The Great Grid Upgrade

Sea Link

# Sea Link

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**Interim Subtidal Survey Report (Additional Surveys)**

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DOCUMENT

# VOLUME 5 –
# INTERIM BENTHIC REPORT

PROJECT

# SEA LINK
# ADDITIONAL SURVEY WORKS

EMPLOYER

**National Grid Electricity Transmission PLC (NGET)**

EMPLOYER DOCUMENT CODE

***N/A***

NEXT GEOSOLUTIONS DOCUMENT CODE

**P2097-010-REP-007**

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# DEFINITIONS AND ABBREVIATIONS

| Acronym | Description | Acronym | Description |
|---|---|---|---|
| A5.23 | Infralittoral fine sand | JNCC | Joint Nature Conservation Committee |
| A5.25 | Circalittoral fine sand | LAT | Lowest Astronomical Tide |
| A5.43 | Infralittoral Mixed Sediment | LED | Light-emitting Diode |
| A5.44 | Circalittoral mixed sediments | MAG | Magnetometer |
| BDC | Biodiversity Committee | MBES | Multi Beam Echo Sounder |
| BGS | British Geological Survey | MCZ | Marine Conservation Zone |
| BSL | Benthic Solutions Limited | MESH | Mapping European Seabed Habitats |
| CBD | Conservation of Biological Diversity | NEXT | Next Geosolutions |
| Cefas | Centre for Environment, Fisheries and Aquaculture. | NGET | National Grid Electricity Transmission Plc |
| CTD | Conductivity Temperature Depth | NMMP | National Marine Monitoring Programme |
| DVV | Dual Van Veen Sampler | NMBAQC | National Marine Biological Association Quality Control scheme |
| EBS | Environmental Baseline Survey | N/S | No Sample |
| EC | European Commission | OSPAR | Convention for the Protection of the Marine Environment of the North-East Atlantic |
| EMODnet | European Marine Observation and Data Network | PCA | Principle Component Analyses |
| ETRS | European Terrestrial Reference System | PC | Physio-chemistry |
| EU | European Union | PSA | Particle Size Analysis |
| EUBS | European Union Biodiversity Strategy | PSD | Particle Size Distribution |
| EUNIS | European University Information Systems organisation | SAC | Special Area of Conservation |
| F1 and F2 | Fauna grab samples 1 and 2 | SBP | Sub-bottom Profiler |
| FOCI | Features of Conservation Interest | SCI | Site of Community Importance |
| GIS | Geographic Information System | SSS | Side Scan Sonar |
| HAP | Habitat Action Plan | UK | United Kingdom |
| HAS | Habitat Assessment Survey | UK BAP | United Kingdom Biodiversity Action Plan |
| HD | High Definition | UKCS | United Kingdom Continental Shelf |
| HG | Hamon Grab | UTC | Universal Time Coordinated |
| HVDC | High Voltage Direct Current | UTM 31 | Universal Transverse Mercator – Zone 31 |
| HSG | Herring Spawning Ground | | |

*Where abbreviations used in this document are not included in this list, it may be assumed that they are either equipment brand names or company names.*

## EXECUTIVE SUMMARY

The England and Wales Transmission Owner, National Grid Electricity Transmission Plc (NGET) are developing a High Voltage Direct Current (HVDC) electricity transmission link in the east coast of England from Richborough in Kent to Friston in Suffolk. A comprehensive survey of the main route has already been completed by MMT (2022). However, upon analysing the data, an additional five areas have been identified where the route could potentially avoid hazards or challenging seabed conditions whilst optimising the overall route length.

Next Geosolutions conducted a geophysical survey, acquiring multibeam echosounder data, side scan sonar, sub-bottom profiler and magnetometer aboard the *Shore Presence* between the 6th of November 2023 to the 6th of March 2024. The environmental survey, conducted with the support of Benthic Solutions Limited aboard the *Ievoli Grey* between the 22nd of August and the 2nd of September 2024, aimed to characterise the marine habitats and gather information on the physico-chemical and biological environment, including identifying any EC Habitats Directive Annex I habitats within the five additional survey areas.

The depths across the surveyed areas ranged between 7.3m to 27.4m below LAT. Sediment across the survey site was heterogeneous with most stations in Areas 2, 4 and 5 showing dominance of sand or gravels, stations in Areas 2 and 3 showed mixed sediments and one instance of dominant fines in Area. Sediment characteristics were found to be in line with findings within the previous MMT (2022) survey. The samples collected across the survey areas were represented by three Folk classifications, 'Muddy Sandy Gravel', 'Gravelly Sand', and 'Slightly Gravelly Sandy Mud'.

The survey route consisted of four level four EUNIS (2012) habitats, 'Circalittoral Mixed Sediment' (A5.44), 'Circalittoral Fine Sand' (A5.25), 'Infralittoral Mixed Sediment' (A5.43) and 'Infralittoral Fine Sand' (A5.23). These habitats featured epifauna such as brittlestars (Ophiuroidea), hermit crabs (*Pagurus* sp.) and common sea stars (*Asterias rubens*).

An assessment of Annex I Geogenic Stony Reef was conducted across six transects in Areas 3 and 4 using HD video data, focusing on cobble and boulder coverage, elevation, epifaunal diversity, and patch extent. Results showed low-elevation cobble and boulder coverage, with only the Area 4 transects exhibiting more extensive patches. Although classified as "Low Reef," the limited species diversity—mainly tube worms, faunal turf, and sponges—and the lack of key reef-building species indicated the absence of any Annex I habitat.

The presence of *Sabellaria spinulosa* was analysed to evaluate its potential for forming Annex I Biogenic Reef habitats across four transects in Area 2, focusing on coverage, tube elevation, and patch extent from HD video stills. The results indicated that the area does not qualify as a reef due to insufficient elevation of *S. spinulosa* aggregations. While a few stills were classified as "Low Reef," they were only marginally distinguishable from surrounding "Not a Reef" areas, leading to the site's classification as "Not a Reef.

An assessment of Annex I blue mussel (*Mytilus edulis*) beds was conducted due to observations in Area 5. Using the SACFOR scale adapted from Roberts *et al.* (2012), results showed that coverage at A5_OPB_Add_01 was too sparse and patchy to qualify as an Annex I habitat, with no areas meeting Grade 1 criteria. In contrast, A5_OPB_05_HAS exhibited significant blue mussel coverage, with most stills classified as Grade 1 and forming three large patches, suggesting the presence of a potential Annex I habitat.

The survey route is located in areas designated as lesser sandeel (*Ammodytes marinus*) nursery and low-intensity spawning grounds. PSA data, assessed using methods from Greenstreet *et al*. (2010) and Latto *et al*. (2013), revealed that most stations were classified as 'Unsuitable,' with two stations identified as 'Preferred' due to their predominance of 'Gravelly Sand'. Additionally, the survey route intersects areas designated as high and low-intensity nursery grounds for Atlantic herring (*Clupea harengus*). Using methods outlined in Reach et al. (2013), it was found that most habitats were 'Unsuitable' because of excessive fine content (>5%) or insufficient gravel (<10%). No adult ocean quahogs were identified during field operations, nor were siphons observed in the HD video review; macrofaunal data in the subsequent EBS report will further investigate the presence of juvenile specimens (<1cm shell diameter).

# 1 INTRODUCTION

## 1.1 Project Information and Survey Area

| | |
|---|---|
| **Client:** | National Grid Electricity Transmission PLC (NGET) |
| **Project:** | Sea Link Next Geo NGET |
| **Main Contractor:** | Next GeoSolutions Europe S.p.A. (NEXT) |
| **Main Contractor Reference:** | P2097-010-REP-007 |
| **Subcontractor:** | Benthic Solutions Limited |
| **Survey Areas:** | East of Shipwash, North of the Sunk, Grid Link Crossing and Outer Pegwell Bay (UK). |
| **Survey Type:** | Environmental Baseline Survey (EBS) and Habitat Assessment (HAS) |
| **Survey Period:** | 22/08/2024 – 03/09/2024 |
| **Survey Equipment:** | BSL Double Van Veen Grab, BSL Mini Hamon Grab, MOD4.1 Camera System, MOD4.5 Camera System, BSL Freshwater Lens, Valeport MIDAS 606 CTD. |
| **Main Contractor Project Manager:** | Lucy Cotton (l.cotton@nextgeosolutions.com) |
| **Subcontractor Manager:** | Cinda Houldsworth (cinda.houldsworth@benthicsolutions.com) |

The England and Wales Transmission Owner, National Grid Electricity Transmission Plc (NGET), are developing a High Voltage Direct Current (HVDC) electricity transmission link in the east coast of England from Richborough in Kent to Friston in Suffolk (Figure 1-1). The overall route of the marine cable is 120km with the additional areas to be surveyed adding up to approximately 35km in length. NGET has awarded these additional marine surveys to Next GeoSolutions, supported by Benthic Solutions Limited (BSL), to execute the geophysical, habitat assessment (HAS) and environmental baseline survey (EBS), analysis, interpretation and reporting services for the programme.

This report is focussed on the interim habitat assessment and particle size analysis (PSA) for the survey areas two to five along the Sea Link cable route, located in UKCS Blocks 56 and 52.

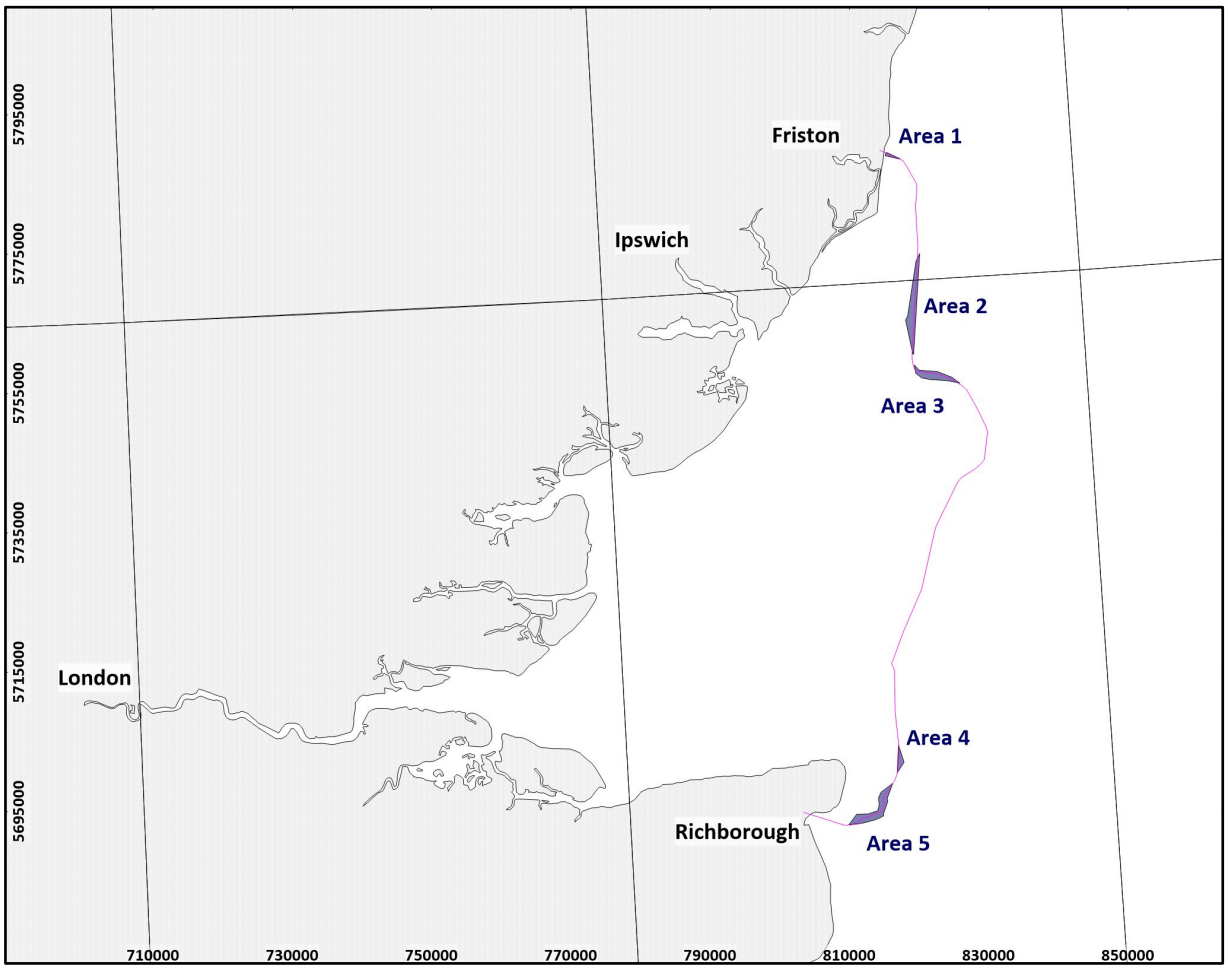



**Figure 1-1 Sea Link Route : East of Shipwash to Outer Pegwell Bay**

## 1.2 Survey Information

The objective of the environmental survey was to acquire all appropriate data for the confirmation of the preferred route for the high voltage direct current (HVDC) cable.

The environmental survey comprised grab sampling for faunal and sediment analyses and seabed imagery. This report covers the interim findings of the environmental survey for a habitat assessment and PSA results. The following final report will discuss the entire suite of sample analysis along with the habitat assessment (Document ref.; P2097-010-REP-005).

## 1.3 Scope of Work

### 1.3.1 Environmental Survey Objectives

The survey included characterisation of the benthos and investigation of the sediment and water column physico-chemistry (PC) and sediment benthic macrofauna to provide an understanding of baseline conditions at each survey area along the route. The specific objectives of the benthic survey are:

- Undertake a review of the acquired geophysical data within the survey area to preliminarily identify all habitats for further investigation and characterisation;
- Follow a benthic sampling plan and methodology agreed with the Client; to support consenting and environmental impact assessment (EIA) requirements.
- Acquire baseline data of PC and sediment biological characteristics across the survey area as well as water profiles from each location.
- Characterise the benthic environment across the sites to assign habitat types to biological level according to JNCC/EUNIS habitat classification systems;
- Identify habitats and species of potential conservation interest, defined as those listed in Annex I of the EC Habitats Directive, the OSPAR List of Threatened and/or Declining Species and Habitats, the UK Post-2010 Biodiversity Framework (formerly the UK Biodiversity Action Plan Priority Habitat descriptions).

## 1.4 Reference documents

The following reports will be provided by BSL, relating to the habitat assessment and environmental baseline surveys conducted at the Sea Link survey areas two to five for the potential cable route installation:

- **P2097-010-REP-008:** Benthic Field Report
- **P2097-010-REP-009:** Preliminary Geophysical Technical Note
- **P2097-010-REP-007:** Interim Benthic Report **(This Report)**
- **P2097-010-REP-005:** Benthic and Environmental Survey Results Report

# 2 SURVEY PARAMETERS

## 2.1 Geodetic Datum and Grid Coordinate System

### 2.1.1 Projection Parameters

The horizontal datum was referenced to the ETRS89 Datum, UTM 31N projection. The geodetic parameters used are provided below in Table 2-1.

**Table 2-1 Projection parameters**

| **Required Datum** | |
|---|---|
| GPS Datum | ETRS1989 |
| **Projection Parameters** | |
| Projection | UTM 31N |
| Central Meridian | 03° 00′ 00.0″ E |
| Latitude of Natural Origin | 00° 00′ 00.0″ E |
| False Easting | 500 000 m |
| False Northing | 0 m |
| Scale Factor at Origin | 0.9996 at CM |

### 2.1.2 Vertical Datum

The vertical datum for the marine survey operations is the LAT (Lowest Astronomical Tide). Height data was acquired in relation to the ellipsoid and translated to the project vertical datum (LAT) as defined by the United Kingdom Office Vertical Offshore Reference Frame (VORF) geoid model at the project location.

# 3 SURVEY PERFORMANCE

## 3.1 Survey Tasks

The environmental work scope was completed by BSL aboard the *Ievoli Grey* on a 24-hour operational basis. The vessel was provided by NEXT and was mobilised in Aberdeen, Scotland on the 23rd of August 2024 and demobilised in Great Yarmouth on the 3rd of September 2024. A summary of the survey operations is given in Table 3-1.

**Table 3-1 Environmental Survey Tasks**

| Date | Activity | Details of Activity |
|---|---|---|
| 22/08/2024 | Travel/Standby | Travel to Aberdeen. Standby for vessel transfer. |
| 23/08/2024 | Standby/Transfer | Transfer to vessel at Aberdeen port. |
| 24/08/2024 | Transit/Operations | USBL calibrations offshore. Transit to Great Yarmouth. |
| 25/08/2024 | Transit | Transit to Great Yarmouth. |
| 26/08/2024 | Arrival/Standby | Vessel arrives at Great Yarmouth. |
| 27/08/2024 | Standby | Kick-off and HIRA meetings. |
| 28/08/2024 | Mobilisation | Benthic mobilisation. |
| 29/08/2024 | Operations | Camera ops: A2_ES_01 to A3_NS_01. |
| 30/08/2024 | Operations | Camera & grab ops: A2_ES_01 to A5_OPB_01. Weather standby. |
| 31/08/2024 | Standby (Weather) | Waiting on weather. |
| 01/09/2024 | Operations | Camera & grab ops: A4_GLC_01 to A5_OPB_04. Winch issues. |
| 02/09/2024 | Operations/Transit | Camera ops: A5_OPB_Add_01, A2_ES_Add_01, transit to Great Yarmouth. |
| 03/09/2024 | Demobilisation | Benthic demobilisation. Samples sent to BSL office. |

### 3.1.1 Mobilisation

The initial Mobilisation commenced on the 28th of August 2024 in Great Yarmouth, UK, and was completed on the 2nd of September, 2024. For further details, please refer to the Benthic Field Report (Document ref.: P2097-010-REP-008).

### 3.1.2 Environmental Survey Operations

Out of the 11 proposed grab stations, 8 were successfully sampled with two stations removed from the scope, and one station's sampling attempt was unsuccessful. 14 of the original 18 proposed water profiling locations were acquired, with an additional three taken at camera transects, totalling 17 acquired water column profiles. Finally, 14 of the 18 planned camera transects were carried out with three removed from the scope and one required a re-run. Please refer to Appendix H – SAMPLE LOG SHEETS for sample positions for grabs and camera transects.

### 3.1.3 Demobilisation

The personnel conducting the environmental survey for Sea Link completed demobilisation in Great Yarmouth, UK on the 3rd September 2024.

## 3.2 Survey Vessel

The Environmental survey operations were conducted by the survey vessel *Ievoli Grey,* vessel specifications are detailed within Table 3-2. A complete list of survey equipment is provided in Table 3-3.

**Table 3-2 Survey Vessel Details**

| Parameter | Detail | Parameter | Detail |
|---|---|---|---|
| Name | *Ievoli Grey* | Helideck (yes/no) | No |
| Flag | Italian | Gross Ton (T) | 2995 |
| Built (year) | 2013 | Endurance (days) | 28 |
| Length OA (m) | 72m | Main Engine (-) | Main Engine Wartsila 12V M26 2 x 4000Kw at 1000 rpm |
| Breadth OA (m) | 17m | Bow thrusters (-) | 2 Tunnel Bow Thruster 2 x 900Kw / 1200Bhp - 1 Tunnel Stern Thruster 1 x 900Kw / 1200Bhp |
| Draft (m) | 6.35m | Accommodation. (No.) | 40 |
| DP capacity (yes/no) | Yes | | |

**Table 3-3 Vessel Equipment**

| Function | Type |
|---|---|
| Primary grab sampler | BSL Double Van Veen Grab (DVV) |
| Secondary grab sampler (in coarse sediments) | Mini Hamon Grab |
| Processing of fauna samples | *Wilson* Auto-siever |
| Primary camera system | MOD 4.1 Camera System with FWL |
| Secondary camera system | MOD 4.5 Camera System (Compatible with FWL) |
| CTD Profiler | Valeport MIDAS 606 CTD |

## 3.3 Deviations from the Work Scope

Due to the shallow depth in Area 5, two grab locations (A5_OPB_02 and A5_OPB_03) were removed from the Scope of Work as per discussions with the Client (Document ref.: ECF_001, Reference No: 2353) (Appendix L – ENVIRONMENTAL CONCESSION FORMS.

One grab location (A4_GLC_02) was unsuccessful after attempting sampling with the DVV and Mini Hamon grab, as well as moving location 50m from the original position.

Three transects in Area 5 were removed from the Scope of Work as per discussion with the Client due to shallow depths in these areas (Document ref.: ECF_001, Reference No: 2353) (Appendix L – ENVIRONMENTAL CONCESSION FORMS. The shallowest station (A5_OPB_03), was attempted during high tide when operations could commence safely, however, camera and grab operations were unable to be accomplished due to vessel working limits and shallow depth. One transect (A4_GLC_03_A) was rerun to improve video quality

Three additional transects selected in the field were acquired to investigate the presence of the sensitive species *Sabellaria spinulosa* (A2_ES_ADD_01 and A2_ES_ADD_02), as well as the presence of blue mussel (*Mytilus edulis*) beds (A5_OPB_ADD_01).

# 4 METHODOLOGY

The benthic survey was performed using grab samplers and a video and still camera system. Sample sites were selected using the information provided from the geophysical survey data and in accordance with the requirements of the Client.

## 4.1 Field Methods

### 4.1.1 Survey Design

Prior to sampling operations, sidescan sonar (SSS) and multibeam echosounder (MBES) data were collected in the five additional areas of the Sea Link route. This data was reviewed to inform the survey strategy by BSL with input from NEXT. All sampling stations were approved by the Client prior to the environmental survey commencing.

A total of 11 environmental sampling stations were proposed across the five additional survey areas, targeting seabed features and varying sediment types, all with corresponding 50-150m camera transects. An additional seven camera transects were proposed to provide an enhanced regional understanding of different habitats encountered.

### 4.1.2 Photo and Video Sampling

Seabed video footage was the BSL MOD 4.1 camera system within the BSL freshwater lens fitted with a 5cm laser scale, to ground-truth all grab locations, and additional transects were performed to increase coverage of the site and target features observed within the geophysical data. Once at the seabed, the camera system was towed along the transect line as close to the seabed as possible to acquire high-quality imagery at a speed of approximately 0.3 - 0.5 knots, at an elevation of between 0.3 - 1.0 m above the seafloor. Best efforts were made to minimise the contact with the seabed throughout the transects. Live video footage, overlaid with the date, time, position and site details were viewed in real-time, and were recorded by BSL personnel. High-definition stills images were taken at regular intervals along the transects. Upon recovery of the camera, data was backed onto a second storage medium to prevent inadvertent loss of information.

### 4.1.3 Particle Size Analysis

Sediment was sampled for PSA and chemical analyses at each benthic grab sample site. The sediment was sampled using a Double Van Veen (DVV) in softer sediments and a Mini Hamon Grab (HG) in areas of coarser material. From these grabs, a PSA sample was taken as well as a physico-chemical (PC) sample to undergo analysis of heavy-metals and hydrocarbon analysis.

### 4.1.4 Faunal Grab Sampling and Sample Preservation

All fauna samples were sieved using the *Wilson* Auto-siever (WAS) over a 5mm and a 0.5mm mesh sieve. These specific sieve sizes were used to replicate the sampling method applied by MMT (2022; Document ref: 103748-NAT-MMT-SUR-REP-ENVSURRE). The inner grab buckets were cleaned before deployment for any new station to avoid contamination. Samples were subject to quality control on recovery and were flagged if they did not meet the following requirements:

- Water above sample was undisturbed
- Bucket closure complete (no sediment washout)
- Sampler was retrieved perfectly upright
- Inspection/access doors had closed properly
- Sample size was at least 40% of the sampler's capacity
- No hagfish (*Myxine glutinosa*) and/or mucus coagulants

Key observations from samples included colour, sediment classification, layering, smell (including the presence of $H_2S$), obvious fauna, evidence of bioturbation and anthropogenic debris, including artefacts of archaeological importance. Sub-sampling of physico-chemical parameters was undertaken from the grab samples with the following material retrieved from the surface sediments for later analysis:

- Hydrocarbons (stored in a pre-washed glass jar)
- Heavy & trace metals and Total Organic Carbon & Total Organic Matter (stored in doubled lined ziplock plastic bag)
- Particle size distribution (PSA; stored in doubled lined ziplock plastic bag)

The preservation of materials was undertaken using standard techniques. All physico-chemical samples were stored in appropriate containers (i.e. glass for hydrocarbons and plastics for metals and PSA) and immediately frozen and stored (<-18°C) for later transportation (frozen) to the laboratory upon demobilisation. Macrofaunal samples were fixed in 5-10% buffered formalin. This material will be later transferred to Industrial Methylated Spirit (IMS). All biological samples were double-labelled with internal and external tags.

## 4.2 Laboratory Methods

### 4.2.1 Particle Size Analysis

The samples recovered from each site were analysed by BSL which is accredited under the National Marine Biological Association Quality Control scheme (NMBAQC) for PSA analysis.

The sample was homogenised and split into a small sub-sample for laser diffraction and the remaining material was sieved through stainless steel sieves with mesh apertures from 63mm down to 1mm. In most cases almost the entire sample would pass through the sieve stack, but any material retained on the sieve, such as small shells, shell fragments and stones were removed and the weight was recorded.

The smaller sub-sample was wet screened through a 1000µm sieve and determined using a Malvern Mastersizer 3000 particle sizer according to Standard Operating Procedures (SOP). The results obtained by a laser sizer have been previously validated by comparison with independent assessment by wet sieving (Hart, 1996). The range of sieve sizes, together with their Wentworth classifications (Appendix F – DATA PRESENTATION, LABORATORY AND STATISTICAL ANALYSES. For additional quality control, all datasets were run through the Mastersizer in triplicate and the variations in sediment distributions assessed to be within the 95% percentile.

The separate assessments of the fractions above and below 1000µm were combined using a computer programme. This followed a manual input of the sieve results for fractions >63mm, 63mm-45mm, 45mm-31.5mm, 31.5mm-22.4mm, 22.4mm-16mm, 16mm-11.2mm, 11.2mm-8mm, 8mm-5.6mm, 5.6mm-4mm, 4mm-2.8mm, 2.8mm-2mm, 2mm-1.4mm and 1.4mm-1mm fractions and the electronic data captured by the Mastersizer below 1000µm.

This method defines the particle size distributions in terms of Phi mean, median, fraction percentages (i.e. coarse sediments, sands and fines), sorting (mixture of sediment sizes) and skewness (weighting of sediment fractions above and below the mean sediment size; Folk 1954). For more information on laboratory analyses please refer to Appendix F – DATA PRESENTATION, LABORATORY AND STATISTICAL ANALYSES.

## 4.3 Data Analyses

### 4.3.1 Visual Data Analysis

The stills were analysed to identify species including seabed substrate. The video recordings were used to aid in the assessment of features and extent of habitats. Particular attention was paid to the elevation of habitats above ambient seabed level, together with their spatial extent, percentage biogenic cover and patchiness, as these are key criteria for evaluating areas of conservation importance and reef structures (Gubbay, 2007; Irving, 2009).

### 4.3.2 Particle Size Analysis

Sediment particle size distribution statistics for each sample were calculated from the raw data by BSL's internal laboratory. The distribution curve compositions are present in Appendix G – PARTICLE SIZE DISTRIBUTION

### 4.3.3 Multivariate Statistical Analysis

Multivariate analysis of samples was undertaken using the PRIMER 7 software (Clarke *et al.*, 2014).

*Similarity Matrices and Hierarchical Agglomerative Clustering (CLUSTER)*

A similarity matrix is used to compare every individual sample station with each other. The coefficient used in this process is based upon Euclidean distance considered to be the most suitable for environmental data. These are subsequently assigned into groups according to their level of similarity and clustered together based upon a Group Average Method into a dendrogram of similarity.

*Similarity Profiling (SIMPROF)*

Analyses data for significant clusters that show evidence of a multivariate pattern in data that are a priori unstructured, i.e. single samples from each site. The test works by comparing samples which have been ranked and ordered by resemblance against an expected profile which is obtained by permuting random variables across the set of samples, a mean of 1000 permutations is taken to produce an expected result for null structure with rare and common species displaying the same pattern. If the actual data deviates outside the 95% limits of the expected profile, then there is evidence for significant structure and vice versa. The 'significant structure' is well represented on a dendrogram which will also show the clusters containing that lack significant differentiation (null structure), (Clarke & Gorley, 2006).

*Principle Component Analyses (PCA)*

This analysis is used to reduce the number of variables of larger data sets to smaller ones while still preserving as much information as possible. The PCA looks for patterns in the data and detects similarities or correlations between variables and brings out the strongest pattern in the data set which can then be further explored.

## 4.4 Habitat Classification

Habitat descriptions have been interpreted from the side scan sonar (SSS) and bathymetric data acquired during the current survey. Global Mapper V20 GIS software was used to review the SSS mosaic (Geotiff) and multibeam bathymetry data (Geotiff and xyz) and to delineate areas of different seabed habitats. In addition, information on seabed sediment types and faunal communities from seabed photography and grab sampling, and the predicted seabed habitat map produced by EMODnet was utilised in the habitat investigation across the Sea Link survey area.

## 4.5 Protected Habitat and Species Assessments

### 4.5.1 EMODnet Predicted Habitat Distributions

To further aid interpretation, comparison has been made with the predicted seabed habitat distribution data produced by the European marine observation and data network (EMODnet). EMODnet is a long-term marine data initiative developed through a stepwise approach to collect data and build on existing databases to provide access to European marine data across seven discipline-based themes: bathymetry, geology, seabed habitats, chemistry, biology, physics, and human activities (EMODnet, 2021). The broad-scale seabed habitat map is a predictive delineation of habitats within all European seas to the EUNIS classification system (EMODnet, 2022). Formulated through international (OSPAR) and national monitoring programmes in collaboration with European projects such as MESH or Mesh Atlantic the predicted seabed habitat map can be a useful resource in confidently assigning biotopes within a given survey area (Figure 4-1).

### 4.5.2 Legislative Background

#### 4.5.2.1 UK Post-2010 Biodiversity Framework

The 'UK Post-2010 Biodiversity Framework' was released in July 2012 as a replacement for the UK Biodiversity Action Plan (UKBAP) and 'Conserving Biodiversity – the UK Approach'. It reflects a shift in strategic direction prompted by the publication of the CBDs 'Strategic Plan for Biodiversity 2011-2010' and the introduction of the EU Biodiversity Strategy (EUBS) in May 2011.

The UKBAP (2008) outlines priority species and habitats earmarked for protection, including 22 marine and coastal habitats of particular importance. Key habitats relevant to the survey area include:

- Subtidal Chalk
- Fragile Sponge and Anthozoan Communities on Subtidal Rocky Habitat
- *Sabellaria spinulosa* Reefs
- Subtidal Sands and Gravels
- Horse Mussel Beds
- File Shell Beds
- Maerl Beds
- Serpulid Reefs
- Geogenic Reefs
- Blue Mussel Beds on Sediment

#### 4.5.2.2 OSPAR Commission

At its Biodiversity Committee (BDC) meeting in 2003, OSPAR agreed to proceed with a programme to collate existing data on the distribution of fourteen key habitats, as part of a wider programme to develop measures for their protection and conservation. The UK agreed to compile the relevant data for its marine waters and submit these for collation into composite maps on the distribution of each habitat type across the whole OSPAR area. The work is being coordinated by the Joint Nature Conservation Committee (JNCC). Key OSPAR habitats that may occur in coastal/open water marine environment include: "*Sabellaria spinulosa* Reefs", "*Modiolus modiolus* Beds", and "*Arctica islandica*" (OSPAR, 2008a).

#### 4.5.2.3 European Habitats Directive

The United Kingdom, a signatory of the Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention, 1979), adopted the European Community Habitats Directive in 1992 to fulfil its obligations under the convention. This Directive mandates member states to undertake various measures including, protecting species listed in Annexes, monitoring habitats and species, and submitting reports every six years on Directive Implementation.

The Directive lists 189 habitats in Annex I and 788 species in Annex II, which Member States must protect through a network of sites. Each Member State must propose a national list of sites for evaluation, leading to the establishment of a European network of Sites of Community Importance (SCIs). Eventually, these sites will be designated as Special Areas of Conservation (SACs) and, together with Special Protection Areas (SPAs) under the EC Birds Directive (2009), form the Natura 2000 protected area network. The Directive underwent amendments in 1997 and 2003.

Implementation of the Habitats Directive in offshore waters began in 2000, identifying potential habitats for SAC selection in UK offshore waters. Relevant habitats for this region include Sub-tidal reefs and Submarine structures formed by leaking gases. The Directive applies the precautionary principle to protect sensitive areas, allowing projects only if they do not adversely affect site integrity.

Following the UK's exit from the European Union (EU), new regulations have transposed the land and marine aspects of the Habitats Directive and Wild Birds Directive. The Conservation of Habitats and Species (EU exit) Regulations 2019, effective from January 1, 2021, amended the 2017 regulations to ensure their continued functionality post-EU exit. These amendments primarily transferred functions from the European Commission to authorities in England and Wales, while retaining existing processes and terms (GOV.UK, 2022).

#### 4.5.2.4 The UK Marine Monitoring Programme

The UK National Marine Monitoring Programme (NMMP) was established in response to the 1986 House of Lords select committee on marine science and technology, who recommended that a common approach to marine monitoring should be established to comply with the international and national commitments (OSPAR Convention and EC Directives). The NMMP focuses on stable depositional sites and records data on sediment chemistry, biological communities, the bioaccumulation of heavy metals (cadmium, mercury and lead) and their ecological effects (Bordin *et al.*, 1992; McLeese *et al.*, 1987).

A National Marine Biology Analytical Quality Control Scheme (NMBAQC) was established in 1992 to establish quality assurance standards for the biological aspects of the NMMP. Similar schemes were set up for chemical (NMCAQC) and ecotoxicological monitoring (NMEAQC) (Davies *et al.*, 2001). The NMCAQC scheme was subsequently renamed the National Marine Chemistry Advisory Group (NMCAG) and the terms of reference for this group were updated in 2007.

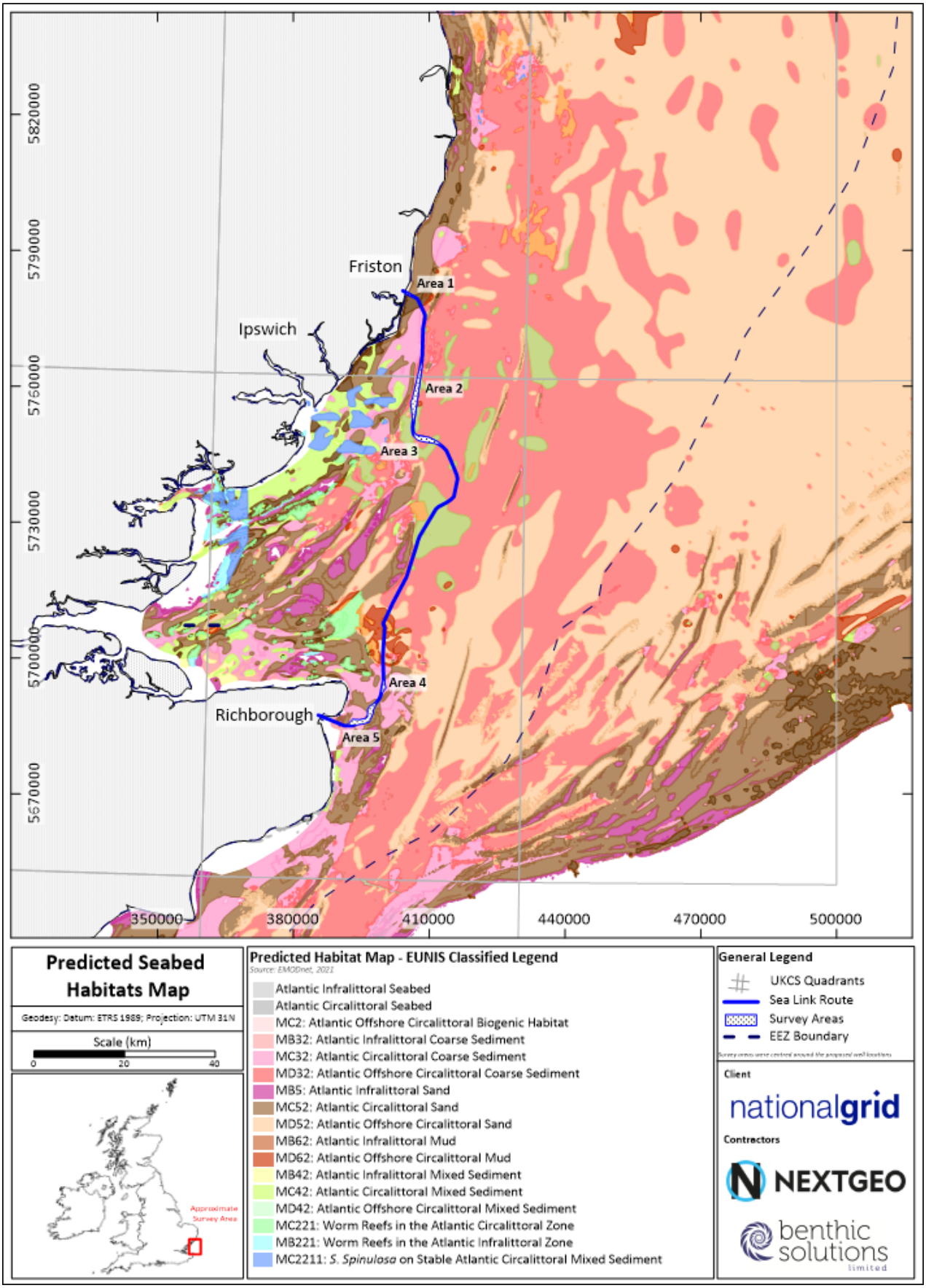



**Figure 4-1 EMODnet Predicted Seabed Habitats Map in Relation to Survey Area**

# 5 RESULTS

A total of 8 grab sampling stations were completed with a full suite of PSA/PC/Fauna samples retained, as well as 17 camera transects were acquired, paired with 17 acquired CTD profiles, which will be discussed in the following final deliverable (Document ref.: P2097-010-REP-005).

See Table 5-1 for the summary of acquired data, Table 5-2 for the acquired grab stations and Table 5-2 Summary of Completed Grab Stations

| Geodetics; ETRS89, UTM 31N | | | | |
|---|---|---|---|---|
| **Station** | **Easting (m)** | **Northing (m)** | **Grab Sampling** | |
| | | | **PC** | **Fauna** |
| A2_ES_01 | 407 815 | 5 762 429 | ✓ | ✓ |
| A2_ES_02 | 407 344 | 5 759 565 | ✓ | ✓ |
| A2_ES_03 | 406 826 | 5 756 145 | ✓ | ✓ |
| A2_ES_04 | 406 419 | 5 752 338 | ✓ | ✓ |
| A3_NS_01 | 408 455 | 5 748 522 | ✓ | ✓ |
| A4_GLC_01 | 399 550 | 5 693 348 | ✓ | ✓* |
| A4_GLC_02 | 399 794 | 5 694 996 | N/S | N/S |
| A4_GLC_03 | 399 278 | 5 691 871 | ✓ | ✓* |
| A5_OPB_01 | 396 886 | 5 687 396 | ✓ | ✓ |
| *Notes:*<br>*"PC" = Physico-chemistry (Particle Size Analysis, Total Organic Carbon and Matter, Hydrocarbons, Heavy and Trace Metals)*<br>*"*"= Small sample (<40% retention) however, sample collected as alternate*<br>*"N/S" = No sample acquired* | | | | |

Table 5-3 for the acquired camera transects.

**Table 5-1 Number of Sample Stations**

| Number of Sample Sites | Camera Transects | Grab Sample Stations | PSA/PC Sample Stations | CTD Profiles |
|---|---|---|---|---|
| | 17 | 8 | 8 | 17 |

**Table 5-2 Summary of Completed Grab Stations**

| Geodetics; ETRS89, UTM 31N | | | | |
|---|---|---|---|---|
| **Station** | **Easting (m)** | **Northing (m)** | **Grab Sampling** | |
| | | | **PC** | **Fauna** |
| A2_ES_01 | 407 815 | 5 762 429 | ✓ | ✓ |
| A2_ES_02 | 407 344 | 5 759 565 | ✓ | ✓ |
| A2_ES_03 | 406 826 | 5 756 145 | ✓ | ✓ |
| A2_ES_04 | 406 419 | 5 752 338 | ✓ | ✓ |
| A3_NS_01 | 408 455 | 5 748 522 | ✓ | ✓ |
| A4_GLC_01 | 399 550 | 5 693 348 | ✓ | ✓* |
| A4_GLC_02 | 399 794 | 5 694 996 | N/S | N/S |
| A4_GLC_03 | 399 278 | 5 691 871 | ✓ | ✓* |
| A5_OPB_01 | 396 886 | 5 687 396 | ✓ | ✓ |

| Geodetics; ETRS89, UTM 31N | | | |
|---|---|---|---|
| **Station** | **Easting (m)** | **Northing (m)** | **Grab Sampling** |
| | | | **PC** / **Fauna** |

*Notes:*
*"PC" = Physico-chemistry (Particle Size Analysis, Total Organic Carbon and Matter, Hydrocarbons, Heavy and Trace Metals)*
*"*"= Small sample (<40% retention) however, sample collected as alternate*
*"N/S" = No sample acquired*

**Table 5-3 Summary of Completed Camera Transects**

| Geodetics; ETRS89, UTM 31N | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Transect** | | **Date** | **Time (UTC)** | **Easting (m)** | **Northing (m)** | **Video footage (mm: ss)** | **HD Video Quality** | **SD Video Quality** |
| A2_ES_01 | SOL | 29/08/2024 | 13:08:58 | 407 799 | 5 762 436 | 11:17 | ✓ | ✓ |
| | EOL | | 13:20:15 | 407 898 | 5 762 412 | | | |
| A2_ES_02 | SOL | 29/08/2024 | 14:54:20 | 407 302 | 5 759 548 | 12:35 | ✓ | ✓ |
| | EOL | | 15:06:55 | 407 408 | 5 759 583 | | | |
| A2_ES_03* | SOL | 29/08/2024 | 16:52:30 | 406 867 | 5 756 096 | 19:30 | ✓ | ✓ |
| | EOL | | 17:11:50 | 406 754 | 5 756 210 | | | |
| A2_ES_04 | SOL | 29/08/2024 | 20:14:00 | 406 412 | 5 752 292 | 11:30 | ✓ | ✓ |
| | EOL | | 20:25:30 | 406 430 | 5 752 403 | | | |
| A2_ES_05_HAS | SOL | 29/08/2024 | 18:42:35 | 406 509 | 5 754 562 | 16:52 | ✓ | ✓ |
| | EOL | | 18:59:27 | 406 451 | 5 754 701 | | | |
| A2_ES_ADD_01 | SOL | 02/09/2024 | 22:43:52 | 406 513 | 5 754 735 | 10:18 | ✓ | ✓ |
| | EOL | | 22:54:10 | 406 496 | 5 754 649 | | | |
| A2_ES_ADD_02_A | SOL | 02/09/2024 | 21:57:58 | 406 493 | 5 754 602 | 11:32 | ✓ | ✓ |
| | EOL | | 22:09:30 | 406 547 | 5 754 652 | | | |
| A3_NS_01 | SOL | 29/08/2024 | 22:27:12 | 408 394 | 5 748 504 | 10:48 | ✓ | ✓ |
| | EOL | | 22:38:00 | 408 499 | 5 748 537 | | | |
| A3_NS_02_HAS* | SOL | 30/08/2024 | 00:05:30 | 411 282 | 5 747 288 | 09:30 | ✓ | ✓ |
| | EOL | | 00:15:00 | 411 374 | 5 747 305 | | | |
| A3_NS_03_HAS | SOL | 30/08/2024 | 00:34:00 | 411 454 | 5 747 317 | 12:45 | ✓ | ✓ |
| | EOL | | 00:46:45 | 411 563 | 5 747 370 | | | |
| A4_GLC_01* | SOL | 01/09/2024 | 09:03:20 | 399 546 | 5 693 322 | 06:50 | ✓ | ✓ |
| | EOL | | 09:10:10 | 399 556 | 5 693 389 | | | |
| A4_GLC_02* | SOL | 01/09/2024 | 02:30:00 | 399 773 | 5 695 092 | 14:00 | ✓ | ✓ |
| | EOL | | 02:44:00 | 399 805 | 5 694 967 | | | |
| A4_GLC_03_A* | SOL | 01/09/2024 | 13:27:00 | 399 310 | 5 691 952 | 20:00 | ✓ | ✓ |
| | EOL | | 13:47:00 | 399 266 | 5 691 838 | | | |
| A5_OPB_01* | SOL | 30/08/2024 | 21:37:00 | 396 900 | 5 687 404 | 12:00 | ✓ | ✓ |
| | EOL | | 21:48:58 | 396 869 | 5 687 369 | | | |
| A5_OPB_02 | SOL | - | - | 407 305 | 5 759 552 | - | - | - |
| | EOL | | | 407 401 | 5 759 584 | | | |
| A5_OPB_03 | SOL | 01/09/2024 | - | - | - | - | - | - |
| | EOL | | - | - | - | | | |
| A5_OPB_04_HAS* | SOL | 01/09/2024 | 18:09:04 | 397 284 | 5 688 336 | 13:00 | ✓ | ✓ |
| | EOL | | 18:22:00 | 397 253 | 5 688 423 | | | |
| A5_OPB_05_HAS | SOL | 30/08/2024 | 20:19:00 | 396 556 | 5 686 646 | 16:00 | ✓ | ✓ |

| Geodetics; ETRS89, UTM 31N | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Transect** | | **Date** | **Time (UTC)** | **Easting (m)** | **Northing (m)** | **Video footage (mm: ss)** | **HD Video Quality** | **SD Video Quality** |
| | EOL | | 20:35:00 | 396 500 | 5 686 781 | | | |
| A5_OPB_ADD_01* | SOL | 02/09/2024 | 00:51:00 | 396 438 | 5 686 901 | 21:00 | ✓ | ✓ |
| | EOL | | 01:12:00 | 396 320 | 5 686 745 | | | |
| A5_OPB_06_HAS | SOL | - | - | 395 520 | 5 686 312 | - | - | - |
| | EOL | | | 395 554 | 5 686 192 | | | |
| A5_OPB_07_HAS | SOL | - | - | 394 361 | 5 685 625 | - | - | - |
| | EOL | | | 394 260 | 5 685 636 | | | |

*Notes:*
*The suffix "_A" denotes where camera transect was re-run.*
"✓" Data acceptable for habitat assessment.
*"-" Unable to obtain data after attempt.*
*"*" Poor visibility due to high turbidity.*
*"Greyed" are stations abandoned as per Client agreement.*

## 5.1 Particle Size Analysis

### 5.1.1 Univariate Analysis of Sediment

The results of particle size analyses indicated a heterogeneous sediment type across the Sea Link route (Table 5-4). The seabed sediments across the route were primarily dominated by either sand (mean 45.1%±25.7SD) or gravel (mean 32.8%±24.0SD). The heterogeneity of the sediment was demonstrated by a high coefficient of variation for the proportion of sands (56.9%), gravel (73.3%) and fines (87.6%).

Proportions of sand ranged from 16.7% at station A2_ES_01 to 86.8% at station A5_OPB_01 (Figure 5-1). Stations with the highest proportions of sand (A5_OPB_01 and A2_ES_04) aligned with the defined area of Infralittoral Fine Sand (A5.23) in the northern extent of Area 5 as well as Circalittoral Fine Sand (A5.25) seen in the southern extent of Area 2. This was also reflected in the mean sand per survey area within the previous MMT report (MMT, 2022), which observes highest mean sands within Area 5 and Area 2 Table 5-4 ). No significant Spearman's correlation was apparent between the proportion of sands and water depth ($p>0.05$) (Appendix K – SPEARMAN'S CORRELATION).

Gravel content ranged from 1.4% at station A2_ES_02 to 67.8% at station A2_ES_01 (Figure 5-1). While Area 2 exhibited both the highest and lowest gravel content amongst the stations, analysis of the average gravel percentages per area, shows a different pattern. Both this study and the previous MMT study identified Area 4 as having the lowest mean gravel content and Area 5 as the highest, highlighting heterogeneity across the surveyed areas. Fines content also varied, with the lowest proportion (3.0%) noted in the southern extent at A5_OPB_01, while the maximum (63.2%) was noted within Area 2 at station A2_ES_02. The variation was consistent with the mean fines data per area, where both the current and historical MMT reports had Area 2 as having the highest average fines. No significant Spearman's correlation was apparent between the proportion of gravel or fines and water depth ($p>0.05$).

The Folk (1954) and Wentworth (1922) classifications for each station are listed in Table 5-4. The Wentworth classification assigns a single sediment class based on the mean particle size and is appropriate for well sorted modal sediments, dominated by a narrow range of sediment particle sizes. The Folk classification provides a more representative description for poorly sorted sediments, encompassing a range of particle sizes as it takes into account the relative proportions of mud (<63µm), sand (63µm-2mm) and gravel (>2mm) fractions. For the purposes of this study, we have used the modified Folk classification produced by the British Geological Survey (Long, 2006).

The samples collected in the survey area were represented by three Folk classifications with the majority of stations assigned as the 'Muddy Sandy Gravel' classification. The remaining stations were allocated as either 'Gravelly Sand' or Slightly Gravelly Sandy Mud', reflecting the variation in seabed sediment types across the overall survey area (Table 5-4).

The Wentworth classification scale identified five different sediment classifications, with more than one station assigned as either 'Coarse Sand', 'Medium Sand' or 'Granule' whilst the 'Very Coarse Sand' and 'Medium Silt' were each assigned to just one station. All stations were classified as either Poorly Sorted, Very Poorly Sorted or Extremely Poorly Sorted, suggesting a natural variation in sediment composition throughout the four areas.

**Table 5-4 Summary of Surface Particle Characteristics**

| Station | Depth (m) | Mean Sediment Size | | Wentworth Classification | Sorting Coefficient | Sorting Classification | Fines (%) | Sands (%) | Gravel (%) | Modified Folk Scale |
|---|---|---|---|---|---|---|---|---|---|---|
| | | (mm) | (Phi) | | | | | | | |
| A2_ES_01 | 17.7 | 3.68 | -1.88 | Granule | 4.37 | Extremely Poorly Sorted | 15.5 | 16.7 | 67.8 | Muddy Sandy Gravel |
| A2_ES_02 | 22.9 | 0.03 | 5.19 | Medium Silt | 2.55 | Very Poorly Sorted | 63.2 | 35.4 | 1.4 | Slightly Gravelly Sandy Mud |
| A2_ES_03 | 24.7 | 0.26 | 1.95 | Medium Sand | 4.08 | Extremely Poorly Sorted | 30.4 | 36.2 | 33.4 | Muddy Sandy Gravel |
| A2_ES_04 | 21.6 | 0.52 | 0.94 | Coarse Sand | 1.70 | Poorly Sorted | 7.1 | 82.8 | 10.1 | Gravelly Sand |
| A3_NS_01 | 22.8 | 0.28 | 1.85 | Medium Sand | 4.37 | Extremely Poorly Sorted | 31.0 | 33.8 | 35.2 | Muddy Sandy Gravel |
| A4_GLC_01 | 13.5 | 1.53 | -0.62 | V. Coarse Sand | 3.67 | Very Poorly Sorted | 11.0 | 42.2 | 46.7 | Muddy Sandy Gravel |
| A4_GLC_03 | 11.5 | 2.16 | -1.11 | Granule | 4.14 | Extremely Poorly Sorted | 15.9 | 26.9 | 57.2 | Muddy Sandy Gravel |
| A5_OPB_01 | 11.8 | 0.76 | 0.40 | Coarse Sand | 1.15 | Poorly Sorted | 3.0 | 86.8 | 10.2 | Gravelly Sand |
| **Route Mean** | | **1.15** | **0.84** | | **3.25** | | **22.1** | **45.1** | **32.8** | |
| **SD** | | **1.25** | **2.23** | | **1.28** | | **19.4** | **25.7** | **24.0** | |
| **CV (%)** | | **108.5** | **265** | | **39.25** | | **87.6** | **56.9** | **73.3** | |
| **Minimum** | | **0.03** | **-1.88** | | **1.15** | | **3.0** | **16.7** | **1.4** | |
| **Maximum** | | **3.68** | **5.19** | | **4.37** | | **63.2** | **86.8** | **67.8** | |
| **Area Mean** | | | | | | | | | | |
| **Area 2** | | **1.12** | **1.55** | | **3.17** | | **29.0** | **42.8** | **28.2** | |
| **Area 3** | | **0.28** | **1.85** | | **4.37** | | **31.0** | **33.8** | **35.2** | |
| **Area 4** | | **1.85** | **-0.86** | | **3.90** | | **13.5** | **34.5** | **52.0** | |
| **Area 5** | | **0.76** | **0.40** | | **1.15** | | **3.0** | **86.8** | **10.2** | |
| **Historical Data (MMT, 2021)** | | | | | | | | | | |
| **MMT Route Mean** | | | | | | | **18.4** | **66.5** | **15.1** | |
| **Area 2** | | | | | | | **18.4** | **59.2** | **22.4** | |
| **Area 4** | | | | | | | **9.0** | **45.0** | **46.0** | |
| **Area 5** | | | | | | | **14.2** | **79.9** | **5.9** | |

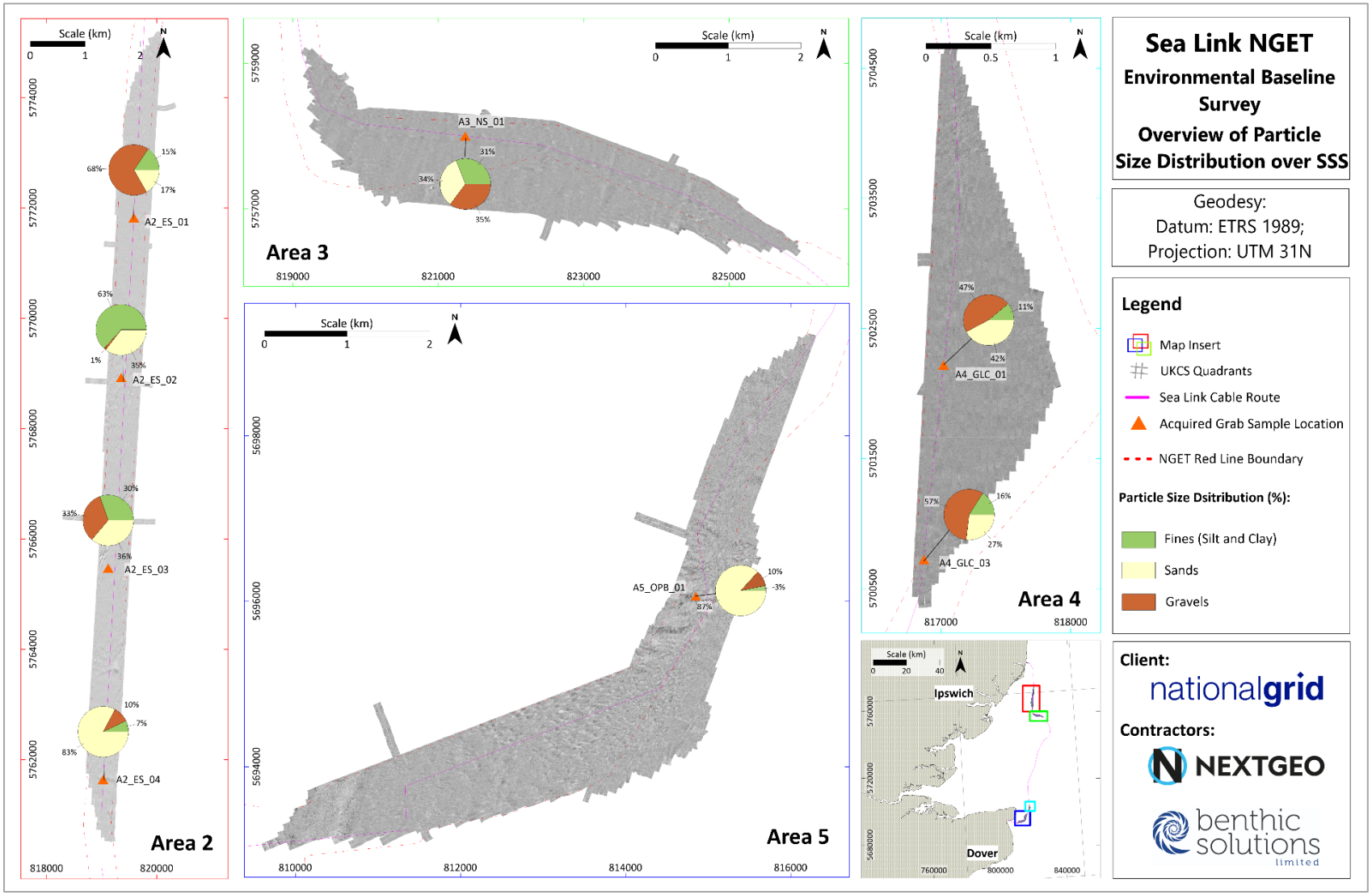



**Figure 5-1 Overview of Particle Size Distribution**

### 5.1.2 Multivariate Analysis of Sediment

The particle size distribution of sediments across the survey area were subjected to further detailed investigation by multivariate analysis using the Plymouth Routines in Multivariate Ecological Research software (PRIMER 7.0.17; Clarke *et al.*, 2014) to elucidate any spatial trends within the data.

A similarity dendrogram was generated by hierarchical agglomerative clustering (CLUSTER) using particle size data (phi) to illustrate similarities/differences between stations using the Euclidean distance dissimilarity measure. The dendrogram produced by cluster analysis is shown in and also sat within muddy sandy gravel and sandy gravel seabed feature. With red lines denoting statistically similar stations and black lines revealing significant differences. Similarity profiling analysis (SIMPROF) indicated the presence of five significantly different ($p<0.05$) clusters (Figure 5-2) as follows:

- Cluster 'a': This cluster was made up of two stations A2_ES_04 and A5_OPB_01 which both noted high proportion of sands (>80%) and are situated in an area defined seabed features of Sandy Gravel/ Silty Sand. The cluster was assigned the Modified Folk Classification of 'Gravelly Sand'.
- Cluster 'b': This cluster was formed by a single station; A2_ES_01 which noted the highest gravels (68%) across the survey areas. And assigned the 'Muddy Sandy Gravel' Modified Folk Classification.
- Cluster 'c': This cluster was formed of two Area 4 stations, A4_GLC_01 and A4_GLC_03, defined by seabed features as gravelly sand/sandy gravel. This cluster differentiated due to higher gravel content (>45%) compared to the majority of the route, increased influence of sands (>25%) and low proportions of fines were also noted (<15%). Similar to Cluster 'b' it was assigned the 'Muddy Sandy Gravel' Modified Folk Classification.
- Cluster 'd': This cluster was comprised of one station; A2_ES_02 which noted the highest fines content (63%) of the survey areas and was defined as 'Slightly Gravelly Sandy Mud' by the Modified Folk Classification.
- Cluster 'e': This final cluster comprised of two stations: A2_ES_03 and A3_NS_01, with mixed sediments. The cluster was defined as 'Muddy Sandy Gravel' by the Modified Folk Classification and was also situated within Muddy Sandy Gravel and Sandy Gravel seabed features.

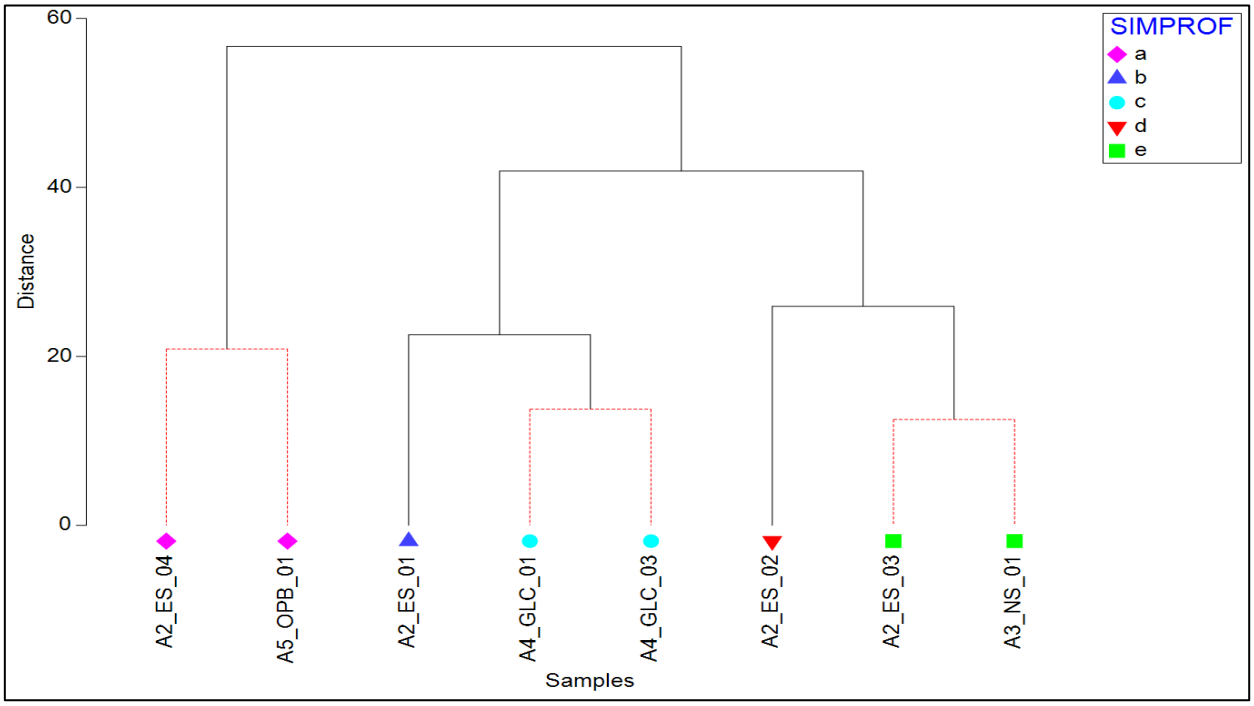



**Figure 5-2 Particle Size Analysis Similarity Dendrogram**

Similarities between the stations were also displayed as a 2-dimensional non-metric multi-dimensional scaling (nMDS) ordination (Figure 5-3) at a low stress level of 0.01. This plot shows the significant inter-cluster variation between cluster 'a' and the remaining clusters, of which were ordinated central and to the left of the plot, suggesting they were more closely related to each other than they were to cluster 'a'.

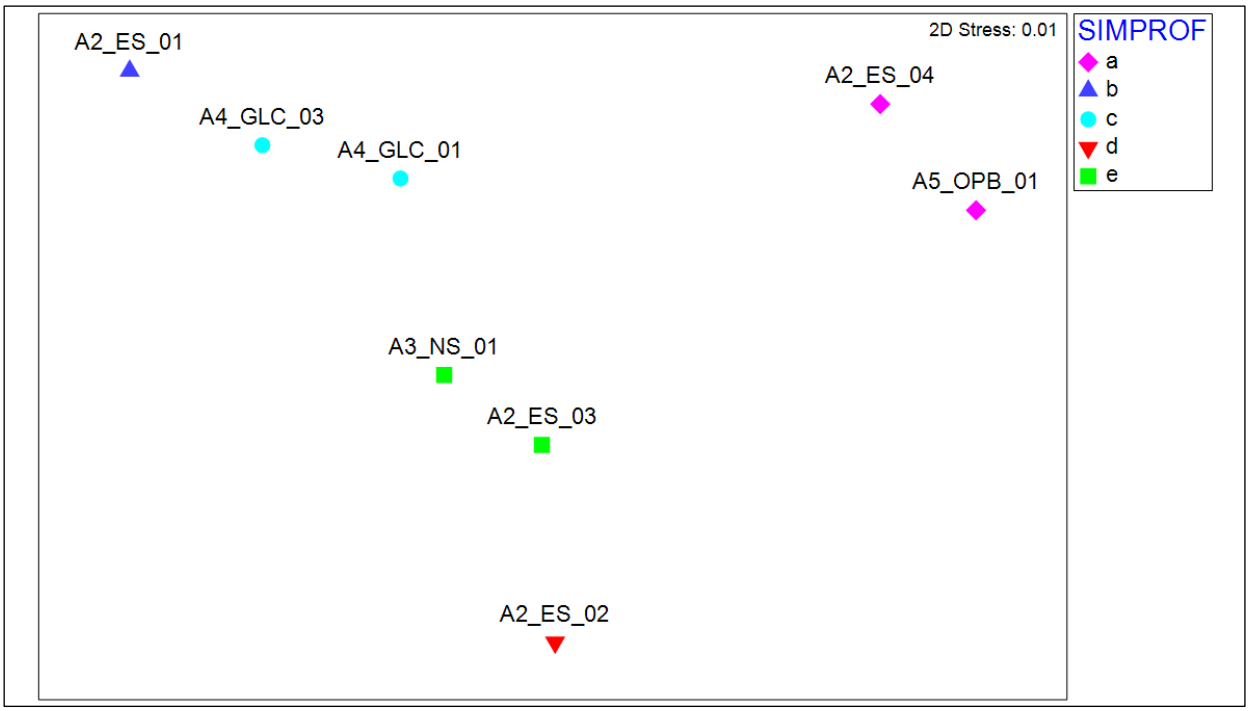



**Figure 5-3 Particle Size Distribution nMDS Plot**

A principal component analysis (PCA) was carried out on the proportional whole phi sieve fraction data for each survey station (Figure 5-4). The resultant PCA plot shows the distribution of each station along axes

formed by the two principal components (PC1 and PC2) which together describe the largest proportion of overall variability in the particle size fraction dataset. The plot indicated that the varying proportions of phi fractions 1 to 2 (coarse to fine sand), as well as the proportion of phi fraction -3 (medium pebbles), were principally responsible for the differences in sediment composition across the Sea Link survey areas. Differentiation of cluster 'a' appeared to be largely due to the higher proportions of coarse to fine sand (phi 1 to 2), whilst clusters 'b' and 'c' were driven by proportions of medium pebble (phi -3). Clusters 'd' and 'e' were notably separated due to the negative relationship with the phi -3 fraction, where Cluster 'e' suggests an increased influence from higher phi fractions of fine sand to clay (phi >4).

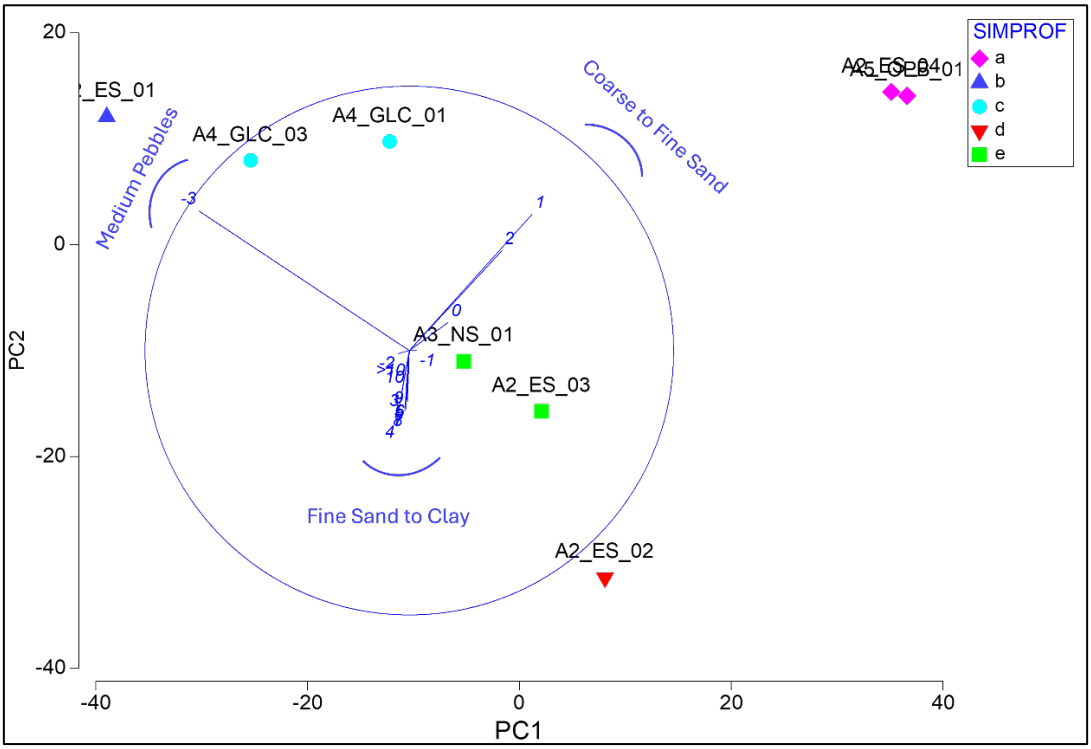



**Figure 5-4 Particle Size Analysis Principal Components Analysis (PCA)**

A comparison of the full particle size distribution dataset using Wentworth (1922) size categories split into the five clusters described above is shown in Figure 5-5, along with example sieve and grab sample photographs. The plot illustrates the general heterogeneity of the seabed sampled, with Cluster 'a' showing a unimodal distribution with a peak in the coarse to fine sand fraction (phi fraction 1 to 2). Cluster 'c' also noted a peak of coarse to fine sand, with a notable increase in the medium pebble fraction (phi -3). Cluster 'b' additionally showed a peak in the pebble fraction (phi -3) in comparison to Cluster 'e' which was notably more mixed and was defined by influence from the very coarse sand fraction (phi -1), the fine sand (phi 3) and the very fine silt fraction (phi 8). Cluster 'd' showed a similar distribution to Cluster 'e', however small peaks were only noted within the fine to very fine sand (phi 3 to 4) and very fine silt (phi 8) fractions. The geographical distribution of clusters is displayed over SSS in Figure 5-6.

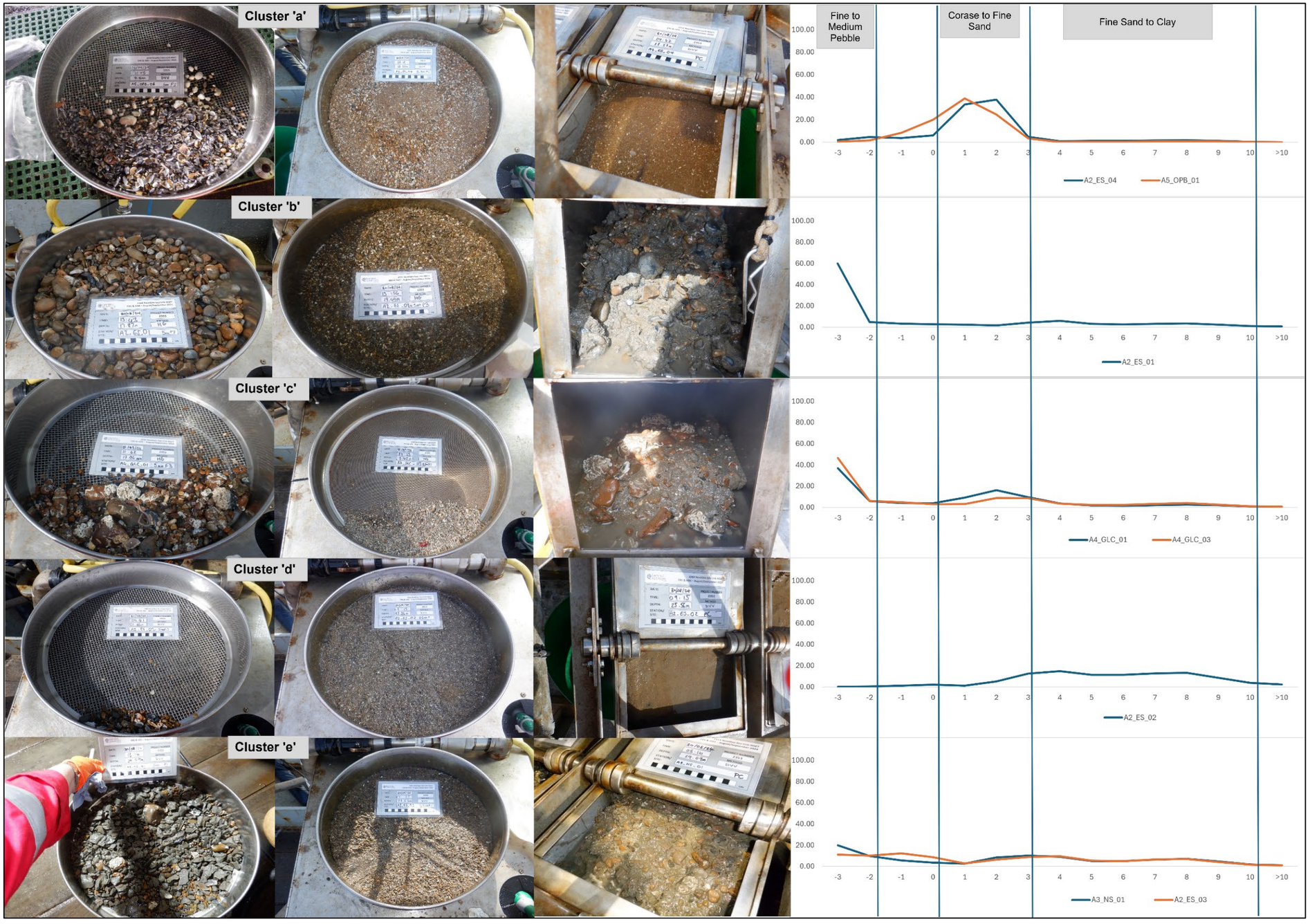



**Figure 5-5 Particle Size Distribution for Clusters 'a' to 'e', with Example Grab Photographs of Samples Over 5mm (left) and 0.5mm (centre)**

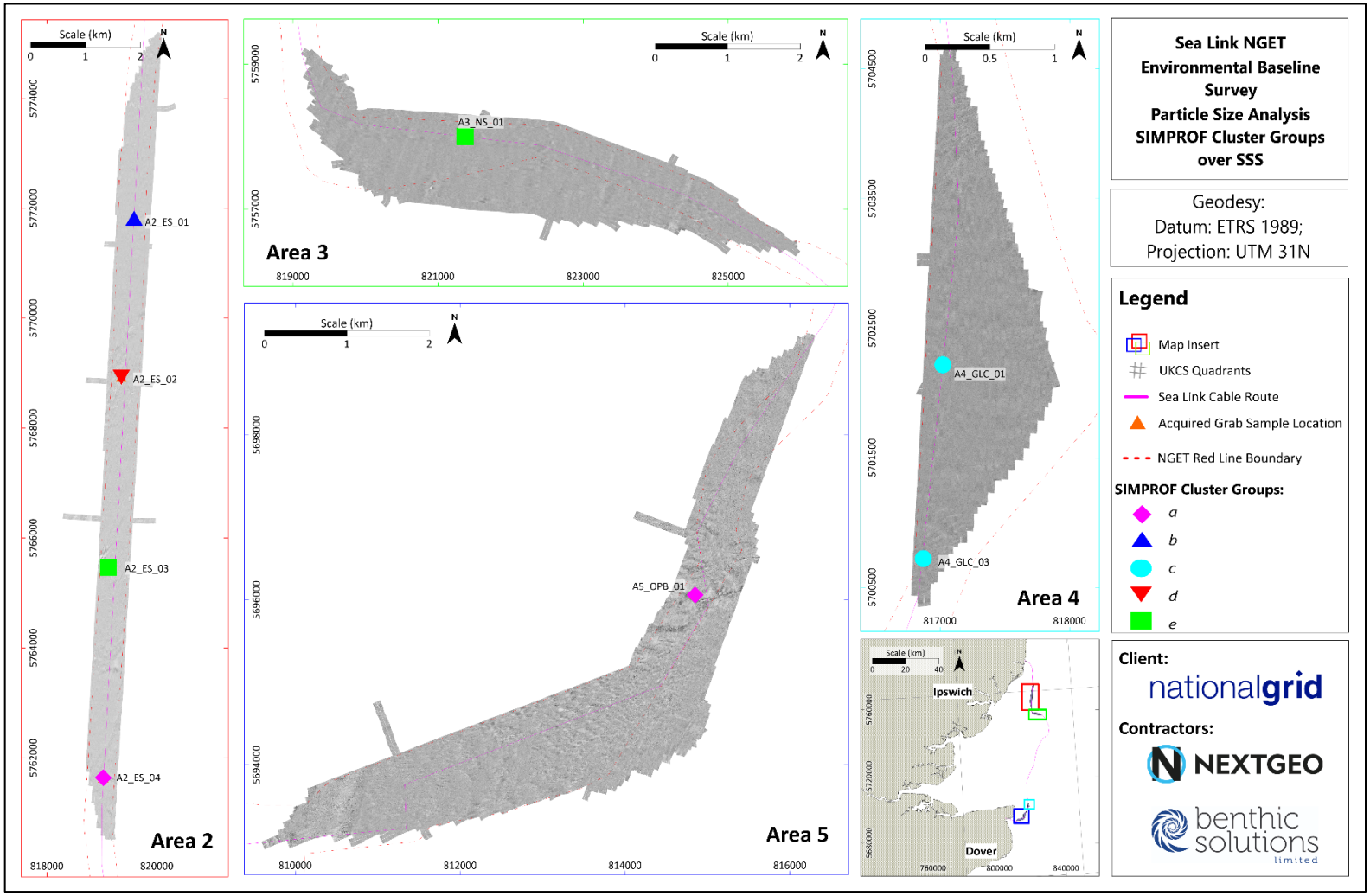



**Figure 5-6 Particle Size Analysis SIMPROF Cluster Groups over SSS**

## 5.2 Summary of Identified Habitats

Habitats were identified using a combination of field observations, detailed review of the SSS, bathymetry, video footage and stills images. Based on the ground-truthing data obtained from the Sea Link survey route, a total of four EUNIS habitats are indicated to be present within the additional areas (Area 2 – Area 5).

See Table 5-5 below which translates BGS Modified Folk Classification and seabed features to its respective EUNIS classification, and Figure 5-7 representing the identified EUNIS classifications across the survey area.

**Table 5-5 Summarised Habitat Classifications**

| BGS Modified Folk Classification of Particle Size Analysis | Seabed Features | 2012 EUNIS Classification |
|---|---|---|
| Muddy sandy gravel, Gravelly sand, | Gravelly Sand to Sandy Gravel, Gravelly Sand, Sandy Gravel, Muddy Sandy Gravel, Chalk | A5.44<br>Circalittoral mixed sediments |
| Gravelly sand | Silty Sand, Sand, Clayey Sand, Gravelly Sand, Sandy Silt | A5.25<br>Circalittoral fine sand |
| Gravelly sand | Sand to Silty Sand | A5.23<br>Infralittoral fine sand |
| No grab sample acquired. | Sandy Gravel | A5.43<br>Infralittoral Mixed Sediment |

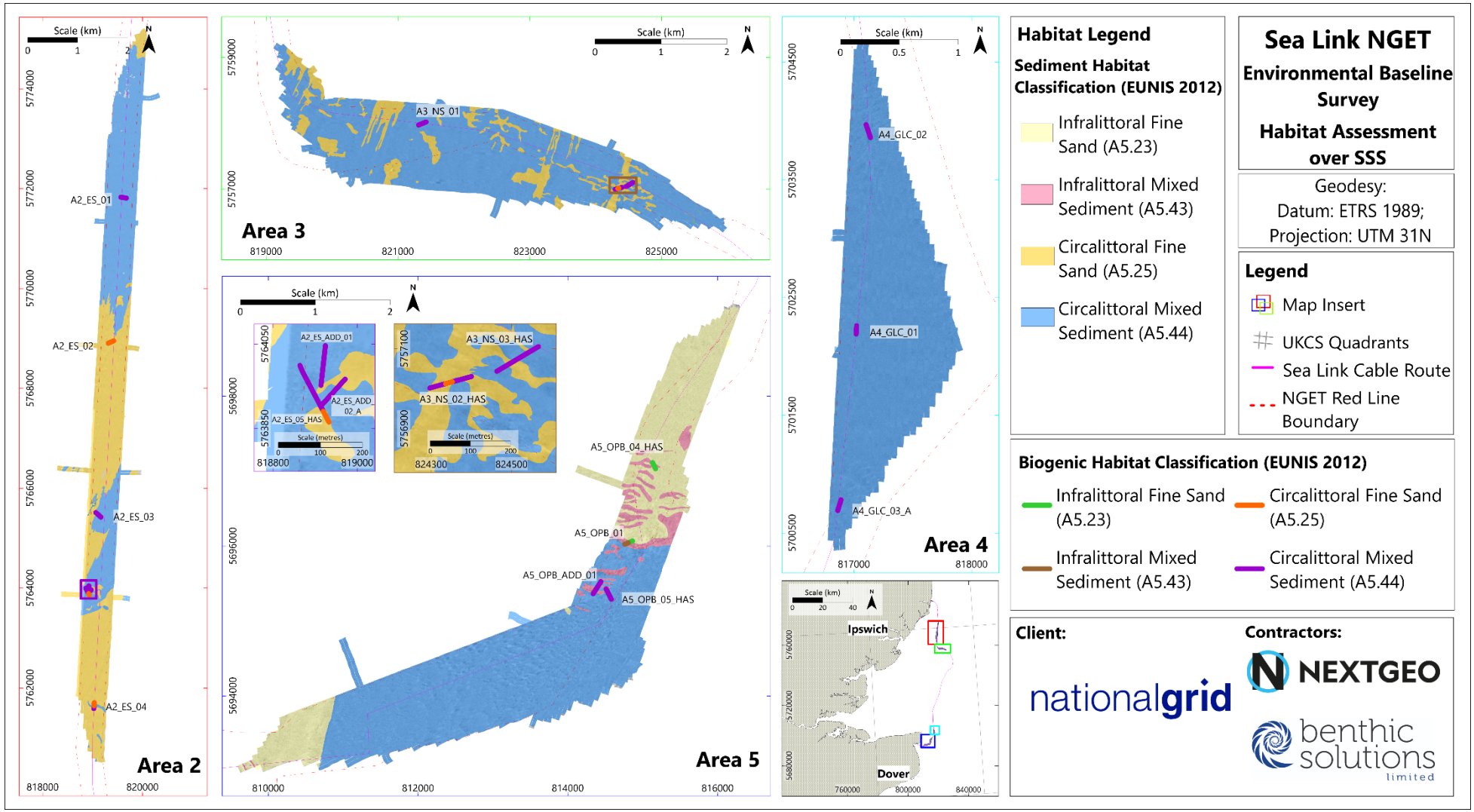



**Figure 5-7 Habitat Distribution over SSS Data for the Sea Link Survey Area**

## 5.3 Detailed Area Descriptions

### 5.3.1 Route Overview

'Circalittoral Fine Sand' (A5.25) made up the northern end of the route (Area 2 and 3) alongside 'Circalittoral Mixed Sediment' (A5.44) (Figure 5-7). The southern region of the route (Area 4 and 5) mostly consisted of 'Circalittoral Mixed Sediment' (A5.44) with area 5 showing areas of 'Infralittoral Fine Sand' (A5.23) and 'Infralittoral Mixed Sediment' (A5.43) in more shallow regions (Figure 5-7).

#### 5.3.1.1 **Infralittoral Fine Sand (A5.1)**

Habitats consisting mainly of rippled fine sand with some coarser elements were observed in Area 5 in a depth range of 10-12m in the transects A5_OPB_01 and A5_OPB_04_HAS. This habitat possessed some coarser elements with gravel and shell but was predominantly sand based. Described by EUNIS as "*Clean sands which occur in shallow water, either on the open coast or in tide-swept channels of marine inlets. The habitat typically lacks a significant seaweed component and is characterised by robust fauna, particularly amphipods (Bathyporeia) and robust polychaetes including Nephtys cirrosa and Lanice conchilega*".

There was little observed fauna in the HD video data with only Actinopterygii species observed, this limited diversity of epifauna further supports this EUNIS classification. The lack of epifauna also indicates visual conformance to 'Infralittoral mobile clean sand with sparse fauna' (A5.231) which can later be confirmed with faunal analysis which will be processed at a later date (Document ref.: P2097-010-REP-005), leaving this habitat at a level 4. The previous MMT report also identified this habitat in a similar region within Area 5 and denoted it as '*Nephtys cirrosa* and *Bathyporeia* spp. in infralittoral sand' due to the faunal data obtained from grab stations in the area.

Example images are given in Figure 5-8 and the expected extent of the habitat 'Infralittoral Fine Sand' (A5.23) is mapped in Figure 5-7.

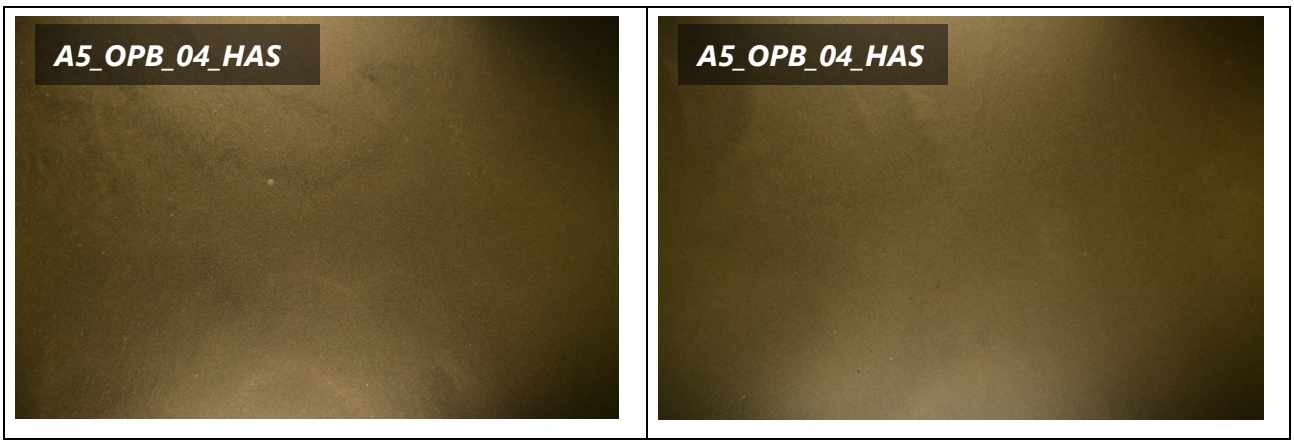




**Figure 5-8 Example Images of Infralittoral Fine Sand habitats**

#### 5.3.1.2 Infralittoral Mixed Sediment (A5.43)

Within Area 5, bathymetry data and HD video footage indicated ribbons of shallow areas of mixed sediment with noticeable fines, sand and gravel. This habitat is described by EUNIS 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.*" This habitat was observed across A5_OPB_01 where a shallow (<10m) area occurred, also showing intermixed areas of "Circalittoral Mixed Sediment", both were observed in areas of "Sandy Gravel" across the survey route.

No epifauna was noted across A5_OPB_01. However, other transects at similar depths showed no distinct differences from 'Circalittoral Mixed Sediment', indicating that faunal composition of these biotopes is similar. There are several level 5 habitats associated with 'Infralittoral Mixed Sediment', although these cannot be assigned due to limited epifaunal presence in the video data and no current infaunal data. Therefore the classification of this habitat remains at a level 4 classification. This habitat was featured in the MMT (2021) report but in southern areas closer to the shore along the survey route.

Example images are provided in Figure 5-9 and the spatial extent of the 'Infralittoral Mixed Sediment' (A5.43) habitat is mapped in Figure 5-7.

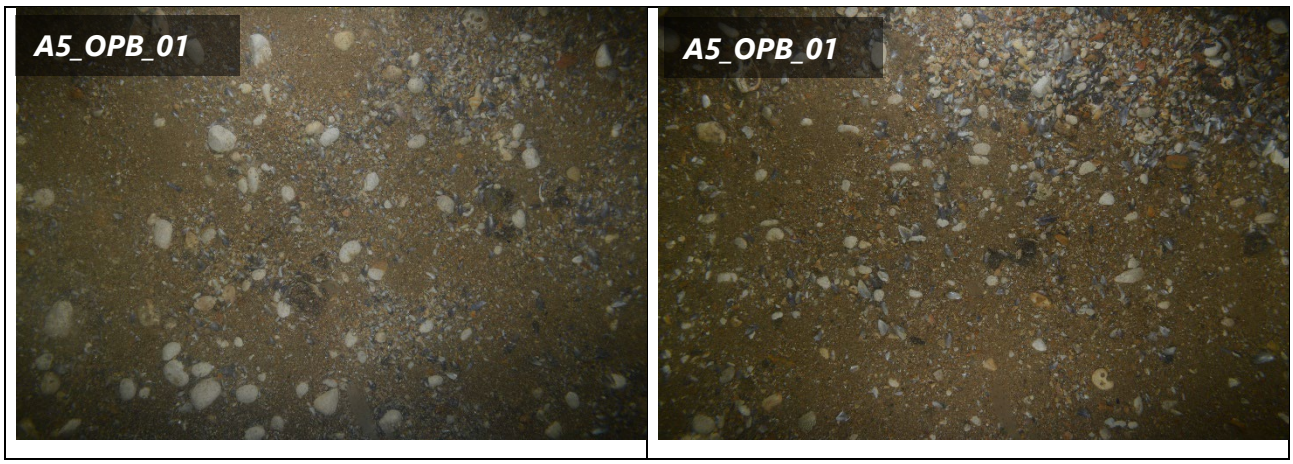


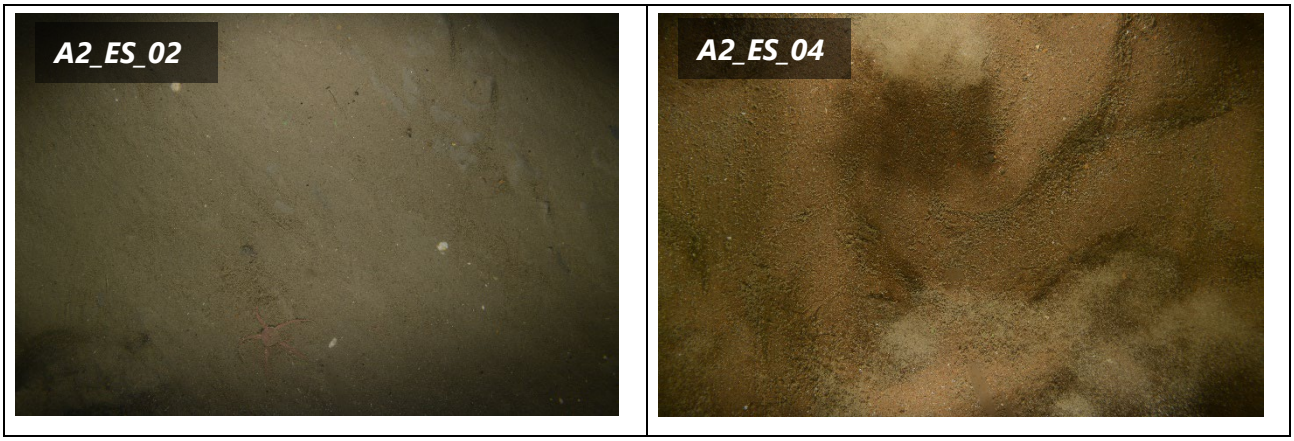
**Figure 5-9 Example Images of Infralittoral Mixed Sediment Habitats**

#### 5.3.1.3 **Circalittoral Fine Sand (A5.25)**

This habitat occurred in several areas across Area 2 and 3, generally possessing fine sand in the deeper regions of the survey area presenting as areas of lower reflectivity on SSS imagery. This habitat is described by EUNIS as "*Clean fine sands with less than 5% silt/clay in deeper water, either on the open coast or in tide-swept channels of marine inlets in depths of over 15-20 m. The habitat may also extend offshore and is characterised by a wide range of echinoderms (in some areas including the pea urchin Echinocyamus pusillus), polychaetes and bivalves. This habitat is generally more stable than shallower, infralittoral sands and consequently supports a more diverse community.*" This habitat was found to associate with the seabed features silty sand, sand, clayey sand, gravelly sand and sandy silt within the survey route.

Epifauna observed were commonly seen throughout the route, such as brittle stars (Ophiuroidea), common sea stars (*Asterias rubens*) and hermit crabs (*Pagurus* sp.). This variation corresponds to the EUNIS description of the A5.25 habitat. There are three level 5 EUNIS habitats associated with 'Circalittoral Fine Sand' which require faunal data analysis for assignment, further classification will be presented within the subsequent report (Document ref.: P2097-010-REP-005), leaving this habitat at a level 4. This habitat was found within the MMT report alongside the EUNIS habitat 'Circalittoral Muddy Sand' in similar areas, in updated habitat classifications, these two habitats are combined due to their similarity.

Example images are provided in Figure 5-10 and the spatial extent of the 'Circalittoral Fine Sand' (A5.25) habitat is mapped in mapped in Figure 5-7.



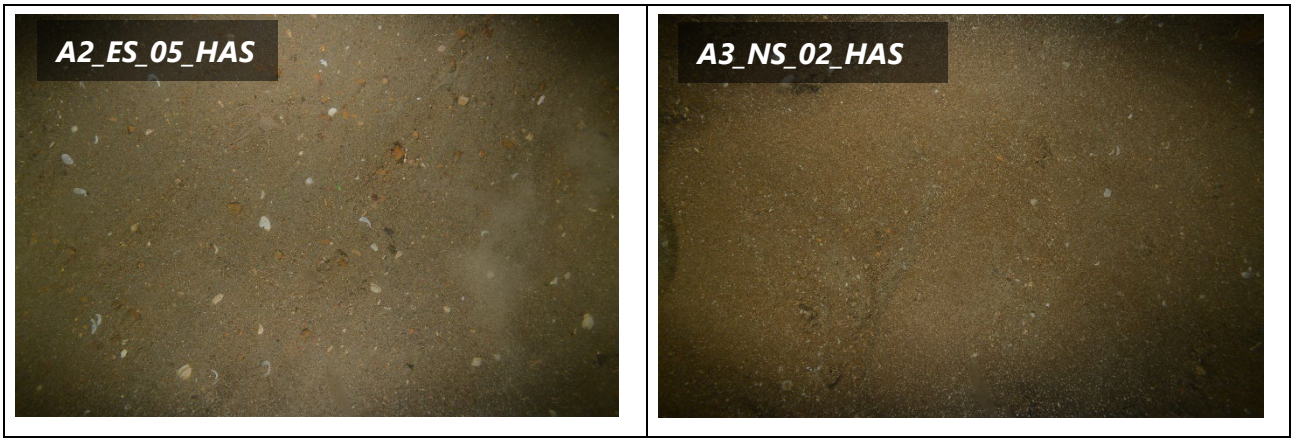



**Figure 5-10 Example Images of Circalittoral Fine Sand Habitat**

#### 5.3.1.4 Circalittoral Mixed Sediments (A5.44)

Areas dominated by pebbles, cobbles and gravel overlying a sandy sediment with noticeable fines was observed across all four areas. This habitat is described by EUNIS as "*Mixed (heterogeneous) sediment habitats in the circalittoral zone (generally below 15-20 m) including well mixed muddy gravelly sands or very poorly sorted mosaics of shell, cobbles and pebbles embedded in or lying upon mud, sand or gravel.*"

Faunal diversity observed within this habitat was increased in comparison to other habitats. The increase in hard substrate (cobbles and gravel) lead to a noticeable proportion of Serpulidae, bryozoan/hydrozoan turf, dead man's fingers (*Alcyonium digitatum*) and anemone species (Actinaria). In two transects (A5_OPB_05_HAS and A5_OPB_Add_01) in Area 5, there was a noticeable population of blue mussels (*Mytilus edulis*) creating an encrusting layer of which will undergo further assessment to determine potential sensitive habitat presence. This diversity was also present alongside species found in other biotopes such as brittlestars (Ophuiroidea), hermit crabs (*Pagurus* sp.) and common sea stars (*Asterias rubens*).

There are several level 5 habitat classifications associated with 'Circalittoral Mixed Sediment', however these are often based on identifying infaunal species, so will later be assigned in the subsequent report (Document ref.: P2097-010-REP-005), leaving this habitat at a level 4 classification. The presence of *Sabellaria spinulosa* was noted across various transects consisting of mixed sediment potentially indicating the presence of the level 5 habitat '*Sabellaria spinulosa* on stable circalittoral mixed sediment', requiring an assessment to determine whether this is a reef forming population (see Section 5.4.2). This habitat also possessed epifauna covered cobbles frequent enough to warrant a stony reef assessment on transects in Area 3 and 4. This would determine whether an Annex I habitat would occur within the survey area.

Example images are given in Figure 5-11 and the expected extent of the habitat 'Circalittoral Mixed Sediment' (A5.44) is mapped in Figure 5-7.

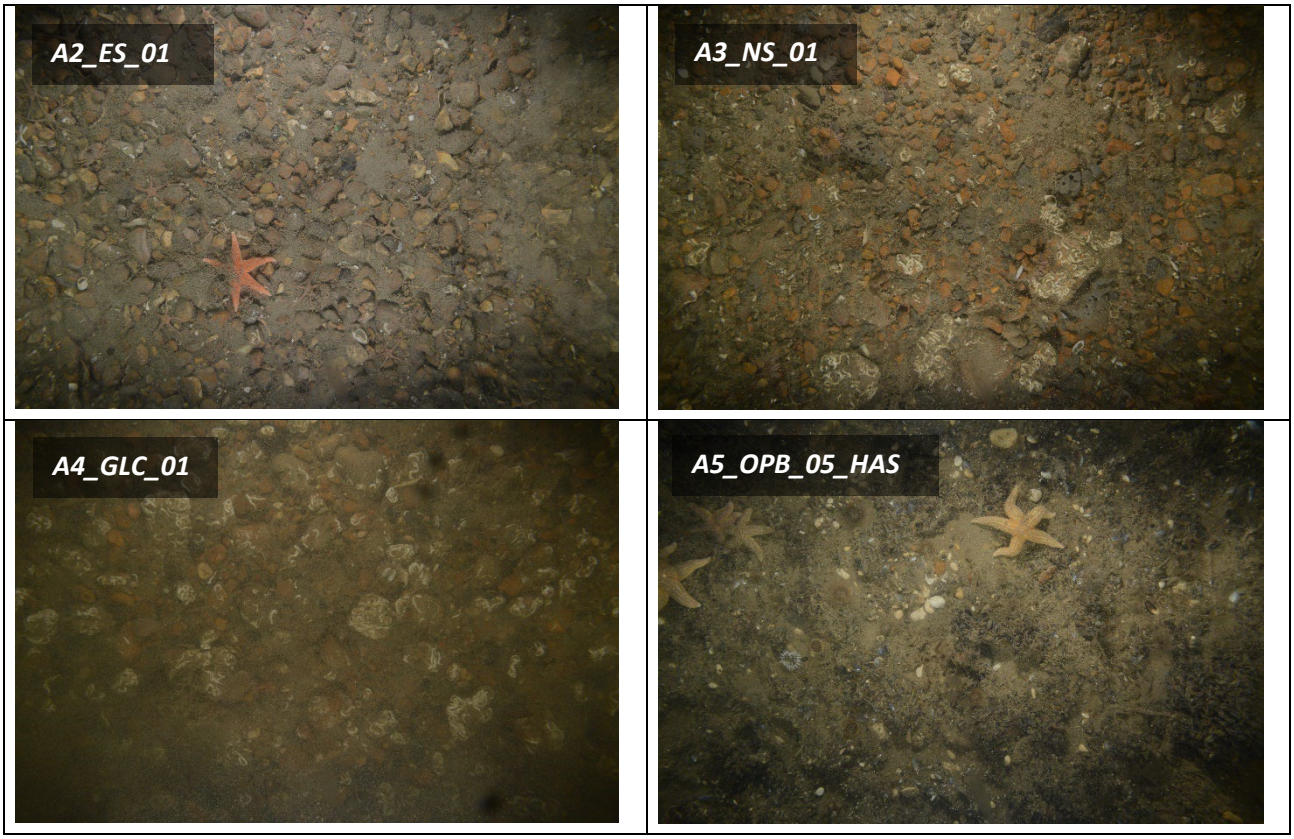



**Figure 5-11 Example Images of Circalittoral Mixed Sediment Habitats**

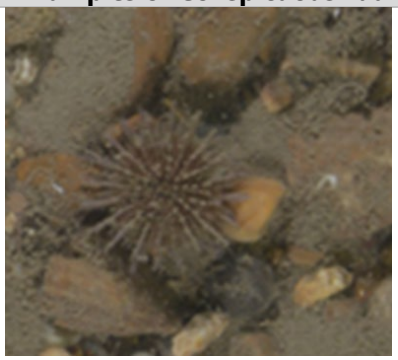
## 5.4 Potential Areas and Species of Conservation Value

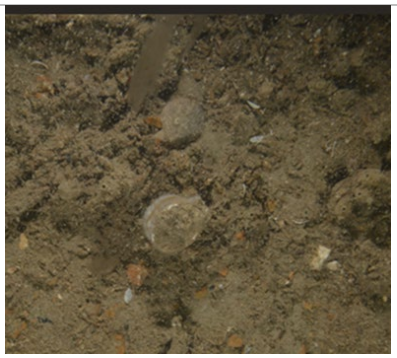
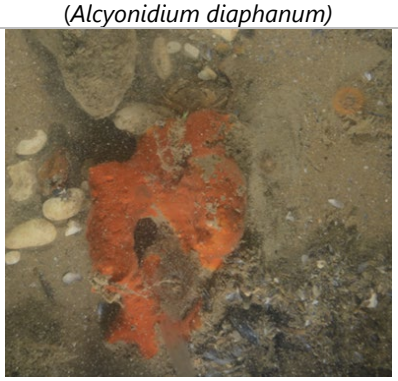
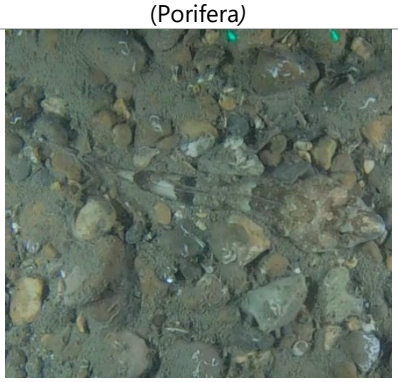
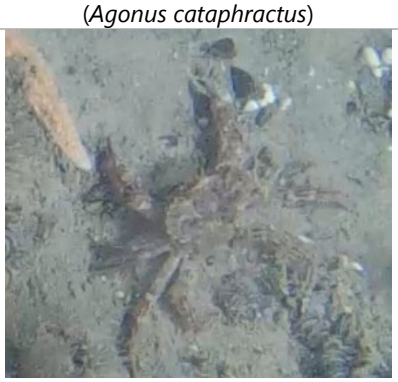
Variable diversity was present throughout the Sea Link survey area with example images shown below in Table 5-6, with brittle stars (Ophiuroidea), hermit crabs (*Pagurus* sp.) and common sea stars (*Asterias rubens*) found across a majority of the transects analysed. Areas 3 and 4 had increased cobbles/hard substrate which fauna can attach to, such as calcareous tube worms (Serpulidae), dead man's finger (*Alcyonium digitatum*) and anemones (Actinaria).

Chordata species were observed across the survey area with various fish (Actinopterygii) observed, including the common dragonet (*Callionymus lyra*) and solenette (*Buglossidium luteum*) observed. Brachyura species were observed in the survey area with occasional observations of the velvet swimming crab (*Necora puber*), harbour crab (*Polybius* sp.), and leeches spider crab (*Inachus phalangium). Sabellaria spinulosa* aggregations were observed across the survey areas in variable abundances. In contrast, bivalves were present in fewer areas along the survey route. The queens scallop (*Aequipecten opercularis*) was observed only along a singular transect, while blue mussels (*Mytilus edulis*) were more widespread, forming crusts that covered parts of the seabed, particularly at A5_OPB_05_HAS and, to a lesser extent, A5_OPB_Add_01. Both *S. spinulosa* and *M. edulis* have been further evaluated to assess the potential sensitivities of the habitats (see Sections 5.4.2 and 5.4.3).

Whilst no sandeel (Ammodytidae) were identified on the HD footage, the route enters an area marked as a low intensity spawning ground and nursery ground, also requiring further assessment to determine the potential occurrence of a sandeel spawning ground (see Section 5.4.4). Herring (Clupeidae) were observed at A3_NS_03_HAS, with several points along the survey route overlapping with areas designated as high and low intensity nursery grounds. This warranted a further investigation to determine whether areas in the survey route could be designated as a potential herring spawning ground (see Section 5.4.5).

**Table 5-6 Example Images of Conspicuous Fauna**

| **Examples of Conspicuous Fauna** | | |
|---|---|---|
|  |  |  |
| Spiny Dogfish (*Squalus acanthias*) | Urchin (Echinodermata) | Brittlestar (Ophiuroidea) |

| | | |
|---|---|---|
|  Blue Mussel bed (*Mytulis edulis)* |  Sea Chevril (*Alcyonidium diaphanum)* |  Ross Worm (*Sabellaria spinulosa*) |
|  Fish (Actinopterygii) |  Sponge (Porifera*)* |  Calcareous Worm Serpulidae |
|  Common Sea Star (*Asterias rubens*) |  Pogge (*Agonus cataphractus*) |  Leeches Spider Crab *(Inachus phalangium)* |
|  Hermit Crab (*Pagurus* sp.) |  Velvet Swimming Crab (*Necora puber*) |  Solenette (*Buglossidium luteum*) |

### 5.4.1 Annex I Stony Reef formed from boulders and cobbles

Noticeable coverage of cobbles were record across six transects (A3_NS_01, A3_NS_02_HAS, A3_NS_03_HAS, A4_GLC_01, A4_GLC_02, A4_GLC_03_A) within Area 3 and Area 4. These transects comprised of mainly mixed sediment including cobbles and underwent further assessment to determine whether an Annex I Stony Reef habitat occurs.

The underwater video footage was assessed for potential stony reefs using the criteria proposed by Irving (2009). This breaks down the assessment criteria measures of 'quality' or 'reefiness' as outlined in Table 5-7. This is based on a minimum cobble size of 64mm being present and indicating relief above the natural seabed where >10% of the matrix are cobble related and a minimum area of ~25m$^2$ is recorded. The stony reef assessment was based on acquired underwater stills taken every 20 seconds along the camera transect. When underwater stills were out of focus due to environmental conditions (boat movement, seabed slope, turbidity etc.), additional screengrabs were taken in the office (using HD video footage). These screengrabs were taken as close to the 20 second interval as possible but may have varied by a few seconds to enable a clear focus. Each still and screengrab was assessed for changes in density, height and cover of cobbles and boulders. Each section of the transects where cobbles or boulders were detected was then analysed and categorised according to its composition, elevation and extent.

**Table 5-7 Summary of resemblance to a stony reef as summarised in Irving (2009)**

| Measure of 'Reefiness' | Not a Reef | Low[(c)] | Medium | High |
|---|---|---|---|---|
| Composition[(a)] | <10% | 10-40% | 40-95% | >95% |
| Elevation[(b)] | Flat seabed | <64mm | 64mm-5m | >5m |
| Extent (m$^2$) | <25m$^2$ | >25m$^2$ | >25m$^2$ | >25m$^2$ |
| Biota | Dominated by infauna | | | >80% of species are epifauna |

(a) *Diameter of cobbles / boulders being greater than 64mm. Percentage cover relates to a minimum area of 25m$^2$. This 'composition' characteristic also includes 'patchiness'.*

(b) *Minimum height (64mm) relates to minimum size of constituent cobbles. This characteristic could also include 'distinctness' from the surrounding seabed.*

(c) *When determining if the seabed is considered as Annex I stony reef, a 'low' scored in any category, would require a strong justification for this area to be considered as contributing to the Marine Natura site network of qualifying reefs in terms of the EC Habitats Directive.*

The Irving (2009) stony reef protocol was split into separate assessments of reef 'structure' and 'overall reefiness' using a method developed by BSL staff (Table 5-8, Table 5-9 and Table 5-10). This provided a reef structure value that could then be assessed against extent, where applicable, to provide a measure of overall reefiness, as illustrated in Table 5-10. As separate thresholds for 'Low', 'Medium' and 'High' stony reef extent were not given in Irving (2009), the overall reefiness is determined by reef structure provided that the extent of the stony reef covers a minimum of 25m$^2$. Reefiness parameters are colour coded to aid visual assessment of the data.

**Table 5-8 Stony Reef Structure Matrix (after Irving, 2009)**

| Reef Structure Matrix | | | Elevation | | | |
|---|---|---|---|---|---|---|
| | | | Flat | <64mm | 64mm-5m | >5m |
| | | | Not a Reef | Low | Medium | High |
| Composition | <10% | Not a Reef | Not a Reef | Not a Reef | Not a Reef | Not a Reef |
| | 10-40% | Low | Not a Reef | Low | Low | Low |
| | 40-95% | Medium | Not a Reef | Low | Medium | Medium |
| | >95% | High | Not a Reef | Low | Medium | High |

**Table 5-9 Stony Reef Structure Matrix (Structure vs Biota)**

| Reef Structure Matrix | | | Structure | | | |
|---|---|---|---|---|---|---|
| | | | Not a Reef | Low | Medium | High |
| Epifaunal Coverage | <10% | Not a Reef | Not a Reef | Not a Reef | Not a Reef | Not a Reef |
| | 10-40% | Low | Not a Reef | Low | Low | Low |
| | 40-80% | Medium | Not a Reef | Low | Medium | Medium |
| | >80% | High | Not a Reef | Low | Medium | High |

**Table 5-10 Overall Stony Reefiness Matrix (Structure vs Extent)**

| Overall Reefiness Matrix | | | Reef Structure (incl. Composition and Elevation) | | | |
|---|---|---|---|---|---|---|
| | | | Not a Reef | Low | Medium | High |
| Extent ($m^2$) | <25 | Not a Reef | Not a Reef | Not a Reef | Not a Reef | Not a Reef |
| | >25 | Low - High | Not a Reef | Low | Medium | High |

The stills taken during the survey and additional screengrabs from the video footage analysed for stony reef assessment indicated intermittent distribution of cobbles and boulders across the offshore transects (a complete log of the assessment per still is provided in Appendix I – REEF AND MUSSEL BED ASSESSMENT LOGSHEET). For example, out of the 183 images from transects reviewed for stony reef presence, 5 (2.7%) were classified as 'No Reef' with no cobbles present and 60 (32.8%) were unclear images due to poor visibility (Table 5-11). A total of 30 (16.4%) images classed as 'Not a Reef', 30 (16.4%) as 'Low Reef' and 58 (31.7%) as 'Medium Reef' and no stills were classified as 'High Reef' in terms of stony reef composition or percentage cover (Table 5-11). In terms of elevation, 5 stills (2.7%) were classified as 'Not a Reef' and 118 (64.5%) were classified as 'Low Reef'. When both composition and elevation were taken into account, by examining reef structure, there was a noticeable proportion of reefiness with 30 (16.4%) classed as 'Not a Reef' and 88 (48.1%) as 'Low Reef' with no stills being classed as 'Medium Reef' or 'High Reef' (Table 5-11). This is consistent of the video footage as transects in Area 4 show a noticeable proportion of cobbles present across the entire transect, whereas Area 3 showed a larger variation (Figure 5-12).

**Table 5-11 Summary of stony reef image analysis (Composition vs Elevation)**

| 'Reefiness' of Video Screengrabs | Unclear Footage | | No Stony Reef | | Not a Reef | | Low | | Medium | | High | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | No. | % | No. | % | No. | % | No. | % | No. | % | No. | % |
| Composition (% cover) | 60 | 32.8 | 5 | 2.7 | 30 | 16.4 | 30 | 16.4 | 58 | 31.7 | 0 | 0 |
| Elevation | | | | | 16 | 8.7 | 102 | 55.7 | 0 | 0 | 0 | 0 |
| Reef Structure | | | | | 30 | 16.9 | 88 | 48.1 | 0 | | 0 | 0 |

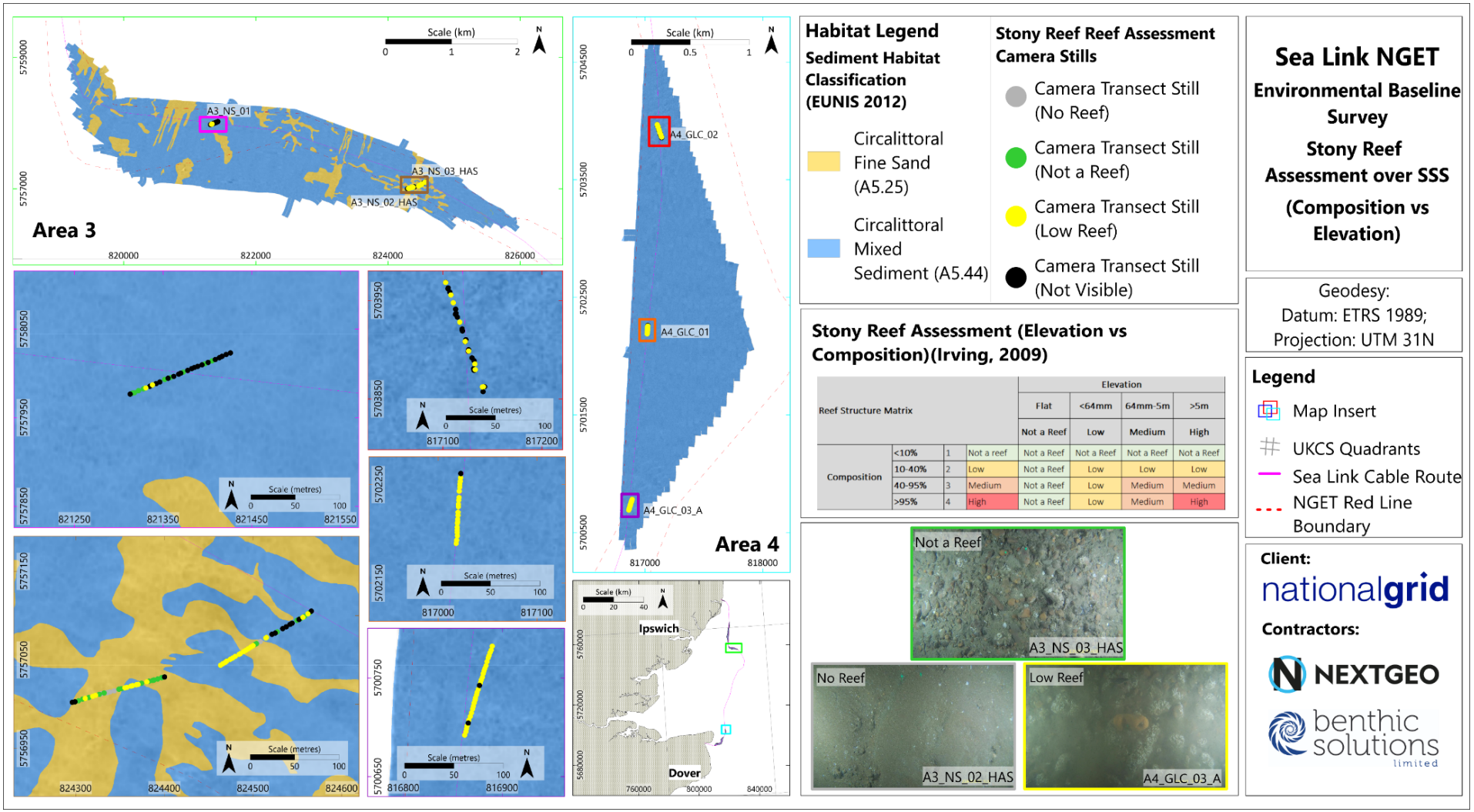



**Figure 5-12 Stony Reef Assessment (Composition vs Elevation)**

Another aspect of the stony reef assessment is to take into account the coverage of epifauna (erect and turf forming species such as Bryozoans or Hydrozoans) on the cobbles present which indicates whether this elevation is reef forming. Of the 118 stills which showed a potential stony reef (i.e. 'Not a Reef', 'Low Reef', 'Medium Reef', 'High Reef'), 19 stills (16.1%) were classified as 'Not a Reef', 72 stills (61%) were classified as 'Low Reef', 27 stills (22.9%) were classified as 'Medium Reef', and none were 'High Reef' (Table 5-12). Considering epifaunal coverage in relation to composition and elevation can further inform reef structure. When epifaunal coverage was applied to structure, 54 stills (45.8%) were classified as 'Not a Reef' and 64 stills (54.2%) were classified as 'Low Reef' with no stills classified as 'Medium Reef' or 'High Reef' (Table 5-12; Figure 5-13).

**Table 5-12 Summary of stony reef image analysis (Structure vs Biota)**

| 'Reefiness' of Video Screengrabs | Not a Reef | | Low | | Medium | | High | |
|---|---|---|---|---|---|---|---|---|
| | No. | % | No. | % | No. | % | No. | % |
| Epifaunal Coverage (%) | 19 | 16.1 | 72 | 61.0 | 27 | 22.9 | 0 | 0 |
| Reef Structure | 54 | 45.8 | 64 | 54.2 | 0 | 0 | 0 | 0 |

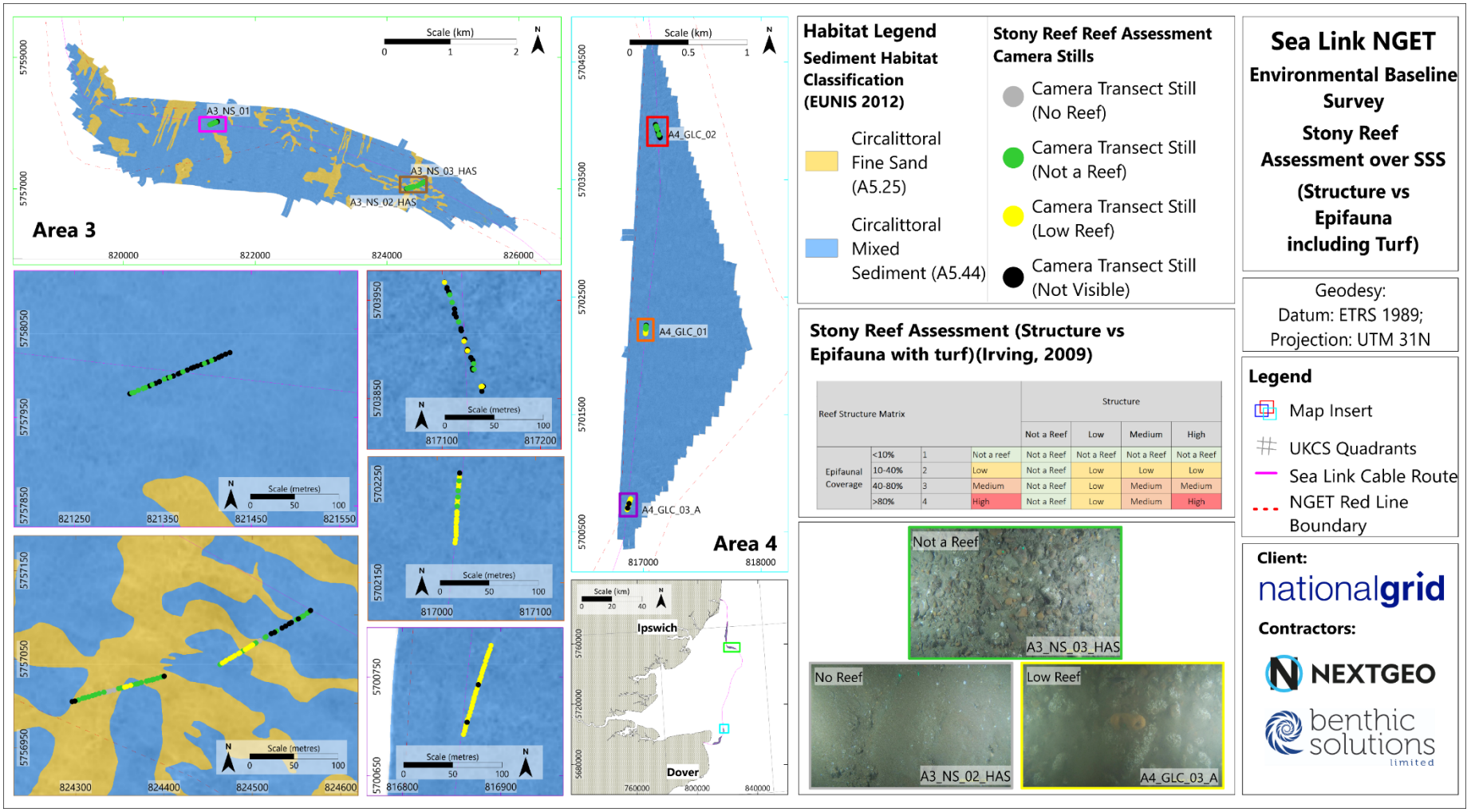



**Figure 5-13 Stony Reef Assessment (Structure vs Epifauna including turf)**

In order to determine whether reefiness was associated with any seabed features or sediment types, a Chi-squared frequency test was performed. The test revealed that there was no statistically significant association with the seabed features 'Muddy Sandy Gravel' ($x^2$= 2.1, $p$>0.05), 'Chalk' ($x^2$= 2.06, $p$>0.05), 'Sandy Gravel' ($x^2$= 2.55, $p$>0.05) and 'Gravelly Sand' ($x^2$= 3.1, $p$>0.05). There was a significant statistical association with 'Silty Sand' ($x^2$=16.39, $p$<0.01) however the test reveals this was due to an association between reef stills being outside of 'Silty Sand' areas.

As there was no strong correlation between sediment type and reefiness, a precautionary approach was taken to estimate the extent of the reef formations. Approximations were based on the measured length of continuous reef along the transect, assuming that reefs occupied circular areas of seabed (i.e. the straight-line distance between known locations of reef stills equates to the diameter of a circle, the area of which is calculated using $\pi r^2$). Utilising the Irving (2009) guidance, areas of seabed classified as 'Not a Reef', based on reef structure (composition vs. elevation vs. epifaunal coverage) would still be 'Not a Reef' regardless of whether the extent was <25m$^2$ or >25m$^2$ (Table 5-10).

The results, mapped in Figure 5-14, revealed 3 patches of poor visibility, 1 patch of 'No Reef', 10 patches of 'Not a Reef' and 7 patches considered 'Low Reef' (Table 5-13). The patches of 'Low Reef' all occurred in Areas 3 and 4. Details of the full assessment are provided in Appendix I – REEF AND MUSSEL BED ASSESSMENT LOGSHEET.

**Table 5-13 Overview of Stony Reef Extent Patches**

| Structure vs Extent | Total Patches | Not Visible | No Reef | Not a Reef | Low Reef |
|---|---|---|---|---|---|
| Patch Number | 21 | 3 | 1 | 11 | 6 |

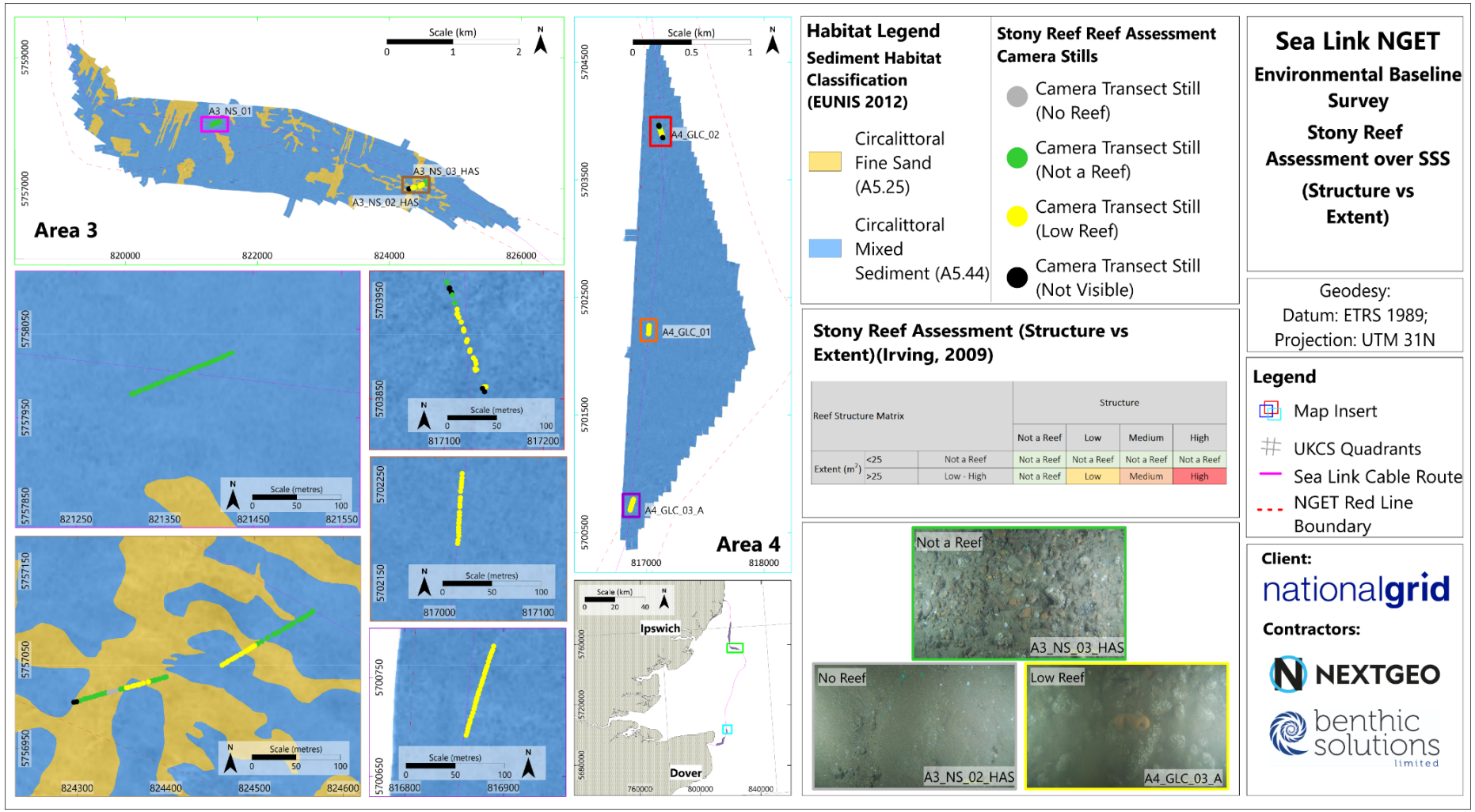



**Figure 5-14 Stony Reef Assessment (Strcuture vs Extent)**

**Table 5-14 Summary of Stony Reef Assessment (After Irving, 2009)**

| Geodetics: ETRS89, UTM 31N | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Station** | **Easting (m)** | **Northing (m)** | **Sediment Type** | **Stony Reefiness (After Irving, 2009)** | | | | | |
| | | | | **Mean Composition (% Cover of Cobbles/ Boulders)** | **Mean Elevation (of Cobbles/ Boulders in mm)** | **Mean Epifaunal Coverage (% of epifaunal coverage on Cobbles / Boulders)** | **Mean Reefiness (Structure)** | **>25m²** | **Overall Mean Reefiness (Structure vs Extent)** |
| A3_NS_01 | 408 394 | 5 748 504 | Muddy Sand with gravel | 7.7 | 15.0 | 12.3 | Not a Reef | >25m² | Not a Reef |
| | 408 419 | 5 748 512 | | | | | | | |
| | 408 424 | 5 748 513 | Muddy Sand with gravel | 6.2 | 9.0 | 5.2 | Not a Reef | >25m² | Not a Reef |
| | 408 510 | 5 748 541 | | | | | | | |
| A3_NS_02_HAS | 411 283 | 5 747 288 | Not Visible | N/A | N/A | N/A | N/A | <25m² | N/A |
| | 411 286 | 5 747 289 | | | | | | | |
| | 411 290 | 5 747 289 | Muddy Sand with gravel | 8.2 | 9.3 | 7.8 | Not a Reef | >25m² | Not a Reef |
| | 411 320 | 5 747 296 | | | | | | | |
| | 411 323 | 5 747 296 | Rippled fine sand with gravel in troughs | 0.0 | 0.0 | 0.0 | No Reef | >25m² | No Reef |
| | 411 331 | 5 747 297 | | | | | | | |
| | 411 337 | 5 747 299 | Muddy Sand with gravel | 5.5 | 20.0 | 0 | Not a Reef | <25m² | Not a Reef |
| | 411 340 | 5 747 299 | | | | | | | |
| | 411 344 | 5 747 300 | Muddy Sand with gravel | 29.8 | 18.8 | 15.0 | Low Reef | >25m² | Low Reef |
| | 411 369 | 5 747 304 | | | | | | | |
| | 411 371 | 5 747 305 | Muddy Sand with gravel | 6.5 | 12.5 | 10 | Not a Reef | >25m² | Not a Reef |
| | 411 389 | 5 747 308 | | | | | | | |

| Geodetics: ETRS89, UTM 31N | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Station** | **Easting (m)** | **Northing (m)** | **Sediment Type** | **Stony Reefiness (After Irving, 2009)** | | | | | |
| | | | | **Mean Composition (% Cover of Cobbles/ Boulders)** | **Mean Elevation (of Cobbles/ Boulders in mm)** | **Mean Epifaunal Coverage (% of epifaunal coverage on Cobbles / Boulders)** | **Mean Reefiness (Structure)** | **>25m²** | **Overall Mean Reefiness (Structure vs Extent)** |
| A3_NS_03_HAS | 411 453 | 5 747 316 | Muddy Sand with gravel | 45.0 | 22.1 | 39.3 | Low Reef | >25m² | Low Reef |
| | 411 491 | 5 747 335 | | | | | | | |
| | 411 494 | 5 747 336 | Muddy Sand with gravel | 4.7 | 5.0 | 6.7 | Not a Reef | >25m² | Not a Reef |
| | 411 500 | 5 747 339 | | | | | | | |
| | 411 506 | 5 747 343 | Muddy Sand with gravel | 15.0 | 15.0 | 9 | Not a Reef | <25m² | Not a Reef |
| | 411 507 | 5 747 343 | | | | | | | |
| | 411 514 | 5 747 346 | Muddy Sand with gravel | 6.5 | 7.5 | 2.5 | Not a Reef | >25m² | Not a Reef |
| | 411 545 | 5 747 360 | | | | | | | |
| | 411 547 | 5 747 361 | Muddy Sand with gravel | 8.2 | 5.2 | 12 | Not a Reef | >25m² | Not a Reef |
| | 411 560 | 5 747 369 | | | | | | | |
| A4_GLC_01 | 399 545 | 5 693 321 | Muddy Sand with gravel | 43.5 | 20.8 | 22 | Low Reef | >25m² | Low Reef |
| | 399 556 | 5 693 391 | | | | | | | |
| A4_GLC_02 | 399 775 | 5 695 084 | Muddy Sand with gravel | 40.0 | 50.0 | 40 | Low Reef | <25m² | Not a Reef |
| | 399 775 | 5 695 084 | | | | | | | |
| | 399 777 | 5 695 078 | Not Visible | N/A | N/A | N/A | N/A | >25m² | N/A |
| | 399 779 | 5 695 071 | | | | | | | |
| | 399 779 | 5 695 071 | Muddy Sand with gravel | 35.0 | 10.0 | 2.5 | Not a Reef | >25m² | Not a Reef |
| | 399 781 | 5 695 063 | | | | | | | |
| | 399 781 | 5 695 063 | Muddy Sand with gravel | 26.0 | 21.0 | 20 | Low Reef | >25m² | Low Reef |
| | 399 805 | 5 694 975 | | | | | | | |
| | 399 828 | 5 694 999 | Muddy Sand with gravel | 25.0 | 10.0 | 35 | Low Reef | >25m² | Low Reef |
| | 399 803 | 5 694 975 | | | | | | | |
| | 399 802 | 5 694 974 | Not Visible | N/A | N/A | N/A | N/A | <25m² | N/A |
| | 399 803 | 5 694 970 | | | | | | | |
| | 399 303 | 5 691 929 | | | | | | | |

| Geodetics: ETRS89, UTM 31N | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Station | Easting (m) | Northing (m) | Sediment Type | Stony Reefiness (After Irving, 2009) | | | | | |
| | | | | Mean Composition (% Cover of Cobbles/ Boulders) | Mean Elevation (of Cobbles/ Boulders in mm) | Mean Epifaunal Coverage (% of epifaunal coverage on Cobbles / Boulders) | Mean Reefiness (Structure) | >25m² | Overall Mean Reefiness (Structure vs Extent) |
| A4_GLC_03_A | 399 268 | 5 691 842 | Muddy Sand with | 61.6 | 21.3 | 36.8 | Low Reef | >25m² | Low Reef |

One of the key principles to be considered for an area when assessing its 'resemblance' to Annex I stony reef is stability; areas of consolidated and patchy hard substrate may not fulfil the composition requirements of the Annex I stony reef criteria by Irving (i.e. not having the required percentage of cobbles and boulders), but stability allows a diverse and 'reef-like' epifaunal community to develop (Golding *et al.,* 2020).

The transects where an initial Annex I stony reef assessment were conducted and exhibited overall 'Low Reef' (structure vs epifaunal coverage vs extent) were further investigated to establish whether hard substrate areas still corresponded to reef-like structures based on the epifauna present. This involved the assignment of 'reef biotopes', the identification of key species and the richness of 'reef species' according to the criteria outlined in Golding *et al.,* 2020 (Table 5-15).

**Table 5-15 Biota Criteria for Defining 'Low Resemblance' Stony Reef (Golding *et al.,* 2020)**

| Reef | Stage 1 | Stage 2 | Stage 3 |
|---|---|---|---|
| | **Reef Biotopes** | **Key Reef Species Count** | **Reef Species Count** |
| **Reef** | Reef biotope | ≥3 | >20 |
| **Possible reef** | Possible reef biotope | >1 and <3 | >5 and <20 |
| **Not reef** | Non-reef biotope | 0 | <5 |

The majority of the transects occurred in the habitat 'Circalittoral Mixed Sediment' a possible reef biotope (Golding *et al.,* 2020). Throughout the 'Low Reef' stills of the assessment, the number of species present was very low. A majority of the stills only possessed tube worms (Serpulidae) on the cobbles, these tube worms are considered a desirable species rather than a key reef species. This indicates that these stills were 'Not a Reef' due to the low epifaunal diversity. Alongside these tube worms there were occasions where faunal turf or sponge would occur, however this would still bring the reef species to <5. Therefore these patches were likely to consist of 'Low Reef' with insufficient evidence to justify Annex I protection for these formations.

Overall due to the low species diversity and generally low elevation of many of the habitats present it is unlikely that an Annex I Stony Reef habitat occurs along the survey route.

### 5.4.2 Annex I Biogenic reefs formed by *Sabellaria spinulosa*;

*Sabellaria spinulosa* is a tube-building polychaete worm and can occur as isolated individuals, small aggregations, thin crust-like veneers, or when in large numbers can form hard reef-like structures which can act to stabilise the surrounding seabed (Gibb *et al.*, 2014). As their tubes are built of sand, a high suspended sediment content is essential for growth of reeflike structures and the mobile sandy seabed within the survey corridor may provide this.

The presence of *S. spinulosa* was noted along four transects in Area 2 of the survey route. These transects were therefore investigated further to assess whether any areas have the potential to be classified as Annex I Biogenic reefs. An assessment of reefiness as described by Gubbay (2007) (Table 5-16) was performed to describe the habitat, focusing on transects where *S. spinulosa* was recorded during review of video footage and stills photographs. Changes in coverage and density of the *S. spinulosa* tubes were noted during the videos in order to accurately estimate the area covered by *S. spinulosa*.

**Table 5-16 An Overview of *Sabellaria spinulosa* Reef Classification (after Gubbay, 2007)**

| Measure of 'Reefiness' | Not a Reef | Low | Medium | High |
|---|---|---|---|---|
| Elevation (average tube height, cm) | <2 | 2-5 | 5-10 | >10 |
| Area ($m^2$) | <25 | 25-10,000 | 10,000–1,000,000 | >1,000,000 |
| Patchiness (%Cover) | <10 | 10-20 | 20-30 | >30 |

To apply the Gubbay (2007) protocol to the acquired data, it was further separated into reef 'structure' and overall 'reefiness' (Table 5-17 and Table 5-18). The advantage of this method is that the reef structure value derived from the patchiness (i.e. percent coverage) and tube elevation reefiness, can be assessed against the extent to produce a measure of overall reefiness. This method was initially devised by BSL staff and later approved by the JNCC in 2010 (see Jenkins *et al.* (2015) for an example of application by JNCC and Cefas).

Stills were created at 20 second intervals to ensure appropriate coverage of the transects where *S. spinulosa* was present. Each still was assessed for *S. spinulosa* patchiness and tube elevation, which were then combined to assess reef structure. Areas of similar reefiness were grouped together to create patches and underwent a chi squared test to see whether areas of reefiness are associated with certain seabed features.

Assessment was more challenging for *S. spinulosa* encrusted cobbles and boulders as it was difficult to estimate the size of the underlying cobble/boulder, therefore tube elevation levels were estimated by the reviewer, focussing on differentiating between tube elevation size classes of relevance to 'reefiness' assessment. For example, *S. spinulosa* aggregations <64mm were estimated to have a tube elevation of 2 to 5cm (Low Reefiness), while aggregation of 64 to 256mm would be estimated to have a tube elevation of 5 to 10cm (Medium Reefiness) and aggregations >256mm would be estimated as >10cm tube elevation (High Reefiness).

**Table 5-17 *Sabellaria spinulosa* Reef Assessment Composition vs Elevation**

| Reef Structure Matrix | | | Elevation (cm) | | | |
|---|---|---|---|---|---|---|
| | | | <2 | 2 to 5 | 5 to 10 | >10 |
| | | | Not a Reef | Low | Medium | High |
| Patchiness | <10% | Not a Reef | Not a Reef | Not a Reef | Not a Reef | Not a Reef |
| | 10-20% | Low | Not a Reef | Low | Low | Low |
| | 20-30% | Medium | Not a Reef | Low | Medium | Medium |
| | >30% | High | Not a Reef | Low | Medium | High |

**Table 5-18 *Sabellaria spinulosa* Reef Assessment Structure vs Extent**

| Reef Structure vs Area | | | Area ($m^2$) | | | |
|---|---|---|---|---|---|---|
| | | | <25 | 25-10,000 | 10,000-1,000,000 | >1,000,000 |
| | | | Not a Reef | Low | Medium | High |
| Reef Structure (incl. Patchiness and Elevation) | <10% | Not a Reef | Not a Reef | Not a Reef | Not a Reef | Not a Reef |
| | 10-20% | Low | Not a Reef | Low | Low | Low |
| | 20-30% | Medium | Not a Reef | Low | Medium | Medium |
| | >30% | High | Not a Reef | Medium | High | High |

The UW stills indicated a low density of *S. spinulosa* across the survey area with transects mainly comprising of low elevation elements of *S. spinulosa* on top of mixed sediment. Of the 151 total images assessed, 19 (12.6%) were unclear for analysis, with 52 (34.4%) were classified as 'No Reef. In terms of percentage cover 32 stills (21.2%) were considered 'Not a Reef', 21 stills (13.9%) were considered 'Low Reef', 13 (8.6%) were considered 'Medium Reef' and 14 stills (9.3%) were considered 'High Reef'. In terms of elevation the data indicated less reefiness with 64 stills (27.2%) being classified as 'Not a Reef' and 16 stills (10.6%) were considered 'Low Reef' with no stills considered 'Medium Reef' or 'High Reef' (Table 5-19). When both patchiness and elevation were taken into account to look at overall reef structure, 74 images (49%) were considered 'Not a Reef' and 6 stills (3.4%) were considered 'Low Reef'. The low elevation of the *S. spinulosa* structures was the main reasoning for reef structure being 'Not a Reef' overall. The distribution of the stills and their reef structure is illustrated in Figure 5-15.

**Table 5-19 *Sabellaria spinulosa* Reef Assessment (Composition vs Elevation)**

| 'Reefiness' of Video Screengrabs | Unclear UW Still | | No *Sabellaria* | | Not a Reef | | Low | | Medium | | High | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | No. | % | No. | % | No. | % | No. | % | No. | % | No. | % |
| Patchiness (% cover) | 19 | 12.6 | 52 | 34.4 | 32 | 21.2 | 21 | 13.9 | 13 | 8.6 | 14 | 9.3 |
| Elevation (Tube height) | | | | | 64 | 27.2 | 16 | 10.6 | 0 | 0 | 0 | 0 |
| Reef Structure | | | | | 74 | 49 | 6 | 3.4 | 0 | 0 | 0 | 0 |

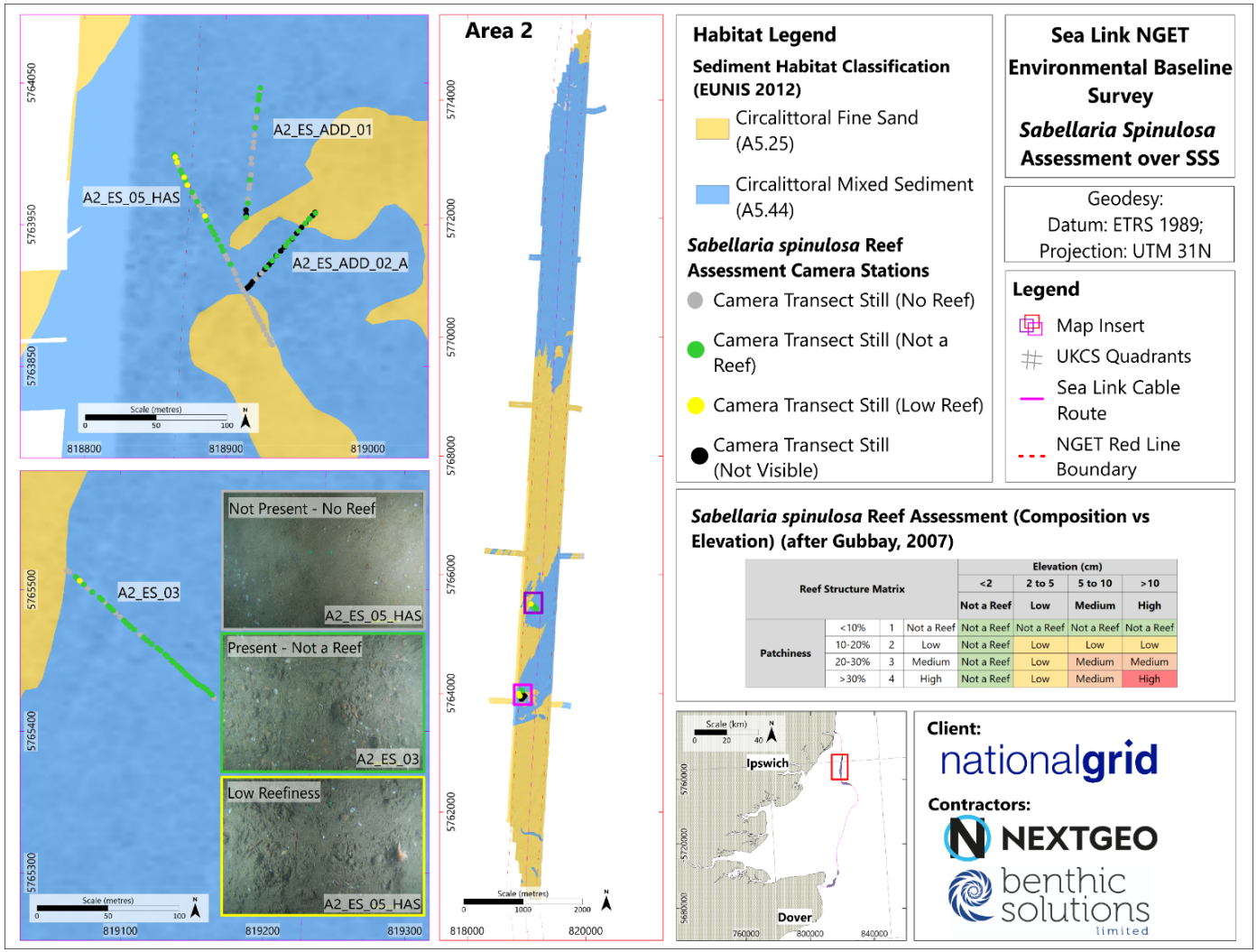



**Figure 5-15 *Sabellaria spinulosa* Reef Assessment (Composition vs Elevation)**

The second stage of the *Sabellaria* reefiness investigation was to assess the average reef structure for each delineated patch of *S. spinulosa* against the delineated patch area to assess the overall patch 'reefiness' (Table 5-19). In such circumstances, an approximation of the aerial extent of each *S. spinulosa* patch can be made from the transect length, by assuming that reefs occupied circular areas of seabed (i.e. reef extent or distance equates to the diameter of a circle, whose area is calculated using $\pi r^2$).

There were 12 areas delineated as 'Not a Reef' with no patches considered 'Low Reef', 'Medium Reef' or 'High Reef' (Table 5-20; Figure 5-16.). Details of the full assessment are provided in Appendix I – REEF AND MUSSEL BED ASSESSMENT LOGSHEET. Overall the results indicate that an Annex I habitat did not occur in the survey route with any *Sabellaria spinulosa* aggregations being low elevation and non-reef forming.

**Table 5-20 Overview of *Sabellaria spinulosa* Reef Assessment Patches**

| Structure vs Extent | Total | Not Visible | No Reef | Not a Reef | Medium Reef | High Reef |
|---|---|---|---|---|---|---|
| Patches | 14 | 1 | 2 | 12 | 0 | 0 |

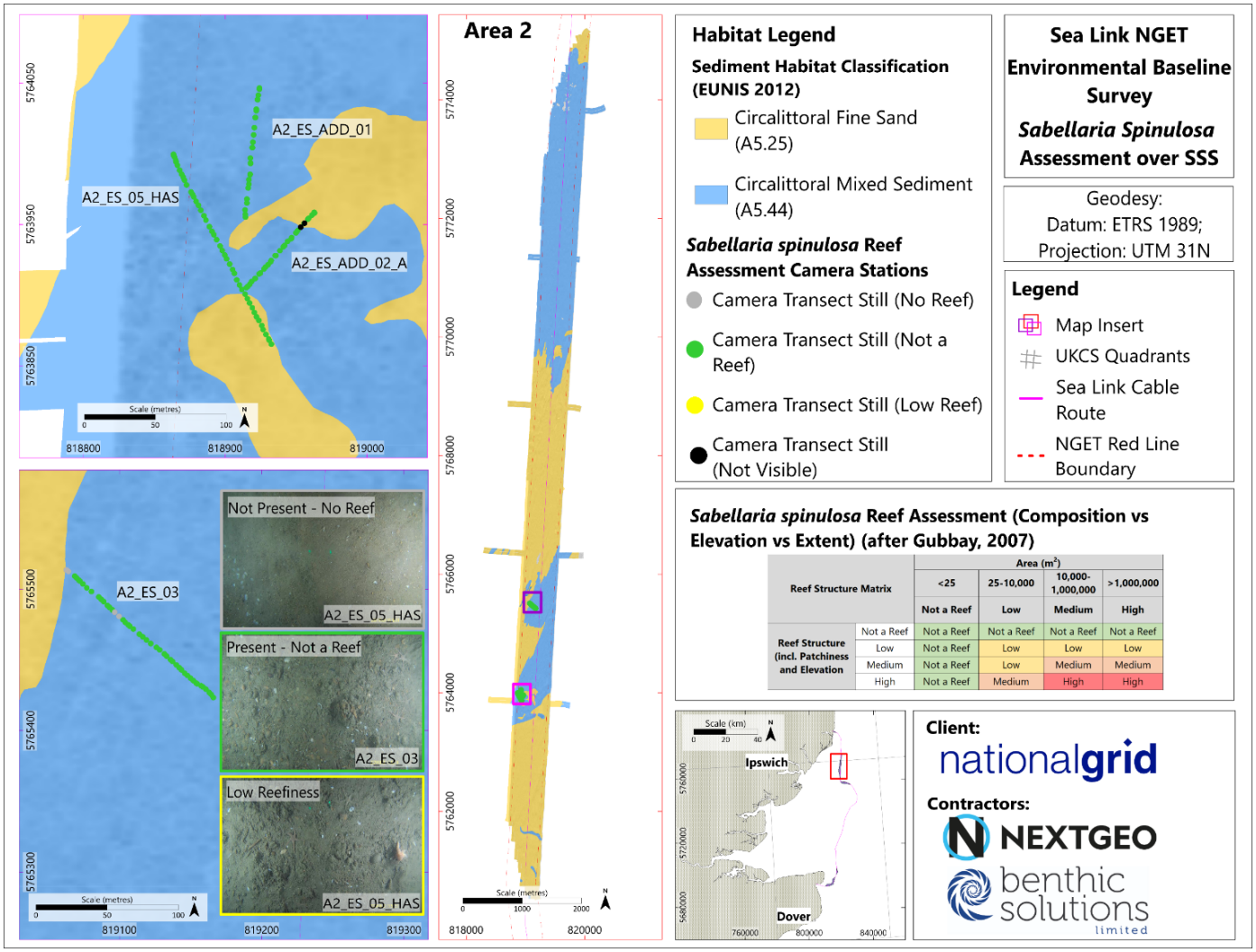



**Figure 5-16 *Sabellaria spinulosa* Reef Assessment (Structure vs Extent)**

### 5.4.3 Annex I Blue Mussel (*Mytilus edulis*) Beds

During video assessment, two transects (A5_OPB_05_HAS and A5_OPB_Add_01) were observed to have a high density of blue mussels (*Mytilus edulis*). Blue mussel beds are a UKBAP priority habitat with blue mussels having a role in coastal sediment dynamics, acting as a food source and providing enhanced biodiversity (JNCC, 2008). This habitat is threatened by commercial fisheries with the targeted removal of mussels as well as fishing causing physical damage to the beds, due to their feeding habits *Mytilus edulis* accumulate pollutants which can lead to sublethal or lethal responses and coastal development causing physical damage.

To assess the presence of mussels in these transects, a method was adopted incorporating the SACFOR scale alongside a grading system outlined in Roberts *et al.*, (2011). Stills were captured at 20 second intervals to evaluate total mussel coverage. Initially it was determined whether the still represented a crust/meadow (single layer of mussels on sediment) or a massive/turf (several layers of mussel on a large scale) as this classification would inform the application of the SACFOR scale based on coverage (Table 5-21). Each still was then assigned a SACFOR scale rating according to mussel coverage, which was used to inform the grading of the mussel habitat, to provide a quantitative assessment.

**Table 5-21 Overview of Mussel (*Mytilus edulis*) Bed Assessment Categories**

| Coverage | Crust/Meadow SACFOR | BSL Grading adapted from Roberts *et al*, 2011 | Massive/Turf | BSL Grading adapted from Roberts *et al*, 2011 |
|---|---|---|---|---|
| >80% | Superabundant | 1 | Superabundant | 1 |
| 40-79% | Abundant | | Superabundant | |
| 20-39% | Common | | Abundant | |
| 10-19% | Frequent | 2 | Common | |
| 5-9% | Occasional | | Frequent | 2 |
| 1-5% | Rare | 3 | Occasional | |
| <1% | Less than Rare | | Rare | 3 |
| 0% | Absent | 4 | Absent | 4 |

The stills taken during the survey and additional screengrabs from the video footage analysed displayed crust/meadow rather than a massive/turf environment form was present (a complete log of the assessment per still is provided in Appendix I – REEF AND MUSSEL BED ASSESSMENT LOGSHEET). Of the 99 images from transects, six (6.1%) were unclear images due to poor visibility (Table 5-22). Five stills (5.1%) were classified as 'Superabundant', 14 (14.1%) were classified as 'Abundant', 15 (15.2%) were classified as 'Common', 14 (14.1%) were classified as 'Frequent', 16 (16.2%) as 'Occasional', 10 (10.1%) as 'Rare' and 19 (19.2%) as 'Absent' (Table 5-22.)

**Table 5-22 Overview of SACFOR Results for Blue Mussel Bed Assessment**

| | Stills |
|---|---|

| SACFOR Scale | No. | % |
|---|---|---|
| Super abundant | 5 | 5.1 |
| Abundant | 14 | 14.1 |
| Common | 15 | 15.2 |
| Frequent | 14 | 14.1 |
| Occasional | 16 | 16.2 |
| Rare | 10 | 10.1 |
| Less than rare | 0 | 0.0 |
| Absent | 19 | 19.2 |
| Not visible | 6 | 6.1 |

When this SACFOR scale was converted into the grading system by Roberts *et al* (2011) it revealed that most images were considered Grade 1 and 2. A total of 34 stills (34.3%) were considered Grade 1, 30 (30.3%) were categorised as Grade 2, 10 (10.1%) were classed as Grade 3, 19 (19.2%) were classified as Grade 4. These findings can be summarised in Table 5-23 and illustrated in Figure 5-17 showing the spatial distribution.

**Table 5-23 Overview of BSL Grading of Blue Mussel Bed Assessment**

| Roberts *et al* (2011) Adapted BSL Grading | Unclear UW Still | | Grade 4 | | Grade 3 | | Grade 2 | | Grade 1 | |
|---|---|---|---|---|---|---|---|---|---|---|
| | No. | % | No. | % | No. | % | No. | % | No. | % |
| Stills | 6 | 6.1% | 19 | 19.2 | 10 | 10.1 | 30 | 30.3 | 34 | 34.3 |

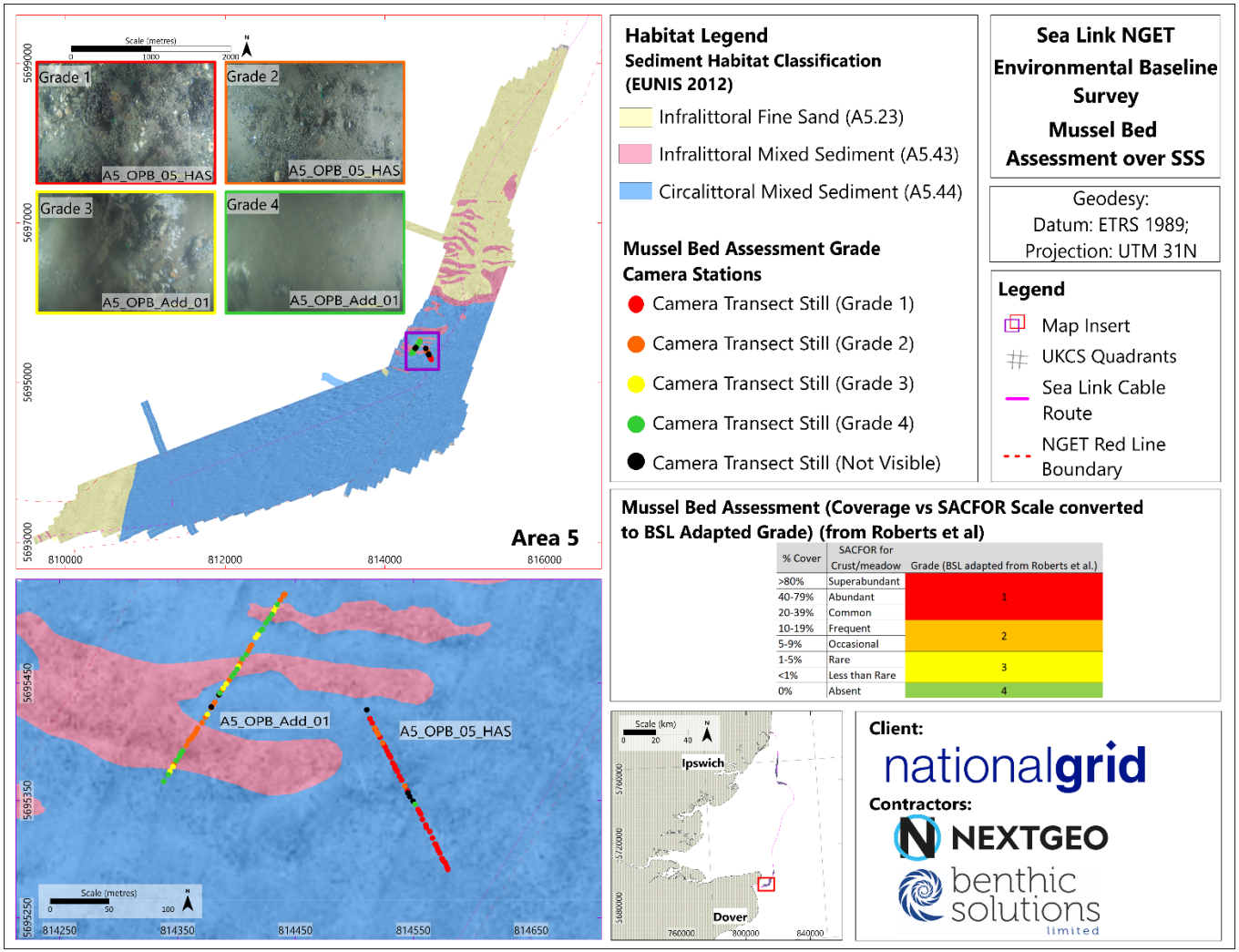



**Figure 5-17 Blue Mussel (*Mytilus edulis*) Bed Assessment (BSL Grading)**

This assessment reveals that all of the Grade 1 stills were found along transects A5_OPB_05_HAS with A5_OPB_Add_01 showing more patchy and less dense aggregations. To calculate the estimated area of the Mussel beds, an approximation of the aerial extent of each *M. edulis* patch was made from the transect length, by assuming that reefs occupied circular areas of seabed (i.e. reef extent or distance equates to the diameter of a circle, whose area is calculated using $\pi r^2$).

Overall there were 18 patches in the survey area with a single non-visible patch. Of the remaining patches, 3 were classed as Grade 1, 5 being classed as Grade 2, 4 being classed as Grade 3 and 5 being classed as Grade 4. OSPAR definitions define a mussel bed as at least a 20% cover of subtidal sediments over an area of at least 25m$^2$ to qualify as a bed (OSPAR, 2010), using this definition patches can be estimated and those with an area of greater than 25m$^2$ and considered Grade 1 could be potential mussel beds. This revealed that all three grade 1 patches found could be a potential mussel bed under this definition with an overview of these patches is summarised in Table 5-24.

**Table 5-24 Blue Mussel Assessment Patches Extent Overview**

| Grading vs Extent | Total | Grade 1 | Grade 2 | Grade 3 | Grade 4 | Not Visible |
|---|---|---|---|---|---|---|
| Patches | 18 | 3 | 5 | 4 | 5 | 1 |

### 5.4.4 Lesser Sandeel (*Ammodytes marinus*) Spawning and Nursery Grounds

Sandeels are small, thin eel-like fish that form large shoals and live most of their life buried in the seabed. They are considered an important component of marine food webs providing food for marine predators such as seabirds, mammals, and other fish (Furness, 1990; 2002). Of the five species of sandeels occurring in the North Sea, the lesser sandeel (*A. marinus*) is the most abundant and comprises over 90% of sandeel fishery catches (Fisheries Management Guidance, 2014). Sandbanks and other sandy areas are known to be important habitat for sandeel, which prefer habitats in water depths between 30m and 70m but are known to occur at depths of 15 m and 120 m (Holland *et al.,* 2005). These small fish burrow into the sediment, sand and use interstitial water to ventilate their gills (Holland *et al.,* 2005). They do not create a permanent opening when burrowed. Fine sediment has the potential to clog their gills and therefore, sandeel have a very specific habitat requirement, resulting in an often highly patchy distribution (Holland *et al.,* 2005; Jensen *et al.,* 2011).

Preferred sandeel habitat is a substrate which contains a high percentage of medium to coarse sand (particle size of 0.25 mm to 2 mm), with a mud content of less than 10% (particles <63 µm) (Wright *et al.,* 1998; Holland *et al.,* 2005). Sediments with a gravel component are also considered to be suitable for sandeel habitat. The inclusion of gravel means that using Folk classifications (Folk, 1954) to assess the habitat can overstate the suitability of habitat for sandeels. To determine areas of potential available habitat for sandeel grounds, the PSA results for the grab stations were compared to the parameters specified by Latto *et al.* (2013), as shown in Table 5-25 with these groupings overlaid on a Folk Triangle scale in Figure 5-18.

**Table 5-25 Sandeel Ground Assessment Categories Specified by Latto *et al.* (2013)**

| Folk Categories | Habitat Preference |
|---|---|
| Sand | Preferred |
| Gravelly Sand | Preferred |
| Slightly Gravelly Sand | Preferred |
| Sandy Gravel | Marginal |
| Other | Unsuitable |

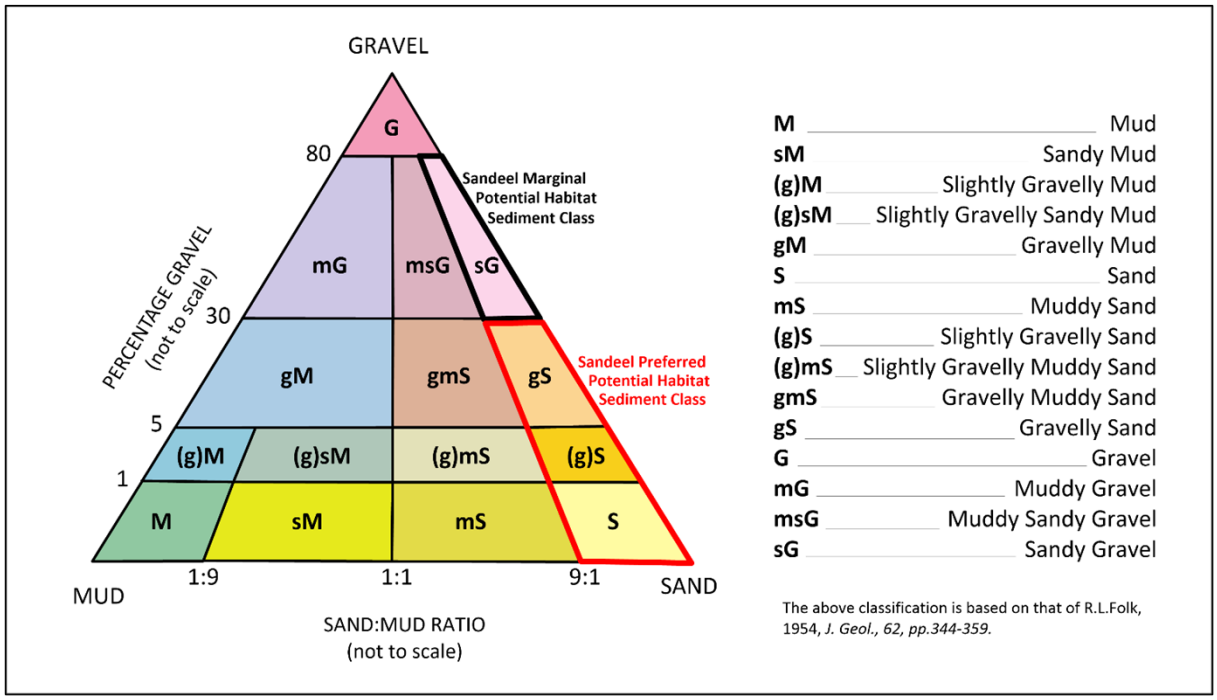



**Figure 5-18 Folk Sediment Triangle with Sandeel Preferred and Marginal Habitat Sediment Classes (Based on Latto *et al.*, 2011; adapted from Greenlink 2019)**

Results from analysis of PSA and assigned Folk scale data, using the method outlined in Latto *et al.* (2013) are outlined in Table 5-26. 'Preferred' sediments for sandeel grounds were identified at two stations (A2_ES_04 and A5_OPB_01) located Area 2 and Area 5 of the survey area with the folk scale 'Gravelly Sand' (Table 5-26). A2_ES_04 was located in 'Circalittoral Mixed Sediment', however this small area was surrounded by a large area of 'Circalittoral Fine Sand' with A5_OPB_01 located in an area of 'Infralittoral Fine Sand'. Both grab locations were situated in areas with ripples and wave features. The remaining stations were classed as 'Unsuitable' for sandeel habitat as the stations showed bimodal sediment distributions, containing fine and coarse material, and were therefore assigned to Folk classifications of 'Muddy Sandy Gravel' and 'Slightly Gravelly Sandy Mud' (Table 5-26).

**Table 5-26 Sandeel ground assessment results using Latto *et al.* (2013)**

| Station | Depth (m) | Modified Folk Scale | Habitat Preference |
|---|---|---|---|
| A2_ES_01 | 17.7 | Muddy Sandy Gravel | Unsuitable |
| A2_ES_02 | 22.9 | Slightly Gravelly Sandy Mud | Unsuitable |
| A2_ES_03 | 24.7 | Muddy Sandy Gravel | Unsuitable |
| A2_ES_04 | 21.6 | Gravelly Sand | Preferred |
| A3_NS_01 | 22.8 | Muddy Sandy Gravel | Unsuitable |
| A4_GLC_01 | 13.5 | Muddy Sandy Gravel | Unsuitable |
| A4_GLC_03 | 11.5 | Muddy Sandy Gravel | Unsuitable |
| A5_OPB_01 | 11.8 | Gravelly Sand | Preferred |

More specific definitions of sandeel preferred grounds using sediment particle size were provided by Greenstreet *et al.* (2010). This method utilises the percentage composition of the sediment by weight, which is split into two distinct fractions; silt and fine sand (particles >0.25mm), and medium to coarse sand (particles

0.25-2.0mm). The coarse >2mm fraction, which can often overstate sandeel habitat suitability, is not considered by this method. The sediment fraction data are then used to assess sandeel sediment preference for each station from Figure 5-19.

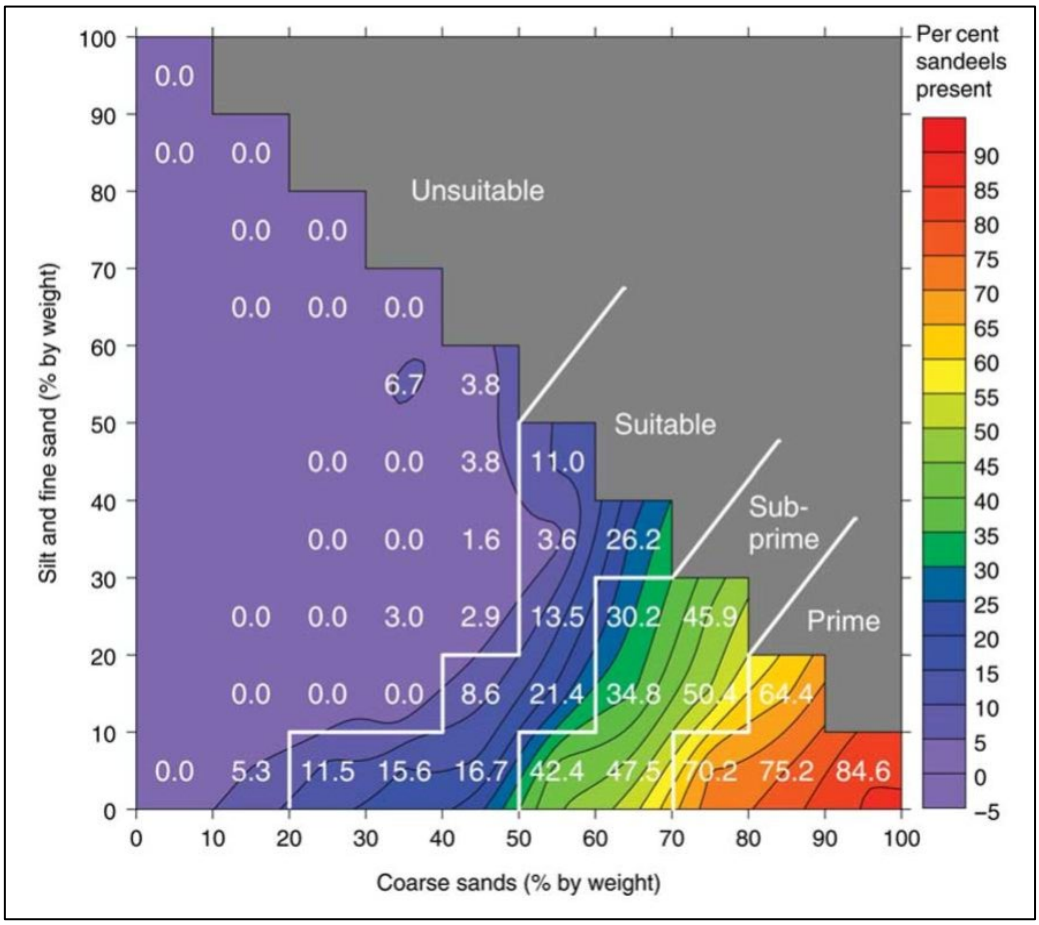



**Figure 5-19 Sandeel sediment preference categories as per Greenstreet *et al.* (2010) (silt and fine sand refer to particle sizes >0.25mm, whilst medium to coarse sand refer to particle sizes 0.25 to 2.0mm)**

The results using the method outlined in Greenstreet *et al.* (2010) indicated less habitat suitability than with the Latto *et al.,* (2013) method, with stations that were 'Unsuitable' in Latto *et al.,* (2013) method still being 'Unsuitable'. A5_OPB_01 was classed as 'Prime' with this method however A2_ES_04 became classed as 'Sub-Prime' due to the higher proportion of 'Silt and Fine Sands' (Table 5-27 and Figure 5-20). The presence of sandeels within the macrofauna data obtained at each station will be discussed in the subsequent environmental baseline survey report. The Sea Link survey route falls within sandeels low intensity spawning and nursing grounds; however, it should be noted that even optimal habitats may not be occupied by sandeels if populations are below the area's carrying capacity (Holland *et al.,* 2005).

**Table 5-27 Sandeel ground assessment results using Greenstreet *et al.* (2010)**

| Station | Water Depth (m) | Silt and Fine Sands (% by weight) | Medium to Coarse Sands (% by weight) | Habitat Preference |
|---|---|---|---|---|
| A2_ES_01 | 17.7 | 25.5 | 6.7 | Unsuitable |
| A2_ES_02 | 22.9 | 90.3 | 8.3 | Unsuitable |
| A2_ES_03 | 24.7 | 48.8 | 17.8 | Unsuitable |
| A2_ES_04 | 21.6 | 12.6 | 77.3 | Sub-Prime |
| A3_NS_01 | 22.8 | 50.3 | 14.5 | Unsuitable |
| A4_GLC_01 | 13.5 | 24.2 | 29.1 | Unsuitable |
| A4_GLC_03 | 11.5 | 28.0 | 14.8 | Unsuitable |
| A5_OPB_01 | 11.8 | 6.5 | 83.3 | Prime |

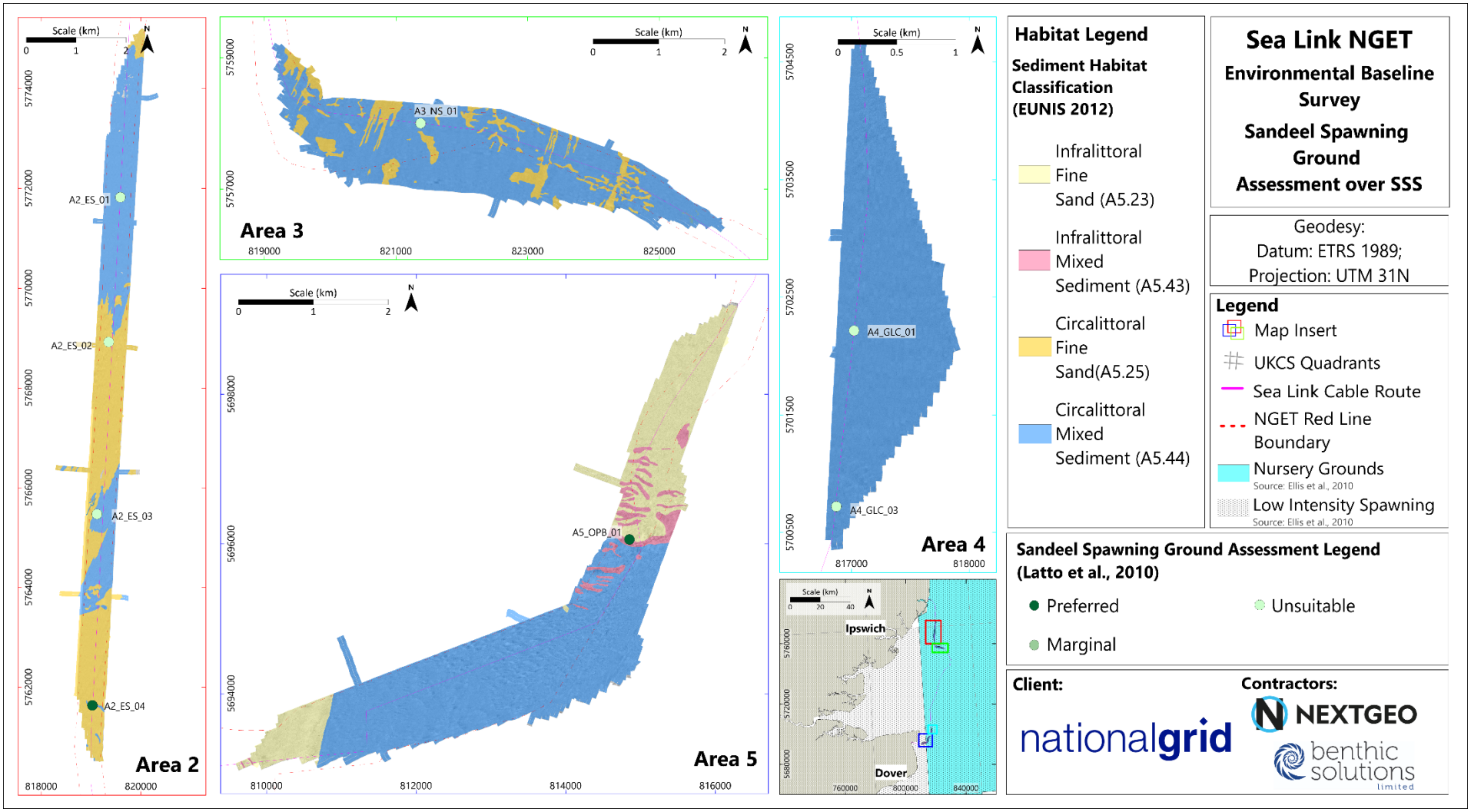



**Figure 5-20 Sandeel Spawning and Nursing Grounds (Latto *et al.*,2013)**

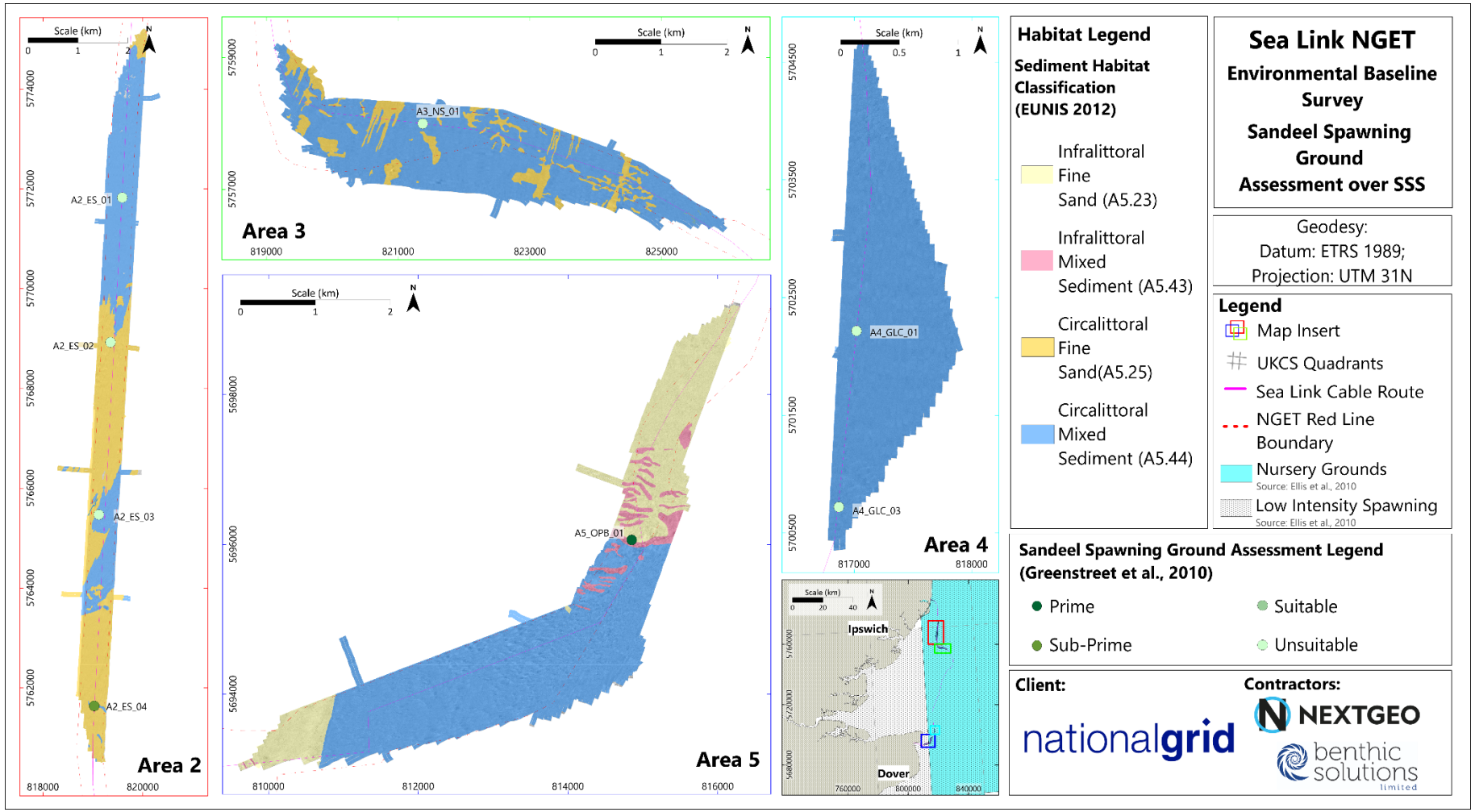



**Figure 5-21 Sandeel Spawning and Nursing Grounds (Greenstreet et al.,2010)**

### 5.4.5 Herring Spawning and Nursery Grounds

Herring spawning grounds (HSGs) and nursery grounds have been delineated by Cefas for UK waters. The Sea Link survey route lies within both a low intensity and high intensity nursery ground (Figure 5-22). Spawning occurs during August to October and suitable HSGs include sediments that are well oxygenated, allowing their sticky eggs to gestate for around three weeks before they hatch (Rogers & Stocks, 2001). Such sediments are limited to unimodal, unmixed very coarse sands and gravels with a low proportion of fines (Ellis *et al.,* 2012). Overexploitation and poor recruitment led to a decline in the North Sea herring spawning stock in the 1970s, forcing closure of the fishery in 1977. Due to the unique sedimentary requirement for HSGs and the stock's vulnerability to overfishing (Rogers & Stocks 2001), HSGs may be subject to protection if found. To determine whether any potential habitat for herring spawning exists within the Sea Link survey route, the PSA results from the grab sampling stations were assigned to the categories specified by Reach *et al.* (2013), as shown in Table 5-28.

**Table 5-28 Herring Spawning Ground Assessment Categories Specified by Reach *et al.* (2013)**

| Percent Contribution of Mud & Gravel | Habitat Sediment Preference | Habitat Sediment Classification |
|---|---|---|
| <5% mud, >50% gravel | Prime | Preferred |
| <5% mud, >25% gravel | Sub-prime | Preferred |
| <5% mud, >10% gravel | Suitable | Marginal |
| >5% mud or <10% gravel | Unsuitable | Unsuitable |

Results from particle size distribution of the survey area indicated that most stations were classified as 'Unsuitable' for herring spawning grounds due to the fines content being above 5%. The only exception was A5_OPB_01 which had a lower fines content of 3.0% however gravel content was at 10.2% which whilst considered 'Suitable' in terms of preference only allowed it to be classified as 'Marginal'. This station was found in an area with the modified folk classification of 'Gravelly Sand' and classified as 'Infralittoral Fine Sand' from the habitat assessment (Table 5-29 and Figure 5-22). Assessments for HSG have only been carried out for grab stations in which ground truthing PSA data is available and not across the entire transects. Although video data can provide a view into the overall transects potential classification, the significant influencing factors have not been quantified and therefore cannot be used to define the preference and classification of HSG.

**Table 5-29 Herring Spawning Ground Assessment Results Using Reach *et al.* (2013)**

| Station | Water Depth (m) | Fines (%) | Sands (%) | Gravel (%) | Habitat Sediment Preference | Habitat Sediment Classification |
|---|---|---|---|---|---|---|
| A2_ES_01 | 17.7 | 15.5 | 16.7 | 67.8 | Unsuitable | Unsuitable |
| A2_ES_02 | 22.9 | 63.2 | 35.4 | 1.4 | Unsuitable | Unsuitable |
| A2_ES_03 | 24.7 | 30.4 | 36.2 | 33.4 | Unsuitable | Unsuitable |
| A2_ES_04 | 21.6 | 7.1 | 82.8 | 10.1 | Unsuitable | Unsuitable |
| A3_NS_01 | 22.8 | 31.0 | 33.8 | 35.2 | Unsuitable | Unsuitable |
| A4_GLC_01 | 13.5 | 11.0 | 42.2 | 46.7 | Unsuitable | Unsuitable |
| A4_GLC_03 | 11.5 | 15.9 | 26.9 | 57.2 | Unsuitable | Unsuitable |
| A5_OPB_01 | 11.8 | 3.0 | 86.8 | 10.2 | Suitable | Marginal |

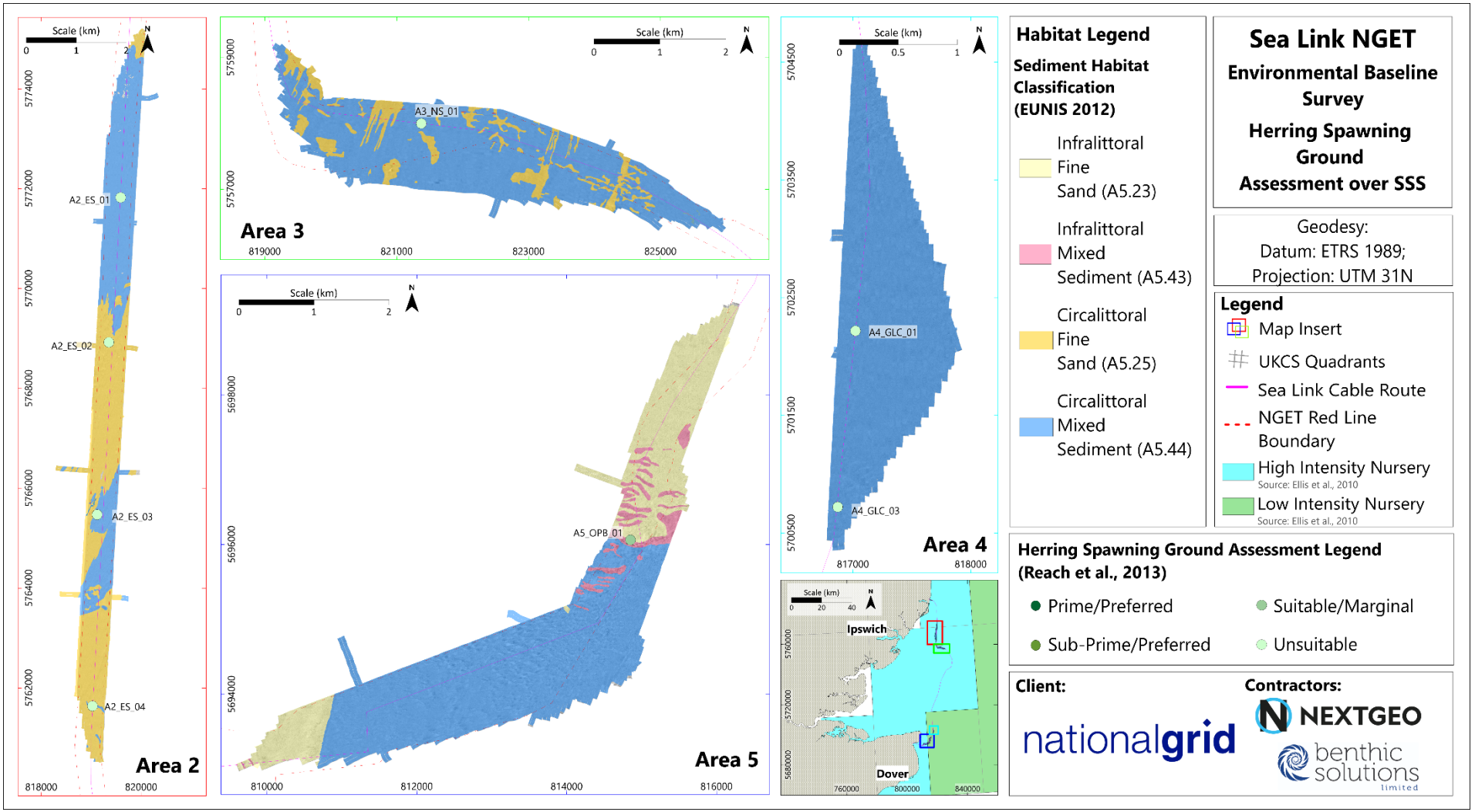



**Figure 5-22 Herring Spawning and Nursing Grounds (Reach *et al.*, 2013)**

### 5.4.6 Ocean Quahog (*Arctica islandica)*

The ocean quahog (*Arctica islandica*) bivalve species is afforded protected status under the OSPAR Commission due to its inclusion on the OSPAR list of threatened and/or declining species in the Greater North Sea area as a priority species (OSPAR, 2008; 2009a). This species is also listed as an MCZ FOCI for both inshore and offshore protection (JNCC and Natural England, 2016). Ocean quahog grow very slowly, and are at particular risk from bottom fishing gear, and, like other slow-growing animals, once their numbers have been reduced their populations can take a long time to recover.

No living adult specimens were identified during field operations (>5cm shell diameter) and no siphons were observed during the HD video review or stills. Further information on the potential presence of juvenile *A. islandica* (<1cm shell diameter) will be explored using faunal data in the subsequent environmental baseline survey report.

## 5.5 Designated Sites

The Sea Link survey areas two and three are situated within the large Southern North Sea Special Area of Conservation (SAC), which stretches from the central North Sea (north of Dogger Bank) to the Straits of Dover in the south. A mix of habitats which are afforded Annex I protection, such as sandbanks and gravel beds, are present within the SAC but are designated as individual SACs and Marine Conservation Zones (MCZs). No Sea Link survey areas are not situated within a MCZ but is located near to two MCZs; Orford Inshore and Kentish Knock East (Table 5-30). There is also a Special Protection Area (SPA) near the cable route; the Outer Thames Estuary, which is split into three sections and all Sea Link survey areas are under 10km away at the nearest point. The MCZs, SACs and SPAs found near to the Sea Link survey area and the primary features for which they were designated are summarised below in Table 5-30.

**Table 5-30 Key aspects of nearby protected areas**

| Protected Area Type | Designated Site | Site Area | Closest Distance to Survey Site | Key Aspects |
|---|---|---|---|---|
| MCZ | Orford Inshore | 72km$^2$ | 9.27km North West of area 2 | The site protects the Subtidal mixed sediments habitats, which is important nursery and spawning grounds for many fish species, including Dover sole (*Solea solea*), lemon sole (*Microstomus kitt*) and sandeels. Important shark species are also found within the site, including the small-spotted catshark (*Scyliorhinus canicula*). |
| | Kentish Knock East | 96.4 km$^2$ | 16.5kmSouth West of area 3 | The site protects examples of different Subtidal sediments, supporting a wide variety of infaunal species and the small spotted cat shark (*Scyliorhinus canicula*) and flatfish species. |
| SAC | Southern North Sea | 36,951km$^2$ | Areas 2 and 3 are Situated within and 5.94km West of Area 4 and 8.35km West of Area 5 | Important area for Annex II harbour porpoise (*Phocoena phocoena*). |
| SPA | Outer Thames Estuary | 3, 924km$^2$ made up of three inshore and offshore areas | Area 2 is partly situated within, 6.35km South West of Area 3 , 7.12km West of Area 4, and 7.55km North West of Area 5 | Protects the wintering red-throated diver, breeding little terns and breeding common terns. The area also contains sandbanks (Annex I) |

# 6 CONCLUSION

The depths in the surveyed areas of the Sea Link ranged from 7.3m to 27.4m below LAT. Sediment composition across the site was varied, with Areas 2, 4, and 5 predominantly consisting of sand and gravel, while Areas 2 and 3 exhibited mixed sediments. There was also one instance of dominant fines in Area 3. These sediment characteristics align with the results from the previous MMT (2022) survey.

Particle size analysis revealed a relatively heterogeneous seabed. Stations in the southern part of Area 2 and in Area 5 were dominated by sand, while stations in Area 4 and the northern part of Area 2 were primarily composed of gravel. Other stations in Areas 3 and the central part of Area 2 exhibited more mixed sediments. One station (A2_ES_02) in the central region of Area 2 was notably dominated by fines. No significant correlation was found between sediment characteristics and depth ($p$>0.05). . The samples collected represented three Folk classifications: the majority were classified as 'Muddy Sandy Gravel', while the remaining samples were categorised as either 'Gravelly Sand' or 'Slightly Gravelly Sandy Mud'. The mean particle size for each area aligned with the findings from the previous MMT (2022) survey.

The seabed within the survey area was classified into four EUNIS level four habitats. In the northern part of the survey route (Areas 2 and 3), the habitats identified were 'Circalittoral Mixed Sediment' (A5.44) and 'Circalittoral Fine Sand' (A5.25). The 'Circalittoral Mixed Sediment' was characterised by a higher gravel content within muddy sand, while 'Circalittoral Fine Sand' consisted predominantly of fine sand with occasional gravel patches. In the southern section (Areas 4 and 5), the habitats included both 'Circalittoral Mixed Sediment' and two additional types: 'Infralittoral Mixed Sediment' (A5.43) and 'Infralittoral Fine Sand' (A5.23). The 'Infralittoral Mixed Sediment' was similar to its circalittoral counterpart, featuring a gravel component within muddy sand, and was observed in shallow ribbons, particularly in Area 5. 'Infralittoral Fine Sand', found in the shallower parts of Area 5, was primarily composed of fine sand with occasional gravel patches.

Conspicuous fauna has increased diversity in areas with a higher density of cobbles with certain species occurring across most of the survey route such as brittlestars (Ophiuroidea), hermit crabs (*Pagurus* sp.) and common sea stars (*Asterias rubens*). Areas with a larger degree of hard substrate to attach to lead to an increase of tube worms (Serpulidae), dead man's finger (*Alcyonium digitatum*) and anemones (Actinaria).

Various potential sensitive habitats and species were identified from the HD video data. These included Annex I Geogenic stony reefs (EC Habitats Directive Annex I habitat), biogenic reef (EC Habitats Directive Annex I, Habitat FOCI, OSPAR Threatened and/or Declining Habitat, UKBAP Priority Habitat), lesser sandeel (*Ammodytes marinus*) (Species FOCI, UKBAP Priority Species), herring (*Clupea harengus*) spawning grounds, ocean quahog *(Arctica islandica*) (Species FOCI, OSPAR Threatened and/or Declining Species) and blue mussel (*Mytilus edulis*) beds (EC Habitats Directive Annex I habitat, UKBAP Priority Habitat).

An assessment for Annex I Geogenic Stony Reef was conducted across six transects in Areas 3 and 4, using HD video data. The evaluation focused on cobble and boulder coverage, elevation, epifaunal diversity, and patch extent. The results indicated low-elevation cobble and boulder coverage, with only the Area 4 transects (A4_GLC_01, A4_GLC_02, A4_GLC_03_A) displaying more extensive patches. Although classified as "Low Reef," the low species diversity—

primarily consisting of tube worms, faunal turf, and sponges—and the absence of key reef-building species indicated no Annex I habitat present.

The presence of *Sabellaria spinulosa* was analysed to assess its potential to form Annex I Biogenic Reef habitats. Observed across four transects in Area 2, the analysis focused on coverage, tube elevation, and patch extent using still images from HD video. The results concluded that the area as a whole does not qualify as a reef, with *S. spinulosa* aggregations lacking sufficient elevation. Only a few stills were classified as "Low Reef," but these were marginally distinguishable from the surrounding "Not a Reef" areas. Consequently, the site is categorised as "Not a Reef."

An assessment of Annex I blue mussel (*Mytilus edulis*) beds was carried out due to high-density observations at A5_OPB_05_HAS and less frequent occurrences at A5_OPB_Add_01. Using the SACFOR scale and a grading system adapted from Roberts *et al.* (2012), results indicated that *M. edulis* coverage at A5_OPB_Add_01 was too sparse and patchy to qualify as an Annex I habitat, with no areas meeting the Grade 1 criteria. In contrast, A5_OPB_05_HAS showed blue mussel coverage, with most stills classified as Grade 1, forming three large patches. These findings suggest the presence of a potential Annex I habitat at A5_OPB_05_HAS.

The survey route is situated in areas considered lesser sandeel (*Ammodytes marinus*) nursery grounds as well as low intensity spawning grounds. The PSA data was therefore assessed using methods outline in Greenstreet *et al* (2010) and Latto *et al* (2013) to determine habitat suitability for lesser sandeel spawning grounds. Using the method outlined in Latto *et al* (2013) it was found that most stations were deemed 'Unsuitable' with two stations (A2_ES_04 and A5_OPB_01) deemed 'Preferred' with these stations consisting mainly of 'Gravelly Sand'. The Greenstreet *et al* (2010) method showed similar results with most stations being 'Unsuitable' with A2_ES_04 considered 'Sub-Prime' due to a higher silt content compared to A5_OPB_01 which was considered 'Prime'.

The survey route is also present in areas designated as high and low intensity nursery grounds for Atlantic Herring (*Clupea harengus*). PSA was used to determine the suitability of the habitat for herring spawning grounds using methods outlined in Reach *et al* (2013). It was found that most habitats were 'Unsuitable' due to possessing too much fine content (>5%) or too little gravel (<10%), the only exception was A5_OPB_01 which was considered 'Suitable' but as it only just possesses enough gravel content (10.2%) and subsequently classed as 'Marginal'.

Ocean quahog are a bivalve species afforded protected status under the OSPAR Commission and declining population in the Greater North Sea. No adult specimens were identified during field operations and no siphons were observed during HD video review. In the subsequent EBS report, macrofaunal data will be analysed for the presence of any juvenile specimens (<1cm shell diameter).

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# APPENDIX A – BSL DOUBLE GRAB

benthic solutions limited

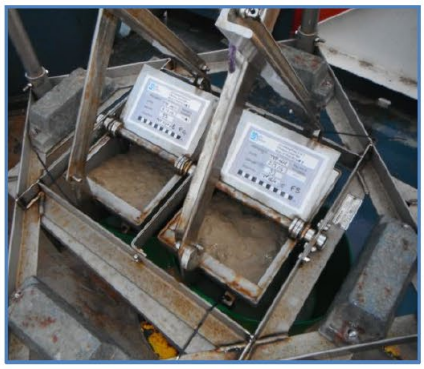
## BSL DOUBLE GRAB

- **General Specifications**

  - 2 x 0.1m² Sample Area
  - Total Stainless Steel Construction
  - Adjustable weight
  - Proven performance in 2000m depth
  - Flat Pack for Air Freighting

- **Services**

The BSL Double Grab was designed and built by BSL in 2007 to carry out more efficient grab sampling operations in very deep waters. It is also routinely used for projects where multiple replicates are required or where both chemical and biological analysis are needed from the same deployment. This multi-purpose sampling tool is ideal for shallow water and deep water operations alike, halving the ship-time required to acquire sample replicates in moderate water depths.



Recovery

Grab stand and sample trays

Made of stainless steel, the grab can be ballasted with additional lead weights, for operations in deeper waters, strong currents or compacted sediments. The two pairs of extended stainless steel arms increase the leverage on closure to the buckets, but these can be fouled by coarser gravels.

Both buckets have hinged doors fully enclosing the samples on recovery but allowing the scientist access to the undisturbed sample prior to emptying the sampler. Each bucket has the capacity to collect samples of approximately 15L.

Deployment

Direct access to sample

| | |
|---|---|
| Shipping weight | 200kg |
| Shipping dimension | 0.4*to 1.2 x 1 x 0.2m |
| Specifications | 920 x 920 x 1000mm |

**if sampler is dismantled for freighting*

Benthic Solutions, Unit A, Greengates Way, Hoveton, NR12 8ED, United Kingdom
Tel : +44 (0) 1603 784726 Mail: info@benthicsolutions.com www.benthicsolutions.com

# APPENDIX B – BSL MINI HAMMON GRAB

benthic solutions limited

## Mini-HAMON GRAB

- **General Specifications**

- 0.1m² Sample Area
- Stainless Steel Bucket Construction
- Proven performance in both deep and shallow waters
- Excellent for coarse sediments
- Inspection hatch for direct sub-sampling

- **Services**

Benthic Solutions Limited owns and operates several 0.1m² Mini-Hamon grabs, which are ideal for obtaining bulk samples in mixed sands and gravels, as well as for sampling benthic macrofauna (approved by CEFAS). This relative small grab was modified from the larger 0.2m² unit used in the aggregate industry for use during inshore environmental assessments in mixed sediments.

The Hamon Grab comprises of a stainless steel box shaped sampling scoop mounted in a triangular frame. Upon contact with the seabed tensioned wires are released which causes the sampling bucket to pivot through 90° pushing seabed sediment into the bucket in a single direction. On completion of its travel the open end of the bucket comes against a rubber sealed steel plate which stops the sediment escaping during recovery. The surface area of seabed covered during the travel of this bucket is approximately 1000cm² and achieves a penetration of typically 15-20cm.

On recovery the grab is landed onto a rectangular base from where access can be gained to the inside of the bucket via an inspection hatch added to the back of the sampler. Whilst in the stand, the grab sample can easily be emptied into a sampling container located under the frame.

| | |
|---|---|
| Shipping weight | 120-200kg |
| Shipping dimension | 1 x 1 x 1.5m |
| Sample area | 0.1m² |

These grabs are used for the collection of samples from coarse (diamicton sands and gravel) where glacial deposits are common or in areas of high energy environments. Note that there is some minor disturbance to the structure of the sample (particularly in granular sediments) so it is not the preferred sampling tool for detailed physico-chemical sub-sampling where the in situ structure needs to be maintained. The sampler is regularly used for macro-invertebrate and particle size analysis.

ISO 9001 REGISTERED FIRM

**Please contact us for any further information,**
**Benthic Solutions, Unit A Greengates Way, Hoveton, Norwich, NR12 8ED, UK**
**Tel : +44 (0) 1603 784726 Mail: enquiries@benthicsolutions.com www.benthicsolutions.com**

# APPENDIX C – WILSON AUTO-SIEVER

benthic solutions limited

## WILSON AUTOSIEVER
### *Best practice** for benthic samples

- **General Specifications**

The *Wilson* Autosiever is a semi-automated sieving table for reducing benthic sediment samples offshore in a routine and controlled manner.

- Reduces time consuming and laborious sample handling in the field
- Reduces personnel numbers required for benthic processing
- Reduces damage to biological material during processing
- Well proven field performance on benthic surveys worldwide
- Standardises sample processing
- Robust stainless-steel construction that dismantles for storage or freighting
- New design with adjustable height

- **Services**

The *Wilson* Autosiever (WAS) was initially designed in the late 1980s by Ian Wilson (BSL Director), but was implemented from the early 1990s as the preferred benthic processing tool for all sampling operations by a major UK based environmental survey contractor. The system was subsequently commercialised and made available for purchase to other operators and users following the success of the trial at an NMBAQC workshop in 1997*.

The WAS system was designed to standardise all sieving operations between surveys and personnel, increasing the efficiency of the sample handling and processing without compromising the quality of the biology recovered.

Its simple yet unique and revolutionary design enables its employment from small vessels and large ships alike and in a variety of different sediment conditions, ranging from coarse heterogenic substrates down to soft clays and silts.

Cited as *best practice* for biological processing*, the WAS system has become the preferred tool for a large number of organisations that routinely carry out benthic surveys. Systems are currently being employed around the world (including UK, Ireland, Norway, Netherlands, Germany, France, Australia, Africa and South America) by a multitude of different users including survey companies, fish farms, government institutes and agencies, laboratories, universities and environmental consultancies.

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Benthic Solutions, Unit A Greengates Way, Hoveton, Norwich, NR12 8ED, UK
Tel : +44 (0) 1603 784726 F-mail: enquiries@benthicsolutions.com www.benthicsolutions.com

# APPENDIX D – BSL UNDERWATER CAMERA – MOD4

benthic solutions limited

## UNDERWATER CAMERA – MOD4
## Seabed Monitoring & Underwater Real-time Footage

- **General Specifications**
  - Flexible deployment scenarios
  - Depth rated to 3500m
  - Superior stills and streaming video quality
  - Near zero-delay shutter release
  - Unattended time lapse photography
  - Solutions for very low visibility environments

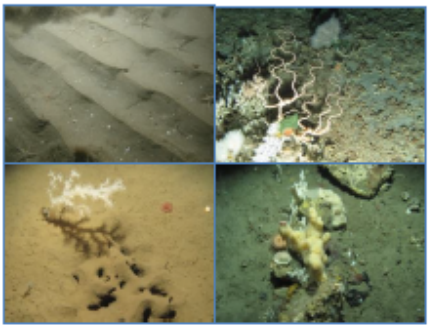
- **4 Camera Configurations**
  1. Deepwater real time
  2. Shallow water real time
  3. Ultra deepwater timelapse
  4. Remote timelapse

- **4 Deployment Configurations**
  1. Towed system (deep to shallow)
  2. Bed-hop ultra deep water
  3. Remote mooring timelapse
  4. Poor visibility freshwater lens

- **Services**

Benthic Solutions Ltd have an array of underwater cameras for various deployment scenarious. Our latest development (MOD4) is the most flexible camera to date. For water depths of less than 400m it is capable of communicating with the surface via a multicore umbilical cable, which provides a very high quality live view of the seabed. Zero-delay still images of 24 megapixels can be captured and transmitted to the surface for instant review.

For deeper waters the camera can be controlled via an armoured coax cable, of the type commonly used for towing sidescan sonar. A theoretical maximum cable length of 12km can be used. In this setup, the live feed quality is slightly reduced. To compensate for this an additional 1080p 30fps camera can be added if very high quality seabed video footage is desired.



High output lighting has been developed using the latest LED technology. 2x 2200 lumen lamps provide flood lighting ahead of the camera for video streaming, whilst a multi-head strobe system (up to three heads) can be utilised in TTL configuration to give perfectly exposed under water still images.

Benthic Solutions can also provide different camera frames suitable for seabed towing or 'drop down' use. These can be small and lightweight, or larger with increased ballast for deep water scenarios.

| | |
|---|---|
| Shipping weight | 200kg * |
| Shipping dimension | 2 x 1 x 0.2m * |
| Specifications | 2 x 1 x 1m * |

**as multiple configurations are available, values shown indicate the maximum*

www.benthicsolutions.com

# APPENDIX E – FIELD OPERATIONS AND SURVEY METHODS

Appendix A to D presents a summary of the different equipment and methods employed during the survey field operations. For additional information, please refer to the Environmental Field Report (BSL 2024).

**Seabed Photography and Video**

Seabed video footage was acquired at 14 locations across the Sea Link Route to provide ground-truthing of sediments indicated in the acoustic data. The 14 camera transects were carried out using MOD4.1 and MOD4.5 camera systems mounted within a BSL freshwater lens equipped with a separate strobe, and LED lamps.

Once at the seabed, the camera was moved along the length of the transect at a speed of 0.3 to 0.5 knots. Still photographs were captured remotely using a surface control unit via a soft towed umbilical to the camera system. The stills were uploaded in real-time and saved to the camera and a laptop via specialist software. Live video footage, overlaid with the date, time, position and site details were viewed in real-time. The live video stream was used to assist with targeting of the stills camera. HD footage was saved internally by the video camera; data was downloaded at the end of each day of camera operations and backed-up onto a hard drive

**Grab Sampling**

A BSL double grab (dual Van Veen) acquiring 2 x 0.1m$^2$ samples per deployment was used at 4 sampling locations. Where samples were not acquired due to coarse sediment the Mini-Hammon Grab was used. This occurred at four stations across the site. When using the BSL double grab, two successful deployments were required at each location. Three consecutive 'no sample' deployments were agreed to be the maximum number of attempts at any location before moving on.

Pre-deployment procedures included the cleaning of the inner stainless grab buckets, cable and shackles so that they were generally grease free. Samples were subject to quality control upon recovery and were flagged if they did not meet the following requirements:

- Water above sample is undisturbed;
- Bucket closure complete allowing no sediment washout;
- Sampler access doors had closed properly enclosing the sample;
- No disruption of the sample through striking the side of the vessel;
- Sample was taken within the acceptable target range <10m;
- Sample represented greater than 5L capacity (ca. 40% of the sampler's capacity);
- No hagfish (*Myxine glutinosa*) and/or other mucus coagulants were found in the sample;
- No obvious contamination from equipment or the vessel;
- The sample was acceptable to the principal scientist.

Upon recovery, each sample was inspected, described and photographed prior to processing. Key observations from samples included colour, sediment classification, layering, smell (including the presence of $H_2S$), obvious fauna, evidence of bioturbation and evidence of anthropogenic debris. Four successful 0.1m$^2$ replicates were required per station to acquire enough material for three macrofauna replicates and sub-sampling of physico-chemistry from the remaining sample, achieved through two deployments of the double grab and four deployments of the Hamon Grab. The macrofaunal replicates were processed on-board over a 1 over a 5mm and a 0.5mm aperture mesh by BSL scientists using a *Wilson* Auto-siever.

**Sample Processing**

Field processing was conducted on board by BSL scientists after they had been subjected to the afore mentioned quality control and proclaimed acceptable. Sub-sampling of physico-chemical parameters was undertaken from the grab samples with the following material retrieved from the surface sediments (0-2cm) for later analysis:

1. Hydrocarbons (stored in a pre-washed foil capped glass jar);
2. Heavy & trace metals and Total Organic Carbon & Matter (stored in doubled lined Ziplock plastic bag);
3. Particle size distribution (PSA; stored in doubled lined Ziplock plastic bag).

The preservation of materials was undertaken using standard techniques. All physico-chemical samples were stored in appropriate containers (i.e., glass for hydrocarbons, and plastics for metals and PSA) and immediately frozen and stored (<-18°C) for later transportation (frozen) to the laboratory upon demobilisation. Macrofaunal samples were fixed and stained in 5-10% buffered formalin for storage and transportation. This material will be later transferred to Industrial Methylated Spirit (IMS). All biological samples were double labelled with internal tags.

# APPENDIX F – DATA PRESENTATION, LABORATORY AND STATISTICAL ANALYSES

## PARTICLE SIZE DISTRIBUTION

Formulae and classifications for particle calculations made are given below:

- **Graphic Mean (M)** - a very valuable measure of average particle size in Phi units (Folk and Ward, 1957).

$$M = \frac{\phi 16 + \phi 50 + \phi 84}{3}$$

*Where* *M = The graphic mean particle size in Phi*
*ø = the Phi size of the 16th, 50th and 84th percentile of the sample*

***Phi and Sieve Apertures with Wentworth Classifications***

| Microns (µm) | | Phi (φ) | | Sediment Description | |
|---|---|---|---|---|---|
| **Aperture** | **Sediment Retained** | **Aperture** | **Sediment Retained** | | |
| 63000 | ≥ 63000 | -6 | <-6 | Cobbles & Boulders | Gravel |
| 45000 | 45000 < 63000 | -5.5 | -5.5 < -6 | Very Coarse Pebble | |
| 31500 | 31500 < 45000 | -5 | -5 < -5.5 | | |
| 22400 | 22400 < 31500 | -4.5 | -4.5 < -5 | Coarse Pebble | |
| 16000 | 16000 < 22400 | -4 | -4 < -4.5 | | |
| 11200 | 11200 < 16000 | -3.5 | -3.5 < -4 | Medium Pebble | |
| 8000 | 8000 < 11200 | -3 | -3 < -3.5 | | |
| 5600 | 5600 < 8000 | -2.5 | -2.5 < -3 | Fine Pebble | |
| 4000 | 4000 < 5600 | -2 | -2 < -2.5 | | |
| 2800 | 2800 < 4000 | -1.5 | -1.5 < -2 | Very Fine Pebble | |
| 2000 | 2000 < 2800 | -1 | -1 < -1.5 | | |
| 1400 | 1400 < 2000 | -0.5 | -0.5 < -1 | Very Coarse Sand | Sands |
| 1000 | 1000 < 1400 | 0 | 0 < -0.5 | | |
| 710 | 710 < 1000 | 0.5 | 0.5 < 0 | Coarse Sand | |
| 500 | 500 < 710 | 1 | 1 < 0.5 | | |
| 355 | 355 < 500 | 1.5 | 1.5 < 1 | Medium Sand | |
| 250 | 250 < 355 | 2 | 2 < 1.5 | | |
| 180 | 180 < 250 | 2.5 | 2.5 < 2 | Fine Sand | |
| 125 | 125 < 180 | 3 | 3 < 2.5 | | |
| 90 | 90 < 125 | 3.5 | 3.5 < 3 | Very Fine Sand | |
| 63 | 63 < 90 | 4 | 4 < 3.5 | | |
| 44 | 44 < 63 | 4.5 | 4.5 < 4 | Coarse Silt | Fines (Silts) |
| 31.5 | 31.5 < 44 | 5 | 5 < 4.5 | | |
| 22 | 22 < 31.5 | 5.5 | 5.5 < 5 | Medium Silt | |
| 15.6 | 15.6 < 22 | 6 | 6 < 5.5 | | |
| 11 | 11 < 15.6 | 6.5 | 6.5 < 6 | Fine Silt | |
| 7.8 | 7.8 < 11 | 7 | 7 < 6.5 | | |
| 5.5 | 5.5 < 7.8 | 7.5 | 7.5 < 7 | Very Fine Silt | |
| 3.9 | 3.9 < 5.5 | 8 | 8 < 7.5 | | |
| 2.8 | 2.8 < 3.9 | 8.5 | 8.5 < 8 | Clay | Fines (Clays) |
| 2 | 2 < 2.8 | 9 | 9 < 8.5 | | |
| 1.4 | 1.4 < 2 | 9.5 | 9.5 < 9 | | |
| 1 | 1 < 1.4 | 10 | 10 < 9.5 | | |
| <1 | <1 | 10.5 | ≥ 10.5 | | |

- **Sorting (D)** – the inclusive graphic standard deviation of the sample is a measure of the degree of sorting (Table II.II).

$$D = \frac{ø84 + ø16}{4} + \frac{ø95 + ø5}{6.6}$$

*where* *D = the inclusive graphic standard deviation*
*ø = the Phi size of the 84th, 16th, 95th and 5th percentile of the sample*

***Sorting Classifications***

| Sorting Coefficient (Graphical Standard Deviation) | Sorting Classifications |
|---|---|
| 0 < 0.35 | Very well sorted |
| 0.35 < 0.50 | Well sorted |
| 0.50 < 0.71 | Moderately well sorted |
| 0.71 < 1 | Moderately sorted |
| 1 < 2 | Poorly sorted |
| 2 < 4 | Very poorly sorted |
| 4 + | Extremely poorly sorted |

- **Skewness (S)** – the degree of asymmetry of a frequency or cumulative curve (Table II.III).

$$S = \frac{ø84 + ø16 - (ø50)}{2(ø84 - ø16)} + \frac{ø95 + ø5 - 2(ø50)}{2(ø95 - ø5)}$$

*where* *S = the skewness of the sample*
*ø = the Phi size of the 84th, 16th, 50th, 95th and 5th percentile of the sample*

***Skewness Classifications***

| Skewness Coefficient | Mathematical Skewness | Graphical Skewness |
|---|---|---|
| +1 > +0.30 | Strongly positive | Strongly coarse skewed |
| +0.30 > +0.10 | Positive | Coarse skewed |
| +0.10 > -0.10 | Near symmetrical | Symmetrical |
| -0.10 > -0.30 | Negative | Fine skewed |
| -0.30 > -1 | Strongly negative | Strongly fine skewed |

- **Graphic Kurtosis (K) –** The degree of peakedness or departure from the 'normal' frequency or cumulative curve.

$$K = \frac{ø95 - ø5}{2.44(ø75 - ø25)}$$

*Where* *K = Kurtosis*
*ø = the Phi size of the 95th, 5th, 75th and 25th percentile of the sample*

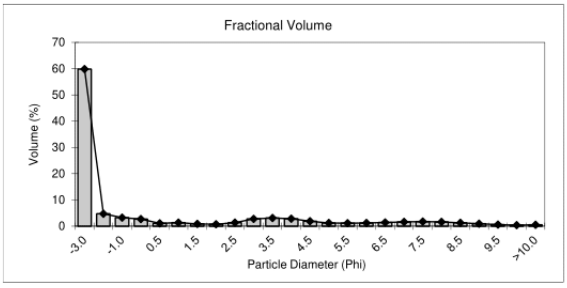
***Kurtosis Classifications***

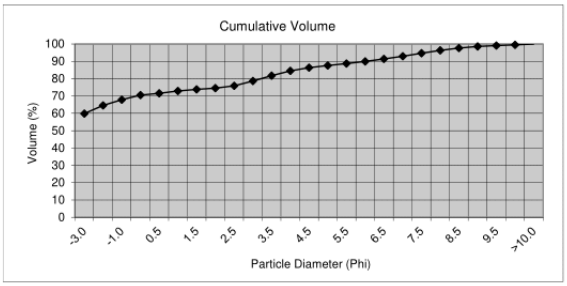
| Kurtosis Coefficient | Kurtosis Classification | Graphical meaning |
|---|---|---|
| 0.41 < 0.67 | Very Platykurtic | |

| | | |
|---|---|---|
| 0.67 < 0.90 | Platykurtic | Flat-peaked; the ends are better sorted than the centre |
| 0.90 < 1.10 | Mesokurtic | Normal; bell shaped curve |
| 1.11 < 1.50 | Leptokurtic | Curves are excessively peaked; the centre is better sorted than the ends. |
| 1.50 < 3 | Very Leptokurtic | |
| 3 + | Extremely Leptokurtic | |

# APPENDIX G – PARTICLE SIZE DISTRIBUTION

| Sample No.: | A2_ES_01 | Operator | MilliGasser |
|---|---|---|---|
| Source Data: | 2353 Sealink | Date & Time: | 09/09/2024 11:45 |



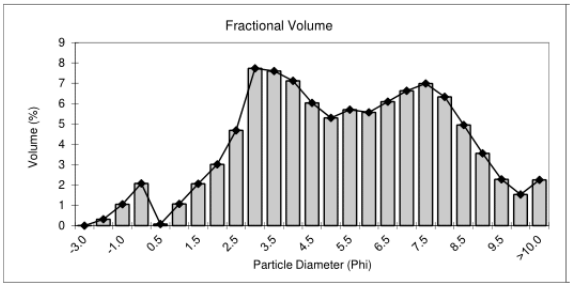

| Aperture (mm) | Aperture (Phi unit) | Percentage Fractional | Cumulative | Sediment Description |
|---|---|---|---|---|
| 8.0000 | -3.0 | 59.86 | 59.86 | Pebble |
| 4.0000 | -2.0 | 4.73 | 64.59 | |
| 2.0000 | -1.0 | 3.24 | 67.83 | Granule |
| 1.0000 | 0.0 | 2.72 | 70.55 | V.Coarse Sand |
| 0.7100 | 0.5 | 1.04 | 71.59 | Coarse Sand |
| 0.5000 | 1.0 | 1.32 | 72.92 | |
| 0.3550 | 1.5 | 0.89 | 73.81 | Medium Sand |
| 0.2500 | 2.0 | 0.71 | 74.52 | |
| 0.1800 | 2.5 | 1.33 | 75.85 | Fine Sand |
| 0.1250 | 3.0 | 2.76 | 78.60 | |
| 0.0900 | 3.5 | 3.07 | 81.68 | V.Fine Sand |
| 0.0630 | 4.0 | 2.83 | 84.51 | |
| 0.0440 | 4.5 | 1.87 | 86.37 | Coarse Silt |
| 0.0315 | 5.0 | 1.18 | 87.56 | |
| 0.0220 | 5.5 | 1.17 | 88.73 | Medium Silt |
| 0.0156 | 6.0 | 1.23 | 89.96 | |
| 0.0110 | 6.5 | 1.42 | 91.38 | Fine silt |
| 0.0078 | 7.0 | 1.60 | 92.97 | |
| 0.0055 | 7.5 | 1.74 | 94.71 | V.Fine Silt |
| 0.0039 | 8.0 | 1.62 | 96.33 | |
| 0.0028 | 8.5 | 1.29 | 97.62 | |
| 0.0020 | 9.0 | 0.92 | 98.54 | Coarse Clay |
| 0.0014 | 9.5 | 0.57 | 99.10 | |
| 0.0010 | 10.0 | 0.37 | 99.48 | Medium Clay |
| <0.001 | >10.0 | 0.53 | 100.00 | Fine Clay |

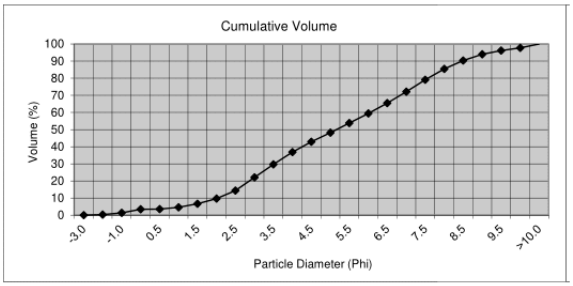
| Graphical | mm | StDev (mm) | Phi |
|---|---|---|---|
| Mean (MZ) | 3.683 | 23.887 | -1.881 |
| Median | 16.335 | | -4.030 |
| Wentworth Classification | | | Granule |

| Sorting | Value | Inference |
|---|---|---|
| Coefficient | 4.37 | Extremely Poorly Sorted |
| Skewness | 0.71 | Very Positive (Coarse) |
| Kurtosis | 0.74 | Platykurtic |
| Fines (%) | 15.50% | |
| Sands (%) | 16.68% | |
| Gravel (%) | 67.83% | |

| | |
|---|---|
| BGS Mod. Folk Classification | Muddy Sandy Gravel |
| Mod. Folk for Habitat Classification | Mixed Sediments |

| Sample No.: | A2_ES_02 | Operator | MilliGasser |
|---|---|---|---|
| Source Data: | 2353 Sealink | Date & Time: | 09/09/2024 12:16 |



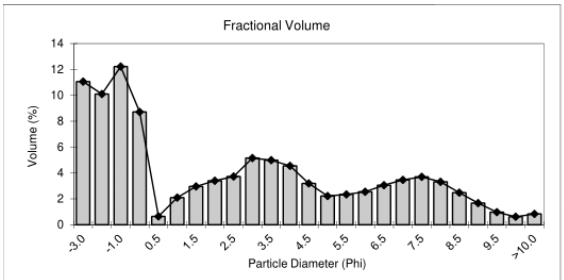

| Aperture (mm) | Aperture (Phi unit) | Percentage Fractional | Cumulative | Sediment Description |
|---|---|---|---|---|
| 8.0000 | -3.0 | 0.00 | 0.00 | Pebble |
| 4.0000 | -2.0 | 0.32 | 0.32 | |
| 2.0000 | -1.0 | 1.05 | 1.37 | Granule |
| 1.0000 | 0.0 | 2.08 | 3.45 | V.Coarse Sand |
| 0.7100 | 0.5 | 0.07 | 3.52 | Coarse Sand |
| 0.5000 | 1.0 | 1.07 | 4.59 | |
| 0.3550 | 1.5 | 2.06 | 6.65 | Medium Sand |
| 0.2500 | 2.0 | 3.01 | 9.66 | |
| 0.1800 | 2.5 | 4.69 | 14.35 | Fine Sand |
| 0.1250 | 3.0 | 7.73 | 22.08 | |
| 0.0900 | 3.5 | 7.60 | 29.68 | V.Fine Sand |
| 0.0630 | 4.0 | 7.12 | 36.80 | |
| 0.0440 | 4.5 | 6.03 | 42.83 | Coarse Silt |
| 0.0315 | 5.0 | 5.30 | 48.13 | |
| 0.0220 | 5.5 | 5.70 | 53.83 | Medium Silt |
| 0.0156 | 6.0 | 5.57 | 59.40 | |
| 0.0110 | 6.5 | 6.10 | 65.49 | Fine silt |
| 0.0078 | 7.0 | 6.63 | 72.12 | |
| 0.0055 | 7.5 | 6.99 | 79.11 | V.Fine Silt |
| 0.0039 | 8.0 | 6.33 | 85.44 | |
| 0.0028 | 8.5 | 4.95 | 90.39 | |
| 0.0020 | 9.0 | 3.56 | 93.95 | Coarse Clay |
| 0.0014 | 9.5 | 2.27 | 96.22 | |
| 0.0010 | 10.0 | 1.53 | 97.75 | Medium Clay |
| <0.001 | >10.0 | 2.25 | 100.00 | Fine Clay |

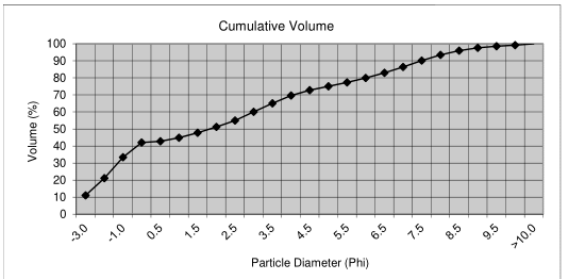
| Graphical | mm | StDev (mm) | Phi |
|---|---|---|---|
| Mean (MZ) | 0.027 | 0.159 | 5.195 |
| Median | 0.028 | | 5.139 |
| Wentworth Classification | | | Medium Silt |

| Sorting | Value | Inference |
|---|---|---|
| Coefficient | 2.55 | Very Poorly Sorted |
| Skewness | 0.02 | Symmetrical |
| Kurtosis | 0.82 | Platykurtic |
| Fines (%) | 63.20% | |
| Sands (%) | 35.43% | |
| Gravel (%) | 1.37% | |

| | |
|---|---|
| BGS Mod. Folk Classification | Slightly Gravelly Sandy Mud |
| Mod. Folk for Habitat Classification | Mud and Sandy Mud |

| Sample No.: | A2_ES_03 | Operator | MilliGasser |
|---|---|---|---|
| Source Data: | 2353 Sealink | Date & Time: | 09/09/2024 12:36 |



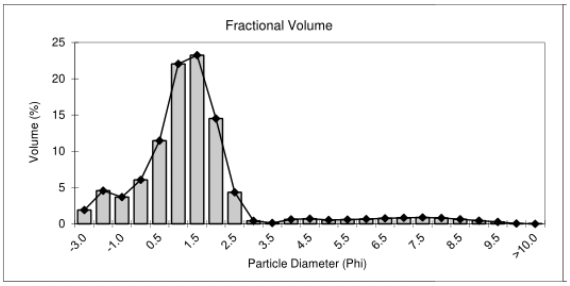

| Aperture (mm) | Aperture (Phi unit) | Percentage Fractional | Cumulative | Sediment Description |
|---|---|---|---|---|
| 8.0000 | -3.0 | 11.05 | 11.05 | Pebble |
| 4.0000 | -2.0 | 10.10 | 21.15 | |
| 2.0000 | -1.0 | 12.22 | 33.37 | Granule |
| 1.0000 | 0.0 | 8.72 | 42.09 | V.Coarse Sand |
| 0.7100 | 0.5 | 0.65 | 42.73 | Coarse Sand |
| 0.5000 | 1.0 | 2.10 | 44.83 | |
| 0.3550 | 1.5 | 2.96 | 47.79 | Medium Sand |
| 0.2500 | 2.0 | 3.39 | 51.18 | |
| 0.1800 | 2.5 | 3.73 | 54.92 | Fine Sand |
| 0.1250 | 3.0 | 5.15 | 60.06 | |
| 0.0900 | 3.5 | 4.99 | 65.05 | V.Fine Sand |
| 0.0630 | 4.0 | 4.55 | 69.61 | |
| 0.0440 | 4.5 | 3.19 | 72.80 | Coarse Silt |
| 0.0315 | 5.0 | 2.22 | 75.02 | |
| 0.0220 | 5.5 | 2.34 | 77.36 | Medium Silt |
| 0.0156 | 6.0 | 2.55 | 79.91 | |
| 0.0110 | 6.5 | 3.05 | 82.96 | Fine silt |
| 0.0078 | 7.0 | 3.47 | 86.43 | |
| 0.0055 | 7.5 | 3.70 | 90.13 | V.Fine Silt |
| 0.0039 | 8.0 | 3.31 | 93.44 | |
| 0.0028 | 8.5 | 2.48 | 95.92 | |
| 0.0020 | 9.0 | 1.66 | 97.59 | Coarse Clay |
| 0.0014 | 9.5 | 0.97 | 98.55 | |
| 0.0010 | 10.0 | 0.61 | 99.17 | Medium Clay |
| <0.001 | >10.0 | 0.84 | 100.00 | Fine Clay |

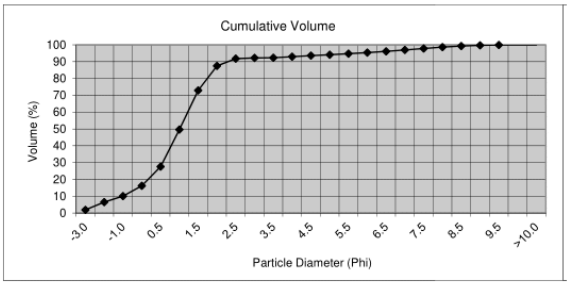
| Graphical | mm | StDev (mm) | Phi |
|---|---|---|---|
| Mean (MZ) | 0.259 | 4.126 | 1.949 |
| Median | 0.287 | | 1.803 |
| Wentworth Classification | | | Medium Sand |

| Sorting Coefficient | Value | Inference |
|---|---|---|
| | 4.08 | Extremely Poorly Sorted |
| Skewness | 0.08 | Symmetrical |
| Kurtosis | 0.71 | Platykurtic |
| Fines (%) | 30.39% | |
| Sands (%) | 36.24% | |
| Gravel (%) | 33.37% | |

| BGS Mod. Folk Classification | Muddy Sandy Gravel |
|---|---|
| Mod. Folk for Habitat Classification | Mixed Sediments |

| Sample No.: | A2_ES_04 | Operator | MilliGasser |
|---|---|---|---|
| Source Data: | 2353 Sealink | Date & Time: | 09/09/2024 12:53 |



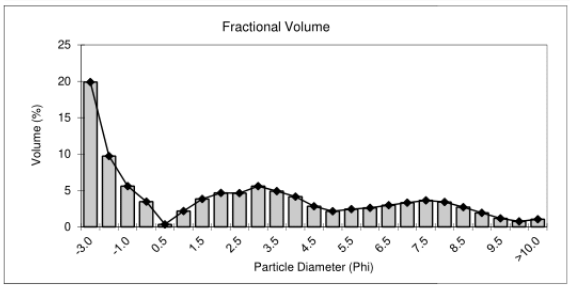

| Aperture (mm) | Aperture (Phi unit) | Percentage Fractional | Cumulative | Sediment Description |
|---|---|---|---|---|
| 8.0000 | -3.0 | 1.91 | 1.91 | Pebble |
| 4.0000 | -2.0 | 4.55 | 6.47 | |
| 2.0000 | -1.0 | 3.67 | 10.14 | Granule |
| 1.0000 | 0.0 | 6.05 | 16.19 | V.Coarse Sand |
| 0.7100 | 0.5 | 11.45 | 27.64 | Coarse Sand |
| 0.5000 | 1.0 | 22.04 | 49.68 | |
| 0.3550 | 1.5 | 23.23 | 72.92 | Medium Sand |
| 0.2500 | 2.0 | 14.52 | 87.44 | |
| 0.1800 | 2.5 | 4.35 | 91.79 | Fine Sand |
| 0.1250 | 3.0 | 0.40 | 92.19 | |
| 0.0900 | 3.5 | 0.13 | 92.32 | V.Fine Sand |
| 0.0630 | 4.0 | 0.61 | 92.93 | |
| 0.0440 | 4.5 | 0.69 | 93.62 | Coarse Silt |
| 0.0315 | 5.0 | 0.54 | 94.15 | |
| 0.0220 | 5.5 | 0.58 | 94.74 | Medium Silt |
| 0.0156 | 6.0 | 0.65 | 95.39 | |
| 0.0110 | 6.5 | 0.75 | 96.14 | Fine silt |
| 0.0078 | 7.0 | 0.82 | 96.95 | |
| 0.0055 | 7.5 | 0.87 | 97.82 | V.Fine Silt |
| 0.0039 | 8.0 | 0.80 | 98.63 | |
| 0.0028 | 8.5 | 0.64 | 99.26 | |
| 0.0020 | 9.0 | 0.45 | 99.71 | Coarse Clay |
| 0.0014 | 9.5 | 0.25 | 99.96 | |
| 0.0010 | 10.0 | 0.04 | 100.00 | Medium Clay |
| <0.001 | >10.0 | 0.00 | 100.00 | Fine Clay |

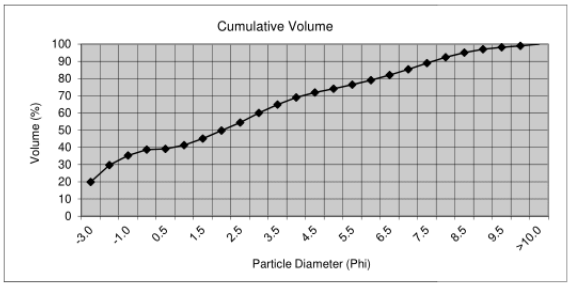
| Graphical | mm | StDev (mm) | Phi |
|---|---|---|---|
| Mean (MZ) | 0.521 | 1.663 | 0.941 |
| Median | 0.498 | | 1.006 |
| Wentworth Classification | | | Coarse Sand |

| Sorting Coefficient | Value | Inference |
|---|---|---|
| | 1.70 | Poorly Sorted |
| Skewness | 0.03 | Symmetrical |
| Kurtosis | 2.78 | Very Leptokurtic |
| Fines (%) | 7.08% | |
| Sands (%) | 82.79% | |
| Gravel (%) | 10.14% | |

| BGS Mod. Folk Classification | Gravelly Sand |
|---|---|
| Mod. Folk for Habitat Classification | Coarse Sediments |

| | | | |
|---|---|---|---|
| **Sample No.:** | A3_NS_01 | **Operator** | MilliGasser |
| **Source Data:** | 2353 Sealink | **Date & Time:** | 09/09/2024 14:45 |



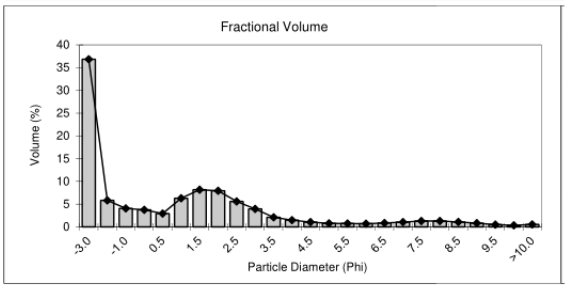

| Aperture (mm) | Aperture (Phi unit) | Percentage Fractional | Cumulative | Sediment Description |
|---|---|---|---|---|
| 8.0000 | -3.0 | 19.90 | 19.90 | Pebble |
| 4.0000 | -2.0 | 9.73 | 29.63 | |
| 2.0000 | -1.0 | 5.60 | 35.23 | Granule |
| 1.0000 | 0.0 | 3.47 | 38.71 | V.Coarse Sand |
| 0.7100 | 0.5 | 0.35 | 39.06 | Coarse Sand |
| 0.5000 | 1.0 | 2.18 | 41.24 | |
| 0.3550 | 1.5 | 3.83 | 45.07 | Medium Sand |
| 0.2500 | 2.0 | 4.66 | 49.73 | |
| 0.1800 | 2.5 | 4.64 | 54.38 | Fine Sand |
| 0.1250 | 3.0 | 5.59 | 59.96 | |
| 0.0900 | 3.5 | 4.90 | 64.87 | V.Fine Sand |
| 0.0630 | 4.0 | 4.16 | 69.02 | |
| 0.0440 | 4.5 | 2.84 | 71.87 | Coarse Silt |
| 0.0315 | 5.0 | 2.15 | 74.01 | |
| 0.0220 | 5.5 | 2.43 | 76.44 | Medium Silt |
| 0.0156 | 6.0 | 2.60 | 79.04 | |
| 0.0110 | 6.5 | 2.98 | 82.02 | Fine silt |
| 0.0078 | 7.0 | 3.32 | 85.34 | |
| 0.0055 | 7.5 | 3.63 | 88.97 | V.Fine Silt |
| 0.0039 | 8.0 | 3.41 | 92.38 | |
| 0.0028 | 8.5 | 2.72 | 95.10 | |
| 0.0020 | 9.0 | 1.93 | 97.03 | Coarse Clay |
| 0.0014 | 9.5 | 1.18 | 98.21 | |
| 0.0010 | 10.0 | 0.75 | 98.96 | Medium Clay |
| <0.001 | >10.0 | 1.05 | 100.00 | Fine Clay |

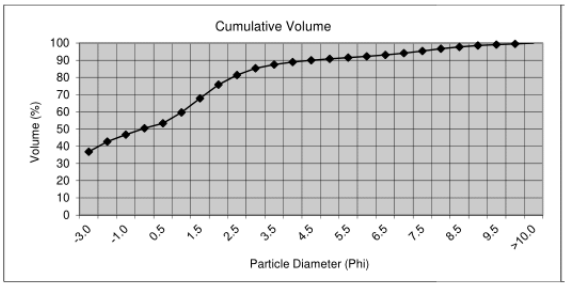
| Graphical | mm | StDev (mm) | Phi |
|---|---|---|---|
| **Mean (MZ)** | 0.278 | 5.877 | 1.847 |
| **Median** | 0.246 | | 2.023 |
| **Wentworth Classification** | | | Medium Sand |

| Sorting | Value | Inference |
|---|---|---|
| **Coefficient** | 4.37 | Extremely Poorly Sorted |
| **Skewness** | 0.00 | Symmetrical |
| **Kurtosis** | 0.65 | Very Platykurtic |
| **Fines (%)** | 30.98% | |
| **Sands (%)** | 33.79% | |
| **Gravel (%)** | 35.23% | |

| | |
|---|---|
| **BGS Mod. Folk Classification** | Muddy Sandy Gravel |
| **Mod. Folk for Habitat Classification** | Mixed Sediments |

| | | | |
|---|---|---|---|
| **Sample No.:** | A4_GLC_01 | **Operator** | MilliGasser |
| **Source Data:** | 2353 Sealink | **Date & Time:** | 09/09/2024 15:19 |



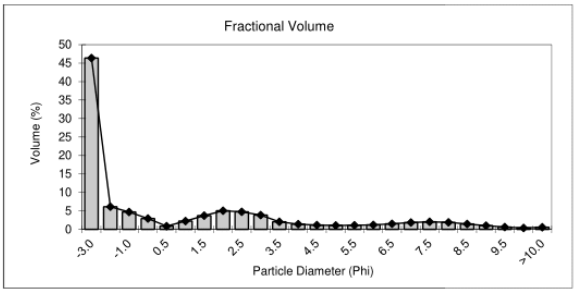

| Aperture (mm) | Aperture (Phi unit) | Percentage Fractional | Cumulative | Sediment Description |
|---|---|---|---|---|
| 8.0000 | -3.0 | 36.84 | 36.84 | Pebble |
| 4.0000 | -2.0 | 5.82 | 42.66 | |
| 2.0000 | -1.0 | 4.05 | 46.71 | Granule |
| 1.0000 | 0.0 | 3.75 | 50.46 | V.Coarse Sand |
| 0.7100 | 0.5 | 2.94 | 53.40 | Coarse Sand |
| 0.5000 | 1.0 | 6.28 | 59.69 | |
| 0.3550 | 1.5 | 8.18 | 67.87 | Medium Sand |
| 0.2500 | 2.0 | 7.94 | 75.80 | |
| 0.1800 | 2.5 | 5.59 | 81.39 | Fine Sand |
| 0.1250 | 3.0 | 3.95 | 85.35 | |
| 0.0900 | 3.5 | 2.11 | 87.46 | V.Fine Sand |
| 0.0630 | 4.0 | 1.49 | 88.95 | |
| 0.0440 | 4.5 | 1.06 | 90.02 | Coarse Silt |
| 0.0315 | 5.0 | 0.77 | 90.79 | |
| 0.0220 | 5.5 | 0.73 | 91.52 | Medium Silt |
| 0.0156 | 6.0 | 0.71 | 92.23 | |
| 0.0110 | 6.5 | 0.85 | 93.08 | Fine silt |
| 0.0078 | 7.0 | 1.05 | 94.13 | |
| 0.0055 | 7.5 | 1.27 | 95.40 | V.Fine Silt |
| 0.0039 | 8.0 | 1.29 | 96.69 | |
| 0.0028 | 8.5 | 1.10 | 97.79 | |
| 0.0020 | 9.0 | 0.82 | 98.61 | Coarse Clay |
| 0.0014 | 9.5 | 0.52 | 99.13 | |
| 0.0010 | 10.0 | 0.34 | 99.47 | Medium Clay |
| <0.001 | >10.0 | 0.53 | 100.00 | Fine Clay |

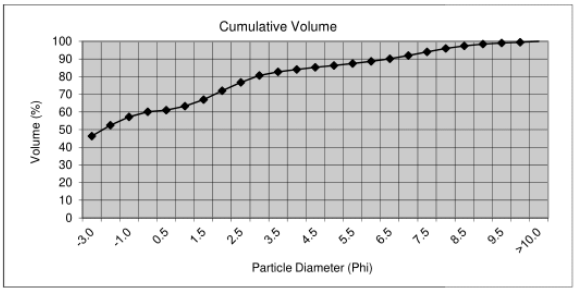
| Graphical | mm | StDev (mm) | Phi |
|---|---|---|---|
| **Mean (MZ)** | 1.533 | 12.848 | -0.617 |
| **Median** | 1.123 | | -0.167 |
| **Wentworth Classification** | | | V. Coarse Sand |

| Sorting | Value | Inference |
|---|---|---|
| **Coefficient** | 3.67 | Very Poorly Sorted |
| **Skewness** | 0.02 | Symmetrical |
| **Kurtosis** | 0.84 | Platykurtic |
| **Fines (%)** | 11.05% | |
| **Sands (%)** | 42.24% | |
| **Gravel (%)** | 46.71% | |

| | |
|---|---|
| **BGS Mod. Folk Classification** | Muddy Sandy Gravel |
| **Mod. Folk for Habitat Classification** | Mixed Sediments |

| | | | |
|---|---|---|---|
| **Sample No.:** | A4_GLC_03 | **Operator** | MilliGasser |
| **Source Data:** | 2353 Sealink | **Date & Time:** | 09/09/2024 15:39 |



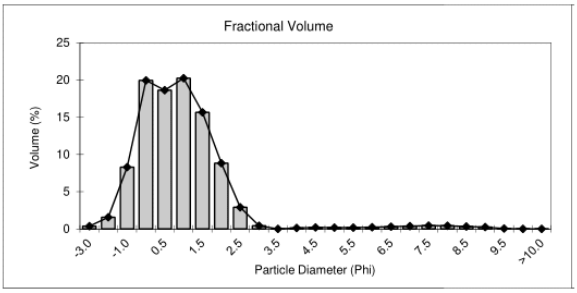

| Aperture (mm) | Aperture (Phi unit) | Percentage Fractional | Cumulative | Sediment Description |
|---|---|---|---|---|
| 8.0000 | -3.0 | 46.36 | 46.36 | Pebble |
| 4.0000 | -2.0 | 6.14 | 52.50 | |
| 2.0000 | -1.0 | 4.72 | 57.22 | Granule |
| 1.0000 | 0.0 | 2.91 | 60.14 | V.Coarse Sand |
| 0.7100 | 0.5 | 0.86 | 60.99 | Coarse Sand |
| 0.5000 | 1.0 | 2.27 | 63.26 | |
| 0.3550 | 1.5 | 3.73 | 66.99 | Medium Sand |
| 0.2500 | 2.0 | 5.04 | 72.03 | |
| 0.1800 | 2.5 | 4.73 | 76.76 | Fine Sand |
| 0.1250 | 3.0 | 3.89 | 80.65 | |
| 0.0900 | 3.5 | 2.03 | 82.69 | V.Fine Sand |
| 0.0630 | 4.0 | 1.39 | 84.08 | |
| 0.0440 | 4.5 | 1.17 | 85.25 | Coarse Silt |
| 0.0315 | 5.0 | 1.06 | 86.31 | |
| 0.0220 | 5.5 | 1.14 | 87.44 | Medium Silt |
| 0.0156 | 6.0 | 1.20 | 88.65 | |
| 0.0110 | 6.5 | 1.51 | 90.15 | Fine silt |
| 0.0078 | 7.0 | 1.83 | 91.99 | |
| 0.0055 | 7.5 | 2.06 | 94.04 | V.Fine Silt |
| 0.0039 | 8.0 | 1.90 | 95.95 | |
| 0.0028 | 8.5 | 1.46 | 97.41 | |
| 0.0020 | 9.0 | 1.01 | 98.42 | Coarse Clay |
| 0.0014 | 9.5 | 0.61 | 99.02 | |
| 0.0010 | 10.0 | 0.40 | 99.43 | Medium Clay |
| <0.001 | >10.0 | 0.58 | 100.00 | Fine Clay |

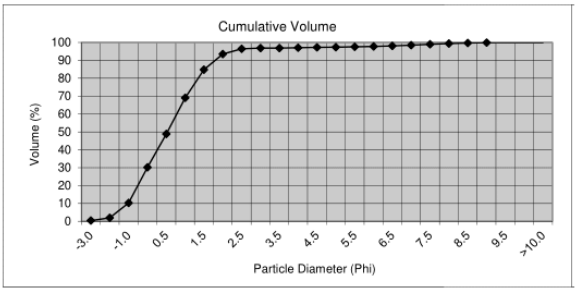
| Graphical | mm | StDev (mm) | Phi |
|---|---|---|---|
| **Mean (MZ)** | 2.161 | 15.208 | -1.111 |
| **Median** | 5.630 | | -2.493 |
| **Wentworth Classification** | | | Granule |

| Sorting | Value | Inference |
|---|---|---|
| **Coefficient** | 4.14 | Extremely Poorly Sorted |
| **Skewness** | 0.53 | Very Positive (Coarse) |
| **Kurtosis** | 0.78 | Platykurtic |
| **Fines (%)** | 15.93% | |
| **Sands (%)** | 26.85% | |
| **Gravel (%)** | 57.22% | |

| | |
|---|---|
| **BGS Mod. Folk Classification** | Muddy Sandy Gravel |
| **Mod. Folk for Habitat Classification** | Mixed Sediments |

| | | | |
|---|---|---|---|
| **Sample No.:** | A5_OPB_01 | **Operator** | MilliGasser |
| **Source Data:** | 2353 Sealink | **Date & Time:** | 09/09/2024 15:58 |




| Aperture (mm) | Aperture (Phi unit) | Percentage Fractional | Cumulative | Sediment Description |
|---|---|---|---|---|
| 8.0000 | -3.0 | 0.38 | 0.38 | Pebble |
| 4.0000 | -2.0 | 1.57 | 1.96 | |
| 2.0000 | -1.0 | 8.29 | 10.24 | Granule |
| 1.0000 | 0.0 | 19.94 | 30.18 | V.Coarse Sand |
| 0.7100 | 0.5 | 18.64 | 48.83 | Coarse Sand |
| 0.5000 | 1.0 | 20.24 | 69.07 | |
| 0.3550 | 1.5 | 15.66 | 84.73 | Medium Sand |
| 0.2500 | 2.0 | 8.82 | 93.55 | |
| 0.1800 | 2.5 | 2.92 | 96.47 | Fine Sand |
| 0.1250 | 3.0 | 0.41 | 96.88 | |
| 0.0900 | 3.5 | 0.00 | 96.88 | V.Fine Sand |
| 0.0630 | 4.0 | 0.13 | 97.01 | |
| 0.0440 | 4.5 | 0.21 | 97.22 | Coarse Silt |
| 0.0315 | 5.0 | 0.17 | 97.39 | |
| 0.0220 | 5.5 | 0.19 | 97.57 | Medium Silt |
| 0.0156 | 6.0 | 0.23 | 97.80 | |
| 0.0110 | 6.5 | 0.31 | 98.11 | Fine silt |
| 0.0078 | 7.0 | 0.38 | 98.49 | |
| 0.0055 | 7.5 | 0.44 | 98.94 | V.Fine Silt |
| 0.0039 | 8.0 | 0.42 | 99.36 | |
| 0.0028 | 8.5 | 0.34 | 99.70 | |
| 0.0020 | 9.0 | 0.25 | 99.94 | Coarse Clay |
| 0.0014 | 9.5 | 0.06 | 100.00 | |
| 0.0010 | 10.0 | 0.00 | 100.00 | Medium Clay |
| <0.001 | >10.0 | 0.00 | 100.00 | Fine Clay |

| Graphical | mm | StDev (mm) | Phi |
|---|---|---|---|
| **Mean (MZ)** | 0.756 | 1.034 | 0.404 |
| **Median** | 0.698 | | 0.519 |
| **Wentworth Classification** | | | Coarse Sand |

| Sorting | Value | Inference |
|---|---|---|
| **Coefficient** | 1.15 | Poorly Sorted |
| **Skewness** | -0.14 | Negative (Fine) |
| **Kurtosis** | 1.07 | Mesokurtic |
| **Fines (%)** | 2.99% | |
| **Sands (%)** | 86.77% | |
| **Gravel (%)** | 10.24% | |

| | |
|---|---|
| **BGS Mod. Folk Classification** | Gravelly Sand |
| **Mod. Folk for Habitat Classification** | Coarse Sediments |

## APPENDIX H – SAMPLE LOG SHEETS

| Cast # | Station | Sampler Used | Water Depth (m) | Time | Date | Volume Recovered | Sample Name | Container Type/Quantity | Sediment Characteristic | | | Conspicuous fauna/comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | Stratification (cm) | Munsell Colour | Sediment Description | |
| 1 | A3_NS_01 | DVV | 24.09 | 02:16 | 30/08/2024 | 70% | PC | 3X BAG, 2 JAR | 0-2 | 2.5Y 5/4 | Mixed Coarse pebbles | Ophiuroidea, Amphipod, Nudibranch |
| | | | | | | 70% | F1 | 1X 5L (5MM) 1X 3L (0.5MM) | 3+ | 2.5Y 5/4 | | |
| 2 | A3_NS_01 | DVV | 24.6 | 02:47 | 30/08/2024 | 70% | F2 | 1X 5L (5MM) 1X 3L (0.5MM) | 3+ | 2.5Y 5/4 | Mixed Coarse pebbles | |
| | | | | | | | | | | | | |
| | | | | | | 70% | F3 | 1X 5L (5MM) 1X 3L (0.5MM) | 3+ | 2.5Y 5/4 | | |
| 3 | A2_ES_04 | DVV | 23.37 | 04:52 | 30/08/2024 | 70% | PC | 3X BAG, 2 JAR | 0-2 | 10YR 4/6 | | |
| | | | | | | 50% | F1 | 1X 5L(5MM) 1X 5L(0.5MM) | 3+ | 10YR 4/6 | | |
| 4 | A2_ES_04 | DVV | 23.25 | 05:18 | 30/08/2024 | 70% | F2 | 1X 5L(5MM) | 3+ | 10YR 4/6 | | |
| | | | | | | 40% | F3 | 1X3L(5MM) 1X 3L (0.5MM) | | 10YR 4/6 | | |
| 5 | A2_ES_03 | DVV | 27.09 | 07:03 | 30/08/2024 | 30% | NS | - | | 10YR 4/4 | | Ophiuroidea, Annelida |
| | | | | | | 25% | NS | - | | 10YR 4/4 | | |
| 6 | A2_ES_03 | DVV | 27.33 | 07:25 | 30/08/2024 | 40% | PC | 3X BAG, 2 JAR | | 10YR 4/4 | Gravelly Sediment | Ophiuroidea |
| | | | | | | 40% | F1 | 1X 5L (5MM) 1X 5L (0.5MM) | | 10YR 4/4 | Sabellaria rubble - cobbles, pebbles and gravel. | |
| 7 | A2_ES_03 | DVV | 27.36 | 07:46 | 30/08/2024 | 40% | F2 | 1X 5L (5MM) 1X 5L (0.5MM) | | 10YR 4/4 | Sabellaria rubble, cobbles, pebbles and gravel. | Ophiuroidea |

| Cast # | Station | Sampler Used | Water Depth (m) | Time | Date | Volume Recovered | Sample Name | Container Type/Quantity | Sediment Characteristic | | | Conspicuous fauna/comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | Stratification (cm) | Munsell Colour | Sediment Description | |
| | | | | | | 10% | NS | - | | | | |
| 8 | A2_ES_03 | DVV | 27.4 | 08:02 | 30/08/2024 | 40% | F3 | 1X 1L(5MM) | | 10YR 4/4 | Sabellaria rubble - cobbles, pebbles and gravel. | Ophiuroidea |
| | | | | | | | | 1X 5L(0.5MM) | | | | |
| | | | | | | 30% | NS | - | - | - | - | |
| 9 | A2_ES_02 | DVV | 25.56 | 09:15 | 30/08/2024 | 90% | PC | 3X BAG, 2 JAR | 0-3CM | 2.5Y 5/4 | Sandy mud, slightly gravelly mud | *Nucula sp.*, Polychaetes |
| | | | | | | | | | 3+ | - | Hydrophobic oily, cohesive mud | |
| | | | | | | 95% | F1 | | | 2.5Y 5/4 | | |
| 10 | A2_ES_02 | DVV | 25.66 | 09:41 | 30/08/2024 | 95% | F2 | | 0-3CM | 2.5Y 5/4 | Sandy mud, slightly gravelly mud | Ophiuroidea, (F3) |
| | | | | | | | | | 3+ | | Hydrophobic oily, cohesive mud | |
| | | | | | | 95% | F3 | " | | 2.5Y 5/4 | | |
| 11 | A2_ES_01 | DVV | 20.02 | 10:52 | 30/08/2024 | 10% | NS | " | | | | Cobbles in jaws. |
| | | | | | | 15% | NS | " | | | | |
| 12 | A2_ES_01 | DVV | 20.02 | 12:09 | 30/08/2024 | 10% | NS | " | | | | Switch to Mini Hamon Grab |
| | | | | | | 10% | NS | " | | | | |
| 13 | A2_ES_01 | HG | 18.33 | 12:35 | 30/08/2024 | 40% | PC | 3X BAG, 2 JAR | | 2.5YR 4/3 | Cobbles, pebbles, | Brittle star |

| Cast # | Station | Sampler Used | Water Depth (m) | Time | Date | Volume Recovered | Sample Name | Container Type/Quantity | Sediment Characteristic | | | Conspicuous fauna/comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | Stratification (cm) | Munsell Colour | Sediment Description | |
| | | | | | | | | | | | gravelly muddy sand | |
| 14 | A2_ES_01 | HG | 19.93 | 12:58 | 30/08/2024 | 10% | NS | - | | | | |
| 15 | A2_ES_01 | HG | 17.82 | 13:10 | 30/08/2024 | 50% | F1 | 1X 5L(5MM), 1X 5L(0.5MM) | | 2.5YR 4/3 | Pebbles, Gravelly muddy sand | Crustacea, whelk, Actinaria |
| 16 | A2_ES_01 | HG | 19.3 | 13:28 | 30/08/2024 | 10% | NS | - | | | | |
| 17 | A2_ES_01 | HG | 17.87 | 13:43 | 30/08/2024 | 50% | F2 | 1X 5L(5MM), 1X 5L(0.5MM) | | 2.5YR 4/3 | Pebbles, Gravelly muddy sand | Actinaria, Ophiuroidea |
| 18 | A2_ES_01 | HG | 19.49 | 13:56 | 30/08/2024 | 60% | F3 | 1X 5L(5MM), 1X 5L(0.5MM) | | 2.5YR 4/3 | Pebbles, Gravelly muddy sand | Ophiuroidea, Ascidia, Echinodermata, Annelida, Actinaria |
| 21 | A4_GLC_02 | DVV | 16 | 03:25 | 01/09/2024 | 0% | NS | - | | | | Cobble in jaws |
| 22 | A4_GLC_02 | DVV | 15.8 | 03:45 | 01/09/2024 | 0% | NS | - | | | | Cobble in jaws |
| 23 | A4_GLC_02 | DVV | 16.5 | 03:59 | 01/09/2024 | 0% | NS | - | | | | Moved 5m from original location, cobble in jaws |
| 24 | A4_GLC_02 | HG | 16 | 04:18 | 01/09/2024 | 0% | NS | - | | | | |
| 25 | A4_GLC_02 | HG | 16 | 04:31 | 01/09/2024 | 0% | NS | - | | | | Moved 50m from original location |
| 26 | A4_GLC_02 | HG | 16 | 04:43 | 01/09/2024 | 0% | NS | - | | | | Cobble in jaws |
| 27 | A4_GLC_01 | HG | 16.44 | 11:00 | 01/09/2024 | 10% | NS | - | | | | |
| 28 | A4_GLC_01 | HG | 17.04 | 11:42 | 01/09/2024 | 15% | NS/F3 | 1x 3L(5mm), 1x 3L (0.5MM) | | | | Ragworm, Keel worm |
| | A4_GLC_01 | HG | | | 01/09/2024 | 30% | F1 | | | | | |
| | A4_GLC_01 | HG | | | 01/09/2024 | 20% | F2 | | | | | |

| Cast # | Station | Sampler Used | Water Depth (m) | Time | Date | Volume Recovered | Sample Name | Container Type/Quantity | Sediment Characteristic | | | Conspicuous fauna/comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | Stratification (cm) | Munsell Colour | Sediment Description | |
| 29 | A4_GLC_03 | HG | 8.43 | 14:13 | 01/09/2024 | 15% | NS/F1 | 1x 3L(5mm), 1x 1L (0.5mm) | | 2.5Y 4/4 | Pebbles over silty sand | Ascidia, *Alcyonium digitatum*, Annelida |
| 30 | A4_GLC_03 | HG | 7.28 | 14:28 | 01/09/2024 | 0% | NS | N/A | | | | Moving 5 meters along the line |
| 31 | A4_GLC_03 | HG | 7.61 | 14:41 | 01/09/2024 | 10% | NS/F2 | 1x 5L (5mm), 1x 1L (0.5mm) | | | | |
| 32 | A4_GLC_03 | HG | 9.1 | 14:53 | 01/09/2024 | 20% | NS/PC | | | | | Small samples, kept at client request |
| 33 | A5_OPB_01 | DVV | 11.8 | 23:43 | 01/09/2024 | 95% | PC | 3X BAG, 2 JAR | | 2.5Y 6/6 | Medium/coarse sand | No fauna noted |
| | | | | | | 95% | F1 | 1x 3L (5mm) 3x 5L (0.5mm) | | | | |
| 34 | A5_OPB_01 | DVV | 11.8 | 00:00 | 02/09/2024 | 75% | F2 | 1x 3L (5mm) 2x 5L (0.5mm) | | 2.5Y 6/6 | | No fauna noted |
| | | | | | | 75% | F3 | 1x 3L (5mm), 3x 5L (0.5mm) | | | | |

# APPENDIX I – REEF AND MUSSEL BED ASSESSMENT LOGSHEET

**Table 1: Sabellaria Assessment**

**Goedetics: ETRS 1989, UTM 31N**

| Transect Name | Picture | Date Time | Easting | Northing | Composition (% cover) | Elevation (Average tube height in cm) | Reefiness value | Mean *Sabellaria* % cover for areas of similar cover | Mean height (cm) cover for areas of similar cover | Mean *Reefiness (Value)* cover for areas of similar cover | Extent | Area | Area Category | Reefiness Value |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A2_ES_03 | A2_ES_03_00001 | 29/08/2024 16:51:51 | 406,869 | 5,756,093 | 0 | 0 | No Reef | | | | | | | |
| A2_ES_03 | A2_ES_03_00002 | 29/08/2024 16:52:14 | 406,868 | 5,756,096 | 20 | 1 | Not a Reef | | | | | | | |
| A2_ES_03 | A2_ES_03_00003 | 29/08/2024 16:52:35 | 406,867 | 5,756,097 | 5 | 1 | Not a Reef | | | | | | | |
| A2_ES_03 | A2_ES_03_00004 | 29/08/2024 16:53:00 | 406,865 | 5,756,100 | 10 | 1 | Not a Reef | | | | | | | |
| A2_ES_03 | A2_ES_03_00005 | 29/08/2024 16:53:23 | 406,863 | 5,756,101 | 7 | 2 | Not a Reef | | | | | | | |
| A2_ES_03 | A2_ES_03_00006 | 29/08/2024 16:53:36 | 406,862 | 5,756,102 | 20 | 1 | Not a Reef | | | | | | | |
| A2_ES_03 | A2_ES_03_00007 | 29/08/2024 16:53:57 | 406,859 | 5,756,104 | 10 | 1 | Not a Reef | 12.0 | 1.1 | Not a Reef | 83.8 | 22074.7 | 25-10000m$^2$ | Not a Reef |
| A2_ES_03 | A2_ES_03_00008 | 29/08/2024 16:54:17 | 406,858 | 5,756,105 | 3 | 1 | Not a Reef | | | | | | | |
| A2_ES_03 | A2_ES_03_00009 | 29/08/2024 16:54:37 | 406,856 | 5,756,106 | 8 | 1 | Not a Reef | | | | | | | |
| A2_ES_03 | A2_ES_03_00010 | 29/08/2024 16:54:56 | 406,855 | 5,756,108 | 20 | 1 | Not a Reef | | | | | | | |
| A2_ES_03 | A2_ES_03_00011 | 29/08/2024 16:55:17 | 406,853 | 5,756,110 | 40 | 1 | Not a Reef | | | | | | | |
| A2_ES_03 | A2_ES_03_00012 | 29/08/2024 16:55:44 | 406,851 | 5,756,112 | 10 | 1 | Not a Reef | | | | | | | |
| A2_ES_03 | A2_ES_03_00013 | 29/08/2024 16:56:10 | 406,849 | 5,756,115 | 15 | 1 | Not a Reef | | | | | | | |

| Transect Name | Picture | Date Time | Easting | Northing | Composition (% cover) | Elevation (Average tube height in cm) | Reefiness value | Mean *Sabellaria* % cover for areas of similar cover | Mean height (cm) cover for areas of similar cover | Mean *Reefiness (Value)* cover for areas of similar cover | Extent | Area | Area Category | Reefiness Value |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A2_ES_03 | A2_ES_03_00014 | 29/08/2024 16:56:36 | 406,847 | 5,756,116 | 5 | 2 | Not a Reef | | | | | | | |
| A2_ES_03 | A2_ES_03_00015 | 29/08/2024 16:56:57 | 406,845 | 5,756,118 | 3 | 1 | Not a Reef | | | | | | | |
| A2_ES_03 | A2_ES_03_00016 | 29/08/2024 16:57:24 | 406,843 | 5,756,121 | 20 | 1 | Not a Reef | | | | | | | |
| A2_ES_03 | A2_ES_03_00017 | 29/08/2024 16:57:48 | 406,842 | 5,756,122 | 10 | 1 | Not a Reef | | | | | | | |
| A2_ES_03 | A2_ES_03_00018 | 29/08/2024 16:58:16 | 406,839 | 5,756,125 | 5 | 1 | Not a Reef | | | | | | | |
| A2_ES_03 | A2_ES_03_00019 | 29/08/2024 16:58:36 | 406,838 | 5,756,127 | 10 | 1 | Not a Reef | | | | | | | |
| A2_ES_03 | A2_ES_03_00020 | 29/08/2024 16:59:04 | 406,835 | 5,756,130 | 10 | 1 | Not a Reef | | | | | | | |
| A2_ES_03 | A2_ES_03_00021 | 29/08/2024 16:59:25 | 406,833 | 5,756,132 | 2 | 1 | Not a Reef | | | | | | | |
| A2_ES_03 | A2_ES_03_00022 | 29/08/2024 16:59:55 | 406,829 | 5,756,135 | 5 | 2 | Not a Reef | | | | | | | |
| A2_ES_03 | A2_ES_03_00023 | 29/08/2024 17:00:23 | 406,826 | 5,756,138 | 20 | 1 | Not a Reef | | | | | | | |
| A2_ES_03 | A2_ES_03_00024 | 29/08/2024 17:00:45 | 406,824 | 5,756,140 | 5 | 2 | Not a Reef | | | | | | | |
| A2_ES_03 | A2_ES_03_00025 | 29/08/2024 17:01:08 | 406,821 | 5,756,142 | 0 | 0 | No Reef | | | | | | | |
| A2_ES_03 | A2_ES_03_00026 | 29/08/2024 17:01:38 | 406,817 | 5,756,146 | 40 | 1 | Not a Reef | | | | | | | |
| A2_ES_03 | A2_ES_03_00027 | 29/08/2024 17:02:00 | 406,815 | 5,756,148 | 10 | 1 | Not a Reef | | | | | | | |

| Transect Name | Picture | Date Time | Easting | Northing | Composition (% cover) | Elevation (Average tube height in cm) | Reefiness value | Mean *Sabellaria* % cover for areas of similar cover | Mean height (cm) cover for areas of similar cover | Mean *Reefiness (Value)* cover for areas of similar cover | Extent | Area | Area Category | Reefiness Value |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A2_ES_03 | A2_ES_03_00028 | 29/08/2024 17:02:20 | 406,814 | 5,756,149 | 20 | 1 | Not a Reef | | | | | | | |
| A2_ES_03 | A2_ES_03_00029 | 29/08/2024 17:02:45 | 406,812 | 5,756,151 | 20 | 1 | Not a Reef | | | | | | | |
| A2_ES_03 | A2_ES_03_00031 | 29/08/2024 17:03:15 | 406,811 | 5,756,153 | 8 | 2 | Not a Reef | | | | | | | |
| A2_ES_03 | A2_ES_03_00032 | 29/08/2024 17:03:43 | 406,808 | 5,756,156 | 0 | 0 | No Reef | 0.0 | 0.0 | No Reef | 4.2 | 56.6 | <25m$^2$ | No Reef |
| A2_ES_03 | A2_ES_03_00033 | 29/08/2024 17:04:10 | 406,805 | 5,756,159 | 0 | 0 | No Reef | | | | | | | |
| A2_ES_03 | A2_ES_03_00034 | 29/08/2024 17:04:30 | 406,804 | 5,756,161 | 5 | 1 | Not a Reef | | | | | | | |
| A2_ES_03 | A2_ES_03_00035 | 29/08/2024 17:04:55 | 406,802 | 5,756,163 | 5 | 2 | Not a Reef | | | | | | | |
| A2_ES_03 | A2_ES_03_00036 | 29/08/2024 17:05:15 | 406,801 | 5,756,164 | 8 | 2 | Not a Reef | | | | | | | |
| A2_ES_03 | A2_ES_03_00037 | 29/08/2024 17:05:49 | 406,798 | 5,756,167 | 0 | 0 | No Reef | | | | | | | |
| A2_ES_03 | A2_ES_03_00038 | 29/08/2024 17:06:09 | 406,797 | 5,756,169 | 5 | 2 | Not a Reef | 4.8 | 1.2 | Not a Reef | 35.5 | 3956.9 | 25-10000m$^2$ | Not a Reef |
| A2_ES_03 | A2_ES_03_00039 | 29/08/2024 17:06:27 | 406,795 | 5,756,171 | 10 | 1 | Not a Reef | | | | | | | |
| A2_ES_03 | A2_ES_03_00040 | 29/08/2024 17:06:54 | 406,790 | 5,756,175 | 5 | 2 | Not a Reef | | | | | | | |
| A2_ES_03 | A2_ES_03_00041 | 29/08/2024 17:07:16 | 406,787 | 5,756,178 | 0 | 0 | No Reef | | | | | | | |
| A2_ES_03 | A2_ES_03_00042 | 29/08/2024 17:07:38 | 406,785 | 5,756,181 | 5 | 1 | Not a Reef | | | | | | | |

| Transect Name | Picture | Date Time | Easting | Northing | Composition (% cover) | Elevation (Average tube height in cm) | Reefiness value | Mean *Sabellaria* % cover for areas of similar cover | Mean height (cm) cover for areas of similar cover | Mean *Reefiness (Value)* cover for areas of similar cover | Extent | Area | Area Category | Reefiness Value |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A2_ES_03 | A2_ES_03_00043 | 29/08/2024 17:08:08 | 406,783 | 5,756,183 | 0 | 0 | No Reef | | | | | | | |
| A2_ES_03 | A2_ES_03_00044 | 29/08/2024 17:08:28 | 406,782 | 5,756,184 | 10 | 2 | Low Reef | | | | | | | |
| A2_ES_03 | A2_ES_03_00045 | 29/08/2024 17:08:51 | 406,781 | 5,756,185 | 5 | 1 | Not a Reef | | | | | | | |
| A2_ES_03 | A2_ES_03_00046 | 29/08/2024 17:09:11 | 406,780 | 5,756,187 | 5 | 1 | Not a Reef | | | | | | | |
| A2_ES_03 | A2_ES_03_00047 | 29/08/2024 17:09:33 | 406,775 | 5,756,190 | 0 | 0 | No Reef | | | | | | | |
| A2_ES_03 | A2_ES_03_00048 | 29/08/2024 17:09:54 | 406,774 | 5,756,192 | 0 | 0 | No Reef | | | | | | | |
| A2_ES_03 | A2_ES_03_00049 | 29/08/2024 17:10:15 | 406,774 | 5,756,192 | 0 | 0 | No Reef | 0.0 | 0.0 | No Reef | 1.6 | 8.5 | <25m$^2$ | No Reef |
| A2_ES_03 | A2_ES_03_00050 | 29/08/2024 17:10:36 | 406,774 | 5,756,192 | 0 | 0 | No Reef | | | | | | | |
| A2_ES_03 | A2_ES_03_00051 | 29/08/2024 17:10:56 | 406,774 | 5,756,192 | 0 | 0 | No Reef | | | | | | | |
| A2_ES_05_HAS | A2_ES_05_HAS_00001 | 29/08/2024 18:42:33 | 406,509 | 5,754,562 | 0 | 0 | No Reef | | | | | | | |
| A2_ES_05_HAS | A2_ES_05_HAS_00002 | 29/08/2024 18:42:54 | 406,507 | 5,754,565 | 0 | 0 | No Reef | | | | | | | |
| A2_ES_05_HAS | A2_ES_05_HAS_00003 | 29/08/2024 18:43:04 | 406,507 | 5,754,566 | 0 | 0 | No Reef | 0.1 | 0.0 | Not a Reef | 70.9 | 15791.1 | 25-10000m$^2$ | Not a Reef |
| A2_ES_05_HAS | A2_ES_05_HAS_00004 | 29/08/2024 18:43:30 | 406,505 | 5,754,569 | 0 | 0 | No Reef | | | | | | | |
| A2_ES_05_HAS | A2_ES_05_HAS_00005 | 29/08/2024 18:43:55 | 406,504 | 5,754,573 | 0 | 0 | No Reef | | | | | | | |

| Transect Name | Picture | Date Time | Easting | Northing | Composition (% cover) | Elevation (Average tube height in cm) | Reefiness value | Mean *Sabellaria* % cover for areas of similar cover | Mean height (cm) cover for areas of similar cover | Mean *Reefiness (Value)* cover for areas of similar cover | Extent | Area | Area Category | Reefiness Value |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A2_ES_05_HAS | A2_ES_05_HAS_00006 | 29/08/2024 18:44:13 | 406,503 | 5,754,575 | 0 | 0 | No Reef | | | | | | | |
| A2_ES_05_HAS | A2_ES_05_HAS_00007 | 29/08/2024 18:44:39 | 406,501 | 5,754,579 | 0 | 0 | No Reef | | | | | | | |
| A2_ES_05_HAS | A2_ES_05_HAS_00008 | 29/08/2024 18:44:59 | 406,500 | 5,754,582 | 0 | 0 | No Reef | | | | | | | |
| A2_ES_05_HAS | A2_ES_05_HAS_00009 | 29/08/2024 18:45:22 | 406,499 | 5,754,585 | 0 | 0 | No Reef | | | | | | | |
| A2_ES_05_HAS | A2_ES_05_HAS_00010 | 29/08/2024 18:45:43 | 406,497 | 5,754,588 | 0 | 0 | No Reef | | | | | | | |
| A2_ES_05_HAS | A2_ES_05_HAS_00011 | 29/08/2024 18:46:04 | 406,496 | 5,754,592 | 0 | 0 | No Reef | | | | | | | |
| A2_ES_05_HAS | A2_ES_05_HAS_00012 | 29/08/2024 18:46:26 | 406,495 | 5,754,595 | 0 | 0 | No Reef | | | | | | | |
| A2_ES_05_HAS | A2_ES_05_HAS_00013 | 29/08/2024 18:46:48 | 406,493 | 5,754,598 | 0 | 0 | No Reef | | | | | | | |
| A2_ES_05_HAS | A2_ES_05_HAS_00014 | 29/08/2024 18:47:09 | 406,491 | 5,754,602 | 0 | 0 | No Reef | | | | | | | |
| A2_ES_05_HAS | A2_ES_05_HAS_00015 | 29/08/2024 18:47:31 | 406,490 | 5,754,605 | 0 | 0 | No Reef | | | | | | | |
| A2_ES_05_HAS | A2_ES_05_HAS_00016 | 29/08/2024 18:47:58 | 406,488 | 5,754,609 | 0 | 0 | No Reef | | | | | | | |
| A2_ES_05_HAS | A2_ES_05_HAS_00017 | 29/08/2024 18:48:28 | 406,487 | 5,754,614 | 0 | 0 | No Reef | | | | | | | |
| A2_ES_05_HAS | A2_ES_05_HAS_00018 | 29/08/2024 18:48:48 | 406,486 | 5,754,616 | 0 | 0 | No Reef | | | | | | | |
| A2_ES_05_HAS | A2_ES_05_HAS_00019 | 29/08/2024 18:49:11 | 406,484 | 5,754,620 | 2 | 1 | Not a Reef | | | | | | | |

| Transect Name | Picture | Date Time | Easting | Northing | Composition (% cover) | Elevation (Average tube height in cm) | Reefiness value | Mean *Sabellaria* % cover for areas of similar cover | Mean height (cm) cover for areas of similar cover | Mean *Reefiness (Value)* cover for areas of similar cover | Extent | Area | Area Category | Reefiness Value |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A2_ES_05_HAS | A2_ES_05_HAS_00020 | 29/08/2024 18:49:37 | 406,482 | 5,754,624 | 0 | 0 | No Reef | | | | | | | |
| A2_ES_05_HAS | A2_ES_05_HAS_00021 | 29/08/2024 18:49:58 | 406,481 | 5,754,627 | 0 | 0 | No Reef | | | | | | | |
| A2_ES_05_HAS | A2_ES_05_HAS_00022 | 29/08/2024 18:50:18 | 406,480 | 5,754,630 | 8 | 1 | Not a Reef | 21.4 | 1.1 | Not a Reef | 27.8 | 2425.0 | 25-10000m$^2$ | Not a Reef |
| A2_ES_05_HAS | A2_ES_05_HAS_00023 | 29/08/2024 18:50:40 | 406,478 | 5,754,634 | 3 | 1 | Not a Reef | | | | | | | |
| A2_ES_05_HAS | A2_ES_05_HAS_00024 | 29/08/2024 18:51:09 | 406,476 | 5,754,638 | 10 | 1 | Not a Reef | | | | | | | |
| A2_ES_05_HAS | A2_ES_05_HAS_00025 | 29/08/2024 18:51:32 | 406,475 | 5,754,642 | 20 | 1 | Not a Reef | | | | | | | |
| A2_ES_05_HAS | A2_ES_05_HAS_00026 | 29/08/2024 18:51:51 | 406,474 | 5,754,645 | 40 | 1 | Not a Reef | | | | | | | |
| A2_ES_05_HAS | A2_ES_05_HAS_00027 | 29/08/2024 18:52:14 | 406,472 | 5,754,648 | 30 | 1 | Not a Reef | | | | | | | |
| A2_ES_05_HAS | A2_ES_05_HAS_00028 | 29/08/2024 18:52:42 | 406,470 | 5,754,653 | 40 | 1 | Not a Reef | | | | | | | |
| A2_ES_05_HAS | A2_ES_05_HAS_00029 | 29/08/2024 18:53:03 | 406,469 | 5,754,656 | 20 | 2 | Low Reef | | | | | | | |
| A2_ES_05_HAS | A2_ES_05_HAS_00030 | 29/08/2024 18:53:30 | 406,467 | 5,754,660 | 0 | 0 | No Reef | 4.0 | 0.2 | Not a Reef | 12.7 | 509.4 | 25-10000m$^2$ | Not a Reef |
| A2_ES_05_HAS | A2_ES_05_HAS_00031 | 29/08/2024 18:53:50 | 406,466 | 5,754,664 | 0 | 0 | No Reef | | | | | | | |
| A2_ES_05_HAS | A2_ES_05_HAS_00032 | 29/08/2024 18:54:12 | 406,464 | 5,754,667 | 20 | 1 | Not a Reef | | | | | | | |
| A2_ES_05_HAS | A2_ES_05_HAS_00033 | 29/08/2024 18:54:37 | 406,463 | 5,754,670 | 0 | 0 | No Reef | | | | | | | |

| Transect Name | Picture | Date Time | Easting | Northing | Composition (% cover) | Elevation (Average tube height in cm) | Reefiness value | Mean *Sabellaria* % cover for areas of similar cover | Mean height (cm) cover for areas of similar cover | Mean *Reefiness (Value)* cover for areas of similar cover | Extent | Area | Area Category | Reefiness Value |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A2_ES_05_HAS | A2_ES_05_HAS_00034 | 29/08/2024 18:54:57 | 406,462 | 5,754,672 | 0 | 0 | No Reef | | | | | | | |
| A2_ES_05_HAS | A2_ES_05_HAS_00035 | 29/08/2024 18:55:26 | 406,461 | 5,754,673 | 5 | 2 | Not a Reef | | | | | | | |
| A2_ES_05_HAS | A2_ES_05_HAS_00036 | 29/08/2024 18:55:57 | 406,458 | 5,754,679 | 10 | 2 | Low Reef | | | | | | | |
| A2_ES_05_HAS | A2_ES_05_HAS_00037 | 29/08/2024 18:56:17 | 406,457 | 5,754,682 | 10 | 1 | Not a Reef | | | | | | | |
| A2_ES_05_HAS | A2_ES_05_HAS_00038 | 29/08/2024 18:56:37 | 406,457 | 5,754,684 | 10 | 2 | Low Reef | | | | | | | |
| A2_ES_05_HAS | A2_ES_05_HAS_00039 | 29/08/2024 18:56:57 | 406,456 | 5,754,686 | 5 | 1 | Not a Reef | | | | | | | |
| A2_ES_05_HAS | A2_ES_05_HAS_00040 | 29/08/2024 18:57:18 | 406,454 | 5,754,689 | 5 | 1 | Not a Reef | | | | | | | |
| A2_ES_05_HAS | A2_ES_05_HAS_00041 | 29/08/2024 18:57:39 | 406,453 | 5,754,693 | 0 | 0 | No Reef | 9.1 | 1.2 | Not a Reef | 29.4 | 2706.6 | 25-10000m$^2$ | Not a Reef |
| A2_ES_05_HAS | A2_ES_05_HAS_00042 | 29/08/2024 18:57:59 | 406,452 | 5,754,695 | 10 | 2 | Low Reef | | | | | | | |
| A2_ES_05_HAS | A2_ES_05_HAS_00043 | 29/08/2024 18:58:19 | 406,452 | 5,754,697 | 40 | 1 | Not a Reef | | | | | | | |
| A2_ES_05_HAS | A2_ES_05_HAS_00044 | 29/08/2024 18:58:44 | 406,451 | 5,754,699 | 10 | 2 | Low Reef | | | | | | | |
| A2_ES_05_HAS | A2_ES_05_HAS_00045 | 29/08/2024 18:59:04 | 406,451 | 5,754,700 | 10 | 1 | Not a Reef | | | | | | | |
| A2_ES_05_HAS | A2_ES_05_HAS_00046 | 29/08/2024 18:59:24 | 406,451 | 5,754,701 | 3 | 1 | Not a Reef | | | | | | | |
| A2_ES_05_HAS | A2_ES_05_HAS_00047 | 29/08/2024 18:59:44 | 406,451 | 5,754,701 | 0 | 0 | No Reef | | | | | | | |

| Transect Name | Picture | Date Time | Easting | Northing | Composition (% cover) | Elevation (Average tube height in cm) | Reefiness value | Mean *Sabellaria* % cover for areas of similar cover | Mean height (cm) cover for areas of similar cover | Mean *Reefiness (Value)* cover for areas of similar cover | Extent | Area | Area Category | Reefiness Value |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A2_ES_Add_01 | A2_ES_Add_01_00001 | 02/09/2024 22:43:58 | 406,515 | 5,754,743 | 20 | 1 | Not a Reef | 12.1 | 0.9 | Not a Reef | 16.1 | 817.7 | 25-10000m$^2$ | Not a Reef |
| A2_ES_Add_01 | A2_ES_Add_01_00002 | 02/09/2024 22:44:20 | 406,515 | 5,754,742 | 0 | 0 | No Reef | | | | | | | |
| A2_ES_Add_01 | A2_ES_Add_01_00003 | 02/09/2024 22:44:37 | 406,514 | 5,754,738 | 30 | 1 | Not a Reef | | | | | | | |
| A2_ES_Add_01 | A2_ES_Add_01_00004 | 02/09/2024 22:44:57 | 406,513 | 5,754,735 | 20 | 1 | Not a Reef | | | | | | | |
| A2_ES_Add_01 | A2_ES_Add_01_00005 | 02/09/2024 22:45:15 | 406,513 | 5,754,734 | 7 | 1 | Not a Reef | | | | | | | |
| A2_ES_Add_01 | A2_ES_Add_01_00006 | 02/09/2024 22:45:47 | 406,512 | 5,754,728 | 5 | 1 | Not a Reef | | | | | | | |
| A2_ES_Add_01 | A2_ES_Add_01_00007 | 02/09/2024 22:46:07 | 406,512 | 5,754,727 | 3 | 1 | Not a Reef | | | | | | | |
| A2_ES_Add_01 | A2_ES_Add_01_00008 | 02/09/2024 22:46:34 | 406,511 | 5,754,722 | 0 | 0 | No Reef | 2.2 | 0.3 | Not a Reef | 70.6 | 15666.0 | 25-10000m$^2$ | Not a Reef |
| A2_ES_Add_01 | A2_ES_Add_01_00009 | 02/09/2024 22:46:54 | 406,511 | 5,754,722 | 0 | 0 | No Reef | | | | | | | |
| A2_ES_Add_01 | A2_ES_Add_01_00010 | 02/09/2024 22:47:14 | 406,509 | 5,754,715 | 10 | 1 | Not a Reef | | | | | | | |
| A2_ES_Add_01 | A2_ES_Add_01_00011 | 02/09/2024 22:47:34 | 406,508 | 5,754,710 | 0 | 0 | No Reef | | | | | | | |
| A2_ES_Add_01 | A2_ES_Add_01_00012 | 02/09/2024 22:47:57 | 406,507 | 5,754,705 | 0 | 0 | No Reef | | | | | | | |
| A2_ES_Add_01 | A2_ES_Add_01_00013 | 02/09/2024 22:48:24 | 406,507 | 5,754,701 | 0 | 0 | No Reef | | | | | | | |
| A2_ES_Add_01 | A2_ES_Add_01_00015 | 02/09/2024 22:49:15 | 406,505 | 5,754,694 | 0 | 0 | No Reef | | | | | | | |

| Transect Name | Picture | Date Time | Easting | Northing | Composition (% cover) | Elevation (Average tube height in cm) | Reefiness value | Mean *Sabellaria* % cover for areas of similar cover | Mean height (cm) cover for areas of similar cover | Mean *Reefiness (Value)* cover for areas of similar cover | Extent | Area | Area Category | Reefiness Value |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A2_ES_Add_01 | A2_ES_Add_01_00016 | 02/09/2024 22:49:45 | 406,505 | 5,754,690 | 0 | 0 | No Reef | | | | | | | |
| A2_ES_Add_01 | A2_ES_Add_01_00018 | 02/09/2024 22:50:29 | 406,503 | 5,754,682 | 0 | 0 | No Reef | | | | | | | |
| A2_ES_Add_01 | A2_ES_Add_01_00020 | 02/09/2024 22:51:09 | 406,503 | 5,754,679 | 3 | 1 | Not a Reef | | | | | | | |
| A2_ES_Add_01 | A2_ES_Add_01_00021 | 02/09/2024 22:51:29 | 406,502 | 5,754,676 | 0 | 0 | No Reef | | | | | | | |
| A2_ES_Add_01 | A2_ES_Add_01_00022 | 02/09/2024 22:51:46 | 406,502 | 5,754,673 | 0 | 0 | No Reef | | | | | | | |
| A2_ES_Add_01 | A2_ES_Add_01_00023 | 02/09/2024 22:52:21 | 406,500 | 5,754,665 | 0 | 0 | No Reef | | | | | | | |
| A2_ES_Add_01 | A2_ES_Add_01_00024 | 02/09/2024 22:52:41 | 406,500 | 5,754,662 | 10 | 1 | Not a Reef | | | | | | | |
| A2_ES_Add_01 | A2_ES_Add_01_00027 | 02/09/2024 22:53:54 | 406,498 | 5,754,653 | 10 | 1 | Not a Reef | | | | | | | |
| A2_ES_Add_02_A | A2_ES_Add_02_A_00001 | 02/09/2024 21:58:11 | 406,494 | 5,754,603 | Not Visible | Not Visible | #N/A | 15.0 | 0.6 | Not a Reef | 38.9 | 4742.2 | 25-10000m$^2$ | Not a Reef |
| A2_ES_Add_02_A | A2_ES_Add_02_A_00002 | 02/09/2024 21:58:33 | 406,496 | 5,754,604 | Not Visible | Not Visible | #N/A | | | | | | | |
| A2_ES_Add_02_A | A2_ES_Add_02_A_00003 | 02/09/2024 21:58:53 | 406,497 | 5,754,605 | Not Visible | Not Visible | #N/A | | | | | | | |
| A2_ES_Add_02_A | A2_ES_Add_02_A_00004 | 02/09/2024 21:59:15 | 406,498 | 5,754,607 | Not Visible | Not Visible | #N/A | | | | | | | |
| A2_ES_Add_02_A | A2_ES_Add_02_A_00005 | 02/09/2024 21:59:35 | 406,501 | 5,754,609 | Not Visible | Not Visible | #N/A | | | | | | | |
| A2_ES_Add_02_A | A2_ES_Add_02_A_00006 | 02/09/2024 21:59:55 | 406,501 | 5,754,609 | 0 | 0 | No Reef | | | | | | | |

| Transect Name | Picture | Date Time | Easting | Northing | Composition (% cover) | Elevation (Average tube height in cm) | Reefiness value | Mean *Sabellaria* % cover for areas of similar cover | Mean height (cm) cover for areas of similar cover | Mean *Reefiness (Value)* cover for areas of similar cover | Extent | Area | Area Category | Reefiness Value |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A2_ES_Add_02_A | A2_ES_Add_02_A_00007 | 02/09/2024 22:00:17 | 406,504 | 5,754,612 | Not Visible | Not Visible | #N/A | | | | | | | |
| A2_ES_Add_02_A | A2_ES_Add_02_A_00008 | 02/09/2024 22:00:37 | 406,505 | 5,754,612 | 0 | 0 | No Reef | | | | | | | |
| A2_ES_Add_02_A | A2_ES_Add_02_A_00009 | 02/09/2024 22:00:57 | 406,508 | 5,754,615 | Not Visible | Not Visible | #N/A | | | | | | | |
| A2_ES_Add_02_A | A2_ES_Add_02_A_00010 | 02/09/2024 22:01:17 | 406,509 | 5,754,616 | 20 | 1 | Not a Reef | | | | | | | |
| A2_ES_Add_02_A | A2_ES_Add_02_A_00011 | 02/09/2024 22:01:43 | 406,511 | 5,754,618 | Not Visible | Not Visible | #N/A | | | | | | | |
| A2_ES_Add_02_A | A2_ES_Add_02_A_00012 | 02/09/2024 22:02:03 | 406,513 | 5,754,620 | Not Visible | Not Visible | #N/A | | | | | | | |
| A2_ES_Add_02_A | A2_ES_Add_02_A_00013 | 02/09/2024 22:02:25 | 406,513 | 5,754,621 | 5 | 1 | Not a Reef | | | | | | | |
| A2_ES_Add_02_A | A2_ES_Add_02_A_00014 | 02/09/2024 22:02:53 | 406,517 | 5,754,624 | Not Visible | Not Visible | #N/A | | | | | | | |
| A2_ES_Add_02_A | A2_ES_Add_02_A_00015 | 02/09/2024 22:03:13 | 406,517 | 5,754,624 | 50 | 1 | Not a Reef | | | | | | | |
| A2_ES_Add_02_A | A2_ES_Add_02_A_00016 | 02/09/2024 22:03:34 | 406,520 | 5,754,627 | Not Visible | Not Visible | #N/A | | | | | | | |
| A2_ES_Add_02_A | A2_ES_Add_02_A_00017 | 02/09/2024 22:03:58 | 406,523 | 5,754,630 | Not Visible | Not Visible | #N/A | | | | | | | |
| A2_ES_Add_02_A | A2_ES_Add_02_A_00018 | 02/09/2024 22:04:18 | 406,524 | 5,754,630 | 60 | 1 | Not a Reef | | | | | | | |
| A2_ES_Add_02_A | A2_ES_Add_02_A_00019 | 02/09/2024 22:04:41 | 406,526 | 5,754,633 | 10 | 1 | Not a Reef | 52.5 | 1.0 | Not a Reef | 14.0 | 614.8 | 25-10000m$^2$ | Not a Reef |
| A2_ES_Add_02_A | A2_ES_Add_02_A_00020 | 02/09/2024 22:05:06 | 406,529 | 5,754,635 | Not Visible | Not Visible | #N/A | | | | | | | |

| Transect Name | Picture | Date Time | Easting | Northing | Composition (% cover) | Elevation (Average tube height in cm) | Reefiness value | Mean *Sabellaria* % cover for areas of similar cover | Mean height (cm) cover for areas of similar cover | Mean *Reefiness (Value)* cover for areas of similar cover | Extent | Area | Area Category | Reefiness Value |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A2_ES_Add_02_A | A2_ES_Add_02_A_00021 | 02/09/2024 22:05:26 | 406,529 | 5,754,635 | 70 | 1 | Not a Reef | | | | | | | |
| A2_ES_Add_02_A | A2_ES_Add_02_A_00022 | 02/09/2024 22:05:52 | 406,532 | 5,754,639 | Not Visible | Not Visible | #N/A | | | | | | | |
| A2_ES_Add_02_A | A2_ES_Add_02_A_00023 | 02/09/2024 22:06:24 | 406,534 | 5,754,640 | 70 | 1 | Not a Reef | | | | | | | |
| A2_ES_Add_02_A | A2_ES_Add_02_A_00024 | 02/09/2024 22:06:45 | 406,536 | 5,754,642 | Not Visible | Not Visible | #N/A | Not Visible | Not Visible | #N/A | 3.9 | 46.9 | <25m$^2$ | #N/A |
| A2_ES_Add_02_A | A2_ES_Add_02_A_00025 | 02/09/2024 22:07:07 | 406,539 | 5,754,645 | Not Visible | Not Visible | #N/A | | | | | | | |
| A2_ES_Add_02_A | A2_ES_Add_02_A_00026 | 02/09/2024 22:07:27 | 406,539 | 5,754,645 | 50 | 1 | Not a Reef | | | | | | | |
| A2_ES_Add_02_A | A2_ES_Add_02_A_00027 | 02/09/2024 22:07:48 | 406,542 | 5,754,647 | 5 | 1 | Not a Reef | 41.7 | 1.0 | Not a Reef | 4.8 | 72.3 | <25m$^2$ | Not a Reef |
| A2_ES_Add_02_A | A2_ES_Add_02_A_00028 | 02/09/2024 22:08:08 | 406,542 | 5,754,648 | 70 | 1 | Not a Reef | | | | | | | |
| A2_ES_Add_02_A | A2_ES_Add_02_A_00029 | 02/09/2024 22:08:29 | 406,545 | 5,754,650 | Not Visible | Not Visible | #N/A | | | | | | | |
| A2_ES_Add_02_A | A2_ES_Add_02_A_00030 | 02/09/2024 22:08:49 | 406,546 | 5,754,651 | Not Visible | Not Visible | #N/A | 30.0 | 1.0 | Not a Reef | 2.6 | 22.0 | <25m$^2$ | Not a Reef |
| A2_ES_Add_02_A | A2_ES_Add_02_A_00031 | 02/09/2024 22:09:09 | 406,547 | 5,754,651 | 30 | 1 | Not a Reef | | | | | | | |
| A2_ES_Add_02_A | A2_ES_Add_02_A_00032 | 02/09/2024 22:09:29 | 406,546 | 5,754,652 | Not Visible | Not Visible | #N/A | | | | | | | |

**Table 2: Sabellaria Assessment**

**Goedetics: ETRS 1989, UTM 31N**

| Transect Name | Picture | Date Time | Easting | Northing | Biota % cover including Turf on rocks | Biota % cover (excluding turf; non turf forming sessile organisms) | Species Present | Composition (% cover) | Elevation (average boulder and cobble height in mm) | Reefiness value (Comp vs Elevation ) | Reefiness Value (Comp vs elevation vs biota with turf) | Mean composition for areas of similar cover | Mean elevation for areas of similar cover | Mean Reefiness (Value) for areas of similar cover | Mean biota for areas of similar cover (with turf) | Mean Reefiness (Comp x elevation x biota) | Extent (m) | Area (m2) | Extent category | Overall reef structure (structure x biota x extent) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A3_NS_01 | A3_NS_01_00001 | 29/08/2024 22:27:10 | 408,394 | 5,748,504 | Poor Vis | Poor Vis | | Poor Vis | Poor Vis | #N/A | #N/A | | | | | | | | | |
| A3_NS_01 | A3_NS_01_00002 | 29/08/2024 22:27:32 | 408,396 | 5,748,505 | 30 | 30 | Serpulidae | 8 | 30 | Not a Reef | Not a Reef | | | | | | | | | |
| A3_NS_01 | A3_NS_01_00003 | 29/08/2024 22:27:52 | 408,399 | 5,748,505 | 20 | 20 | Serpulidae | 5 | 20 | Not a Reef | Not a Reef | | | | | | | | | |
| A3_NS_01 | A3_NS_01_00004 | 29/08/2024 22:28:18 | 408,403 | 5,748,507 | 15 | 15 | Serpulidae | 8 | 20 | Not a Reef | Not a Reef | 7.7 | 15.0 | Not a Reef | 12.3 | Not a Reef | 27.2 | 2322.0 | >25 m2 | Not a Reef |
| A3_NS_01 | A3_NS_01_00005 | 29/08/2024 22:28:51 | 408,409 | 5,748,509 | 5 | 5 | Serpulidae | 5 | 10 | Not a Reef | Not a Reef | | | | | | | | | |
| A3_NS_01 | A3_NS_01_00006 | 29/08/2024 22:29:17 | 408,412 | 5,748,509 | 1 | 1 | Serpulidae | 10 | 5 | Low Reef | Not a Reef | | | | | | | | | |
| A3_NS_01 | A3_NS_01_00007 | 29/08/2024 22:29:45 | 408,416 | 5,748,511 | Poor Vis | Poor Vis | | Poor Vis | Poor Vis | #N/A | #N/A | | | | | | | | | |
| A3_NS_01 | A3_NS_01_00008 | 29/08/2024 22:30:04 | 408,419 | 5,748,512 | 3 | 3 | Serpulidae | 10 | 5 | Low Reef | Not a Reef | | | | | | | | | |
| A3_NS_01 | A3_NS_01_00009 | 29/08/2024 22:30:28 | 408,424 | 5,748,513 | Poor Vis | Poor Vis | | Poor Vis | Poor Vis | #N/A | #N/A | 6.2 | 9.0 | Not a Reef | 5.2 | Not a Reef | 90.7 | 25833.9 | >25 m2 | Not a Reef |
| A3_NS_01 | A3_NS_01_00010 | 29/08/2024 22:30:59 | 408,428 | 5,748,515 | Poor Vis | Poor Vis | | Poor Vis | Poor Vis | #N/A | #N/A | | | | | | | | | |

| Transect Name | Picture | Date Time | Easting | Northing | Biota % cover including Turf on rocks | Biota % cover (excluding turf; non turf forming sessile organisms) | Species Present | Composition (% cover) | Elevation (average boulder and cobble height in mm) | Reefiness value (Comp vs Elevation) | Reefiness Value (Comp vs elevation vs biota with turf) | Mean composition for areas of similar cover | Mean elevation for areas of similar cover | Mean Reefiness (Value) for areas of similar cover | Mean biota for areas of similar cover (with turf) | Mean Reefiness (Comp x elevation x biota) | Extent (m) | Area (m2) | Extent category | Overall reef structure (structure x biota x extent) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A3_NS_01 | A3_NS_01_00012 | 29/08/2024 22:31:29 | 408,434 | 5,748,517 | 10 | 10 | Serpulidae | 8 | 10 | Not a Reef | Not a Reef | | | | | | | | | |
| A3_NS_01 | A3_NS_01_00013 | 29/08/2024 22:31:55 | 408,438 | 5,748,518 | Poor Vis | Poor Vis | | Poor Vis | Poor Vis | #N/A | #N/A | | | | | | | | | |
| A3_NS_01 | A3_NS_01_00014 | 29/08/2024 22:32:14 | 408,440 | 5,748,519 | 10 | 10 | Serpulidae | 8 | 10 | Not a Reef | Not a Reef | | | | | | | | | |
| A3_NS_01 | A3_NS_01_00015 | 29/08/2024 22:32:39 | 408,444 | 5,748,520 | Poor Vis | Poor Vis | | Poor Vis | Poor Vis | #N/A | #N/A | | | | | | | | | |
| A3_NS_01 | A3_NS_01_00016 | 29/08/2024 22:33:09 | 408,450 | 5,748,522 | Poor Vis | Poor Vis | | Poor Vis | Poor Vis | #N/A | #N/A | | | | | | | | | |
| A3_NS_01 | A3_NS_01_00017 | 29/08/2024 22:33:26 | 408,452 | 5,748,523 | Poor Vis | Poor Vis | | Poor Vis | Poor Vis | #N/A | #N/A | | | | | | | | | |
| A3_NS_01 | A3_NS_01_00018 | 29/08/2024 22:33:46 | 408,455 | 5,748,523 | 2 | 2 | Serpulidae | 5 | 5 | Not a Reef | Not a Reef | | | | | | | | | |
| A3_NS_01 | A3_NS_01_00019 | 29/08/2024 22:34:11 | 408,460 | 5,748,525 | Poor Vis | Poor Vis | | Poor Vis | Poor Vis | #N/A | #N/A | | | | | | | | | |
| A3_NS_01 | A3_NS_01_00020 | 29/08/2024 22:34:37 | 408,465 | 5,748,527 | Poor Vis | Poor Vis | | Poor Vis | Poor Vis | #N/A | #N/A | | | | | | | | | |
| A3_NS_01 | A3_NS_01_00021 | 29/08/2024 22:35:00 | 408,468 | 5,748,528 | Poor Vis | Poor Vis | | Poor Vis | Poor Vis | #N/A | #N/A | | | | | | | | | |
| A3_NS_01 | A3_NS_01_00022 | 29/08/2024 22:35:23 | 408,472 | 5,748,529 | Poor Vis | Poor Vis | | Poor Vis | Poor Vis | #N/A | #N/A | | | | | | | | | |

| Transect Name | Picture | Date Time | Easting | Northing | Biota % cover including Turf on rocks | Biota % cover (excluding turf; non turf forming sessile organisms) | Species Present | Composition (% cover) | Elevation (average boulder and cobble height in mm) | Reefiness value (Comp vs Elevation) | Reefiness Value (Comp vs elevation vs biota with turf) | Mean composition for areas of similar cover | Mean elevation for areas of similar cover | Mean Reefiness (Value) for areas of similar cover | Mean biota for areas of similar cover (with turf) | Mean Reefiness (Comp x elevation x biota) | Extent (m) | Area (m2) | Extent category | Overall reef structure (structure x biota x extent) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A3_NS_01 | A3_NS_01_00023 | 29/08/2024 22:35:50 | 408,477 | 5,748,530 | Poor Vis | Poor Vis | | Poor Vis | Poor Vis | #N/A | #N/A | | | | | | | | | |
| A3_NS_01 | A3_NS_01_00024 | 29/08/2024 22:36:10 | 408,480 | 5,748,531 | 3 | 3 | | 5 | 10 | Not a Reef | Not a Reef | | | | | | | | | |
| A3_NS_01 | A3_NS_01_00025 | 29/08/2024 22:36:36 | 408,484 | 5,748,532 | Poor Vis | Poor Vis | | Poor Vis | Poor Vis | #N/A | #N/A | | | | | | | | | |
| A3_NS_01 | A3_NS_01_00026 | 29/08/2024 22:37:01 | 408,489 | 5,748,533 | 1 | 1 | Serpulidae | 5 | 10 | Not a Reef | Not a Reef | | | | | | | | | |
| A3_NS_01 | A3_NS_01_00027 | 29/08/2024 22:37:26 | 408,492 | 5,748,535 | Poor Vis | Poor Vis | | Poor Vis | Poor Vis | #N/A | #N/A | | | | | | | | | |
| A3_NS_01 | A3_NS_01_00028 | 29/08/2024 22:37:49 | 408,497 | 5,748,536 | Poor Vis | Poor Vis | | Poor Vis | Poor Vis | #N/A | #N/A | | | | | | | | | |
| A3_NS_01 | A3_NS_01_00029 | 29/08/2024 22:38:14 | 408,500 | 5,748,538 | Poor Vis | Poor Vis | | Poor Vis | Poor Vis | #N/A | #N/A | | | | | | | | | |
| A3_NS_01 | A3_NS_01_00030 | 29/08/2024 22:38:33 | 408,505 | 5,748,539 | Poor Vis | Poor Vis | | Poor Vis | Poor Vis | #N/A | #N/A | | | | | | | | | |
| A3_NS_01 | A3_NS_01_00031 | 29/08/2024 22:38:53 | 408,510 | 5,748,541 | Poor Vis | Poor Vis | | Poor Vis | Poor Vis | #N/A | #N/A | | | | | | | | | |
| A3_NS_02_HAS | A3_NS_02_HAS_00001 | 30/08/2024 00:05:37 | 411,283 | 5,747,288 | Poor Vis | Poor Vis | | Poor Vis | Poor Vis | #N/A | #N/A | Poor Vis | Poor Vis | #N/A | Poor Vis | #N/A | 3.1 | 30.9 | <25 m2 | #N/A |
| A3_NS_02_HAS | A3_NS_02_HAS_00002 | 30/08/2024 00:06:00 | 411,286 | 5,747,289 | Poor Vis | Poor Vis | | Poor Vis | Poor Vis | #N/A | #N/A | | | | | | | | | |
| A3_NS_02_HAS | A3_NS_02_HAS_00003 | 30/08/2024 00:06:23 | 411,290 | 5,747,289 | 10 | 10 | Serpulidae | 5 | 10 | Not a Reef | Not a Reef | 8.2 | 9.3 | Not a Reef | 7.78 | Not a Reef | 30.1 | 2846.4 | >25 m2 | Not a Reef |

| Transect Name | Picture | Date Time | Easting | Northing | Biota % cover including Turf on rocks | Biota % cover (excluding turf; non turf forming sessile organisms) | Species Present | Composition (% cover) | Elevation (average boulder and cobble height in mm) | Reefiness value (Comp vs Elevation ) | Reefiness Value (Comp vs elevation vs biota with turf) | Mean composition for areas of similar cover | Mean elevation for areas of similar cover | Mean Reefiness (Value) for areas of similar cover | Mean biota for areas of similar cover (with turf) | Mean Reefiness (Comp x elevation x biota) | Extent (m) | Area (m2) | Extent category | Overall reef structure (structure x biota x extent) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A3_NS_02_HAS | A3_NS_02_HAS_00004 | 30/08/2024 00:06:51 | 411,295 | 5,747,291 | 2 | 2 | Serpulidae | 8 | 10 | Not a Reef | Not a Reef | | | | | | | | | |
| A3_NS_02_HAS | A3_NS_02_HAS_00005 | 30/08/2024 00:07:11 | 411,298 | 5,747,292 | 10 | 10 | Serpulidae | 10 | 20 | Low Reef | Not a Reef | | | | | | | | | |
| A3_NS_02_HAS | A3_NS_02_HAS_00006 | 30/08/2024 00:07:37 | 411,302 | 5,747,292 | 5 | 5 | Serpulidae | 8 | 5 | Not a Reef | Not a Reef | | | | | | | | | |
| A3_NS_02_HAS | A3_NS_02_HAS_00007 | 30/08/2024 00:08:04 | 411,307 | 5,747,293 | 5 | 5 | Serpulidae | 20 | 20 | Low Reef | Not a Reef | | | | | | | | | |
| A3_NS_02_HAS | A3_NS_02_HAS_00008 | 30/08/2024 00:08:26 | 411,310 | 5,747,294 | 8 | 8 | Serpulidae | 10 | 8 | Low Reef | Not a Reef | | | | | | | | | |
| A3_NS_02_HAS | A3_NS_02_HAS_00009 | 30/08/2024 00:08:47 | 411,314 | 5,747,295 | 20 | 20 | Serpulidae | 5 | 6 | Not a Reef | Not a Reef | | | | | | | | | |
| A3_NS_02_HAS | A3_NS_02_HAS_00010 | 30/08/2024 00:09:07 | 411,316 | 5,747,295 | 0 | 0 | | 0 | 0 | No Reef | No Reef | | | | | | | | | |
| A3_NS_02_HAS | A3_NS_02_HAS_00011 | 30/08/2024 00:09:27 | 411,320 | 5,747,296 | 10 | 10 | Serpulidae | 8 | 5 | Not a Reef | Not a Reef | | | | | | | | | |
| A3_NS_02_HAS | A3_NS_02_HAS_00012 | 30/08/2024 00:09:47 | 411,323 | 5,747,296 | 0 | 0 | | 0 | 0 | No Reef | No Reef | | | | | | | | | |
| A3_NS_02_HAS | A3_NS_02_HAS_00013 | 30/08/2024 00:10:07 | 411,326 | 5,747,297 | 0 | 0 | | 0 | 0 | No Reef | No Reef | 0.0 | 0.0 | No Reef | 0 | No Reef | 7.9 | 197.8 | >25 m2 | No Reef |
| A3_NS_02_HAS | A3_NS_02_HAS_00014 | 30/08/2024 00:10:30 | 411,331 | 5,747,297 | 0 | 0 | | 0 | 0 | No Reef | No Reef | | | | | | | | | |
| A3_NS_02_HAS | A3_NS_02_HAS_00015 | 30/08/2024 00:11:01 | 411,337 | 5,747,299 | 0 | 0 | | 5 | 20 | Not a Reef | Not a Reef | 5.5 | 20.0 | Not a Reef | 0 | Not a Reef | 2.9 | 26.8 | <25 m2 | Not a Reef |

| Transect Name | Picture | Date Time | Easting | Northing | Biota % cover including Turf on rocks | Biota % cover (excluding turf; non turf forming sessile organisms) | Species Present | Composition (% cover) | Elevation (average boulder and cobble height in mm) | Reefiness value (Comp vs Elevation) | Reefiness Value (Comp vs elevation vs biota with turf) | Mean composition for areas of similar cover | Mean elevation for areas of similar cover | Mean Reefiness (Value) for areas of similar cover | Mean biota for areas of similar cover (with turf) | Mean Reefiness (Comp x elevation x biota) | Extent (m) | Area (m2) | Extent category | Overall reef structure (structure x biota x extent) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A3_NS_02_HAS | A3_NS_02_HAS_00016 | 30/08/2024 00:11:21 | 411,340 | 5,747,299 | 0 | 0 | | 6 | 20 | Not a Reef | Not a Reef | | | | | | | | | |
| A3_NS_02_HAS | A3_NS_02_HAS_00017 | 30/08/2024 00:11:42 | 411,344 | 5,747,300 | 20 | 0 | Faunal Turf | 50 | 30 | Low Reef | Low Reef | | | | | | | | | |
| A3_NS_02_HAS | A3_NS_02_HAS_00018 | 30/08/2024 00:12:02 | 411,346 | 5,747,300 | 30 | 0 | Faunal Turf | 50 | 40 | Low Reef | Low Reef | | | | | | | | | |
| A3_NS_02_HAS | A3_NS_02_HAS_00019 | 30/08/2024 00:12:25 | 411,350 | 5,747,301 | 20 | 0 | Faunal Turf | 60 | 30 | Low Reef | Low Reef | | | | | | | | | |
| A3_NS_02_HAS | A3_NS_02_HAS_00020 | 30/08/2024 00:12:47 | 411,353 | 5,747,301 | 10 | 0 | Faunal Turf | 30 | 20 | Low Reef | Not a Reef | 29.8 | 18.8 | Low Reef | 15 | Low Reef | 25.5 | 2042.0 | >25 m2 | Low Reef |
| A3_NS_02_HAS | A3_NS_02_HAS_00021 | 30/08/2024 00:13:07 | 411,357 | 5,747,302 | 10 | 0 | Faunal Turf | 20 | 10 | Low Reef | Not a Reef | | | | | | | | | |
| A3_NS_02_HAS | A3_NS_02_HAS_00022 | 30/08/2024 00:13:28 | 411,359 | 5,747,302 | 10 | 0 | Faunal Turf | 10 | 5 | Low Reef | Not a Reef | | | | | | | | | |
| A3_NS_02_HAS | A3_NS_02_HAS_00023 | 30/08/2024 00:13:54 | 411,363 | 5,747,303 | 10 | 0 | Faunal Turf | 8 | 5 | Not a Reef | Not a Reef | | | | | | | | | |
| A3_NS_02_HAS | A3_NS_02_HAS_00024 | 30/08/2024 00:14:19 | 411,369 | 5,747,304 | 10 | 0 | Faunal Turf | 10 | 10 | Low Reef | Not a Reef | | | | | | | | | |
| A3_NS_02_HAS | A3_NS_02_HAS_00025 | 30/08/2024 00:14:40 | 411,371 | 5,747,305 | 10 | 0 | Faunal Turf | 7 | 20 | Not a Reef | Not a Reef | | | | | | | | | |
| A3_NS_02_HAS | A3_NS_02_HAS_00026 | 30/08/2024 00:15:03 | 411,375 | 5,747,305 | 10 | 0 | Faunal Turf | 5 | 10 | Not a Reef | Not a Reef | 6.5 | 12.5 | Not a Reef | 10 | Not a Reef | 18.2 | 1036.6 | >25 m2 | Not a Reef |
| A3_NS_02_HAS | A3_NS_02_HAS_00027 | 30/08/2024 00:15:22 | 411,377 | 5,747,306 | 10 | 0 | Faunal Turf | 4 | 20 | Not a Reef | Not a Reef | | | | | | | | | |

| Transect Name | Picture | Date Time | Easting | Northing | Biota % cover including Turf on rocks | Biota % cover (excluding turf; non turf forming sessile organisms) | Species Present | Composition (% cover) | Elevation (average boulder and cobble height in mm) | Reefiness value (Comp vs Elevation) | Reefiness Value (Comp vs elevation vs biota with turf) | Mean composition for areas of similar cover | Mean elevation for areas of similar cover | Mean Reefiness (Value) for areas of similar cover | Mean biota for areas of similar cover (with turf) | Mean Reefiness (Comp x elevation x biota) | Extent (m) | Area (m2) | Extent category | Overall reef structure (structure x biota x extent) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A3_NS_02_HAS | A3_NS_02_HAS_00028 | 30/08/2024 00:15:43 | 411,381 | 5,747,307 | 10 | 0 | Faunal Turf | 8 | 10 | Not a Reef | Not a Reef | | | | | | | | | |
| A3_NS_02_HAS | A3_NS_02_HAS_00029 | 30/08/2024 00:16:03 | 411,386 | 5,747,308 | 10 | 0 | Faunal Turf | 6 | 10 | Not a Reef | Not a Reef | | | | | | | | | |
| A3_NS_02_HAS | A3_NS_02_HAS_00030 | 30/08/2024 00:16:23 | 411,388 | 5,747,308 | 10 | 0 | Faunal Turf | 9 | 5 | Not a Reef | Not a Reef | | | | | | | | | |
| A3_NS_02_HAS | A3_NS_02_HAS_00031 | 30/08/2024 00:16:44 | 411,389 | 5,747,308 | Poor Vis | Poor Vis | | Poor Vis | Poor Vis | #N/A | #N/A | | | | | | | | | |
| A3_NS_03_HAS | A3_NS_03_HAS_00001 | 30/08/2024 00:33:41 | 411,453 | 5,747,316 | 10 | 10 | Serpulidae | 20 | 40 | Low Reef | Not a Reef | | | | | | | | | |
| A3_NS_03_HAS | A3_NS_03_HAS_00002 | 30/08/2024 00:34:09 | 411,456 | 5,747,318 | 20 | 20 | Serpulidae | 40 | 30 | Low Reef | Low Reef | | | | | | | | | |
| A3_NS_03_HAS | A3_NS_03_HAS_00003 | 30/08/2024 00:34:32 | 411,459 | 5,747,319 | 30 | 30 | Serpulidae | 50 | 30 | Low Reef | Low Reef | | | | | | | | | |
| A3_NS_03_HAS | A3_NS_03_HAS_00004 | 30/08/2024 00:34:52 | 411,460 | 5,747,320 | 50 | 50 | Serpulidae | 60 | 20 | Low Reef | Low Reef | 45.0 | 22.1 | Low Reef | 39.3 | Low Reef | 42.6 | 5704.2 | >25 m2 | Low Reef |
| A3_NS_03_HAS | A3_NS_03_HAS_00005 | 30/08/2024 00:35:10 | 411,465 | 5,747,322 | 70 | 70 | Serpulidae | 50 | 30 | Low Reef | Low Reef | | | | | | | | | |
| A3_NS_03_HAS | A3_NS_03_HAS_00006 | 30/08/2024 00:35:30 | 411,467 | 5,747,323 | 60 | 60 | Serpulidae | 50 | 20 | Low Reef | Low Reef | | | | | | | | | |
| A3_NS_03_HAS | A3_NS_03_HAS_00007 | 30/08/2024 00:35:56 | 411,470 | 5,747,325 | 50 | 50 | Serpulidae | 30 | 15 | Low Reef | Low Reef | | | | | | | | | |

| Transect Name | Picture | Date Time | Easting | Northing | Biota % cover including Turf on rocks | Biota % cover (excluding turf; non turf forming sessile organisms) | Species Present | Composition (% cover) | Elevation (average boulder and cobble height in mm) | Reefiness value (Comp vs Elevation) | Reefiness Value (Comp vs elevation vs biota with turf) | Mean composition for areas of similar cover | Mean elevation for areas of similar cover | Mean Reefiness (Value) for areas of similar cover | Mean biota for areas of similar cover (with turf) | Mean Reefiness (Comp x elevation x biota) | Extent (m) | Area (m2) | Extent category | Overall reef structure (structure x biota x extent) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A3_NS_03_HAS | A3_NS_03_HAS_00008 | 30/08/2024 00:36:24 | 411,475 | 5,747,327 | 40 | 40 | Serpulidae | 40 | 10 | Low Reef | Low Reef | | | | | | | | | |
| A3_NS_03_HAS | A3_NS_03_HAS_00009 | 30/08/2024 00:36:41 | 411,476 | 5,747,327 | 20 | 20 | Serpulidae | 50 | 20 | Low Reef | Low Reef | | | | | | | | | |
| A3_NS_03_HAS | A3_NS_03_HAS_00010 | 30/08/2024 00:37:01 | 411,480 | 5,747,329 | 10 | 10 | Serpulidae | 30 | 20 | Low Reef | Not a Reef | | | | | | | | | |
| A3_NS_03_HAS | A3_NS_03_HAS_00011 | 30/08/2024 00:37:21 | 411,483 | 5,747,331 | 50 | 50 | Serpulidae | 60 | 15 | Low Reef | Low Reef | | | | | | | | | |
| A3_NS_03_HAS | A3_NS_03_HAS_00012 | 30/08/2024 00:37:42 | 411,486 | 5,747,332 | 50 | 50 | Serpulidae | 40 | 10 | Low Reef | Low Reef | | | | | | | | | |
| A3_NS_03_HAS | A3_NS_03_HAS_00013 | 30/08/2024 00:38:07 | 411,489 | 5,747,334 | 50 | 50 | Serpulidae | 50 | 20 | Low Reef | Low Reef | | | | | | | | | |
| A3_NS_03_HAS | A3_NS_03_HAS_00014 | 30/08/2024 00:38:29 | 411,491 | 5,747,335 | 40 | 40 | Serpulidae | 60 | 30 | Low Reef | Low Reef | | | | | | | | | |
| A3_NS_03_HAS | A3_NS_03_HAS_00015 | 30/08/2024 00:38:49 | 411,494 | 5,747,336 | 10 | 10 | Serpulidae | 8 | 10 | Not a Reef | Not a Reef | | | | | | | | | |
| A3_NS_03_HAS | A3_NS_03_HAS_00016 | 30/08/2024 00:39:09 | 411,495 | 5,747,337 | 10 | 10 | Serpulidae | 6 | 5 | Not a Reef | Not a Reef | 4.7 | 5.0 | Not a Reef | 6.7 | Not a Reef | 6.7 | 140.7 | >25 m2 | Not a Reef |
| A3_NS_03_HAS | A3_NS_03_HAS_00017 | 30/08/2024 00:39:31 | 411,500 | 5,747,339 | 0 | 0 | | 0 | 0 | No Reef | No Reef | | | | | | | | | |
| A3_NS_03_HAS | A3_NS_03_HAS_00018 | 30/08/2024 00:39:55 | 411,506 | 5,747,343 | 10 | 10 | Serpulidae | 20 | 20 | Low Reef | Not a Reef | | | | | | | | | |
| A3_NS_03_HAS | A3_NS_03_HAS_00019 | 30/08/2024 00:40:15 | 411,507 | 5,747,343 | 8 | 8 | Serpulidae | 10 | 10 | Low Reef | Not a Reef | 15.0 | 15.0 | Low Reef | 9 | Not a Reef | 0.9 | 2.6 | <25 m2 | Not a Reef |

| Transect Name | Picture | Date Time | Easting | Northing | Biota % cover including Turf on rocks | Biota % cover (excluding turf; non turf forming sessile organisms) | Species Present | Composition (% cover) | Elevation (average boulder and cobble height in mm) | Reefiness value (Comp vs Elevation) | Reefiness Value (Comp vs elevation vs biota with turf) | Mean composition for areas of similar cover | Mean elevation for areas of similar cover | Mean Reefiness (Value) for areas of similar cover | Mean biota for areas of similar cover (with turf) | Mean Reefiness (Comp x elevation x biota) | Extent (m) | Area (m2) | Extent category | Overall reef structure (structure x biota x extent) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A3_NS_03_HAS | A3_NS_03_HAS_00020 | 30/08/2024 00:40:45 | 411,514 | 5,747,346 | Poor Vis | Poor Vis | | Poor Vis | Poor Vis | #N/A | #N/A | 6.5 | 7.5 | Not a Reef | 2.5 | Not a Reef | 34.9 | 3829.7 | >25 m2 | Not a Reef |
| A3_NS_03_HAS | A3_NS_03_HAS_00021 | 30/08/2024 00:41:11 | 411,517 | 5,747,347 | Poor Vis | Poor Vis | | Poor Vis | Poor Vis | #N/A | #N/A | | | | | | | | | |
| A3_NS_03_HAS | A3_NS_03_HAS_00022 | 30/08/2024 00:41:30 | 411,520 | 5,747,348 | 0 | 0 | | 5 | 5 | Not a Reef | Not a Reef | | | | | | | | | |
| A3_NS_03_HAS | A3_NS_03_HAS_00023 | 30/08/2024 00:41:50 | 411,520 | 5,747,349 | Poor Vis | Poor Vis | | Repeat | Poor Vis | #N/A | #N/A | | | | | | | | | |
| A3_NS_03_HAS | A3_NS_03_HAS_00024 | 30/08/2024 00:42:17 | 411,526 | 5,747,352 | Poor Vis | Poor Vis | | Poor Vis | Poor Vis | #N/A | #N/A | | | | | | | | | |
| A3_NS_03_HAS | A3_NS_03_HAS_00025 | 30/08/2024 00:42:40 | 411,530 | 5,747,353 | Poor Vis | Poor Vis | | Poor Vis | Poor Vis | #N/A | #N/A | | | | | | | | | |
| A3_NS_03_HAS | A3_NS_03_HAS_00026 | 30/08/2024 00:43:07 | 411,535 | 5,747,356 | Poor Vis | Poor Vis | | Poor Vis | Poor Vis | #N/A | #N/A | | | | | | | | | |
| A3_NS_03_HAS | A3_NS_03_HAS_00027 | 30/08/2024 00:43:35 | 411,537 | 5,747,357 | Poor Vis | Poor Vis | | Poor Vis | Poor Vis | #N/A | #N/A | | | | | | | | | |
| A3_NS_03_HAS | A3_NS_03_HAS_00028 | 30/08/2024 00:44:00 | 411,543 | 5,747,360 | 5 | 0 | Faunal Turf | 8 | 10 | Not a Reef | Not a Reef | | | | | | | | | |
| A3_NS_03_HAS | A3_NS_03_HAS_00029 | 30/08/2024 00:44:27 | 411,545 | 5,747,360 | Poor Vis | Poor Vis | | Poor Vis | Poor Vis | #N/A | #N/A | | | | | | | | | |
| A3_NS_03_HAS | A3_NS_03_HAS_00030 | 30/08/2024 00:44:47 | 411,547 | 5,747,361 | 20 | 0 | Faunal Turf | 5 | 5 | Not a Reef | Not a Reef | 8.2 | 5.2 | Not a Reef | 12 | Not a Reef | 14.8 | 687.8 | >25 m2 | Not a Reef |
| A3_NS_03_HAS | A3_NS_03_HAS_00031 | 30/08/2024 00:45:15 | 411,550 | 5,747,362 | 10 | 3 | Faunal Turf, | 10 | 3 | Low Reef | Not a Reef | | | | | | | | | |

| Transect Name | Picture | Date Time | Easting | Northing | Biota % cover including Turf on rocks | Biota % cover (excluding turf; non turf forming sessile organisms) | Species Present | Composition (% cover) | Elevation (average boulder and cobble height in mm) | Reefiness value (Comp vs Elevation ) | Reefiness Value (Comp vs elevation vs biota with turf) | Mean composition for areas of similar cover | Mean elevation for areas of similar cover | Mean Reefiness (Value) for areas of similar cover | Mean biota for areas of similar cover (with turf) | Mean Reefiness (Comp x elevation x biota) | Extent (m) | Area (m2) | Extent category | Overall reef structure (structure x biota x extent) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A3_NS_03_HAS | A3_NS_03_HAS_00032 | 30/08/2024 00:45:35 | 411,552 | 5,747,363 | 10 | 5 | Serpulidae<br>Faunal Turf, Serpulidae | 8 | 3 | Not a Reef | Not a Reef | | | | | | | | | |
| A3_NS_03_HAS | A3_NS_03_HAS_00033 | 30/08/2024 00:45:58 | 411,556 | 5,747,366 | 10 | 7 | Faunal Turf, Serpulidae | 10 | 10 | Low Reef | Not a Reef | | | | | | | | | |
| A3_NS_03_HAS | A3_NS_03_HAS_00034 | 30/08/2024 00:46:17 | 411,558 | 5,747,367 | 10 | 8 | Faunal Turf, Serpulidae | 8 | 5 | Not a Reef | Not a Reef | | | | | | | | | |
| A3_NS_03_HAS | A3_NS_03_HAS_00035 | 30/08/2024 00:46:39 | 411,560 | 5,747,369 | Poor Vis | Poor Vis | | Poor Vis | Poor Vis | #N/A | #N/A | | | | | | | | | |
| A4_GLC_01 | A4_GLC_01_00001 | 01/09/2024 09:03:13 | 399,545 | 5,693,321 | 40 | 40 | Serpulidae | 70 | 20 | Low Reef | Low Reef | 43.5 | 20.8 | Low Reef | 22 | Low Reef | 70.9 | 1579 8.1 | >25 m2 | Low Reef |
| A4_GLC_01 | A4_GLC_01_00002 | 01/09/2024 09:03:34 | 399,546 | 5,693,324 | 30 | 30 | Serpulidae | 50 | 20 | Low Reef | Low Reef | | | | | | | | | |
| A4_GLC_01 | A4_GLC_01_00003 | 01/09/2024 09:03:58 | 399,547 | 5,693,329 | 40 | 40 | Serpulidae | 60 | 30 | Low Reef | Low Reef | | | | | | | | | |
| A4_GLC_01 | A4_GLC_01_00004 | 01/09/2024 09:04:19 | 399,547 | 5,693,332 | 30 | 30 | Serpulidae | 70 | 40 | Low Reef | Low Reef | | | | | | | | | |
| A4_GLC_01 | A4_GLC_01_00005 | 01/09/2024 09:04:39 | 399,548 | 5,693,334 | 20 | 20 | Serpulidae | 50 | 25 | Low Reef | Low Reef | | | | | | | | | |
| A4_GLC_01 | A4_GLC_01_00006 | 01/09/2024 09:04:59 | 399,548 | 5,693,337 | 30 | 30 | Serpulidae | 30 | 10 | Low Reef | Low Reef | | | | | | | | | |

| Transect Name | Picture | Date Time | Easting | Northing | Biota % cover including Turf on rocks | Biota % cover (excluding turf; non turf forming sessile organisms) | Species Present | Composition (% cover) | Elevation (average boulder and cobble height in mm) | Reefiness value (Comp vs Elevation) | Reefiness Value (Comp vs elevation vs biota with turf) | Mean composition for areas of similar cover | Mean elevation for areas of similar cover | Mean Reefiness (Value) for areas of similar cover | Mean biota for areas of similar cover (with turf) | Mean Reefiness (Comp x elevation x biota) | Extent (m) | Area (m2) | Extent category | Overall reef structure (structure x biota x extent) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A4_GLC_01 | A4_GLC_01_00007 | 01/09/2024 09:05:19 | 399,548 | 5,693,341 | 20 | 20 | Serpulidae | 40 | 30 | Low Reef | Low Reef | | | | | | | | | |
| A4_GLC_01 | A4_GLC_01_00008 | 01/09/2024 09:05:39 | 399,549 | 5,693,343 | 30 | 30 | Serpulidae | 50 | 20 | Low Reef | Low Reef | | | | | | | | | |
| A4_GLC_01 | A4_GLC_01_00009 | 01/09/2024 09:05:59 | 399,549 | 5,693,345 | 20 | 20 | Serpulidae | 40 | 20 | Low Reef | Low Reef | | | | | | | | | |
| A4_GLC_01 | A4_GLC_01_00010 | 01/09/2024 09:06:21 | 399,550 | 5,693,349 | 15 | 15 | Serpulidae | 50 | 20 | Low Reef | Low Reef | | | | | | | | | |
| A4_GLC_01 | A4_GLC_01_00011 | 01/09/2024 09:06:44 | 399,550 | 5,693,352 | 20 | 20 | Serpulidae | 50 | 10 | Low Reef | Low Reef | | | | | | | | | |
| A4_GLC_01 | A4_GLC_01_00012 | 01/09/2024 09:07:07 | 399,551 | 5,693,358 | 10 | 10 | Serpulidae | 30 | 10 | Low Reef | Not a Reef | | | | | | | | | |
| A4_GLC_01 | A4_GLC_01_00013 | 01/09/2024 09:07:28 | 399,551 | 5,693,360 | 20 | 20 | Serpulidae | 40 | 10 | Low Reef | Low Reef | | | | | | | | | |
| A4_GLC_01 | A4_GLC_01_00014 | 01/09/2024 09:07:50 | 399,552 | 5,693,364 | 20 | 20 | Serpulidae | 30 | 10 | Low Reef | Low Reef | | | | | | | | | |
| A4_GLC_01 | A4_GLC_01_00015 | 01/09/2024 09:08:09 | 399,552 | 5,693,367 | 10 | 10 | Serpulidae | 20 | 20 | Low Reef | Not a Reef | | | | | | | | | |
| A4_GLC_01 | A4_GLC_01_00016 | 01/09/2024 09:08:37 | 399,553 | 5,693,373 | 10 | 10 | Serpulidae | 20 | 30 | Low Reef | Not a Reef | | | | | | | | | |
| A4_GLC_01 | A4_GLC_01_00017 | 01/09/2024 09:09:00 | 399,554 | 5,693,377 | 15 | 15 | Serpulidae | 50 | 40 | Low Reef | Low Reef | | | | | | | | | |

| Transect Name | Picture | Date Time | Easting | Northing | Biota % cover including Turf on rocks | Biota % cover (excluding turf; non turf forming sessile organisms) | Species Present | Composition (% cover) | Elevation (average boulder and cobble height in mm) | Reefiness value (Comp vs Elevation) | Reefiness Value (Comp vs elevation vs biota with turf) | Mean composition for areas of similar cover | Mean elevation for areas of similar cover | Mean Reefiness (Value) for areas of similar cover | Mean biota for areas of similar cover (with turf) | Mean Reefiness (Comp x elevation x biota) | Extent (m) | Area (m2) | Extent category | Overall reef structure (structure x biota x extent) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A4_GLC_01 | A4_GLC_01_00018 | 01/09/2024 09:09:19 | 399,554 | 5,693,380 | 20 | 20 | Serpulidae | 40 | 30 | Low Reef | Low Reef | | | | | | | | | |
| A4_GLC_01 | A4_GLC_01_00019 | 01/09/2024 09:09:40 | 399,555 | 5,693,383 | 10 | 10 | Serpulidae | 30 | 10 | Low Reef | Not a Reef | | | | | | | | | |
| A4_GLC_01 | A4_GLC_01_00020 | 01/09/2024 09:10:02 | 399,555 | 5,693,387 | 30 | 30 | Serpulidae, sponge | 50 | 10 | Low Reef | Low Reef | | | | | | | | | |
| A4_GLC_01 | A4_GLC_01_00021 | 01/09/2024 09:10:22 | 399,556 | 5,693,391 | Poor Vis | Poor Vis | | Poor Vis | Poor Vis | #N/A | #N/A | | | | | | | | | |
| A4_GLC_02 | A4_GLC_02_00001 | 01/09/2024 02:30:52 | 399,775 | 5,695,084 | Poor Vis | Poor Vis | | Poor Vis | Poor Vis | #N/A | #N/A | 40.0 | 50.0 | Low Reef | 40 | Low Reef | 0.2 | 0.1 | <25 m2 | Not a Reef |
| A4_GLC_02 | A4_GLC_02_00002 | 01/09/2024 02:31:13 | 399,775 | 5,695,084 | 40 | 40 | Serpulidae, sponge | 40 | 50 | Low Reef | Low Reef | | | | | | | | | |
| A4_GLC_02 | A4_GLC_02_00003 | 01/09/2024 02:31:37 | 399,777 | 5,695,078 | Poor Vis | Poor Vis | | Poor Vis | Poor Vis | #N/A | #N/A | Poor Vis | Poor Vis | #N/A | Poor Vis | #N/A | 7.5 | 174.6 | >25 m2 | #N/A |
| A4_GLC_02 | A4_GLC_02_00004 | 01/09/2024 02:31:58 | 399,777 | 5,695,077 | Poor Vis | Poor Vis | | Poor Vis | Poor Vis | #N/A | #N/A | | | | | | | | | |
| A4_GLC_02 | A4_GLC_02_00005 | 01/09/2024 02:32:24 | 399,778 | 5,695,074 | Poor Vis | Poor Vis | | Poor Vis | Poor Vis | #N/A | #N/A | | | | | | | | | |
| A4_GLC_02 | A4_GLC_02_00006 | 01/09/2024 02:32:45 | 399,779 | 5,695,071 | Poor Vis | Poor Vis | | Poor Vis | Poor Vis | #N/A | #N/A | | | | | | | | | |
| A4_GLC_02 | A4_GLC_02_00007 | 01/09/2024 02:33:05 | 399,779 | 5,695,071 | 0 | 0 | | 30 | 10 | Low Reef | Not a Reef | 35.0 | 10.0 | Low Reef | 2.5 | Not a Reef | 8.4 | 219.8 | >25 m2 | Not a Reef |
| A4_GLC_02 | A4_GLC_02_00008 | 01/09/2024 02:33:25 | 399,781 | 5,695,063 | 5 | 5 | Serpulidae | 40 | 10 | Low Reef | Not a Reef | | | | | | | | | |

| Transect Name | Picture | Date Time | Easting | Northing | Biota % cover including Turf on rocks | Biota % cover (excluding turf; non turf forming sessile organisms) | Species Present | Composition (% cover) | Elevation (average boulder and cobble height in mm) | Reefiness value (Comp vs Elevation) | Reefiness Value (Comp vs elevation vs biota with turf) | Mean composition for areas of similar cover | Mean elevation for areas of similar cover | Mean Reefiness (Value) for areas of similar cover | Mean biota for areas of similar cover (with turf) | Mean Reefiness (Comp x elevation x biota) | Extent (m) | Area (m2) | Extent category | Overall reef structure (structure x biota x extent) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A4_GLC_02 | A4_GLC_02_00009 | 01/09/2024 02:33:45 | 399,781 | 5,695,063 | Poor Vis | Poor Vis | | Poor Vis | Poor Vis | #N/A | #N/A | | | | | | | | | |
| A4_GLC_02 | A4_GLC_02_00010 | 01/09/2024 02:34:05 | 399,783 | 5,695,056 | Poor Vis | Poor Vis | | Poor Vis | Poor Vis | #N/A | #N/A | | | | | | | | | |
| A4_GLC_02 | A4_GLC_02_00011 | 01/09/2024 02:34:27 | 399,783 | 5,695,052 | Poor Vis | Poor Vis | | Poor Vis | Poor Vis | #N/A | #N/A | | | | | | | | | |
| A4_GLC_02 | A4_GLC_02_00012 | 01/09/2024 02:34:47 | 399,782 | 5,695,051 | Poor Vis | Poor Vis | | Poor Vis | Poor Vis | #N/A | #N/A | | | | | | | | | |
| A4_GLC_02 | A4_GLC_02_00013 | 01/09/2024 02:35:10 | 399,784 | 5,695,048 | Poor Vis | Poor Vis | | Poor Vis | Poor Vis | #N/A | #N/A | | | | | | | | | |
| A4_GLC_02 | A4_GLC_02_00014 | 01/09/2024 02:35:34 | 399,786 | 5,695,043 | 5 | 5 | Serpulidae | 20 | 5 | Low Reef | Not a Reef | 26.0 | 21.0 | Low Reef | 20 | Low Reef | 90.8 | 25902.3 | >25 m2 | Low Reef |
| A4_GLC_02 | A4_GLC_02_00015 | 01/09/2024 02:35:53 | 399,786 | 5,695,043 | Poor Vis | Poor Vis | | Repeat | Poor Vis | #N/A | #N/A | | | | | | | | | |
| A4_GLC_02 | A4_GLC_02_00016 | 01/09/2024 02:36:22 | 399,788 | 5,695,036 | Poor Vis | Poor Vis | | Poor Vis | Poor Vis | #N/A | #N/A | | | | | | | | | |
| A4_GLC_02 | A4_GLC_02_00017 | 01/09/2024 02:36:41 | 399,787 | 5,695,034 | Poor Vis | Poor Vis | | Poor Vis | Poor Vis | #N/A | #N/A | | | | | | | | | |
| A4_GLC_02 | A4_GLC_02_00018 | 01/09/2024 02:37:04 | 399,788 | 5,695,034 | Poor Vis | Poor Vis | | Poor Vis | Poor Vis | #N/A | #N/A | | | | | | | | | |
| A4_GLC_02 | A4_GLC_02_00019 | 01/09/2024 02:37:31 | 399,790 | 5,695,025 | Poor Vis | Poor Vis | | Poor Vis | Poor Vis | #N/A | #N/A | | | | | | | | | |
| A4_GLC_02 | A4_GLC_02_00020 | 01/09/2024 02:37:51 | 399,790 | 5,695,023 | Poor Vis | Poor Vis | | Poor Vis | Poor Vis | #N/A | #N/A | | | | | | | | | |

| Transect Name | Picture | Date Time | Easting | Northing | Biota % cover including Turf on rocks | Biota % cover (excluding turf; non turf forming sessile organisms) | Species Present | Composition (% cover) | Elevation (average boulder and cobble height in mm) | Reefiness value (Comp vs Elevation) | Reefiness Value (Comp vs elevation vs biota with turf) | Mean composition for areas of similar cover | Mean elevation for areas of similar cover | Mean Reefiness (Value) for areas of similar cover | Mean biota for areas of similar cover (with turf) | Mean Reefiness (Comp x elevation x biota) | Extent (m) | Area (m2) | Extent category | Overall reef structure (structure x biota x extent) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A4_GLC_02 | A4_GLC_02_00021 | 01/09/2024 02:38:11 | 399,790 | 5,695,023 | 50 | 50 | Serpulidae, sponge | 50 | 50 | Low Reef | Low Reef | | | | | | | | | |
| A4_GLC_02 | A4_GLC_02_00022 | 01/09/2024 02:38:38 | 399,792 | 5,695,014 | Poor Vis | Poor Vis | | Poor Vis | Poor Vis | #N/A | #N/A | | | | | | | | | |
| A4_GLC_02 | A4_GLC_02_00023 | 01/09/2024 02:38:57 | 399,792 | 5,695,012 | Poor Vis | Poor Vis | | Poor Vis | Poor Vis | #N/A | #N/A | | | | | | | | | |
| A4_GLC_02 | A4_GLC_02_00024 | 01/09/2024 02:39:17 | 399,792 | 5,695,013 | 30 | 30 | Serpulidae | 30 | 20 | Low Reef | Low Reef | | | | | | | | | |
| A4_GLC_02 | A4_GLC_02_00025 | 01/09/2024 02:39:48 | 399,795 | 5,695,006 | Poor Vis | Poor Vis | | Poor Vis | Poor Vis | #N/A | #N/A | | | | | | | | | |
| A4_GLC_02 | A4_GLC_02_00026 | 01/09/2024 02:40:16 | 399,797 | 5,695,002 | Poor Vis | Poor Vis | | Poor Vis | Poor Vis | #N/A | #N/A | | | | | | | | | |
| A4_GLC_02 | A4_GLC_02_00027 | 01/09/2024 02:40:35 | 399,817 | 5,695,007 | 10 | 10 | Serpulidae | 20 | 20 | Low Reef | Not a Reef | | | | | | | | | |
| A4_GLC_02 | A4_GLC_02_00028 | 01/09/2024 02:40:58 | 399,796 | 5,694,994 | Poor Vis | Poor Vis | | Poor Vis | Poor Vis | #N/A | #N/A | | | | | | | | | |
| A4_GLC_02 | A4_GLC_02_00029 | 01/09/2024 02:41:18 | 399,796 | 5,694,993 | Poor Vis | Poor Vis | | Poor Vis | Poor Vis | #N/A | #N/A | | | | | | | | | |
| A4_GLC_02 | A4_GLC_02_00030 | 01/09/2024 02:41:38 | 399,796 | 5,694,993 | Poor Vis | Poor Vis | | Poor Vis | Poor Vis | #N/A | #N/A | | | | | | | | | |
| A4_GLC_02 | A4_GLC_02_00031 | 01/09/2024 02:41:58 | 399,797 | 5,694,993 | 5 | 5 | Serpulidae | 10 | 10 | Low Reef | Not a Reef | | | | | | | | | |
| A4_GLC_02 | A4_GLC_02_00032 | 01/09/2024 02:42:30 | 399,805 | 5,694,975 | Poor Vis | Poor Vis | | Poor Vis | Poor Vis | #N/A | #N/A | | | | | | | | | |

| Transect Name | Picture | Date Time | Easting | Northing | Biota % cover including Turf on rocks | Biota % cover (excluding turf; non turf forming sessile organisms) | Species Present | Composition (% cover) | Elevation (average boulder and cobble height in mm) | Reefiness value (Comp vs Elevation) | Reefiness Value (Comp vs elevation vs biota with turf) | Mean composition for areas of similar cover | Mean elevation for areas of similar cover | Mean Reefiness (Value) for areas of similar cover | Mean biota for areas of similar cover (with turf) | Mean Reefiness (Comp x elevation x biota) | Extent (m) | Area (m2) | Extent category | Overall reef structure (structure x biota x extent) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A4_GLC_02 | A4_GLC_02_00033 | 01/09/2024 02:42:50 | 399,828 | 5,694,999 | 40 | 40 | Serpulidae | 30 | 10 | Low Reef | Low Reef | 25.0 | 10.0 | Low Reef | 35 | Low Reef | 34.3 | 3700.0 | >25 m2 | Low Reef |
| A4_GLC_02 | A4_GLC_02_00034 | 01/09/2024 02:43:13 | 399,803 | 5,694,975 | 30 | 30 | Serpulidae, sponge | 20 | 10 | Low Reef | Low Reef | | | | | | | | | |
| A4_GLC_02 | A4_GLC_02_00035 | 01/09/2024 02:43:33 | 399,802 | 5,694,974 | Poor Vis | Poor Vis | | Repeat | Poor Vis | #N/A | #N/A | Poor Vis | Poor Vis | #N/A | Poor Vis | #N/A | 3.8 | 44.5 | <25 m2 | #N/A |
| A4_GLC_02 | A4_GLC_02_00036 | 01/09/2024 02:43:53 | 399,803 | 5,694,970 | Poor Vis | Poor Vis | | Poor Vis | Poor Vis | #N/A | #N/A | | | | | | | | | |
| A4_GLC_03_A | A4_GLC_03_A_00001 | 01/09/2024 13:35:50 | 399,303 | 5,691,929 | 20 | 20 | Serpulidae | 60 | 10 | Low Reef | Low Reef | 61.6 | 21.3 | Low Reef | 36.79 | Low Reef | 94.4 | 28012.5 | >25 m2 | Low Reef |
| A4_GLC_03_A | A4_GLC_03_A_00002 | 01/09/2024 13:36:14 | 399,301 | 5,691,926 | 40 | 40 | Serpulidae | 70 | 20 | Low Reef | Low Reef | | | | | | | | | |
| A4_GLC_03_A | A4_GLC_03_A_00003 | 01/09/2024 13:36:34 | 399,300 | 5,691,923 | 50 | 50 | Serpulidae | 80 | 30 | Low Reef | Low Reef | | | | | | | | | |
| A4_GLC_03_A | A4_GLC_03_A_00004 | 01/09/2024 13:36:58 | 399,299 | 5,691,920 | 30 | 30 | Serpulidae | 70 | 20 | Low Reef | Low Reef | | | | | | | | | |
| A4_GLC_03_A | A4_GLC_03_A_00005 | 01/09/2024 13:37:19 | 399,298 | 5,691,918 | 35 | 35 | Serpulidae | 80 | 20 | Low Reef | Low Reef | | | | | | | | | |
| A4_GLC_03_A | A4_GLC_03_A_00006 | 01/09/2024 13:37:43 | 399,296 | 5,691,914 | 50 | 50 | Serpulidae | 75 | 30 | Low Reef | Low Reef | | | | | | | | | |
| A4_GLC_03_A | A4_GLC_03_A_00007 | 01/09/2024 13:38:03 | 399,295 | 5,691,910 | 40 | 40 | Serpulidae | 70 | 20 | Low Reef | Low Reef | | | | | | | | | |
| A4_GLC_03_A | A4_GLC_03_A_00008 | 01/09/2024 13:38:23 | 399,294 | 5,691,908 | 30 | 30 | Serpulidae | 50 | 20 | Low Reef | Low Reef | | | | | | | | | |

| Transect Name | Picture | Date Time | Easting | Northing | Biota % cover including Turf on rocks | Biota % cover (excluding turf; non turf forming sessile organisms) | Species Present | Composition (% cover) | Elevation (average boulder and cobble height in mm) | Reefiness value (Comp vs Elevation) | Reefiness Value (Comp vs elevation vs biota with turf) | Mean composition for areas of similar cover | Mean elevation for areas of similar cover | Mean Reefiness (Value) for areas of similar cover | Mean biota for areas of similar cover (with turf) | Mean Reefiness (Comp x elevation x biota) | Extent (m) | Area (m2) | Extent category | Overall reef structure (structure x biota x extent) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A4_GLC_03_A | A4_GLC_03_A_00009 | 01/09/2024 13:38:46 | 399,293 | 5,691,905 | 50 | 50 | Serpulidae | 60 | 30 | Low Reef | Low Reef | | | | | | | | | |
| A4_GLC_03_A | A4_GLC_03_A_00010 | 01/09/2024 13:39:09 | 399,291 | 5,691,903 | 40 | 40 | Serpulidae | 70 | 10 | Low Reef | Low Reef | | | | | | | | | |
| A4_GLC_03_A | A4_GLC_03_A_00011 | 01/09/2024 13:39:34 | 399,290 | 5,691,899 | 60 | 60 | Serpulidae, sponge | 80 | 30 | Low Reef | Low Reef | | | | | | | | | |
| A4_GLC_03_A | A4_GLC_03_A_00012 | 01/09/2024 13:39:54 | 399,289 | 5,691,896 | 30 | 30 | Serpulidae | 50 | 20 | Low Reef | Low Reef | | | | | | | | | |
| A4_GLC_03_A | A4_GLC_03_A_00013 | 01/09/2024 13:40:14 | 399,288 | 5,691,894 | 20 | 20 | Serpulidae | 50 | 20 | Low Reef | Low Reef | | | | | | | | | |
| A4_GLC_03_A | A4_GLC_03_A_00014 | 01/09/2024 13:40:35 | 399,287 | 5,691,891 | Poor Vis | Poor Vis | | Poor Vis | Poor Vis | #N/A | #N/A | | | | | | | | | |
| A4_GLC_03_A | A4_GLC_03_A_00015 | 01/09/2024 13:41:02 | 399,285 | 5,691,887 | 15 | 15 | Serpulidae | 60 | 10 | Low Reef | Low Reef | | | | | | | | | |
| A4_GLC_03_A | A4_GLC_03_A_00016 | 01/09/2024 13:41:24 | 399,284 | 5,691,884 | 70 | 70 | Serpulidae, sponge | 80 | 50 | Low Reef | Low Reef | | | | | | | | | |
| A4_GLC_03_A | A4_GLC_03_A_00017 | 01/09/2024 13:41:44 | 399,283 | 5,691,882 | 30 | 30 | Serpulidae | 70 | 20 | Low Reef | Low Reef | | | | | | | | | |
| A4_GLC_03_A | A4_GLC_03_A_00018 | 01/09/2024 13:42:07 | 399,282 | 5,691,879 | 20 | 20 | Serpulidae | 70 | 10 | Low Reef | Low Reef | | | | | | | | | |
| A4_GLC_03_A | A4_GLC_03_A_00019 | 01/09/2024 13:42:27 | 399,281 | 5,691,876 | 40 | 40 | Serpulidae | 60 | 10 | Low Reef | Low Reef | | | | | | | | | |

| Transect Name | Picture | Date Time | Easting | Northing | Biota % cover including Turf on rocks | Biota % cover (excluding turf; non turf forming sessile organisms) | Species Present | Composition (% cover) | Elevation (average boulder and cobble height in mm) | Reefiness value (Comp vs Elevation) | Reefiness Value (Comp vs elevation vs biota with turf) | Mean composition for areas of similar cover | Mean elevation for areas of similar cover | Mean Reefiness (Value) for areas of similar cover | Mean biota for areas of similar cover (with turf) | Mean Reefiness (Comp x elevation x biota) | Extent (m) | Area (m2) | Extent category | Overall reef structure (structure x biota x extent) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A4_GLC_03_A | A4_GLC_03_A_0020 | 01/09/2024 13:42:47 | 399,280 | 5,691,874 | 30 | 30 | Serpulidae | 50 | 10 | Low Reef | Low Reef | | | | | | | | | |
| A4_GLC_03_A | A4_GLC_03_A_0021 | 01/09/2024 13:43:08 | 399,279 | 5,691,870 | 20 | 20 | Serpulidae | 40 | 20 | Low Reef | Low Reef | | | | | | | | | |
| A4_GLC_03_A | A4_GLC_03_A_0022 | 01/09/2024 13:43:28 | 399,278 | 5,691,868 | 40 | 40 | Serpulidae | 60 | 25 | Low Reef | Low Reef | | | | | | | | | |
| A4_GLC_03_A | A4_GLC_03_A_0023 | 01/09/2024 13:43:56 | 399,276 | 5,691,864 | 30 | 30 | Serpulidae | 50 | 20 | Low Reef | Low Reef | | | | | | | | | |
| A4_GLC_03_A | A4_GLC_03_A_0024 | 01/09/2024 13:44:17 | 399,275 | 5,691,860 | 20 | 20 | Serpulidae | 50 | 20 | Low Reef | Low Reef | | | | | | | | | |
| A4_GLC_03_A | A4_GLC_03_A_0025 | 01/09/2024 13:44:47 | 399,273 | 5,691,857 | 30 | 30 | Serpulidae | 70 | 25 | Low Reef | Low Reef | | | | | | | | | |
| A4_GLC_03_A | A4_GLC_03_A_0026 | 01/09/2024 13:45:08 | 399,272 | 5,691,854 | Poor Vis | Poor Vis | | Poor Vis | Poor Vis | #N/A | #N/A | | | | | | | | | |
| A4_GLC_03_A | A4_GLC_03_A_0027 | 01/09/2024 13:45:29 | 399,271 | 5,691,851 | 50 | 50 | Serpulidae, sponge | 50 | 25 | Low Reef | Low Reef | | | | | | | | | |
| A4_GLC_03_A | A4_GLC_03_A_0028 | 01/09/2024 13:45:49 | 399,270 | 5,691,848 | 60 | 60 | Serpulidae | 40 | 40 | Low Reef | Low Reef | | | | | | | | | |
| A4_GLC_03_A | A4_GLC_03_A_0029 | 01/09/2024 13:46:09 | 399,269 | 5,691,845 | 20 | 20 | Serpulidae | 30 | 10 | Low Reef | Low Reef | | | | | | | | | |
| A4_GLC_03_A | A4_GLC_03_A_0030 | 01/09/2024 13:46:32 | 399,268 | 5,691,842 | 60 | 60 | Serpulidae | 80 | 20 | Low Reef | Low Reef | | | | | | | | | |

**Table 3:Mussel Assessment**

Goedetics: ETRS 1989, UTM 31N

| Transect Name | Picture | Date Time | Easting | Northing | Composition (% cover) | Crust/Meadow or Massive/Turf | SACFOR Scale | Grade (BSL adapted from Roberts et al) | Average coverage | SACFOR | Grade | Extent | Area | Area Category | Potential Mussel bed |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A5_OPB_05_HAS | A5_OPB_05_HAS_00001 | 30/08/2024 20:19:39 | 396,554 | 5,686,652 | 50 | Crust/meadow | Abundant | 1 | | | | | | | |
| A5_OPB_05_HAS | A5_OPB_05_HAS_00002 | 30/08/2024 20:20:00 | 396,553 | 5,686,654 | 60 | Crust/meadow | Abundant | 1 | | | | | | | |
| A5_OPB_05_HAS | A5_OPB_05_HAS_00003 | 30/08/2024 20:20:19 | 396,552 | 5,686,657 | 80 | Crust/meadow | Superabundant | 1 | | | | | | | |
| A5_OPB_05_HAS | A5_OPB_05_HAS_00004 | 30/08/2024 20:20:44 | 396,551 | 5,686,659 | 70 | Crust/meadow | Abundant | 1 | | | | | | | |
| A5_OPB_05_HAS | A5_OPB_05_HAS_00005 | 30/08/2024 20:21:04 | 396,550 | 5,686,661 | 70 | Crust/meadow | Abundant | 1 | | | | | | | |
| A5_OPB_05_HAS | A5_OPB_05_HAS_00006 | 30/08/2024 20:21:32 | 396,548 | 5,686,666 | 80 | Crust/meadow | Superabundant | 1 | | | | | | | |
| A5_OPB_05_HAS | A5_OPB_05_HAS_00007 | 30/08/2024 20:21:52 | 396,547 | 5,686,668 | 70 | Crust/meadow | Abundant | 1 | | | | | | | |
| A5_OPB_05_HAS | A5_OPB_05_HAS_00008 | 30/08/2024 20:22:12 | 396,546 | 5,686,671 | 85 | Crust/meadow | Superabundant | 1 | | | | | | | |
| A5_OPB_05_HAS | A5_OPB_05_HAS_00009 | 30/08/2024 20:22:32 | 396,546 | 5,686,674 | 80 | Crust/meadow | Superabundant | 1 | | | | | | | |
| A5_OPB_05_HAS | A5_OPB_05_HAS_00010 | 30/08/2024 20:22:52 | 396,545 | 5,686,674 | 50 | Crust/meadow | Abundant | 1 | | | | | | | |
| A5_OPB_05_HAS | A5_OPB_05_HAS_00011 | 30/08/2024 20:23:14 | 396,543 | 5,686,679 | 80 | Crust/meadow | Superabundant | 1 | | | | | | | |
| A5_OPB_05_HAS | A5_OPB_05_HAS_00012 | 30/08/2024 20:23:38 | 396,541 | 5,686,685 | 30 | Crust/meadow | Common | 1 | | | | | | | |
| A5_OPB_05_HAS | A5_OPB_05_HAS_00013 | 30/08/2024 20:23:58 | 396,539 | 5,686,688 | 70 | Crust/meadow | Abundant | 1 | | | | | | | |
| A5_OPB_05_HAS | A5_OPB_05_HAS_00014 | 30/08/2024 20:24:19 | 396,538 | 5,686,691 | 40 | Crust/meadow | Abundant | 1 | 55.0 | Abundant | 1 | 62.0 | 3021.2 | >25m2 | Yes |

| Transect Name | Picture | Date Time | Easting | Northing | Composition (% cover) | Crust/Meadow or Massive/Turf | SACFOR Scale | Grade (BSL adapted from Roberts et al) | Average coverage | SACFOR | Grade | Extent | Area | Area Category | Potential Mussel bed |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A5_OPB_05_HAS | A5_OPB_05_HAS_00015 | 30/08/2024 20:24:51 | 396,536 | 5,686,696 | 30 | Crust/meadow | Common | 1 | | | | | | | |
| A5_OPB_05_HAS | A5_OPB_05_HAS_00016 | 30/08/2024 20:25:13 | 396,535 | 5,686,700 | 20 | Crust/meadow | Common | 1 | | | | | | | |
| A5_OPB_05_HAS | A5_OPB_05_HAS_00017 | 30/08/2024 20:25:33 | 396,534 | 5,686,701 | 50 | Crust/meadow | Abundant | 1 | | | | | | | |
| A5_OPB_05_HAS | A5_OPB_05_HAS_00018 | 30/08/2024 20:25:53 | 396,533 | 5,686,704 | 30 | Crust/meadow | Common | 1 | | | | | | | |
| A5_OPB_05_HAS | A5_OPB_05_HAS_00019 | 30/08/2024 20:26:15 | 396,531 | 5,686,709 | 0 | Crust/meadow | Absent | 4 | | | | | | | |
| A5_OPB_05_HAS | A5_OPB_05_HAS_00020 | 30/08/2024 20:26:45 | 396,529 | 5,686,712 | Poor Vis | Crust/meadow | Poor Vis | #N/A | | | | | | | |
| A5_OPB_05_HAS | A5_OPB_05_HAS_00021 | 30/08/2024 20:27:08 | 396,527 | 5,686,716 | Poor Vis | Crust/meadow | Poor Vis | #N/A | Poor Vis | Poor Vis | #N/A | 8.3 | 54.0 | >25m2 | #N/A |
| A5_OPB_05_HAS | A5_OPB_05_HAS_00022 | 30/08/2024 20:27:30 | 396,526 | 5,686,719 | Poor Vis | Crust/meadow | Poor Vis | #N/A | | | | | | | |
| A5_OPB_05_HAS | A5_OPB_05_HAS_00023 | 30/08/2024 20:27:50 | 396,525 | 5,686,721 | 60 | Crust/meadow | Abundant | 1 | | | | | | | |
| A5_OPB_05_HAS | A5_OPB_05_HAS_00024 | 30/08/2024 20:28:17 | 396,523 | 5,686,725 | 10 | Crust/meadow | Frequent | 2 | | | | | | | |
| A5_OPB_05_HAS | A5_OPB_05_HAS_00025 | 30/08/2024 20:28:45 | 396,521 | 5,686,731 | 40 | Crust/meadow | Abundant | 1 | | | | | | | |
| A5_OPB_05_HAS | A5_OPB_05_HAS_00026 | 30/08/2024 20:29:19 | 396,520 | 5,686,734 | 20 | Crust/meadow | Common | 1 | 29.3 | Common | 1 | 51.1 | 2052.5 | >25m2 | Yes |
| A5_OPB_05_HAS | A5_OPB_05_HAS_00027 | 30/08/2024 20:29:44 | 396,518 | 5,686,738 | 20 | Crust/meadow | Common | 1 | | | | | | | |
| A5_OPB_05_HAS | A5_OPB_05_HAS_00028 | 30/08/2024 20:30:07 | 396,517 | 5,686,741 | 50 | Crust/meadow | Abundant | 1 | | | | | | | |
| A5_OPB_05_HAS | A5_OPB_05_HAS_00029 | 30/08/2024 20:30:26 | 396,516 | 5,686,744 | 40 | Crust/meadow | Abundant | 1 | | | | | | | |

| Transect Name | Picture | Date Time | Easting | Northing | Composition (% cover) | Crust/Meadow or Massive/Turf | SACFOR Scale | Grade (BSL adapted from Roberts et al) | Average coverage | SACFOR | Grade | Extent | Area | Area Category | Potential Mussel bed |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A5_OPB_05_HAS | A5_OPB_05_HAS_00030 | 30/08/2024 20:30:46 | 396,515 | 5,686,746 | 30 | Crust/meadow | Common | 1 | | | | | | | |
| A5_OPB_05_HAS | A5_OPB_05_HAS_00031 | 30/08/2024 20:31:13 | 396,513 | 5,686,751 | 20 | Crust/meadow | Common | 1 | | | | | | | |
| A5_OPB_05_HAS | A5_OPB_05_HAS_00032 | 30/08/2024 20:31:33 | 396,512 | 5,686,753 | 40 | Crust/meadow | Abundant | 1 | | | | | | | |
| A5_OPB_05_HAS | A5_OPB_05_HAS_00033 | 30/08/2024 20:31:55 | 396,511 | 5,686,756 | 30 | Crust/meadow | Common | 1 | | | | | | | |
| A5_OPB_05_HAS | A5_OPB_05_HAS_00034 | 30/08/2024 20:32:12 | 396,510 | 5,686,760 | 30 | Crust/meadow | Common | 1 | | | | | | | |
| A5_OPB_05_HAS | A5_OPB_05_HAS_00035 | 30/08/2024 20:32:28 | 396,509 | 5,686,762 | 20 | Crust/meadow | Common | 1 | | | | | | | |
| A5_OPB_05_HAS | A5_OPB_05_HAS_00036 | 30/08/2024 20:32:47 | 396,508 | 5,686,763 | 10 | Crust/meadow | Frequent | 2 | | | | | | | |
| A5_OPB_05_HAS | A5_OPB_05_HAS_00038 | 30/08/2024 20:33:15 | 396,506 | 5,686,768 | 20 | Crust/meadow | Common | 1 | | | | | | | |
| A5_OPB_05_HAS | A5_OPB_05_HAS_00039 | 30/08/2024 20:33:35 | 396,505 | 5,686,771 | 15 | Crust/meadow | Frequent | 2 | 16.3 | Frequent | 2 | 6.2 | 30.0 | >25m2 | No |
| A5_OPB_05_HAS | A5_OPB_05_HAS_00040 | 30/08/2024 20:33:55 | 396,504 | 5,686,773 | 15 | Crust/meadow | Frequent | 2 | | | | | | | |
| A5_OPB_05_HAS | A5_OPB_05_HAS_00041 | 30/08/2024 20:34:15 | 396,503 | 5,686,775 | 20 | Crust/meadow | Common | 1 | | | | | | | |
| A5_OPB_05_HAS | A5_OPB_05_HAS_00042 | 30/08/2024 20:34:36 | 396,502 | 5,686,777 | 15 | Crust/meadow | Frequent | 2 | | | | | | | |
| A5_OPB_05_HAS | A5_OPB_05_HAS_00043 | 30/08/2024 20:34:55 | 396,500 | 5,686,781 | 20 | Crust/meadow | Common | 1 | 25.0 | Common | 1 | 12.2 | 117.6 | >25m2 | Yes |
| A5_OPB_05_HAS | A5_OPB_05_HAS_00044 | 30/08/2024 20:35:15 | 396,499 | 5,686,785 | 30 | Crust/meadow | Common | 1 | | | | | | | |
| A5_OPB_05_HAS | A5_OPB_05_HAS_00045 | 30/08/2024 20:35:35 | 396,497 | 5,686,793 | Poor Vis | Crust/meadow | Poor Vis | #N/A | | | | | | | |

| Transect Name | Picture | Date Time | Easting | Northing | Composition (% cover) | Crust/Meadow or Massive/Turf | SACFOR Scale | Grade (BSL adapted from Roberts et al) | Average coverage | SACFOR | Grade | Extent | Area | Area Category | Potential Mussel bed |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A5_OPB_Add_01 | A5_OPB_Add_01_00001 | 02/09/2024 00:51:33 | 396,435 | 5,686,897 | 10 | Crust/meadow | Frequent | 2 | 5.6 | Occasional | 2 | 10.7 | 90.5 | >25m2 | No |
| A5_OPB_Add_01 | A5_OPB_Add_01_00002 | 02/09/2024 00:51:53 | 396,434 | 5,686,895 | 8 | Crust/meadow | Occasional | 2 | | | | | | | |
| A5_OPB_Add_01 | A5_OPB_Add_01_00003 | 02/09/2024 00:52:13 | 396,434 | 5,686,895 | 5 | Crust/meadow | Occasional | 2 | | | | | | | |
| A5_OPB_Add_01 | A5_OPB_Add_01_00004 | 02/09/2024 00:52:34 | 396,431 | 5,686,892 | 5 | Crust/meadow | Occasional | 2 | | | | | | | |
| A5_OPB_Add_01 | A5_OPB_Add_01_00005 | 02/09/2024 00:52:57 | 396,428 | 5,686,888 | 0 | Crust/meadow | Absent | 4 | | | | | | | |
| A5_OPB_Add_01 | A5_OPB_Add_01_00006 | 02/09/2024 00:53:18 | 396,427 | 5,686,887 | 3 | Crust/meadow | Rare | 3 | 2.5 | Rare | 3 | 4.4 | 15.0 | <25m2 | No |
| A5_OPB_Add_01 | A5_OPB_Add_01_00007 | 02/09/2024 00:53:42 | 396,425 | 5,686,883 | 2 | Crust/meadow | Rare | 3 | | | | | | | |
| A5_OPB_Add_01 | A5_OPB_Add_01_00008 | 02/09/2024 00:54:03 | 396,423 | 5,686,880 | 0 | Crust/meadow | Absent | 4 | 0.0 | Absent | 4 | 16.6 | 215.2 | >25m2 | No |
| A5_OPB_Add_01 | A5_OPB_Add_01_00009 | 02/09/2024 00:54:28 | 396,420 | 5,686,877 | 0 | Crust/meadow | Absent | 4 | | | | | | | |
| A5_OPB_Add_01 | A5_OPB_Add_01_00010 | 02/09/2024 00:54:53 | 396,417 | 5,686,873 | 0 | Crust/meadow | Absent | 4 | | | | | | | |
| A5_OPB_Add_01 | A5_OPB_Add_01_00011 | 02/09/2024 00:55:18 | 396,414 | 5,686,868 | 0 | Crust/meadow | Absent | 4 | | | | | | | |
| A5_OPB_Add_01 | A5_OPB_Add_01_00012 | 02/09/2024 00:55:43 | 396,413 | 5,686,867 | 0 | Crust/meadow | Absent | 4 | | | | | | | |
| A5_OPB_Add_01 | A5_OPB_Add_01_00013 | 02/09/2024 00:56:07 | 396,410 | 5,686,864 | 3 | Crust/meadow | Rare | 3 | 2.5 | Rare | 3 | 3.2 | 8.1 | <25m2 | No |
| A5_OPB_Add_01 | A5_OPB_Add_01_00014 | 02/09/2024 00:56:32 | 396,408 | 5,686,862 | 2 | Crust/meadow | Rare | 3 | | | | | | | |
| A5_OPB_Add_01 | A5_OPB_Add_01_00015 | 02/09/2024 00:57:04 | 396,404 | 5,686,856 | 5 | Crust/meadow | Occasional | 2 | 6.7 | Occasional | 2 | 5.6 | 24.8 | <25m2 | No |

| Transect Name | Picture | Date Time | Easting | Northing | Composition (% cover) | Crust/Meadow or Massive/Turf | SACFOR Scale | Grade (BSL adapted from Roberts et al) | Average coverage | SACFOR | Grade | Extent | Area | Area Category | Potential Mussel bed |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A5_OPB_Add_01 | A5_OPB_Add_01_00016 | 02/09/2024 00:57:24 | 396,402 | 5,686,854 | 10 | Crust/meadow | Frequent | 2 | | | | | | | |
| A5_OPB_Add_01 | A5_OPB_Add_01_00017 | 02/09/2024 00:57:44 | 396,401 | 5,686,851 | 5 | Crust/meadow | Occasional | 2 | | | | | | | |
| A5_OPB_Add_01 | A5_OPB_Add_01_00018 | 02/09/2024 00:58:10 | 396,399 | 5,686,848 | 0 | Crust/meadow | Absent | 4 | 0.0 | Absent | 4 | 4.7 | 17.2 | <25m2 | No |
| A5_OPB_Add_01 | A5_OPB_Add_01_00019 | 02/09/2024 00:58:36 | 396,395 | 5,686,845 | 0 | Crust/meadow | Absent | 4 | | | | | | | |
| A5_OPB_Add_01 | A5_OPB_Add_01_00020 | 02/09/2024 00:59:07 | 396,393 | 5,686,841 | 15 | Crust/meadow | Frequent | 2 | 9.0 | Occasional | 2 | 3.2 | 8.1 | <25m2 | No |
| A5_OPB_Add_01 | A5_OPB_Add_01_00021 | 02/09/2024 00:59:27 | 396,391 | 5,686,838 | 3 | Crust/meadow | Rare | 3 | | | | | | | |
| A5_OPB_Add_01 | A5_OPB_Add_01_00022 | 02/09/2024 00:59:47 | 396,390 | 5,686,836 | 0 | Crust/meadow | Absent | 4 | 0.0 | Absent | 4 | 7.7 | 46.0 | >25m2 | No |
| A5_OPB_Add_01 | A5_OPB_Add_01_00023 | 02/09/2024 01:00:07 | 396,387 | 5,686,833 | 0 | Crust/meadow | Absent | 4 | | | | | | | |
| A5_OPB_Add_01 | A5_OPB_Add_01_00024 | 02/09/2024 01:00:31 | 396,385 | 5,686,830 | 0 | Crust/meadow | Absent | 4 | | | | | | | |
| A5_OPB_Add_01 | A5_OPB_Add_01_00025 | 02/09/2024 01:00:53 | 396,383 | 5,686,828 | 5 | Crust/meadow | Occasional | 2 | 4.2 | Rare | 3 | 15.6 | 191.0 | >25m2 | No |
| A5_OPB_Add_01 | A5_OPB_Add_01_00026 | 02/09/2024 01:01:19 | 396,380 | 5,686,824 | 3 | Crust/meadow | Rare | 3 | | | | | | | |
| A5_OPB_Add_01 | A5_OPB_Add_01_00027 | 02/09/2024 01:01:46 | 396,377 | 5,686,821 | 2 | Crust/meadow | Rare | 3 | | | | | | | |
| A5_OPB_Add_01 | A5_OPB_Add_01_00028 | 02/09/2024 01:02:05 | 396,376 | 5,686,820 | 7 | Crust/meadow | Occasional | 2 | | | | | | | |
| A5_OPB_Add_01 | A5_OPB_Add_01_00029 | 02/09/2024 01:02:29 | 396,374 | 5,686,817 | 0 | Crust/meadow | Absent | 4 | | | | | | | |
| A5_OPB_Add_01 | A5_OPB_Add_01_00030 | 02/09/2024 01:02:48 | 396,373 | 5,686,816 | 8 | Crust/meadow | Occasional | 2 | | | | | | | |

| Transect Name | Picture | Date Time | Easting | Northing | Composition (% cover) | Crust/Meadow or Massive/Turf | SACFOR Scale | Grade (BSL adapted from Roberts et al) | Average coverage | SACFOR | Grade | Extent | Area | Area Category | Potential Mussel bed |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A5_OPB_Add_01 | A5_OPB_Add_01_00031 | 02/09/2024 01:03:08 | 396,373 | 5,686,816 | Repeat Still | Crust/meadow | Repeat Still | #N/A | | | | | | | |
| A5_OPB_Add_01 | A5_OPB_Add_01_00032 | 02/09/2024 01:03:31 | 396,369 | 5,686,810 | 8 | Crust/meadow | Occasional | 2 | | | | | | | |
| A5_OPB_Add_01 | A5_OPB_Add_01_00033 | 02/09/2024 01:03:52 | 396,367 | 5,686,807 | 5 | Crust/meadow | Occasional | 2 | | | | | | | |
| A5_OPB_Add_01 | A5_OPB_Add_01_00034 | 02/09/2024 01:04:12 | 396,365 | 5,686,805 | 7 | Crust/meadow | Occasional | 2 | | | | | | | |
| A5_OPB_Add_01 | A5_OPB_Add_01_00035 | 02/09/2024 01:04:32 | 396,366 | 5,686,806 | Repeat Still | Crust/meadow | Repeat Still | #N/A | | | | | | | |
| A5_OPB_Add_01 | A5_OPB_Add_01_00036 | 02/09/2024 01:04:52 | 396,362 | 5,686,800 | 2 | Crust/meadow | Rare | 3 | | | | | | | |
| A5_OPB_Add_01 | A5_OPB_Add_01_00037 | 02/09/2024 01:05:12 | 396,360 | 5,686,797 | 5 | Crust/meadow | Occasional | 2 | | | | | | | |
| A5_OPB_Add_01 | A5_OPB_Add_01_00038 | 02/09/2024 01:05:33 | 396,357 | 5,686,793 | 7 | Crust/meadow | Occasional | 2 | 9.5 | Occasional | 2 | 51.2 | 2056.8 | >25m2 | No |
| A5_OPB_Add_01 | A5_OPB_Add_01_00039 | 02/09/2024 01:05:57 | 396,352 | 5,686,789 | 15 | Crust/meadow | Frequent | 2 | | | | | | | |
| A5_OPB_Add_01 | A5_OPB_Add_01_00040 | 02/09/2024 01:06:19 | 396,351 | 5,686,786 | 18 | Crust/meadow | Frequent | 2 | | | | | | | |
| A5_OPB_Add_01 | A5_OPB_Add_01_00041 | 02/09/2024 01:06:39 | 396,350 | 5,686,785 | 17 | Crust/meadow | Frequent | 2 | | | | | | | |
| A5_OPB_Add_01 | A5_OPB_Add_01_00042 | 02/09/2024 01:07:00 | 396,348 | 5,686,783 | 10 | Crust/meadow | Frequent | 2 | | | | | | | |
| A5_OPB_Add_01 | A5_OPB_Add_01_00043 | 02/09/2024 01:07:20 | 396,347 | 5,686,781 | 15 | Crust/meadow | Frequent | 2 | | | | | | | |
| A5_OPB_Add_01 | A5_OPB_Add_01_00044 | 02/09/2024 01:07:43 | 396,344 | 5,686,779 | 10 | Crust/meadow | Frequent | 2 | | | | | | | |
| A5_OPB_Add_01 | A5_OPB_Add_01_00045 | 02/09/2024 01:08:05 | 396,342 | 5,686,775 | 5 | Crust/meadow | Occasional | 2 | | | | | | | |

| Transect Name | Picture | Date Time | Easting | Northing | Composition (% cover) | Crust/Meadow or Massive/Turf | SACFOR Scale | Grade (BSL adapted from Roberts et al) | Average coverage | SACFOR | Grade | Extent | Area | Area Category | Potential Mussel bed |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A5_OPB_Add_01 | A5_OPB_Add_01_00046 | 02/09/2024 01:08:37 | 396,338 | 5,686,771 | 0 | Crust/meadow | Absent | 4 | 0.0 | Absent | 4 | 10.0 | 78.7 | >25m2 | No |
| A5_OPB_Add_01 | A5_OPB_Add_01_00047 | 02/09/2024 01:08:58 | 396,336 | 5,686,769 | 0 | Crust/meadow | Absent | 4 | | | | | | | |
| A5_OPB_Add_01 | A5_OPB_Add_01_00048 | 02/09/2024 01:09:18 | 396,335 | 5,686,766 | 0 | Crust/meadow | Absent | 4 | | | | | | | |
| A5_OPB_Add_01 | A5_OPB_Add_01_00049 | 02/09/2024 01:09:39 | 396,332 | 5,686,763 | 0 | Crust/meadow | Absent | 4 | | | | | | | |
| A5_OPB_Add_01 | A5_OPB_Add_01_00050 | 02/09/2024 01:10:12 | 396,330 | 5,686,759 | 5 | Crust/meadow | Occasional | 2 | 4.5 | Rare | 3 | 6.9 | 37.0 | >25m2 | No |
| A5_OPB_Add_01 | A5_OPB_Add_01_00051 | 02/09/2024 01:10:32 | 396,329 | 5,686,758 | 3 | Crust/meadow | Rare | 3 | | | | | | | |
| A5_OPB_Add_01 | A5_OPB_Add_01_00052 | 02/09/2024 01:10:56 | 396,326 | 5,686,754 | 2 | Crust/meadow | Rare | 3 | | | | | | | |
| A5_OPB_Add_01 | A5_OPB_Add_01_00053 | 02/09/2024 01:11:16 | 396,326 | 5,686,754 | 8 | Crust/meadow | Occasional | 2 | | | | | | | |
| A5_OPB_Add_01 | A5_OPB_Add_01_00054 | 02/09/2024 01:11:36 | 396,324 | 5,686,751 | 0 | Crust/meadow | Absent | 4 | 0.0 | Absent | 4 | 6.7 | 35.6 | >25m2 | No |
| A5_OPB_Add_01 | A5_OPB_Add_01_00055 | 02/09/2024 01:11:58 | 396,320 | 5,686,746 | 0 | Crust/meadow | Absent | 4 | | | | | | | |

# APPENDIX J – SAMPLE AND SEABED PHOTOGRAPHS

# Habitat Summary Information: A2_ES_01

## Survey Area: East of Shipwash

**No. of Stills: 15** **Mins of Video: 12:11** **Track Length: 109m**

**Site Selection Criteria**

Camera transect investigating crest of sandbank (possible EC Habitats Directive Annex I Shallow Sandbank Habitat) within high-intensity HSG area and low-intensity spawning and nursery grounds.

**Analogue Interpretation**

Low mottled reflectivity with gravel.

**Sediment Description**

Muddy sand with gravel (mixed).

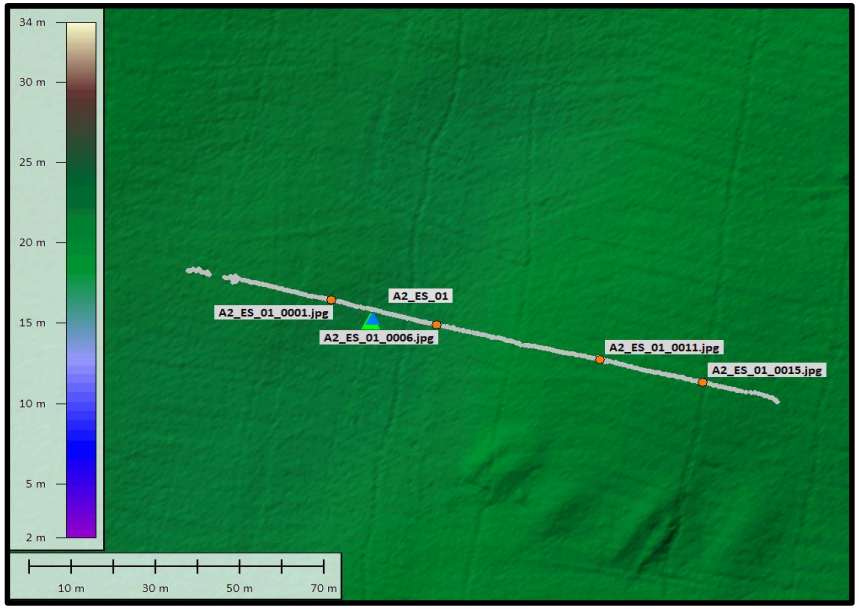
**Conspicuous Fauna**

**Cnidaria:** Actiniaria. **Chordata:** *Agonus cataphractus.* **Echinodermata:** *Asterias rubens, Psammechinus miliaris,* Ophiuroidea. **Mollusca:** *Buccinum undatum.* **Arthropoda:** *Inachus phalangium.* **Annelida:** Serpulidae.


Photo Position: 407806 mE, 5762434 mN


Photo Position: 407870 mE, 5762419 mN


Sediment Example Image




**Client** nationalgrid

**Contractors** benthic solutions NEXTGEO

▲ Proposed Location ▲ Grab Location ● Featured Photos ∿ UW Video Track


Photo Position: 407831 mE, 5762428 mN


Photo Position: 407894 mE, 5762413 mN

Sieved Sample Image (0.5mm)

Geodetic Infomation: Datum: ETRS1989 Projection: UTM Zone: 31 North Central Meridian: 03° East

# Habitat Summary Information: A2_ES_02

## Survey Area: East of Shipwash

**No. of Stills: 32** **Mins of Video: 12:12** **Track Length: 119m**

**Site Selection Criteria**

Camera transect investigating background sand dominated sediments within high-intensity HSG area and low-intensity spawning and nursery grounds.

**Analogue Interpretation**

Low mottled reflectivity with patches of clay.

**Sediment Description**

Fine sand with occasional pebbles and clay patches.

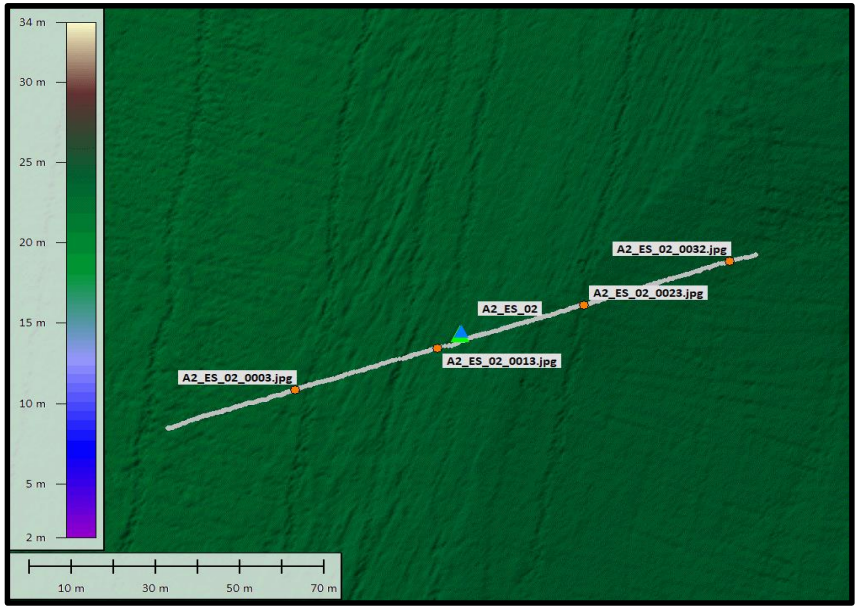
**Conspicuous Fauna**

**Echinodermata:** *Asterias rubens* . **Bryozoan/Hydrozoan turf. Arthropoda:** *Pagurus* sp. **Chordata:** *Pleuronectiformes.* **Echinodermata:** *Psammechinus miliaris.*


Photo Position: 407305 mE, 5759549 mN


Photo Position: 407374 mE, 5759572 mN

Sediment Example Image




**Client** nationalgrid

**Contractors** benthic solutions, NEXTGEO

Proposed Location  Grab Location  Featured Photos  UW Video Track


Photo Position: 407339 mE, 5759561 mN


Photo Position: 407408 mE, 5759584 mN

Sieved Sample Image (0.5mm)

Geodetic Infomation: Datum: ETRS1989 Projection: UTM Zone: 31 North Central Meridian: 03° East

# Habitat Summary Information: A2_ES_03

## Survey Area: East of Shipwash

**No. of Stills: 19** **Mins of Video: 12:19** **Track Length: 136m**

**Site Selection Criteria**

Camera transect investigating background sand dominated sediments within high-intensity HSG area and low-intensity spawning and nursery grounds.

**Analogue Interpretation**

Low mottled reflectivity with gravel.

**Sediment Description**

Muddy sand with gravel (mixed).

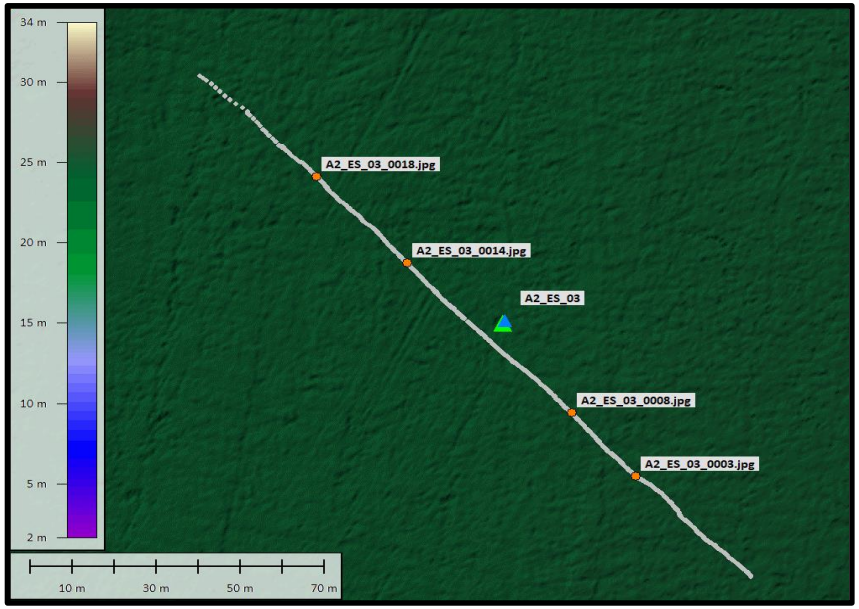
**Conspicuous Fauna**

**Mollusca:** *Aequipecten opercularis* . **Bryozoa:** *Alcyonidium diaphanum* . **Echinodermata:** *Asterias rubens,* Ophiuroidea. **Arthropoda:** *Inachus phalangium,* Brachyura. **Annelida:** *Sabellaria spinulosa.*


Photo Position: 406858 mE, 5756104 mN


Photo Position: 406804 mE, 5756161 mN

Sediment Example Image




**Client** nationalgrid

**Contractors** benthic solutions, NEXTGEO

Proposed Location | Grab Location | Featured Photos | UW Video Track


Photo Position: 406843 mE, 5756121 mN


Photo Position: 406782 mE, 5756184 mN

Sieved Sample Image (0.5mm)

Geodetic Infomation: Datum: ETRS1989 Projection: UTM Zone: 31 North Central Meridian: 03° East

# Habitat Summary Information: A2_ES_04

## Survey Area: East of Shipwash

**No. of Stills: 15** **Mins of Video: 12:11** **Track Length: 119m**

**Site Selection Criteria**

Camera transect investigating rippled sand dominated sediments within high-intensity HSG area and low-intensity spawning and nursery grounds.

**Analogue Interpretation**

Mottled reflectivity with gravel and higher reflectivity gravel in troughs.

**Sediment Description**

Muddy sand with gravel (mixed) with rippled fine sand and gravel in troughs.

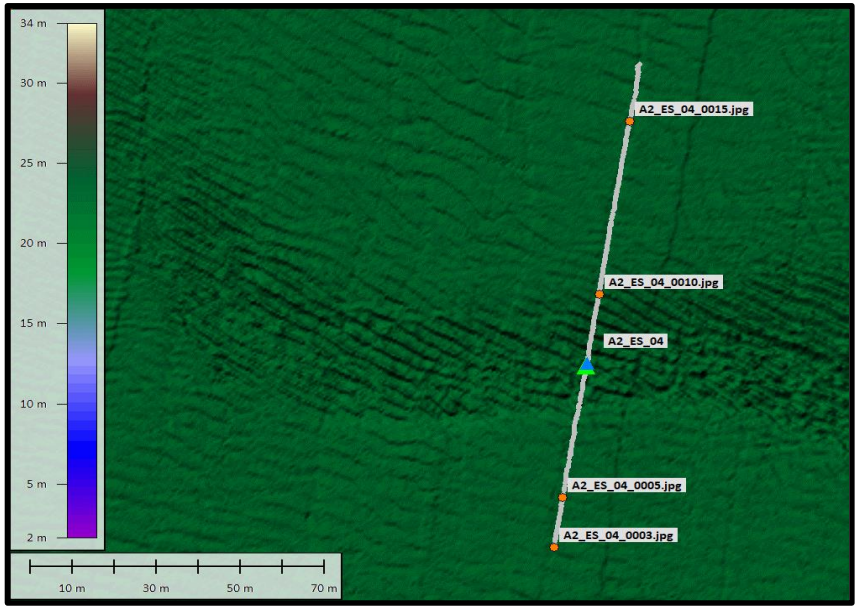
**Conspicuous Fauna**

**Chordata:** Actinopterygii. **Echinodermata:** *Asterias rubens,* Ophiuroidea. **Arthropoda:** *Pagurus* sp.


Photo Position: 406412 mE, 5752290 mN


Photo Position: 406423 mE, 5752357 mN

Sediment Example Image




**Client** nationalgrid

**Contractors** benthic solutions, NEXTGEO


Photo Position: 406414 mE, 5752303 mN


Photo Position: 406430 mE, 5752403 mN

Sieved Sample Image (0.5mm)

Proposed Location  Grab Location  Featured Photos  UW Video Track

Geodetic Infomation: Datum: ETRS1989  Projection: UTM  Zone: 31 North  Central Meridian: 03° East

# Habitat Summary Information: A2_ES_05_HAS

## Survey Area: East of Shipwash

**No. of Stills: 26** **Mins of Video: 12:16** **Track Length: 151m**

**Site Selection Criteria**

Camera transect to ground truth habitat within high-intensity HSG area and low-intensity spawning and nursery grounds.

**Analogue Interpretation**

Mottled reflectivity with gravel and higher reflectivity gravel in troughs.

**Sediment Description**

Rippled fine sand with gravel in troughs with patches of gravelly sand and muddy sand with gravel (mixed).

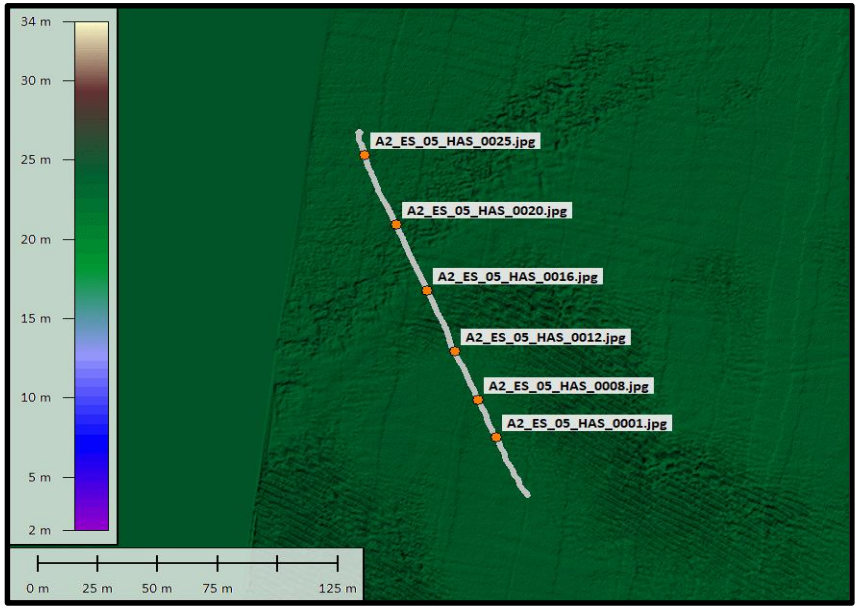
**Conspicuous Fauna**

**Bryozoa:** *Alcyonidium diaphanum* . **Echinodermata:** *Asterias rubens* , Ophiuroidea. **Arthropoda:** *Pagurus* sp.


Photo Position: 406507 mE, 5754566 mN


Photo Position: 406490 mE, 5754605 mN


Photo Position: 406466 mE, 5754664 mN




**Client**

nationalgrid

**Contractors**

benthic solutions

NEXTGEO

Featured Photos

UW Video Track


Photo Position: 406499 mE, 5754583 mN


Photo Position: 406478 mE, 5754633 mN


Photo Position: 406452 mE, 5754696 mN

Geodetic Infomation: Datum: ETRS1989 Projection: UTM Zone: 31 North Central Meridian: 03° East

# Habitat Summary Information: A2_ES_Add_01

## Survey Area: East of Shipwash

**No. of Stills: 17** **Mins of Video: 12:10** **Track Length: 94m**

**Site Selection Criteria**
Camera transect to investigate the presence of *Sabellaria spinulosa.*

**Analogue Interpretation**
Low mottled reflectivity with gravel.

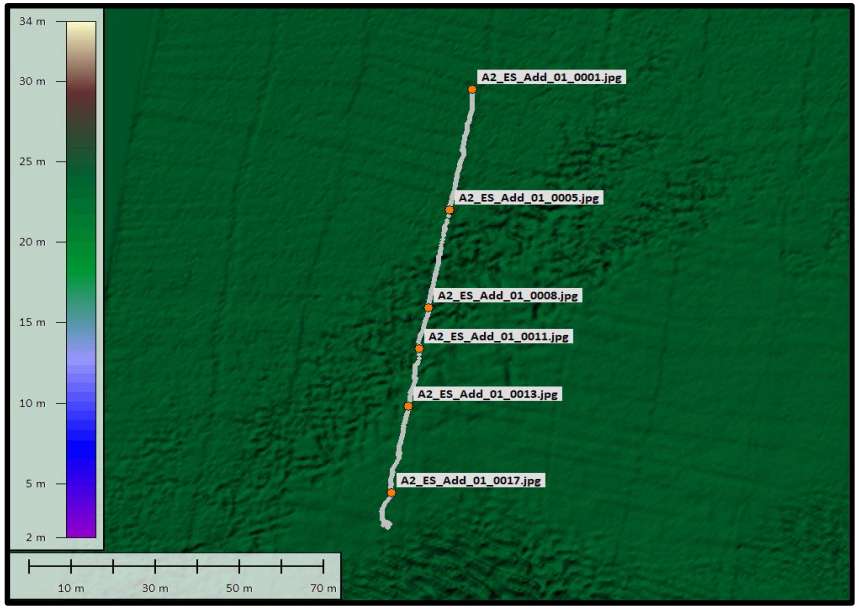
**Sediment Description**
Muddy sand with gravel (mixed).

**Conspicuous Fauna**
**Chordata:** Actinopterygii. **Bryozoa:** *Alcyonidium diaphanum.* **Echinodermata:** *Asterias rubens,* Ophiuroidea. **Arthropoda:** *Pagurus* sp. **Annelida:** *Sabellaria spinulosa.*

Photo Position: 406517 mE, 5754759 mN

Photo Position: 406507 mE, 5754701 mN

Photo Position: 406502 mE, 5754675 mN




**Client** nationalgrid

**Contractors** benthic solutions, NEXTGEO

Featured Photos  UW Video Track

Photo Position: 406512 mE, 5754727 mN

Photo Position: 406505 mE, 5754690 mN

Photo Position: 406498 mE, 5754652 mN

Geodetic Infomation: Datum: ETRS1989 Projection: UTM Zone: 31 North Central Meridian: 03° East

# Habitat Summary Information: A2_ES_Add_02

## Survey Area: East of Shipwash

**No. of Stills: 12** **Mins of Video: 12:11** **Track Length: 83m**

**Site Selection Criteria**
Camera transect to investigate the presence of *Sabellaria spinulosa.*

**Analogue Interpretation**
Low mottled reflectivity with gravel.

**Sediment Description**
Muddy sand with gravel (mixed).

**Conspicuous Fauna**
**Bryozoa:** *Alcyonidium diaphanum* . **Echinodermata:** *Asterias rubens* , Ophiuroidea. **Arthropoda:** *Pagurus* sp. **Annelida:** *Sabellaria spinulosa.*

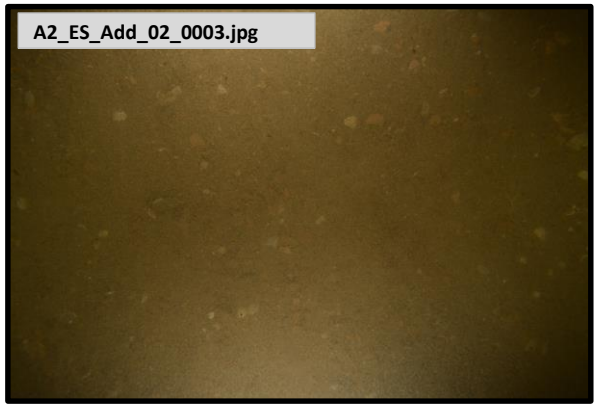


Photo Position: 406496 mE, 5754604 mN

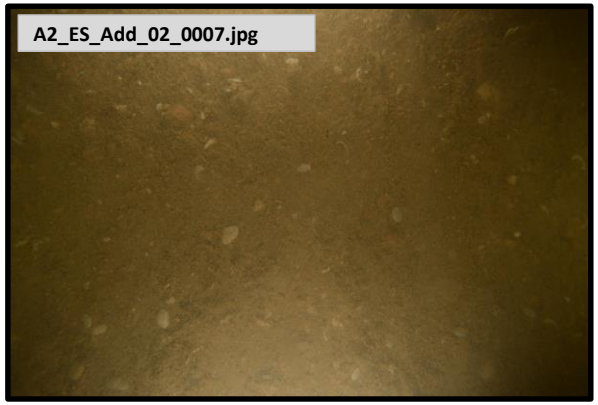
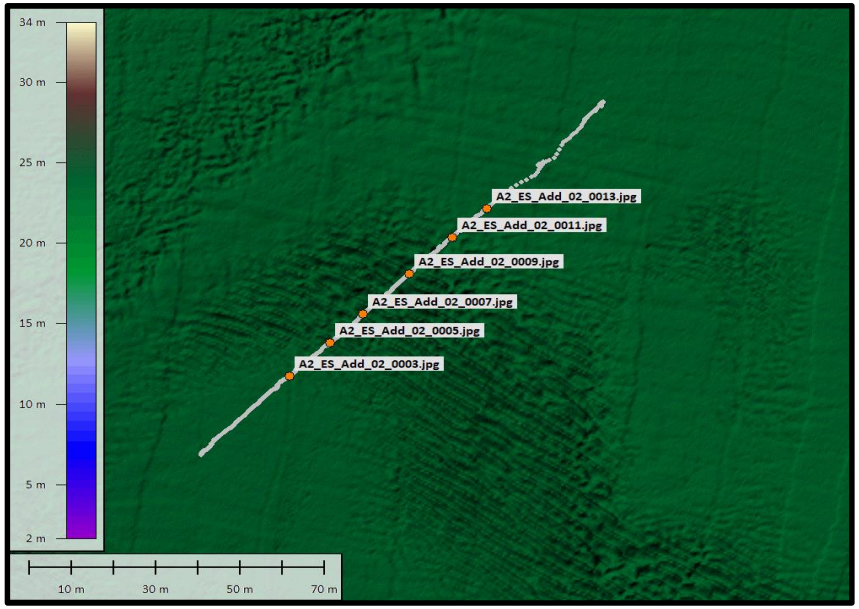


Photo Position: 406513 mE, 5754620 mN

Photo Position: 406534 mE, 5754640 mN




**Client** nationalgrid

**Contractors** benthic solutions, NEXTGEO

Featured Photos  UW Video Track

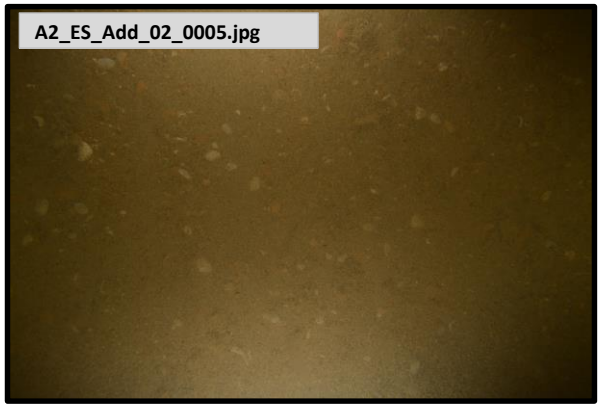


Photo Position: 406505 mE, 5754612 mN

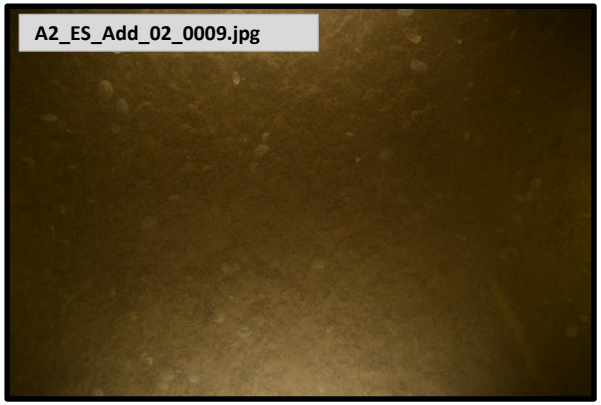


Photo Position: 406524 mE, 5754631 mN

Photo Position: 406542 mE, 5754648 mN

Geodetic Infomation: Datum: ETRS1989 Projection: UTM Zone: 31 North Central Meridian: 03° East

# Habitat Summary Information: A3_NS_01

## Survey Area: North of the Sunk

**No. of Stills: 20** **Mins of Video: 12:10** **Track Length: 123m**

**Site Selection Criteria**

Camera transect to investigate sand dominated sediment of Area 3, along RPL within high-intensity HSG area and low-intensity spawning and nursery grounds.

**Analogue Interpretation**

Low mottled reflectivity with gravel.

**Sediment Description**

Muddy sand with gravel (mixed).

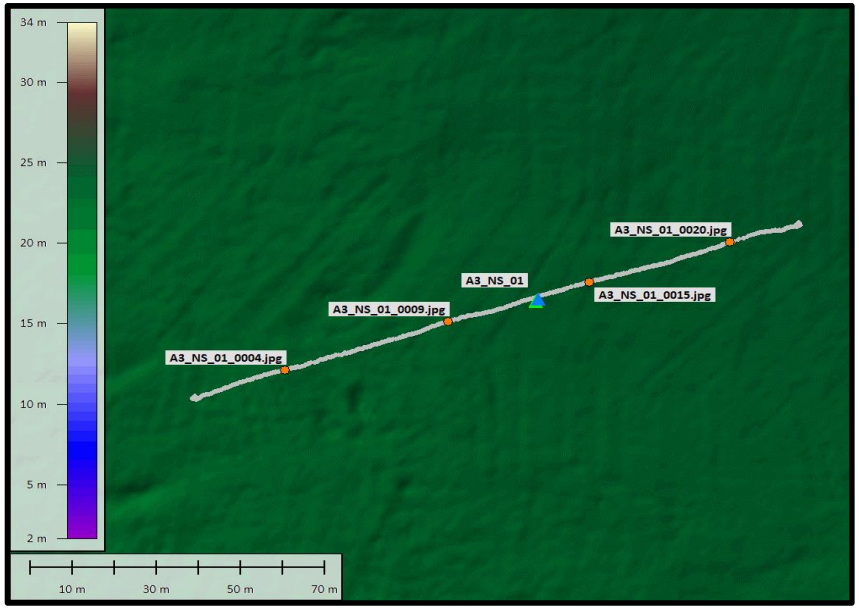
**Conspicuous Fauna**

**Chordata:** Actinopterygii, *Buglossidium luteum, Squalus acanthias.* **Cnidaria:** *Alcyonium digitatum,* Actiniaria, *Metridium senile.* **Echinodermata:** *Asterias rubens, Psammechinus miliaris,* Ophiuroidea. **Bryozoan/Hydrozoan turf. Mollusca:** *Buccinum undatum.* **Arthropoda:** *Pagurus* sp. **Annelida:** *Sabella pavonia,* Serpulidae.


Photo Position: 408395 mE, 5748504 mN


Photo Position: 408467 mE, 5748527 mN

Sediment Example Image




**Client** nationalgrid

**Contractors** benthic solutions, NEXTGEO

Proposed Location  Grab Location  Featured Photos  UW Video Track


Photo Position: 408434 mE, 5748517 mN


Photo Position: 408501 mE, 5748538 mN

Sieved Sample Image (0.5mm)

Geodetic Infomation: Datum: ETRS1989  Projection: UTM  Zone: 31 North  Central Meridian: 03° East

# Habitat Summary Information: A3_NS_02_HAS

## Survey Area: North of the Sunk

**No. of Stills: 16** **Mins of Video: 12:09** **Track Length: 108m**

**Site Selection Criteria**

Camera transect to investigate a potential sensitive habitat within high-intensity HSG area and low-intensity spawning and nursery grounds.

**Analogue Interpretation**

Low mottled reflectivity with gravel.

**Sediment Description**

Muddy sand with gravel (mixed).

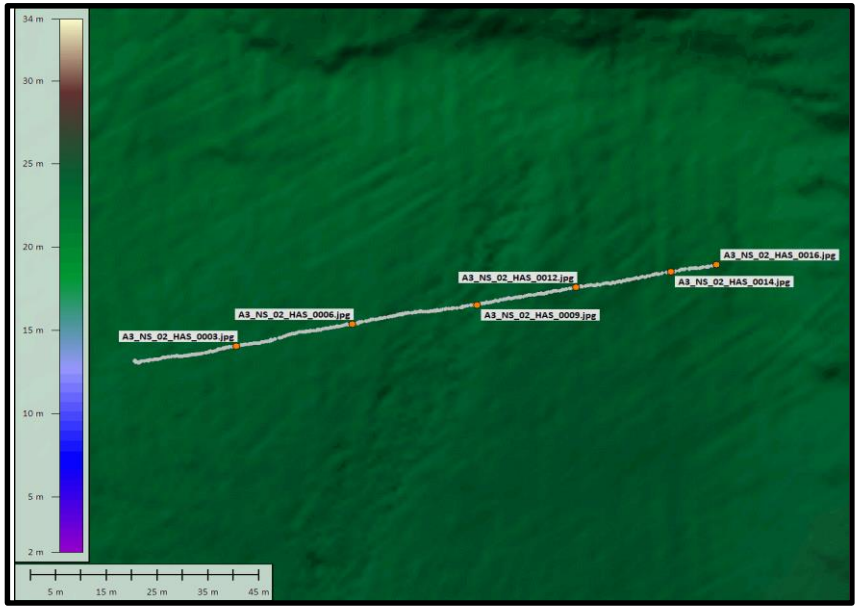
**Conspicuous Fauna**

**Cnidaria:** Actiniaria, *Metridium senile, Alcyonium digitatum.* **Chordata:** Actinopterygii. **Echinodermata:** *Asterias rubens,* Ophiuroidea, *Psammechinus miliaris.* **Bryozoan/Hydrozoan turf. Annelida:** Serpulidae.


Photo Position: 411284 mE, 5747288 mN


Photo Position: 411331 mE, 5747297 mN


Photo Position: 411370 mE, 5747305 mN




**Client** nationalgrid

**Contractors** benthic solutions, NEXTGEO

Featured Photos  UW Video Track


Photo Position: 411307 mE, 5747293 mN


Photo Position: 411351 mE, 5747301 mN

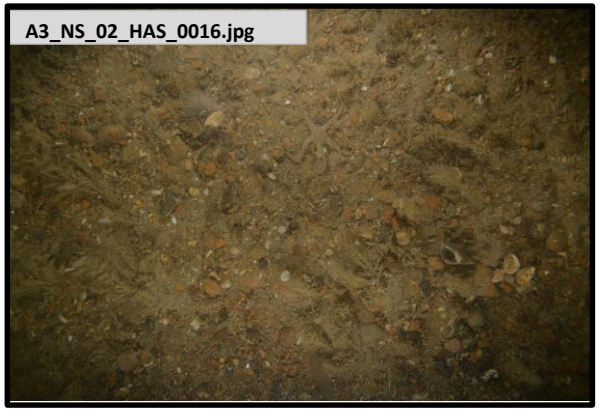



Photo Position: 411379 mE, 5747306 mN

Geodetic Infomation: Datum: ETRS1989 Projection: UTM Zone: 31 North Central Meridian: 03° East

# Habitat Summary Information: A3_NS_03_HAS

## Survey Area: North of the Sunk

**No. of Stills: 18** **Mins of Video: 12:12** **Track Length: 120m**

**Site Selection Criteria**

Camera transect to investigate a potential sensitive habitat within high-intensity HSG area and low-intensity spawning and nursery grounds.

**Analogue Interpretation**

Low mottled reflectivity with gravel.

**Sediment Description**

Muddy sand with gravel (mixed).

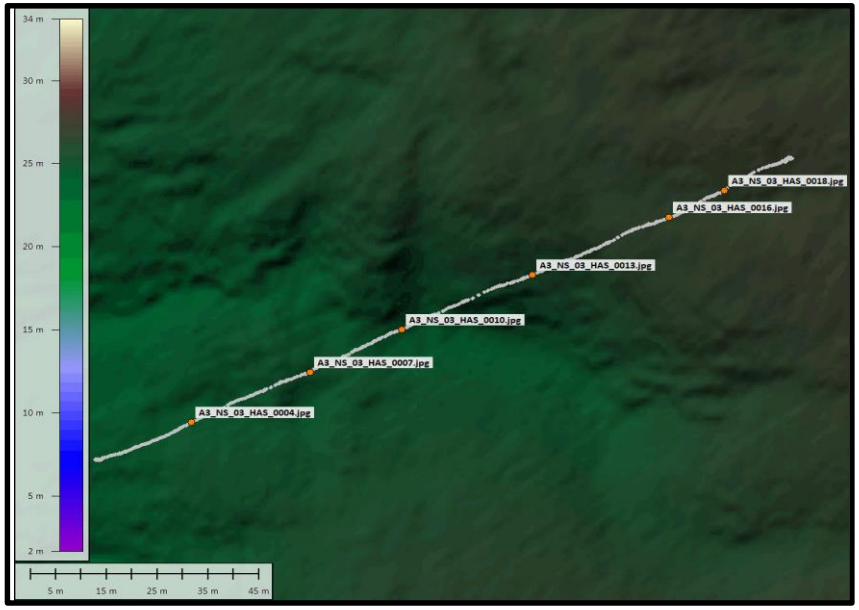
**Conspicuous Fauna**

**Cnidaria:** Actiniaria, *Metridium senile.* **Echinodermata:** *Asterias rubens, Psammechinus miliaris,* Ophiuroidea. **Chordata:** Clupeidae, *Squalus acanthias,* Actinopterygii. **Arthropoda:** *Inachus phalangium, Pagurus* sp. **Annelida:** Serpulidae.


Photo Position: 411453 mE, 5747316 mN


Photo Position: 411495 mE, 5747337 mN


Photo Position: 411547 mE, 5747361 mN




**Client** nationalgrid

**Contractors** benthic solutions, NEXTGEO

Featured Photos  UW Video Track


Photo Position: 411476 mE, 5747327 mN


Photo Position: 411520 mE, 5747349 mN


Photo Position: 411558 mE, 5747367 mN

Geodetic Infomation: Datum: ETRS1989 Projection: UTM Zone: 31 North Central Meridian: 03° East

# Habitat Summary Information: A4_GLC_01

## Survey Area: Grid Link Crossing

**No. of Stills: 12** **Mins of Video: 12:06** **Track Length: 70m**

**Site Selection Criteria**

Camera transect to investigate coarse sediment of Area 4, along RPL within high-intensity HSG area and low-intensity spawning and nursery grounds.

**Analogue Interpretation**

Low mottled reflectivity with gravel.

**Sediment Description**

Muddy sand with gravel (mixed).

**Conspicuous Fauna**

**Echinodermata :** *Asterias rubens, Psammechinus miliaris* . **Bryozoan/Hydrozoan turf. Arthropoda:** *Inachus phalangium.* **Annelida:** Serpulidae. **Porifera**.

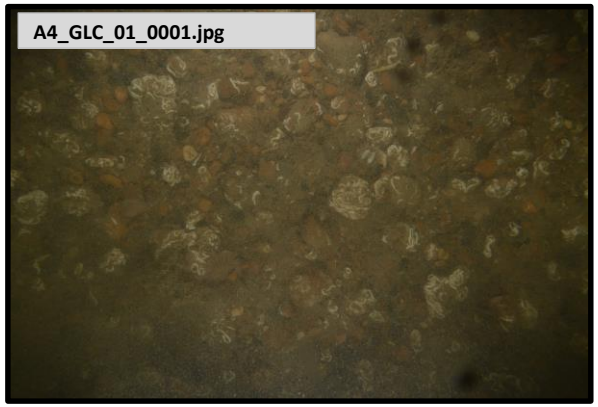



Photo Position: 399546 mE, 5693327 mN

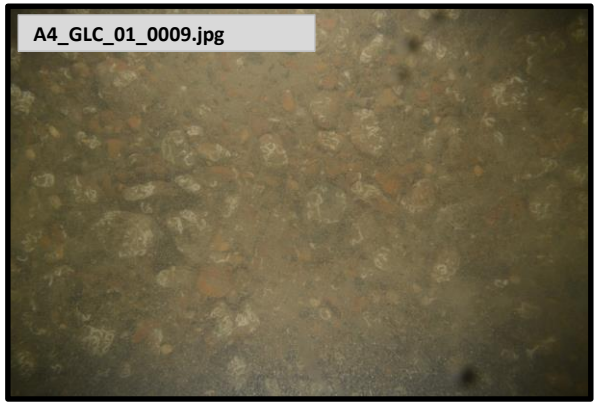
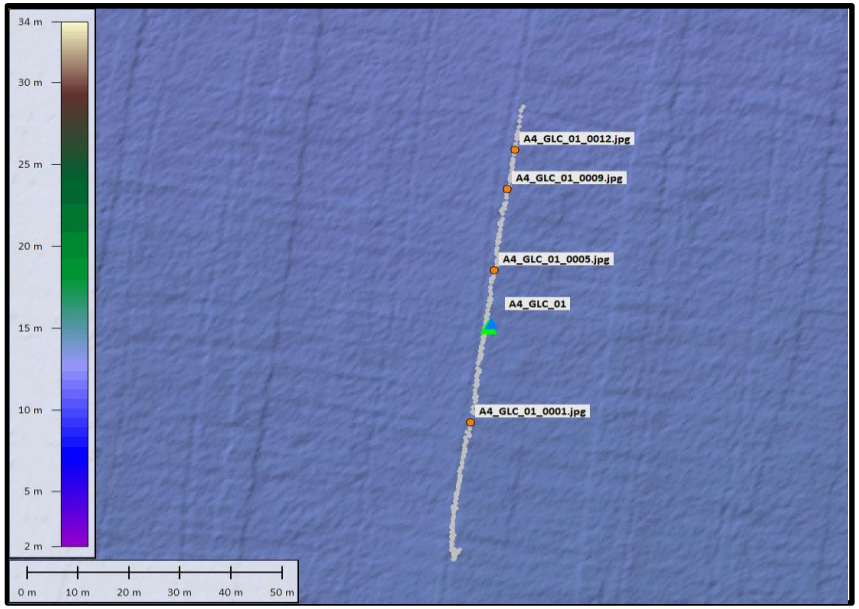



Photo Position: 399554 mE, 5693377 mN

Sediment Example Image




**Client** nationalgrid

**Contractors** benthic solutions, NEXTGEO

Proposed Location  Grab Location  Featured Photos  UW Video Track

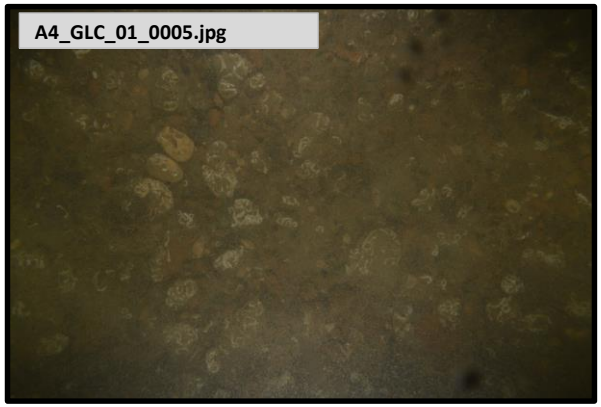



Photo Position: 399551 mE, 5693360 mN


Photo Position: 399555 mE, 5693386 mN

Sieved Sample Image (0.5mm)

Geodetic Infomation: Datum: ETRS1989  Projection: UTM  Zone: 31 North  Central Meridian: 03° East

# Habitat Summary Information: A4_GLC_02

## Survey Area: Grid Link Crossing

**No. of Stills: 17** **Mins of Video: 12:14** **Track Length: 116m**

**Site Selection Criteria**

Camera transect to investigate deeper coarse sediment to the north of Area 4 within high-intensity HSG area and low-intensity spawning and nursery grounds.

**Analogue Interpretation**

Low mottled reflectivity with gravel.

**Sediment Description**

Muddy sand with gravel (mixed).

**Conspicuous Fauna**

**Cnidaria:** Actiniaria, *Alcyonium digitatum.* **Echinodermata:** *Asterias rubens, Psammechinus miliaris.* **Annelida:** Serpulidae. **Porifera.**

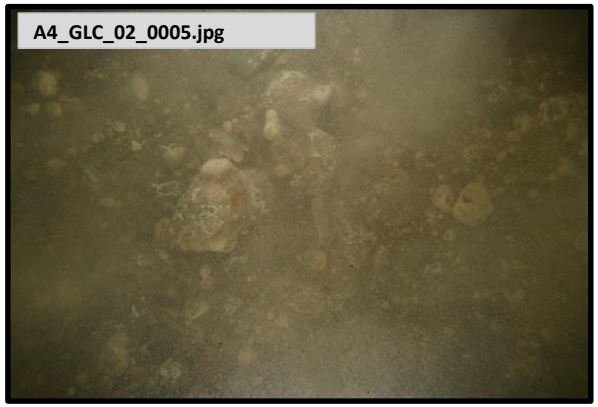
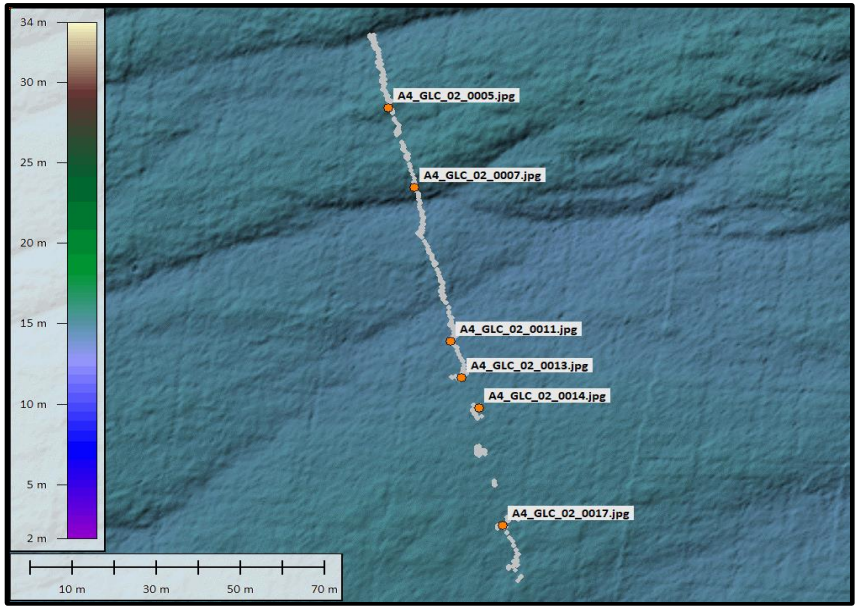



Photo Position: 399775 mE, 5695084 mN


Photo Position: 399789 mE, 5695022 mN


Photo Position: 399796 mE, 5695005 mN




**Client** nationalgrid

**Contractors** benthic solutions, NEXTGEO

Featured Photos  UW Video Track


Photo Position: 399781 mE, 5695063 mN


Photo Position: 399792 mE, 5695013 mN


Photo Position: 399802 mE, 5694974 mN

Geodetic Infomation: Datum: ETRS1989 Projection: UTM Zone: 31 North Central Meridian: 03° East

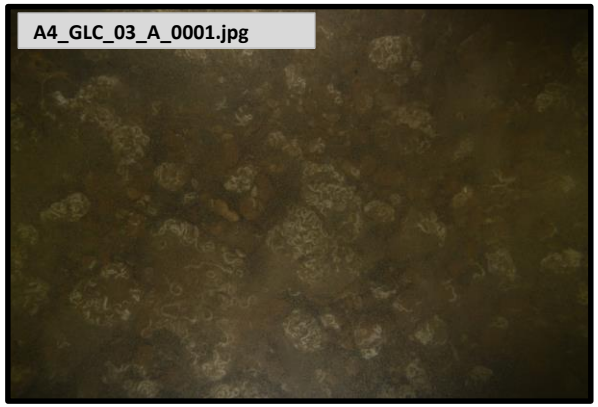



Photo Position: 399302 mE, 5691927 mN

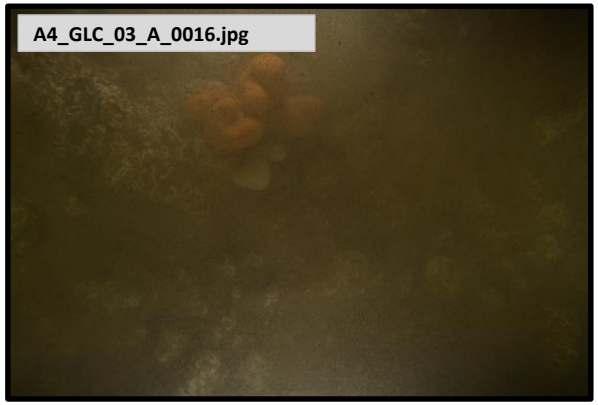



Photo Position: 399286 mE, 5691888 mN

Sediment Example Image

# Habitat Summary Information: A4_GLC_03_A

## Survey Area: Grid Link Crossing

**No. of Stills: 26** **Mins of Video: 12:20** **Track Length: 94m**

**Site Selection Criteria**

Camera transect to investigate shallower coarse sediment to the south of Area 5, on crest of mound within high-intensity HSG area and low-intensity spawning and nursery grounds.

**Analogue Interpretation**

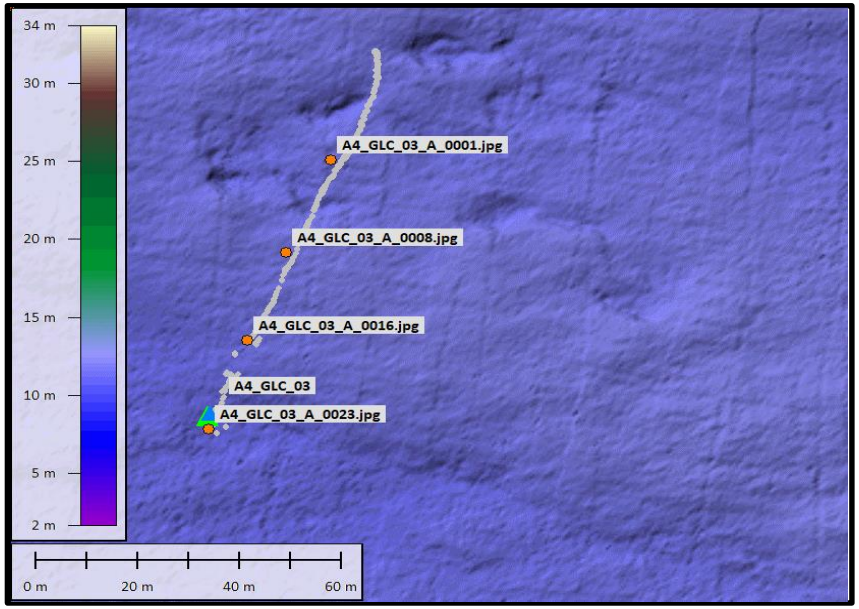
Low mottled reflectivity with gravel.

**Sediment Description**

Muddy sand with gravel (mixed).

**Conspicuous Fauna**

**Cnidaria:** Actiniaria, *Alcyonium digitatum, Urticina felina.* **Bryozoan/Hydrozoan turf. Echinodermata:** *Psammechinus miliaris.* **Annelida:** Serpulidae. **Porifera.**




**Client** nationalgrid

**Contractors** benthic solutions, NEXTGEO

Proposed Location  Grab Location  Featured Photos  UW Video Track

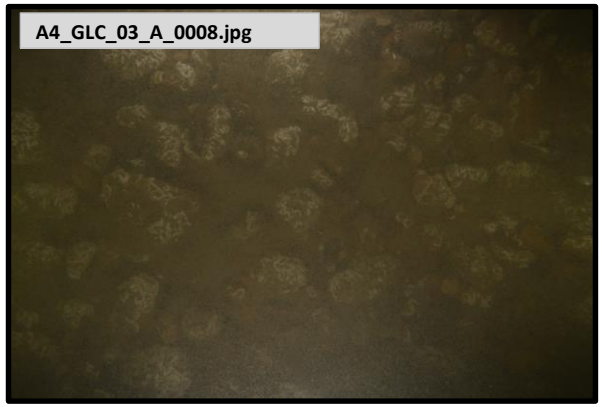



Photo Position: 399293 mE, 5691907 mN

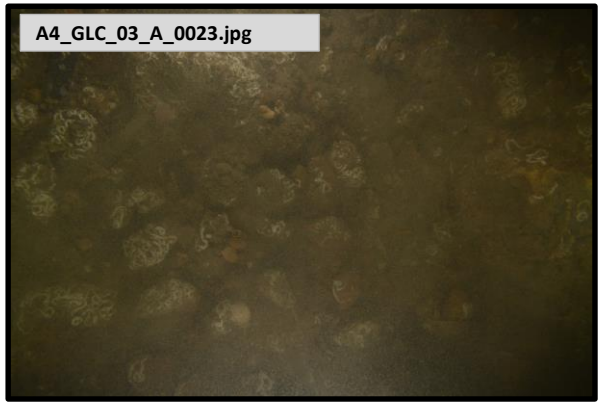



Photo Position: 399278 mE, 5691868 mN

Sieved Sample Image (0.5mm)

Geodetic Infomation: Datum: ETRS1989  Projection: UTM  Zone: 31 North  Central Meridian: 03° East

# Habitat Summary Information: A5_OPB_01

## Survey Area: Outer Pegwell Bay

**No. of Stills: 16** **Mins of Video: 12:12** **Track Length: 110m**

**Site Selection Criteria**

Camera transect to investigate trough of thin sandbank/shoaling within high-intensity HSG area and low-intensity spawning and nursery grounds.

**Analogue Interpretation**

High mottled reflectivity with coarse sand and gravel.

**Sediment Description**

Rippled coarse sand with shell fragments with coarse sand and gravel.

**Conspicuous Fauna**

No fauna observed during the video review.


Photo Position: 396895 mE, 5687402 mN

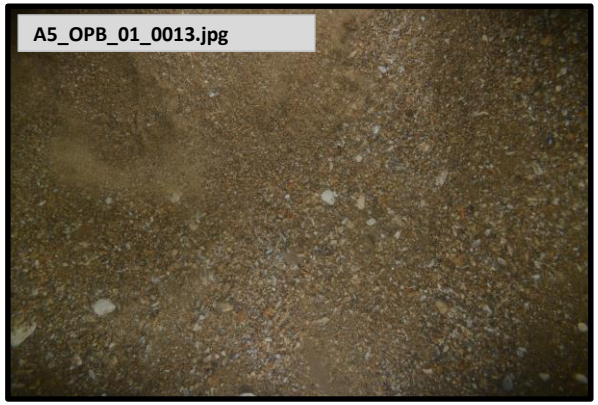
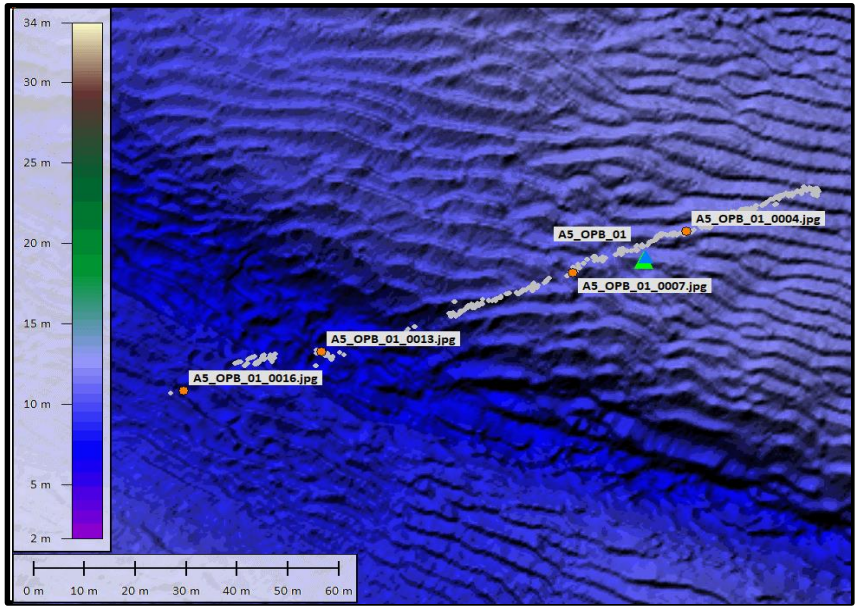



Photo Position: 396823 mE, 5687376 mN

Sediment Example Image




**Client** nationalgrid

**Contractors** benthic solutions, NEXTGEO

▲ Proposed Location ▲ Grab Location ● Featured Photos ∿ UW Video Track

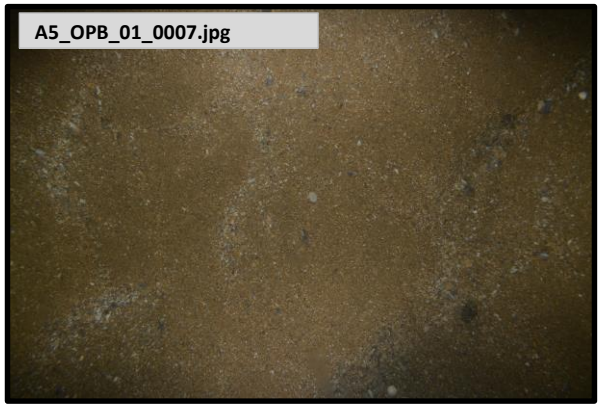



Photo Position: 396873 mE, 5687393 mN


Photo Position: 396796 mE, 5687368 mN

Sieved Sample Image (0.5mm)

Geodetic Infomation: Datum: ETRS1989 Projection: UTM Zone: 31 North Central Meridian: 03° East

# Habitat Summary Information: A5_OPB_04_HAS

## Survey Area: Outer Pegwell Bay

**No. of Stills: 9** **Mins of Video: 12:13** **Track Length: 92m**

**Site Selection Criteria**

Camera transect to investigate a potential sensitive habitat within high-intensity HSG area and low-intensity spawning and nursery grounds.

**Analogue Interpretation**

High mottled reflectivity with sand ripples.

**Sediment Description**

Rippled fine sand.

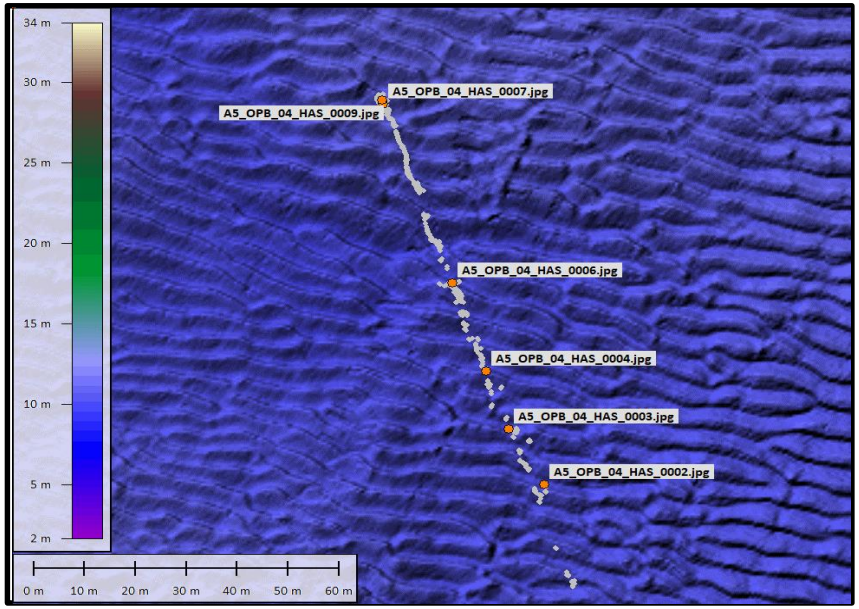
**Conspicuous Fauna**

**Chordata:** Actinopterygii.


Photo Position: 397285 mE, 5688340 mN


Photo Position: 397274 mE, 5688364 mN


Photo Position: 397253 mE, 5688422 mN




**Client**

nationalgrid

**Contractors**

benthic solutions

NEXTGEO

Featured Photos

UW Video Track


Photo Position: 397278 mE, 5688352 mN


Photo Position: 397267 mE, 5688383 mN


Photo Position: 397253 mE, 5688423 mN

Geodetic Infomation: Datum: ETRS1989 Projection: UTM Zone: 31 North Central Meridian: 03° East

# Habitat Summary Information: A5_OPB_05_HAS

## Survey Area: Outer Pegwell Bay

**No. of Stills: 21** **Mins of Video: 12:16** **Track Length: 153m**

**Site Selection Criteria**

Camera transect to investigate a potential sensitive habitat within high-intensity HSG area and low-intensity spawning and nursery grounds.

**Analogue Interpretation**

High mottled reflectivity with mussel beds.

**Sediment Description**

Gravelly sand with mussel beds.

**Conspicuous Fauna**

**Cnidaria:** Actiniaria. **Bryozoa:** *Alcyonidium diaphanum., Flustra foliacea.* **Echinodermata:** *Asterias rubens.* **Bryozoan/Hydrozoan turf. Chordata:** *Callionymus lyra.* **Arthropoda:** *Inachus phalangium, Liocarcinus, Necora puber.* **Mollusca:** *Mytilus edulis.* **Porifera.**

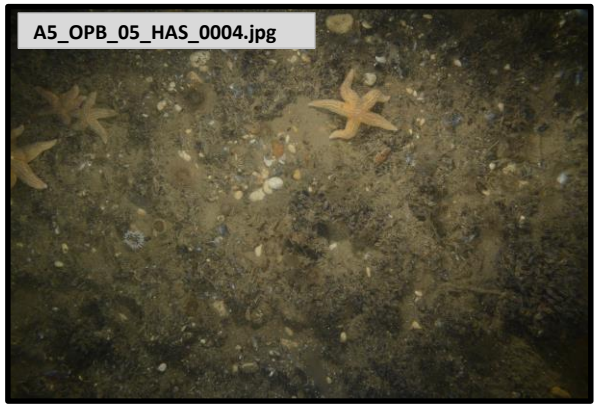
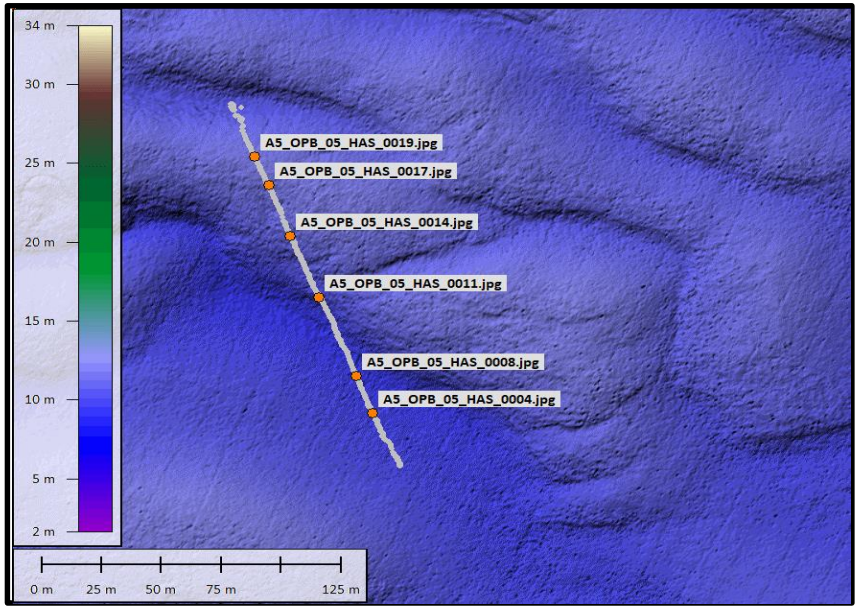



Photo Position: 396552 mE, 5686657 mN


Photo Position: 396530 mE, 5686710 mN


Photo Position: 396508 mE, 5686762 mN




**Client** nationalgrid

**Contractors** benthic solutions, NEXTGEO

Featured Photos  UW Video Track

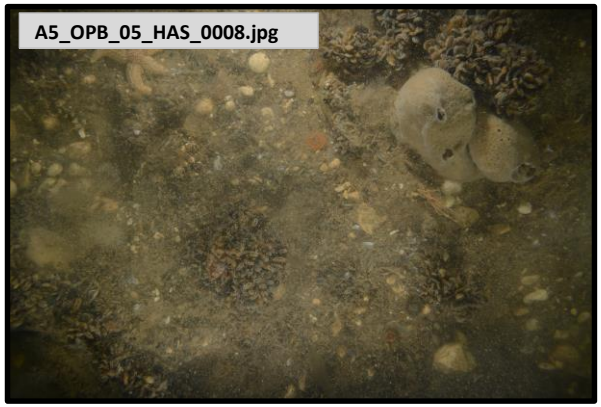



Photo Position: 396545 mE, 5686674 mN

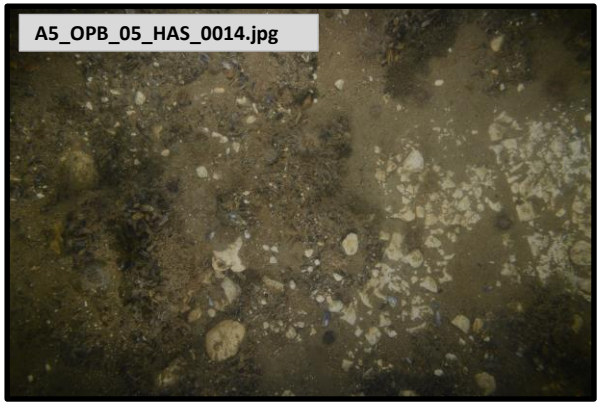



Photo Position: 396518 mE, 5686739 mN

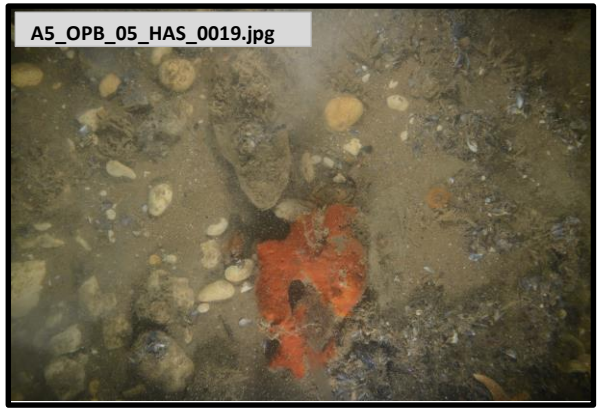



Photo Position: 396503 mE, 5686776 mN

Geodetic Infomation: Datum: ETRS1989 Projection: UTM Zone: 31 North Central Meridian: 03° East

# Habitat Summary Information: A5_OPB_Add_01

## Survey Area: Outer Pegwell Bay

**No. of Stills: 29** **Mins of Video: 12:21** **Track Length: 191m**

**Site Selection Criteria**

Camera transect to investigate the presence of *Mytilus edulis.*

**Analogue Interpretation**

Low mottled reflectivity with gravel and chalk.

**Sediment Description**

Fine sand with gravel and chalk patches.

**Conspicuous Fauna**

**Echinodermata:** *Asterias rubens* . **Bryozoan/Hydrozoan turf. Arthropoda:** *Inachus phalangium.* **Mollusca:** *Mytilus edulis.*


Photo Position: 396453 mE, 5686922 mN

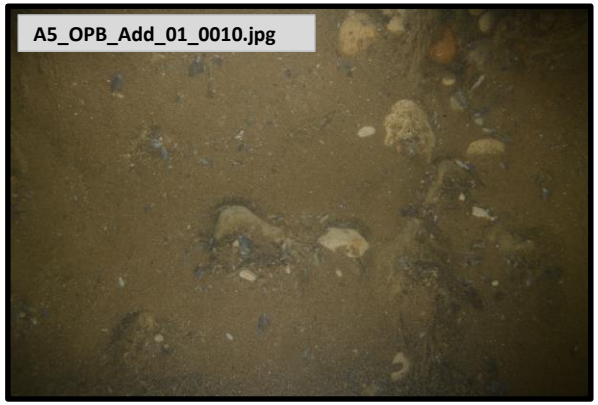
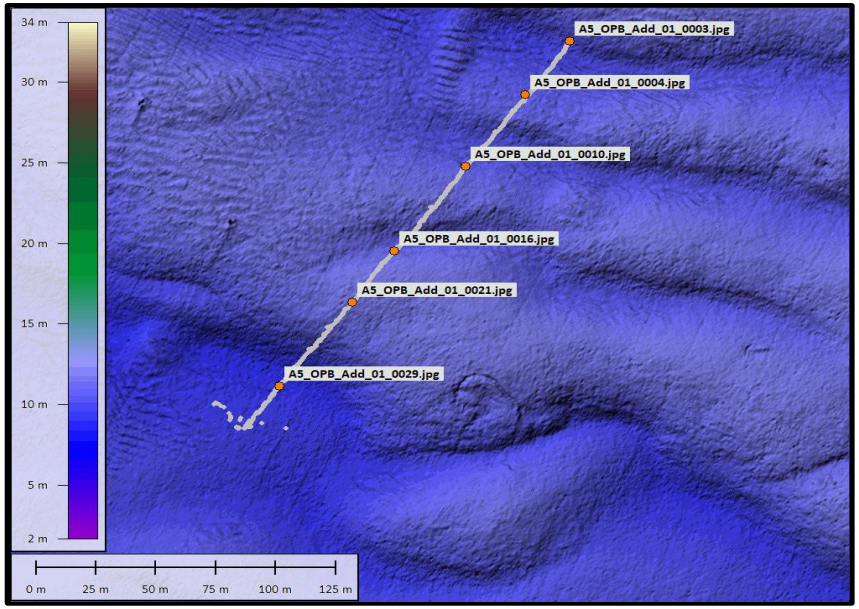



Photo Position: 396409 mE, 5686864 mN


Photo Position: 396362 mE, 5686801 mN




**Client** nationalgrid

**Contractors** benthic solutions, NEXTGEO

Featured Photos  UW Video Track


Photo Position: 396434 mE, 5686897 mN

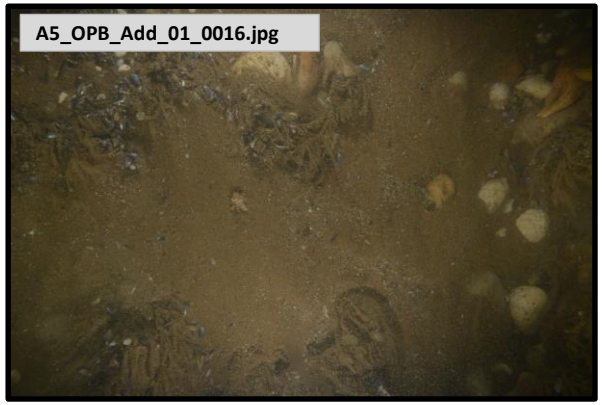



Photo Position: 396380 mE, 5686825 mN


Photo Position: 396331 mE, 5686762 mN

Geodetic Infomation: Datum: ETRS1989 Projection: UTM Zone: 31 North Central Meridian: 03° East

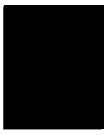
# APPENDIX K – SPEARMAN'S CORRELATION

| Spearman's Correlation Coefficient (Two-tailed) | | Water Depth (m) | Mean (mm) | Sorting | Skewness | Kurtosis | % Fines | % Sands | % Gravel |
|---|---|---|---|---|---|---|---|---|---|
| *Number of Data Points* | 8 | | | | | | | | |
| *p=0.05, 95% Significant* | 0.738 | | | | | | | | |
| *p=0.01, 99% Significant* | 0.881 | | | | | | | | |
| *p=0.001, 99.9% Significant* | 0.976 | | | | | | | | |
| **Water Depth (m)** | | | -0.810 | 0.119 | -0.071 | -0.405 | 0.619 | -0.024 | -0.476 |
| **Mean (mm)** | | | | 0.238 | 0.500 | 0.119 | -0.548 | -0.310 | 0.810 |
| **Sorting** | | | | | 0.429 | -0.881 | 0.548 | -0.857 | 0.714 |
| **Skewness** | | | | | | -0.238 | 0.048 | -0.595 | 0.595 |
| **Kurtosis** | | | | | | | -0.714 | 0.714 | -0.452 |
| **% Fines** | | | | | | | | -0.595 | -0.071 |
| **% Sands** | | | | | | | | | -0.643 |
| **% Gravel** | | | | | | | | | |

# APPENDIX L – ENVIRONMENTAL CONCESSION FORMS

| ECF_001<br>Environmental Concession Form (ECF) | | |
|---|---|---|
| Reference No: 2353 | *Office use Only* | Date: 02/09/2024 |
| This form should be completed to formally log and approve Client's environment concessions in circumstances of environmental sampling doesn't achieve the scope specifications.<br><br>It is recommended that protocol is agreed between the scientist and client representative on-board that this form would be completed at the end of the shift summarising the decision of the previous 12hours. | | |

| Section 1 – Overview | | |
|---|---|---|
| **Date / Shift :** | 29/08/2024-02/09/2024 – Day/night shift | **Origin/vessel:** Ievoli Grey |
| **Survey :** | Sea Link Environmental Survey | |
| **(Requester) Author :** | Charlotte Cooke | |
| **(Approver) Action by :** | Thomas Hinman/NGET | |

| Section 2 - Concessions | | | | | |
|---|---|---|---|---|---|
| **Station** | **Equipment used** | **Sample type** | **Criteria not met** | **Reason for Concession** | **Client's acceptance: yes / no and Initials** |
| A2_ES_03<br>29/08/2024<br>Day Shift | MOD 4.1<br>FWL | Video | Video/stills quality affected by sediment plumes | Some stills poor quality due to sediment plumes caused by current in shallow waters. Plumes also appear throughout HD video. However, data deemed sufficient enough for habitat assessment. | Yes<br>  |
| A3_NS_02_HAS<br>30/08/2024<br>Night shift | MOD 4.1<br>FWL | Video | Video/stills quality affected by sediment plumes | Some stills poor quality due to sediment plumes caused by current in shallow waters. Plumes also appear throughout HD video. However, data deemed sufficient enough for habitat assessment. | Yes<br>  |
| A5_OPB_01<br>30/08/2024<br>Night Shift | MOD 4.1<br>FWL | Video | Video/stills quality affected by sediment plumes | Some stills poor quality due to sediment plumes caused by strong current in shallow waters. Plumes also appear throughout HD video. However, data deemed sufficient enough for habitat assessment. | Yes<br>  |

| | | | | | |
|---|---|---|---|---|---|
| A5_OPB_01<br>30/08/2024<br>Night Shift | MOD 4.1<br>FWL | Nav Files | Gaps in nav files with no positioning data | Due to extremely shallow water (7-11m LAT) survey struggled to receive positional data resulting in gaps in the camera nav files (1 second to ~60 seconds with no positional data). Transects in area 5 could not be re-ran due to environmental conditions (strong fast-changing currents) causing the vessel to abandon area. | Yes [redacted] |
| A4_GLC_03<br>01/09/2024<br>Night Shift | MOD 4.1<br>FWL | Video | Video/stills quality affected by sediment plumes | No visibility due to strong currents following bad weather mixing sediment in the water column. Settings adjusted but no change. Transect abandoned and re-ran at a later date (A4_GLC_03_A) | Yes [redacted] |
| A4_GLC_02<br>01/09/2024<br>Day Shift | MOD 4.1<br>FWL | Video | Video/stills quality affected by turbidity | Some stills and video poor quality due to turbidity caused by current in shallow waters. However, data deemed sufficient enough for habitat assessment. | Yes [redacted] |
| A4_GLC_01<br>01/09/2024<br>Day Shift | MOD 4.1<br>FWL | Video | Video/stills quality affected by turbidity | Some stills and video poor quality due to turbidity caused by current in shallow waters. Progressively worse throughout transect. Frequent sediment plumes. However, data deemed sufficient enough for habitat assessment. | Yes [redacted] |
| A4_GLC_03_A<br>01/09/2024<br>Day Shift | MOD 4.1<br>FWL | Video | Video/stills quality affected by sediment plumes | Some stills poor quality due to sediment plumes caused by current in shallow waters. Plumes also appear throughout HD video. However, data deemed sufficient enough for habitat assessment. | Yes [redacted] |
| A5_OPB_04_HAS<br>01/09/2024<br>Night Shift | MOD 4.1<br>FWL | Video | Video/stills quality affected by turbidity | Some stills and video poor quality due to turbidity caused by current in extremely shallow waters. Frequent sediment plumes. However, | Ye [redacted] |

| | | | | | |
|---|---|---|---|---|---|
| | | | | data deemed sufficient enough for habitat assessments. | |
| A5_OPB_04_HAS 01/09/2024 Night Shift | MOD 4.1 FWL | Nav Files | Gaps in nav files with no positioning data | Due to extremely shallow water (7-11m LAT) survey struggled to receive positional data resulting in gaps in the camera nav files (1 second to ~60 seconds with no positional data). Transects in area 5 could not be re-ran due to environmental conditions (strong fast-changing currents) causing the vessel to abandon area. | Yes [redacted] |
| A5_OPB_03 01/09/2024 Night Shift | MOD 4.1 FWL | Video | Video/stills quality affected by sediment plumes | Difficult for vessel to get heading correct for camera flight angle. Transect abandoned for safety reasons | Yes [redacted] |
| A5_OPB_Add_01 02/09/2024 Night Shift | MOD 4.1 FWL | Video | Video/stills quality affected by turbidity | Some stills and video poor quality due to turbidity caused by current in extremely shallow waters. Frequent sediment plumes. However, data deemed sufficient enough for habitat assessments. | Yes [redacted] |
| A5_OPB_06_HAS 02/09/2024 Day Shift | MOD 4.1 FWL | Video | Video/stills quality affected by turbidity | Transect abandoned before starting line due to vessel unable to hold position due to fast changing strong currents. Remaining stations in area 5 abandoned completely due to safety reasons. | Yes [redacted] |
| A4_GLC_02 01/09/2024 Night Shift | DVV/HG | PC, F1, F2, F3 | No samples taken | No sampleable sediment at original location or any adequate alternative locations with Dual Van Veen or Hamon grab. | Yes [redacted] |
| A4_GLC_01 01/09/2024 Day Shift | DVV/HG | F1, F2, F3 | Small samples | Difficult to obtain good samples at original location or any adequate alternative locations due to seabed of hard substrate. Small "no samples" retained for F1, F2 and F3. | Yes [redacted] |
| A4_GLC_03 01/09/2024 | HG | PC, F1, F2 | Small samples | Difficult to obtain good samples at original location or | Yes [redacted] |

| | | | | | |
|---|---|---|---|---|---|
| Day Shift | | | | any adequate alternative locations due to seabed of hard substrate. Small "no samples" retained for PC, F1 and F2. Not enough sediment retained in grabs for small F3. | |
| A5_OPB_02 | Camera/Grab | Video, PC, F1, F2, F3 | No video/stills or samples taken | No video or grab sample obtained due to vessel abandoning area 5 because of dangerous conditions in extremely shallow waters. | Yes [redacted] |
| A5_OPB_03 | Camera/Grab | Video, PC, F1, F2, F3 | No video/stills or samples taken | No video or grab sample obtained due to vessel abandoning area 5 because of dangerous conditions in extremely shallow waters. | Yes [redacted] |
| A5_OPB_06_HAS | Camera | Video | No video/stills taken | No video or grab sample obtained due to vessel abandoning area 5 because of dangerous conditions in extremely shallow waters. | Yes [redacted] |
| A5_OPB_07_HAS | Camera | Video | No video/stills taken | No video or grab sample obtained due to vessel abandoning area 5 because of dangerous conditions in extremely shallow waters. | Yes [redacted] |

| Section 3 – Signatures | | | | | | |
|---|---|---|---|---|---|---|
| Requested by : | Name : | [redacted] | Sign : | [redacted] | ate : | 02/09/2024 |
| Approved by : | Name : | [redacted] | Sign : | [redacted] | ate : | 3/9/24 |

The Requester/Author of this form is to send a copy the Approver/Actionee. The pending copy will be held on the management system until the closeout form is completed and received by the QHSE Department.

# APPENDIX M – MANAGEMENT OF CHANGE

| Management of Change (MOC) Form | | |
|---|---|---|
| Reference No: | *Office use Only* | Date: 02/09/2024 |
| This form should be completed to formally log, track and closeout changes to controlled documentation and procedures. | | |

| Section 1 – Overview | | |
|---|---|---|
| **Date:** | 02/09/2024 | **Origin/vessel: Ievoli Grey** |
| **Title :** | Additional transects for potential *Sabellaria spinulosa* reef and *Mytilus edulis* beds | |
| **(Requester) Author :** | Charlotte Cooke | |
| **(Approver) Action by :** | | |
| **Target Comp Date :** | | |

**Section 2 – Actions Required**

- Two additional transects in Area 2 to be added in order to further ground-truth high reflectivity mottled areas of potential *Sabellaria spinulosa.*
- An extension of the transect A2_ES_05_HAS to further ground-truth area following observations of *S. spinulosa* towards the end of the camera transect.
- This follows an initial find of rock encrusting *S. spinulosa* on transect A2_ES_05_HAS. Further review of bathymetry and SSS done by BSL field crew targeting similar geophysical features to the ground-truthed areas of *S. spinulosa* reef.
- One additional transect to be added in Area 5 to ground-truth high reflectivity areas of *Mytilus edulis* beds.
- This follows the initial findings of dense aggregations of *M. edulis* at A5_OPB_05_HAS. Further review of bathymetry and SSS to be done by BSL field crew targeting similar geophysical features to the ground-truthed areas of *M. edulis* beds.

| Approved: Yes [redacted] | Not Approved: |
|---|---|

**Section 3 – Closeout Notes (What action has been taken)**

- BSL field staff liaised with BSL office and NGET representative onboard about adding further *S. spinulosa* transects immediately after observations of *S. spinulosa* encrusting potential *Mytilus edulis* beds at stations A2_ES_05_HAS and A5_OPB_05_HAS, respectively. Client representative verbally accepted the three suggested additional transects and the extension of the original transect.

- Three additional transects were proposed on the 31/09/2024 to better delineate reefy areas. These transects were approved by NGET.

Investigation to be completed offshore and additional interpretation and reporting will need to be carried out onshore during the analysis and reporting phase.

| | | | | | |
|---|---|---|---|---|---|
| Close out Completed by : | Name : [redacted] | Sign : [redacted] | | Date : | 02/09/2024 |
| Close out Checked by : | Name : | Sign : | | Date : | 3/9/24 |

The Requester/Author of this form is requested to send a copy to the respective Senior Project Manager [redacted] and also the Operations Manager pending close out. The pending copy will be held on the management system until the closeout form is completed. Note: Close out is complete only when then actions required have been actioned and the close out notes reflect the action required.

## APPENDIX N – SERVICE WARRANTY

This report, with its associated works and services, has been designed solely to meet the requirements of the contract agreed with you, our client. If used in other circumstances, some or all the results may not be valid, and we can accept no liability for such use. Such circumstances include different or changed objectives, use by third parties, or changes to, for example, site conditions or legislation occurring after completion of the work. In case of doubt, please consult Benthic Solutions Limited. Please note that all charts, where applicable should not be used for navigational purposes.

National Grid plc
National Grid House,
Warwick Technology Park,
Gallows Hill, Warwick.
CV34 6DA United Kingdom

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