Folk and Ward (1957) method

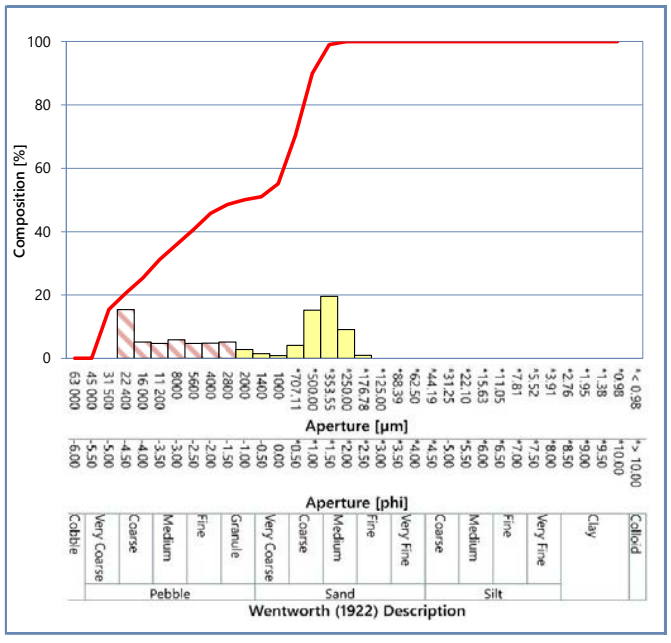
= Description based on BGS modified Folk classification (Long, 2006)

STATION: E_ST09

FRACTIONAL DATA

Aperture [µm]	Aperture [phi]	Fractional [%]	Cumulative [%]
63 000	-6.00	0.00	0.00
45 000	-5.50	0.00	0.00
31 500	-5.00	0.00	0.00
22 400	-4.50	15.40	15.40
16 000	-4.00	5.18	20.59
11 200	-3.50	4.72	25.31
8000	-3.00	5.82	31.13
5600	-2.50	4.74	35.87
4000	-2.00	4.79	40.66
2800	-1.50	5.13	45.79
2000	-1.00	2.79	48.58
1400	-0.50	1.50	50.08
1000	0.00	0.91	50.99
*707.11	*0.50	4.10	55.09
*500.00	*1.00	15.25	70.34
*353.55	*1.50	19.62	89.97
*250.00	*2.00	9.07	99.04
*176.78	*2.50	0.96	100.00
*125.00	*3.00	0.00	100.00
*88.39	*3.50	0.00	100.00
*62.50	*4.00	0.00	100.00
*44.19	*4.50	0.00	100.00
*31.25	*5.00	0.00	100.00
*22.10	*5.50	0.00	100.00
*15.63	*6.00	0.00	100.00
*11.05	*6.50	0.00	100.00
*7.81	*7.00	0.00	100.00
*5.52	*7.50	0.00	100.00
*3.91	*8.00	0.00	100.00
*2.76	*8.50	0.00	100.00
*1.95	*9.00	0.00	100.00
*1.38	*9.50	0.00	100.00
*0.98	*10.00	0.00	100.00
*< 0.98	*> 10.00	0.00	100.00
Total		**100.00**	-

PARTICLE SIZE DISTRIBUTION



SUMMARY STATISTICS

Mode 1 [µm]†	427	Medium sand
Mode 2 [µm]†	26950	Coarse pebble
Mode 3 [µm]†	9600	Medium pebble
Median [µm]†	1426	Very coarse sand
Median [phi]†	-0.51	
Mean [µm]†‡	2294	Granule
Mean [phi]†‡	-1.20	
Sorting [µm]‡	5.44	Very poorly sorted
Sorting [phi]‡	2.44	
Skewness [µm]‡	0.33	Very coarse skewed
Skewness [phi]‡	-0.33	
Gravel [%]#	48.58	Sandy gravel
Sand [%]#	51.42	
Fines [%]#	0.00	

Notes

Particle Size Distribution by Dry Sieving (63 000 µm - 1000 µm) and Laser Diffraction* (< 1000 µm - < 0.98 µm) at 0.5 phi Intervals

* = Determinand not included in UKAS Accreditation

† = Particle size expressed in accordance with Wentworth (1922) scale

‡ = Statistics calculated using Folk and Ward (1957) method

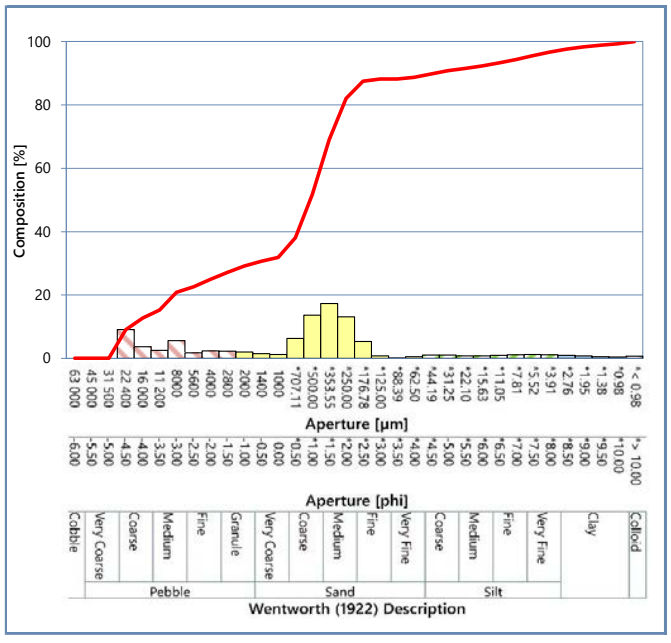
= Description based on BGS modified Folk classification (Long, 2006)

STATION: E_ST11

FRACTIONAL DATA

Aperture [µm]	Aperture [phi]	Fractional [%]	Cumulative [%]
63 000	-6.00	0.00	0.00
45 000	-5.50	0.00	0.00
31 500	-5.00	0.00	0.00
22 400	-4.50	9.09	9.09
16 000	-4.00	3.64	12.73
11 200	-3.50	2.50	15.23
8000	-3.00	5.62	20.85
5600	-2.50	1.73	22.58
4000	-2.00	2.37	24.95
2800	-1.50	2.24	27.19
2000	-1.00	1.98	29.17
1400	-0.50	1.46	30.63
1000	0.00	1.20	31.83
*707.11	*0.50	6.27	38.10
*500.00	*1.00	13.63	51.73
*353.55	*1.50	17.29	69.01
*250.00	*2.00	13.07	82.09
*176.78	*2.50	5.36	87.44
*125.00	*3.00	0.74	88.19
*88.39	*3.50	0.00	88.19
*62.50	*4.00	0.49	88.68
*44.19	*4.50	1.08	89.75
*31.25	*5.00	1.02	90.77
*22.10	*5.50	0.78	91.55
*15.63	*6.00	0.75	92.30
*11.05	*6.50	0.92	93.22
*7.81	*7.00	1.10	94.32
*5.52	*7.50	1.18	95.50
*3.91	*8.00	1.13	96.63
*2.76	*8.50	0.97	97.60
*1.95	*9.00	0.75	98.35
*1.38	*9.50	0.54	98.89
*0.98	*10.00	0.41	99.30
*< 0.98	*> 10.00	0.70	100.00
Total		**100.00**	-

PARTICLE SIZE DISTRIBUTION



SUMMARY STATISTICS

Mode 1 [µm]†	427	Medium sand
Mode 2 [µm]†	26950	Coarse pebble
Mode 3 [µm]†	9600	Medium pebble
Median [µm]†	522	Coarse sand
Median [phi]†	0.94	
Mean [µm]†‡	1073	Very coarse sand
Mean [phi]†‡	-0.10	
Sorting [µm]‡	9.30	Very poorly sorted
Sorting [phi]‡	3.22	
Skewness [µm]‡	0.25	Coarse skewed
Skewness [phi]‡	-0.25	
Gravel [%]#	29.17	Gravelly muddy sand
Sand [%]#	59.51	
Fines [%]#	11.32	

Notes

Particle Size Distribution by Dry Sieving (63 000 µm - 1000 µm) and Laser Diffraction* (< 1000 µm - < 0.98 µm) at 0.5 phi Intervals

* = Determinand not included in UKAS Accreditation

† = Particle size expressed in accordance with Wentworth (1922) scale

‡ = Statistics calculated using Folk and Ward (1957) method

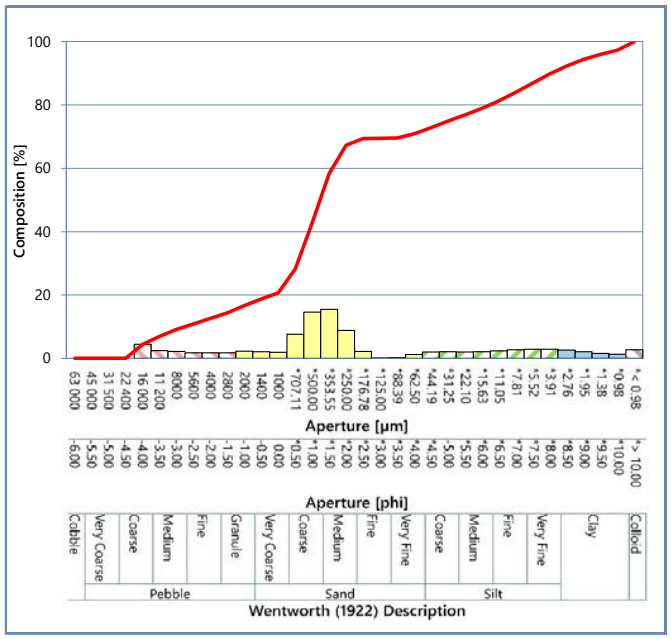
= Description based on BGS modified Folk classification (Long, 2006)

STATION: E_ST12

FRACTIONAL DATA

Aperture [µm]	Aperture [phi]	Fractional [%]	Cumulative [%]
63 000	-6.00	0.00	0.00
45 000	-5.50	0.00	0.00
31 500	-5.00	0.00	0.00
22 400	-4.50	0.00	0.00
16 000	-4.00	4.45	4.45
11 200	-3.50	2.47	6.92
8000	-3.00	2.21	9.14
5600	-2.50	1.73	10.87
4000	-2.00	1.74	12.61
2800	-1.50	1.74	14.35
2000	-1.00	2.30	16.65
1400	-0.50	2.09	18.74
1000	0.00	1.93	20.67
*707.11	*0.50	7.64	28.32
*500.00	*1.00	14.60	42.91
*353.55	*1.50	15.49	58.40
*250.00	*2.00	8.84	67.24
*176.78	*2.50	2.15	69.39
*125.00	*3.00	0.05	69.44
*88.39	*3.50	0.15	69.60
*62.50	*4.00	1.23	70.83
*44.19	*4.50	1.99	72.82
*31.25	*5.00	2.06	74.87
*22.10	*5.50	1.97	76.85
*15.63	*6.00	2.08	78.93
*11.05	*6.50	2.36	81.28
*7.81	*7.00	2.67	83.95
*5.52	*7.50	2.89	86.84
*3.91	*8.00	2.88	89.72
*2.76	*8.50	2.58	92.30
*1.95	*9.00	2.08	94.38
*1.38	*9.50	1.60	95.97
*0.98	*10.00	1.32	97.30
*< 0.98	*> 10.00	2.70	100.00
Total		**100.00**	-

PARTICLE SIZE DISTRIBUTION



SUMMARY STATISTICS

Mode 1 [µm]†	427	Medium sand
Mode 2 [µm]†	19200	Coarse pebble
Mode 3 [µm]†	5	Very fine silt
Median [µm]†	427	Medium sand
Median [phi]†	1.23	
Mean [µm]†‡	194	Fine sand
Mean [phi]†‡	2.37	
Sorting [µm]‡	16.21	Extremely poorly sorted
Sorting [phi]‡	4.02	
Skewness [µm]‡	-0.32	Very fine skewed
Skewness [phi]‡	0.32	
Gravel [%]#	16.65	Gravelly muddy sand
Sand [%]#	54.18	
Fines [%]#	29.17	

Notes

Particle Size Distribution by Dry Sieving (63 000 µm - 1000 µm) and Laser Diffraction* (< 1000 µm - < 0.98 µm) at 0.5 phi Intervals

* = Determinand not included in UKAS Accreditation

† = Particle size expressed in accordance with Wentworth (1922) scale

‡ = Statistics calculated using Folk and Ward (1957) method

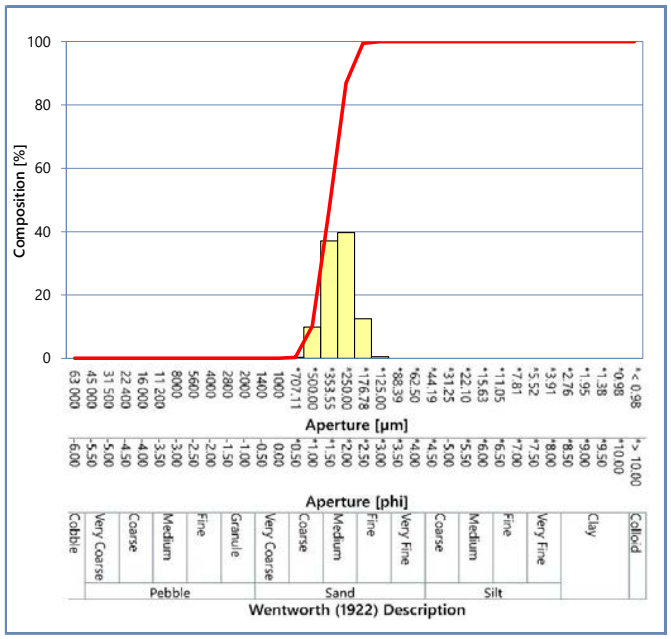
= Description based on BGS modified Folk classification (Long, 2006)

STATION: E_ST13

FRACTIONAL DATA

Aperture [µm]	Aperture [phi]	Fractional [%]	Cumulative [%]
63 000	-6.00	0.00	0.00
45 000	-5.50	0.00	0.00
31 500	-5.00	0.00	0.00
22 400	-4.50	0.00	0.00
16 000	-4.00	0.00	0.00
11 200	-3.50	0.00	0.00
8000	-3.00	0.00	0.00
5600	-2.50	0.00	0.00
4000	-2.00	0.00	0.00
2800	-1.50	0.00	0.00
2000	-1.00	0.00	0.00
1400	-0.50	0.00	0.01
1000	0.00	0.01	0.02
*707.11	*0.50	0.31	0.33
*500.00	*1.00	9.84	10.17
*353.55	*1.50	37.04	47.21
*250.00	*2.00	39.73	86.94
*176.78	*2.50	12.49	99.44
*125.00	*3.00	0.56	100.00
*88.39	*3.50	0.00	100.00
*62.50	*4.00	0.00	100.00
*44.19	*4.50	0.00	100.00
*31.25	*5.00	0.00	100.00
*22.10	*5.50	0.00	100.00
*15.63	*6.00	0.00	100.00
*11.05	*6.50	0.00	100.00
*7.81	*7.00	0.00	100.00
*5.52	*7.50	0.00	100.00
*3.91	*8.00	0.00	100.00
*2.76	*8.50	0.00	100.00
*1.95	*9.00	0.00	100.00
*1.38	*9.50	0.00	100.00
*0.98	*10.00	0.00	100.00
*< 0.98	*> 10.00	0.00	100.00
Total		**100.00**	-

PARTICLE SIZE DISTRIBUTION



SUMMARY STATISTICS

Mode 1 [µm]†	302	Medium sand
Mode 2 [µm]†	-	-
Mode 3 [µm]†	-	-
Median [µm]†	345	Medium sand
Median [phi]†	1.54	
Mean [µm]†‡	347	Medium sand
Mean [phi]†‡	1.53	
Sorting [µm]‡	1.38	Well sorted
Sorting [phi]‡	0.46	
Skewness [µm]‡	0.02	Symmetrical
Skewness [phi]‡	-0.02	
Gravel [%]#	0.00	Sand
Sand [%]#	100.00	
Fines [%]#	0.00	

Notes

Particle Size Distribution by Dry Sieving (63 000 µm - 1000 µm) and Laser Diffraction* (< 1000 µm - < 0.98 µm) at 0.5 phi Intervals

* = Determinand not included in UKAS Accreditation

† = Particle size expressed in accordance with Wentworth (1922) scale

‡ = Statistics calculated using Folk and Ward (1957) method

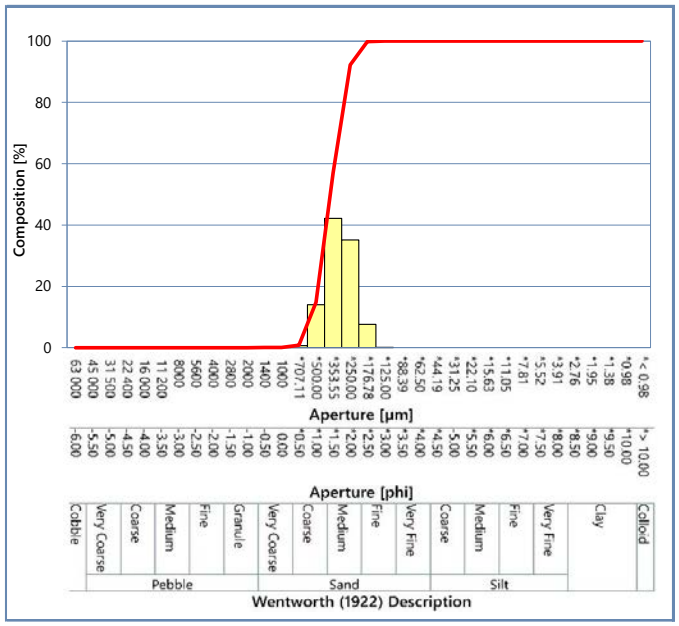
= Description based on BGS modified Folk classification (Long, 2006)

STATION: E_ST14

FRACTIONAL DATA

Aperture [µm]	Aperture [phi]	Fractional [%]	Cumulative [%]
63 000	-6.00	0.00	0.00
45 000	-5.50	0.00	0.00
31 500	-5.00	0.00	0.00
22 400	-4.50	0.00	0.00
16 000	-4.00	0.00	0.00
11 200	-3.50	0.00	0.00
8000	-3.00	0.00	0.00
5600	-2.50	0.00	0.00
4000	-2.00	0.00	0.00
2800	-1.50	0.01	0.01
2000	-1.00	0.01	0.03
1400	-0.50	0.03	0.06
1000	0.00	0.03	0.09
*707.11	*0.50	0.71	0.79
*500.00	*1.00	14.04	14.83
*353.55	*1.50	42.23	57.06
*250.00	*2.00	35.18	92.23
*176.78	*2.50	7.63	99.87
*125.00	*3.00	0.13	100.00
*88.39	*3.50	0.00	100.00
*62.50	*4.00	0.00	100.00
*44.19	*4.50	0.00	100.00
*31.25	*5.00	0.00	100.00
*22.10	*5.50	0.00	100.00
*15.63	*6.00	0.00	100.00
*11.05	*6.50	0.00	100.00
*7.81	*7.00	0.00	100.00
*5.52	*7.50	0.00	100.00
*3.91	*8.00	0.00	100.00
*2.76	*8.50	0.00	100.00
*1.95	*9.00	0.00	100.00
*1.38	*9.50	0.00	100.00
*0.98	*10.00	0.00	100.00
*< 0.98	*> 10.00	0.00	100.00
Total		**100.00**	-

PARTICLE SIZE DISTRIBUTION



SUMMARY STATISTICS

Mode 1 [µm]†	427	Medium sand
Mode 2 [µm]†	-	-
Mode 3 [µm]†	-	-
Median [µm]†	375	Medium sand
Median [phi]†	1.42	
Mean [µm]†‡	369	Medium sand
Mean [phi]†‡	1.44	
Sorting [µm]‡	1.37	Well sorted
Sorting [phi]‡	0.45	
Skewness [µm]‡	-0.04	Symmetrical
Skewness [phi]‡	0.04	
Gravel [%]#	0.03	Sand
Sand [%]#	99.97	
Fines [%]#	0.00	

Notes

Particle Size Distribution by Dry Sieving (63 000 µm - 1000 µm) and Laser Diffraction* (< 1000 µm - < 0.98 µm) at 0.5 phi Intervals

* = Determinand not included in UKAS Accreditation

† = Particle size expressed in accordance with Wentworth (1922) scale

‡ = Statistics calculated using Folk and Ward (1957) method

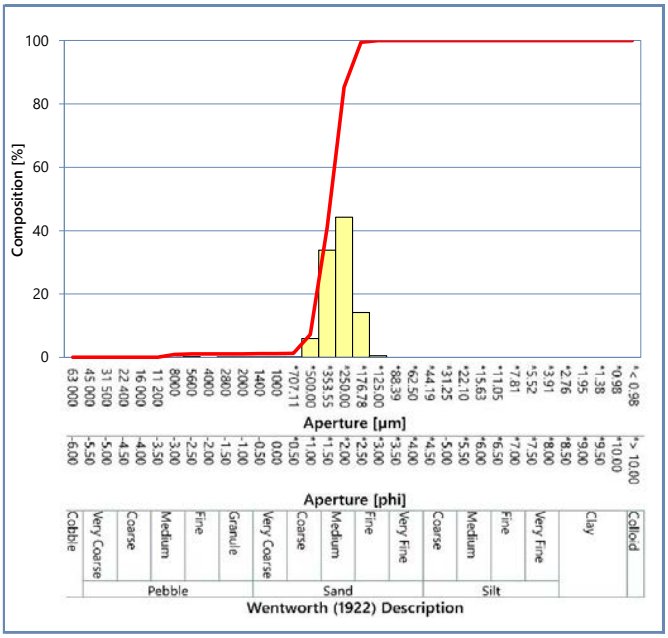
= Description based on BGS modified Folk classification (Long, 2006)

STATION: E_ST15

FRACTIONAL DATA

Aperture [µm]	Aperture [phi]	Fractional [%]	Cumulative [%]
63 000	-6.00	0.00	0.00
45 000	-5.50	0.00	0.00
31 500	-5.00	0.00	0.00
22 400	-4.50	0.00	0.00
16 000	-4.00	0.00	0.00
11 200	-3.50	0.00	0.00
8000	-3.00	0.88	0.88
5600	-2.50	0.16	1.05
4000	-2.00	0.00	1.05
2800	-1.50	0.05	1.09
2000	-1.00	0.02	1.12
1400	-0.50	0.03	1.15
1000	0.00	0.06	1.20
*707.11	*0.50	0.04	1.25
*500.00	*1.00	5.93	7.17
*353.55	*1.50	33.85	41.03
*250.00	*2.00	44.29	85.31
*176.78	*2.50	14.13	99.44
*125.00	*3.00	0.56	100.00
*88.39	*3.50	0.00	100.00
*62.50	*4.00	0.00	100.00
*44.19	*4.50	0.00	100.00
*31.25	*5.00	0.00	100.00
*22.10	*5.50	0.00	100.00
*15.63	*6.00	0.00	100.00
*11.05	*6.50	0.00	100.00
*7.81	*7.00	0.00	100.00
*5.52	*7.50	0.00	100.00
*3.91	*8.00	0.00	100.00
*2.76	*8.50	0.00	100.00
*1.95	*9.00	0.00	100.00
*1.38	*9.50	0.00	100.00
*0.98	*10.00	0.00	100.00
*< 0.98	*> 10.00	0.00	100.00
Total		**100.00**	-

PARTICLE SIZE DISTRIBUTION



SUMMARY STATISTICS

Mode 1 [µm]†	302	Medium sand
Mode 2 [µm]†	-	-
Mode 3 [µm]†	-	-
Median [µm]†	330	Medium sand
Median [phi]†	1.60	
Mean [µm]†‡	336	Medium sand
Mean [phi]†‡	1.57	
Sorting [µm]‡	1.36	Well sorted
Sorting [phi]‡	0.44	
Skewness [µm]‡	0.07	Symmetrical
Skewness [phi]‡	-0.07	
Gravel [%]#	1.12	Sand
Sand [%]#	98.88	
Fines [%]#	0.00	

Notes

Particle Size Distribution by Dry Sieving (63 000 µm - 1000 µm) and Laser Diffraction* (< 1000 µm - < 0.98 µm) at 0.5 phi Intervals

* = Determinand not included in UKAS Accreditation

† = Particle size expressed in accordance with Wentworth (1922) scale

‡ = Statistics calculated using Folk and Ward (1957) method

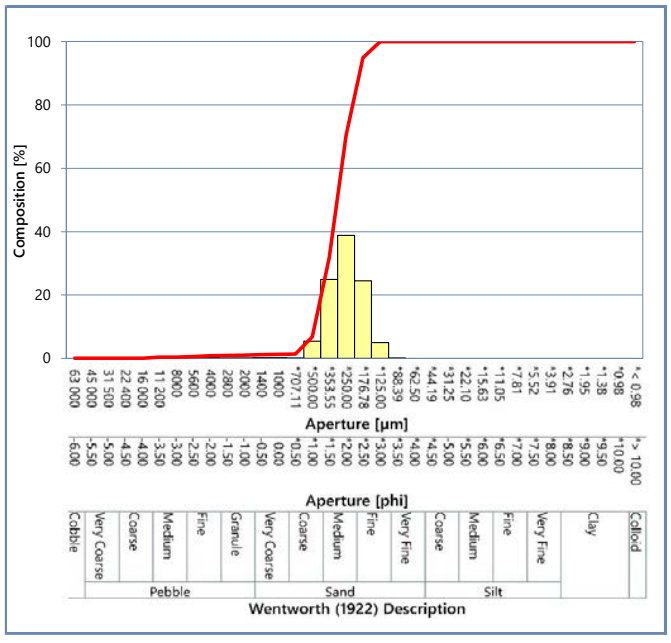
= Description based on BGS modified Folk classification (Long, 2006)

STATION: E_ST16

FRACTIONAL DATA

Aperture [µm]	Aperture [phi]	Fractional [%]	Cumulative [%]
63 000	-6.00	0.00	0.00
45 000	-5.50	0.00	0.00
31 500	-5.00	0.00	0.00
22 400	-4.50	0.00	0.00
16 000	-4.00	0.00	0.00
11 200	-3.50	0.35	0.35
8000	-3.00	0.08	0.43
5600	-2.50	0.12	0.55
4000	-2.00	0.25	0.80
2800	-1.50	0.11	0.90
2000	-1.00	0.10	1.00
1400	-0.50	0.16	1.16
1000	0.00	0.14	1.30
*707.11	*0.50	0.08	1.38
*500.00	*1.00	5.40	6.78
*353.55	*1.50	24.88	31.67
*250.00	*2.00	38.78	70.45
*176.78	*2.50	24.51	94.96
*125.00	*3.00	5.02	99.97
*88.39	*3.50	0.03	100.00
*62.50	*4.00	0.00	100.00
*44.19	*4.50	0.00	100.00
*31.25	*5.00	0.00	100.00
*22.10	*5.50	0.00	100.00
*15.63	*6.00	0.00	100.00
*11.05	*6.50	0.00	100.00
*7.81	*7.00	0.00	100.00
*5.52	*7.50	0.00	100.00
*3.91	*8.00	0.00	100.00
*2.76	*8.50	0.00	100.00
*1.95	*9.00	0.00	100.00
*1.38	*9.50	0.00	100.00
*0.98	*10.00	0.00	100.00
*< 0.98	*> 10.00	0.00	100.00
Total		**100.00**	-

PARTICLE SIZE DISTRIBUTION



SUMMARY STATISTICS

Mode 1 [µm]†	302	Medium sand
Mode 2 [µm]†	-	-
Mode 3 [µm]†	-	-
Median [µm]†	300	Medium sand
Median [phi]†	1.74	
Mean [µm]†‡	301	Medium sand
Mean [phi]†‡	1.73	
Sorting [µm]‡	1.44	Moderately well sorted
Sorting [phi]‡	0.53	
Skewness [µm]‡	0.04	Symmetrical
Skewness [phi]‡	-0.04	
Gravel [%]#	1.00	Sand
Sand [%]#	99.00	
Fines [%]#	0.00	

Notes

Particle Size Distribution by Dry Sieving (63 000 µm - 1000 µm) and Laser Diffraction* (< 1000 µm - < 0.98 µm) at 0.5 phi Intervals

* = Determinand not included in UKAS Accreditation

† = Particle size expressed in accordance with Wentworth (1922) scale

‡ = Statistics calculated using Folk and Ward (1957) method

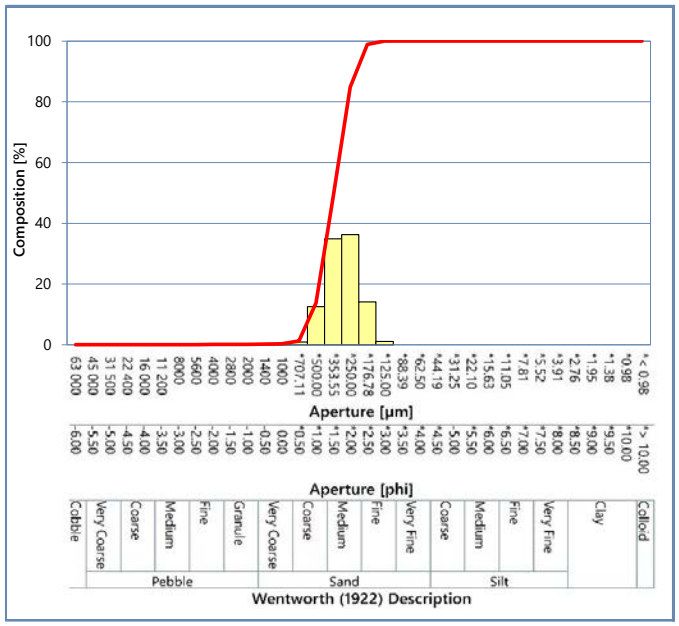
= Description based on BGS modified Folk classification (Long, 2006)

STATION: E_ST18

FRACTIONAL DATA

Aperture [µm]	Aperture [phi]	Fractional [%]	Cumulative [%]
> 63 000	-6.00	0.00	0.00
45 000	-5.50	0.00	0.00
31 500	-5.00	0.00	0.00
22 400	-4.50	0.00	0.00
16 000	-4.00	0.00	0.00
11 200	-3.50	0.00	0.00
8000	-3.00	0.00	0.00
5600	-2.50	0.00	0.00
4000	-2.00	0.08	0.08
2800	-1.50	0.03	0.11
2000	-1.00	0.06	0.16
1400	-0.50	0.07	0.23
1000	0.00	0.07	0.30
*707.11	*0.50	0.90	1.20
*500.00	*1.00	12.55	13.74
*353.55	*1.50	34.86	48.61
*250.00	*2.00	36.22	84.83
*176.78	*2.50	14.08	98.90
*125.00	*3.00	1.10	100.00
*88.39	*3.50	0.00	100.00
*62.50	*4.00	0.00	100.00
*44.19	*4.50	0.00	100.00
*31.25	*5.00	0.00	100.00
*22.10	*5.50	0.00	100.00
*15.63	*6.00	0.00	100.00
*11.05	*6.50	0.00	100.00
*7.81	*7.00	0.00	100.00
*5.52	*7.50	0.00	100.00
*3.91	*8.00	0.00	100.00
*2.76	*8.50	0.00	100.00
*1.95	*9.00	0.00	100.00
*1.38	*9.50	0.00	100.00
*0.98	*10.00	0.00	100.00
*< 0.98	*> 10.00	0.00	100.00
Total		**100.00**	-

PARTICLE SIZE DISTRIBUTION



SUMMARY STATISTICS

Mode 1 [µm]†	302	Medium sand
Mode 2 [µm]†	-	-
Mode 3 [µm]†	-	-
Median [µm]†	349	Medium sand
Median [phi]†	1.52	
Mean [µm]†‡	350	Medium sand
Mean [phi]†‡	1.51	
Sorting [µm]‡	1.41	Moderately well sorted
Sorting [phi]‡	0.50	
Skewness [µm]‡	0.02	Symmetrical
Skewness [phi]‡	-0.02	
Gravel [%]#	0.16	Sand
Sand [%]#	99.84	
Fines [%]#	0.00	

Notes

Particle Size Distribution by Dry Sieving (63 000 µm - 1000 µm) and Laser Diffraction* (< 1000 µm - < 0.98 µm) at 0.5 phi Intervals

* = Determinand not included in UKAS Accreditation

† = Particle size expressed in accordance with Wentworth (1922) scale

‡ = Statistics calculated using Folk and Ward (1957) method

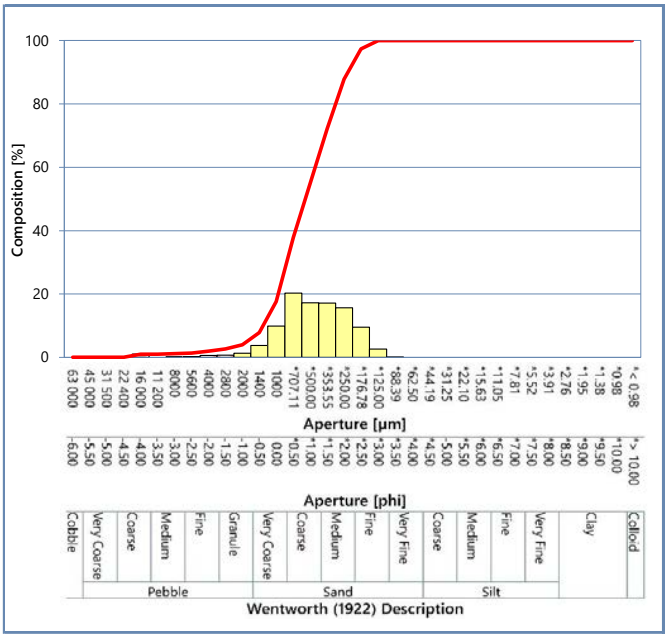
= Description based on BGS modified Folk classification (Long, 2006)

STATION: E_ST19

FRACTIONAL DATA

Aperture [µm]	Aperture [phi]	Fractional [%]	Cumulative [%]
63 000	-6.00	0.00	0.00
45 000	-5.50	0.00	0.00
31 500	-5.00	0.00	0.00
22 400	-4.50	0.00	0.00
16 000	-4.00	1.00	1.00
11 200	-3.50	0.00	1.00
8000	-3.00	0.13	1.13
5600	-2.50	0.25	1.38
4000	-2.00	0.57	1.95
2800	-1.50	0.70	2.65
2000	-1.00	1.34	4.00
1400	-0.50	3.79	7.78
1000	0.00	9.84	17.62
*707.11	*0.50	20.27	37.89
*500.00	*1.00	17.19	55.08
*353.55	*1.50	17.12	72.20
*250.00	*2.00	15.62	87.83
*176.78	*2.50	9.55	97.38
*125.00	*3.00	2.61	99.99
*88.39	*3.50	0.01	100.00
*62.50	*4.00	0.00	100.00
*44.19	*4.50	0.00	100.00
*31.25	*5.00	0.00	100.00
*22.10	*5.50	0.00	100.00
*15.63	*6.00	0.00	100.00
*11.05	*6.50	0.00	100.00
*7.81	*7.00	0.00	100.00
*5.52	*7.50	0.00	100.00
*3.91	*8.00	0.00	100.00
*2.76	*8.50	0.00	100.00
*1.95	*9.00	0.00	100.00
*1.38	*9.50	0.00	100.00
*0.98	*10.00	0.00	100.00
*< 0.98	*> 10.00	0.00	100.00
Total		**100.00**	-

PARTICLE SIZE DISTRIBUTION



SUMMARY STATISTICS

Mode 1 [µm]†	854	Coarse sand
Mode 2 [µm]†	-	-
Mode 3 [µm]†	-	-
Median [µm]†	554	Coarse sand
Median [phi]†	0.85	
Mean [µm]†‡	542	Coarse sand
Mean [phi]†‡	0.88	
Sorting [µm]‡	1.97	Moderately sorted
Sorting [phi]‡	0.98	
Skewness [µm]‡	0.01	Symmetrical
Skewness [phi]‡	-0.01	
Gravel [%]#	4.00	Sand
Sand [%]#	96.00	
Fines [%]#	0.00	

Notes

Particle Size Distribution by Dry Sieving (63 000 µm - 1000 µm) and Laser Diffraction* (< 1000 µm - < 0.98 µm) at 0.5 phi Intervals

* = Determinand not included in UKAS Accreditation

† = Particle size expressed in accordance with Wentworth (1922) scale

‡ = Statistics calculated using Folk and Ward (1957) method

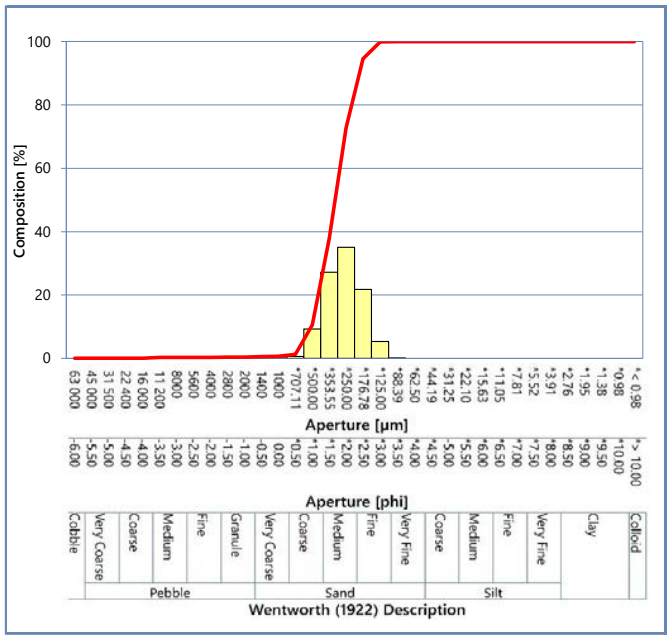
= Description based on BGS modified Folk classification (Long, 2006)

STATION: E_ST20

FRACTIONAL DATA

Aperture [µm]	Aperture [phi]	Fractional [%]	Cumulative [%]
63 000	-6.00	0.00	0.00
45 000	-5.50	0.00	0.00
31 500	-5.00	0.00	0.00
22 400	-4.50	0.00	0.00
16 000	-4.00	0.00	0.00
11 200	-3.50	0.32	0.32
8000	-3.00	0.00	0.32
5600	-2.50	0.00	0.32
4000	-2.00	0.00	0.32
2800	-1.50	0.03	0.35
2000	-1.00	0.08	0.43
1400	-0.50	0.11	0.53
1000	0.00	0.11	0.64
*707.11	*0.50	0.60	1.24
*500.00	*1.00	9.26	10.50
*353.55	*1.50	27.22	37.72
*250.00	*2.00	35.03	72.75
*176.78	*2.50	21.81	94.56
*125.00	*3.00	5.37	99.93
*88.39	*3.50	0.07	100.00
*62.50	*4.00	0.00	100.00
*44.19	*4.50	0.00	100.00
*31.25	*5.00	0.00	100.00
*22.10	*5.50	0.00	100.00
*15.63	*6.00	0.00	100.00
*11.05	*6.50	0.00	100.00
*7.81	*7.00	0.00	100.00
*5.52	*7.50	0.00	100.00
*3.91	*8.00	0.00	100.00
*2.76	*8.50	0.00	100.00
*1.95	*9.00	0.00	100.00
*1.38	*9.50	0.00	100.00
*0.98	*10.00	0.00	100.00
*< 0.98	*> 10.00	0.00	100.00
Total		**100.00**	-

PARTICLE SIZE DISTRIBUTION



SUMMARY STATISTICS

Mode 1 [µm]†	302	Medium sand
Mode 2 [µm]†	-	-
Mode 3 [µm]†	-	-
Median [µm]†	313	Medium sand
Median [phi]†	1.68	
Mean [µm]†‡	312	Medium sand
Mean [phi]†‡	1.68	
Sorting [µm]‡	1.48	Moderately well sorted
Sorting [phi]‡	0.57	
Skewness [µm]‡	0.03	Symmetrical
Skewness [phi]‡	-0.03	
Gravel [%]#	0.43	Sand
Sand [%]#	99.57	
Fines [%]#	0.00	

Notes

Particle Size Distribution by Dry Sieving (63 000 µm - 1000 µm) and Laser Diffraction* (< 1000 µm - < 0.98 µm) at 0.5 phi Intervals

* = Determinand not included in UKAS Accreditation

† = Particle size expressed in accordance with Wentworth (1922) scale

‡ = Statistics calculated using Folk and Ward (1957) method

= Description based on BGS modified Folk classification (Long, 2006)

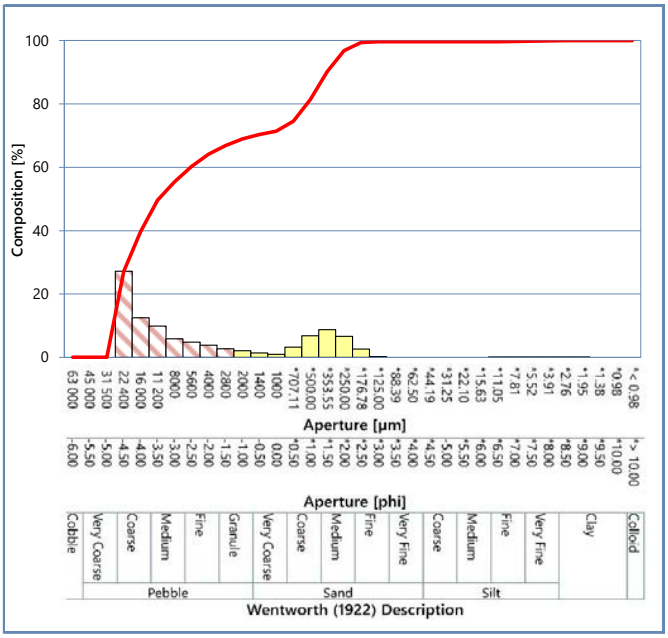
STATION: E_ST21

No image available

FRACTIONAL DATA

Aperture [µm]	Aperture [phi]	Fractional [%]	Cumulative [%]
63 000	-6.00	0.00	0.00
45 000	-5.50	0.00	0.00
31 500	-5.00	0.00	0.00
22 400	-4.50	27.19	27.19
16 000	-4.00	12.51	39.70
11 200	-3.50	9.89	49.59
8000	-3.00	5.82	55.41
5600	-2.50	4.85	60.26
4000	-2.00	3.85	64.10
2800	-1.50	2.73	66.83
2000	-1.00	2.12	68.95
1400	-0.50	1.42	70.37
1000	0.00	0.98	71.35
*707.11	*0.50	3.22	74.57
*500.00	*1.00	6.81	81.38
*353.55	*1.50	8.77	90.15
*250.00	*2.00	6.66	96.82
*176.78	*2.50	2.58	99.40
*125.00	*3.00	0.22	99.62
*88.39	*3.50	0.00	99.62
*62.50	*4.00	0.00	99.62
*44.19	*4.50	0.00	99.62
*31.25	*5.00	0.00	99.62
*22.10	*5.50	0.00	99.62
*15.63	*6.00	0.00	99.62
*11.05	*6.50	0.03	99.65
*7.81	*7.00	0.09	99.74
*5.52	*7.50	0.10	99.84
*3.91	*8.00	0.08	99.92
*2.76	*8.50	0.06	99.98
*1.95	*9.00	0.02	100.00
*1.38	*9.50	0.00	100.00
*0.98	*10.00	0.00	100.00
*< 0.98	*> 10.00	0.00	100.00
Total		**100.00**	-

PARTICLE SIZE DISTRIBUTION



SUMMARY STATISTICS

Mode 1 [µm]†	26950	Coarse pebble
Mode 2 [µm]†	427	Medium sand
Mode 3 [µm]†	-	-
Median [µm]†	10937	Medium pebble
Median [phi]†	-3.45	
Mean [µm]†‡	5028	Fine pebble
Mean [phi]†‡	-2.33	
Sorting [µm]‡	5.59	Very poorly sorted
Sorting [phi]‡	2.48	
Skewness [µm]‡	-0.58	Very fine skewed
Skewness [phi]‡	0.58	
Gravel [%]#	68.95	Sandy gravel
Sand [%]#	30.67	
Fines [%]#	0.38	

Notes

Particle Size Distribution by Dry Sieving (63 000 µm - 1000 µm) and Laser Diffraction* (< 1000 µm - < 0.98 µm) at 0.5 phi Intervals

* = Determinand not included in UKAS Accreditation

† = Particle size expressed in accordance with Wentworth (1922) scale

‡ = Statistics calculated using Folk and Ward (1957) method

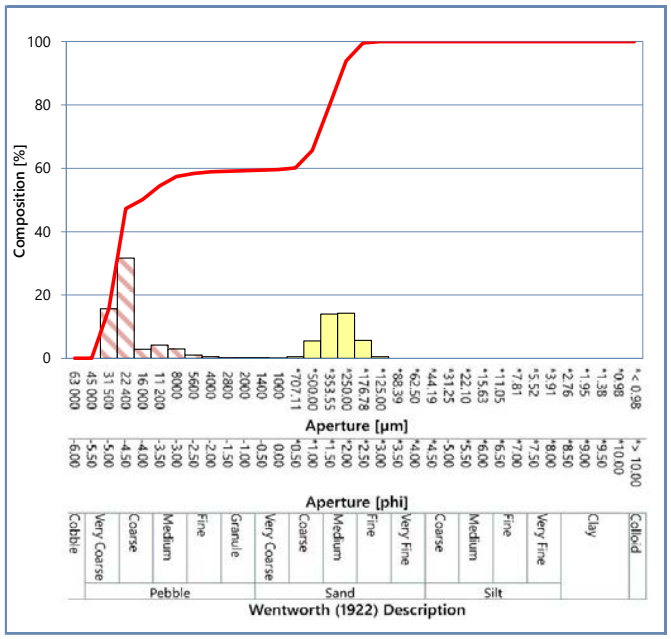
= Description based on BGS modified Folk classification (Long, 2006)

STATION: E_ST22

FRACTIONAL DATA

Aperture [µm]	Aperture [phi]	Fractional [%]	Cumulative [%]
63 000	-6.00	0.00	0.00
45 000	-5.50	0.00	0.00
31 500	-5.00	15.62	15.62
22 400	-4.50	31.67	47.29
16 000	-4.00	2.89	50.18
11 200	-3.50	4.21	54.39
8000	-3.00	3.01	57.40
5600	-2.50	1.01	58.40
4000	-2.00	0.48	58.88
2800	-1.50	0.15	59.03
2000	-1.00	0.21	59.24
1400	-0.50	0.18	59.42
1000	0.00	0.13	59.55
*707.11	*0.50	0.56	60.11
*500.00	*1.00	5.50	65.61
*353.55	*1.50	13.99	79.60
*250.00	*2.00	14.25	93.85
*176.78	*2.50	5.66	99.52
*125.00	*3.00	0.48	100.00
*88.39	*3.50	0.00	100.00
*62.50	*4.00	0.00	100.00
*44.19	*4.50	0.00	100.00
*31.25	*5.00	0.00	100.00
*22.10	*5.50	0.00	100.00
*15.63	*6.00	0.00	100.00
*11.05	*6.50	0.00	100.00
*7.81	*7.00	0.00	100.00
*5.52	*7.50	0.00	100.00
*3.91	*8.00	0.00	100.00
*2.76	*8.50	0.00	100.00
*1.95	*9.00	0.00	100.00
*1.38	*9.50	0.00	100.00
*0.98	*10.00	0.00	100.00
*< 0.98	*> 10.00	0.00	100.00
Total		**100.00**	-

PARTICLE SIZE DISTRIBUTION



SUMMARY STATISTICS

Mode 1 [µm]†	26950	Coarse pebble
Mode 2 [µm]†	302	Medium sand
Mode 3 [µm]†	-	-
Median [µm]†	16335	Coarse pebble
Median [phi]†	-4.03	
Mean [µm]†‡	5460	Fine pebble
Mean [phi]†‡	-2.45	
Sorting [µm]‡	6.88	Very poorly sorted
Sorting [phi]‡	2.78	
Skewness [µm]‡	-0.68	Very fine skewed
Skewness [phi]‡	0.68	
Gravel [%]#	59.24	Sandy gravel
Sand [%]#	40.76	
Fines [%]#	0.00	

Notes

Particle Size Distribution by Dry Sieving (63 000 µm - 1000 µm) and Laser Diffraction* (< 1000 µm - < 0.98 µm) at 0.5 phi Intervals

* = Determinand not included in UKAS Accreditation

† = Particle size expressed in accordance with Wentworth (1922) scale

‡ = Statistics calculated using Folk and Ward (1957) method

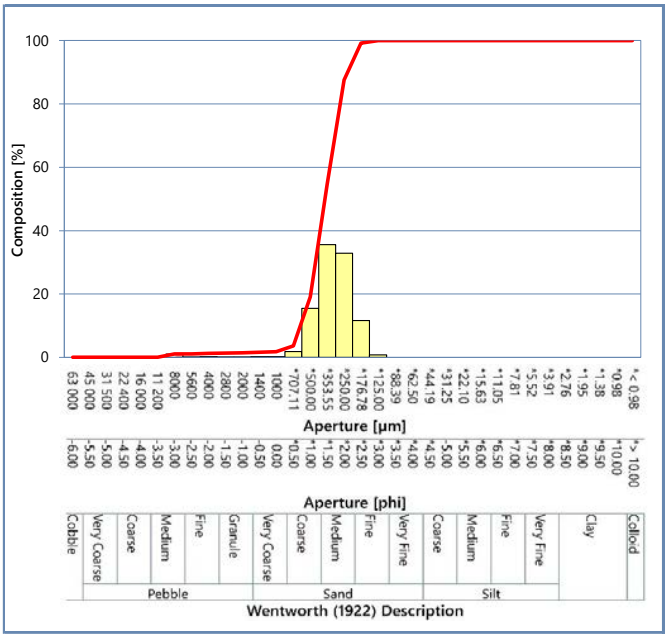
= Description based on BGS modified Folk classification (Long, 2006)

STATION: E_ST23

FRACTIONAL DATA

Aperture [µm]	Aperture [phi]	Fractional [%]	Cumulative [%]
63 000	-6.00	0.00	0.00
45 000	-5.50	0.00	0.00
31 500	-5.00	0.00	0.00
22 400	-4.50	0.00	0.00
16 000	-4.00	0.00	0.00
11 200	-3.50	0.00	0.00
8000	-3.00	1.06	1.06
5600	-2.50	0.04	1.10
4000	-2.00	0.17	1.27
2800	-1.50	0.06	1.33
2000	-1.00	0.10	1.43
1400	-0.50	0.20	1.62
1000	0.00	0.20	1.82
*707.11	*0.50	1.81	3.63
*500.00	*1.00	15.50	19.13
*353.55	*1.50	35.57	54.70
*250.00	*2.00	32.89	87.59
*176.78	*2.50	11.65	99.24
*125.00	*3.00	0.76	100.00
*88.39	*3.50	0.00	100.00
*62.50	*4.00	0.00	100.00
*44.19	*4.50	0.00	100.00
*31.25	*5.00	0.00	100.00
*22.10	*5.50	0.00	100.00
*15.63	*6.00	0.00	100.00
*11.05	*6.50	0.00	100.00
*7.81	*7.00	0.00	100.00
*5.52	*7.50	0.00	100.00
*3.91	*8.00	0.00	100.00
*2.76	*8.50	0.00	100.00
*1.95	*9.00	0.00	100.00
*1.38	*9.50	0.00	100.00
*0.98	*10.00	0.00	100.00
*< 0.98	*> 10.00	0.00	100.00
Total		**100.00**	-

PARTICLE SIZE DISTRIBUTION



SUMMARY STATISTICS

Mode 1 [µm]†	427	Medium sand
Mode 2 [µm]†	-	-
Mode 3 [µm]†	-	-
Median [µm]†	370	Medium sand
Median [phi]†	1.43	
Mean [µm]†‡	372	Medium sand
Mean [phi]†‡	1.43	
Sorting [µm]‡	1.44	Moderately well sorted
Sorting [phi]‡	0.53	
Skewness [µm]‡	0.01	Symmetrical
Skewness [phi]‡	-0.01	
Gravel [%]#	1.43	Sand
Sand [%]#	98.57	
Fines [%]#	0.00	

Notes

Particle Size Distribution by Dry Sieving (63 000 µm - 1000 µm) and Laser Diffraction* (< 1000 µm - < 0.98 µm) at 0.5 phi Intervals

* = Determinand not included in UKAS Accreditation

† = Particle size expressed in accordance with Wentworth (1922) scale

‡ = Statistics calculated using Folk and Ward (1957) method

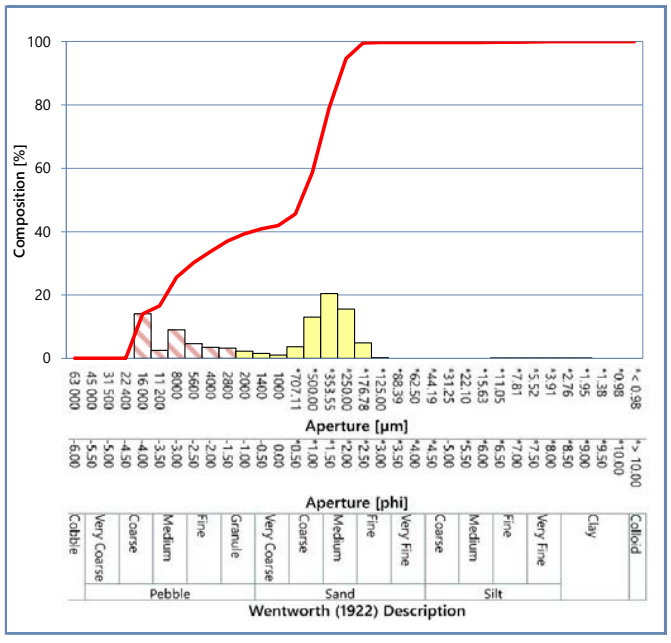
= Description based on BGS modified Folk classification (Long, 2006)

STATION: E_ST24

FRACTIONAL DATA

Aperture [µm]	Aperture [phi]	Fractional [%]	Cumulative [%]
63 000	-6.00	0.00	0.00
45 000	-5.50	0.00	0.00
31 500	-5.00	0.00	0.00
22 400	-4.50	0.00	0.00
16 000	-4.00	14.04	14.04
11 200	-3.50	2.54	16.58
8000	-3.00	9.01	25.59
5600	-2.50	4.64	30.24
4000	-2.00	3.51	33.75
2800	-1.50	3.27	37.02
2000	-1.00	2.27	39.29
1400	-0.50	1.55	40.84
1000	0.00	1.05	41.89
*707.11	*0.50	3.69	45.58
*500.00	*1.00	13.05	58.63
*353.55	*1.50	20.47	79.10
*250.00	*2.00	15.54	94.64
*176.78	*2.50	4.91	99.55
*125.00	*3.00	0.21	99.76
*88.39	*3.50	0.00	99.76
*62.50	*4.00	0.00	99.76
*44.19	*4.50	0.00	99.76
*31.25	*5.00	0.00	99.76
*22.10	*5.50	0.00	99.76
*15.63	*6.00	0.00	99.76
*11.05	*6.50	0.02	99.78
*7.81	*7.00	0.06	99.84
*5.52	*7.50	0.06	99.91
*3.91	*8.00	0.05	99.96
*2.76	*8.50	0.04	99.99
*1.95	*9.00	0.01	100.00
*1.38	*9.50	0.00	100.00
*0.98	*10.00	0.00	100.00
*< 0.98	*> 10.00	0.00	100.00
Total		**100.00**	-

PARTICLE SIZE DISTRIBUTION



SUMMARY STATISTICS

Mode 1 [µm]†	427	Medium sand
Mode 2 [µm]†	19200	Coarse pebble
Mode 3 [µm]†	9600	Medium pebble
Median [µm]†	629	Coarse sand
Median [phi]†	0.67	
Mean [µm]†‡	1343	Very coarse sand
Mean [phi]†‡	-0.43	
Sorting [µm]‡	4.85	Very poorly sorted
Sorting [phi]‡	2.28	
Skewness [µm]‡	0.60	Very coarse skewed
Skewness [phi]‡	-0.60	
Gravel [%]#	39.29	Sandy gravel
Sand [%]#	60.47	
Fines [%]#	0.24	

Notes

Particle Size Distribution by Dry Sieving (63 000 µm - 1000 µm) and Laser Diffraction* (< 1000 µm - < 0.98 µm) at 0.5 phi Intervals

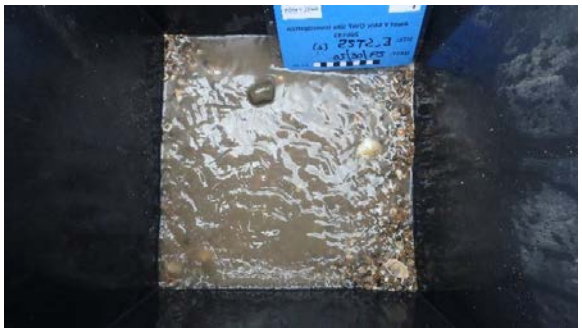
* = Determinand not included in UKAS Accreditation

† = Particle size expressed in accordance with Wentworth (1922) scale

‡ = Statistics calculated using Folk and Ward (1957) method

= Description based on BGS modified Folk classification (Long, 2006)

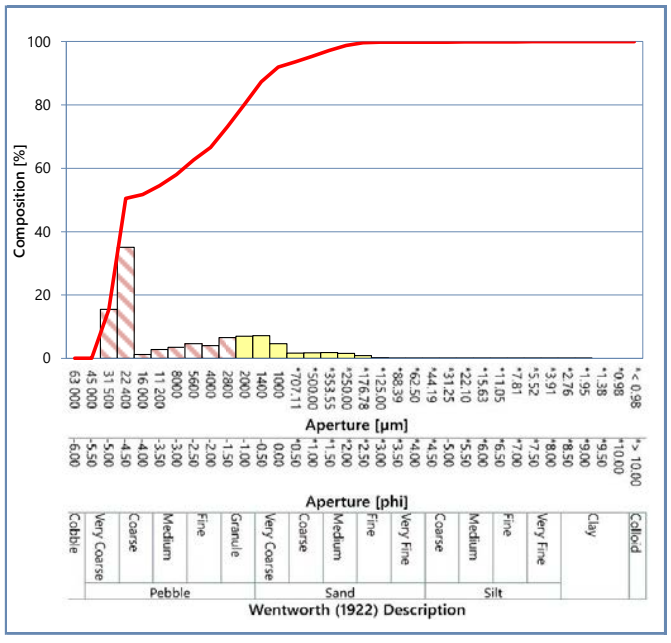
STATION: E_ST25



FRACTIONAL DATA

Aperture [µm]	Aperture [phi]	Fractional [%]	Cumulative [%]
63 000	-6.00	0.00	0.00
45 000	-5.50	0.00	0.00
31 500	-5.00	15.45	15.45
22 400	-4.50	35.06	50.51
16 000	-4.00	1.19	51.70
11 200	-3.50	2.81	54.51
8000	-3.00	3.53	58.04
5600	-2.50	4.59	62.63
4000	-2.00	3.98	66.60
2800	-1.50	6.55	73.16
2000	-1.00	6.99	80.15
1400	-0.50	7.16	87.31
1000	0.00	4.63	91.94
*707.11	*0.50	1.66	93.60
*500.00	*1.00	1.71	95.31
*353.55	*1.50	1.86	97.17
*250.00	*2.00	1.59	98.76
*176.78	*2.50	0.86	99.63
*125.00	*3.00	0.19	99.82
*88.39	*3.50	0.00	99.82
*62.50	*4.00	0.00	99.82
*44.19	*4.50	0.01	99.83
*31.25	*5.00	0.02	99.85
*22.10	*5.50	0.01	99.86
*15.63	*6.00	0.01	99.87
*11.05	*6.50	0.02	99.90
*7.81	*7.00	0.03	99.92
*5.52	*7.50	0.03	99.95
*3.91	*8.00	0.02	99.98
*2.76	*8.50	0.01	99.99
*1.95	*9.00	0.01	100.00
*1.38	*9.50	0.00	100.00
*0.98	*10.00	0.00	100.00
*< 0.98	*> 10.00	0.00	100.00
Total		**100.00**	-

PARTICLE SIZE DISTRIBUTION



SUMMARY STATISTICS

Mode 1 [µm]†	26950	Coarse pebble
Mode 2 [µm]†	2400	Granule
Mode 3 [µm]†	-	-
Median [µm]†	22512	Coarse pebble
Median [phi]†	-4.49	
Mean [µm]†‡	10521	Medium pebble
Mean [phi]†‡	-3.40	
Sorting [µm]‡	4.02	Very poorly sorted
Sorting [phi]‡	2.01	
Skewness [µm]‡	-0.75	Very fine skewed
Skewness [phi]‡	0.75	
Gravel [%]#	80.15	Gravel
Sand [%]#	19.67	
Fines [%]#	0.18	

Notes

Particle Size Distribution by Dry Sieving (63 000 µm - 1000 µm) and Laser Diffraction* (< 1000 µm - < 0.98 µm) at 0.5 phi Intervals

* = Determinand not included in UKAS Accreditation

† = Particle size expressed in accordance with Wentworth (1922) scale

‡ = Statistics calculated using Folk and Ward (1957) method

= Description based on BGS modified Folk classification (Long, 2006)

Appendix E

Sediment Hydrocarbon Analysis

E.1 United States Environmental Protection Agency (US EPA) 16 Polycyclic Aromatic Hydrocarbon (PAH) Concentrations

PAH [ng/g of Dry Sediment]	E_ST04	E_ST09	E_ST13	E_ST15	E_ST16	E_ST18	E_ST20	E_ST23	CEMP Assessment Criteria (OSPAR, 2014) ERL
Naphthalene	2.3	0.1	0.1	0.1	0.6	0.2	0.9	0.1	**160**
Acenaphthylene	0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	-
Acenaphthene	0.3	< 0.1	< 0.1	< 0.1	0.1	< 0.1	0.1	< 0.1	-
Fluorene	1.1	0.1	0.1	0.1	0.3	0.1	0.4	0.1	-
Phenanthrene	6.6	0.4	0.2	0.2	1.4	0.5	1.9	0.3	**240**
Anthracene	0.7	0.1	< 0.1	0.1	0.2	0.1	0.3	0.1	**85**
Fluoranthene	4.9	0.4	0.3	0.4	1.7	0.6	2.0	0.3	**600**
Pyrene	4.5	0.4	0.3	0.3	1.5	0.5	1.7	0.3	**665**
Benzo(a)anthracene	2.8	0.2	0.2	0.2	0.9	0.3	1.1	0.2	**261**
Chrysene	3.4	0.3	0.2	0.2	1.0	0.4	1.3	0.2	**384**
Benzo(b)fluoranthene	6.9	0.8	0.7	0.8	3.1	1.4	3.4	0.8	-
Benzo(k)fluoranthene	2.1	0.2	0.2	0.2	0.9	0.4	1.0	0.2	-
Benzo(a)pyrene	3.2	0.2	0.2	0.2	1.1	0.5	1.3	0.2	**430**
Indeno(1,2,3-cd)pyrene	4.8	0.4	0.4	0.5	1.9	1.1	1.8	0.4	**240**
Benzo(ghi)perylene	4.8	0.4	0.3	0.4	1.5	0.9	1.3	0.3	**85**
Dibenzo(a,h)anthracene	1.1	0.1	0.1	0.1	0.3	0.2	0.3	0.1	-
Total US EPA 16	**49.6**	**< 4.3**	**< 3.5**	**< 4.0**	**< 16.6**	**< 7.4**	**< 18.9**	**< 3.8**	-

Notes
PAH = Polycyclic aromatic hydrocarbon
OSPAR = Oslo and Paris Commission
CEMP = Coordinated Environmental Monitoring Programme
ERL = Effects range low
US EPA 16 = United States Environmental Protection Agency's 16 priority polycyclic aromatic hydrocarbons

Key:	Below ERL	Above ERL

E.2 Total 2 to 6 Ring PAH Concentrations

PAH	Station							
	E_ST04	E_ST09	E_ST13	E_ST15	E_ST16	E_ST18	E_ST20	E_ST23
Naphthalene (128)	2.3	0.1	0.1	0.1	0.6	0.2	0.9	0.1
C_1 128	5.5	0.2	0.1	0.1	1.0	0.3	1.5	0.2
C_2 128	9.8	0.4	0.2	0.2	1.5	0.5	2.2	0.3
C_3 128	10.9	0.5	0.2	0.2	1.6	0.5	2.3	0.3
C_4 128	6.0	0.3	0.2	0.1	0.8	0.3	1.2	0.2
TOTAL 128	**34.5**	**1.5**	**0.8**	**0.7**	**5.5**	**1.8**	**8.1**	**1.1**
Phenanthrene/anthracene (178)	7.3	0.5	0.2	0.3	1.6	0.6	2.2	0.4
C_1 178	8.3	0.4	0.2	0.3	1.4	0.5	2.0	0.3
C_2 178	9.2	0.5	0.3	0.3	1.6	0.6	2.2	0.3
C_3 178	6.5	0.5	0.3	0.3	1.3	0.5	1.7	0.3
TOTAL 178	**31.3**	**1.9**	**1.0**	**1.2**	**5.9**	**2.2**	**8.1**	**1.3**
Dibenzothiophene (184)	0.4	< 0.1	< 0.1	< 0.1	0.1	< 0.1	0.1	< 0.1
C_1 184	0.8	< 0.1	< 0.1	< 0.1	0.2	0.1	0.2	< 0.1
C_2 184	0.9	0.1	0.1	0.1	0.2	0.1	0.2	0.1
C_3 184	0.7	0.1	0.1	0.1	0.2	0.1	0.2	< 0.1
TOTAL 184	**2.8**	**< 0.4**	**< 0.4**	**< 0.4**	**0.7**	**< 0.4**	**0.7**	**< 0.4**
Fluoranthene/pyrene (202)	9.4	0.8	0.6	0.7	3.2	1.1	3.7	0.6
C_1 202	6.3	0.5	0.3	0.4	1.6	0.6	2.0	0.4
C_2 202	5.9	0.4	0.3	0.3	1.4	0.5	1.8	0.3
C_3 202	5.4	0.4	0.3	0.3	1.2	0.5	1.6	0.3
TOTAL 202	**27.0**	**2.1**	**1.5**	**1.7**	**7.4**	**2.7**	**9.1**	**1.6**
Benzanthracenes/ benzphenanthrenes (228)	9.3	1.0	0.6	0.6	3.1	1.3	3.6	0.7
C_1 228	6.0	0.4	0.3	0.3	1.6	0.6	1.8	0.4
C_2 228	7.0	0.6	0.5	0.6	2.0	1.0	2.2	0.5
TOTAL 228	**22.3**	**2.0**	**1.4**	**1.5**	**6.7**	**2.9**	**7.6**	**1.6**
m/z 252*	20.7	2.4	2.1	2.4	8.7	3.8	9.2	2.1
C_1 252	7.6	0.8	0.6	0.7	2.6	1.2	2.9	0.7
C_2 252	5.4	0.4	0.4	0.4	1.5	0.7	1.7	0.4
TOTAL 252	**33.7**	**3.6**	**3.1**	**3.5**	**12.8**	**5.7**	**13.8**	**3.2**
m/z 276†	14.0	1.2	1.3	1.5	5.0	3.1	4.6	1.1
C_1 276	3.4	0.3	0.2	0.3	1.0	0.5	0.9	0.2
C_2 276	2.9	0.3	0.2	0.2	0.7	0.4	0.7	0.2
TOTAL 276	**20.3**	**1.8**	**1.7**	**2.0**	**6.7**	**4.0**	**6.2**	**1.5**
NPD‡	**68.6**	**< 3.8**	**< 2.2**	**< 2.3**	**12.1**	**< 4.4**	**16.9**	**< 2.8**
NPD [%]	**40**	**< 29**	**< 22**	**< 21**	**26**	**< 22**	**32**	**< 26**
Total 2 to 6 ring PAH	**172**	**< 13.3**	**< 9.9**	**< 11.0**	**45.7**	**< 19.7**	**53.6**	**< 10.7**

Notes
Concentrations expressed as ng/g dry sediment
* = m/z 252 - benzfluoranthenes/benzpyrenes/perylene
† = m/z 276 - anthanthrene/indenopyrenes/benzperylenes
‡ = NPD - naphthalenes, phenanthrenes and dibenzothiophenes (totals)

Appendix F

Macrofaunal Analysis

F.1 Macrofaunal Abundance

Taxon	Qualifiers	SDC	APHIA ID	Authority	Sample									
					E_ST01 FA	E_ST02 FA	E_ST03 FA	E_ST04 FA	E_ST07 FA	E_ST09 FA	E_ST11 FA	E_ST12 FA	E_ST13 FA	E_ST14 FA
CNIDARIA														
ACTINIARIA		D662	1360	Hertwig, 1882		3			1		4			
Edwardsiidae		D759	100665	Andres, 1881				5	1					
PLATYHELMINTHES														
PLATYHELMINTHES		F2	793	Minot, 1876							1			
NEMERTEA														
NEMERTEA		G1	152391		3	1	1	3	7	2	8		1	
SIPUNCULA														
Golfingia elongata		N14	175026	(Keferstein, 1862)					1	1	1			
POLYCHAETA														
Gattyana cirrhosa		P49	130749	(Pallas, 1766)							1			
Harmothoe		P50	129491	Kinberg, 1856						1				
Malmgrenia andreapolis		P51	147008	McIntosh, 1874										
Malmgrenia darbouxi			863197	(Pettibone, 1993)		1								
Pholoe baltica		P95	130599	Örsted, 1843					3		5			
Sthenelais boa		P107	131074	(Johnston, 1833)										
Eteone longa	aggregate	P118	130616	(Fabricius, 1780)		4				1	2			
Mysta picta		P127	147026	(Quatrefages, 1866)				1				1		
Phyllodoce groenlandica		P141	334506	Örsted, 1842										
Phyllodoce mucosa		P145	334512	Örsted, 1843										
Eulalia ornata		P156	130632	Saint-Joseph, 1888										
Eumida bahusiensis		P164	130641	Bergstrom, 1914		1								

Taxon	Qualifiers	SDC	APHIA ID	Authority	Sample									
					E_ST01 FA	E_ST02 FA	E_ST03 FA	E_ST04 FA	E_ST07 FA	E_ST09 FA	E_ST11 FA	E_ST12 FA	E_ST13 FA	E_ST14 FA
Glycera fallax		P259	336908	Quatrefages, 1850					1					
Glycera lapidum		P260	130123	Quatrefages, 1866					1					
Glycera oxycephala		P262	130126	Ehlers, 1887	2									
Glycera tridactyla		P265	130130	Schmarda, 1861				2				1		
Psamathe fusca		P305	152249	Johnston, 1836										
Podarkeopsis capensis		P319	130195	(Day, 1963)				1						
Eunereis longissima		P475	130375	(Johnston, 1840)							2			
Nephtys assimilis		P495	130353	Örsted, 1843										
Nephtys cirrosa		P498	130357	Ehlers, 1868	4	5	1	2		6		11	5	5
Lumbrineris cf. cingulata			130240	Ehlers, 1897					1					
Scoloplos armiger		P672	130537	(Müller, 1776)		2	1	4	2	4	2	1		
Paradoneis lyra		P699	130585	(Southern, 1914)					1					
Poecilochaetus serpens		P718	130711	Allen, 1904		29			2	1		1		
Aonides oxycephala		P722	131106	(Sars, 1862)							1			
Aonides paucibranchiata		P723	131107	Southern, 1914					3					
Atherospio guillei			478336	(Laubier & Ramos, 1974)					1		3			
Pseudopolydora pulchra		P774	131169	(Carazzi, 1893)										
Scolelepis bonnieri		P779	131171	(Mesnil, 1896)		1							1	1
Spio goniocephala			131184	Thulin, 1957	4	1	4			3				
Spio decorata		P789	152314	Bobretzky, 1870		4								
Spio symphyta			596189	Meißner, Bick & Bastrop, 2011		2								
Spiophanes bombyx	aggregate	P794	131187	(Claparède, 1870)	6	4		3		4		4	4	
Magelona filiformis		P805	130268	Wilson, 1959				1						

Taxon	Qualifiers	SDC	APHIA ID	Authority	Sample									
					E_ST01 FA	E_ST02 FA	E_ST03 FA	E_ST04 FA	E_ST07 FA	E_ST09 FA	E_ST11 FA	E_ST12 FA	E_ST13 FA	E_ST14 FA
Magelona johnstoni			130269	Fiege, Licher & Mackie, 2000									5	11
Chaetozone christiei			152217	Chambers, 2000	2					1			1	
Caulleriella alata		P829	129943	(Southern, 1914)							2			
Tharyx		P845	129249	Webster & Benedict, 1887										
Capitella		P906	129211	Blainville, 1828										
Mediomastus fragilis		P919	129892	Rasmussen, 1973					5		31			
Notomastus		P920	129220	M. Sars, 1851							1			
Ophelia borealis		P999	130491	Quatrefages, 1866						3		4		
Travisia forbesii		P1007	130512	Johnston, 1840	1					4				
Galathowenia oculata		P1093	146950	(Zachs, 1923)					1					
Owenia		P1097	129427	Della Chiaje, 1844					2		1			
Lagis koreni		P1107	152367	Malmgren, 1866		2						1		1
Sabellaria spinulosa		P1117	130867	(Leuckart, 1849)										
Lanice conchilega		P1195	131495	(Pallas, 1766)					1					
Pista mediterranea			131519	Gaillande, 1970										
Lysilla nivea		P1234	131501	Langerhans, 1884										
Polycirrus		P1235	129710	Grube, 1850		2			4		1	2		
Spirobranchus lamarcki		P1340	560033	(Quatrefages, 1866)										
CRUSTACEA														
Balanus crenatus		R77	106215	Bruguière, 1789		4								
Nebalia reboredae			459311	Moreira & Urgorri, 2009					9			1		
Gastrosaccus spinifer		S44	120020	(Goës, 1864)										
Perioculodes longimanus		S131	102915	(Spence Bate & Westwood, 1868)										

Taxon	Qualifiers	SDC	APHIA ID	Authority	Sample									
					E_ST01 FA	E_ST02 FA	E_ST03 FA	E_ST04 FA	E_ST07 FA	E_ST09 FA	E_ST11 FA	E_ST12 FA	E_ST13 FA	E_ST14 FA
Leucothoe incisa		S177	102460	Robertson, 1892		1								
Leucothoe procera		S179	102466	Spence Bate, 1857							1			
Stenothoe marina		S213	103166	(Spence Bate, 1857)										
Urothoe brevicornis		S247	103226	Spence Bate, 1862								3		
Urothoe elegans		S248	103228	Spence Bate, 1857					1		12			
Acidostoma neglectum			102495	Dahl, 1964					1	1				
Lepidepecreum longicorne		S301	102599	(Spence Bate, 1862)									2	
Nototropis falcatus		S410	102139	(Metzger, 1871)	1									
Ampelisca tenuicornis		S440	101930	Liljeborg, 1856										
Bathyporeia elegans		S452	103058	Watkin, 1938	11	1	13					1	6	1
Bathyporeia guilliamsoniana		S454	103060	(Spence Bate, 1857)	2	1	37			3		18	13	4
Abludomelita obtusata		S498	102788	(Montagu, 1813)		3								
Cheirocratus	female	S503	101669	Norman, 1867		1								
Ericthonius punctatus		S564	102408	(Spence Bate, 1857)										
Monocorophium acherusicum		S606	225814	(Costa, 1853)										
Pariambus typicus		S651	101857	(Krøyer, 1845)							6			
Eurydice truncata		S856	118855	(Norman, 1868)	1									
Diastylis bradyi		S1248	110472	Norman, 1879			1			1		2	5	
Processa modica		S1366	107688	Williamson in Williamson & Rochanaburanon, 1979							1			
Philocheras trispinosus		S1390	107562	(Hailstone in Hailstone & Westwood, 1835)										
Callianassa subterranea		S1415	107729	(Montagu, 1808)							2			
Upogebia deltaura		S1419	107739	(Leach, 1816)					4		11			
Pisidia longicornis		S1482	107188	(Linnaeus, 1767)		1								

Taxon	Qualifiers	SDC	APHIA ID	Authority	Sample									
					E_ST01 FA	E_ST02 FA	E_ST03 FA	E_ST04 FA	E_ST07 FA	E_ST09 FA	E_ST11 FA	E_ST12 FA	E_ST13 FA	E_ST14 FA
Thia scutellata		S1559	107281	(Fabricius, 1793)									1	
Liocarcinus depurator		S1580	107387	(Linnaeus, 1758)										
MOLLUSCA														
Euspira nitida		W491	151894	(Donovan, 1803)								1		
Euspira catena		W493	140528	(da Costa, 1778)									1	
Tritonia plebeia		W1254	141738	G. Johnston, 1828					1					
Onchidoris bilamellata		W1322	150457	(Linnaeus, 1767)										
Facelina bostoniensis	?	W1470	139908	(Couthouy, 1838)		4								
Tellimya ferruginosa		W1902	146952	(Montagu, 1808)				5						
Kurtiella bidentata		W1906	345281	(Montagu, 1803)		1			1		1	1		
Mactra stultorum		W1972	140299	(Linnaeus, 1758)										
Lutraria angustior		W1983	140294	Philippi, 1844										
Ensis leei		W1997	876640	M. Huber, 2015										
Ensis ensis		W1999	140733	(Linnaeus, 1758)										
Pharus legumen		W2004	140736	(Linnaeus, 1758)										
Phaxas pellucidus		W2006	140737	(Pennant, 1777)				1						
Fabulina fabula		W2019	146907	(Gmelin, 1791)										
Asbjornsenia pygmaea		W2023	879714	(Lovén, 1846)	1									
Gari fervensis		W2051	140870	(Gmelin, 1791)										
Abra alba		W2059	141433	(W. Wood, 1802)										
Venerupis corrugata														
PHORONIDA														
Phoronis		ZA3	128545	Wright, 1856					40		36			
ECHINODERMATA														

Taxon	Qualifiers	SDC	APHIA ID	Authority	Sample									
					E_ST01 FA	E_ST02 FA	E_ST03 FA	E_ST04 FA	E_ST07 FA	E_ST09 FA	E_ST11 FA	E_ST12 FA	E_ST13 FA	E_ST14 FA
Asterias rubens		ZB100	123776	Linnaeus, 1758							1			
Acrocnida brachiata		ZB151	236130	(Montagu, 1804)				1			1			
Ophiura ophiura		ZB170	124929	(Linnaeus, 1758)										
Echinocyamus pusillus		ZB212	124273	(O.F. Müller, 1776)	1				1	1	1			
Echinocardium cordatum		ZB223	124392	(Pennant, 1777)				1						
Number of taxa					**13**	**24**	**7**	**13**	**26**	**16**	**27**	**16**	**12**	**6**
Abundance					**39**	**79**	**58**	**30**	**96**	**37**	**139**	**53**	**45**	**23**
The following taxa were merged for analysis														
Number of taxa					**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Abundance					**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
The following taxa were excluded from analysis														
Colonial														
Tubulariidae		D158	1603	Goldfuss, 1818	P	P	P	P	P					
Bougainvilliidae		D246	1594	Lütken, 1850		P			P		P			
Phialella quadrata		D343	117804	(Forbes, 1848)	P	P		P						
Hydrallmania falcata		D424	117890	(Linnaeus, 1758)		P					P			
Campanulariidae		D491	1606	Johnston, 1836		P	P		P	P	P			
Crisia		Y13	111032	Lamouroux, 1812		P								
Alcyonidium parasiticum		Y81	111604	(Fleming, 1828)					P	P	P	P		
Arachnidium fibrosum		Y88	111607	Hincks, 1880		P								
Nolella		Y91	111011	Gosse, 1855					P					
Conopeum reticulum		Y172	111351	(Linnaeus, 1767)		P					P			
Flustra foliacea		Y187	111367	(Linnaeus, 1758)							P			
Scrupocellaria scruposa		Y279	111250	(Linnaeus, 1758)							P	P		

Taxon	Qualifiers	SDC	APHIA ID	Authority	Sample									
					E_ST01 FA	E_ST02 FA	E_ST03 FA	E_ST04 FA	E_ST07 FA	E_ST09 FA	E_ST11 FA	E_ST12 FA	E_ST13 FA	E_ST14 FA
Tricellaria	?	Y280	110868	Fleming, 1828						P				
Damaged														
Nebalia	damaged	S5	147031	Leach, 1814					1					
MYSIDA	damaged	S25	149668	Boas, 1883							1			
Bathyporeia	damaged	S451	101742	Lindström, 1855					1		1			
Pharidae	damaged	W1995	23091	H. Adams & A. Adams, 1856										1
THRACIOIDEA	damaged	W2225	382318	Stoliczka, 1870 (1839)										
SPATANGOIDA	damaged	ZB213	123106	L. Agassiz, 1840		P		2					2	
Juvenile														
ANIMALIA	eggs		2			P								
Cerianthidae	juvenile	D630	100684	Milne Edwards & Haime, 1851							2			
Glycera	juvenile	P255	129296	Lamarck, 1818	1									
Nephtyidae	juvenile	P490	956	Grube, 1850	1	3				2		1		
Ophelia	juvenile	P997	129413	Savigny, 1822						2				
Bathyporeia	juvenile	S451	101742	Lindström, 1855										
Upogebia	juvenile	S1418	107079	Leach, 1814 [in Leach, 1813-1815]		1					3			
Thia scutellata	juvenile	S1559	107281	(Fabricius, 1793)						1			1	1
Liocarcinus	juvenile	S1577	106925	Stimpson, 1871										
Portumnus latipes	juvenile	S1596	107400	(Pennant, 1777)										
Mytilidae	juvenile	W1691	211	Rafinesque, 1815										
Spisula	juvenile	W1973	138159	Gray, 1837					1					
Ensis	juvenile	W1996	138333	Schumacher, 1817										
Donacidae	juvenile	W2036	236	J. Fleming, 1828									1	

Taxon	Qualifiers	SDC	APHIA ID	Authority	Sample									
					E_ST01 FA	E_ST02 FA	E_ST03 FA	E_ST04 FA	E_ST07 FA	E_ST09 FA	E_ST11 FA	E_ST12 FA	E_ST13 FA	E_ST14 FA
Abra	juvenile	W2058	138474	Lamarck, 1818	1								1	
THRACIOIDEA	juvenile	W2225	382318	Stoliczka, 1870 (1839)				1	1			1		
OPHIUROIDEA	juvenile	ZB105	123084	Gray, 1840				4					1	
ECHINOIDEA	juvenile	ZB181	123082	Leske, 1778										
SPATANGOIDA	juvenile	ZB213	123106	L. Agassiz, 1840	2									
ASCIDIACEA	juvenile	ZD2	1839	Blainville, 1824					1	1				
Meiofaunal														
Pelagic														
CHAETOGNATHA		L1	2081		2	2								
Number of taxa					**7**	**13**	**2**	**5**	**10**	**7**	**11**	**4**	**5**	**2**
Abundance					**7**	**6**	**0**	**7**	**5**	**6**	**7**	**2**	**6**	**2**

Taxon	Qualifiers	SDC	APHIA ID	Authority	Sample									
					E_ST15 FA	E_ST16 FA	E_ST18 FA	E_ST19 FA	E_ST20 FA	E_ST21 FA	E_ST22 FA	E_ST23 FA	E_ST24 FA	E_ST25 FA
CNIDARIA														
ACTINIARIA		D662	1360	Hertwig, 1882					1	1	1			37
Edwardsiidae		D759	100665	Andres, 1881		1	1							
PLATYHELMINTHES														
PLATYHELMINTHES		F2	793	Minot, 1876										
NEMERTEA														
NEMERTEA		G1	152391			1	4	3	3	1	1		1	16
SIPUNCULA														
Golfingia elongata		N14	175026	(Keferstein, 1862)										
POLYCHAETA														
Gattyana cirrhosa		P49	130749	(Pallas, 1766)										
Harmothoe		P50	129491	Kinberg, 1856						1				
Malmgrenia andreapolis		P51	147008	McIntosh, 1874						1				
Malmgrenia darbouxi			863197	(Pettibone, 1993)		1				1				
Pholoe baltica		P95	130599	Örsted, 1843		5				1				
Sthenelais boa		P107	131074	(Johnston, 1833)						1				
Eteone longa	aggregate	P118	130616	(Fabricius, 1780)		1	3			2	1			
Mysta picta		P127	147026	(Quatrefages, 1866)										
Phyllodoce groenlandica		P141	334506	Örsted, 1842		1								
Phyllodoce mucosa		P145	334512	Örsted, 1843		1							1	
Eulalia ornata		P156	130632	Saint-Joseph, 1888		1								
Eumida bahusiensis		P164	130641	Bergstrom, 1914		2					1			
Glycera fallax		P259	336908	Quatrefages, 1850										
Glycera lapidum		P260	130123	Quatrefages, 1866										

Taxon	Qualifiers	SDC	APHIA ID	Authority	Sample									
					E_ST15 FA	E_ST16 FA	E_ST18 FA	E_ST19 FA	E_ST20 FA	E_ST21 FA	E_ST22 FA	E_ST23 FA	E_ST24 FA	E_ST25 FA
Glycera oxycephala		P262	130126	Ehlers, 1887										
Glycera tridactyla		P265	130130	Schmarda, 1861	2	10	2		3		1	1		
Psamathe fusca		P305	152249	Johnston, 1836						1				
Podarkeopsis capensis		P319	130195	(Day, 1963)										
Eunereis longissima		P475	130375	(Johnston, 1840)						1				
Nephtys assimilis		P495	130353	Örsted, 1843		1								
Nephtys cirrosa		P498	130357	Ehlers, 1868	1		1	3					4	
Lumbrineris cf. cingulata			130240	Ehlers, 1897										
Scoloplos armiger		P672	130537	(Müller, 1776)						2	1			
Paradoneis lyra		P699	130585	(Southern, 1914)										
Poecilochaetus serpens		P718	130711	Allen, 1904			2			3		3	4	
Aonides oxycephala		P722	131106	(Sars, 1862)						1				
Aonides paucibranchiata		P723	131107	Southern, 1914						1				4
Atherospio guillei			478336	(Laubier & Ramos, 1974)										
Pseudopolydora pulchra		P774	131169	(Carazzi, 1893)			1							
Scolelepis bonnieri		P779	131171	(Mesnil, 1896)										
Spio goniocephala			131184	Thulin, 1957									2	
Spio decorata		P789	152314	Bobretzky, 1870									1	
Spio symphyta			596189	Meißner, Bick & Bastrop, 2011			1							
Spiophanes bombyx	aggregate	P794	131187	(Claparède, 1870)		10	4		1		2	1	9	
Magelona filiformis		P805	130268	Wilson, 1959		2	1	5	4					
Magelona johnstoni			130269	Fiege, Licher & Mackie, 2000	8	16	35		3		6	4		
Chaetozone christiei			152217	Chambers, 2000			1							

Taxon	Qualifiers	SDC	APHIA ID	Authority	Sample									
					E_ST15 FA	E_ST16 FA	E_ST18 FA	E_ST19 FA	E_ST20 FA	E_ST21 FA	E_ST22 FA	E_ST23 FA	E_ST24 FA	E_ST25 FA
Caulleriella alata		P829	129943	(Southern, 1914)										
Tharyx		P845	129249	Webster & Benedict, 1887		1								
Capitella		P906	129211	Blainville, 1828		1								
Mediomastus fragilis		P919	129892	Rasmussen, 1973		1				1				
Notomastus		P920	129220	M. Sars, 1851		1								
Ophelia borealis		P999	130491	Quatrefages, 1866										1
Travisia forbesii		P1007	130512	Johnston, 1840										
Galathowenia oculata		P1093	146950	(Zachs, 1923)										
Owenia		P1097	129427	Della Chiaje, 1844		1								
Lagis koreni		P1107	152367	Malmgren, 1866		25	19		2	5	1			3
Sabellaria spinulosa		P1117	130867	(Leuckart, 1849)						3				
Lanice conchilega		P1195	131495	(Pallas, 1766)		6	1							
Pista mediterranea			131519	Gaillande, 1970										
Lysilla nivea		P1234	131501	Langerhans, 1884						1				
Polycirrus		P1235	129710	Grube, 1850						2			1	
Spirobranchus lamarcki		P1340	560033	(Quatrefages, 1866)						1				1
CRUSTACEA														
Balanus crenatus		R77	106215	Bruguière, 1789						3			3	
Nebalia reboredae			459311	Moreira & Urgorri, 2009										
Gastrosaccus spinifer		S44	120020	(Goës, 1864)										
Perioculodes longimanus		S131	102915	(Spence Bate & Westwood, 1868)									1	
Leucothoe incisa		S177	102460	Robertson, 1892		8	1							
Leucothoe procera		S179	102466	Spence Bate, 1857										

Taxon	Qualifiers	SDC	APHIA ID	Authority	Sample									
					E_ST15 FA	E_ST16 FA	E_ST18 FA	E_ST19 FA	E_ST20 FA	E_ST21 FA	E_ST22 FA	E_ST23 FA	E_ST24 FA	E_ST25 FA
Stenothoe marina		S213	103166	(Spence Bate, 1857)	1									
Urothoe brevicornis		S247	103226	Spence Bate, 1862										
Urothoe elegans		S248	103228	Spence Bate, 1857						7				
Acidostoma neglectum			102495	Dahl, 1964						1				
Lepidepecreum longicorne		S301	102599	(Spence Bate, 1862)										
Nototropis falcatus		S410	102139	(Metzger, 1871)										
Ampelisca tenuicornis		S440	101930	Liljeborg, 1856					1					
Bathyporeia elegans		S452	103058	Watkin, 1938									4	
Bathyporeia guilliamsoniana		S454	103060	(Spence Bate, 1857)					1		10		34	
Abludomelita obtusata		S498	102788	(Montagu, 1813)						1				
Cheirocratus	female	S503	101669	Norman, 1867										
Ericthonius punctatus		S564	102408	(Spence Bate, 1857)						1				
Monocorophium acherusicum		S606	225814	(Costa, 1853)						1				
Pariambus typicus		S651	101857	(Krøyer, 1845)										
Eurydice truncata		S856	118855	(Norman, 1868)										
Diastylis bradyi		S1248	110472	Norman, 1879	1	4		1	1				2	
Processa modica		S1366	107688	Williamson in Williamson & Rochanaburanon, 1979										
Philocheras trispinosus		S1390	107562	(Hailstone in Hailstone & Westwood, 1835)							1			
Callianassa subterranea		S1415	107729	(Montagu, 1808)										
Upogebia deltaura		S1419	107739	(Leach, 1816)										
Pisidia longicornis		S1482	107188	(Linnaeus, 1767)										
Thia scutellata		S1559	107281	(Fabricius, 1793)										
Liocarcinus depurator		S1580	107387	(Linnaeus, 1758)						1				

Taxon	Qualifiers	SDC	APHIA ID	Authority	Sample									
					E_ST15 FA	E_ST16 FA	E_ST18 FA	E_ST19 FA	E_ST20 FA	E_ST21 FA	E_ST22 FA	E_ST23 FA	E_ST24 FA	E_ST25 FA
MOLLUSCA														
Euspira nitida		W491	151894	(Donovan, 1803)		1	2				6		1	4
Euspira catena		W493	140528	(da Costa, 1778)		1								
Tritonia plebeia		W1254	141738	G. Johnston, 1828										
Onchidoris bilamellata		W1322	150457	(Linnaeus, 1767)						3				
Facelina bostoniensis	?	W1470	139908	(Couthouy, 1838)										
Tellimya ferruginosa		W1902	146952	(Montagu, 1808)	3		4							
Kurtiella bidentata		W1906	345281	(Montagu, 1803)		25	32		1	1	1		2	5
Mactra stultorum		W1972	140299	(Linnaeus, 1758)		2			1					
Lutraria angustior		W1983	140294	Philippi, 1844						1				1
Ensis leei		W1997	876640	M. Huber, 2015		1			11					
Ensis ensis		W1999	140733	(Linnaeus, 1758)			1							
Pharus legumen		W2004	140736	(Linnaeus, 1758)		1	8					1		
Phaxas pellucidus		W2006	140737	(Pennant, 1777)										
Fabulina fabula		W2019	146907	(Gmelin, 1791)		10	5		6		3	1		
Asbjornsenia pygmaea		W2023	879714	(Lovén, 1846)									1	
Gari fervensis		W2051	140870	(Gmelin, 1791)						1				
Abra alba		W2059	141433	(W. Wood, 1802)		3	3		1		5	2		
Venerupis corrugata										1				
PHORONIDA														
Phoronis		ZA3	128545	Wright, 1856		2	2			2				
ECHINODERMATA														
Asterias rubens		ZB100	123776	Linnaeus, 1758										
Acrocnida brachiata		ZB151	236130	(Montagu, 1804)		1								

Taxon	Qualifiers	SDC	APHIA ID	Authority	Sample									
					E_ST15 FA	E_ST16 FA	E_ST18 FA	E_ST19 FA	E_ST20 FA	E_ST21 FA	E_ST22 FA	E_ST23 FA	E_ST24 FA	E_ST25 FA
Ophiura ophiura		ZB170	124929	(Linnaeus, 1758)							2			
Echinocyamus pusillus		ZB212	124273	(O.F. Müller, 1776)						2				
Echinocardium cordatum		ZB223	124392	(Pennant, 1777)								1		
Number of taxa					**6**	**33**	**23**	**4**	**15**	**32**	**16**	**8**	**16**	**9**
Abundance					**16**	**148**	**134**	**12**	**40**	**55**	**43**	**14**	**71**	**72**
The following taxa were excluded from analysis														
Colonial														
Tubulariidae		D158	1603	Goldfuss, 1818										
Bougainvilliidae		D246	1594	Lütken, 1850		P								
Phialella quadrata		D343	117804	(Forbes, 1848)										
Hydrallmania falcata		D424	117890	(Linnaeus, 1758)			P			P				
Campanulariidae		D491	1606	Johnston, 1836		P								
Crisia		Y13	111032	Lamouroux, 1812										
Alcyonidium parasiticum		Y81	111604	(Fleming, 1828)		P				P				P
Arachnidium fibrosum		Y88	111607	Hincks, 1880										
Nolella		Y91	111011	Gosse, 1855										
Conopeum reticulum		Y172	111351	(Linnaeus, 1767)			P			P			P	P
Flustra foliacea		Y187	111367	(Linnaeus, 1758)										
Scrupocellaria scruposa		Y279	111250	(Linnaeus, 1758)										
Tricellaria	?	Y280	110868	Fleming, 1828										
Damaged														
Nebalia	damaged	S5	147031	Leach, 1814										
MYSIDA	damaged	S25	149668	Boas, 1883										
Bathyporeia	damaged	S451	101742	Lindström, 1855										

Taxon	Qualifiers	SDC	APHIA ID	Authority	Sample									
					E_ST15 FA	E_ST16 FA	E_ST18 FA	E_ST19 FA	E_ST20 FA	E_ST21 FA	E_ST22 FA	E_ST23 FA	E_ST24 FA	E_ST25 FA
Pharidae	damaged	W1995	23091	H. Adams & A. Adams, 1856			1		14					
THRACIOIDEA	damaged	W2225	382318	Stoliczka, 1870 (1839)		1								
SPATANGOIDA	damaged	ZB213	123106	L. Agassiz, 1840	1		1							
Juvenile														
ANIMALIA	eggs		2											
Cerianthidae	juvenile	D630	100684	Milne Edwards & Haime, 1851										
Glycera	juvenile	P255	129296	Lamarck, 1818		4			1					
Nephtyidae	juvenile	P490	956	Grube, 1850							1			
Ophelia	juvenile	P997	129413	Savigny, 1822										
Bathyporeia	juvenile	S451	101742	Lindström, 1855									1	
Upogebia	juvenile	S1418	107079	Leach, 1814 [in Leach, 1813-1815]										
Thia scutellata	juvenile	S1559	107281	(Fabricius, 1793)										
Liocarcinus	juvenile	S1577	106925	Stimpson, 1871		1								
Portumnus latipes	juvenile	S1596	107400	(Pennant, 1777)	2									
Mytilidae	juvenile	W1691	211	Rafinesque, 1815										1
Spisula	juvenile	W1973	138159	Gray, 1837										
Ensis	juvenile	W1996	138333	Schumacher, 1817					1					
Donacidae	juvenile	W2036	236	J. Fleming, 1828										
Abra	juvenile	W2058	138474	Lamarck, 1818						1			1	
THRACIOIDEA	juvenile	W2225	382318	Stoliczka, 1870 (1839)										
OPHIUROIDEA	juvenile	ZB105	123084	Gray, 1840						1	1			
ECHINOIDEA	juvenile	ZB181	123082	Leske, 1778						1				
SPATANGOIDA	juvenile	ZB213	123106	L. Agassiz, 1840									1	

Taxon	Qualifiers	SDC	APHIA ID	Authority	Sample									
					E_ST15 FA	E_ST16 FA	E_ST18 FA	E_ST19 FA	E_ST20 FA	E_ST21 FA	E_ST22 FA	E_ST23 FA	E_ST24 FA	E_ST25 FA
ASCIDIACEA	juvenile	ZD2	1839	Blainville, 1824									1	
Meiofaunal														
Pelagic														
CHAETOGNATHA		L1	2081											
Number of taxa					**2**	**6**	**4**	**0**	**3**	**6**	**2**	**0**	**5**	**3**
Abundance					**3**	**6**	**2**	**0**	**16**	**3**	**2**	**0**	**4**	**1**

F.2 Macrofaunal Biomass

Taxon	SDC	Sample									
		E_ST01 FA	E_ST02 FA	E_ST03 FA	E_ST04 FA	E_ST07 FA	E_ST09 FA	E_ST11 FA	E_ST12 FA	E_ST13 FA	E_ST14 FA
CNIDARIA	D1		0.0748		0.0221	0.7129		0.0214			
POLYCHAETA	P2	0.2532	0.5871	0.0445	0.4390	0.8510	0.3707	1.3365	0.8171	0.2535	0.6520
OLIGOCHAETA	P1402										
CRUSTACEA	R1	0.0235	0.0113	0.8240		6.6496	0.0314	16.6700	0.0618	0.1942	0.0321
MOLLUSCA	W1	0.0047	0.0256		0.1115	0.0189		0.0014	0.0036	2.1862	2.3878
ECHINODERMATA	ZB2	0.0389	0.0250		13.3408	0.0009	0.0396	21.0168		3.0390	
OTHERS		0.0096	0.3904	0.0081	0.0126	0.6533	0.0077	0.1939		0.0031	
Total		**0.3299**	**1.1142**	**0.8766**	**13.9260**	**8.8866**	**0.4494**	**39.2400**	**0.8825**	**5.6760**	**3.0719**

Notes
Blotted wet weight (g) prior to ash free dry weight conversion

Taxon	SDC	Sample									
		E_ST15 FA	E_ST16 FA	E_ST18 FA	E_ST19 FA	E_ST20 FA	E_ST21 FA	E_ST22 FA	E_ST23 FA	E_ST24 FA	E_ST25 FA
CNIDARIA	D1		0.0032	0.0121		0.4342	3.2244	0.0583			0.1788
POLYCHAETA	P2	0.1034	7.6812	4.9538	0.0707	0.4763	0.5973	0.2093	0.0967	0.2288	0.2276
OLIGOCHAETA	P1402										
CRUSTACEA	R1	0.0282	0.0626	0.0009	0.0008	0.0125	1.1344	0.0278		0.0822	
MOLLUSCA	W1	0.0233	20.1811	3.8183		11.4883	0.0828	0.3271	0.2159	0.0385	0.4762
ECHINODERMATA	ZB2	5.4767	0.0471	2.8116			0.0067	2.5949	11.1021	0.1578	
OTHERS			0.0054	0.0237	0.0065	0.0371	0.0506	0.0031		0.0172	0.0539
Total		**5.6316**	**27.9806**	**11.6204**	**0.0780**	**12.4484**	**5.0962**	**3.2205**	**11.4147**	**0.5245**	**0.9365**

Notes
Blotted wet weight (g) prior to ash free dry weight conversion

Fferm Wynt Alltraeth

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