Environmental Baseline and Habitat Assessment Investigation

Rum2

August 2025

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Table of Abbreviations

Acronym	Description	Acronym	Description
AMBI	AZTI Marine Biotic Index	AQC	Analytical Quality Control
BAC	Background Assessment Concentration	BC	Background Concentrations
BCI	Biotic Coefficient Index	BDC	Biodiversity Committee
BGS	British Geological Survey	BSL	Benthic Solutions Limited
CEFAS	Centre for Environment, Fisheries and Aquaculture Science	CEMP	Coordinated Environmental Monitoring Programme
CM	Central Meridian	COP15	15th Conference of Parties
CV	Coefficient of Variation	DG	Day Grab
DTM	Digital Terrain Model	DVV	Double Van Veen
EBS	Environmental Baseline Survey	EC	European Commission
ED50	European Datum 1950	EEC	European Economic Community
EG	Ecological Groups	EMODnet	European Marine Observation and Data Network
EOL	WROV End Of Line	EPA	Environmental Protection Agency
ERL	Effect Range Low	ERM	Effect Range Median
EU	European Union	EUBS	European Union Biodiversity Strategy
EUNIS	European Nature Information System	FID	Flame Ionisation Detector
FOCI	Feature of Conservation Interest	GC	Gas Chromatography
GC-MS	Gas Chromatography-Mass Spectrometry	GC-MS-MS	Gas Chromatography-Tandem Mass Spectrometry
GPS	Global Positioning System	HAS	Habitat Assessment
HC	Hydrocarbons	HD	High Definition
HM	Heavy metals	ICP-MS	Inductively Coupled Plasma Mass Spectrometry
IMS	Industrial Methylated Spirit	JNCC	Joint Nature Conservation Committee
KP	Kilometre Point	LAT	Lowest Astronomical Tide
MBES	Multibeam Echosounder	MCZ	Marine Conservation Zone
MDS	Multi-Dimensional Scaling	MESH	Mapping European Seabed Habitats
MMO	Marine Management Organisation	MPA	Marine Protected Area
NC	Non Calculable	NMBAQC	National Marine Biological Association Quality Control
NMCAQC	National Marine Chemical Association Quality Control	NMCAG	National Marine Chemistry Advisory Group
NMEAQC	National Marine Ecotoxicological Association Quality Control	NMMP	National Marine Monitoring Programme
NOAA	National Oceanic and Atmospheric Administration	NSTA	North Sea Transition Authority
OSPAR	Oslo-Paris Commission	PC	Physico-Chemistry
PCA	Principal Component Analysis	Ph	Phytane
PMF	Priority Marine Feature	PRIMER	Plymouth Routines in Multivariate Ecological Research
PSA	Particle Size Analysis	PSD	Particle Size Distribution
ROV	Remotely Operated Vehicle	SACFOR	Superabundant, Abundant, Common, Frequent, Occasional, Rare
SACs	Special Areas of Conservation	SBF	Seabed Features
SBL	Scottish Biodiversity List	SCI	Sites of Community Importance
SD	Standard Deviation / Standard Definition	SG	Spawning Ground
SIC	Single Ion Current	S&HSG	Sandeel & Herring Spawning Ground
SIMPROF	Similarity Profiling	SOCI	Species of Conservation Interest

Acronym	Description	Acronym	Description
SOP	Standard Operating Procedure	sp.	Species
SPA	Special Protection Areas	SSS	Side Scan Sonar
UK	United Kingdom	UKAS	United Kingdom Accreditation Service
UKBF	UK Biodiversity Framework	UKCS	United Kingdom Continental Shelf
UKOOA	United Kingdom Offshore Operators Association	UTC	Universal Time Coordinated
UTM	Universal Transverse Mercator	UW	Underwater

Executive Summary

Under contract to Mowi Scotland Limited (Mowi), a habitat and baseline survey was conducted at the proposed Rum2 development site off Scotland's west coast. Environmental operations took place aboard the *Benthic Surveyor*, supplied by Benthic Solutions Limited (BSL), between the 11th and 15th of May 2025. The survey aimed to characterise seabed sediments and biological communities and identify habitats of conservation interest, including Priority Marine Features (PMFs) and OSPAR-listed habitats. This report presents the results from the habitat and sensitivity assessment, as well as the environmental baseline results (macrofauna and total organic carbon (TOC)).

Side scan sonar (SSS) footage acquired along proposed camera transects confirmed a generally uniform muddy sand seabed with subtle textural variations. Particle size analysis (PSA) revealed predominantly fine sediments (mean fines: 51.1%), with sandier substrates in the shallower southwest and muddier sediments in the deeper northeast. Multivariate PSA analysis grouped stations into four clusters reflecting this gradient, from 'Muddy Sand' (Cluster '*a*') through transitional sediments (Clusters '*b*' and '*d*') to 'Sandy Mud' and 'Mud' (Cluster '*c*'). Total organic carbon (TOC) concentrations were overall low (mean 0.82%±0.13SD), with slightly higher values noted near the existing fish farm, although still considered low for the survey area.

Drop-down video confirmed a muddy seabed characterised by widespread burrows and diverse megafauna. Habitat complexity followed a spatial gradient across three distinct levels. The outer survey area corresponded to the JNCC Level 4 habitat SS.SMu.CFiMu 'Circalittoral fine mud' (EUNIS: MC621), while the central and central-eastern section supported the JNCC Level 5 biotope SS.SMu.CFiMu.SpnMeg 'Seapens and burrowing megafauna in circalittoral fine mud' (EUNIS: MC6216). The highest ecological sensitivity was recorded in the northeastern deeper transects (Rum2_TR_03 and Rum2_TR_04A), which were classified as the JNCC Level 6 biotope SS.SMu.CFiMu.SpnMeg.Fun 'Seapens and burrowing megafauna with *Funiculina quadrangularis* in undisturbed circalittoral fine mud' (EUNIS: MC62161), reflecting the presence of *Funiculina quadrangularis* in undisturbed Atlantic fine mud, a PMF and OSPAR-listed species

Burrow densities ranged from 'Frequent' to 'Common' (SACFOR), supporting classification of the site as the Scottish Priority Marine Feature 'Burrowed Mud'. The presence of *Funiculina quadrangularis* also confirmed the Level 6 areas as the OSPAR Threatened/Declining Habitat 'Seapen and Burrowing Megafauna Communities'. Sediment analysis indicated that all stations were unsuitable for sandeel nursing and spawning grounds.

Univariate and multivariate analyses revealed that macrofaunal communities were dominated by infauna, followed by colonial and solitary epifauna. Mollusca were the most abundant

group in terms of number of individuals, while Annelida showed the greatest species richness. Ecological indices (AMBI, IQI and diversity metrics) indicated predominantly good to high ecological status, reflecting a stable environment with minimal measurable influence from the neighbouring Rum fish farm. Multivariate analysis identified three distinct faunal clusters. Cluster '*a*' generally associated with the deepest stations and fine sediments, Cluster '*b*' generally associated with the shallowest stations and sandy sediments, and Cluster '*c*' comprising two stations closest to the existing fish farm. All clusters were dominated by Mollusca and Annelida, with *Turritellinella tricarinata*, *Thyasira flexuosa* and *Nephtys incisa* identified as key defining species across the site. Significance testing revealed strong correlations between community composition, sediment type, TOC and water depth. The prevalence of pollutant-intolerant taxa suggests that community variations are primarily driven by natural environmental gradients rather than organic enrichment from the neighbouring Rum fish farm site.

1 Introduction

1.1 Project Information

Client:	Mowi Limited (MOWI)
Project:	Rum2 Environmental Baseline and Habitat Assessment Survey
Contractor:	Benthic Solutions Limited (BSL)
Contractor Reference:	2534
Survey Areas:	Rum2 Proposed Fish Farm
Survey Type:	Environmental Baseline and Habitat Assessment Survey
Survey Period:	09/05/2025-16/05/2025
Survey Vessel:	*Benthic Surveyor*
Survey Equipment:	1 x Day Grab, 1 x Dual Van Veen, 1 x Kongsberg 14208,1 x BSL pressure camera, 1 x Starfish SSS, 1 x 400m umbilical, 1 x 50m umbilical, 1x USB GPS
Client Project Manager:	[redacted]@mowi.com)
BSL Project Manager:	[redacted]@benthicsolutions.com)

1.2 Project Description

Mowi Scotland Limited (Mowi) contracted Benthic Solutions Limited (BSL) for the provision of an Environmental Baseline Survey (EBS) at the proposed Rum2 site and a Compliance Monitoring Survey at the existing Rum site, located off the Isle of Rum, one of the Small Isles of the Inner Hebrides, west of Scotland (Figure 1-1). This report details the findings of the proposed Rum2 site only.

Survey operations were carried out between the 11th and 15th May 2025 on board the BSL *Benthic Surveyor* (previously *Three Counties*) vessel. Side scan sonar (SSS) data was also acquired by BSL using the Blueprint Subsea Starfish 452F lowered from the central stern of the vessel (Figure 2-1).

Seabed video footage were acquired using a towed live-feed Kongsberg camera system mounted on a BSL camera sled frame with a BSL pressure camera system and associated LED lighting. High definition (HD) and standard definition (SD) video footage and high-quality underwater stills were obtained along each transect (Appendix VI) surveyed to identify any seabed features and fauna. Grab sampling was also conducted for physico-chemical and macrofaunal analysis using a BSL Dual Van Veen grab (DVV) at 17 stations.

Figure 1-1 Overview Map Showing Rum2 in the Context of Scotland

1.3 Scope of Work

In May 2025, Mowi commissioned BSL to complete a video inspection survey and sediment sampling of the proposed Rum2 fish farm. The scope of work required 4 high quality camera transects and 17 sampling stations to assess the distribution of seabed habitats and the presence of any species which could be impacted by the fish farming activity.

The main objectives of the habitat and baseline assessment survey were:

- Acquire baseline data of sediment characteristics within the survey area using SSS data, video acquisition and sediment sampling.
- Identify and assess any existing pollutants within the sediment, in particular, those related to existing fish farm activities within the survey area.
- Identify sensitive habitats or species susceptible to disturbance from fish farm related activities.
- Establish an understanding of the natural variation in environmental conditions against which the environmental impact of future development activities can be assessed.

The Rum2 proposed sampling locations are tabulated in Table 1-1, with the proposed camera transects presented in Table 1-2. Both are visually illustrated in Figure 1-2.

Table 1-1 Planned Survey Sampling Locations

Geodesy: British National Grid, OSGB36		
Station Name	Easting (m)	Northing (m)
Rum2_01	140711	803063
Rum2_02	140619	803125
Rum2_03	140862	803149
Rum2_04	140967	803296
Rum2_05	140678	803288
Rum2_06	140557	803378
Rum2_07	140431	803264
Rum2_08	140439	803460
Rum2_09	140228	803622
Rum2_10	140433	803667
Rum2_11	140600	803699
Rum2_12	140645	803490
Rum2_13	140862	803499
Rum2_14	140414	803858
Rum2_15	140517	803031
Rum2_16	140277	803214
Rum2_17	140211	803387

Sampling locations at the Rum2 environmental baseline site were selected using an intelligent design based on existing video (and SSS) data. This consisted of 17 grab locations and 4 long camera transects (~600m to ~800m) covering the site in a grid pattern. Prior to the camera transects, side scan sonar is to be acquired over the proposed transect lines.

Table 1-2 Planned Survey Strategy Camera Transect (with SSS) Locations

Geodesy: British National Grid, OSGB36				
Transect		**Easting (m)**	**Northing (m)**	**Length (m)**
Rum2 TR_01	SOL	140136.922	803576.001	845
	EOL	140821.943	803080.010	
Rum2 TR_02	SOL	140226.033	803717.953	842
	EOL	140902.046	803215.957	
Rum2 TR_03	SOL	140613.578	803713.389	602
	EOL	140277.313	803213.795	
Rum2 TR_04	SOL	140869.140	803513.552	618
	EOL	140502.130	803015.879	

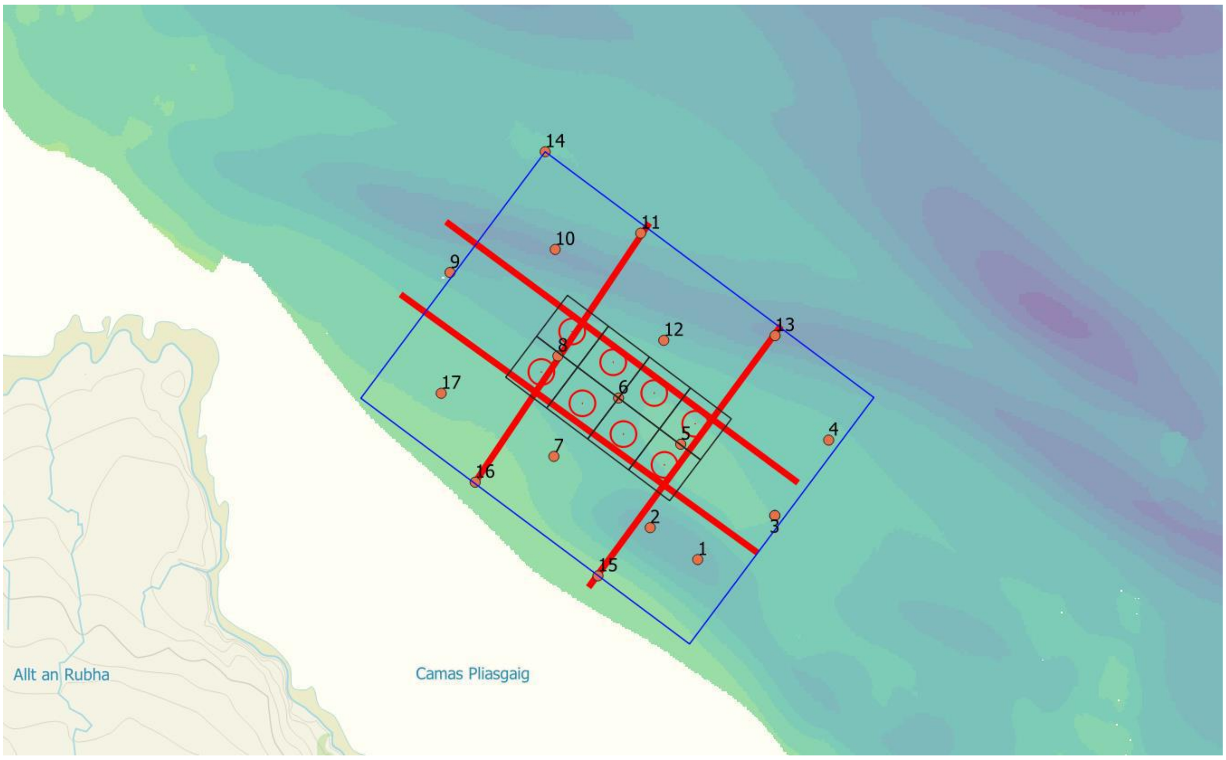


Figure 1-2 Rum2 Proposed Sampling Stations and Camera Transects

1.4 Background and Existing Information

The proposed Rum2 site is located off the Isle of Rum, one of the Small Isles of the Inner Hebrides, west of Scotland. As this is a newly proposed site, no historical information is available however, there is the existing Rum fish farm site to the southeast. The previous baseline video survey report (Marine Harvest Scotland Limited, 2016) was provided by Mowi and used where applicable. Given the close proximity and similar site characteristics, both locations are expected to share a comparable environmental and legislative background.

1.4.1 Legislative Background

Legislation pertaining to protected habitats and species, as well as the promotion of biodiversity in UK waters, has been reviewed to ensure that habitats within the survey area are accurately described and assessed for ecological value or sensitivity to disturbance under such regulations. These legislative frameworks offer essential legal and policy guidance for conserving biodiversity, safeguarding vulnerable habitats, and promoting sustainable management of marine ecosystems, ensuring the survey complies with both national and international conservation objectives.

1.4.1.1 UK Biodiversity Framework

The UK Biodiversity Framework (UKBF), published in May 2024, supersedes both the previous UK Post-2010 Biodiversity Framework and the UK Biodiversity Action Plan (UKBAP). Developed in response to the Kunming Montreal Global Biodiversity Framework agreed upon at the 15th Conference of the Parties (COP15) of the Convention on Biological Diversity in December 2022, the UKBF outlines the UK's strategic approach to biodiversity conservation (JNCC, 2024).

The UKBF emphasises collaborative efforts among the UK's four nations to meet international biodiversity commitments. It identifies key activities that can be more effectively achieved through joint action, enhancing the efficiency and impact of conservation initiatives across the UK.

In Scotland, the Nature Conservation (Scotland) Act 2004 and the Wildlife and Natural Environment (Scotland) Act 2011 provide the legal framework for biodiversity conservation (NatureScot, 2024). This is supported by the Scottish Biodiversity List (SBL), which identifies species and habitats of principal importance, as well as the Priority Marine Features (PMFs), which highlight critical marine species and habitats requiring protection. A total of 81 PMFs have been identified in the seas around Scotland and include: intertidal mudflat, maerl beds, burrowed mud, blue and horse mussel beds and lesser sandeels.

1.4.1.2 EMODnet Predicted Habitats 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, 2019). The broad-scale seabed habitat map is a predictive delineation of habitats within all European seas to the EUNIS classification system (EMODnet, 2019). 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.

1.4.1.3 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 14 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 own 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 an intertidal environment and coastal/open water marine environment include: ‘intertidal mudflats’, ‘intertidal *Mytilus edulis* beds on mixed and sandy sediments’, ‘kelp forests’, ‘*Sabellaria spinulosa* reefs’, ‘*Arctica islandica*’, ‘seapen and burrowing megafauna communities’, ‘*Modiolus modiolus* beds’.

1.4.1.4 The UK 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 exist for chemical monitoring (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 (MARG, 2020).

1.4.1.5 European Habitats Directive

The United Kingdom (including Scotland), 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.

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). In Scotland, environmental regulation responsibilities shifted to the Scottish Government and its agencies following Brexit. The Nature Conservation (Scotland) Act 2004 and the Marine (Scotland) Act 2010 continue to manage habitat and species protection (Scottish Government, 2020). The Scottish Government has updated these regulations to align with post-Brexit requirements, with oversight by NatureScot and Marine Directorate to ensure regional enforcement (Scottish Government, 2021; NatureScot, 2022; Marine Scotland, 2022).

2 Field Survey and Analytical Methods

2.1 Geodetic Parameters

The geodetic parameters used are provided below in Table 2-1.

Table 2-1 Geodetic Parameters

Required Datum		
Reference Spheroid	OSGB36	
Projection Parameters		
Projection	Transverse Mercator	
Central Meridian	-2.0000	
Scale Factor	0.9996	
Latitude of Natural	49.0000	
False Easting	400,000m	
False Northing	-100,000m	
Scale Factor at Origin	0.9996 at CM	

Client supplied information was given in both geographical (Latitude and Longitude) as well as British Grid (OSGB36)

2.2 Logistics

Environmental survey operations were carried out across the Rum2 and Rum sites by BSL from the 11th to the 15th of May 2025 (date of first environmental operations (SSS) to date of final sample on deck) on a 12-hour operational basis. The summarised timings for the different operational components of the survey are provided in Table 2-2 where station names were shortened for clarity.

Table 2-2 Summary of Operations

Date	Activity	Details of Activity
09/05/2025	Travel; Standby	BSL personnel travel from Norwich to Mallaig BSL personnel embark vessel. Standby until mobilisation begins tomorrow AM
10/05/2025	Standby Mobilisation Transit Mobilisation Standby	Standing by for mobilisation Mobilisation of BSL equipment Transit to Rum site Side scan sonar test run Final set up of equipment Standing by for operations to commence tomorrow AM

Date	Activity	Details of Activity
11/05/2025	Standby Transit Env Operations Transit Calibrations/Testi ng Standby	Standing by for operations Transit to Rum2 site Side scan sonar operations Camera operations. TR_01 completed but stills cam failed half way through. Camera troubleshooting due to stills cam failing. TR_02 attempted but abandoned due to entanglement with fishing gear.TR_03 attempted but abandoned due to problems with camera live stream Transit to Rum Moored up in Rum. Troubleshooting camera Standing by for operations tomorrow AM
12/05/2025	Standby Transit Env Operations Transit Standby	Standing by for operations Transit to Rum2 site Camera operations. Troubleshooting camera Camera operations. TR04_A, TR03, TR02_A and TR_01_A completed Transit to Mallaig for fuel and stores, setting up for grab operations Moored up in Mallaig. Preparation for grab operations Standing by for grab operations tomorrow AM
13/05/2025	Standby Transit Env Operations Transit Standby	Standing by for operations moored up in Mallaig Transit to Rum2 site Grab operations at Rum2 site. All grab locations completed Transit to moor up in Rum Moored up in Rum. Preparation for Rum monitoring survey Standing by for grab operations at Rum site tomorrow AM
14/05/2025	Standby Transit Env Operations Transit Standby	Standing by for operations moored up in Rum Transit to Rum fish farm Grab operations at Rum fish farm. T1 and T3 completed Transit to moor up in Rum Moored up in Rum. Preparation for Rum monitoring survey Standing by for grab operations at Rum site tomorrow AM
15/05/2025	Standby Transit Env Operations Transit Demobilisation Standby	Standing by for operations moored up in Rum Transit to Rum fish farm Grab operations at Rum fish farm. T2 and T4 completed Drop down camera operations at T3 125_35m Survey completed, transit to Mallaig, demobilisation begins Demobilisation at Mallaig Harbour Standby for travel home tomorrow AM
16/05/2025	Standby Demobilisation Travel Demobilisation Travel	Standing by to begin travel back to Norwich Frozen sample transferred to cool boxes and demobilised BSL personnel disembark vessel and travel back to Norwich BSL personnel arrive at BSL office and drop off samples BSL personnel travel from BSL office to home

2.3 Data Acquisition

The environmental sampling strategy was developed by the client and BSL prior to sampling. The camera transects were pre-defined by the client before the survey and were used to select the sampling locations in the field using the intelligent sampling design strategy based on the video data. Field sampling was carried out during 12 hours of daylight hours in accordance with BSL's approved standard operating procedures and client project specifications.

2.3.1 Geophysical Data

Side scan sonar (SSS) data was acquired by BSL using the Blueprint Subsea Starfish 452F lowered from the central stern of the vessel (Figure 2-1). Surface positioning was acquired using a differential GPS system with an external antenna located behind the wheelhouse, near the stern, close to the deployment location on the seabed frame. The data string was continuously recorded and monitored using a computer, whilst a further string was overlaid directly onto the video recording system for annotation on the standard definition targeting video file. The overlay string also indicated time, date, speed over ground (SOG) and course over ground (COG). During the geophysical surveying, the survey lines covered an approximate area of 1.0 km x 0.2 km. The range was set to 50m either side of the tow fish. In total, four SSS lines were run over the planned camera transect lines prior to camera operations. The extent of the SSS survey area is illustrated in Figure 2-4.

Figure 2-1 Blueprint Subsea StarFish 452F Side Scan Sonar

2.3.2 Seabed Photography and Video

Camera transects were carried out using a towed live-feed Kongsberg camera system mounted on a BSL camera sled frame with a BSL pressure camera system and associated LED lighting with scaling lasers set at 10cm. A total of four camera transects were carried out across the Rum2 site (Rum2_TR_01_A, Rum2_TR_02_A, Rum2_TR_03 and Rum2_TR_04_A; transects

Rum2_TR_01, Rum2_TR_02 and Rum2_TR_04 were repeated due to interruptions to the Kongsberg camera system. Transects were between 602m and 845m in length.

For each camera transect, positions were logged by the BSL scientist onboard, recording camera location (easting and northing), using a proprietary BSL GPS system connected to a laptop with Global Mapper V23 software. The GPS antenna was situated as close to the deployment point as feasible to minimise any potential offsets. The depths of each logged position were provided from the onboard single beam echosounder.

The location and orientation of the transects were predefined prior to the survey in consultation with MOWI. The Kongsberg camera system was deployed to the seabed while holding position approximately 5m from the SOL. Upon viewing the seabed using the livestream video feed, the vessel began moving off at a speed of ~0.5kts along the transect. Once moving, the camera was regularly lowered to the seabed to capture high-quality still images in conjunction with HD video footage. The live feed SD video footage was used for guidance purposed only. HD video was recorded via a HD pressure camera attached to the camera frame and was overlain with time and date. The height of the camera was controlled by the BSL scientist viewing the video live feed via the winch operator. Upon finishing the camera transect, the camera system was recovered, where stills and video data were downloaded and backed up.

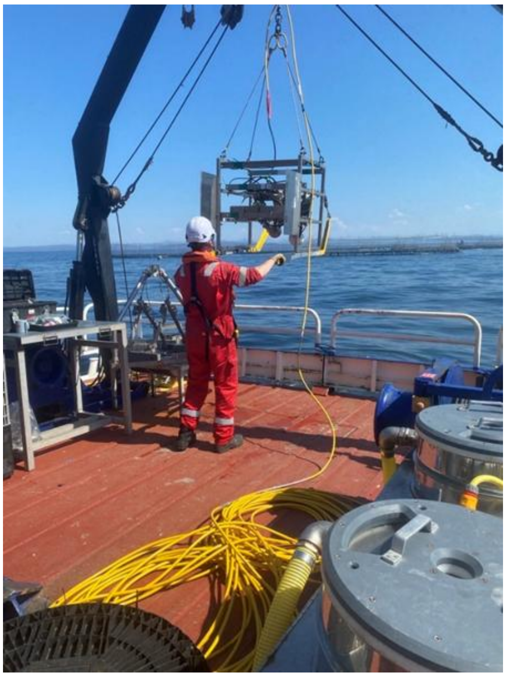


Figure 2-2 Kongsberg and Pressure Camera Towed Camera System Deployment

Table 2-3 Summary of Completed Camera Transects

Transect		Easting (m)	Northing (m)	Date	Time (UTC)	Video footage (hh:mm:ss)	No. of stills	HD Video
Rum2_TR_01	SOL	140 165	803 553	11/05/2025	13:48:50	00:39:46	67	Y
	EOL	140 833	803 072		14:28:36			
Rum2_TR_01_A	SOL	140 806	803 084	12/05/2025	13:48:50	00:39:45	70	Y
	EOL	140 177	803 546		13:56:24			
Rum2_TR_02	SOL	140 231	803 715	11/05/2025	16:53:33	00:12:37	7	Y
	EOL	140 299	803 652		17:06:10			
Rum2_TR_02_A	SOL	140 919	803 211	12/05/2025	11:57:03	00:42:27	67	Y
	EOL	140 217	803 725		12:39:30			
Rum2_TR_03	SOL	140 269	803 208	12/05/2025	10:26:40	00:50:58	101	Y
	EOL	140 633	803 703		11:16:35			
Rum2_TR_04	SOL	140 583	803 492	11/05/2025	17:45:10	00:29:34	40	Y
	EOL	140 590	803 151		18:14:44			
Rum2_TR_04_A	SOL	140 567	803 096	12/05/2025	08:41:25	00:34:45	48	Y
	EOL	140 859	803 512		09:15:35			

2.3.3 Grab Sampling

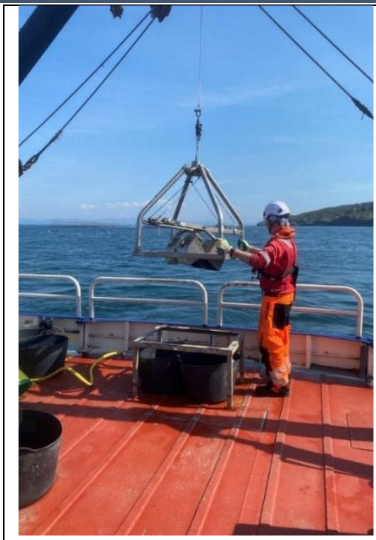
The BSL Dual Van Veen (DVV; 2 x 0.1m^2) was deployed successfully at all 17 proposed stations (Figure 2-3). A full suite of physico-chemistry (PSA, TOC and Spare) samples and one faunal (F1) sample were acquired at all 17 stations. A summary of the grab samples acquired are tabulated in Table 2-4 and illustrated in Figure 2-4.

Recovered sediment samples were processed onboard (Figure 2-3) the survey vessel by trained environmental personnel. Sediment samples were photographed and in-situ sediment observations such as Munsell colour and sediment type were logged. At all stations, physico-chemistry samples (particle size analysis (PSA), Total Organic Carbon (TOC), a spare sample and a sample for benthic fauna (F1) were acquired (Table 2-5).

Except for sediment biology (F1 macrofauna), all samples were immediately frozen and stored (-18^{o}C) for later transportation to the laboratory upon demobilisation. Macrofaunal samples were sieved in the field using a *Wilson* Auto-siever (WAS) over a 1000µm sieve, and subsequently fixed in a 10% solution of buffered formalin with Rose Bengal stain and subsequently stored at ambient room temperature. Photographs of the DVV surface sediments and sieve were taken to document the macrofaunal residues retained after sieving.

Of the original 17 proposed stations, all were successfully sampled for a full suite of physico-chemical and biological samples of analysis of the following parameters:

- Total Organic Carbon (stored in doubled lined zip lock plastic bag–- frozen).
- Particle size analysis (stored in doubled lined zip lock plastic bag–- frozen).
- Spare (stored in doubled lined zip lock plastic bag–- frozen).
- Macrofauna (sieved over 1000µm mesh; stored in 10% formalin solution with Rose Bengal stain in 1, 3 or 5 litre plastic buckets).



DVV Deployment

Sample Processing with Wilson Auto-Siever

Figure 2-3 Dual Van Veen Grab Deployment and Fauna Sample Processing

Table 2-4 Rum2 Survey Area Acquired Sample Locations

Geodesy: British National Grid, OSGB36				
Station	**Depth (m)**	**Recovery (%)**	**Easting**	**Northing**
Rum2_01	44	90	140715.9	803071.6
Rum2_02	43	90	140630.6	803126.1
Rum2_03	30	80	140842.2	803164.2
Rum2_04	36	70	140997.3	803322.1
Rum2_05	33	70	140679.4	803303.1
Rum2_06	30	90	140571.2	803392.2
Rum2_07	27	70	140430.0	803276.6
Rum2_08	34	90	140436.5	803455.1
Rum2_09	43	95	140244.0	803641.8
Rum2_10	49	95	140425.5	803688.8
Rum2_11	40	95	140600.3	803710.2
Rum2_12	36	90	140638.1	803494.6
Rum2_13	50	95	140872.6	803503.9
Rum2_14	36	80	140413.6	803891.6
Rum2_15	23	80	140520.5	803033.7
Rum2_16	23	50	140288.4	803221.5
Rum2_17	28	80	140221.8	803406.7

Table 2-5 Summary of Grab Sample Acquisition

Geodesy: British National Grid, OSGB36								
Station	Date	Time (UTC)	Easting (m)	Northing (m)	PSA	TOC	Spare	F1
Rum2_01	13/05/2025	15:54	140715.9	803071.63	Y	Y	Y	Y
Rum2_02	13/05/2025	14:55	140630.6	803126.11	Y	Y	Y	Y
Rum2_03	13/05/2025	16:05	140842.2	803164.18	Y	Y	Y	Y
Rum2_04	13/05/2025	16:32	140997.3	803322.08	Y	Y	Y	Y
Rum2_05	13/05/2025	14:27	140679.4	803303.14	Y	Y	Y	Y
Rum2_06	13/05/2025	12:21	140571.2	803392.17	Y	Y	Y	Y
Rum2_07	13/05/2025	12:47	140430.0	803276.57	Y	Y	Y	Y
Rum2_08	13/05/2025	10:52	140436.5	803455.14	Y	Y	Y	Y
Rum2_09	13/05/2025	08:17	140244.0	803641.76	Y	Y	Y	Y
Rum2_10	13/05/2025	09:29	140425.5	803688.77	Y	Y	Y	Y
Rum2_11	13/05/2025	10:18	140600.3	803710.17	Y	Y	Y	Y
Rum2_12	13/05/2025	11:45	140638.1	803494.57	Y	Y	Y	Y
Rum2_13	13/05/2025	13:47	140872.6	803503.86	Y	Y	Y	Y
Rum2_14	13/05/2025	08:51	140413.6	803891.6	Y	Y	Y	Y
Rum2_15	13/05/2025	15:24	140520.5	803033.67	Y	Y	Y	Y
Rum2_16	13/05/2025	11:21	140288.4	803221.47	Y	Y	Y	Y
Rum2_17	13/05/2025	09:54	140221.8	803406.68	Y	Y	Y	Y

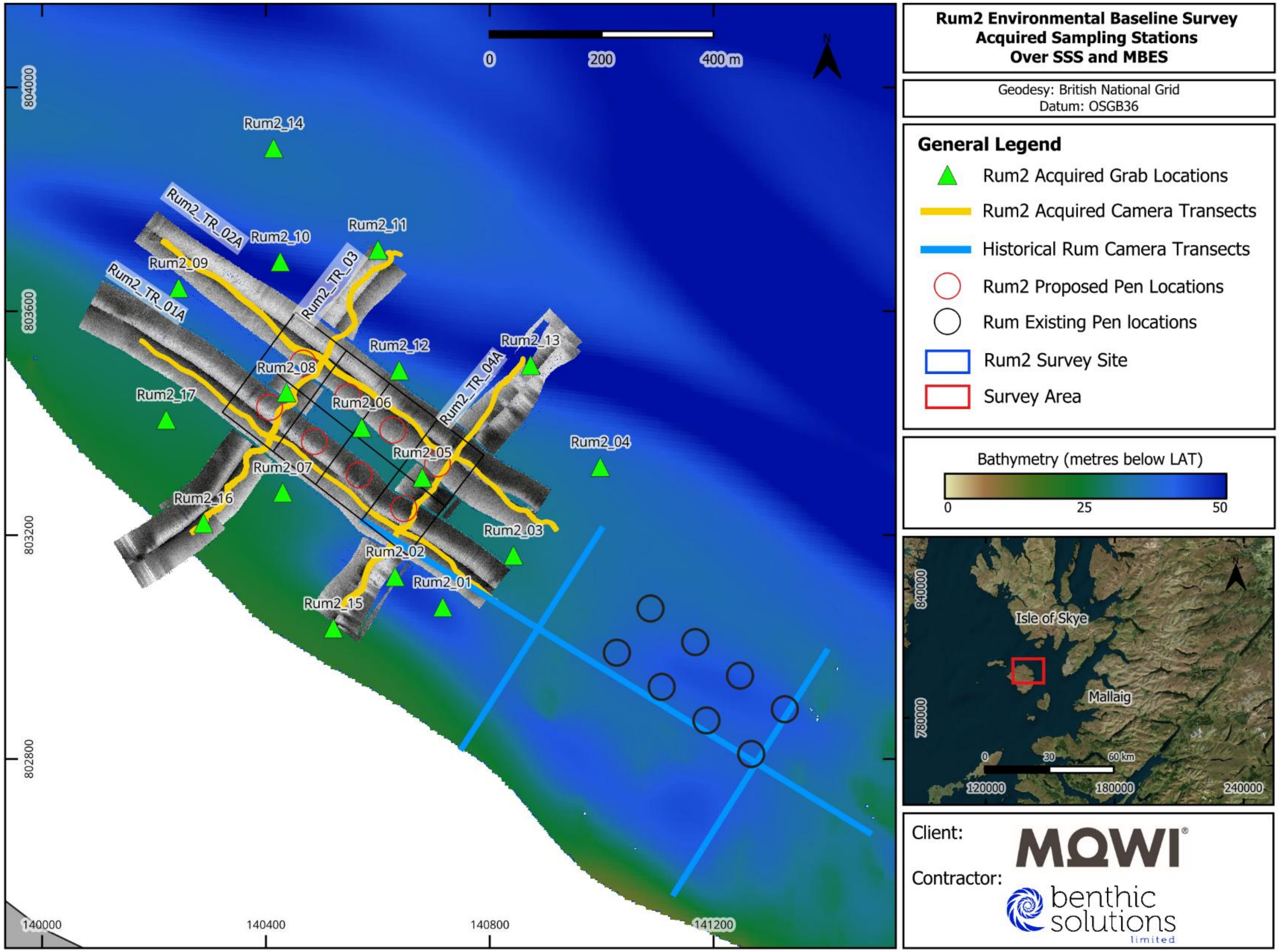


Figure 2-4 Survey Acquisition at the Rum2 Baseline Survey Site

3 Habitat Investigation Methods

3.1 Environmental Habitat Assessment

The habitat assessment was based on review of high resolution still images as well as the recorded HD video footage and the interpreted MBES (multi-beam echosounder) and SSS mosaic data (Figure 2-4). The sediment type in each screenshot was used in conjunction with the HD video footage as a basis for habitat determination, while the conspicuous species composition was used to define suspected variation (biotopes) within the general habitat. QGIS V3.24.2 GIS software was used to review the multibeam bathymetry data (Geotiff and xyz) and to delineate areas of different seabed habitats.

A marine biotope classification system for British waters, developed by Connor et al. (2004) and revised by Parry (2015), provides an improved classification of deep-sea habitats. The combined JNCC (2014) classification system is analogous with the European Nature Information Service Habitat Classification (EUNIS, 2022), both based on the same hierarchical analysis. Abiotic habitats are defined at four levels, with biological communities linked at two lower levels to create a biotope classification (Connor et al., 2004; EUNIS, 2022).

Habitat descriptions have been interpretated from 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 Rum2 survey area. As illustrated in Figure 3-1, the Rum2 survey area is situated within an area characterised by the broader JNCC habitat SS.SMu ‘Sublittoral cohesive mud and sandy mud communities’ (EUNIS: MC62 ‘Atlantic circalittoral mud’) supported in Sections 4.5 and 5.

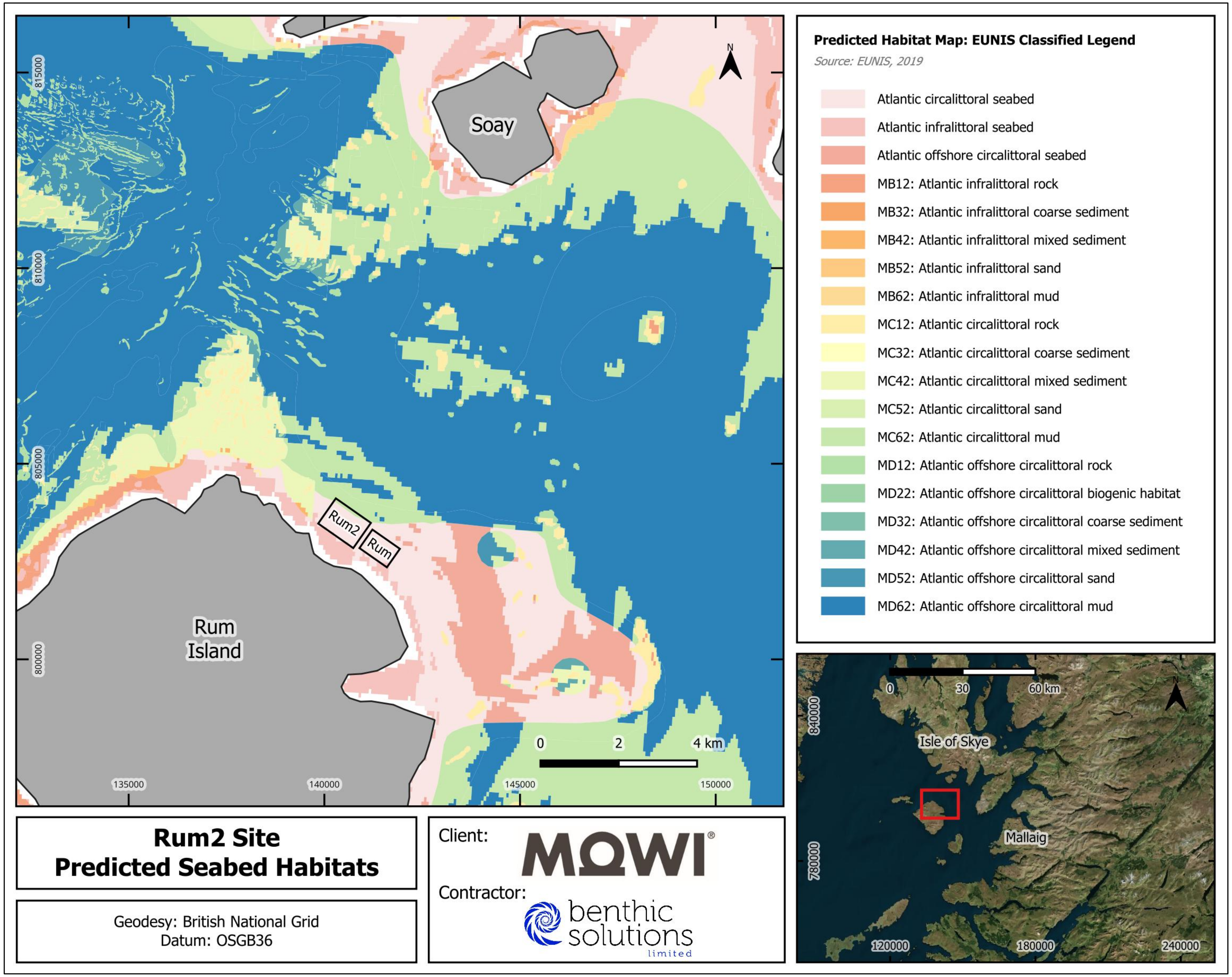


Figure 3-1 Predicted Habitats for the Rum2 Survey Area

3.2 Legislative Species Protection Assessment

The epifauna taxa recorded from review of the underwater video footage and infauna taxa identified by taxonomic analysis (to be reported in the revision of this report) were inputted into a database developed by BSL staff which identifies any species that are afforded protection under several legislative conventions/directives implemented in the UK, including the Scottish Priority Marine Feature and UK Biodiversity Framework (UKBF).

3.2.1 Expected Habitat Sensitivities

The Rum2 survey area is located within the Inner Hebrides and the Minches Special Area of Conservation (SAC), which covers 13,812km², extending along the west coast of mainland Scotland and around the Inner Hebrides, from Cape Wrath in the north to Islay and Jura in the south. The Rum2 site is also in close proximity to Annex I bedrock and stony reefs (JNCC, 2022). The SAC, along with other protected species and sites, is summarised in Table 3-1 and mapped in Figure 3-2.

Table 3-1 Key Aspects of Nearby Protected Areas

Protection Type	Designated Site	Closest Distance to Site (km)	Key Aspects
SAC	Inner Hebrides and The Minches	Within	The Inner Hebrides and the Minches SAC was designated specifically for the protection of harbour porpoise (*Phocoena phocoena*), a species listed under Annex II of the EU Habitats Directive. It's one of the most important areas for this species in the UK.
MPA	Small Isles MPA	Within	The Small Isles MPA was designated to protect rare and sensitive seabed habitats and species, including horse-mussel and fan-mussel beds, burrowed mud, sea-fan communities, and black guillemot.
Annex I Reef	Bedrock & Stony Reef	0.78	This feature qualifies as an Annex I habitat (1170 – Reefs) under the EU Habitats Directive. The area contains bedrock and/or stony reef structures that support diverse benthic communities, including sponges, bryozoans, and encrusting algae.

3.2.1.1 Burrowing Megafauna Communities Assessment

The OSPAR definition of 'seapen and burrowing megafauna communities' is as follows: "*Plains of fine mud, at water depths ranging from 15–200m or more, which are heavily bioturbated by burrowing megafauna; burrows and mounds may form a prominent feature of the sediment surface with conspicuous populations of sea-pens, typically Virgularia mirabilis and Pennatula phosphorea. The burrowing crustaceans present may include Nephrops norvegicus, Calocaris macandreae or Callianassa subterranea. In the deeper fjordic lochs which are protected by an entrance sill, the tall sea-pen Funiculina quadrangularis may also be present.*

The burrowing activity of megafauna creates a complex habitat, providing deep oxygen penetration. This habitat occurs extensively in sheltered basins of fjords, sea lochs, voes and in deeper offshore waters such as the North Sea and Irish Sea basins and the Bay of Biscay." (OSPAR, 2010).

According to JNCC (2014) guidance, the key determinant for classification of 'Seapen and Burrowing Megafauna Communities' is the presence of burrowing species or burrows at a SACFOR (superabundant, abundant, common, frequent, occasional, rare and less than rare) density of at least 'frequent'; Table 3-2). Seapens (e.g. V*. mirabilis*, *P. phosphorea* and *F. quadrangularis*) may, and by extension may not, be present to classify as a 'Seapen and burrowing megafauna communities' habitat. 'Seapen and burrowing megafauna communities' are also contained within the Scottish PMF and Search Feature 'Burrowed mud', the latter with a slightly broader definition which also includes the fireworks anemone *Pachycerianthus multiplicatus* as a specific component of the habitat (JNCC, 2014, Howson et al., 2012).

The BSL protocol is listed below:

- Subsequent sediment changes along the survey lines were treated as separate counting intervals to mitigate counter fatigue, especially during sections with high burrow abundance.
- Counting areas of high burrow density was aided by slowing the video playback speed. Sections of unsuitable seabed quality for burrow counting was excluded from burrow density analysis.
- Using the scale on the video footage the visible seabed area was estimated in order to calculate the number of burrows per m^2.
- Burrows were divided into two size groups and assessed independently, with smaller burrows likely to be inhabited by burrowing fauna of 1 to 3cm length and larger burrows, likely to be inhabited by *N. Norvegicus* which have a typical size class of 5 to 20cm length (Sabatini and Hill, 2008).
- All visible burrow holes were counted as it is not possible to differentiate the burrows of non-*Nephrops* burrowing fauna which may overestimate the total number of burrowing megafauna by including other small body-sized burrowing fauna, such as polychaetes. *N. norvegicus* burrows can form complexes with multiple openings, so care was taken when counting to only count these complexes as one burrow.

Table 3-2 SACFOR Abundance Scale

Cover (%)	Crust/ Meadow	Massive/ Turf	<1cm	1-3cm	3-15cm	>15cm	Density	
>80%	S		S				>1/0.001m² (1x1 cm)	>10,000/m²
40-79%	A	S	A	S			1-9/0.001m²	1000-9999/m²
20-39%	C	A	C	A	S		1-9 / 0.01m² (10 x 10 cm)	100-999/m²
10-19%	F	C	F	C	A	S	1-9 / 0.1m²	10-99/m²
5-9%	O	F	O	F	C	A	1-9/m²	
1-5% or density	R	O	R	O	F	C	1-9 / 10m² (3.16 x 3.16m)	0.1 to 0.9
<1% or density	L	R	L	R	O	F	1-9 / 100m² (10 x 10m)	0.01 to 0.09
		L		L	R	O	1-9 / 1000m² (31.6 x 31.6m)	0.001 to 0.009
					L	R	<1 / 1000m² (100 x 100m)	
						L	<1 / 10000m² (1km²)	

Key						
Superabundant	Abundant	Common	Frequent	Occasional	Rare	Less than Rare

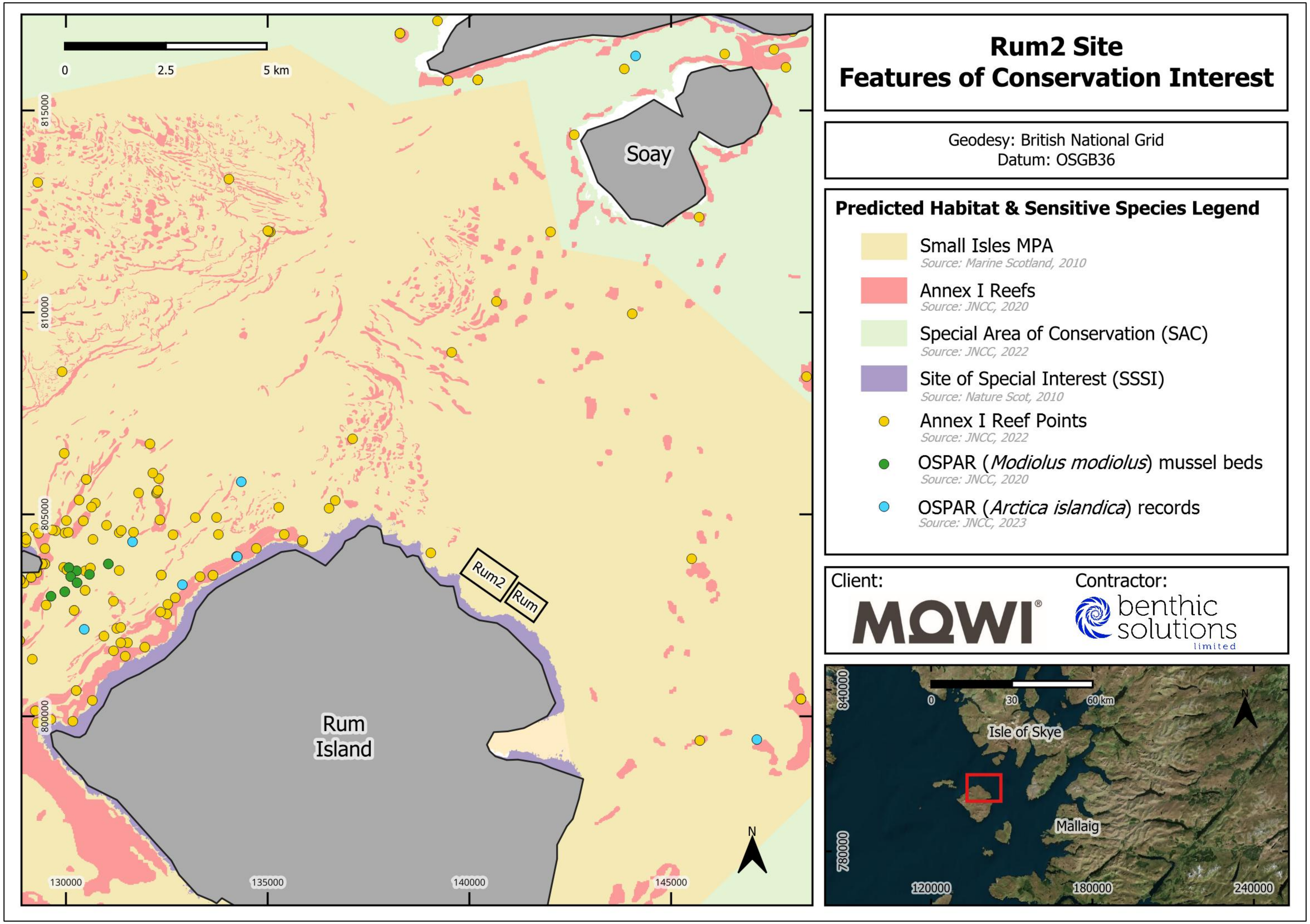


Figure 3-2 Locations of Features of Conservation Interest in Relation to the Rum2 Survey Area

4 Environmental Baseline Results and Discussion

4.1 Bathymetry

Bathymetric data was sourced from GEBCO, providing comprehensive coverage of the survey area with a horizontal resolution of approximately 500m. Water depths across the Rum2 survey area ranged from approximately 20m to 50m below Lowest Astronomical Tide (LAT), with the shallowest points recorded at stations Rum2_15 and Rum2_16 at 23m. The deepest location was found at station Rum2_13, located at the northeastern extent of the main survey area, with a depth of approximately 50m. All other stations fell within a depth range of approximately 30 to 40m.

Side-scan sonar (SSS) lines followed the proposed camera transect lines and provided a slightly broader coverage of the seabed but did not encompass stations Rum2_01, Rum2_03, Rum2_04, Rum2_06, Rum2_07, Rum2_09, Rum2_10, Rum2_12, Rum2_14, Rum2_15 and Rum2_17. However, due to the homogenous nature of sediments observed through ground-truthing and video footage, the existing coverage is considered sufficient to effectively represent the sedimentary conditions across the area. The data revealed a generally low reflectivity and uniform muddy sand seabed, with subtle textural variations. Few geomorphological features were noted, except for two small localised boulder features southwest of Rum2_05 (Figure 2-4), which were not observed in video or ground-truthing data.

4.2 Particle Size Distribution

The particle size interpretation of sediments from the survey was based on observations made from the acoustic, seabed photography and the analytical results acquired from the surface sediments across the 17 stations . Material for particle size analysis was recovered from the full depth of all grab samples and was analysed by BSL. Please refer to Appendix II – Presentation, Laboratory and Statistical Analyses Operations for the laboratory methods employed. The sediment characteristics for each station are listed in Table 4-1 and individual particle size distribution plots are presented in Appendix III – Particle Size Distribution.

4.2.1 General Description

The overall particle size analysis indicated only slight variability in sediment composition across the survey area, which was predominantly fines-dominated (mean: 51.1% ± 11.2SD), with lower proportions of sand (mean: 45.5% ± 10.5SD) and gravel (mean: 3.4% ± 2.6SD; Table 4-1; Figure 4-1, Figure 4-2and Figure 4-3). Fines were dominant throughout most of the area, with the majority of stations showing fines content above 48%, except for five stations in the shallower southwestern region: Rum2_03 (39.8%), Rum2_07 (38.2%), Rum2_15 (38.6%), Rum2_16 (31.3%) and Rum2_17 (35.8%). The highest fines content was recorded at Rum2_13

(71.6%) in the northeastern part of the survey area. Other stations with similarly high fines content included Rum2_10 (65.9%) and Rum2_14 (60.1%), also located in the deeper areas to the northeast.

Sand content was moderate overall, with the highest proportions at Rum2_15 (61.1%), Rum2_16 (60.7%), Rum2_17 (60.3%) and Rum2_07 (58.9%), all situated in the shallower southwestern part of the survey area. The lowest sand content was recorded at Rum2_13 (28.3%).

The proportion of gravel was consistently low across all stations within the survey area, with values below 8.4%. The highest gravel content was recorded at Rum2_05 (8.4%) and the lowest at Rum2_13 (0.1%). Notably, the small boulders near Rum2_05 may have influenced the local sediment composition, contributing to slightly elevated gravel and a greater presence of shell fragments at that site. Although gravel content showed some spatial variability, no clear geographic trend was observed across the survey area.

Fines showed a strong and significant positive Spearman's correlation with water depth ($p < 0.001$; see Appendix VII), indicating a clear relationship between sediment composition and bathymetric gradients. This suggests depth-related sediment sorting, with finer sediments accumulating in deeper areas, likely as a result of lower hydrodynamic conditions.

The Folk (1954) and Wentworth (1922) sediment classification schemes for each station are presented in Table 4-1. The Wentworth classification assigns a single sediment type based on the mean particle size and is most appropriate for well-sorted, unimodal sediments dominated by a narrow grain-size range. In contrast, the Folk classification provides a more comprehensive description for poorly sorted sediments, as it incorporates the relative proportions of mud (<63µm), sand (63µm–2mm), and gravel (> mm). For this study, a modified version of the Folk scheme developed by the British Geological Survey (Long, 2006) was applied. Samples from the Rum2 survey area were assigned to six Folk classes: five stations were classified as 'Slightly Gravelly Sandy Mud', three as 'Sandy Mud', three as 'Slightly Gravelly Muddy Sand', three as 'Gravelly Mud', two as 'Gravelly Muddy Sand', and one as 'Muddy Sand' (Table 4-1). The Wentworth classification identified 11 stations as 'Mud' and 6 as 'Sand'. The relatively consistent nature of the sediments was further reflected in the sorting coefficients, with all stations falling within the 'Very Poorly Sorted' category (mean: 2.46 ± 0.37SD), indicating a dominance of mixed fine-grained material across the area.

Table 4-1 Summary of Particle Size Characteristics

Station	Depth (m)	Mean Sediment Size		Wentworth Classification	Sorting Coefficient	Sorting Classification	Fines (%)	Sands (%)	Gravel (%)	Modified Folk Scale
		mm	Phi							
Rum2_01	44	0.039	4.67	Coarse Silt	2.17	Very Poorly Sorted	53.4	46.2	0.4	Sandy Mud
Rum2_02	43	0.043	4.53	Coarse Silt	2.22	Very Poorly Sorted	48.1	50.6	1.3	Slightly Gravelly Muddy
Rum2_03	30	0.100	3.32	V. Fine Sands	3.22	Very Poorly Sorted	39.8	55.0	5.2	Gravelly Muddy Sand
Rum2_04	36	0.036	4.80	Coarse Silt	2.27	Very Poorly Sorted	57.7	37.7	4.6	Slightly Gravelly Sandy
Rum2_05	33	0.044	4.50	Coarse Silt	3.01	Very Poorly Sorted	51.0	40.6	8.4	Gravelly Mud
Rum2_06	30	0.045	4.46	Coarse Silt	2.78	Very Poorly Sorted	49.9	44.9	5.2	Gravelly Mud
Rum2_07	27	0.061	4.04	Coarse Silt	2.17	Very Poorly Sorted	38.2	58.9	2.9	Slightly Gravelly Muddy
Rum2_08	34	0.035	4.83	Coarse Silt	2.30	Very Poorly Sorted	53.9	44.6	1.5	Slightly Gravelly Sandy
Rum2_09	43	0.035	4.85	Coarse Silt	2.26	Very Poorly Sorted	57.2	39.9	2.9	Slightly Gravelly Sandy
Rum2_10	49	0.027	5.22	Medium Silt	2.14	Very Poorly Sorted	65.9	33.9	0.3	Sandy Mud
Rum2_11	40	0.038	4.73	Coarse Silt	2.93	Very Poorly Sorted	56.6	37.3	6.1	Gravelly Mud
Rum2_12	36	0.033	4.92	Coarse Silt	2.25	Very Poorly Sorted	59.7	37.9	2.4	Slightly Gravelly Sandy
Rum2_13	50	0.023	5.43	Medium Silt	2.09	Very Poorly Sorted	71.6	28.3	0.1	Sandy Mud
Rum2_14	36	0.032	4.99	Coarse Silt	2.74	Very Poorly Sorted	60.1	35.2	4.7	Slightly Gravelly Sandy
Rum2_15	23	0.054	4.22	Coarse Silt	2.14	Very Poorly Sorted	38.6	61.1	0.3	Muddy Sand
Rum2_16	23	0.073	3.78	V. Fine Sands	2.80	Very Poorly Sorted	31.3	60.7	8.0	Gravelly Muddy Sand
Rum2_17	28	0.059	4.08	Coarse Silt	2.30	Very Poorly Sorted	35.8	60.3	3.9	Slightly Gravelly Muddy
Mean		**0.05**	**4.55**	-	**0.92**	-	**51.1**	**45.5**	**3.4**	-
SD		**0.02**	**0.53**	-	**0.19**	-	**11.2**	**10.51**	**2.6**	-
CV (%)		**41.75**	**11.70**	-	**20.94**	-	**21.9**	**23.1**	**77.3**	-
Minimum		**0.02**	**3.32**	-	**0.74**	-	**31.3**	**28.3**	**0.1**	-
Maximum		**0.10**	**5.43**	-	**1.45**	-	**71.6**	**61.1**	**8.4**	-

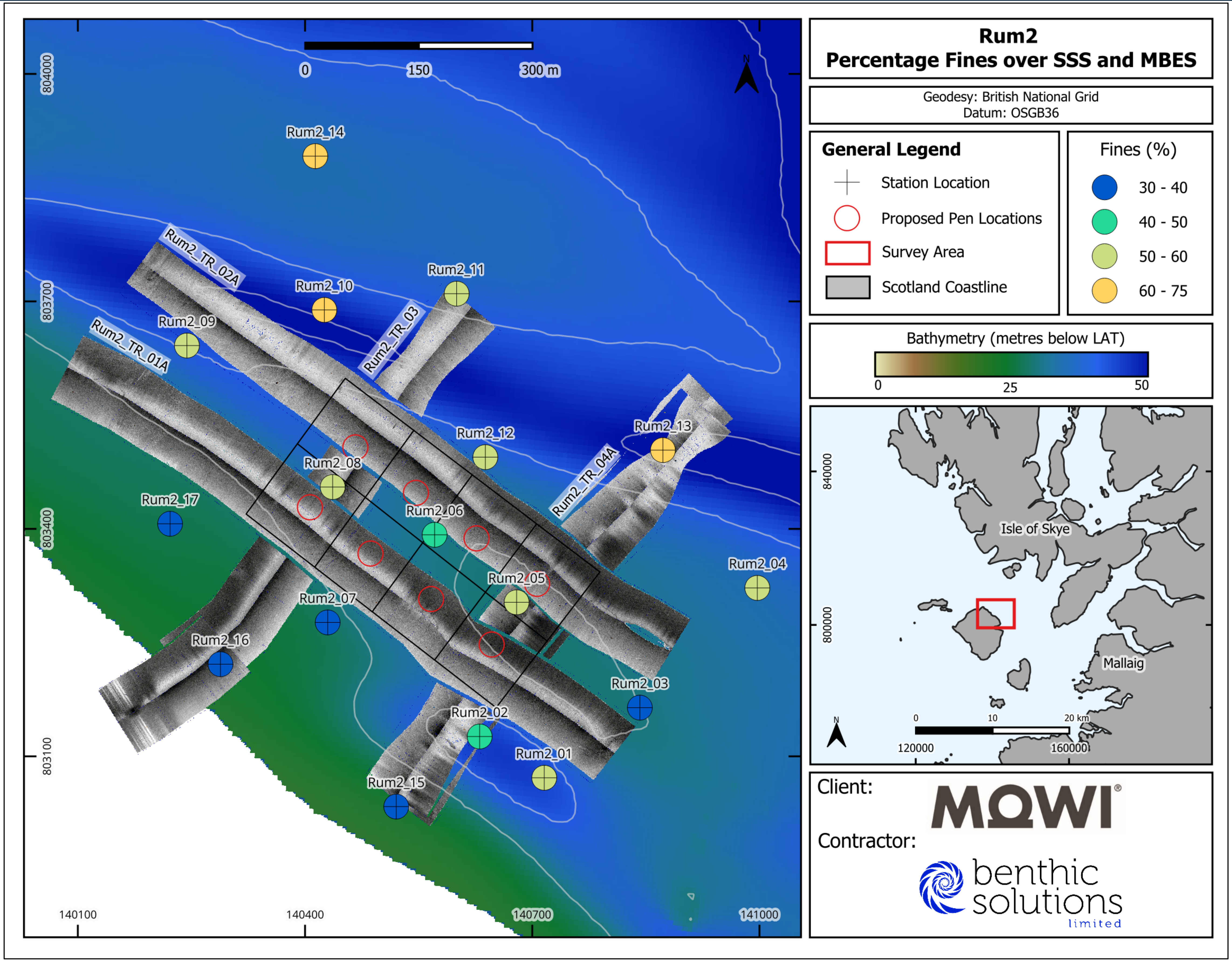


Figure 4-1 Proportion of Fines

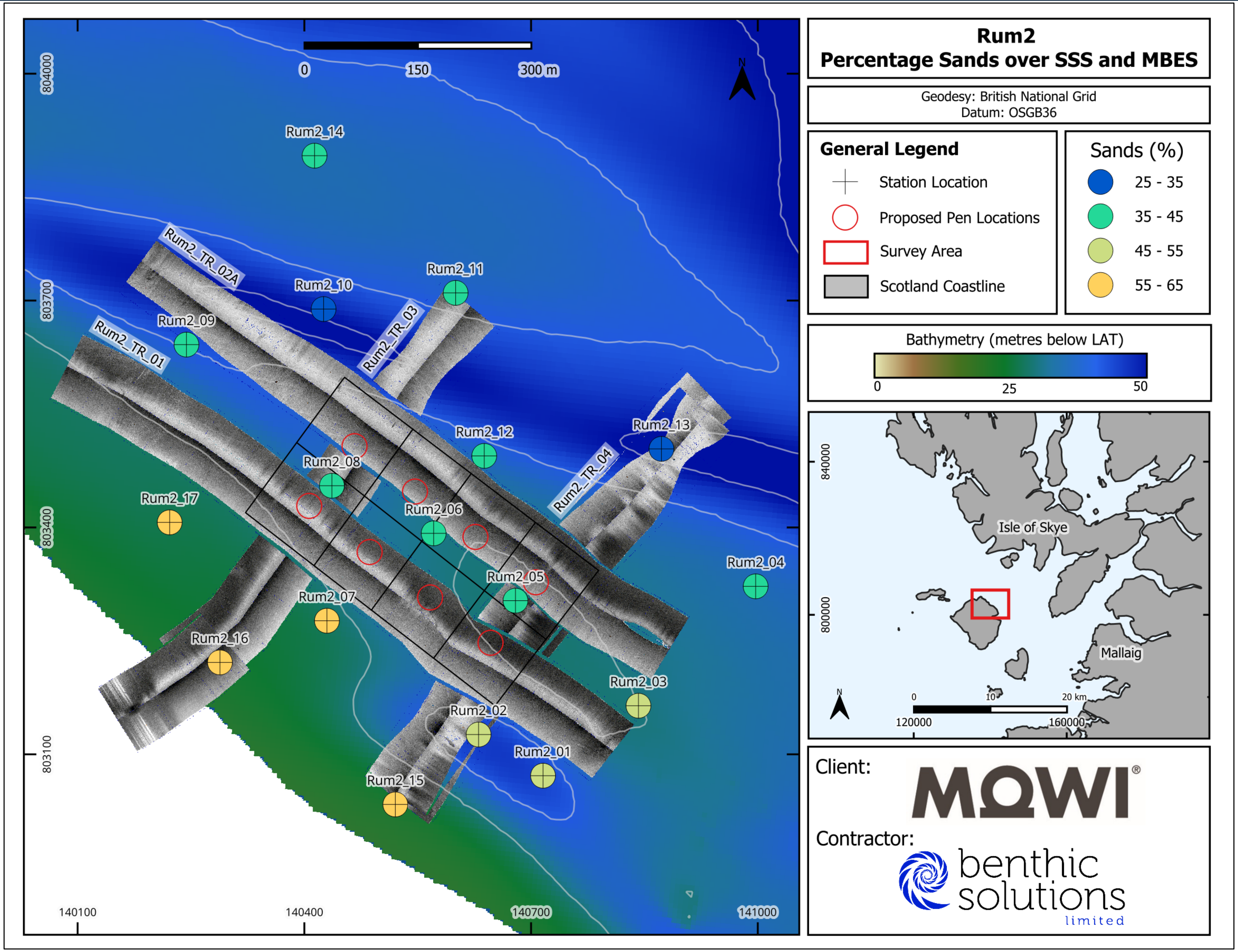


Figure 4-2 Proportion of Sand

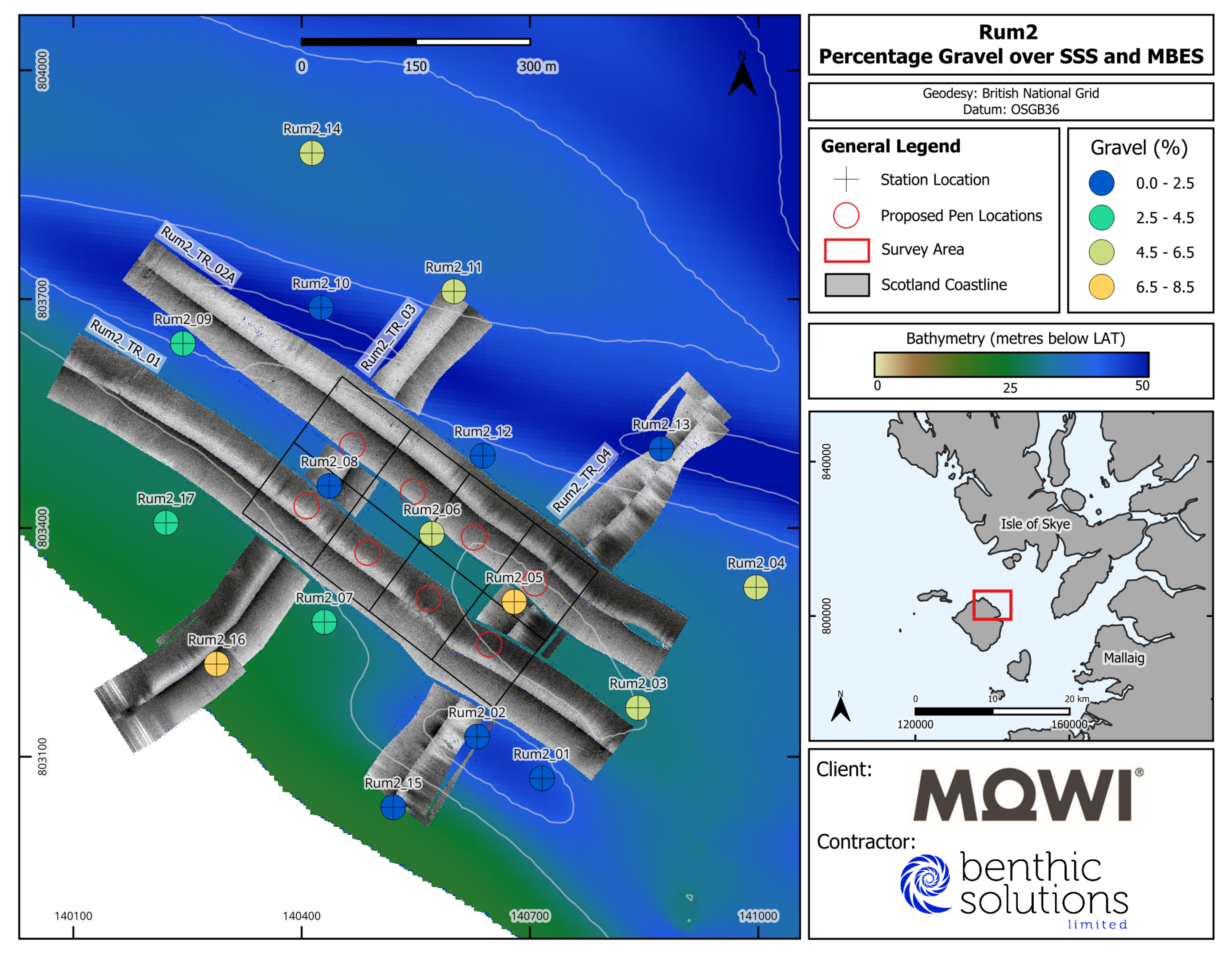


Figure 4-3 Percentage of Gravel

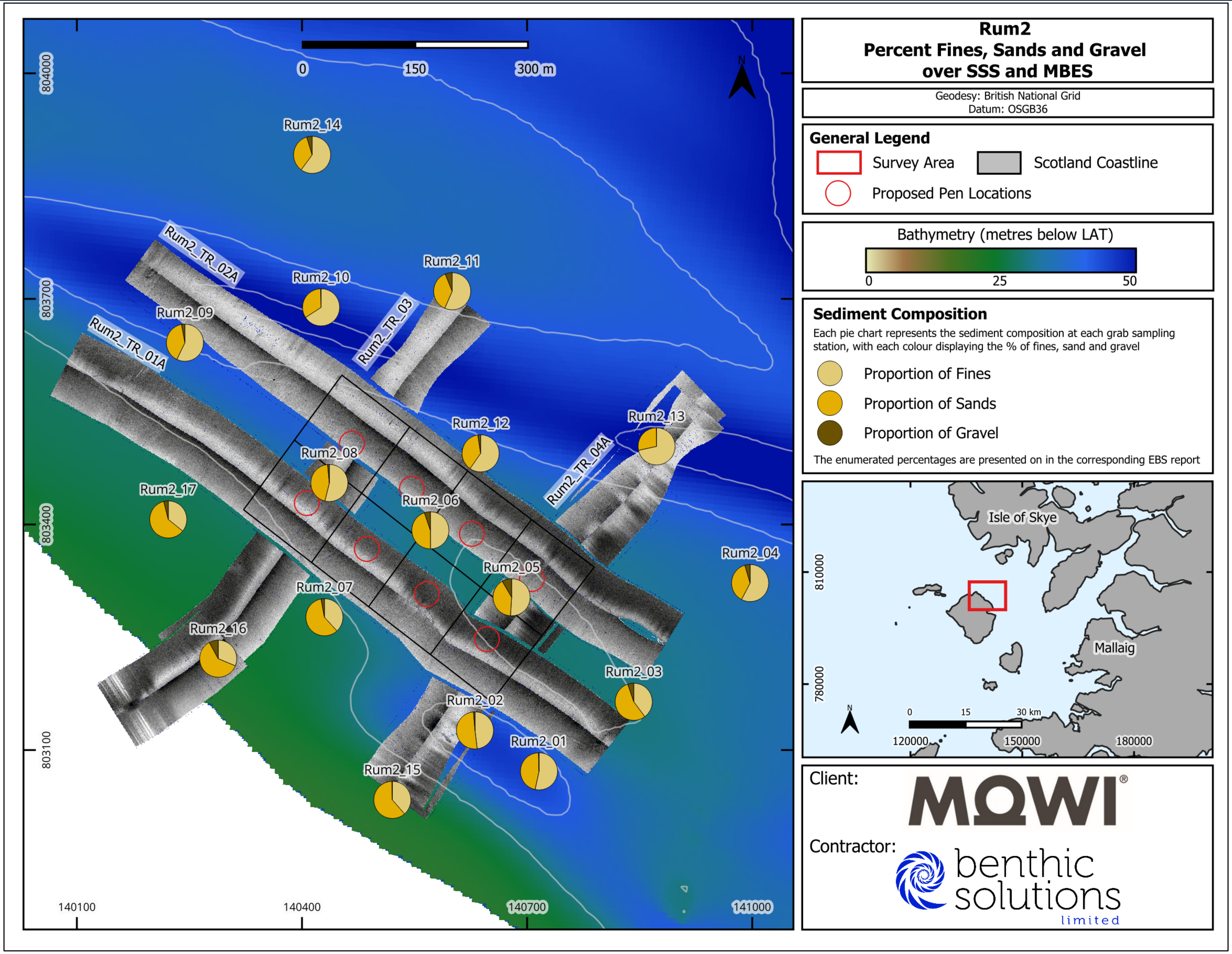


Figure 4-4 Percentage Fines, Gravel and Sand across the Rum2 Site

4.2.2 Multivariate Description

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 Figure 4-5 with red lines denoting statistically similar stations and black lines revealing significant differences. Whilst the similarity profiling analysis (SIMPROF) originally indicated the presence of six significantly different (p<0.05) clusters, a slice was placed at a Euclidean distance of 9 due to similarity of stations across the survey area. The four remaining clusters are described as follows:

In the context of Euclidean distance, values between 0 and 20 are typically considered low, so this threshold allowed for the grouping of relatively similar stations while maintaining interpretability.

- <u>Cluster 'a'</u>: This cluster contained the second-highest number of stations (4) (Rum2_07, Rum2_15, Rum2_16, Rum2_17) all located in the southwestern part of the survey area, in relatively shallow water depths between 23m and 28m. Folk classifications within this cluster included 'Muddy Sand', 'Gravelly Muddy Sand' and two instances of 'Slightly Gravelly Muddy Sand'. According to the Wentworth classifications, all sediments were categorised as 'Sand', exhibiting the highest sand content (58.9%–61.1%) and the lowest proportion of fines (31.3%–38.2%). Gravel content was moderate across all stations, neither the lowest nor the highest among the clusters identified.
- <u>Cluster 'b'</u>: The only cluster containing a single distinct station (Rum2_03) was located in the southeasternmost part of the survey area at a moderate water depth of approx. 30m. The Folk classification assigned for this station was 'Gravelly Muddy Sand', while the Wentworth classification revealed a 'Sand' category. This station recorded moderate proportions of fines (39.8%), sand (55%) and gravel (5.2%) compared to the other clusters. However, the sorting coefficient at this station was the highest among all, indicating that the sediment was more mixed and less uniform compared to the other more well sorted clusters.
- <u>Cluster 'c'</u>: The third cluster represented by two stations, (Rum2_10, Rum2_13) located to the northwest and east of the survey area, in depths of 49m and 50m, respectively. Both stations contained the highest level of fines 65.9%-71.6% and the lowest proportion of sands (28.8%-33.9%) and gravels (0.1%-0.3%). The folk classification for

both stations was ‘Sandy Mud’ with a Wentworth classification of ‘Mud’, indicative of a deeper more lower-energy environment.

- Cluster ‘*d*’: The fourth cluster was represented the majority of stations (10) located to the north and southeast of the survey area in depths of approximately 30m and 44m. This cluster encompassed the widest spread of Folk classification, ranging from ‘Slightly Gravelly Muddy Sand’ (1 station), ‘Sandy Mud’ (1 station), ‘Gravelly Mud’ (3 stations) and ‘Slightly Gravelly Sandy Mud’ (5 stations). Apart from ‘Rum2_02’, all stations were categorised as ‘Mud’ on the Wentworth scale.

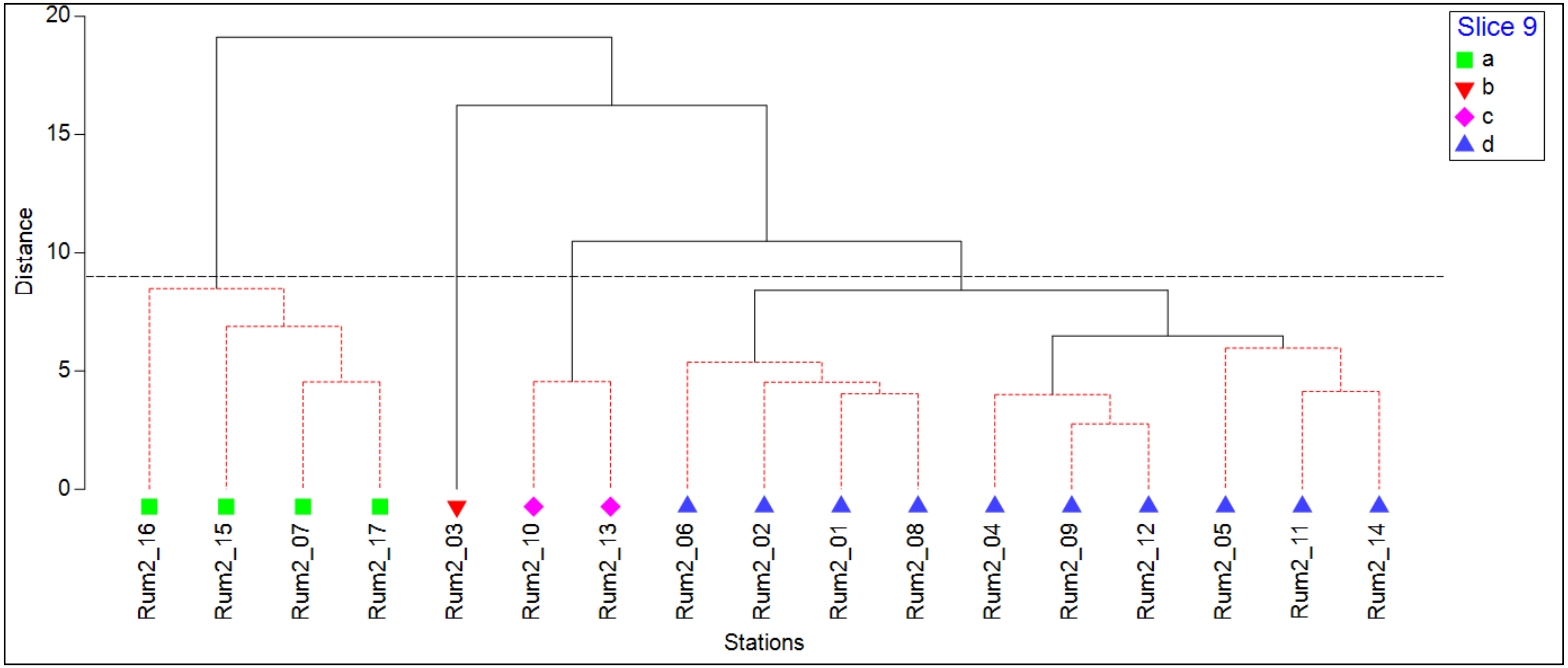


Figure 4-5 Particle Size Analysis Similarity Dendrograms

A Principal Component Analysis (PCA) was performed on the proportional whole-phi sieve fraction data for each survey station. The resulting PCA plot displays the distribution of stations along axes defined by the first two principal components (PC1 and PC2), which together account for the greatest proportion of variability in the particle size fraction dataset. The plot indicates that the primary driver of variability in the sediment is the proportion of 'Very Fine Sand' to 'Fine Sand' (phi 3–4), followed by 'Very Fine Sand' to 'Coarse Silt' (phi 5–4) and 'Medium Sand' to 'Fine Sand' (phi 2-3; Figure 4-6). This is represented by the eigenvector plots: the greater the length, the greater the influence of each phi fraction on the sediment composition of the stations (see Appendix II). The longer eigenvectors associated with finer sediments highlight the dominance of fines in the survey area.

Cluster '*a*' exhibited the highest proportion of very fine to fine sand across the stations identified. Cluster '*b*', comprising the outlier station Rum2_03, was most influenced by fine pebbles to medium sand, showing a clear trend towards coarser, medium sandy material. Cluster '*c*' was primarily characterised by a dominance of very fine sand to coarse silt. Cluster '*d*' showed the greatest variability across phi 5–3, with some stations trending towards very fine sand to coarse silt, and others towards very fine to fine sand, reflecting a broader range of grain size influences within this group.

Figure 4-7 compares the full particle size distribution dataset (Wentworth, 1922) grouped by the four identified clusters, alongside example seabed and sieve sample photographs. The plot highlights the overall homogeneity of the seabed, with most samples peaking at phi 3 (fine sand). Cluster '*a*' shows a primary peak at phi 2 (medium sand) and a secondary at phi 3. Clusters '*b*', '*c*' and '*d*' all peaked at phi 3, with Cluster '*b*' showing the most pronounced peak (40% fine sand). Despite minor variation, sample profiles remain relatively consistent. The spatial distribution of clusters is shown over SSS and MBES data in Figure 4-8.

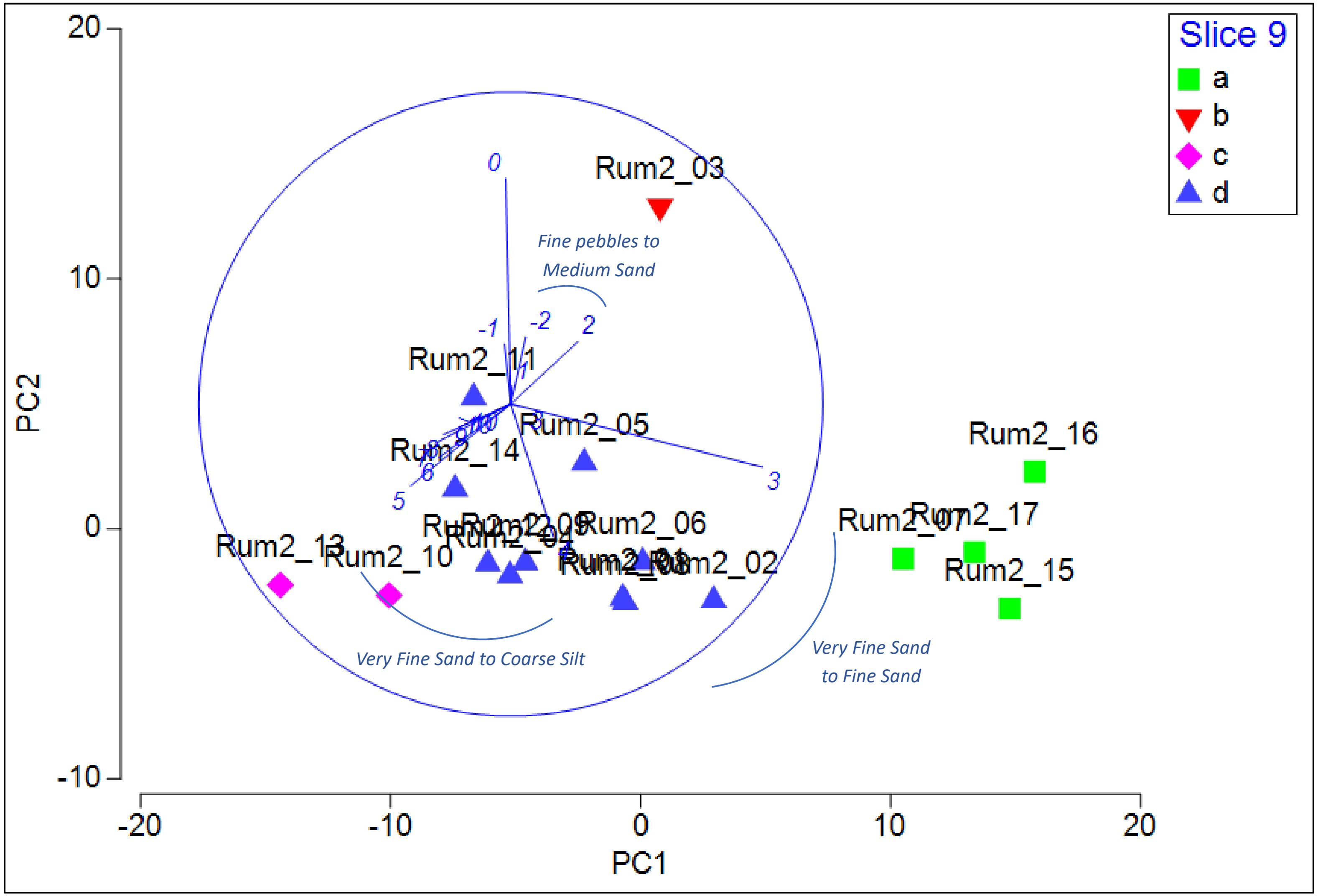


Figure 4-6 Particle Size Principal Component Analysis

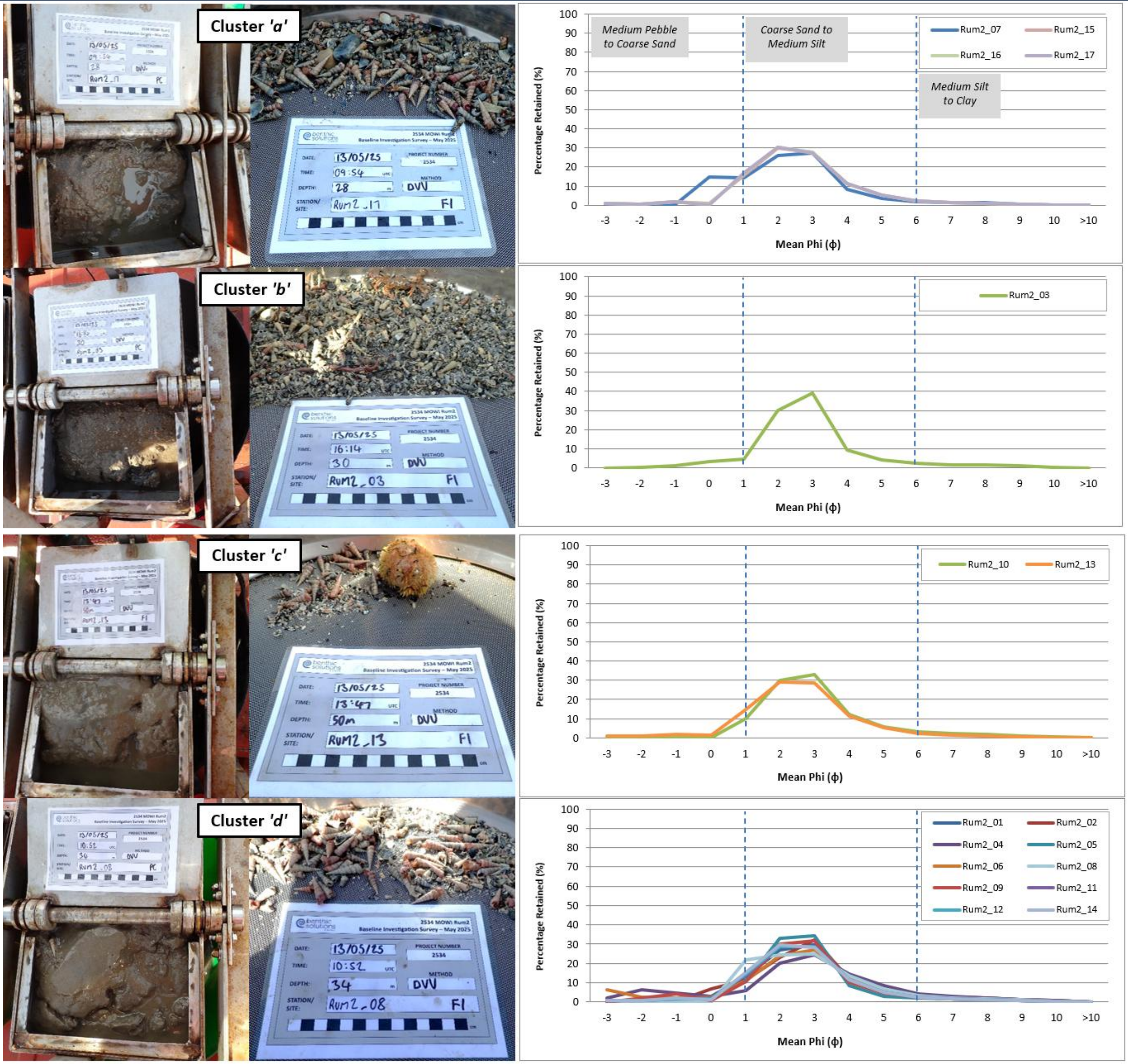


Figure 4-7 Particle Size Distribution for the Different Cluster

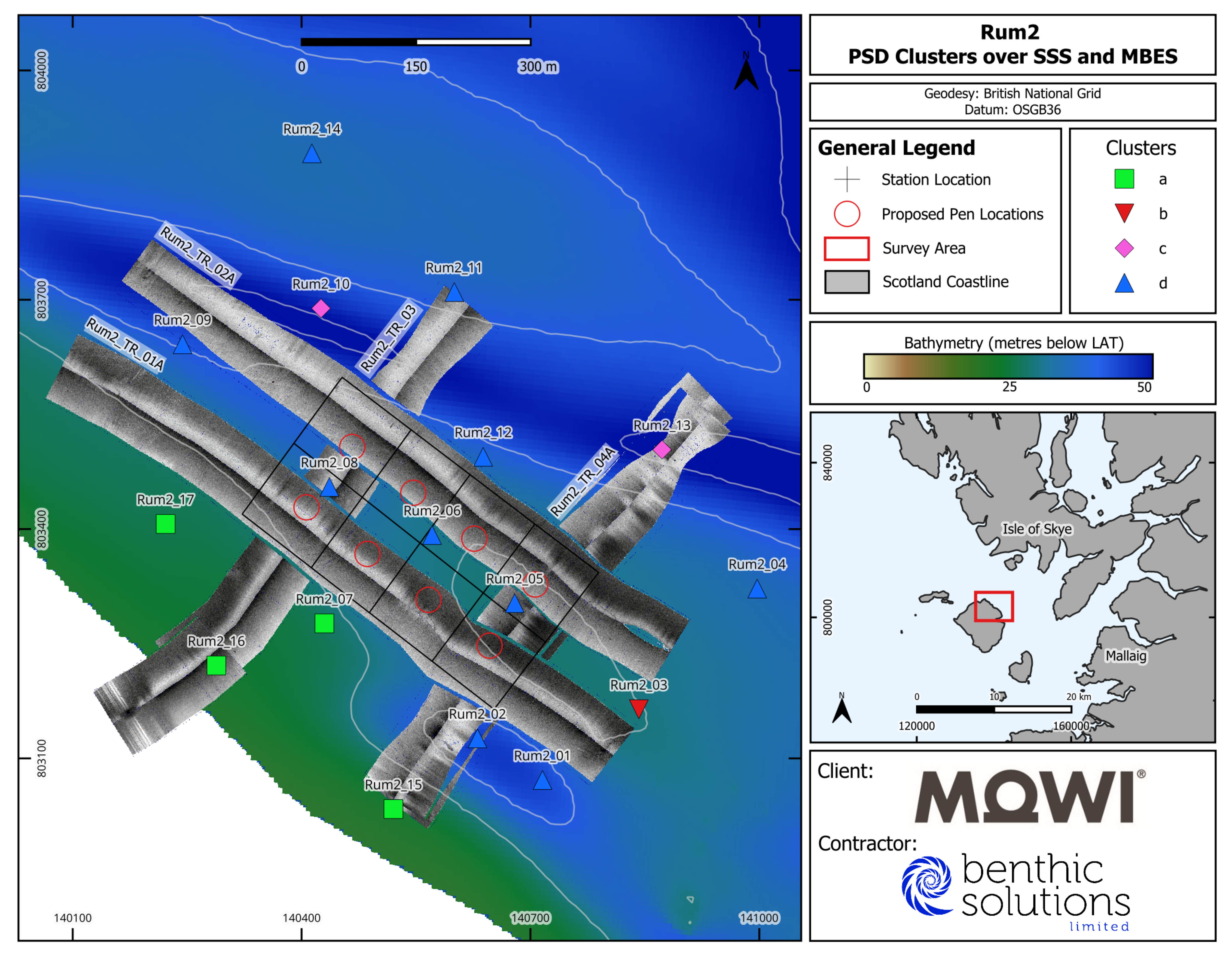


Figure 4-8 Spatial Distribution of PSD Clusters

4.3 Total Organic Carbon

The sediment samples were analysed for total organic carbon (TOC); the results of which are presented in Table 4.2 and illustrated in Figure 4 8. TOC represents the proportion of biological material and organic detritus within the substrates. This method is less susceptible to the interference sometimes recorded using crude combustion techniques, such as analysing total organic matter by loss on ignition (LOI).

TOC results were generally low surrounding the Rum2 site (mean 0.82% ± 0.13 SD), indicating a predominantly organically deprived environment. Relatively low TOC (Table 4-2; Figure 4-9) concentrations were recorded at the southwestern extent of the survey area at stations Rum2_07, Rum2_15, Rum2_16 and Rum2_17, ranging from 0.60% to 0.69%. Stations closest to the proposed Rum2 pen locations (Rum2_05, Rum2_06, Rum2_08) also exhibited low TOC levels, ranging from 0.78% to 0.79%. The highest TOC concentrations were scattered throughout the survey site, with the greatest values found at the southeastern stations overlapping with the established Rum fish farm, including Rum2_01 (1.06%) and Rum2_02 (0.95%), potentially reflecting nutrient enrichment from the neighbouring fish farm. Nevertheless, these concentrations are considered low and are not indicative of significant contamination.

Overall, the spatial distribution of TOC concentrations between stations, along with the lack of notable differences in sediment colour or composition observed in deck logs (Appendix IV) and sample photographs, suggests that the slight variations in TOC across the survey area are primarily due to natural variability and do not display concerning signs of enrichment from the neighbouring fish farm.

The TOC in surface sediments is an important source of food for benthic fauna (Snelgrove & Butman, 1994), although an overabundance may lead to reductions in species richness and abundance due to oxygen depletion. Increases in TOC may also reflect increases in both physical factors (i.e. fines) and common co-varying environmental factors through greater sorption on increased sediment surface areas (Thompson and Lowe, 2004). This sedimentary relationship was apparent in the survey area with higher concentrations of TOC noted at stations with higher proportions of fines, a significant Spearman's correlation for these two parameters provides further evidence of this ($p<0.05$).

Table 4-2 Total Organic Carbon

Station	Depth (m)	Total Organic Carbon (% M/M)
Rum2_01	44	1.06
Rum2_02	43	0.95
Rum2_03	30	0.85
Rum2_04	36	0.82
Rum2_05	33	0.79
Rum2_06	30	0.82
Rum2_07	27	0.69
Rum2_08	34	0.78
Rum2_09	43	0.88
Rum2_10	49	0.92
Rum2_11	40	0.85
Rum2_12	36	0.87
Rum2_13	50	0.91
Rum2_14	36	0.89
Rum2_15	23	0.60
Rum2_16	23	0.60
Rum2_17	28	0.64
Mean		**0.82**
SD		**0.13**
CV (%)		**15.4**

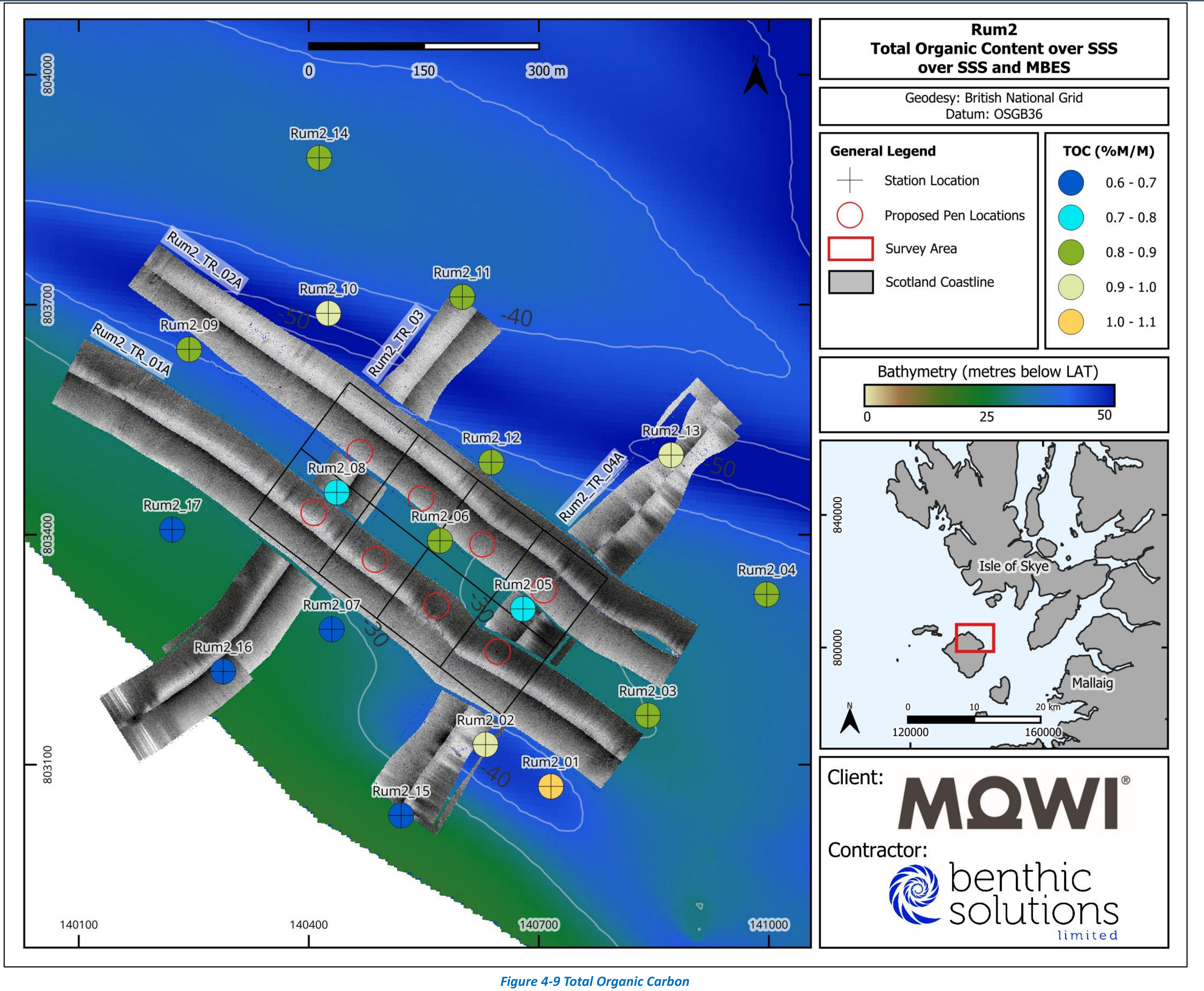


Figure 4-9 Total Organic Carbon

4.4 Macrofaunal Analysis

Macrofaunal analysis was carried out on 17 samples acquired across the Rum2 survey site. The sediment was relatively homogeneous across the survey area with all stations being fines dominant variations of sandy mud and muddy sand, with minimal proportions of gravel. All macrofaunal samples were processed in the field over a 1,000µm sieve for taxonomic review.

The macrofauna were broadly split into two functional groups: 'infauna' are animals which live within the sediments and 'epifauna' are animals living on or attached to the seabed, stones, or biota. Epifauna may be further divided into 'solitary epifauna' and 'colonial epifauna.' Solitary epifauna includes taxa which are epifaunal in nature but form distinct and countable units which can be attached to hard substrate and are included in infaunal analysis. Colonial epifauna are inclusive of epifauna which are counted on a presence and absence basis and are omitted from infaunal analysis.

The macrofaunal taxonomy analysis identified a total of 1,868 individuals (total infauna including solitary epifauna) from the 17 samples analysed. Faunal data is provided in Appendix VII – Macrofauna Species List, whilst univariate analyses are summarised by station in Table 4-3. Of the 107 recorded taxa, 1 species was classed as solitary epifauna (182 individuals, representing 9.7% of total individuals) and the remaining were categorised as infauna. The highest epifaunal richness was found at station Rum2_03, recording 56 individuals, within the Actinaria (anemone) family. The infaunal community consisted of 52 Annelida species (479 individuals, 25.6%), 27 Mollusca species (1,030 individuals, 55.1% of total individuals), 18 Crustacea species (85 individuals, 4.6%), and 4 Echinodermata species (40 individuals, 2.1%). All other groups, including Nemertea, were classed as 'other' groups and accounted for 5 species (52 individuals, 2.8% of total individuals). The contribution percentage of each phylum to total faunal abundance and total species richness at station level is displayed in Figure 4-10 and Figure 4-11.

Additionally, six colonial epifauna taxa were recorded, including Bougainvilliidae, Anthoathecata, *Lovenella clausa*, *Electra pilosa*, *Triticella flava* and *Amathia* (Figure 4-12); however, these were excluded from the primary macrofaunal analysis as these benthic communities are not considered infauna.

Grab sampling often fails to recover coarse material, especially larger pebbles and cobbles colonised by epifauna; therefore, it is important to not only assess epifauna through physical samples, but also to analyse video footage. An overview of the video assessment is provided in section 3.1 with example images of conspicuous fauna presented in Appendix IX. During the video review, sightings of the tall sea pen (*Funiculina quadrangularis*) and Norway lobster (*Nephrops norvegicus*) were observed. The tall sea pen is listed as a Priority Marine Feature (PMF) under the Scottish Biodiversity List (SBL) and is included as a priority species in the UK Biodiversity Framework (UKBF; see sections 5, 5.1.1.2 and 5.1.1.3). The presence of tall sea pen and burrowing Norway lobster are both indicative of the OSPAR Threatened and/or Declining Habitat 'Seapen and Burrowing Megafauna Communities.'

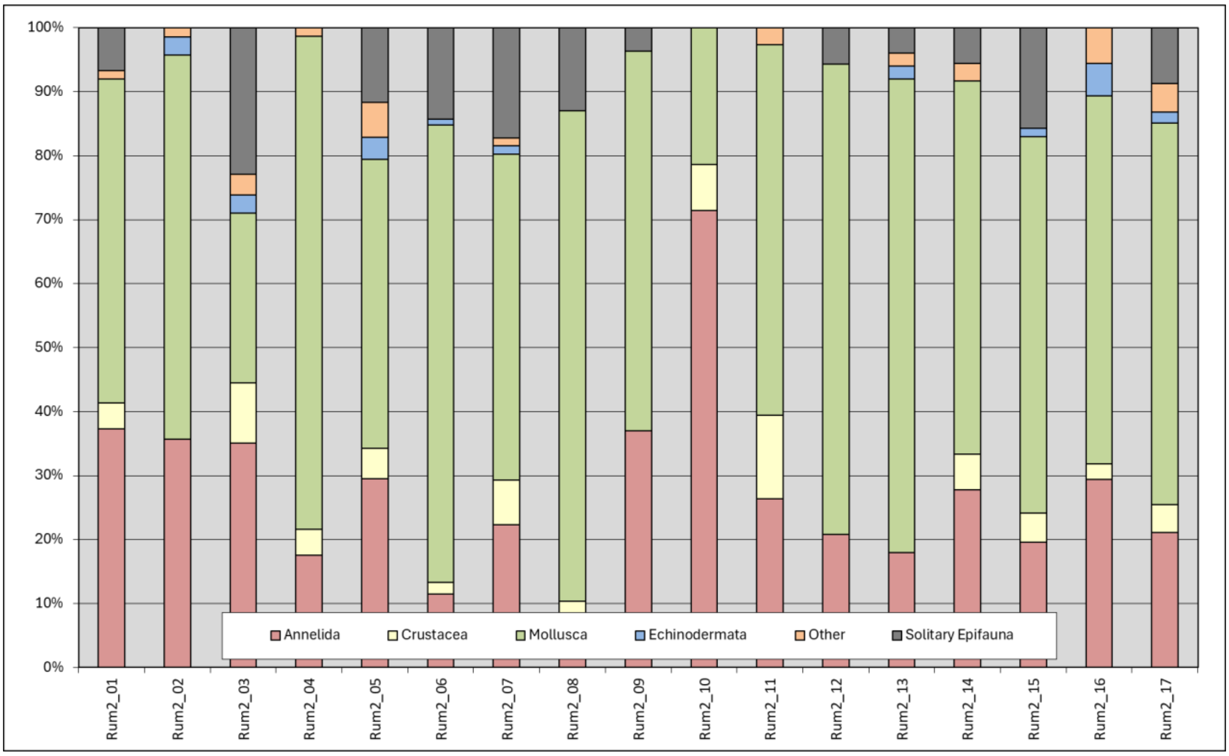


Figure 4-10 Average contribution of each phylum to total faunal abundance for each station

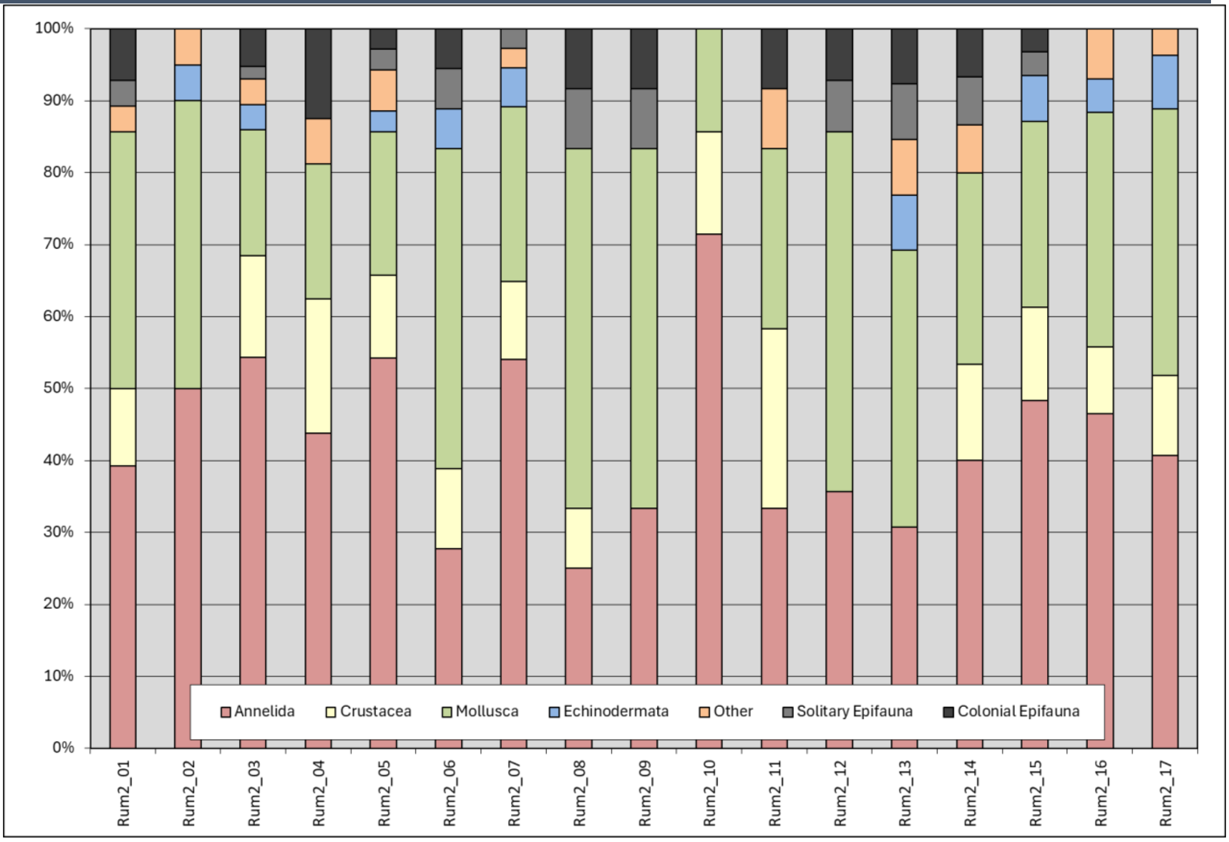


Figure 4-11 Average contribution of each phylum to total number of species for each station

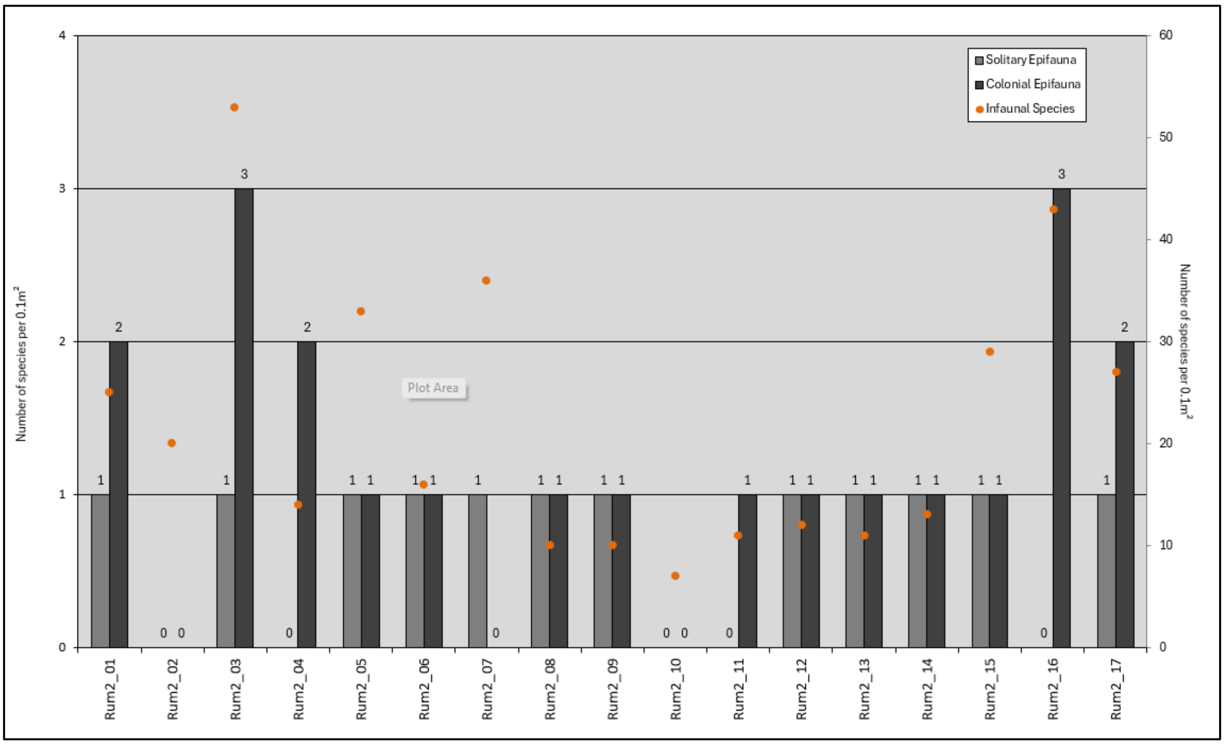


Figure 4-12 Epifaunal Versus Infaunal Richness

The 'as sampled' species accumulation curve in Figure 4-13 shows a consistent and steady increase in fauna with every new grab sample acquired, which was reflective of the homogeneous sandy mud sediment type within the Rum2 survey area. The analysis estimated the maximum species accumulation (Chao expected curve) for the survey area to be 135.9 species, compared to the 107 infaunal species recorded during the survey. The number of species recorded exceeded the representative portion of the population (i.e. 67 % or 91 species) meaning no additional replicates would be required to sample two thirds of the macrofaunal community.

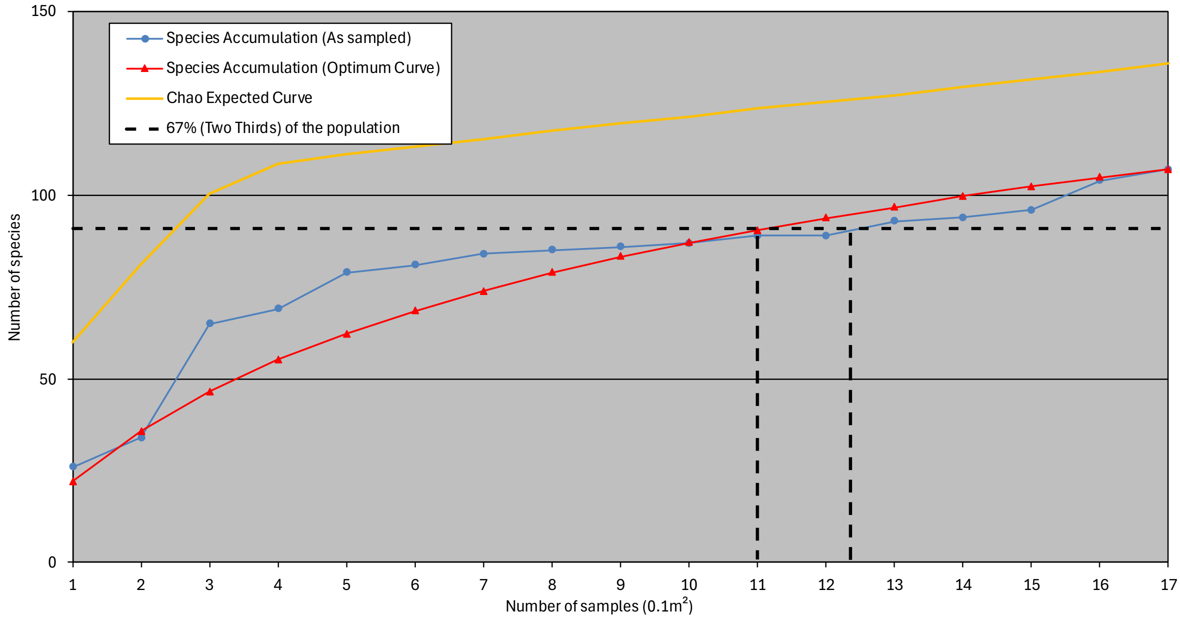


Figure 4-13 Species Accumulation Curve

With the exception of species that have been intentionally grouped into higher taxonomic levels (e.g., Nemertea, Nematoda), the majority of adult specimens were identified to genus level or lower. A total of 11 juvenile taxa were recorded in the survey area, comprising of Annelida, Arthropoda, Mollusca and Echinodermata (104 individuals in total: 11 Annelida, 7 Arthropoda, 63 Mollusca, 23 Echinodermata). It is often not possible to assign these specimens to a particular species at earlier stages of their lifecycle, so most juvenile taxa were grouped at the family level or higher. Juveniles are typically excluded from community analyses due to their high mortality before reaching maturity and the difficulty in distinguishing species within the same genus. Consequently, they can create recruitment spikes at certain times of the year due to rapid settlement and colonisation but are essentially a transient component of the population, masking underlying trends in mature adults. As a result, they have been excluded from univariate and multivariate analyses but are listed separately in Appendix VII.

Nemertea have been included in the macrofaunal analysis as they can serve as indicators of organic enrichment. However, due to their varying sizes, abundance estimates may not be entirely accurate, as some individuals may have passed through the 1,000µm sieve during macrofauna sample processing.

4.4.1 Primary and Univariate Parameters

The primary and univariate parameters for all stations are listed by station in Table 4-3, and represented in Figure 4-14, Figure 4-15 and Figure 4-16. The number of species (S) identified across the survey area varied slightly, ranging from 7 species per $0.1m^2$ at Rum2_06 to 54 species at Rum2_03 (Figure 4-14). In contrast, the number of individuals (N) (Figure 4-15) was more variable, ranging from 9 individuals per 0.1 m^2 at Rum2_06 to 94 individuals at Rum2_02 (Figure 4-14). Margalef's Index, a measure of species richness that accounts for both species count and abundance, was variable across the Rum2 survey area, with values ranging from 2.68 at Rum2_06 to 11.68 at Rum2_03. Evenness was assessed using Pielou's Index, which measures how evenly individuals are distributed among species, with values ranging from 0.892 at Rum2_05 to 0.973 at Rum2_06.

Diversity threshold values, as outlined by Dauvin et al. (2012), are as follows: values >4.00 indicate high diversity; values between 3.00 and 4.00 indicate good diversity; values between 2.00 and 3.00 indicate moderate diversity; values between 1.00 and 2.00 indicate poor diversity; and values <1.00 indicate very poor diversity (Table 4-3). The Shannon–Wiener Diversity Index showed that stations were predominantly classified as either high or good diversity, with stations Rum2_01, Rum2_02, Rum2_03, Rum2_07, Rum2_12, Rum2_13, Rum2_14 and Rum2_16 falling within the 'high diversity' category. Stations Rum2_04, Rum2_05, Rum2_08, Rum2_09, Rum2_10, Rum2_11, Rum2_15 and Rum2_17 were classified as having 'good diversity', while Rum2_06 was the only station classified as 'moderate diversity'.

These results were reflected in the Infaunal Quality Index (IQI), a multi-metric index composed of three components: the AZTI Marine Biotic Index (AMBI), Simpson's Dominance (1–λ), and the number of taxa (S). Together, these metrics describe the ecological health of the macrofaunal biological quality element. Each metric is normalised to a reference value, representing expected conditions in the habitat type under minimal or no anthropogenic disturbance. 14 stations were considered to reveal 'High/Good' IQI ecological status, while 3 stations, Rum2_04, Rum2_08 and Rum2_11, were classified as 'Moderate'. The highest IQI value was recorded at station Rum2_13 with the lowest observed at station Rum2_08 (Table 4-3). Overall, the results indicate a relatively consistent and healthy benthic community within the Rum2 survey area with no obvious signs of impact from the neighbouring existing fish farm.

Table 4-3 Univariate Faunal Parameters by Station (0.1m²)

Sample	Depth (m)	Number of Species (S)	Number of Individuals (N)	Richness (Margalef)	Evenness (Pielou's Evenness)	Simpsons Diversity (1-Lambda')	Shannon-Wiener Diversity	IQI	Ecological Status
Rum2_01	44	26	40	6.79	0.968	0.977	4.55	0.76	HIGH
Rum2_02	43	20	32	5.47	0.957	0.963	4.14	0.78	HIGH
Rum2_03	30	54	94	11.68	0.955	0.983	5.50	0.74	GOOD
Rum2_04	36	11	15	3.68	0.951	0.945	3.29	0.61	MODERATE
Rum2_05	33	14	23	4.13	0.892	0.902	3.40	0.70	GOOD
Rum2_06	30	7	9	2.68	0.973	0.941	2.73	0.69	GOOD
Rum2_07	27	34	58	8.13	0.953	0.973	4.85	0.70	GOOD
Rum2_08	34	11	18	3.49	0.943	0.930	3.26	0.60	MODERATE
Rum2_09	43	13	22	3.87	0.942	0.935	3.49	0.66	GOOD
Rum2_10	49	12	22	3.59	0.948	0.935	3.40	0.66	GOOD
Rum2_11	40	14	19	4.42	0.945	0.949	3.60	0.61	MODERATE
Rum2_12	36	30	50	7.41	0.926	0.958	4.55	0.74	GOOD
Rum2_13	50	43	69	9.92	0.958	0.981	5.20	0.79	HIGH
Rum2_14	36	28	47	7.01	0.954	0.969	4.59	0.70	GOOD
Rum2_15	23	17	31	4.67	0.898	0.920	3.67	0.71	GOOD
Rum2_16	23	37	59	8.83	0.943	0.971	4.91	0.72	GOOD
Rum2_17	28	11	23	3.18	0.909	0.896	3.14	0.70	GOOD
Mean		**22.47**	**37.12**	**5.82**	**0.94**	**0.95**	**4.01**	**0.70**	-
SD		**13.40**	**22.82**	**2.65**	**0.02**	**0.03**	**0.82**	**0.06**	-
CV (%)		**59.6**	**61.5**	**45.5**	**2.4**	**2.8**	**20.5**	**8.2**	-
Minimum		**7**	**9**	**2.68**	**0.892**	**0.896**	**2.73**	**0.60**	-
Maximum		**54**	**94**	**11.68**	**0.973**	**0.983**	**5.50**	**0.79**	-

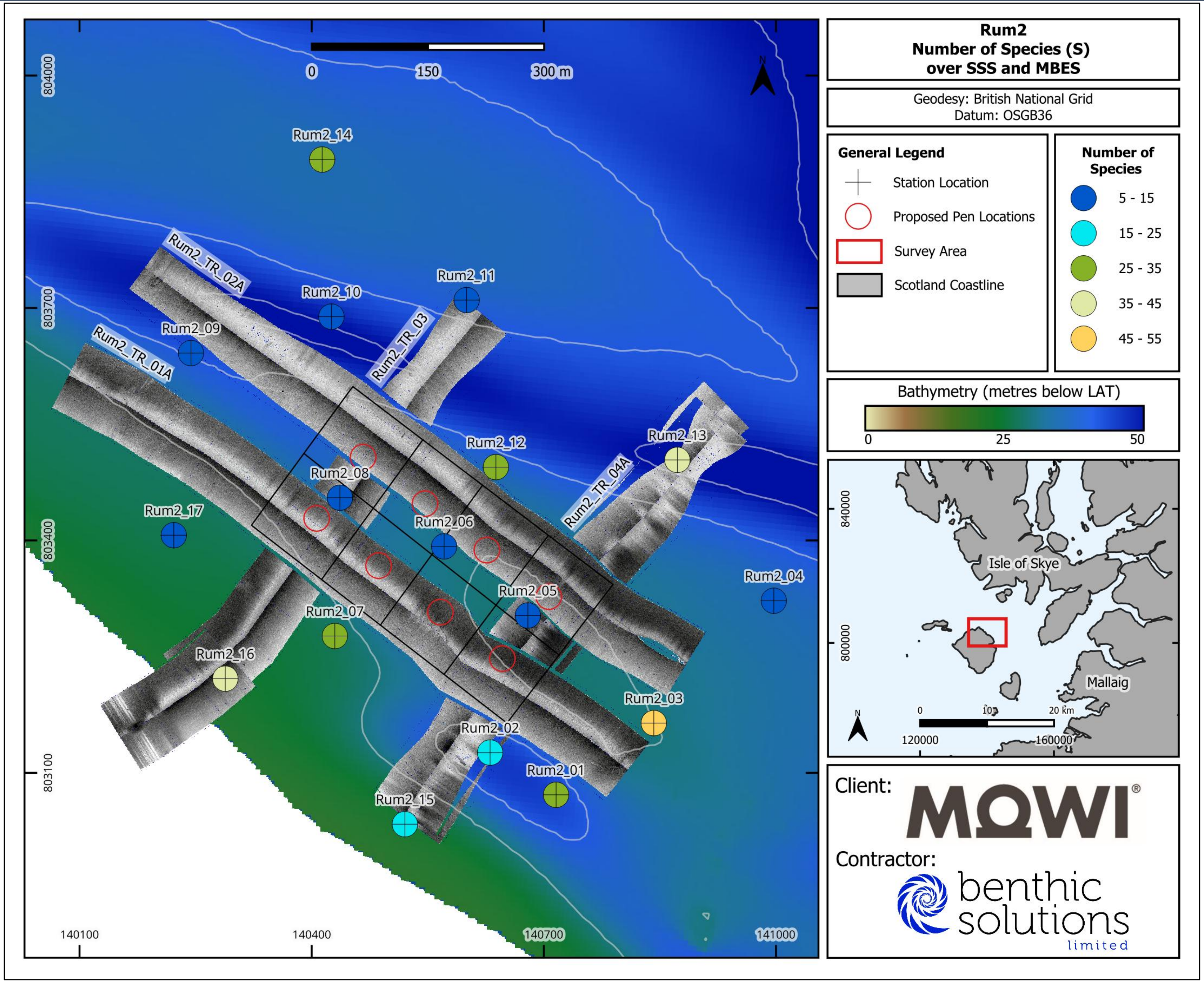


Figure 4-14 Macrofauna Number of Species per 0.1m²

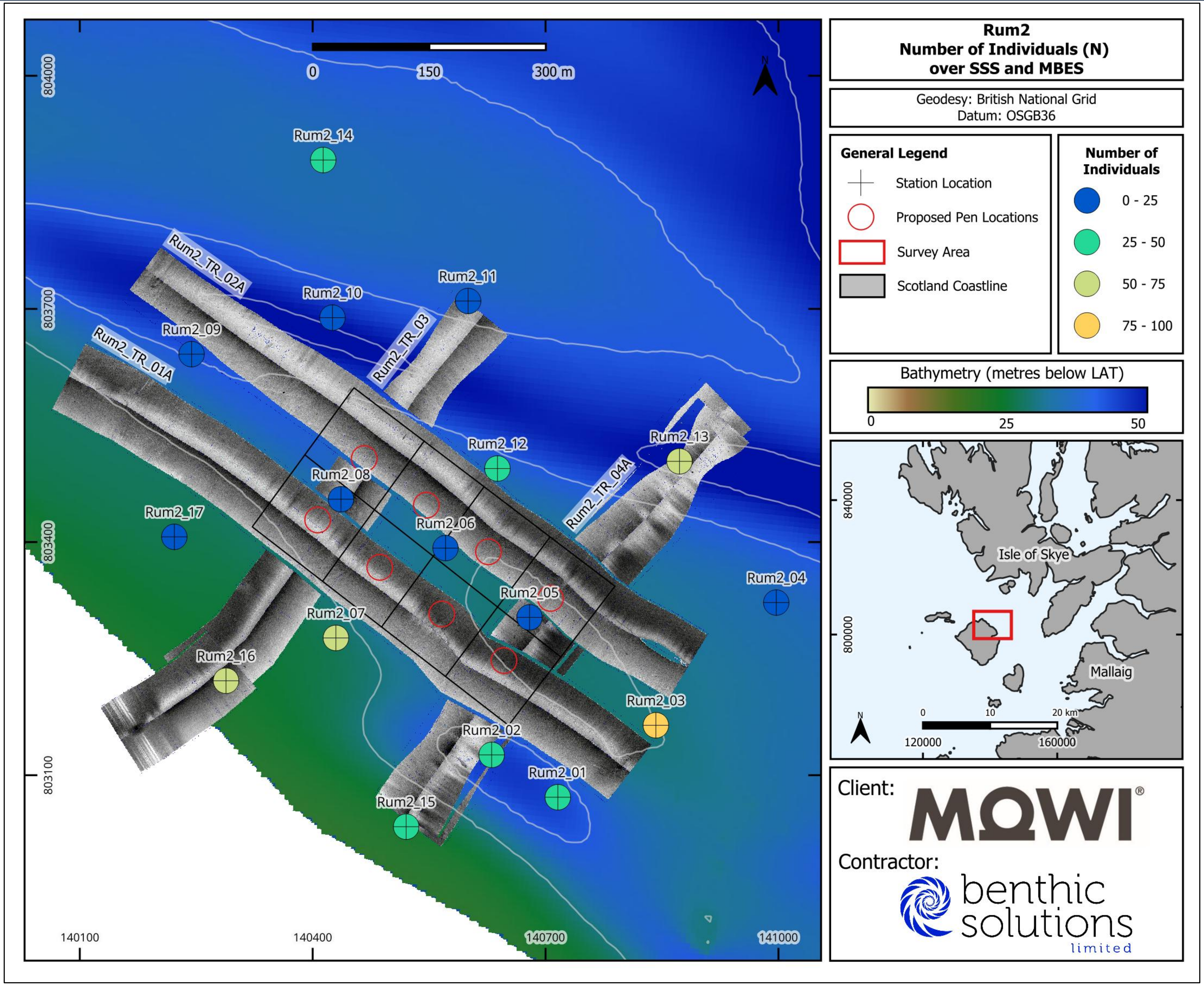


Figure 4-15 Macrofauna Faunal Abundance per 0.1m²

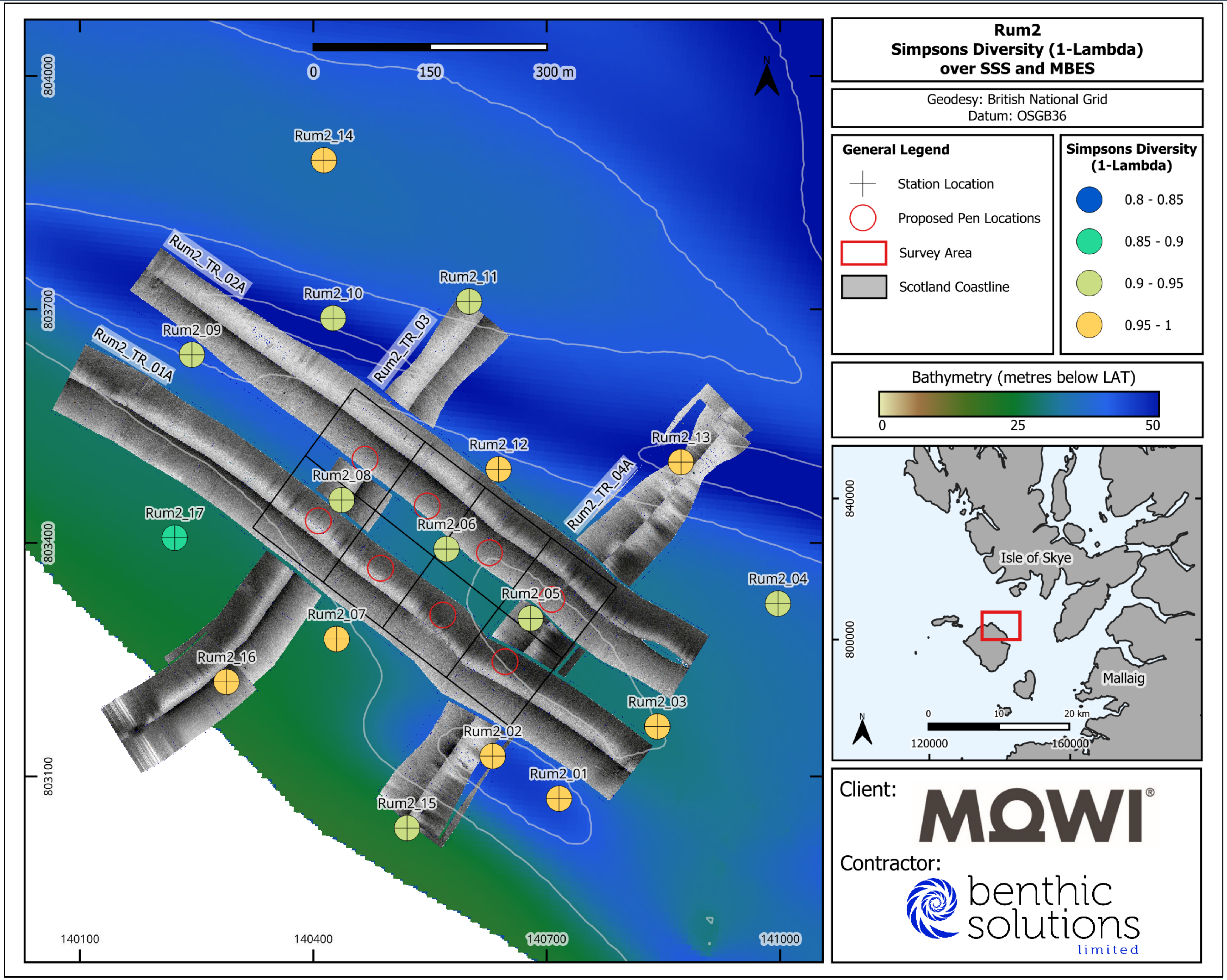


Figure 4-16 Macrofauna Simpsons Diversity by Station (1-Lambda') per 0.1m²

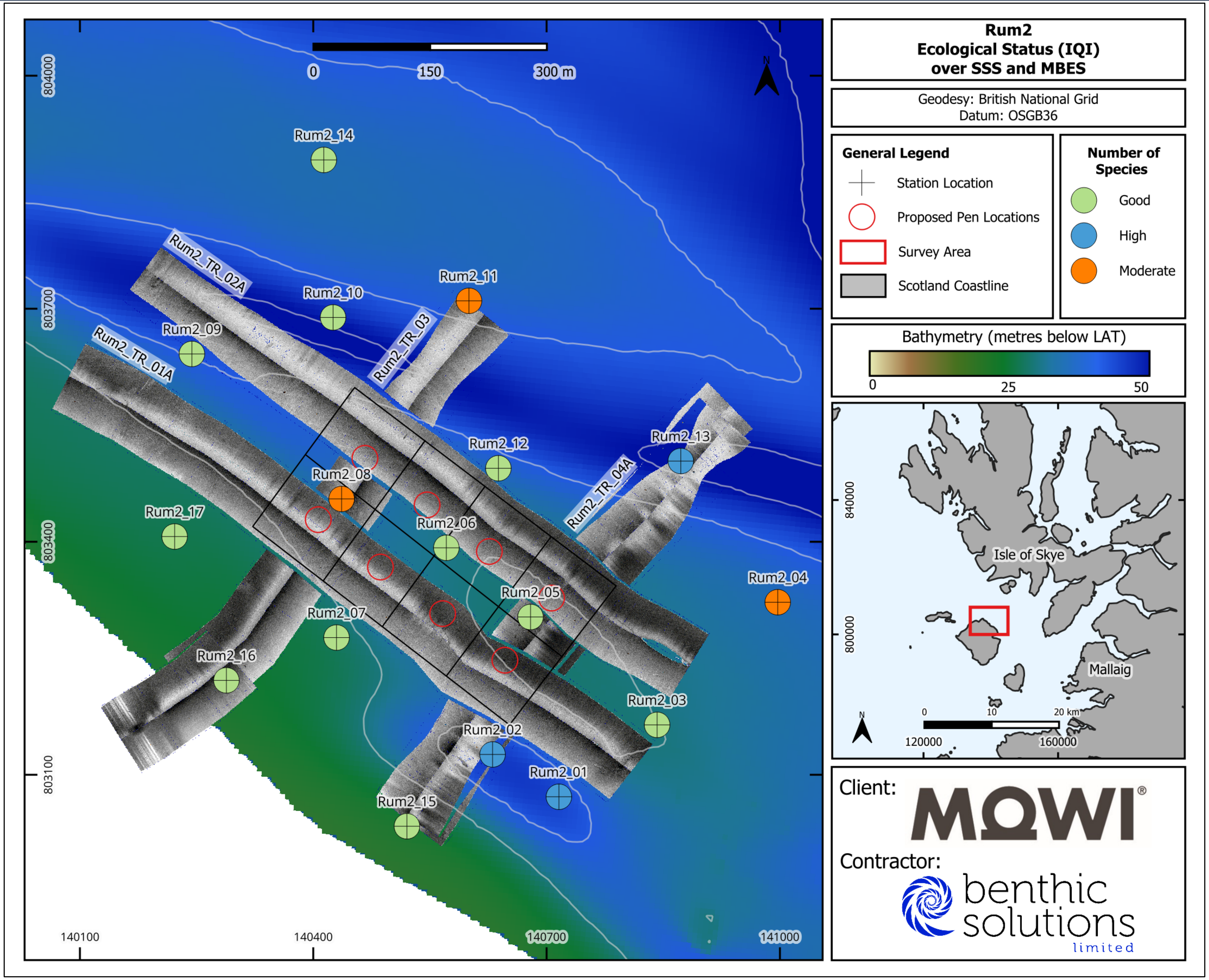


Figure 4-17 Macrofauna – IQI Ecological Status per 0.1m^2

4.4.2 Multivariate Analysis

To provide a more thorough examination of the macrofaunal community, multivariate analyses was performed on the station data using Plymouth Routines in Multivariate Ecological Research software (PRIMER 7.0.17; Clarke et al., 2014) to illustrate data trends. Unlike univariate or derived diversity indices, multivariate analyses preserve the identity of the different species by assigning a similarity or dissimilarity between the samples based on differences in the abundances of constituent species.

4.4.2.1 Hierarchical Agglomerative Clustering – Group Average Method

A similarity dendrogram was created using hierarchical agglomerative clustering (CLUSTER) and is presented for all stations in Table 4-4 and Figure 4-18. SIMPROF analysis highlighted the presence of three significantly different ($p<0.05$) clusters comprising one or more stations ($0.1m^2$) and differentiated by black branches on the dendrogram.

Table 4-4 Summary of SIMPROF Station Groupings

SIMPROF Group	Similarity (%)	Stations	Interpretation
'a'	47.31	Rum2_04 Rum2_06 Rum2_08 Rum2_09 Rum2_10 Rum2_11 Rum2_12 Rum2_13 Rum2_14	The first cluster comprised 9 stations, widely dispersed across the survey area and found at depths ranging between 30m and 50m. Stations within this cluster were mud dominated, with the highest proportion of fines (mean: 59.2%), and lowest proportion of sand (mean: 37.7%). This cluster showed moderate diversity with the highest number of speices (43), and 69 individuals per $0.1m^2$. Mollusca dominated this cluster, comprising 69.4% of individuals, followed by Annelida (19.0%), Crustacea (3.4%), and Echinodermata (0.4%). Two colonial epifauna were observed, and only one species of solitary epifauna was recorded. All other taxonomic groups collectively accounted for 0.8% of the total individuals.
'b'	52.84	Rum2_03 Rum2_05 Rum2_07 Rum2_15 Rum2_16 Rum2_17	The second cluster contained 6 stations located throughout the mid to mid-western extent of the survey area in depths ranging between 23m and 33m. Stations within this cluster were sandy mud dominated, conting the highest proportion of sands (mean: 56.1%) and gravel (mean: 4.8%). This cluster showed moderate diversity recording 54 species and the highest number of individuals (94) per $0.1m^2$. Mollusca dominated this cluster, comprising 49.7% of individuals, followed by Annelida (33.6%), Crustacea (5.3%), and Echinodermata (2.9%). Six colonial epifauna were observed, and only one species of solitary epifauna was recorded. All other taxonomic groups collectively accounted for 3.7% of the total individuals.

SIMPROF Group	Similarity (%)	Stations	Interpretation
'c'	48.13	Rum2_01 Rum2_02	The second cluster contained 2 stations located towards the bottom east of the survey area, overlapping with the extent of the existing Rum fish farm in depths ranging between 43m and 44m. Stations within this cluster were sandy mud dominated, containg (mean: 50.8%) fines and (mean: 48.4%) sands. This cluster displayed a lower diversity, but had fewer staitons, with a max. of 26 species recorded, and 40 individuals per 0.1m^2. Mollusca dominated this cluster, comprising 55.2% of individuals, followed by Annelida (36.6%), Crustacea (2.1%), and Echinodermata (1.4%). Two colonial epifauna were observed, and only one species of solitary epifauna was recorded. All other taxonomic groups collectively accounted for 1.4% of the total individuals.

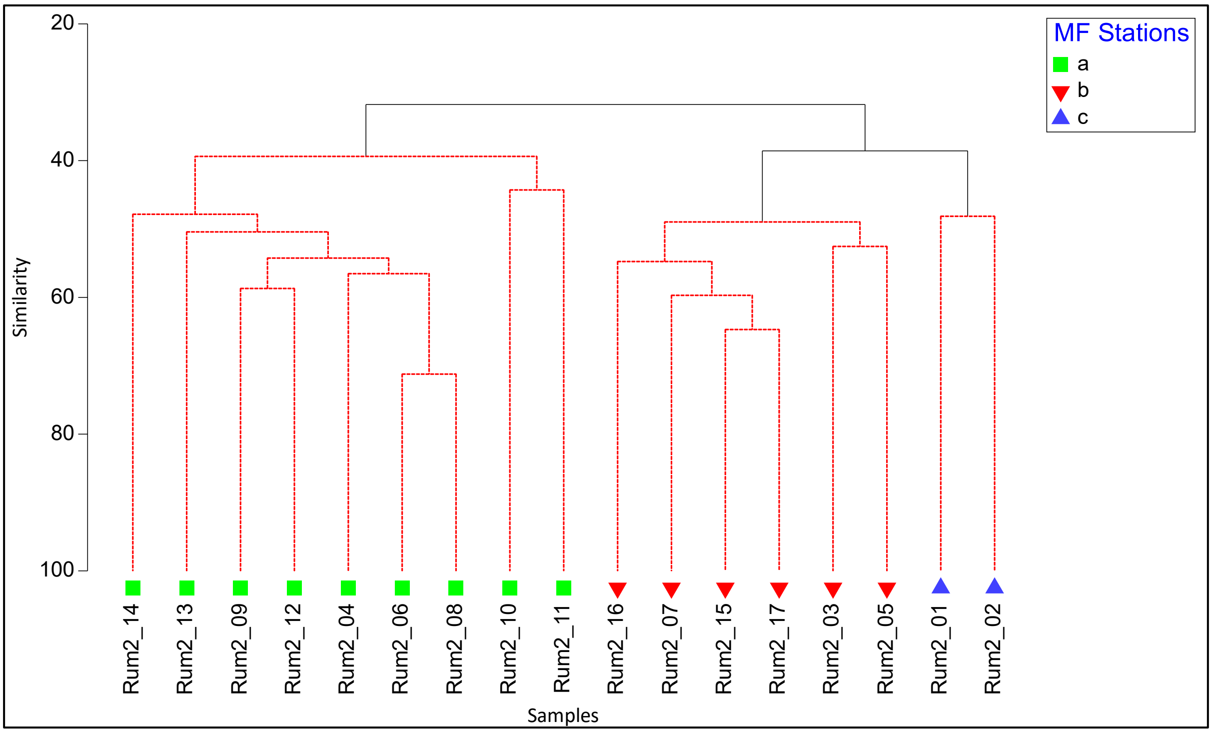


Figure 4-18 Dendrogram of Macrofaunal Stations (0.1m^2)

4.4.2.2 Non-metric Multi-dimensional Scaling (nMDS) Ordination

Similarities within the macrofaunal community recorded across the survey area are presented in Figure 4-19 by station, as 2-dimensional non-metric multi-dimensional scaling (nMDS) ordinations.

The nMDS plot displays three clusters (*'a'*, *'b'*, and *'c'*) based on macrofaunal community composition. Cluster *'a'*, comprising nine stations, was the most geographically dispersed, spanning from the mid-bottom to the mid-west, and from the top-west to the eastern extent of the survey area. These stations were generally located around the periphery of the site and not directly over the proposed pen locations. Cluster *'b'*, the second largest group, was positioned to the right of the nMDS plot, with stations more evenly distributed across the central to eastern extend of the survey site. These stations were typically located in slightly shallower waters and broadly coincided with the majority of the proposed pen locations. Cluster '*c*', situated in the upper-middle portion of the nMDS plot, was more spatially condensed and corresponded to a small geographic area at the south-eastern end of the site, overlapping with the existing Rum fish farm.

Clusters '*a*' and '*b*' appeared to be the most similar in terms of community composition, while Cluster '*c*' was more distinct, reflecting subtle differences in macrofaunal assemblages. Despite the separation into three groups, all stations were considered representative of typical background benthic communities, with no evidence of strong physical or chemical gradients influencing the observed patterns. The geographical distribution of these multivariate clusters is provided in Figure 4-20.

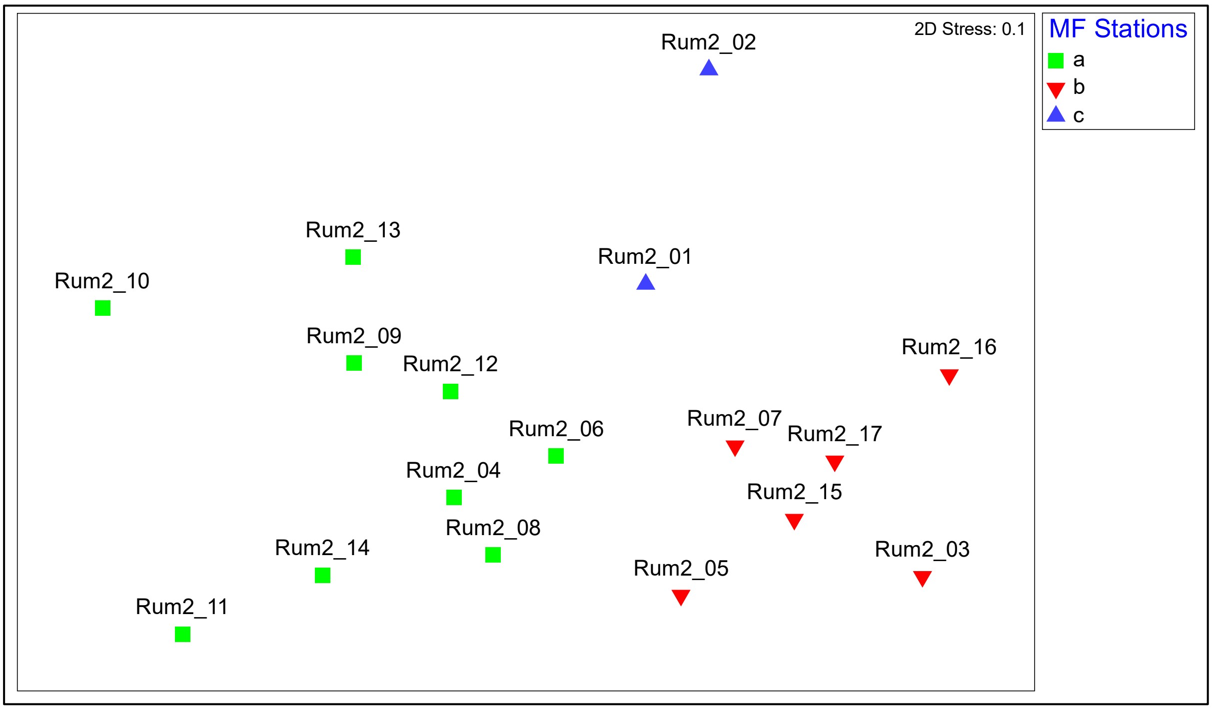


Figure 4-19 nMDS Ordination Plot of Macrofaunal Stations (0.1m²)

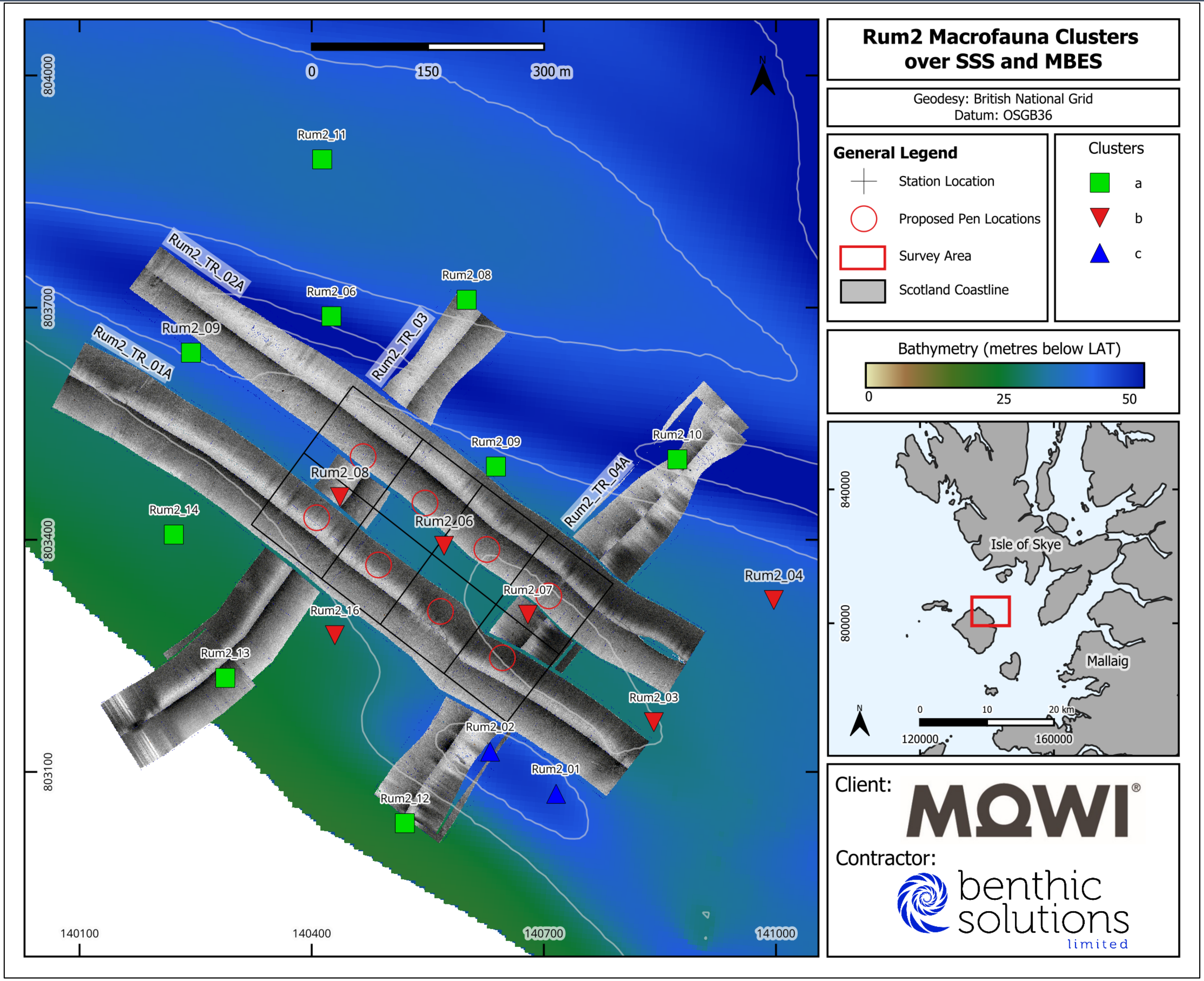


Figure 4-20 Macrofauna SIMPROF Groupings

4.1.1.1 Correlation with Environmental Variables

To assess whether the observed differences in community composition were a result of any relationships between the biological community and environmental parameters, such as sediment composition or the concentrations of organic material within the sediment, a series of RELATE tests (correlation tests) were performed.

A RELATE test between the macrofaunal community structure and the full particle size distribution (PSD) similarity matrices revealed a moderate positive significant relationship between the two (ϱ=0.599; p<0.001). This result is consistent with the slightly varying sediment types observed across the survey area, with differences in sediment composition evident between clusters. Cluster 'a' exhibited the highest proportion of fines (59.2%) and the lowest proportion of sand (3.1%), while cluster 'b' showed the lowest proportion of fines (39.1%) but the highest proportion of sand (56.1%). Although still dominated by fines, cluster 'c' had the most balanced composition, with fines at 50.8%, sands at 48.4%, and the lowest gravel content (0.9%).

Further RELATE tests were carried out between the macrofaunal dataset and separate subsets of TOC and water depth to further investigate any potential relationships between the benthic macrofauna and physico-chemical characteristics. These found a moderate positive significant relationship between the macrofauna data and TOC (ϱ=0.332; p<0.005) and between the macrofauna data and water depth (ϱ=0.5; p<0.001). These results suggest that the differences seen within the macrofaunal communities could be linked to the physical environment.

Spearman's correlation tests were conducted to explore relationships between macrofaunal diversity metrics and key sedimentary and physico-chemical parameters (Appendix VIII). Water depth was strongly positively correlated with total organic carbon (TOC; ρ=0.895, p<0.001) and % fines (ρ=0.776, p<0.001), and negatively correlated with % sand (ρ=–0.754, p<0.001) and % gravel (ρ=–0.460, p < 0.05), indicating deeper stations had finer, more organic-rich sediments. TOC was significantly positively correlated with % fines (ρ=0.723, p<0.01) but showed weaker, non-significant negative correlations with % sand and % gravel. No statistically significant correlations were found between biodiversity indices and environmental variables, though some weak trends were noted. This suggests depth and sediment composition are interrelated and linked to organic content but do not directly influence macrofaunal diversity metrics in this dataset.

4.1.1.2 IQI Indices Comparison by Station (0.1m^2)

The contribution of different ecological groups (EG) was calculated using AMBI developed by Borja et al., 2000. In the AMBI index, species are classified into five EGs based on their tolerance to organic pollution. Group I species are highly sensitive and thrive in clean, well-oxygenated environments, while Group II species tolerate slight pollution but prefer relatively unimpacted habitats. Group III species can adapt to a range of conditions, including moderate organic enrichment, whereas Group IV and Group V species are increasingly tolerant of pollution, with Group V thriving in heavily degraded, hypoxic environments. The relative abundance of these groups provides insight into the ecological health of an area, with a dominance of Groups I and II indicating good environmental quality and higher proportions of Groups IV and V suggesting pollution impacts. This information is presented for each station in Table 4-3 and Figure 4-17.

Analysis showed that all 17 stations were characterised by disturbance-sensitive species (EG I), disturbance-indifferent species (EG II), disturbance-tolerant species (EG III), and second-order opportunist species (EG IV), with only stations Rum2_01 and Rum2_03 containing first-order opportunistic species (EG V). This indicates very little contamination at the Rum2 site. Nonetheless, Cluster ‘c’ (Rum2_01 and Rum2_02) did contain the highest levels of second-order (19.2%) and first-order opportunistic species (0.7%), these being the stations that overlapped with the existing neighbouring Rum fish farm. However, the numbers of these individuals were relatively low and are not reflective of contamination from the neighbouring fish farm.

Furthermore, the AMBI Biotic Coefficient Index (BCI) was developed to determine the impacts and quality status of soft-bottom marine benthic communities, and is now widely used along European coastlines to assess levels of environmental pollution (WFD-UKTAG, 2014). The system operates on a scale from 0 to 7, with lower values indicating higher or ‘Good’ ecological status (WFD-UKTAG, 2014). All but one station scored between 1.2 and <3.3, which is indicative of ‘Good’ ecological status and suggests that most sensitive taxa of the type-specific communities are present at a level of diversity and abundance slightly outside the range associated with undisturbed conditions (WFD-UKTAG, 2014). Station Rum2_02 was classified as having ‘High’ ecological status, signifying an undisturbed community. These results likely reflect natural spatial variability in the distribution of benthic macrofauna and slight differences in sediment characteristics (Table 4-5, Figure 4-21).

Table 4-5 Overview of AMBI Ecological Groups per Station

Station	EG I (%)	EG II (%)	EG III (%)	EG IV (%)	EG V (%)	AMBI BCI
Rum2_01	15.9	46.4	24.6	11.6	1.4	2.043
Rum2_02	55.4	20	13.8	10.8	0	1.2
Rum2_03	13.3	54.5	28.3	3.4	0.4	1.848
Rum2_04	2.7	83.6	11	2.7	0	1.705
Rum2_05	8.1	66.9	19.9	5.1	0	1.831
Rum2_06	5.9	84.3	6.9	2.9	0	1.603
Rum2_07	6.1	71.6	16.2	6.1	0	1.834
Rum2_08	1.3	80.3	11.8	6.6	0	1.855
Rum2_09	8	72	12	8	0	1.8
Rum2_10	7.7	76.9	0	15.4	0	1.846
Rum2_11	10.5	71.1	13.2	5.3	0	1.697
Rum2_12	14	72	8	6	0	1.59
Rum2_13	34.7	53.1	8.2	4.1	0	1.224
Rum2_14	8.3	80.6	2.8	8.3	0	1.667
Rum2_15	8.7	74	9.3	8	0	1.75
Rum2_16	12.8	48.1	15.4	23.7	0	2.25
Rum2_17	9	59.5	15.3	16.2	0	2.081

AMBI BCI:
0.0 ≤ 1.2 = High status
1.2 ≤ 3.3 = Good status
3.3 ≤ 4.3 = Moderate status
4.3 ≤ 5.5 = Poor status
5.5 ≤ 7.0 = Bad status

AMBI Group	Feeding Method
Group I	Disturbance sensitive species
Group II	Disturbance indifferent species
Group III	Disturbance tolerant species
Group IV	Second order opportunistic species
Group V	First order opportunistic taxa

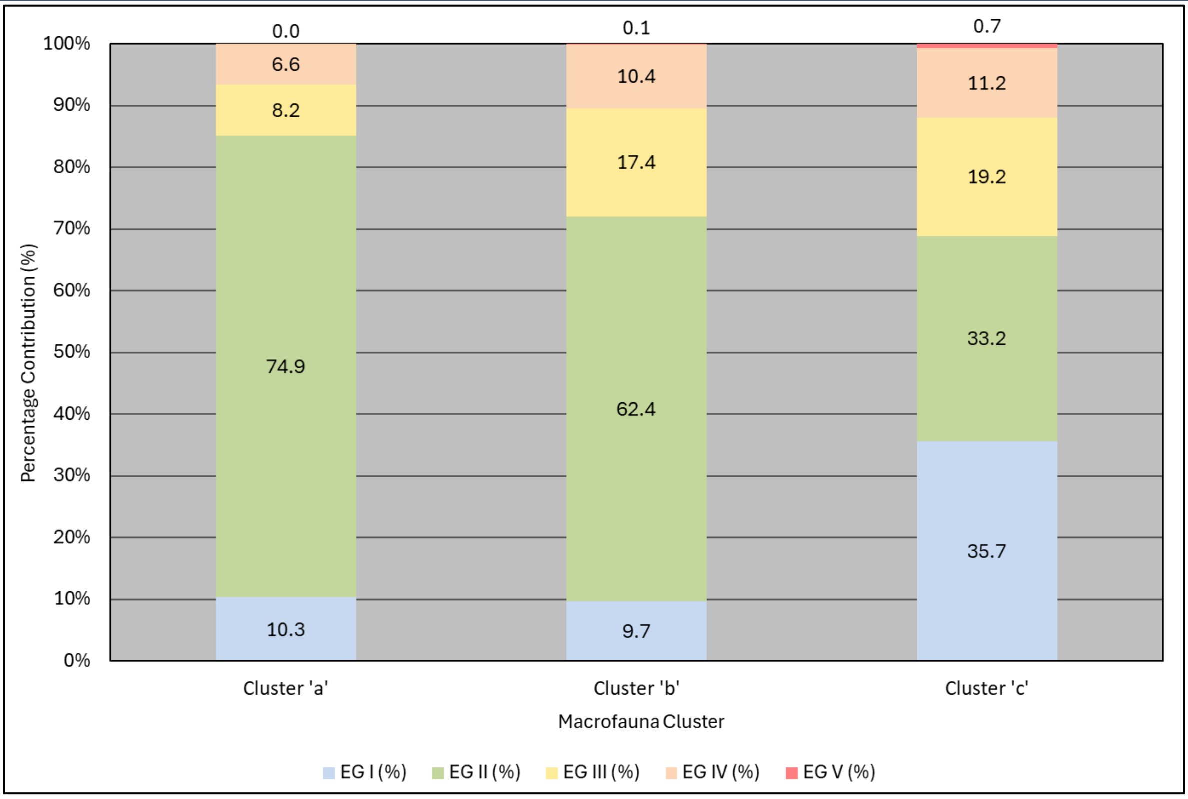


Figure 4-21 AMBI Ecological Groups I - V Percentage Contribution per Cluster

4.4.3 Community Composition

To determine the taxa driving the similarities within the SIMPROF cluster identified from pooled station data, the top ten characterising taxa were examined. Table 4-6 summarises these taxa and their percentage contributions to the overall community composition across the three clusters identified.

The SIMPER analysis highlights key species within clusters '*a*' and '*b*'. The mollusc *Turritellinella tricarinata* showed the highest average abundance (4.93 and 7.22, respectively), contributing significantly to total abundance (38.05% and 20.69%). Similarly, *Thyasira flexuosa* contributed notably to clusters '*b*' and '*c*', with average abundances of 2.08 and 2.22, and total abundances of 6.2% and 11.53%, respectively. Both *T. tricarinata* and *T. flexuosa* are generally associated with soft sediment environments, typically characterised by stable muddy-sand substrates such as those found across the Rum2 survey site. These species play crucial roles in recycling organic matter and bioturbation, enhancing nutrient cycling and sediment oxygenation in these soft-bottom marine habitats.

For cluster '*c*', the highest contributing species was *Nephtys incisa*, with an average abundance of 2.64 and total abundance of 14.12%. Other key community drivers included anemones (Actinaria), contributing average abundances of 1.4 and 4.14 in clusters '*a*' and '*b*', with total abundances of 5.67% and 8.28%, respectively. Marine polychaetes from the genus *Polycirrus* also contributed notably, with average abundances of 0.87 and 2.02 in clusters '*a*' and '*b*', and total abundances of 6.45% and 2.02%, respectively. These taxa act as ecosystem engineers by modifying sediment structure and providing refuge and feeding opportunities for various infaunal and epifaunal organisms, thereby supporting biodiversity and overall community stability in this soft sediment environment.

Importantly, many of the top ten characterising species act as indicators of organic pollution and disturbance. The prevalence of pollutant-intolerant taxa across the survey area suggests that the macrofauna community is not impacted by contaminant levels and is representative of good sediment quality.

Table 4-6 Top 10 Characterising Taxa

Top 10 Species	Cluster 'a'			Cluster 'b'			Cluster 'c'		
	Species	Av. Abundance	Contribution (%)	Species	Av. Abundance	Contribution (%)	Species	Av. Abundance	Contribution (%)
1	*Turritellinella tricarinata*	4.93	38.05	*Turritellinella tricarinata*	7.22	20.69	*Nephtys incisa*	2.64	14.12
2	*Nephtys incisa*	2.27	23.3	*Actiniaria*	4.14	8.28	*Notomastus*	2.34	12.89
3	*Polycirrus*	0.87	6.45	*Thyasira flexuosa*	2.08	6.2	*Thyasira flexuosa*	2.22	11.53
4	*Actiniaria*	1.4	5.67	*Polycirrus*	2.02	5.6	*Nephtys hombergii*	1.83	8.15
5	*Abra nitida*	1.2	5.65	*Varicorbula gibba*	2.55	5.59	*Varicorbula gibba*	1.83	8.15
6	*Notomastus*	0.84	4.86	*Notomastus*	1.92	4.77	*Nucula nitidosa*	1.71	8.15
7	*Varicorbula gibba*	0.79	3.09	*Abludomelita obtusata*	1.9	4.1	*Hyala vitrea*	3.31	8.15
8	*Thyasira flexuosa*	0.65	2.86	*Maelona alleni*	2.04	4.06	*Nemertea*	1	5.77
9	*Abludomelita obtusata*	0.72	2.83	*Nemertea*	1.87	3.85	*Polycirrus*	1.37	5.77
10	*Hyala vitrea*	0.76	1.59	*Myrtea spinifera*	1.37	3.56	*Magelona alleni*	1.5	5.77

Key:
Light blue shading: shared taxa across two clusters.
Dark blue shading: shared taxa across three clusters.

Table 4-7 Dissimilarity Percentages (SIMPER) for Macrofauna Dataset Found in Each Survey Phase

	Cluster *a*		Cluster *b*	
Cluster *c*	**Average dissimilarity 66.66%**		**Average dissimilarity 61.43%**	
	Turritellinella tricarinata	6.08	*Turritellinella tricarinata*	5.8
	Hyala vitrea	5.32	*Hyala vitrea*	3.5
	Nephtys hombergii	3.24	*Actiniaria*	3.42
	Nucula nitidosa	2.93	*Abludomelita obtusata*	1.95
	Thyasira flexuosa	2.86	*Nephtys incisa*	1.92
Cluster *a*			**Average dissimilarity 68.74%**	
			Actiniaria	3.91
			Turritellinella tricarinata	3.38
			Magelona alleni	2.48
			Varicorbula gibba	2.3
			Nemertea	2.23

4.5 Video Assessment

As per the scope of work, drop-down video surveys were conducted along four extended transects (approximately 600 to 800 metres), arranged in a grid pattern across the Rum2 site (Figure 2-4). Video footage confirmed a predominantly sandy mud habitat with a high density of burrows and infauna across all transects (Figure 4-4).

All stations exhibited extensive coverage of the burrowing tube anemone (*Synarachnactis lloydii*), Norway lobster (*Nephrops norvegicus*) and their respective burrows, and common tower shell (*Turritella communis*). Slender sea pen (*Virgularia mirabilis*) and phosphorescent sea pen (*Pennatula phosphorea*) were observed in patches across all transects. Additional fauna, including actiniarians (Actinaria sp.), common starfish (*Asterias rubens*), brachyuran crabs (Brachyura spp.), common goby (*Pomatoschistus microps*) and gurnards (family Triglidae), were also recorded at all stations.

Rum2_TR_01A contained a localised sea pen assemblage at the southeastern end, featuring *Virgularia mirabilis* and *Pennatula phosphorea* (Figure 5-1), as well as the plumose anemone (*Metridium senile*). Mobile fauna observed included red gurnard (*Chelidonichthys cuculus*), edible crab (*Cancer pagurus*), mud runner crab (*Goneplax rhomboides*) and harbour crab (*Liocarcinus depurator*). No tall sea pens (*Funiculina quadrangularis*) were observed at this transect.

Rum2_TR_02A, Rum2_TR_03 and Rum2_TR_04A all exhibited faunal assemblages similar to those recorded along transect Rum2_TR_01A. Additional epifaunal observations included sand brittle stars (*Ophiura albida*), hermit crabs (*Pagurus* sp.), and a greater density of sea pen assemblages, including *Virgularia mirabilis*, *Pennatula phosphorea* and *Funiculina quadrangularis*. Within Rum2_TR_02A, these sea pens were predominantly concentrated near the centre to the northeast of the transect, whereas in Rum2_TR_03 and Rum2_TR_04A, they were found more towards the deeper northeastern side of the survey area. Rum2_TR_04A recorded the highest density of *Funiculina quadrangularis*, with multiple individuals often grouped together exclusively in the muddier sediments at the deeper northeastern end of the transect (Figure 5-2).

4.6 Environmental Habitats

4.6.1 Habitat Classification

Stations across the Rum2 survey area were located at depths ranging between 20m and 50m. The seabed was generally flat and comprised a surface layer of soft mud or muddy sand, often overlying more consolidated gravelly or sandy mud (Appendix III). Sediment types, based on the Wentworth classification, ranged from ‘Mud’ to ‘Sand’, while Folk classifications included ‘Sandy Mud’, ‘Slightly Gravelly Sandy Mud’, ‘Gravelly Mud’, ‘Muddy Sand’, ‘Slightly Gravelly Muddy Sand’ and ‘Gravelly Muddy Sand’ (Table 4-1). Video footage indicated some minor localised variation in sediment features, including bioturbation (e.g. burrows, faunal tracks and mounds), patches of algae and shell debris; however, these occurred within an otherwise uniform sandy mud environment. This was supported by the acquired SSS data, which revealed a low reflective and homogeneous seabed. Apart from two small localised boulders to the southwest of station Rum2_05, which did not significantly alter the surrounding habitat based on video and sediment ground-truthing, no other geomorphological features were identified.

EMODnet predicted habitat mapping initially indicated that the Rum2 site was situated within the broad JNCC Level 3 habitat SS.SMu 'Sublittoral cohesive mud and sandy mud communities' (EUNIS: MC62; Figure 3-1). This habitat is typically classified as cohesive sandy mud with more than 20% silt and clay, found below 10m in areas with weak tidal currents, conditions consistent with those recorded across the Rum2 site. The presence of species such as *Nephrops norvegicus* (which favours fine cohesive mud for burrowing), the sea pens *Funiculina quadrangularis*, *Virgularia mirabilis* and *Pennatula phosphorea*, the tube anemone *Synarachnactis lloydii*, brittlestars (Ophiuroidea spp.), mobile taxa such as *Cancer pagurus, Carcinus maenas*, and *Asterias rubens* within the Rum2 site is consistent with this habitat classification.

Following ground-truthing, video assessment and particle size analysis, further investigation revealed that the site was found to exhibit a stronger affinity to the JNCC Level 4 habitat SS.SMu.CFiMu 'Circalittoral fine mud' (EUNIS: MC621; Figure 4-22). This substrate consisted of cohesive fine sediments likely to support infaunal communities typically associated with low-energy circalittoral mud environments. Within the central corridor of the survey area, the habitat displayed characteristics consistent with the JNCC Level 5 biotope SS.SMu.CFiMu.SpnMeg 'Seapens and burrowing megafauna in circalittoral fine mud' (EUNIS: MC6216; Figure 4-23). This biotope formed a broad band across these areas and was defined by the presence of seapen species alongside diverse burrowing megafauna. Ecological sensitivity increased within the northeastern deeper transects (Rum2_TR_03 and Rum2_TR_04A), which were classified as the JNCC Level 6 biotope SS.SMu.CFiMu.SpnMeg.Fun 'Seapens and burrowing megafauna with *Funiculina quadrangularis* in undisturbed Atlantic fine mud' (EUNIS: MC62161; Figure 4-24). These areas represented the highest ecological sensitivity within the survey and supported the OSPAR Threatened/Declining Habitat 'Seapen and Burrowing Megafauna Communities'. This is discussed further in Section 5 with a summary of habitats presented in Figure 4-25.

Table 4-8 Seabed Substrate Categories Identified

Substrate Category	EUNIS Habitat	JNCC Habitat	Description
Cohesive fine mud	MC621	Level 4 Classification: Circalittoral fine mud (SS.SMu.CFiMu)	This substrate was present throughout the majority of the survey area. Consisted of cohesive fine sediment, likely supporting infaunal communities associated with low-energy circalittoral muds.
Cohesive fine mud	MC6216	Level 5 Classification: Seapens and burrowing megafauna in circalittoral fine mud (SS.SMu.CFiMu.SpnMeg)	This substrate was present throughout the central and central-eastern regions of the survey area, appearing as a broad band that extends towards the east and is characterised by a general abundance of seapens species.
Cohesive fine mud	MC62161	Level 6 Seapens, including Funiculina quadrangularis, and burrowing megafauna in undisturbed Atlantic circalittoral fine mud (SS.SMu.CFiMu.SpnMeg.Fun)	This substrate was present within the deeper, finer northeastern extent of the survey area, particularly at Rum2_TR_03 and mostly Rum2_TR_04_A where a higher number of the tall seapen *Funiculina quadrangularis* individuals were observed.

4.6.2 Fine Mud – Circalittoral Fine Mud Communities (SS.SMu.CFiMu / MC621)

This habitat consists of cohesive fine mud typically found in low-energy circalittoral environments, usually below 15–20 metres depth. It occurs in sheltered or offshore areas with weak tidal currents, where fine sediments settle and accumulate undisturbed.

The faunal community is dominated by infaunal and burrowing species adapted to soft sediments. Characteristic species include the Norway lobster (*Nephrops norvegicus*), the burrowing sea anemone (*Synarachnactis lloydii*), sea pens such as *Funiculina quadrangularis*, *Virgularia mirabilis* and *Pennatula phosphorea*. Brittlestars (Ophiuroidea spp.), polychaetes (*Melinna palmata*, *Nephtys incisa*), the bivalve *Abra nitida*, sea cucumber *Parastichopus tremulus*, and pea urchin *Echinocyamus pusillus* are also commonly recorded (Figure 4-22).

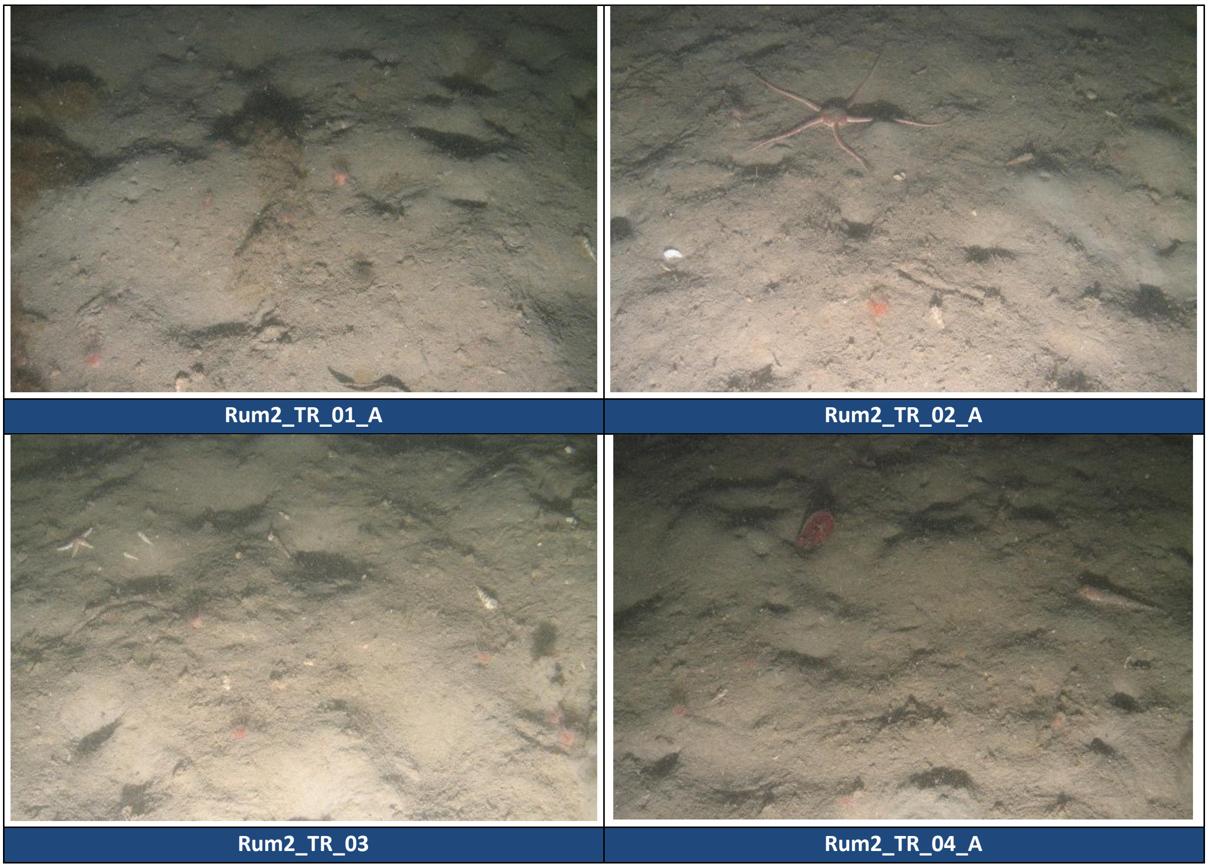


Figure 4-22 Example Images of 'Circalittoral Fine Mud' Habitat

4.6.3 Seapens and burrowing megafauna in circalittoral fine mud (SS.SMu.CFiMu.SpnMeg / MC6216)

The SS.SMu.CFiMu.SpnMeg biotope occurs in stable circalittoral fine mud where low hydrodynamic energy allows the establishment of sea pens and burrowing megafauna. The assemblage is typically characterised by *Virgularia mirabilis* and *Pennatula phosphorea*, with *Funiculina quadrangularis* present in less disturbed examples. Burrowing species, including *Nephrops norvegicus* and *Callianassa subterranea*, are commonly recorded and contribute to sediment reworking.

This biotope represents a biologically enriched variant of the SS.SMu.CFiMu habitat and is defined by the consistent presence of sea pens and megafaunal burrows within cohesive fine mud sediments (Figure 4-23). It is recognised as part of the OSPAR Threatened and/or Declining Habitat "Seapen and Burrowing Megafauna Communities".

Rum2_TR_04	Rum2_TR_04_A

Figure 4-23 Example Images of 'Seapens and Burrowing Megafauna in Circalittoral Fine Mud' Habitat

4.6.4 Seapens, including Funiculina quadrangularis, and burrowing megafauna in undisturbed Atlantic circalittoral fine mud (SS.SMu.CFiMu.SpnMeg.Fun / MC62161)

Funiculina quadrangularis dominates the SS.SMu.CFiMu.SpnMeg.Fun biotope, often accompanied by *Virgularia mirabilis* and *Pennatula phosphorea*. Burrowing megafauna such as *Nephrops norvegicus* and *Callianassa subterranea* are commonly present, alongside a range of infaunal organisms including polychaetes, brittlestars (Ophiuroidea spp.), bivalves like *Abra nitida*, and echinoderms such as *Parastichopus tremulus*.

This biotope occurs in cohesive fine mud within low-energy, deeper circalittoral settings where physical disturbance is limited and fine sediments accumulate. It forms a biologically distinct subset of SS.SMu.CFiMu.SpnMeg, distinguished by the presence of the tall seapen *Funiculina quadrangularis* (Figure 4-24).

The biotope is recognised as part of the OSPAR Threatened and/or Declining Habitat "Seapen and Burrowing Megafauna Communities," with *F. quadrangularis* serving as an indicator of relatively undisturbed muddy seabeds due to its sensitivity to physical disturbance.

Rum2_TR_04	Rum2_TR_04_A

Figure 4-24 Example Images of 'Funiculina quadrangularis in Undisturbed Atlantic Circalittoral Fine Mud' Habitat

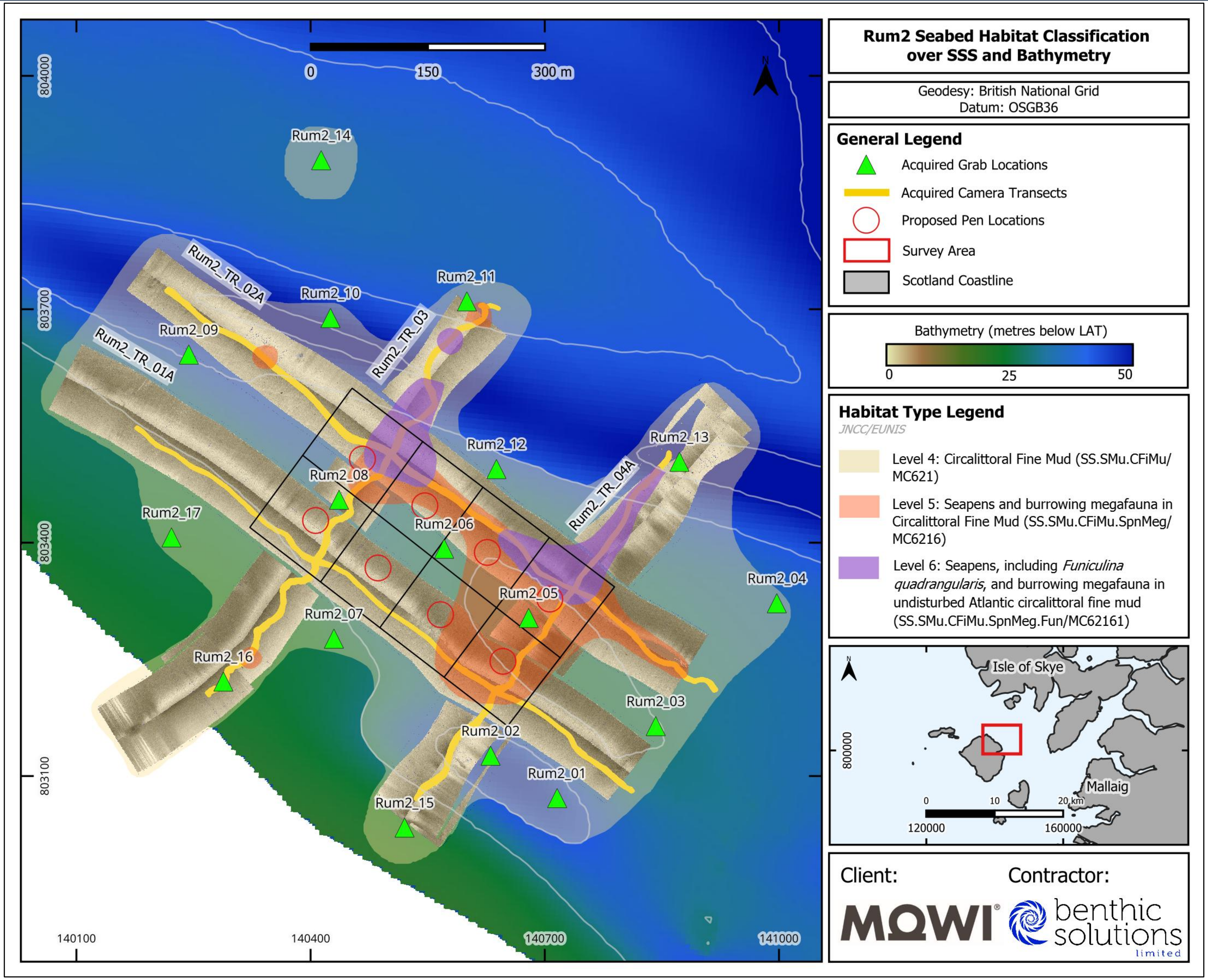


Figure 4-25 Summary of Habitats within the Rum2 Survey Area

5 Potential Sensitive Habitats and Species

5.1.1.1 Legislative Species Protection

In order to assess whether any species afforded legislative protection in the UK were present within the survey area, both the conspicuous fauna (Appendix IX) recorded from the underwater video assessment and the infauna data derived from macrofaunal samples (to be completed and reported in the next revision of this report) were cross-checked against a listed species database developed by BSL staff. This database identifies species protected under several UK legislative conventions and directives, including the UK Biodiversity Framework (UKBF).

Species recorded within the survey area (through underwater footage only) with designated legislative protection included only the tall sea pen (*Funiculina quadrangularis*). This species is covered by all, or a combination of, the legislation summarised in Table 5-1.

Table 5-1 Legislative Species Protection

Species	Species listed as Features of Conservation Interest (FOCI)	UKBF/UK Post 2010 Biodiversity Framework	Scottish Biodiversity List (SBL)	PMF Feature	OSPAR Annex V	IUCN Red list
Funiculina quadrangularis	✓	✓	✓	-	-	-

Individuals of the tall sea pen were recorded along transects Rum2_TR_02, Rum2_TR_03 and Rum2_TR_04 but were entirely absent along Rum2_TR_01. The highest concentrations were noted along transects Rum2_TR_03 and Rum2_TR_04, both located to the deeper, northeastern side of the survey area. This spatial distribution suggests a preference for more stable sedimentary environments, where reduced hydrodynamic energy allows cohesive fine sediments to accumulate, characteristic of the JNCC, SS.SMu 'Sublittoral cohesive mud and sandy mud communities' (EUNIS: MC62) and more specifically the level 4, SS.SMu.CFiMu classification 'Circalittoral fine mud' (EUNIS: MC621).

5.1.1.2 Seapen and Burrowing Megafauna Communities (OSPAR)

Deep-sea mud-dominated ecosystems can form complex habitats when densely populated with sea pens and/or burrowing megafauna, providing protection under the OSPAR Threatened and/or Declining Habitat category 'Seapen and Burrowing Megafauna Communities.' This habitat is characterised by heavily bioturbated sediments created by burrowing megafauna, often crustaceans, with burrows and mounds as prominent biotope features (OSPAR, 2008).

High densities of burrowing tube anemones (*Synarachnactis lloydii*) and Norway lobster (*Nephrops norvegicus*) burrows were observed throughout the entire survey area, with physical sightings of lobsters within or outside their burrows at transects Rum2_TR_03 and Rum2_TR_04 (Figure 5-1).

Sea pens were also recorded consistently throughout the Rum2 survey area, comprising three species: the tall sea pen (*Funiculina quadrangularis*), phosphorescent sea pen (*Pennatula phosphorea*), and slender sea pen (*Virgularia mirabilis*). Within transect Rum2_TR_01A, only *Pennatula phosphorea* and *Virgularia mirabilis* were present, while all three species were observed along transects Rum2_TR_02A, Rum2_TR_03, and Rum2_TR_04A. The greatest density of *F. quadrangularis* occurred along transect Rum2_TR_04A, primarily to the upper northeast, deeper areas. *Funiculina quadrangularis* is listed as a Priority Marine Feature (PMF) under the Scottish Biodiversity List (SBL) and was included as a priority species in the UK Biodiversity Framework (UKBF). The distribution of tall sea pens is indicative of the OSPAR Threatened and/or Declining Habitat ‘Seapen and Burrowing Megafauna Communities’ and highlights the presence of a sensitive, protected benthic habitat (Figure 5-2).

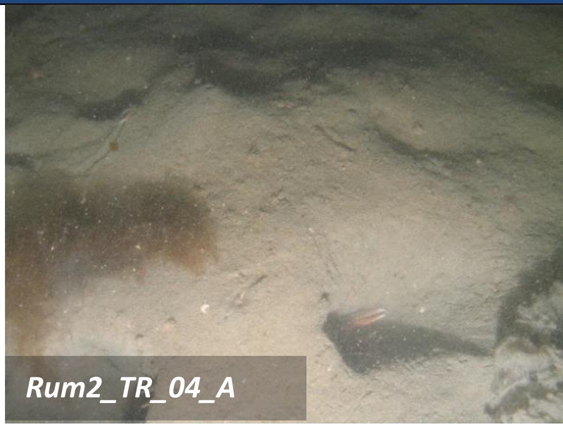
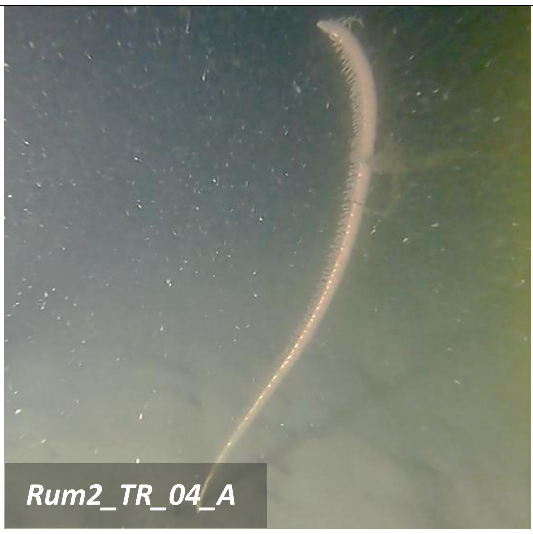
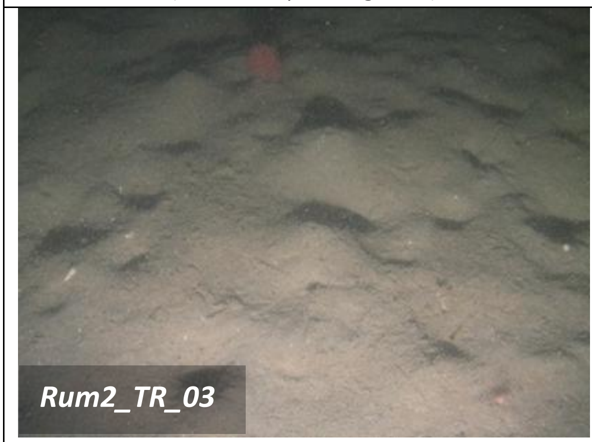
Potential Occurrences of OSPAR Seapen and Burrowing Megafauna Communities	
 Burrowing Tube Anemone (*Synarachnactis lloydii*)	 Norway Lobster Burrow (*Nephrops norvegicus*)
 Tall Sea Pen (*Funiculina quadrangularis*)	 Slender Sea Pen (*Virgularis mirabilis*)
 Phosphorescent Sea Pen (*Pennatula phosphorea*)	

Figure 5-1 Example Images of Sea Pens, Burrowing Megafauna and Bioturbation

Figure 5-2 Sea Pen Coverage Across the Rum2 Survey Area

5.1.1.3 SACFOR Burrow Assessment

In order to determine whether the SS.SMu.CFiMu (EUNIS: MC621) 'Circalittoral fine mud' habitat recorded across the survey area should be classified as the OSPAR 'Seapen and Burrowing Megafauna Communities' (also a Scottish priority marine feature (PMF), listed as 'Burrowed Mud'), a combination of environmental factors and faunal information were considered, as outlined in JNCC (2014). As mentioned in Section 5.1.1.2, for a habitat to be classified as 'Seapen and Burrowing Megafauna Communities' the presence of burrowing macrofauna is an essential element while the presence of sea pens is not a critical qualifying factor.

Within the Rum2 survey area, three different sea pen species (*Funiculina quadrangularis, Pennatula phosphorea* and *Virgularia mirabilis*) were consistently observed throughout the camera transects along with burrow openings of various sizes. In order to apply the SACFOR scale (Table 3-2), the burrows were divided into two size groups and assessed independently, with smaller burrows likely to be inhabited by burrowing fauna of 1 to 3cm length and larger burrows, as observed on the underwater video were inhabited by *N. Norvegicus* (3 to 15cm length).

Due to limited visibility of the laser in the still images, which was only clearly visible in a few instances, HD screenshots from the video were taken at each still location to support the SACFOR assessment. Since the HD video frames covered a larger area than the original still photos, only burrows within the approximate still image boundaries were recorded to avoid overestimating density, which is measured per square metre. Stills were generally taken every 20m, but some small gaps in coverage existed; these were filled using screenshots from the HD video to ensure even spatial representation of the site for the assessment.

Given the presence of burrows at the SACFOR density of 'Frequent' and the sightings of burrowing crustaceans, this area can be considered a 'Seapen and Burrowing Megafauna Community', according to JNCC (2014) guidance and would also fall under the Scottish PMF habitat of 'Burrowed mud' (Howson *et al*., 2012).

Table 5-2 SACFOR Abundance Scale Along Each Transect

Transect	Sediment variation	Number of small burrows present (1 to 3cm)	Number of large burrows present (3 to 15cm)
Rum2_TR_01_A	MC62: Atlantic circalittoral mud	3.04	4.35
Rum2_TR_02_A	MC62: Atlantic circalittoral mud	3.77	4.24
Rum2_TR_03	MC62: Atlantic circalittoral mud	2.94	3.94
Rum2_TR_04_A	MC62: Atlantic circalittoral mud	3.20	4.77

Colour code for SACFOR abundance classification						
Superabundant	Abundant	Common	Frequent	Occasional	Rare	Less than Rare

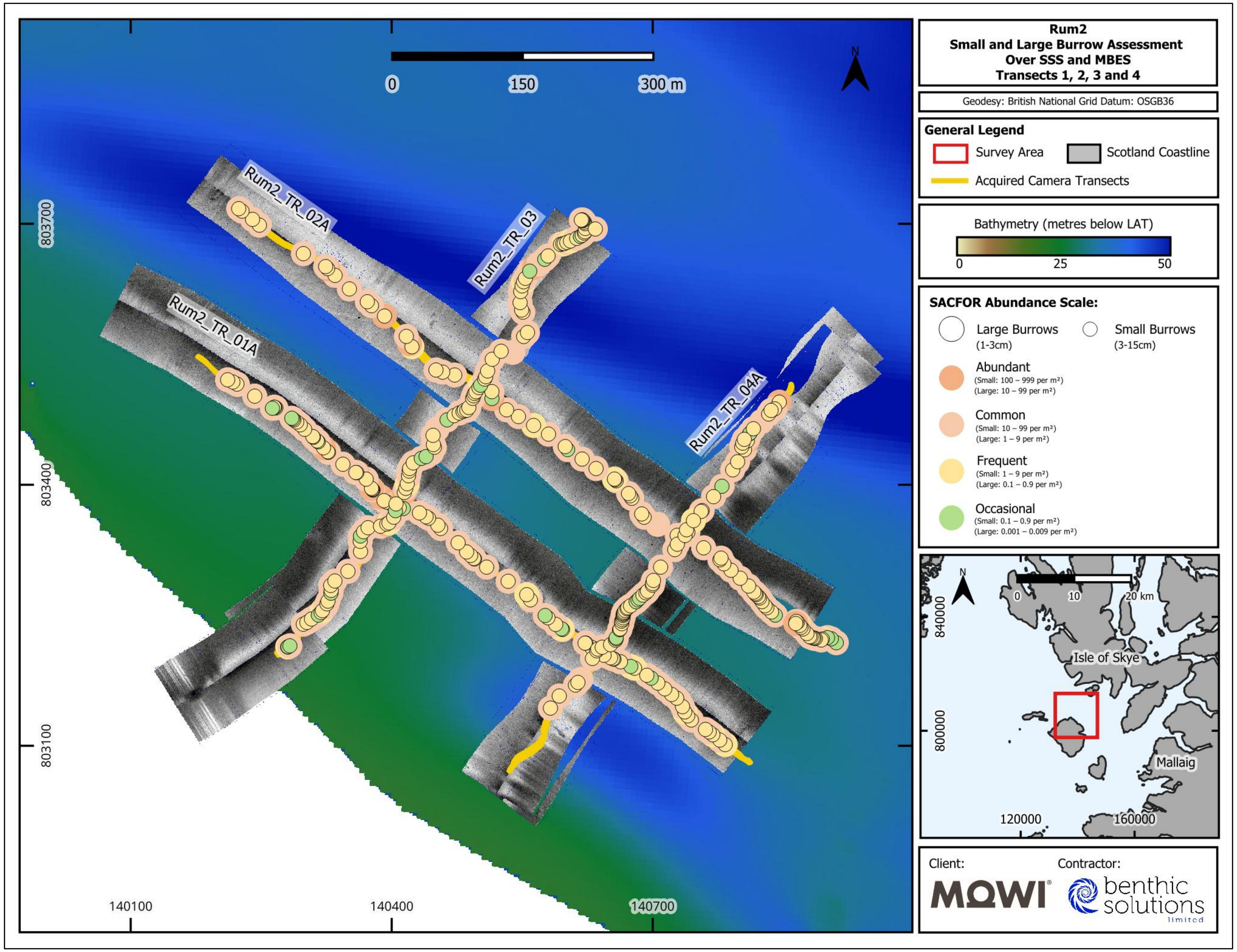


Figure 5-3 Rum2 Summary of Burrow Density Along Each Transect

5.1.1.4 Raitt's Sandeel (Ammodytes marinus)

Sandeels are small, thin eel-like fish that form large shoals and live most of their life buried in the seabed. They are a key 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 Raitt's sandeel (Ammodytes 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 habitats for sandeels, which prefer habitats in water depths between 30m and 70m but are known to occur at depths of 15m and 120m (Holland et al., 2005). These small fish burrow into the sediment 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, sandeels have a very specific habitat requirement, resulting in an often highly patchy distribution (Holland et al., 2005; Jensen et al., 2011). Sandeel spawning grounds and nursery grounds have been delineated by CEFAS for UK waters.

Preferred sandeel habitat is a substrate which contains a high percentage of medium to coarse sand (particle size of 0.25mm to 2mm), with a mud content of less than 10% (particles <63µm) (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), with these groupings overlaid on a Folk Triangle scale in Figure 5-4.

Table 5-3 Sandeel ground assessment categories specified by Latto et al. (2013)

Folk Category	Habitat Preference
Sand	Preferred
Gravelly Sand	Preferred
Slightly Gravelly Sand	Preferred
Sandy Gravel	Marginal
Other	Unsuitable

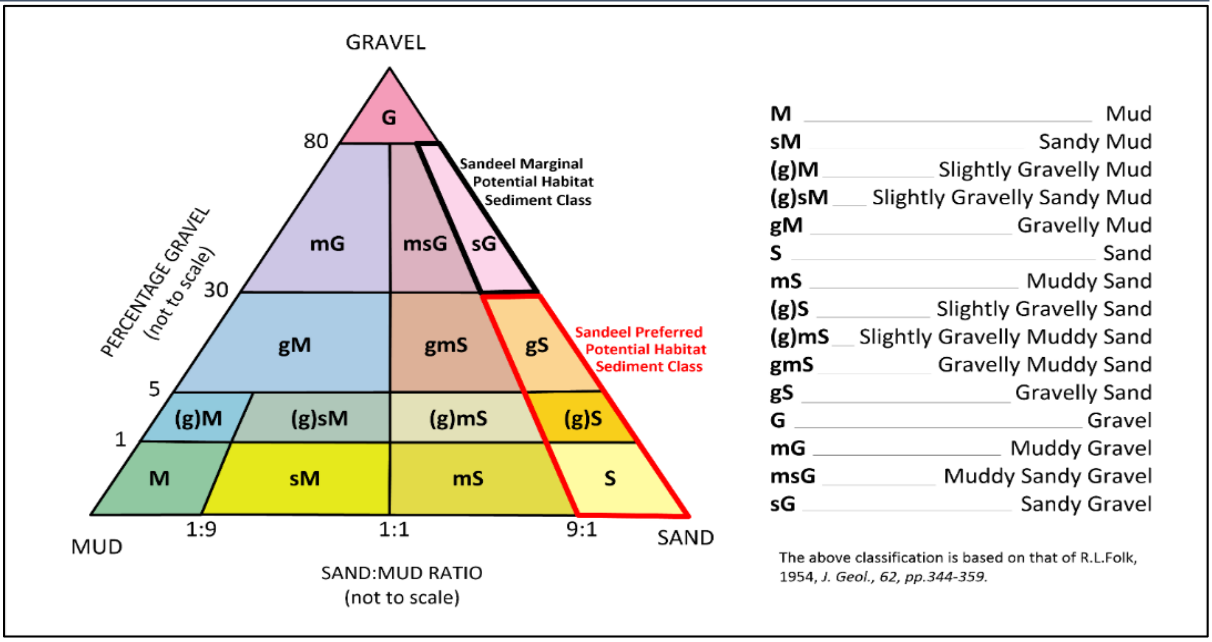


Figure 5-4 Folk sediment triangle with sandeel preferred and marginal habitat sediment classes (based on Latto et al, 2011, adapted from Greenlink, 2019)

Results from the particle size analysis (PSA) and assigned Folk scale sediment classifications, using the method outlined in Latto et al. (2013), are presented in Table 5-4. All stations within the Rum2 site were classified as 'Unsuitable' sediments for sandeel grounds (Figure 5-5).

Table 5-4 Sandeel ground assessment results using Latto et al. (2013)

Station	Water Depth (m)	Modified Folk Scale	Habitat Preference
Rum2_01	44	Sandy Mud	Unsuitable
Rum2_02	43	Slightly Gravelly Muddy Sand	Unsuitable
Rum2_03	30	Gravelly Muddy Sand	Unsuitable
Rum2_04	36	Slightly Gravelly Sandy Mud	Unsuitable
Rum2_05	33	Gravelly Mud	Unsuitable
Rum2_06	30	Gravelly Mud	Unsuitable
Rum2_07	27	Slightly Gravelly Muddy Sand	Unsuitable
Rum2_08	34	Slightly Gravelly Sandy Mud	Unsuitable
Rum2_09	43	Slightly Gravelly Sandy Mud	Unsuitable
Rum2_10	49	Sandy Mud	Unsuitable
Rum2_11	40	Gravelly Mud	Unsuitable
Rum2_12	36	Slightly Gravelly Sandy Mud	Unsuitable
Rum2_13	50	Sandy Mud	Unsuitable
Rum2_14	36	Slightly Gravelly Sandy Mud	Unsuitable
Rum2_15	23	Muddy Sand	Unsuitable
Rum2_16	23	Gravelly Muddy Sand	Unsuitable
Rum2_17	28	Slightly Gravelly Muddy Sand	Unsuitable

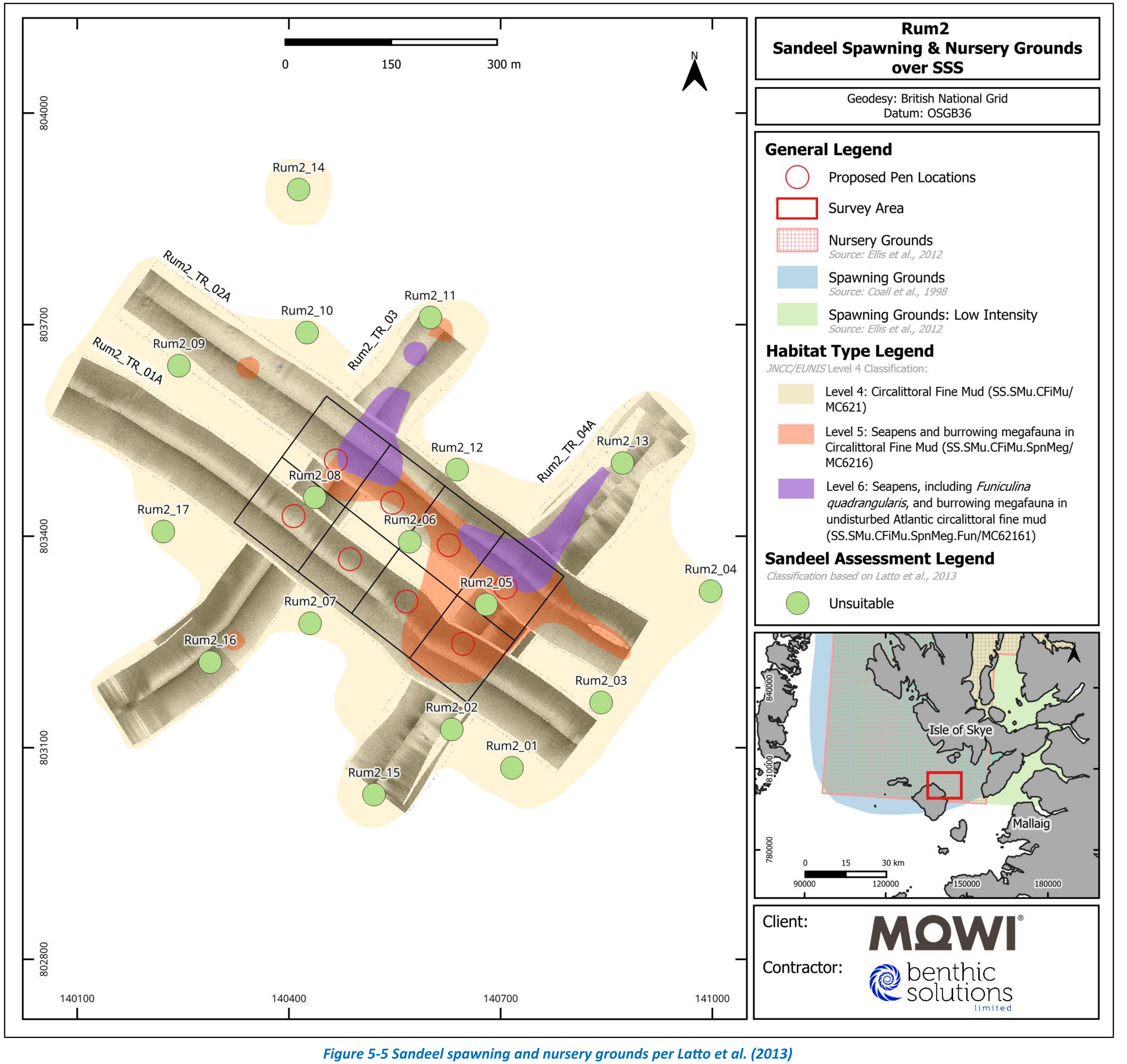


Figure 5-5 Sandeel spawning and nursery grounds per Latto et al. (2013)

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 5-6.

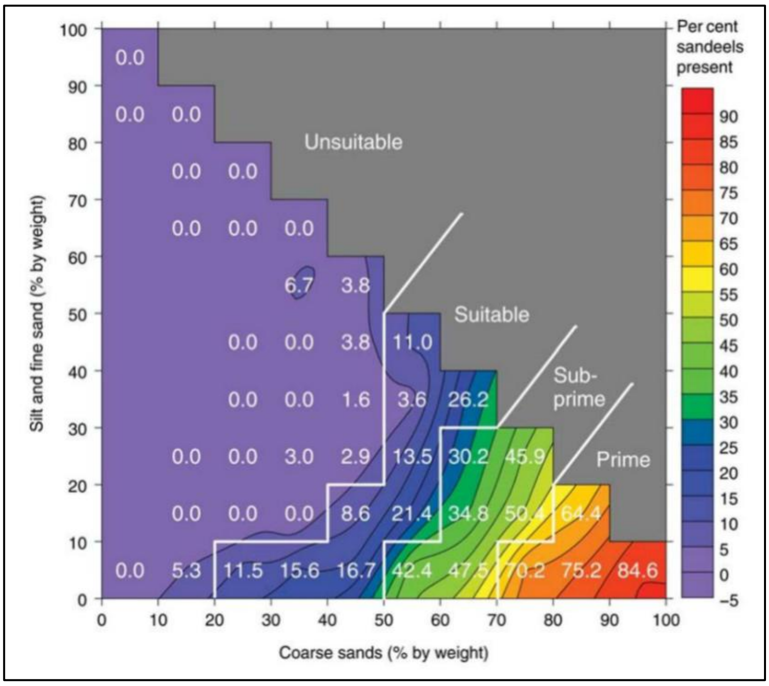


Figure 5-6 Sandeel sediment preference categories as per Greenstreet et al. (2010) (silt and fine sand refer to particle sizes >0.25mm, whilst medium to coarse sand refer to particle sizes 0.25 to 2.0mm)

The results obtained using the method outlined in Greenstreet et al. (2010) again identified all stations as 'Unsuitable' (Table 5-5, Figure 5-7).

Table 5-5 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
Rum2_01	44	93.8	5.8	Unsuitable
Rum2_02	43	92.8	5.9	Unsuitable
Rum2_03	30	72.9	21.9	Unsuitable
Rum2_04	36	91.8	3.6	Unsuitable
Rum2_05	33	85.1	6.5	Unsuitable
Rum2_06	30	89.1	5.7	Unsuitable
Rum2_07	27	87.9	9.2	Unsuitable
Rum2_08	34	94.7	3.8	Unsuitable
Rum2_09	43	93.0	4.1	Unsuitable
Rum2_10	49	96.9	2.8	Unsuitable

Station	Water Depth (m)	Silt and Fine Sands (% by weight)	Medium to Coarse Sands (% by weight)	Habitat Preference
Rum2_11	40	84.7	9.2	Unsuitable
Rum2_12	36	93.2	4.4	Unsuitable
Rum2_13	50	97.6	2.3	Unsuitable
Rum2_14	36	90.1	5.3	Unsuitable
Rum2_15	23	94.2	5.5	Unsuitable
Rum2_16	23	81.2	10.8	Unsuitable
Rum2_17	28	86.9	9.3	Unsuitable

Despite slight differences in sediment classification at the Rum2 site, both studies offer valuable insights into sandeel spawning grounds, each with distinct strengths. Greenstreet et al. (2010) analysed broad-scale survey and fishery data, providing a comprehensive overview of distribution patterns, while Latto et al. (2013) employed refined modelling and detailed habitat data to identify spawning areas with greater precision. Integrating these approaches enhances the analysis by combining large-scale distribution trends with fine-scale habitat suitability assessments. Both studies consistently indicate an absence of suitable habitat preference for sandeel spawning within the Rum2 area.

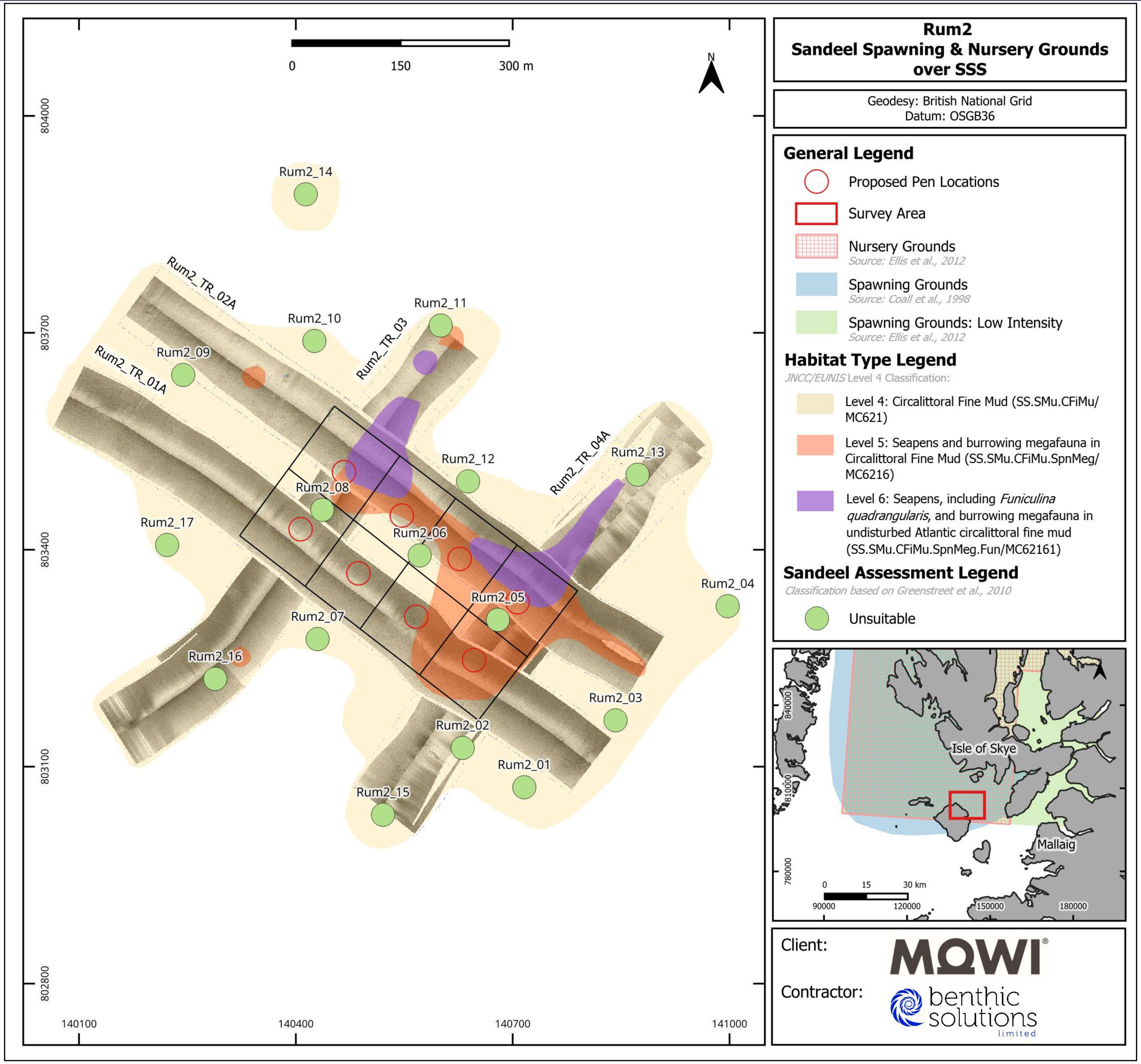


Figure 5-7 Sandeel spawning and nursery grounds per Greenstreet et al. (2010)

6 Conclusion

The Rum2 benthic survey was conducted to characterise the sedimentary environment and biological communities across the proposed development site. Bathymetric data sourced from GEBCO and field investigation revealed that the site lies within a depth range of approximately 20m to 50 m below LAT, with the shallowest stations located to the southwest and the deepest station (Rum2_13) situated to the northeast of the survey area.

Sediment characterisation from particle size analysis revealed a predominantly fines-dominated environment (mean: 51.1%), with lower proportions of sand (mean: 45.5%) and minimal gravel (mean: 3.4%). The spatial distribution of fines and sand content demonstrated a clear pattern, with coarser, sandier sediments in the shallower southwestern region (e.g. Rum2_15, Rum2_16), and finer sediments with increased mud content in the deeper northeast, particularly at Rum2_13 and Rum2_10. Based on particle size characteristics, stations were separated into four distinct clusters. Cluster '*a*' represented coarser 'Muddy Sand' environments at shallower stations. Cluster '*b*' consisted of transitional sediments across the central area of the site. Cluster '*c*' included the deepest, most mud-dominated stations, classified as 'Sandy Mud' or 'Mud', while Cluster 'd', the largest group, spanned mid-depth ranges with more heterogeneous sediment types.

Drop-down video assessment confirmed a cohesive sandy mud seabed characterised by extensive burrows and diverse benthic megafauna. Key taxa observed included *Nephrops norvegicus*, *Synarachnactis lloydii* and the sea pen species (*Funiculina quadrangularis*, *Virgularia mirabilis* and *Pennatula phosphorea*), consistent with the overarching JNCC Level 4 habitat SS.SMu.CFiMu 'Circalittoral fine mud' (EUNIS: MC621). Higher densities of sea pens and burrowing megafauna were recorded within the central corridor and deeper northeastern transects (Rum2_TR_03 and Rum2_TR_04A), corresponding to the JNCC Level 5 biotope SS.SMu.CFiMu.SpnMeg 'Seapens and burrowing megafauna in circalittoral fine mud' (EUNIS: MC6216). Where higher number of the tall seapen was recorded, this area was assigned the Level 6 sub-biotope SS.SMu.CFiMu.SpnMeg.Fun 'Seapens and burrowing megafauna with *Funiculina quadrangularis*' (EUNIS: MC62161). The high abundance of *Funiculina quadrangularis*, a Priority Marine Feature and OSPAR-listed species, confirms the presence of the OSPAR Threatened and/or Declining Habitat 'Seapen and Burrowing Megafauna Communities'.

Burrow densities across these transects ranged from 'Frequent' (small burrows) to 'Common' (large burrows) on the SACFOR scale, supporting classification of the site as the Scottish Priority Marine Feature 'Burrowed Mud'. Sediment analysis indicated that sediments at the proposed Rum2 site are unsuitable for sandeel nursing and spawning.

Total organic carbon (TOC) concentrations were low (0.60%–1.06%), with slightly higher values noted near the existing fish farm, likely reflecting some localised nutrient input.

Benthic fauna were mainly composed of infaunal species, with colonial and solitary epifauna also present. Mollusca were numerically the most abundant group, while Annelida exhibited the greatest species richness. AMBI scores indicated that most communities were intolerant of organic pollution, reflecting good sediment quality. Similarly, IQI and diversity metrics classified the majority of stations as having good to high ecological status, suggesting a stable environment with minimal measurable impact from the nearby fish farm.

Multivariate analysis identified three distinct faunal clusters: cluster '*a*' comprised the deepest stations with fine sediments, cluster '*b*' included the shallowest, sandier stations, and cluster '*c*' consisted of two stations closest to the fish farm with the lowest diversity. All clusters were dominated by Mollusca and Annelida, with SIMPER analysis identifying key defining species as *Turritellinella tricarinata* (clusters '*a*' and '*b*'), *Thyasira flexuosa* (clusters '*b*' and '*c*'), and *Nephtys incisa* (cluster '*c*'). Ecosystem engineers such as *Actinaria* and *Polycirrus* were also important contributors. Statistical tests showed strong correlations between community composition, sediment type, TOC and water depth. Despite slightly lower diversity in cluster '*c*', the dominance of pollutant-intolerant species suggests that natural environmental factors, rather than neighbouring fish farm influence, drive these community differences.

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Appendix I – Field Operations

Geophysical Side Scan Sonar

Side scan sonar (SSS) data was acquired by BSL using the Blueprint Subsea Starfish 452F lowered from the central stern of the vessel. Surface positioning was acquired using a differential GPS system with an external antenna located behind the wheelhouse, near the stern, close to the deployment location on the seabed frame. The data string was continuously recorded and monitored using a computer, whilst a further string was overlaid directly onto the video recording system for annotation on the standard definition targeting video file. The overlay string also indicated time, date, speed over ground (SOG) and course over ground (COG). During the geophysical surveying, the survey lines covered an approximate area of 1.0 km x 0.2 km. The range was set to 100m either side of the tow fish which enabled data acquisition below the fish farm cages. In total, four SSS lines were run over the planned camera transect lines prior to camera operations. The extent of the SSS survey area is illustrated in Figure 2.4.

Seabed Photography and Video

A total of four camera transects were carried out across the Rum2 site; transects Rum2_TR_01, Rum2_TR_02 and Rum2_TR_04 were repeated due to interruptions to the Kongsberg camera system. Transects were between 602m and 845m.

For each camera transect, positions were logged by the BSL scientist onboard, recording camera location (easting and northing), using a proprietary BSL GPS system connected to a laptop with Global Mapper V23 software. The GPS antenna was situated as close to the deployment point as feasible to minimise any potential offsets. The depths of each logged position were provided from the onboard single beam echosounder.

The location and orientation of the transects were predefined prior to the survey in consultation with MOWI Scotland Limited. The Kongsberg camera system was deployed to the seabed while holding position approximately 5m from the SOL. Upon viewing the seabed using the livestream video feed, the vessel began moving off at a speed of ~0.5kts along the transect. Once moving, the camera was regularly lowered to the seabed to capture high-quality still images in conjunction with HD video footage. The live feed SD video footage was used for guidance purposed only. HD video was recorded via a HD pressure camera attached to the camera frame and was overlain with time and date. The height of the camera was controlled by the BSL scientist viewing the video live feed via the winch operator. Upon finishing the camera transect, the camera was recovered, where stills and video data were downloaded and backed up.

Seabed *Grab Sampling*

The BSL Dual Van Veen (DVV; 2 x 0.1m2) was deployed successfully at all 17 proposed stations. A full suite of physico-chemistry (PSA, TOC and Spare) samples and one faunal (F1) sample were acquired at all 17 stations.

Recovered sediment samples were processed onboard the survey vessel by trained environmental personnel. Sediment samples were photographed and in-situ sediment observations such as Munsell colour and sediment type were logged. At all stations, physico-chemistry samples (particle size analysis (PSA), Total Organic Carbon (TOC), a spare sample and a sample for benthic fauna (F1) were acquired (Appendix II - Sample Inventory – Sediment).

Except for sediment biology (F1 macrofauna), all samples were immediately frozen and stored (18oC) for later transportation to the laboratory upon demobilisation. Macrofaunal samples were sieved in the field using a Wilson Auto-siever (WAS) over a 1000µm sieve, and subsequently fixed in a 10% solution of buffered formalin with Rose Bengal stain and subsequently stored at ambient room temperature. Photographs of the DVV surface sediments and sieve were taken to document the macrofaunal residues retained after sieving.

Of the original 17 proposed stations, all were successfully sampled for a full suite of physico-chemical and biological samples of analysis of the following parameters:

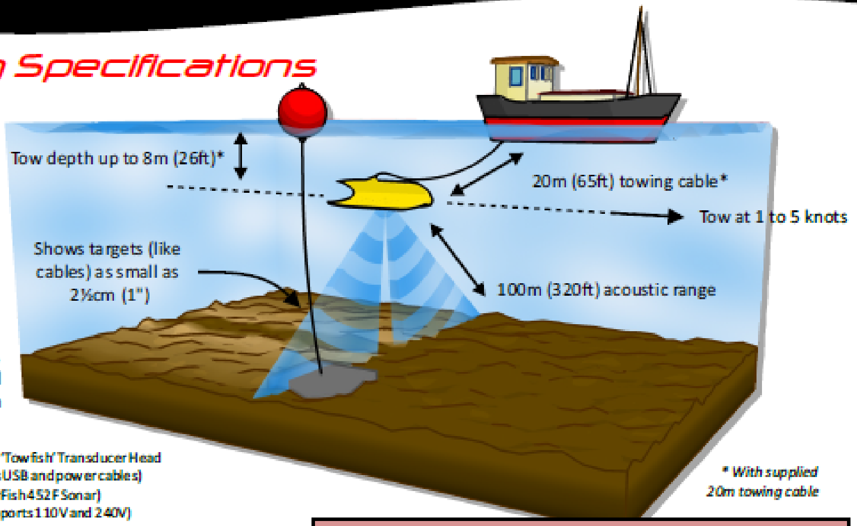
- Total Organic Carbon (stored in doubled lined zip lock plastic bag–- frozen).
- Particle size analysis (stored in doubled lined zip lock plastic bag–- frozen).
- Spare (stored in doubled lined zip lock plastic bag–- frozen).
- Macrofauna (sieved over 1000µm mesh; stored in 10% formalin solution with Rose Bengal stain in 1, 3 or 5 litre plastic buckets).

Blueprint Subsea StarFish 452F

StarFish

452F TOWED SIDESCAN SYSTEM

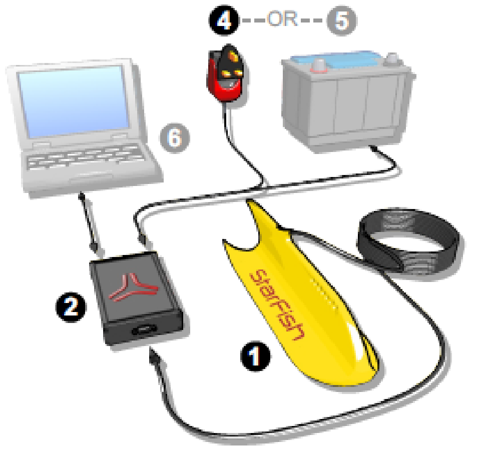
Operating Specifications



The Sonar connects to the Top Box. The Top Box then connects to the power source and any Windows based PC or Laptop via a USB connection to display, record and playback digital sonar images using StarFish Scanline software.

** With supplied 20m towing cable*

1. Starfish452F Side ScanSonar 'Towfish' Transducer Head
2. Starfish450 Top Box (includes USB and power cables)
3. 20m cable (included with StarFish 452F Sonar)
4. ACMains power adapter (supports 110V and 240V)
5. Customer supplied DC power supply 9V-28V (i.e. battery)
6. Customer supplied PC or Laptop (with at least 1 free USB port and Windows XP, Windows Vista or Windows 7)



TOP BOX SPECIFICATIONS

Dimensions	Length	166mm (6.54").
	Width	106mm (4.17").
	Height	34mm (1.34").
Weight	In Air	Approx 0.4kg (0.88lb).
Power	Supply Voltage	90-264V AC, 47-63Hz with Mains adaptor. 9-28V DC supply.
	Consumption	2.4W (200mA @ 12V) approx when idle. 6W (500mA @ 12V) approx when scanning.
Interfaces	Power	2.1mm DC jack socket.
	Data	USB B-Type connector.
	Acoustic	9-Way Female D-Type socket.
Environmental	Temperature Range	-5°C to +40°C (23°F to 104°F).
	IP Rating	IP50 (Protected against ingress of dust, no protection against ingress of liquids).

SONAR HEAD SPECIFICATIONS

Dimensions	Length	378mm (14.88").
	Width	110mm (4.33").
	Height	97mm (3.81").
Weight	In Air	Approx 2.0kg (4.4lb).
	In Fresh Water	Approx 1.0kg (2.2lb).
Body	Costruction	Reinforced yellow polyurethane rubber.
	Depth Rating	50m (164ft).
Towing Cable	Length	20m (65.6ft) supplied - 50m (164ft) available.
	Breaking Strain	>150kg (330.7lb).
	Construction	Black polyurethane jacketed with internal Kevlar reinforcing (strain) member.
	Min Bend Radius	30mm (1.2").
Transducer	Arrangement	Dual fin mounted transducers, with 30° down angle from the horizontal.
	Vertical Beam	60° nominal width (@ -3dB signal level).
	Horizontal Beam	0.8° nominal width (@ -3dB signal level).
Acoustic	Frequency	450kHz nominal.
	Range	1m up to 100m (3ft to 320ft) on each channel providing max 200m (640ft) total coverage.
	Mode	CHIRP pulse compression.
	Pulse Length	400µs typical.
	Transmit Source Power Level	<210dB re 1Pa @ 1m.

SYSTEM SPECIFICATIONS

System Parts	Sonar	StarFish 452F Sonar Head (with 20m tow cable). StarFish 450 Top-Box (with USB interface cable).
	Power Supplies	Universal AC mains to DC power-supply (with international AC adaptors). 2m cigar-plug DC power lead. Crocodile-clip to cigar-socket DC adaptor.
	Software	StarFish Scanline interface software CD and drivers.
	Documentation	User manual, Scanline Manual, Quick start guide.
	Included Accessories	Rugged Peli™ Transport & Storage Case StarFish GPS (SIRF III) StarFish pole mounting bracket
Available Accessories		50m towing cable
Compliances	RoHS	Full compliance to the 2002/95/EC directives
	WEEE	Full EN50419 compliance

Please Note: All specifications are subject to change in line with Tritech's policy of continual product development.
For the latest news, details, mechanical drawings, applications information and evaluation software, visit www.starfishsonar.com

+44 (0)1224 746979
www.starfishsonar.com

BSL Double Grab

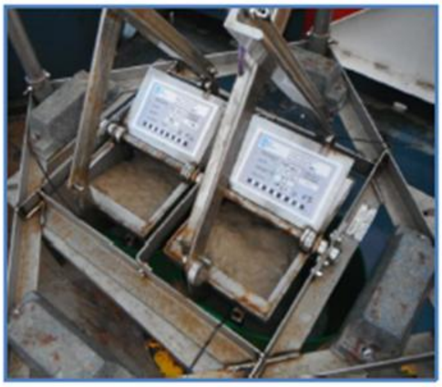
benthic solutions limited

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

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

Grab stand and sample trays

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

ISO 9001 REGISTERED FIRM

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

Wilson Auto-Siever

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.

* Proudfoot, R.K., Elliott, M, Dyer, M.F., Barnett, B.E, Allen, J.H., Proctor, N.L, Cutts, N.D., Nikitik, C., Turner, G. Breen, J. Hemmingway, K.L.and Mackie, T., 1997. Collection and Processing of macrobenthic samples from soft sediments; a best practice review. Proceedings of the Humber Benthic Field Methods Workshop, Hull University.

QMS ISO 9001 REGISTERED FIRM

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Appendix II – Presentation, Laboratory and Statistical Analyses Operations

Environmental Data Presentation

To aid in the interpretation and presentation of the environmental information acquired for this report, both hydrographic and environmental variables were processed using contouring and 3D surface mapping software (QGIS). This software allows a digital terrain model (DTM), or grid, to be interpolated from irregularly spaced geographical information (XYZ data) using a kriging interpolation algorithm. When large quantities of data are used (such as in swathe bathymetry), the level of interpolation is limited only to small spaces in between the data points. However, when processing environmental variables, a diagrammatic circle has been used to colour illustrate the parameter level at each relevant site. It should be remembered that this is done for presentation purposes only and that these data values are "not representative" for the whole of the geographical area covered by the circle. No interpolation is required in this instance except where these circles overlap due to the scaling of the figure.

Particle Size Distribution

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 1mm 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, is given in Table II.I. 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, 63-45mm, 45-31.5mm, 31.5-22.4mm, 22.4-16mm, 16-11.2mm, 11.2-8mm, 8-5.6mm, 5.6-4mm, 4-2.8mm, 2.8-2mm, 2-1.4mm and 1.4-1mm fractions and the electronic data captured by the Mastersizer below 1mm.

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).

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).

$$M = \frac{ø16 + ø50 + ø84}{3}$$

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

1.1.1. Table II.I - Phi and Sieve Apertures with Wentworth Classifications

2. Microns (µm)		3. Phi (ф)		4. Sediment Description	
5. Aperture	6. Sediment Retained	7. Aperture	8. Sediment Retained	9. Wentworth	10. Folk
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 < 4000	-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		
2	2 < 2.8	9	9 <8.5	Clay	Fines (Clays)
1.4	1.4 < 2	9.5	9.5 < 9		
1	1 < 1.4	10	10 < 9.5		
<1	<1	10.5	$\geq$ 10.5		

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

$$D = \frac{\varnothing 84 + \varnothing 16}{4} + \frac{\varnothing 95 + \varnothing 5}{6.6}$$

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

Table II.II - 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 < 1.00	Moderately sorted
1.00 < 2.00	Poorly sorted
2.00 < 4.00	Very poorly sorted
4.00 +	Extremely poorly sorted

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

$$S = \frac{\varnothing 84 + \varnothing 16 - (\varnothing 50)}{2(\varnothing 84 - \varnothing 16)} + \frac{\varnothing 95 + \varnothing 5 - 2(\varnothing 50)}{2(\varnothing 95 - \varnothing 5)}$$

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

Table II.III - 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 (Table II.IV).

$$K = \frac{\text{ø}95 - \text{ø}5}{2.44\,(\text{ø}75 - \text{ø}25)}$$

Where *K = Kurtosis*

ø = the Phi size of the 95th, 5th, 75th and 25th percentile of the sample

Table II.IV - Kurtosis Classifications

Kurtosis Coefficient	Kurtosis Classification	Graphical meaning
0.41 < 0.67	Very Platykurtic	Flat-peaked; the ends are better sorted than the centre
0.67 < 0.90	Platykurtic	
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	

Sediment TOC

Organic and carbon sediments are analysed using a combination of tests. These include Total Carbon (TC), analysed using a known weight of dried soil and combusted at 1,300 °C and the amount of carbon determined by infra-red detection, and TOC (see below). In addition to the standard accreditation as outlined below, additional analytical quality control (AQC), is conducted with every batch where a soil of known value is determined (every batch of 20 samples or part thereof). Blank determinations are also conducted routinely where required.

TOC was analysed using an Eltra combustion method. This method is used for total carbon analysis of dried, crushed rock powder and environmental soil samples. The samples are previously treated with 10 % HCl to remove inorganic carbon (Carbonates) before washing to remove residual acids and further dried. The Carbon Analyser heats the sample in a flow of oxygen and any carbon present is converted to carbon dioxide which is measured by infra-red absorption. The percentage carbon is then calculated with respect to the original sample weight. The range for the method is 0.02 % - 100 % and is accredited under the UKAS accreditation scheme.

Macro-invertebrate Analysis

Methodology

All macrofaunal determination was carried by BSL or BSL contracted specialist taxonomist with extensive experience in the identification of macrofaunal samples undertaken in shallow and deep-water environments (such as Southern North Sea, Channel Island, Ireland, Scotland, Faroes, and sub-Antarctic waters) and the survey region. Benthic sediment samples were thoroughly washed with freshwater on a 500/1000µm sieve to remove traces of formalin, placed in gridded, white trays and then hand sorted by eye followed by binocular microscope, to remove all fauna. Sorted organisms were preserved in 70% IMS and 5% glycerol. Where possible, all organisms were identified to species level according to appropriate keys for the region. Colonial and encrusting organisms were recorded by presence alone and, where colonies could be identified as a single example, these were also recorded, although these datasets have not been considered in the overall statistical analysis of the material. The presence of anthropogenic components was also recorded where relevant.

All taxa were distinguished by species but identified to at least family level where possible. Nomenclature for species names were allocated either when identity was confirmed, allocated as “cf.” when apparently identifying to a known species but confirmation was not possible (for example, incomplete specimens or descriptions), or allocated as “aff.” when close to but distinct from a described species. The terms “indet.” refers to being unable to identify to a lower taxon and “juv” as a juvenile to that species, genus, or family.

Biological Data Standardisation and Analyses

In accordance with OSPAR Commission (2004) guidelines, all species falling into juvenile, colonial, planktonic of meiofaunal taxa are excluded from the full analyses within the dataset (this is discussed further within the text of 4.8.1). This helps to reduce the variability of data undertaken during different periods within the year, or where minor changes may occur or where some groups may only be included in a non-quantitative fashion, such as presence/absence. Certain taxa, such as the Nematoda, normally associated with meiofauna, were included where individuals greater than 10mm were recorded. The following primary and univariate parameters were calculated for all data by stations and sample (Table II.VI).

Table II.VI - Primary and Univariate Parameter Calculations

Variable	Parameter	Formula	Description
Total Species	S	Number of species recorded	Species richness
Total Individuals	N	Number of individuals recorded	Sample abundance
Shannon-Wiener Index	H(s)	$H(s) = -\sum_{i=1}^{S} (Pi)(\log_2 Pi)$ where s = number of species & Pi = proportion of total sample belonging to *i*th species.	Diversity: using both richness and equitability, recorded in log 2.

Variable	Parameter	Formula	Description
Simpsons Diversity	1-Lambda	$$\text{Lambda} = \sum \left| \frac{ni(ni-1)}{N(N-1)} \right|$$ where ni = number of individuals in the *i*th species & N = total number of individuals	Evenness, related to dominance of most common species (Simpson, 1949)
Pielou's Evenness	J	$$J = \frac{H(s)}{(\log S)}$$ where s = number of species & H(s) = Shannon-Wiener diversity index.	Evenness or distribution between species (Pielou, 1969)
Margalef's Richness	D_{Mg}	$$D_{Mg} = \frac{(S-1)}{(\log N)}$$ where s = number of species & N = number of individuals.	Richness derived from number of species and total number of individuals (Clifford and Stevenson, 1975)

Bioaccumulation Curve Estimates using Chao-1

This is a formula that estimates how many additional species would be needed to sample all of the asymptotic species richness of a region, based on the samples acquired. It calculates this by comparing the number of species that occur in one sample with those that occur in two samples where;

$S^*_1 = S_{obs} + (a^2/2b)$

S_{obs} is the number of species observed

a is the number of species observed just once

b is the number of species observed just twice

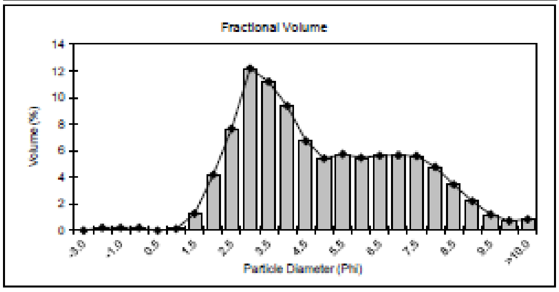
Quality Assurance

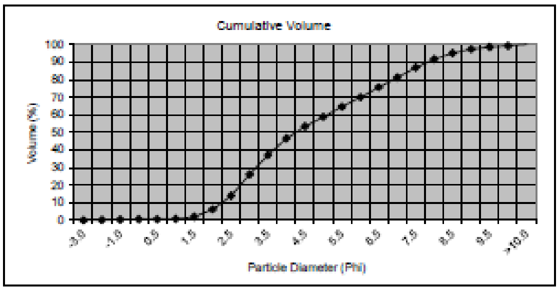
BSL is committed to total quality control from the start of a project to its completion. All samples taken or received by the company were given a unique identification number. All analytical methods were carried out according to recognised standards for marine analyses. All taxonomic staff are fully qualified to post-doctorate level. Documentation is maintained that indicates the stage of analysis that each sample has reached. A full reference collection of all specimens has been retained for further clarification of putative species groups where/if required. BSL is a participant in the NMBAQC quality assurance scheme.

Digital datasets are kept for all sites in the form of excel spreadsheets (by sample and by station) on BSL's archive computer. This system is duplicated onto a second archive drive in case of electronic failure. These datasets will be stored in this way for a minimum of 3 years or transferred to storage disk.

Appendix III – Particle Size Analysis

Sample No.:	Rum2_01	Operator	ER
Source Data:	2534 Rum Baseline	Date & Time:	29/05/2025 16:12





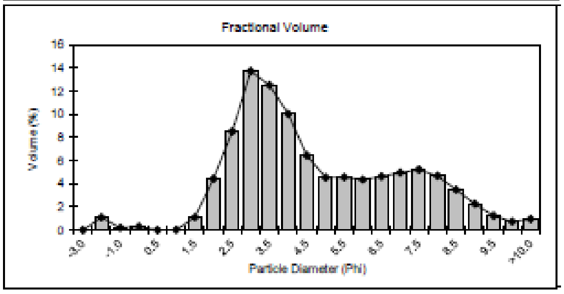
Aperture (mm)	Aperture (Phi unit)	Percentage Fractional	Cumulative	Sediment Description
8.0000	-3.0	0.00	0.00	Pebble
4.0000	-2.0	0.20	0.20	
2.0000	-1.0	0.20	0.40	Granule
1.0000	0.0	0.20	0.60	V.Coarse Sand
0.7100	0.5	0.00	0.60	Coarse Sand
0.5000	1.0	0.12	0.72	
0.3550	1.5	1.28	2.00	Medium Sand
0.2500	2.0	4.18	6.18	
0.1800	2.5	7.66	13.84	Fine Sand
0.1250	3.0	12.19	26.03	
0.0900	3.5	11.19	37.22	V.Fine Sand
0.0630	4.0	9.37	46.59	
0.0440	4.5	6.75	53.33	Coarse Silt
0.0315	5.0	5.41	58.74	
0.0220	5.5	5.74	64.48	Medium Silt
0.0156	6.0	5.47	69.94	
0.0110	6.5	5.61	75.55	Fine silt
0.0078	7.0	5.65	81.21	
0.0055	7.5	5.60	86.81	V.Fine Silt
0.0039	8.0	4.78	91.59	
0.0028	8.5	3.45	95.04	Coarse Clay
0.0020	9.0	2.20	97.24	
0.0014	9.5	1.20	98.44	Medium Clay
0.0010	10.0	0.72	99.16	
<0.001	>10.0	0.84	100.00	Fine Clay

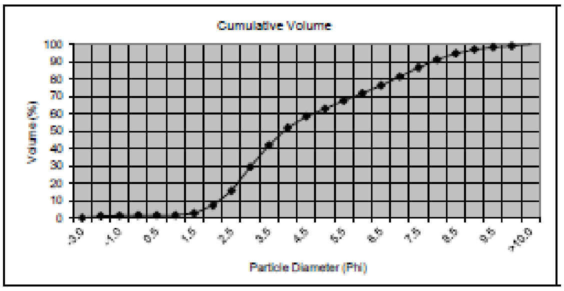
Graphical	mm	StDev (mm)	Phi
Mean (MZ)	0.039	0.105	4.671
Median	0.053		4.227
Wentworth Classification	Coarse Silt		

Sorting	Value	Inference
Coefficient	2.17	Very Poorly Sorted
Skewness	0.28	Positive(Coarse)
Kurtosis	0.78	Platykurtic
Fines (%)	53.42%	
Sands (%)	46.19%	
Gravel (%)	0.40%	

BGS Mod. Folk Classification	Sandy Mud
Mod. Folk for Habitat Classification	Mud and Sandy Mud

Sample No.:	Rum2_02	Operator	ER
Source Data:	2534 Rum Baseline	Date & Time:	29/05/2025 16:25





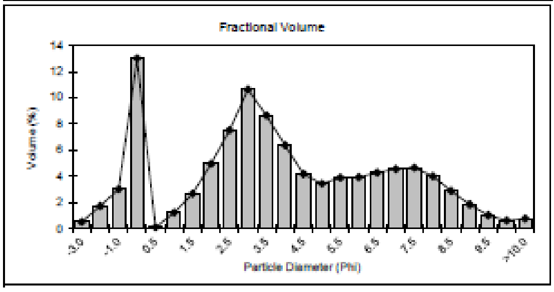
Aperture (mm)	Aperture (Phi unit)	Percentage Fractional	Cumulative	Sediment Description
8.0000	-3.0	0.00	0.00	Pebble
4.0000	-2.0	1.10	1.10	
2.0000	-1.0	0.20	1.30	Granule
1.0000	0.0	0.30	1.60	V.Coarse Sand
0.7100	0.5	0.00	1.60	Coarse Sand
0.5000	1.0	0.03	1.64	
0.3550	1.5	1.11	2.75	Medium Sand
0.2500	2.0	4.43	7.18	
0.1800	2.5	8.52	15.70	Fine Sand
0.1250	3.0	13.71	29.41	
0.0900	3.5	12.50	41.90	V.Fine Sand
0.0630	4.0	10.03	51.93	
0.0440	4.5	6.43	58.36	Coarse Silt
0.0315	5.0	4.53	62.90	
0.0220	5.5	4.57	67.46	Medium Silt
0.0156	6.0	4.35	71.82	
0.0110	6.5	4.63	76.45	Fine silt
0.0078	7.0	4.96	81.40	
0.0055	7.5	5.22	86.62	V.Fine Silt
0.0039	8.0	4.67	91.29	
0.0028	8.5	3.49	94.78	Coarse Clay
0.0020	9.0	2.27	97.05	
0.0014	9.5	1.24	98.30	Medium Clay
0.0010	10.0	0.75	99.04	
<0.001	>10.0	0.96	100.00	Fine Clay

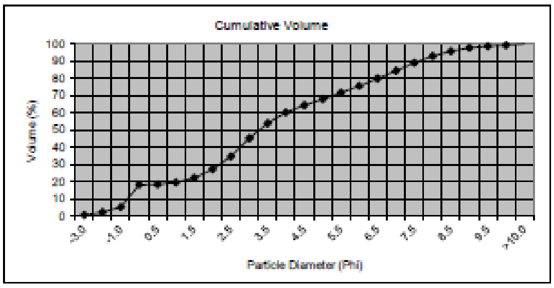
Graphical	mm	StDev (mm)	Phi
Mean (MZ)	0.043	0.112	4.530
Median	0.068		3.874
Wentworth Classification	Coarse Silt		

Sorting	Value	Inference
Coefficient	2.22	Very Poorly Sorted
Skewness	0.39	Very Positive (Coarse)
Kurtosis	0.79	Platykurtic
Fines (%)	48.07%	
Sands (%)	50.63%	
Gravel (%)	1.30%	

BGS Mod. Folk Classification	Slightly Gravelly Muddy Sand
Mod. Folk for Habitat Classification	Mud and Sandy Mud

Sample No.:	Rum2_03	Operator	ER
Source Data:	2534 Rum Baseline	Date & Time:	29/05/2025 16:38





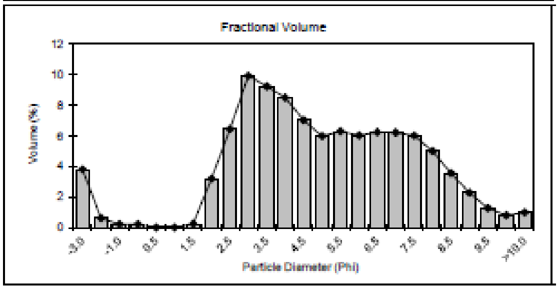
Aperture (mm)	Aperture (Phi unit)	Percentage Fractional	Cumulative	Sediment Description
8.0000	-3.0	0.50	0.50	Pebble
4.0000	-2.0	1.70	2.20	
2.0000	-1.0	3.00	5.20	Granule
1.0000	0.0	13.00	18.20	V.Coarse Sand
0.7100	0.5	0.09	18.29	Coarse Sand
0.5000	1.0	1.20	19.49	
0.3550	1.5	2.65	22.14	Medium Sand
0.2500	2.0	4.94	27.08	
0.1800	2.5	7.51	34.59	Fine Sand
0.1250	3.0	10.62	45.21	
0.0900	3.5	8.64	53.85	V.Fine Sand
0.0630	4.0	6.35	60.20	
0.0440	4.5	4.15	64.36	Coarse Silt
0.0315	5.0	3.42	67.78	
0.0220	5.5	3.88	71.65	Medium Silt
0.0156	6.0	3.91	75.56	
0.0110	6.5	4.26	79.82	Fine silt
0.0078	7.0	4.54	84.36	
0.0055	7.5	4.63	88.99	V.Fine Silt
0.0039	8.0	3.99	92.98	
0.0028	8.5	2.87	95.85	
0.0020	9.0	1.82	97.67	Coarse Clay
0.0014	9.5	0.99	98.66	
0.0010	10.0	0.60	99.26	Medium Clay
<0.001	>10.0	0.74	100.00	Fine Clay

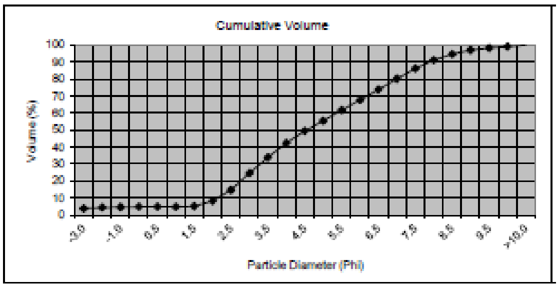
Graphical	mm	StDev (mm)	Phi
Mean (MZ)	0.100	0.827	3.325
Median	0.106		3.243
Wentworth Classification			V. Fine Sand

Sorting	Value	Inference
Coefficient	3.22	Very Poorly Sorted
Skewness	0.06	Symmetrical
Kurtosis	0.93	Mesokurtic
Fines (%)	39.80%	
Sands (%)	55.00%	
Gravel (%)	5.20%	

BGS Mod. Folk Classification	Gravelly Muddy Sand
Mod. Folk for Habitat Classification	Mixed Sediments

Sample No.:	Rum2_04	Operator	ER
Source Data:	2534 Rum Baseline	Date & Time:	29/05/2025 16:50





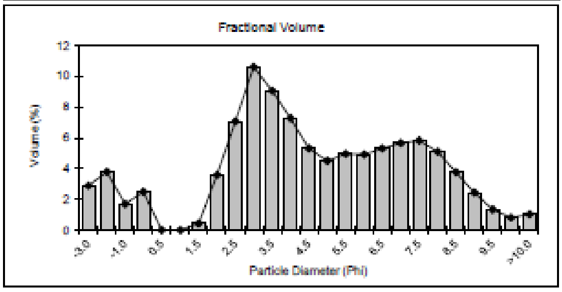
Aperture (mm)	Aperture (Phi unit)	Percentage Fractional	Cumulative	Sediment Description
8.0000	-3.0	3.80	3.80	Pebble
4.0000	-2.0	0.60	4.40	
2.0000	-1.0	0.20	4.60	Granule
1.0000	0.0	0.20	4.80	V.Coarse Sand
0.7100	0.5	0.00	4.80	Coarse Sand
0.5000	1.0	0.00	4.80	
0.3550	1.5	0.24	5.04	Medium Sand
0.2500	2.0	3.20	8.23	
0.1800	2.5	6.45	14.68	Fine Sand
0.1250	3.0	9.93	24.61	
0.0900	3.5	9.23	33.85	V.Fine Sand
0.0630	4.0	8.50	42.35	
0.0440	4.5	7.03	49.38	Coarse Silt
0.0315	5.0	5.98	55.36	
0.0220	5.5	6.30	61.66	Medium Silt
0.0156	6.0	6.02	67.68	
0.0110	6.5	6.23	73.91	Fine silt
0.0078	7.0	6.22	80.13	
0.0055	7.5	6.01	86.14	V.Fine Silt
0.0039	8.0	5.00	91.14	
0.0028	8.5	3.55	94.70	
0.0020	9.0	2.27	96.97	Coarse Clay
0.0014	9.5	1.26	98.23	
0.0010	10.0	0.79	99.02	Medium Clay
<0.001	>10.0	0.98	100.00	Fine Clay

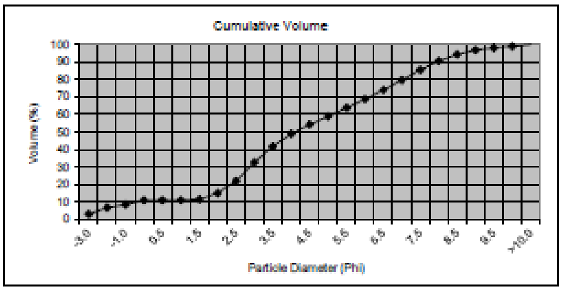
Graphical	mm	StDev (mm)	Phi
Mean (MZ)	0.036	0.131	4.797
Median	0.043		4.550
Wentworth Classification			Coarse Silt

Sorting	Value	Inference
Coefficient	2.27	Very Poorly Sorted
Skewness	0.14	Positive(Coarse)
Kurtosis	0.82	Platykurtic
Fines (%)	57.66%	
Sands (%)	37.75%	
Gravel (%)	4.60%	

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

Sample No.:	Rum2_05	Operator	ER
Source Data:	2534 Rum Baseline	Date & Time:	29/05/2025 17:04





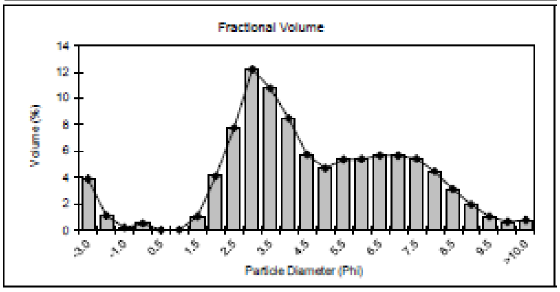
Aperture (mm)	Aperture (Phi unit)	Percentage Fractional	Cumulative	Sediment Description
8.0000	-3.0	2.90	2.90	Pebble
4.0000	-2.0	3.80	6.70	
2.0000	-1.0	1.70	8.40	Granule
1.0000	0.0	2.50	10.90	V.Coarse Sand
0.7100	0.5	0.00	10.90	Coarse Sand
0.5000	1.0	0.00	10.90	
0.3550	1.5	0.43	11.33	Medium Sand
0.2500	2.0	3.60	14.93	
0.1800	2.5	7.07	22.00	Fine Sand
0.1250	3.0	10.62	32.62	
0.0900	3.5	9.07	41.69	V.Fine Sand
0.0630	4.0	7.28	48.97	
0.0440	4.5	5.32	54.29	Coarse Silt
0.0315	5.0	4.51	58.80	
0.0220	5.5	4.97	63.77	Medium Silt
0.0156	6.0	4.92	68.69	
0.0110	6.5	5.32	74.01	Fine silt
0.0078	7.0	5.66	79.67	
0.0055	7.5	5.83	85.50	V.Fine Silt
0.0039	8.0	5.11	90.61	
0.0028	8.5	3.76	94.37	
0.0020	9.0	2.44	96.80	Coarse Clay
0.0014	9.5	1.35	98.15	
0.0010	10.0	0.82	98.97	Medium Clay
<0.001	>10.0	1.03	100.00	Fine Clay

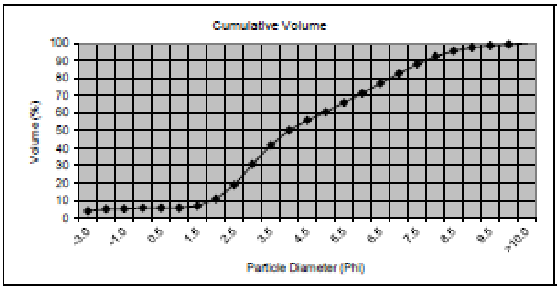
Graphical	mm	StDev (mm)	Phi
Mean (MZ)	0.044	1.903	4.499
Median	0.059		4.075
Wentworth Classification		Coarse Silt	

Sorting	Value	Inference
Coefficient	3.01	Very Poorly Sorted
Skewness	0.03	Symmetrical
Kurtosis	1.15	Leptokurtic
Fines (%)	51.03%	
Sands (%)	40.57%	
Gravel (%)	8.40%	

BGS Mod. Folk Classification	Gravelly Mud
Mod. Folk for Habitat Classification	Mixed Sediments

Sample No.:	Rum2_06	Operator	ER
Source Data:	2534 Rum Baseline	Date & Time:	29/05/2025 17:18





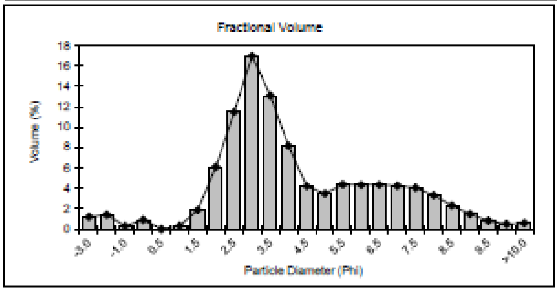
Aperture (mm)	Aperture (Phi unit)	Percentage Fractional	Cumulative	Sediment Description
8.0000	-3.0	3.90	3.90	Pebble
4.0000	-2.0	1.10	5.00	
2.0000	-1.0	0.20	5.20	Granule
1.0000	0.0	0.50	5.70	V.Coarse Sand
0.7100	0.5	0.00	5.70	Coarse Sand
0.5000	1.0	0.03	5.73	
0.3550	1.5	1.05	6.79	Medium Sand
0.2500	2.0	4.10	10.89	
0.1800	2.5	7.76	18.65	Fine Sand
0.1250	3.0	12.20	30.84	
0.0900	3.5	10.78	41.62	V.Fine Sand
0.0630	4.0	8.48	50.10	
0.0440	4.5	5.74	55.84	Coarse Silt
0.0315	5.0	4.71	60.55	
0.0220	5.5	5.36	65.92	Medium Silt
0.0156	6.0	5.39	71.31	
0.0110	6.5	5.66	76.97	Fine silt
0.0078	7.0	5.65	82.62	
0.0055	7.5	5.43	88.04	V.Fine Silt
0.0039	8.0	4.46	92.51	
0.0028	8.5	3.11	95.62	
0.0020	9.0	1.94	97.55	Coarse Clay
0.0014	9.5	1.04	98.60	
0.0010	10.0	0.64	99.24	Medium Clay
<0.001	>10.0	0.76	100.00	Fine Clay

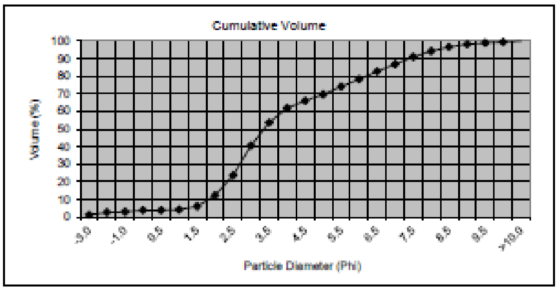
Graphical	mm	StDev (mm)	Phi
Mean (MZ)	0.045	1.307	4.463
Median	0.063		3.981
Wentworth Classification		Coarse Silt	

Sorting	Value	Inference
Coefficient	2.78	Very Poorly Sorted
Skewness	0.07	Symmetrical
Kurtosis	1.19	Leptokurtic
Fines (%)	49.90%	
Sands (%)	44.90%	
Gravel (%)	5.20%	

BGS Mod. Folk Classification	Gravelly Mud
Mod. Folk for Habitat Classification	Mixed Sediments

Sample No.:	Rum2_07	Operator	ER
Source Data:	2534 Rum Baseline	Date & Time:	30/05/2025 09:58





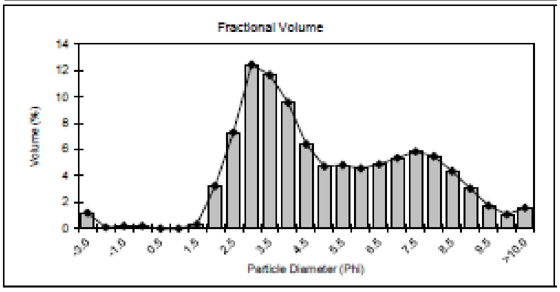
Aperture (mm)	Aperture (Phi unit)	Percentage Fractional	Cumulative	Sediment Description
8.0000	-3.0	1.20	1.20	Pebble
4.0000	-2.0	1.40	2.60	
2.0000	-1.0	0.30	2.90	Granule
1.0000	0.0	0.90	3.80	V.Coarse Sand
0.7100	0.5	0.00	3.80	Coarse Sand
0.5000	1.0	0.32	4.12	
0.3550	1.5	1.87	5.99	Medium Sand
0.2500	2.0	6.11	12.11	
0.1800	2.5	11.49	23.60	Fine Sand
0.1250	3.0	17.00	40.60	
0.0900	3.5	13.08	53.67	V.Fine Sand
0.0630	4.0	8.18	61.85	
0.0440	4.5	4.22	66.07	Coarse Silt
0.0315	5.0	3.51	69.57	
0.0220	5.5	4.39	73.96	Medium Silt
0.0156	6.0	4.35	78.31	
0.0110	6.5	4.36	82.66	Fine silt
0.0078	7.0	4.25	86.91	
0.0055	7.5	4.06	90.97	V.Fine Silt
0.0039	8.0	3.33	94.31	
0.0028	8.5	2.33	96.64	
0.0020	9.0	1.48	98.12	Coarse Clay
0.0014	9.5	0.81	98.93	
0.0010	10.0	0.50	99.43	Medium Clay
<0.001	>10.0	0.57	100.00	Fine Clay

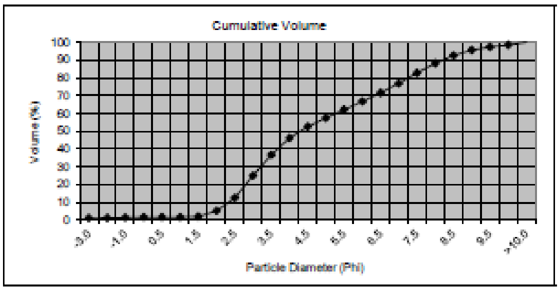
Graphical	mm	StDev (mm)	Phi
Mean (MZ)	0.061	0.152	4.038
Median	0.100		3.324
Wentworth Classification		Coarse Silt	

Sorting	Value	Inference
Coefficient	2.17	Very Poorly Sorted
Skewness	0.43	Very Positive (Coarse)
Kurtosis	0.91	Mesokurtic
Fines (%)	38.16%	
Sands (%)	58.95%	
Gravel (%)	2.90%	

BGS Mod. Folk Classification	Slightly Gravelly Muddy Sand
Mod. Folk for Habitat Classification	Mud and Sandy Mud

Sample No.:	Rum2_08	Operator	ER
Source Data:	2534 Rum Baseline	Date & Time:	30/05/2025 10:11





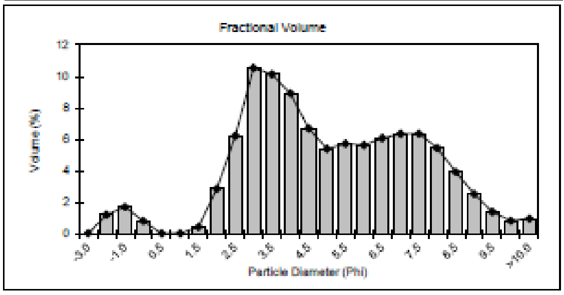
Aperture (mm)	Aperture (Phi unit)	Percentage Fractional	Cumulative	Sediment Description
8.0000	-3.0	1.20	1.20	Pebble
4.0000	-2.0	0.10	1.30	
2.0000	-1.0	0.20	1.50	Granule
1.0000	0.0	0.20	1.70	V.Coarse Sand
0.7100	0.5	0.00	1.70	Coarse Sand
0.5000	1.0	0.00	1.70	
0.3550	1.5	0.32	2.02	Medium Sand
0.2500	2.0	3.24	5.26	
0.1800	2.5	7.29	12.55	Fine Sand
0.1250	3.0	12.41	24.97	
0.0900	3.5	11.62	36.59	V.Fine Sand
0.0630	4.0	9.55	46.14	
0.0440	4.5	6.40	52.54	Coarse Silt
0.0315	5.0	4.72	57.27	
0.0220	5.5	4.82	62.09	Medium Silt
0.0156	6.0	4.56	66.65	
0.0110	6.5	4.87	71.52	Fine silt
0.0078	7.0	5.34	76.86	
0.0055	7.5	5.84	82.70	V.Fine Silt
0.0039	8.0	5.48	88.18	
0.0028	8.5	4.35	92.54	
0.0020	9.0	3.04	95.57	Coarse Clay
0.0014	9.5	1.76	97.33	
0.0010	10.0	1.08	98.42	Medium Clay
<0.001	>10.0	1.59	100.00	Fine Clay

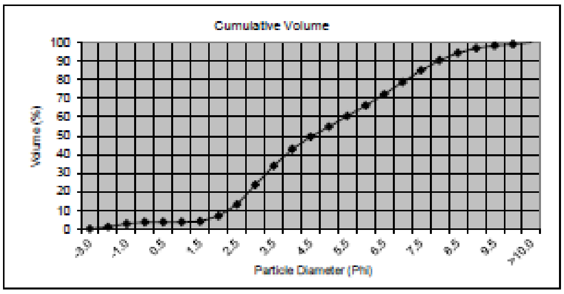
Graphical	mm	StDev (mm)	Phi
Mean (MZ)	0.035	0.099	4.830
Median	0.052		4.278
Wentworth Classification		Coarse Silt	

Sorting	Value	Inference
Coefficient	2.30	Very Poorly Sorted
Skewness	0.33	Very Positive (Coarse)
Kurtosis	0.74	Platykurtic
Fines (%)	53.86%	
Sands (%)	44.64%	
Gravel (%)	1.50%	

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

Sample No.:	Rum2_09	Operator	ER
Source Data:	2534 Rum Baseline	Date & Time:	30/05/2025 10:25





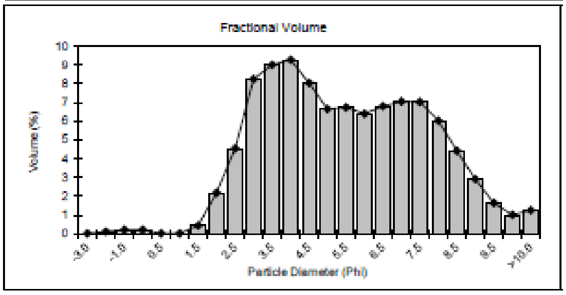
Aperture (mm)	Aperture (Phi unit)	Percentage Fractional	Cumulative	Sediment Description
8.0000	-3.0	0.00	0.00	Pebble
4.0000	-2.0	1.20	1.20	
2.0000	-1.0	1.70	2.90	Granule
1.0000	0.0	0.80	3.70	V.Coarse Sand
0.7100	0.5	0.00	3.70	Coarse Sand
0.5000	1.0	0.00	3.70	
0.3550	1.5	0.42	4.13	Medium Sand
0.2500	2.0	2.85	6.97	
0.1800	2.5	6.21	13.18	Fine Sand
0.1250	3.0	10.54	23.72	
0.0900	3.5	10.13	33.85	V.Fine Sand
0.0630	4.0	8.91	42.76	
0.0440	4.5	6.69	49.45	Coarse Silt
0.0315	5.0	5.39	54.84	
0.0220	5.5	5.72	60.56	Medium Silt
0.0156	6.0	5.62	66.19	
0.0110	6.5	6.07	72.25	Fine silt
0.0078	7.0	6.35	78.60	
0.0055	7.5	6.36	84.96	V.Fine Silt
0.0039	8.0	5.43	90.39	
0.0028	8.5	3.93	94.32	
0.0020	9.0	2.53	96.85	Coarse Clay
0.0014	9.5	1.38	98.24	
0.0010	10.0	0.81	99.05	Medium Clay
<0.001	>10.0	0.95	100.00	Fine Clay

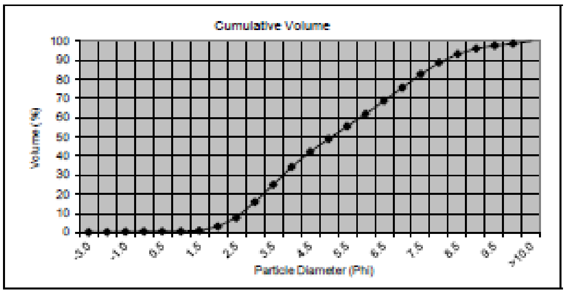
Graphical	mm	StDev (mm)	Phi
Mean (MZ)	0.035	0.116	4.854
Median	0.043		4.548
Wentworth Classification		Coarse Silt	

Sorting	Value	Inference
Coefficient	2.26	Very Poorly Sorted
Skewness	0.18	Positive(Coarse)
Kurtosis	0.78	Platykurtic
Fines (%)	57.24%	
Sands (%)	39.86%	
Gravel (%)	2.90%	

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

Sample No.:	Rum2_10	Operator	ER
Source Data:	2534 Rum Baseline	Date & Time:	30/05/2025 10:37





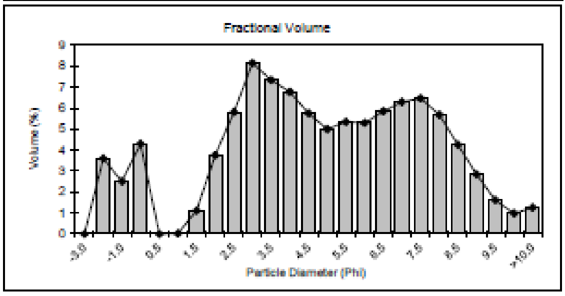
Aperture (mm)	Aperture (Phi unit)	Percentage Fractional	Cumulative	Sediment Description
8.0000	-3.0	0.00	0.00	Pebble
4.0000	-2.0	0.10	0.10	
2.0000	-1.0	0.20	0.30	Granule
1.0000	0.0	0.20	0.50	V.Coarse Sand
0.7100	0.5	0.00	0.50	Coarse Sand
0.5000	1.0	0.00	0.50	
0.3550	1.5	0.43	0.93	Medium Sand
0.2500	2.0	2.17	3.10	
0.1800	2.5	4.54	7.64	Fine Sand
0.1250	3.0	8.24	15.88	
0.0900	3.5	8.99	24.88	V.Fine Sand
0.0630	4.0	9.27	34.15	
0.0440	4.5	8.03	42.18	Coarse Silt
0.0315	5.0	6.64	48.82	
0.0220	5.5	6.73	55.55	Medium Silt
0.0156	6.0	6.39	61.94	
0.0110	6.5	6.79	68.73	Fine silt
0.0078	7.0	7.04	75.77	
0.0055	7.5	7.02	82.80	V.Fine Silt
0.0039	8.0	6.02	88.82	
0.0028	8.5	4.41	93.23	
0.0020	9.0	2.90	96.13	Coarse Clay
0.0014	9.5	1.63	97.76	
0.0010	10.0	1.00	98.76	Medium Clay
<0.001	>10.0	1.24	100.00	Fine Clay

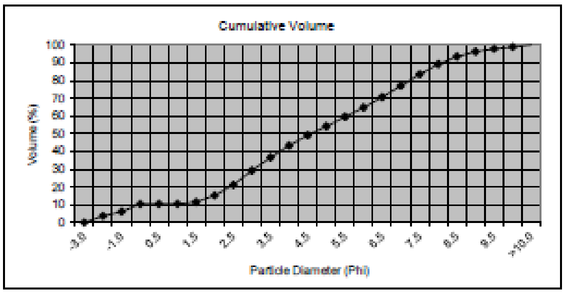
Graphical	mm	StDev (mm)	Phi
Mean (MZ)	0.027	0.082	5.222
Median	0.030		5.067
Wentworth Classification		Medium Silt	

Sorting	Value	Inference
Coefficient	2.14	Very Poorly Sorted
Skewness	0.11	Positive(Coarse)
Kurtosis	0.78	Platykurtic
Fines (%)	65.85%	
Sands (%)	33.85%	
Gravel (%)	0.30%	

BGS Mod. Folk Classification	Sandy Mud
Mod. Folk for Habitat Classification	Mud and Sandy Mud

Sample No.:	Rum2_11	Operator	ER
Source Data:	2534 Rum Baseline	Date & Time:	30/05/2025 10:50





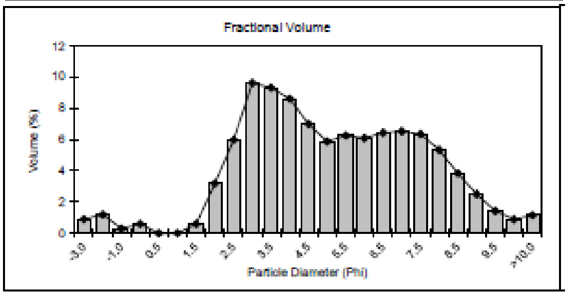
Aperture (mm)	Aperture (Phi unit)	Percentage Fractional	Cumulative	Sediment Description
8.0000	-3.0	0.00	0.00	Pebble
4.0000	-2.0	3.60	3.60	
2.0000	-1.0	2.50	6.10	Granule
1.0000	0.0	4.30	10.40	V.Coarse Sand
0.7100	0.5	0.00	10.40	Coarse Sand
0.5000	1.0	0.02	10.42	
0.3550	1.5	1.11	11.53	Medium Sand
0.2500	2.0	3.76	15.29	
0.1800	2.5	5.81	21.10	Fine Sand
0.1250	3.0	8.15	29.25	
0.0900	3.5	7.34	36.59	V.Fine Sand
0.0630	4.0	6.78	43.37	
0.0440	4.5	5.75	49.12	Coarse Silt
0.0315	5.0	5.00	54.11	
0.0220	5.5	5.35	59.46	Medium Silt
0.0156	6.0	5.29	64.76	
0.0110	6.5	5.85	70.61	Fine silt
0.0078	7.0	6.29	76.90	
0.0055	7.5	6.47	83.37	V.Fine Silt
0.0039	8.0	5.69	89.06	
0.0028	8.5	4.25	93.31	
0.0020	9.0	2.84	96.15	Coarse Clay
0.0014	9.5	1.61	97.76	
0.0010	10.0	0.98	98.74	Medium Clay
<0.001	>10.0	1.26	100.00	Fine Clay

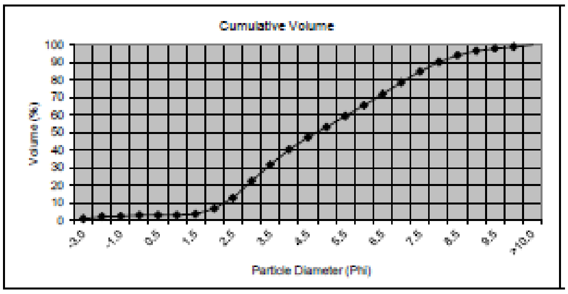
Graphical	mm	StDev (mm)	Phi
Mean (MZ)	0.038	0.961	4.728
Median	0.042		4.581
Wentworth Classification		Coarse Silt	

Sorting	Value	Inference
Coefficient	2.93	Very Poorly Sorted
Skewness	-0.05	Symmetrical
Kurtosis	1.02	Mesokurtic
Fines (%)	56.63%	
Sands (%)	37.27%	
Gravel (%)	6.10%	

BGS Mod. Folk Classification	Gravelly Mud
Mod. Folk for Habitat Classification	Mixed Sediments

Sample No.:	Rum2_12	Operator	ER
Source Data:	2534 Rum Baseline	Date & Time:	30/05/2025 11:03





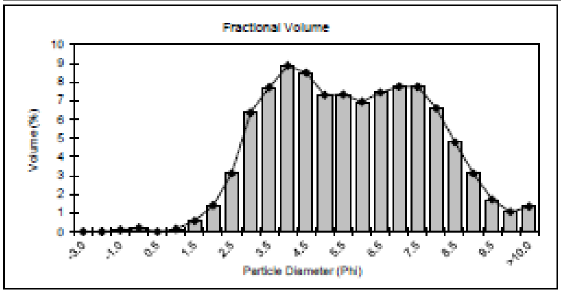
Aperture (mm)	Aperture (Phi unit)	Percentage Fractional	Cumulative	Sediment Description
8.0000	-3.0	0.90	0.90	Pebble
4.0000	-2.0	1.20	2.10	
2.0000	-1.0	0.30	2.40	Granule
1.0000	0.0	0.60	3.00	V.Coarse Sand
0.7100	0.5	0.00	3.00	Coarse Sand
0.5000	1.0	0.00	3.00	
0.3550	1.5	0.60	3.60	Medium Sand
0.2500	2.0	3.19	6.79	
0.1800	2.5	5.98	12.77	Fine Sand
0.1250	3.0	9.62	22.38	
0.0900	3.5	9.31	31.70	V.Fine Sand
0.0630	4.0	8.62	40.32	
0.0440	4.5	6.99	47.31	Coarse Silt
0.0315	5.0	5.88	53.18	
0.0220	5.5	6.25	59.43	Medium Silt
0.0156	6.0	6.09	65.52	
0.0110	6.5	6.43	71.96	Fine silt
0.0078	7.0	6.53	78.48	
0.0055	7.5	6.36	84.84	V.Fine Silt
0.0039	8.0	5.33	90.17	
0.0028	8.5	3.84	94.01	
0.0020	9.0	2.51	96.53	Coarse Clay
0.0014	9.5	1.43	97.95	
0.0010	10.0	0.90	98.85	Medium Clay
<0.001	>10.0	1.15	100.00	Fine Clay

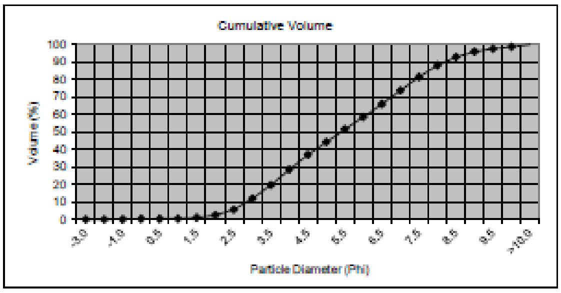
Graphical	mm	StDev (mm)	Phi
Mean (MZ)	0.033	0.112	4.922
Median	0.038		4.708
Wentworth Classification		Coarse Silt	

Sorting	Value	Inference
Coefficient	2.25	Very Poorly Sorted
Skewness	0.13	Positive(Coarse)
Kurtosis	0.79	Platykurtic
Fines (%)	59.69%	
Sands (%)	37.92%	
Gravel (%)	2.40%	

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

Sample No.:	Rum2_13	Operator	ER
Source Data:	2534 Rum Baseline	Date & Time:	30/05/2025 11:15





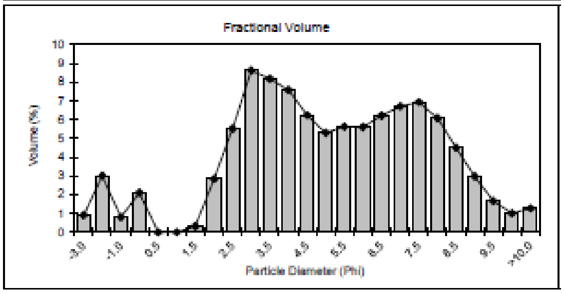
Aperture (mm)	Aperture (Phi unit)	Percentage Fractional	Cumulative	Sediment Description
8.0000	-3.0	0.00	0.00	Pebble
4.0000	-2.0	0.00	0.00	
2.0000	-1.0	0.10	0.10	Granule
1.0000	0.0	0.20	0.30	V.Coarse Sand
0.7100	0.5	0.00	0.30	Coarse Sand
0.5000	1.0	0.14	0.44	
0.3550	1.5	0.56	1.01	Medium Sand
0.2500	2.0	1.40	2.41	
0.1800	2.5	3.11	5.52	Fine Sand
0.1250	3.0	6.36	11.88	
0.0900	3.5	7.70	19.59	V.Fine Sand
0.0630	4.0	8.86	28.45	
0.0440	4.5	8.49	36.94	Coarse Silt
0.0315	5.0	7.30	44.24	
0.0220	5.5	7.33	51.57	Medium Silt
0.0156	6.0	6.93	58.50	
0.0110	6.5	7.43	65.93	Fine silt
0.0078	7.0	7.75	73.68	
0.0055	7.5	7.73	81.41	V.Fine Silt
0.0039	8.0	6.59	88.00	
0.0028	8.5	4.78	92.78	
0.0020	9.0	3.11	95.89	Coarse Clay
0.0014	9.5	1.72	97.61	
0.0010	10.0	1.06	98.67	Medium Clay
<0.001	>10.0	1.34	100.00	Fine Clay

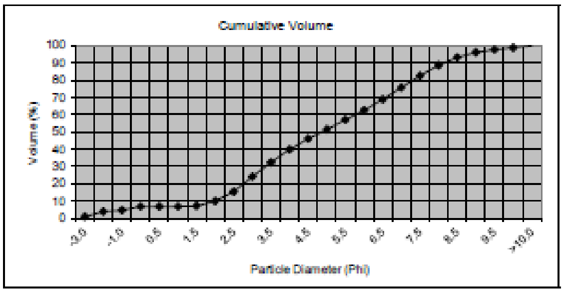
Graphical	mm	StDev (mm)	Phi
Mean (MZ)	0.023	0.071	5.431
Median	0.024		5.379
Wentworth Classification		Medium Silt	

Sorting	Value	Inference
Coefficient	2.09	Very Poorly Sorted
Skewness	0.05	Symmetrical
Kurtosis	0.80	Platykurtic
Fines (%)	71.55%	
Sands (%)	28.35%	
Gravel (%)	0.10%	

BGS Mod. Folk Classification	Sandy Mud
Mod. Folk for Habitat Classification	Mud and Sandy Mud

Sample No.:	Rum2_14	Operator	ER
Source Data:	2534 Rum Baseline	Date & Time:	30/05/2025 11:32





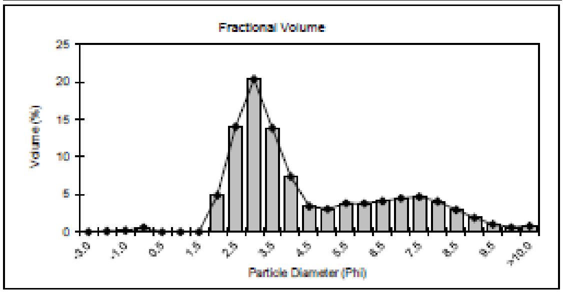
Aperture (mm)	Aperture (Phi unit)	Percentage Fractional	Cumulative	Sediment Description
8.0000	-3.0	0.90	0.90	Pebble
4.0000	-2.0	3.00	3.90	
2.0000	-1.0	0.80	4.70	Granule
1.0000	0.0	2.10	6.80	V.Coarse Sand
0.7100	0.5	0.00	6.80	Coarse Sand
0.5000	1.0	0.00	6.80	
0.3550	1.5	0.32	7.12	Medium Sand
0.2500	2.0	2.83	9.95	
0.1800	2.5	5.52	15.47	Fine Sand
0.1250	3.0	8.63	24.09	
0.0900	3.5	8.18	32.28	V.Fine Sand
0.0630	4.0	7.59	39.87	
0.0440	4.5	6.25	46.12	Coarse Silt
0.0315	5.0	5.29	51.40	
0.0220	5.5	5.63	57.04	Medium Silt
0.0156	6.0	5.60	62.64	
0.0110	6.5	6.22	68.86	Fine silt
0.0078	7.0	6.72	75.57	
0.0055	7.5	6.93	82.50	V.Fine Silt
0.0039	8.0	6.08	88.58	
0.0028	8.5	4.51	93.09	
0.0020	9.0	2.97	96.07	Coarse Clay
0.0014	9.5	1.66	97.73	
0.0010	10.0	1.01	98.73	Medium Clay
<0.001	>10.0	1.27	100.00	Fine Clay

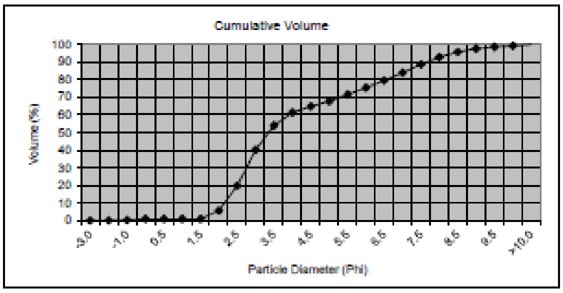
Graphical	mm	StDev (mm)	Phi
Mean (MZ)	0.032	0.601	4.986
Median	0.035		4.844
Wentworth Classification		Coarse Silt	

Sorting	Value	Inference
Coefficient	2.74	Very Poorly Sorted
Skewness	-0.05	Symmetrical
Kurtosis	1.01	Mesokurtic
Fines (%)	60.13%	
Sands (%)	35.17%	
Gravel (%)	4.70%	

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

Sample No.:	Rum2_15	Operator	ER
Source Data:	2534 Rum Baseline	Date & Time:	30/05/2025 11:48





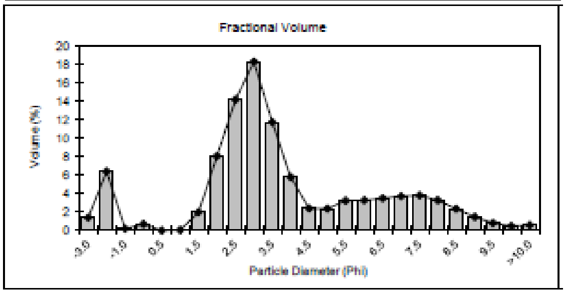
Aperture (mm)	Aperture (Phi unit)	Percentage Fractional	Cumulative	Sediment Description
8.0000	-3.0	0.00	0.00	Pebble
4.0000	-2.0	0.10	0.10	
2.0000	-1.0	0.20	0.30	Granule
1.0000	0.0	0.60	0.90	V.Coarse Sand
0.7100	0.5	0.00	0.90	Coarse Sand
0.5000	1.0	0.00	0.90	
0.3550	1.5	0.00	0.90	Medium Sand
0.2500	2.0	4.87	5.77	
0.1800	2.5	14.03	19.80	Fine Sand
0.1250	3.0	20.39	40.19	
0.0900	3.5	13.83	54.03	V.Fine Sand
0.0630	4.0	7.38	61.41	
0.0440	4.5	3.41	64.81	Coarse Silt
0.0315	5.0	3.03	67.84	
0.0220	5.5	3.82	71.66	Medium Silt
0.0156	6.0	3.79	75.46	
0.0110	6.5	4.10	79.55	Fine silt
0.0078	7.0	4.48	84.03	
0.0055	7.5	4.68	88.72	V.Fine Silt
0.0039	8.0	4.07	92.79	
0.0028	8.5	2.94	95.73	
0.0020	9.0	1.88	97.60	Coarse Clay
0.0014	9.5	1.02	98.62	
0.0010	10.0	0.61	99.23	Medium Clay
<0.001	>10.0	0.77	100.00	Fine Clay

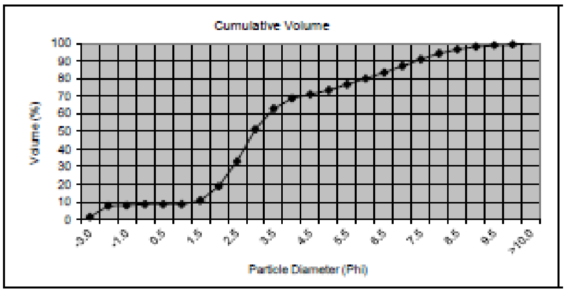
Graphical	mm	StDev (mm)	Phi
Mean (MZ)	0.054	0.107	4.216
Median	0.100		3.319
Wentworth Classification		Coarse Silt	

Sorting	Value	Inference
Coefficient	2.14	Very Poorly Sorted
Skewness	0.57	Very Positive (Coarse)
Kurtosis	0.79	Platykurtic
Fines (%)	38.60%	
Sands (%)	61.11%	
Gravel (%)	0.30%	

BGS Mod. Folk Classification	Muddy Sand
Mod. Folk for Habitat Classification	Mud and Sandy Mud

Sample No.:	Rum2_16	Operator	ER
Source Data:	2534 Rum Baseline	Date & Time:	30/05/2025 12:01





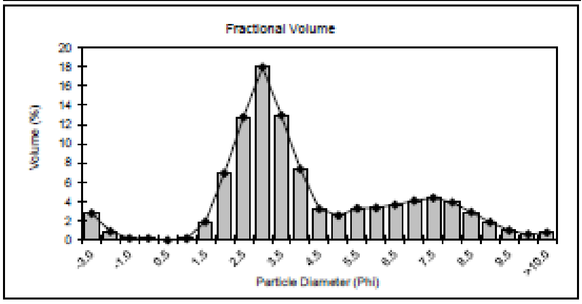
Aperture (mm)	Aperture (Phi unit)	Percentage Fractional	Cumulative	Sediment Description
8.0000	-3.0	1.40	1.40	Pebble
4.0000	-2.0	6.40	7.80	
2.0000	-1.0	0.20	8.00	Granule
1.0000	0.0	0.70	8.70	V.Coarse Sand
0.7100	0.5	0.00	8.70	Coarse Sand
0.5000	1.0	0.06	8.76	
0.3550	1.5	1.98	10.74	Medium Sand
0.2500	2.0	8.06	18.80	
0.1800	2.5	14.19	32.99	Fine Sand
0.1250	3.0	18.26	51.25	
0.0900	3.5	11.72	62.97	V.Fine Sand
0.0630	4.0	5.78	68.75	
0.0440	4.5	2.39	71.14	Coarse Silt
0.0315	5.0	2.35	73.49	
0.0220	5.5	3.23	76.73	Medium Silt
0.0156	6.0	3.27	80.00	
0.0110	6.5	3.48	83.48	Fine silt
0.0078	7.0	3.72	87.20	
0.0055	7.5	3.82	91.02	V.Fine Silt
0.0039	8.0	3.27	94.29	
0.0028	8.5	2.34	96.63	
0.0020	9.0	1.48	98.11	Coarse Clay
0.0014	9.5	0.81	98.92	
0.0010	10.0	0.48	99.40	Medium Clay
<0.001	>10.0	0.60	100.00	Fine Clay

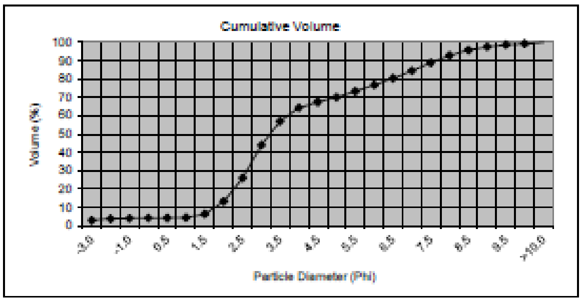
Graphical	mm	StDev (mm)	Phi
Mean (MZ)	0.073	1.877	3.776
Median	0.129		2.957
Wentworth Classification		V. Fine Sand	

Sorting	Value	Inference
Coefficient	2.80	Very Poorly Sorted
Skewness	0.24	Positive(Coarse)
Kurtosis	1.45	Leptokurtic
Fines (%)	31.25%	
Sands (%)	60.75%	
Gravel (%)	8.00%	

BGS Mod. Folk Classification	Gravelly Muddy Sand
Mod. Folk for Habitat Classification	Mixed Sediments

Sample No.:	Rum2_17	Operator	ER
Source Data:	2534 Rum Baseline	Date & Time:	30/05/2025 12:19





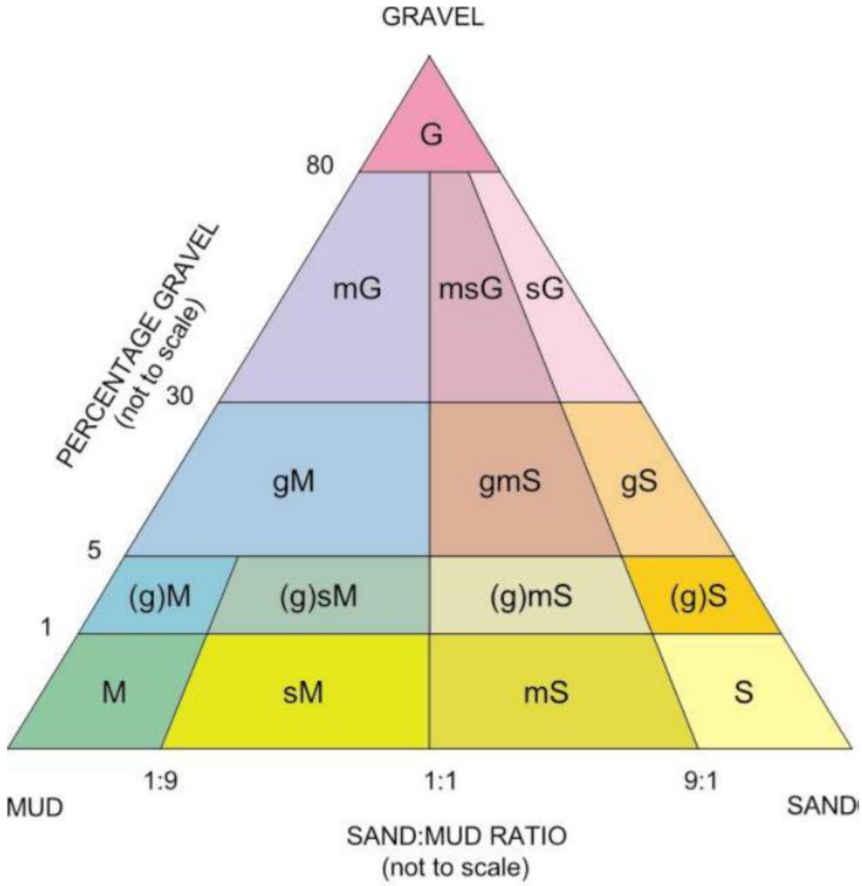
Aperture (mm)	Aperture (Phi unit)	Percentage Fractional	Cumulative	Sediment Description
8.0000	-3.0	2.80	2.80	Pebble
4.0000	-2.0	0.90	3.70	
2.0000	-1.0	0.20	3.90	Granule
1.0000	0.0	0.20	4.10	V.Coarse Sand
0.7100	0.5	0.00	4.10	Coarse Sand
0.5000	1.0	0.17	4.27	
0.3550	1.5	1.91	6.18	Medium Sand
0.2500	2.0	6.96	13.15	
0.1800	2.5	12.76	25.91	Fine Sand
0.1250	3.0	17.97	43.88	
0.0900	3.5	12.97	56.86	V.Fine Sand
0.0630	4.0	7.37	64.22	
0.0440	4.5	3.24	67.46	Coarse Silt
0.0315	5.0	2.57	70.04	
0.0220	5.5	3.30	73.34	Medium Silt
0.0156	6.0	3.37	76.71	
0.0110	6.5	3.68	80.39	Fine silt
0.0078	7.0	4.10	84.49	
0.0055	7.5	4.40	88.89	V.Fine Silt
0.0039	8.0	3.93	92.82	
0.0028	8.5	2.90	95.72	
0.0020	9.0	1.87	97.59	Coarse Clay
0.0014	9.5	1.02	98.61	
0.0010	10.0	0.61	99.22	Medium Clay
<0.001	>10.0	0.78	100.00	Fine Clay

Graphical	mm	StDev (mm)	Phi
Mean (MZ)	0.059	0.157	4.077
Median	0.108		3.204
Wentworth Classification		Coarse Silt	

Sorting	Value	Inference
Coefficient	2.30	Very Poorly Sorted
Skewness	0.49	Very Positive (Coarse)
Kurtosis	0.89	Platykurtic
Fines (%)	35.78%	
Sands (%)	60.32%	
Gravel (%)	3.90%	

BGS Mod. Folk Classification	Slightly Gravelly Muddy Sand
Mod. Folk for Habitat Classification	Mud and Sandy Mud

Modified Folk Classification



- M — Mud
- sM — Sandy mud
- (g)M — Slightly gravelly mud
- (g)sM — Slightly gravelly sandy mud
- gM — Gravelly mud
- S — Sand
- mS — Muddy sand
- (g)S — Slightly gravelly sand
- (g)mS — Slightly gravelly muddy sand
- gmS — Gravelly muddy sand
- gS — Gravelly sand
- G — Gravel
- mG — Muddy gravel
- msG — Muddy sandy gravel
- sG — Sandy gravel

Appendix IV – Grab Sampling Log Sheets

Cast#	Station	Sampler Used	Water Depth (m)	Time	Date	Volume Recovered	Sample Name	Container Type / Quantity	Sediment Characteristic: Stratification (cm)	Sediment Characteristic: Colour	Sediment Characteristic: Sediment Description	Conspicuous fauna / comments	% Grab filled	Grab size	Colour	Consistency / Texture	Surface smell (Yes / No)	Fungus (Yes / No)	Accumulations of fish bones, scales, faeces or feed pellets (Yes/No)	Accumulations of algae (Yes/No)
1	Rum2_09	DVV	43	08:17	13/05/2025	95 95	PC F1	3 Bags 1L	0-5 5-11 -	2.5Y 3/2 5Y 2/5 -	Soft mud Consolidated mud -	Cone shells, polychaetes	95	0.1m2	Grey brown	Soft mud	N	N	N	N
2	Rum2_14	DVV	36	08:51	13/05/2025	80 80	PC F1	3 Bags 5L	0-7 7-13 -	2.5Y 3/2 5Y 3/2 -	Soft mud Consolidated mud -	Cone shells, polychaetes, shell debris	80	0.1m2	Grey brown	Soft mud	N	N	N	N
3	Rum2_10	DVV	49	09:29	13/05/2025	100 100	PC F1	3 Bags 1L	0-7 7-14 -	2.5Y 3/2 5Y 3/2 -	Soft mud Consolidated mud -	Shells, polychaetes	100	0.1m2	Grey brown	Soft mud	N	N	N	N
4	Rum2_17	DVV	28	09:54	13/05/2025	80 80	PC F1	3 Bags 3L	0-3 3-14 -	2.5Y 3/2 5Y 3/2 -	Soft gravelly mud Consolidated gravelly mud -	Cone shells, polychaetes	80	0.1m2	Grey brown	Soft gravelly mud	N	N	N	N
5	Rum2_11	DVV	40	10:18	13/05/2025	95 90	PC F1	3 Bags 5L	0-4 4-14 -	2.5Y 3/2 5Y 3/2 -	Soft gravelly mud Consolidated gravelly mud -	Cone shells, polychaetes Weights removed (x2)	90	0.1m2	Grey brown	Soft gravelly mud	N	N	N	N
6	Rum2_08	DVV	34	10:52	13/05/2025	90 95	PC F1	3 Bags 1L	0-7 7-18 -	2.5Y 3/2 5Y 3/2 -	Soft gravelly mud Consolidated gravelly mud -	Cone shells, polychaetes Remaining weights removed (x4)	95	0.1m2	Grey brown	Soft gravelly mud	N	N	N	N
7	Rum2_16	DVV	23	11:21	13/05/2025	50 50	PC F1	3 Bags 1L	0-5 5-9 -	2.5Y 4/2 5Y 4/2 -	Soft sandy mud More consolidated sandy mud -	Cone shells, polychaetes Brachyura	50	0.1m2	Grey brown	Soft sandy mud	N	N	N	N
8	Rum2_12	DVV	36	11:45	13/05/2025	90 95	PC F1	3 Bags 3L	0-4	2.5Y 4/2	Soft sandy mud		95	0.1m2	Grey brown		N	N	N	N

Cast#	Station	Sampler Used	Water Depth (m)	Time	Date	Volume Recovered	Sample Name	Container Type / Quantity	Sediment Characteristic			Conspicuous fauna / comments	% Grab filled	Grab size	Colour	Consistency / Texture	Surface smell (Yes / No)	Fungus (Yes / No)	Accumulations of fish bones, scales, faeces or feed pellets (Yes/No)	Accumulations of algae (Yes/No)
									Stratification (cm)	Colour	Sediment Description									
									4-15		More consolidated sandy mud	Cone shells, scallop shell, polychaetes				Soft sandy mud				
									-	-	-									
9	Rum2_06	DVV	30	12:21	13/05/2025	90 80	PC F1	3 Bags 1L	0-5	2.5Y 3/2	Soft mud (Sandy)	Cone shells, polychaetes	80	0.1m2	Grey brown	Soft sandy mud	N	N	N	N
									5-16	5Y 3/2	Slightly consolidated mud (Sandy)									
10	Rum2_07	DVV	27	12:47	13/05/2025	70 70	PC F1	3 Bags 1L	0-5	2.5Y 3/2	Soft sandy mud	Cone shells, polychaetes	70	0.1m2	Grey brown	Soft sandy mud	N	N	N	N
									5-13	5Y 3/2	Slightly consolidated sandy mud									
									-	-	-									
11	Rum2_13	DVV	50	13:47	13/05/2025	95 95	PC F1	3 Bags 1L	0-8	2.5Y 3/3	Soft mud	Clumps of black consolidated mud in sieve Cone shells, polychaetes	95	0.1m2	Olive brown	Soft mud	N	N	N	N
									8-17	5Y 4/2	Slightly consolidated mud									
									-	2.5Y 1	-									
12	Rum2_05	DVV	33	14:27	13/05/2025	70 60	PC F1	3 Bags 3L	0-6	2.5Y 4/2	Soft mud (Sandy)	Cone shells, polychaetes	60	0.1m2	Grey brown	Soft sandy mud	N	N	N	N
									6-14	2.5Y 1	Slightly consolidated sandy mud									
									-	-	-									
13	Rum2_02	DVV	43	14:55	13/05/2025	80 75	PC F1	3 Bags 1L	0-4	2.5Y 4/2	Soft sandy mud	Cone shells, polychaetes	75	0.1m2	Grey brown	Soft sandy mud	N	N	N	N
									4-15	2.5Y 3/2	More consolidated sandy mud									
									-	-	-									
14	Rum2_15	DVV	23	15:24	13/05/2025	20 20	NS NS	- -	-	-	-	-	-	-	-	-	-	-	-	--
									-	-	-									
									-	-	-									
15	Rum2_15	DVV	24	15:31	13/05/2025	80 80	PC F1	3 Bags 1L	0-4	2.5Y 4/2	Soft sandy mud	Cone shells, Brachyura	80	0.1m2	Grey brown	Soft sandy mud	N	N	N	N
									4-14	2.5Y 3/2	More consolidated sandy mud									
									-	-	-									
16	Rum2_01	DVV	44	15:54	13/05/2025	90 90	PC F1	3 Bags 1L	0-7	2.5Y 4/2	Soft sandy mud		90	0.1m2	Grey brown		N	N	N	N

Cast#	Station	Sampler Used	Water Depth (m)	Time	Date	Volume Recovered	Sample Name	Container Type / Quantity	Sediment Characteristic			Conspicuous fauna / comments	% Grab filled	Grab size	Colour	Consistency / Texture	Surface smell (Yes / No)	Fungus (Yes / No)	Accumulations of fish bones, scales, faeces or feed pellets (Yes/No)	Accumulations of algae (Yes/No)
									Stratification (cm)	Colour	Sediment Description									
									7-16	2.5Y 3/2	More consolidated sandy mud	Cone shells, polychaetes, Brachyura				Soft sandy mud				
										Black streaks	5Y 2.5Y 1									
17	Rum2_ 03	DVV	30	16:05	13/05/ 2025	-	-	-	- - -	- - -	- - -	Trigger in water column	-	-	-	-	-	-	-	-
18	Rum2_ 03	DVV	30	16:09	13/05/ 2025	-	-	-	- - -	- - -	- - -	Trigger in water column	-	-	-	-	-	-	-	-
19	Rum2_ 03	DVV	30	16:14	13/05/ 2025	80 80	PC F1	3 Bags 5L	0-3 3-13 -	2.5Y 3/2 2.5Y 5/1 -	Soft sandy mud More Consolidated sandy mud -	Cone shell debris, polychaetes, Brachyura	80	0.1m2	Grey brown	Soft sandy mud	N	N	N	N
20	Rum2_ 04	DVV	36	16:32	13/05/ 2025	-	NS NS	-	- - -	- - -	- - -	Trigger in water column	-	-	-	-	-	-	-	-
21	Rum2_ 04	DVV	36	16:37	13/05/ 2025	70 70	PC F1	3 Bags 3L	0-4	2.5Y 4/2	Soft sandy mud	Cone shells, Brachyura, Sipunculidae, prawn Stiff mud - SHMP added	70	0.1m2	Grey brown	Soft sandy mud	N	N	N	N

Appendix V – Camera Transect Log Sheets

Station		Easting	Northing	Date	SOL	EOL	Time	Sediment Type	Conspicuous Fauna	Comments
Rum2 TR_01	SOL	140136.922	803576.922	11/05/2025	13:48:50	14:28:36	SOL	Muddy sandy burrows and mounds	Occasional algae, fish, prawn	
							14:04:00		Sea star, algae	
							14:07:00		Large algae	
							14:07:00		More algae	
	EOL	1408821.943	803080.01				14:10:00		Prawn	
							14:14:00		Sea pens	
							14:18		Brachyura	
							14:24:00	Patch of shell debris		Still camera 'memory card error' mid-transect. Same red all transects
Rum2 TR_02	SOL	140226.033	803717.953	11/05/2025	16:53:33	17:06:10	SOL	Muddy sand		
							16:54		Prawn	
	EOL	140902.046	803215.957							Abandoned transect due to potential entanglement
Rum2 TR_04	SOL	140869.14	803513.552	11/05/2025	17:45:10	18:14:44				Fishing gear - starting within line
	EOL	140502.13	803015.879				SOL		Muddy sand	
							17:49:00		Sea pens	
							17:57:00		Pennatulacea	
							18:57:00		Abandoned transect - lost live feed	
Rum2 TR_04_A				12/05/2025	08:41:25	09:15:35				Started slightly into line due to fishing gear
							08:41:25			Live stream cuts out
							08:41:00		Burrows and mounds, shell debris, prawn, Asteroidea	
							09:09:00		Sea pens	
							09:15:00		Prawn	
Rum2 TR_03	SOL	140613.578	803713.389	12/05/2025	10:26:40	11:16:35	10:25:40	Muddy sand w shell debris	algae	
							10:27:00		Asteroidea	
							10:43:51		Fish	
							10:45:39		Asteroidea	

Station		Easting	Northing	Date	SOL	EOL	Time	Sediment Type	Conspicuous Fauna	Comments
	EOL	140277.313	803213.795				10:46:16		Crab	
							10:47:29		Crab	
							10:48:00	Burrows, mounds		
							10:49:00		Sea pen	
Rum2 TR_02_A				12/05/2025	11:57:03	12:39:30	SOL	Muddy sand with shell debris, faunal tracks.	Crabs	
							12:09:00		Pennatulacea	
							12:22:00		Tall sea pen?	
							12:22:00		Asteroidea	
							12:23:00		Burrows	
							12:25:00		Ophiuridae	
										Entanglement
										Fishing pot near EOL - Ended transect slightly early
Rum2 TR_01_A				12/05/2025	13:19:16	13:56:24	SOL	Muddy sand with shell debris, burrows and tracks		
									Brachyura	
							13:29:00		Sea pen	
							13:11:00		Sea pen, Asteroidea	
							13:32:00		Algae	
							13:39:00		Prawn	Transect abandoned early due to fishing gear near EOL

Appendix VI – Seabed Photographic Positions and Burrow Density

Transect	Easting	Northing	Photo Name	Predominant Physical Habitat			Nephrops	Burrows	
				Sandy Mud	Mixed Sediment	Bedrock		1-3cm	3-15cm
Rum2_TR_01_A	140783	803101	Rum2_TR_01_A_0001.JPG	X				5	2
Rum2_TR_01_A	140777	803107	Rum2_TR_01_A_0002.JPG	X				6	10
Rum2_TR_01_A	140769	803113	Rum2_TR_01_A_0003.JPG	X				8	2
Rum2_TR_01_A	140765	803116	Rum2_TR_01_A_0004.JPG	X				3	4
Rum2_TR_01_A	140761	803119	Rum2_TR_01_A_0005.JPG	X				4	4
Rum2_TR_01_A	140745	803130	Rum2_TR_01_A_0006.JPG	X				6	5
Rum2_TR_01_A	140740	803134	Rum2_TR_01_A_0007.JPG	X				3	4
Rum2_TR_01_A	140737	803139	Rum2_TR_01_A_0008.JPG	X				4	2
Rum2_TR_01_A	140734	803145	Rum2_TR_01_A_0009.JPG	X				3	5
Rum2_TR_01_A	140730	803152	Rum2_TR_01_A_0010.JPG	X				0	3
Rum2_TR_01_A	140728	803155	Rum2_TR_01_A_0011.JPG	X				2	5
Rum2_TR_01_A	140722	803159	Rum2_TR_01_A_0012.JPG	X				2	7
Rum2_TR_01_A	140714	803165	Rum2_TR_01_A_0013.JPG	X				7	5
Rum2_TR_01_A	140706	803172	Rum2_TR_01_A_0014.JPG	X				3	10
Rum2_TR_01_A	140698	803178	Rum2_TR_01_A_0015.JPG	X				1	4
Rum2_TR_01_A	140693	803181	Rum2_TR_01_A_0016.JPG	X				4	6
Rum2_TR_01_A	140679	803189	Rum2_TR_01_A_0017.JPG	X				10	2
Rum2_TR_01_A	140675	803191	Rum2_TR_01_A_0018.JPG	X				2	1
Rum2_TR_01_A	140663	803197	Rum2_TR_01_A_0019.JPG	X				6	7
Rum2_TR_01_A	140656	803200	Rum2_TR_01_A_0020.JPG	X				3	5
Rum2_TR_01_A	140654	803200	Rum2_TR_01_A_0021.JPG	X				12	9
Rum2_TR_01_A	140652	803201	Rum2_TR_01_A_0022.JPG	X				7	4
Rum2_TR_01_A	140644	803204	Rum2_TR_01_A_0023.JPG	X				6	7
Rum2_TR_01_A	140629	803213	Rum2_TR_01_A_0024.JPG	X				3	10
Rum2_TR_01_A	140623	803218	Rum2_TR_01_A_0025.JPG	X				3	5
Rum2_TR_01_A	140596	803234	Rum2_TR_01_A_0026.JPG	X				9	7
Rum2_TR_01_A	140595	803235	Rum2_TR_01_A_0027.JPG	X				2	3
Rum2_TR_01_A	140589	803240	Rum2_TR_01_A_0028.JPG	X				13	4
Rum2_TR_01_A	140580	803247	Rum2_TR_01_A_0029.JPG	X				2	7
Rum2_TR_01_A	140576	803250	Rum2_TR_01_A_0030.JPG	X				1	7
Rum2_TR_01_A	140565	803261	Rum2_TR_01_A_0031.JPG	X				8	6
Rum2_TR_01_A	140562	803265	Rum2_TR_01_A_0032.JPG	X				5	3
Rum2_TR_01_A	140560	803268	Rum2_TR_01_A_0033.JPG	X				9	5
Rum2_TR_01_A	140534	803289	Rum2_TR_01_A_0034.JPG	X				7	6
Rum2_TR_01_A	140522	803297	Rum2_TR_01_A_0035.JPG	X				10	4
Rum2_TR_01_A	140509	803305	Rum2_TR_01_A_0036.JPG	X				7	6
Rum2_TR_01_A	140495	803315	Rum2_TR_01_A_0037.JPG	X				5	9
Rum2_TR_01_A	140494	803315	Rum2_TR_01_A_0038.JPG	X				6	10
Rum2_TR_01_A	140491	803319	Rum2_TR_01_A_0039.JPG	X				2	2
Rum2_TR_01_A	140486	803323	Rum2_TR_01_A_0040.JPG	X				7	6
Rum2_TR_01_A	140456	803350	Rum2_TR_01_A_0041.JPG	X				1	5
Rum2_TR_01_A	140453	803354	Rum2_TR_01_A_0042.JPG	X				3	8
Rum2_TR_01_A	140442	803362	Rum2_TR_01_A_0043.JPG	X				7	8
Rum2_TR_01_A	140440	803363	Rum2_TR_01_A_0044.JPG	X				5	2
Rum2_TR_01_A	140432	803368	Rum2_TR_01_A_0045.JPG	X				8	5
Rum2_TR_01_A	140413	803373	Rum2_TR_01_A_0046.JPG	X				2	11
Rum2_TR_01_A	140409	803374	Rum2_TR_01_A_0047.JPG	X				4	8
Rum2_TR_01_A	140402	803376	Rum2_TR_01_A_0048.JPG	X				2	1
Rum2_TR_01_A	140395	803380	Rum2_TR_01_A_0049.JPG	X				15	9
Rum2_TR_01_A	140391	803382	Rum2_TR_01_A_0050.JPG	X				5	8
Rum2_TR_01_A	140387	803386	Rum2_TR_01_A_0051.JPG	X				0	10
Rum2_TR_01_A	140379	803394	Rum2_TR_01_A_0052.JPG	X				2	7
Rum2_TR_01_A	140378	803394	Rum2_TR_01_A_0053.JPG	X				3	7
Rum2_TR_01_A	140377	803395	Rum2_TR_01_A_0054.JPG	X				7	6
Rum2_TR_01_A	140377	803396	Rum2_TR_01_A_0055.JPG	X				1	10
Rum2_TR_01_A	140371	803407	Rum2_TR_01_A_0056.JPG	X				5	4
Rum2_TR_01_A	140360	803414	Rum2_TR_01_A_0057.JPG	X				3	8
Rum2_TR_01_A	140359	803414	Rum2_TR_01_A_0058.JPG	X				11	10
Rum2_TR_01_A	140358	803414	Rum2_TR_01_A_0059.JPG	X				0	6
Rum2_TR_01_A	140344	803424	Rum2_TR_01_A_0060.JPG	X				3	4
Rum2_TR_01_A	140327	803437	Rum2_TR_01_A_0061.JPG	X				8	10
Rum2_TR_01_A	140327	803438	Rum2_TR_01_A_0062.JPG	X				4	9

Transect	Easting	Northing	Photo Name	Predominant Physical Habitat			Nephrops	Burrows	
				Sandy Mud	Mixed Sediment	Bedrock		1-3cm	3-15cm
Rum2_TR_01_A	140322	803443	Rum2_TR_01_A_0063.JPG	X				6	5
Rum2_TR_01_A	140316	803449	Rum2_TR_01_A_0064.JPG	X				2	11
Rum2_TR_01_A	140314	803450	Rum2_TR_01_A_0065.JPG	X				7	8
Rum2_TR_01_A	140310	803455	Rum2_TR_01_A_0066.JPG	X				4	5
Rum2_TR_01_A	140309	803455	Rum2_TR_01_A_0067.JPG	X				6	3
Rum2_TR_01_A	140300	803464	Rum2_TR_01_A_0068.JPG	X				6	11
Rum2_TR_01_A	140295	803469	Rum2_TR_01_A_0069.JPG	X				5	7
Rum2_TR_01_A	140291	803472	Rum2_TR_01_A_0070.JPG	X				10	6
Rum2_TR_01_A	140288	803475	Rum2_TR_01_A_0071.JPG	X				12	8
Rum2_TR_01_A	140286	803476	Rum2_TR_01_A_0072.JPG	X				10	8
Rum2_TR_01_A	140267	803488	Rum2_TR_01_A_0073.JPG	X				1	5
Rum2_TR_01_A	140266	803489	Rum2_TR_01_A_0074.JPG	X				4	9
Rum2_TR_01_A	140265	803489	Rum2_TR_01_A_0075.JPG	X				7	9
Rum2_TR_01_A	140223	803515	Rum2_TR_01_A_0076.JPG	X				0	9
Rum2_TR_01_A	140222	803516	Rum2_TR_01_A_0077.JPG	X				4	7
Rum2_TR_01_A	140218	803518	Rum2_TR_01_A_0078.JPG	X				6	10
Rum2_TR_01_A	140211	803521	Rum2_TR_01_A_0079.JPG	X				3	11
Rum2_TR_01_A	140263	803488	Rum2_TR_01_A_HDStill_01.JPG	X				1	7
Rum2_TR_01_A	140243	803502	Rum2_TR_01_A_HDStill_02.JPG	X				8	5
Rum2_TR_01_A	140285	803477	Rum2_TR_01_A_HDStill_03.JPG	X				3	6
Rum2_TR_01_A	140476	803333	Rum2_TR_01_A_HDStill_04.JPG	X				7	8
Rum2_TR_01_A	140555	803274	Rum2_TR_01_A_HDStill_05.JPG	X				8	3
Rum2_TR_01_A	140622	803218	Rum2_TR_01_A_HDStill_06.JPG	X				3	6
Rum2_TR_02_A	140911	803219	Rum2_TR_02_A_0001.JPG	X				1	2
Rum2_TR_02_A	140907	803222	Rum2_TR_02_A_0002.JPG	X				5	4
Rum2_TR_02_A	140905	803223	Rum2_TR_02_A_0003.JPG	X				1	5
Rum2_TR_02_A	140901	803224	Rum2_TR_02_A_0004.JPG	X				2	3
Rum2_TR_02_A	140899	803224	Rum2_TR_02_A_0005.JPG	X				2	3
Rum2_TR_02_A	140895	803223	Rum2_TR_02_A_0006.JPG	X				7	1
Rum2_TR_02_A	140894	803222	Rum2_TR_02_A_0007.JPG	X				7	1
Rum2_TR_02_A	140887	803223	Rum2_TR_02_A_0008.JPG	X				4	3
Rum2_TR_02_A	140885	803224	Rum2_TR_02_A_0009.JPG	X				3	2
Rum2_TR_02_A	140884	803224	Rum2_TR_02_A_0010.JPG	X				1	3
Rum2_TR_02_A	140882	803225	Rum2_TR_02_A_0011.JPG	X				4	4
Rum2_TR_02_A	140881	803225	Rum2_TR_02_A_0012.JPG	X				7	2
Rum2_TR_02_A	140877	803229	Rum2_TR_02_A_0013.JPG	X				2	4
Rum2_TR_02_A	140873	803234	Rum2_TR_02_A_0014.JPG	X				3	5
Rum2_TR_02_A	140871	803236	Rum2_TR_02_A_0015.JPG	X				4	6
Rum2_TR_02_A	140869	803238	Rum2_TR_02_A_0016.JPG	X				5	6
Rum2_TR_02_A	140869	803239	Rum2_TR_02_A_0017.JPG	X				0	5
Rum2_TR_02_A	140867	803242	Rum2_TR_02_A_0018.JPG	X				11	1
Rum2_TR_02_A	140865	803243	Rum2_TR_02_A_0019.JPG	X				3	5
Rum2_TR_02_A	140841	803250	Rum2_TR_02_A_0020.JPG	X				1	5
Rum2_TR_02_A	140837	803254	Rum2_TR_02_A_0021.JPG	X				4	4
Rum2_TR_02_A	140831	803259	Rum2_TR_02_A_0022.JPG	X				5	6
Rum2_TR_02_A	140829	803261	Rum2_TR_02_A_0023.JPG	X				4	5
Rum2_TR_02_A	140826	803266	Rum2_TR_02_A_0024.JPG	X				7	4
Rum2_TR_02_A	140823	803270	Rum2_TR_02_A_0025.JPG	X				5	4
Rum2_TR_02_A	140822	803271	Rum2_TR_02_A_0026.JPG	X				3	4
Rum2_TR_02_A	140819	803274	Rum2_TR_02_A_0027.JPG	X				2	5
Rum2_TR_02_A	140818	803275	Rum2_TR_02_A_0028.JPG	X				3	4
Rum2_TR_02_A	140816	803277	Rum2_TR_02_A_0029.JPG	X				7	1
Rum2_TR_02_A	140810	803284	Rum2_TR_02_A_0030.JPG	X				5	5
Rum2_TR_02_A	140801	803293	Rum2_TR_02_A_0031.JPG	X				5	7
Rum2_TR_02_A	140790	803302	Rum2_TR_02_A_0032.JPG	X				8	2
Rum2_TR_02_A	140786	803305	Rum2_TR_02_A_0033.JPG	X				1	8
Rum2_TR_02_A	140782	803309	Rum2_TR_02_A_0034.JPG	X				9	3
Rum2_TR_02_A	140777	803314	Rum2_TR_02_A_0035.JPG	X				5	4
Rum2_TR_02_A	140733	803340	Rum2_TR_02_A_0036.JPG	X				5	7
Rum2_TR_02_A	140706	803355	Rum2_TR_02_A_0037.JPG	X				0	7
Rum2_TR_02_A	140690	803363	Rum2_TR_02_A_0038.JPG	X				7	7
Rum2_TR_02_A	140687	803367	Rum2_TR_02_A_0039.JPG	X				7	6
Rum2_TR_02_A	140676	803385	Rum2_TR_02_A_0040.JPG	X				13	5
Rum2_TR_02_A	140674	803387	Rum2_TR_02_A_0041.JPG	X				9	5
Rum2_TR_02_A	140672	803390	Rum2_TR_02_A_0042.JPG	X				6	7

Transect	Easting	Northing	Photo Name	Predominant Physical Habitat			Nephrops	Burrows	
				Sandy Mud	Mixed Sediment	Bedrock		1-3cm	3-15cm
Rum2_TR_02_A	140658	803405	Rum2_TR_02_A_0043.JPG	X				5	10
Rum2_TR_02_A	140657	803406	Rum2_TR_02_A_0044.JPG	X				4	6
Rum2_TR_02_A	140656	803407	Rum2_TR_02_A_0045.JPG	X				10	1
Rum2_TR_02_A	140635	803419	Rum2_TR_02_A_0046.JPG	X				4	9
Rum2_TR_02_A	140619	803430	Rum2_TR_02_A_0047.JPG	X				3	5
Rum2_TR_02_A	140602	803441	Rum2_TR_02_A_0048.JPG	X				1	12
Rum2_TR_02_A	140580	803458	Rum2_TR_02_A_0049.JPG	X				7	11
Rum2_TR_02_A	140563	803468	Rum2_TR_02_A_0050.JPG	X				7	3
Rum2_TR_02_A	140546	803479	Rum2_TR_02_A_0051.JPG	X				10	8
Rum2_TR_02_A	140532	803486	Rum2_TR_02_A_0052.JPG	X				2	3
Rum2_TR_02_A	140515	803499	Rum2_TR_02_A_0053.JPG	X				1	14
Rum2_TR_02_A	140472	803526	Rum2_TR_02_A_0054.JPG	X				8	5
Rum2_TR_02_A	140459	803530	Rum2_TR_02_A_0055.JPG	X				6	15
Rum2_TR_02_A	140429	803552	Rum2_TR_02_A_0056.JPG	X				5	12
Rum2_TR_02_A	140423	803559	Rum2_TR_02_A_0057.JPG	X				10	2
Rum2_TR_02_A	140420	803562	Rum2_TR_02_A_0058.JPG	X				0	11
Rum2_TR_02_A	140392	803594	Rum2_TR_02_A_0059.JPG	X				2	10
Rum2_TR_02_A	140377	803606	Rum2_TR_02_A_0060.JPG	X				3	9
Rum2_TR_02_A	140351	803625	Rum2_TR_02_A_0061.JPG	X				3	9
Rum2_TR_02_A	140335	803641	Rum2_TR_02_A_0062.JPG	X				12	6
Rum2_TR_02_A	140326	803649	Rum2_TR_02_A_0063.JPG	X				5	8
Rum2_TR_02_A	140299	803666	Rum2_TR_02_A_0064.JPG	X				8	3
Rum2_TR_02_A	140248	803699	Rum2_TR_02_A_0065.JPG	X				8	6
Rum2_TR_02_A	140240	803705	Rum2_TR_02_A_0066.JPG	X				4	7
Rum2_TR_02_A	140228	803715	Rum2_TR_02_A_0067.JPG	X				5	9
Rum2_TR_02_A	140417	803571	Rum2_TR_02_A_HDStill_01.JPG	X				9	11
Rum2_TR_02_A	140224	803717	Rum2_TR_02_A_HDStill_02.JPG	X				3	8
Rum2_TR_02_A	140324	803651	Rum2_TR_02_A_HDStill_03.JPG	X				6	5
Rum2_TR_02_A	140372	803611	Rum2_TR_02_A_HDStill_04.JPG	X				6	4
Rum2_TR_02_A	140451	803532	Rum2_TR_02_A_HDStill_05.JPG	X				6	5
Rum2_TR_02_A	140515	803507	Rum2_TR_02_A_HDStill_06.JPG	X				10	4
Rum2_TR_02_A	140600	803444	Rum2_TR_02_A_HDStill_07.JPG	X				5	7
Rum2_TR_02_A	140728	803342	Rum2_TR_02_A_HDStill_08.JPG	X				9	5
Rum2_TR_02_A	140759	803328	Rum2_TR_02_A_HDStill_09.JPG	X				7	3
Rum2_TR_02_A	140779	803316	Rum2_TR_02_A_HDStill_010.JPG	X				3	2
Rum2_TR_02_A	140865	803241	Rum2_TR_02_A_HDStill_011.JPG	X				7	6
Rum2_TR_03	140280	803214	Rum2_TR_03_0001.JPG	X				4	3
Rum2_TR_03	140281	803214	Rum2_TR_03_0002.JPG	X				2	1
Rum2_TR_03	140283	803215	Rum2_TR_03_0003.JPG	X				3	4
Rum2_TR_03	140285	803217	Rum2_TR_03_0004.JPG	X				4	1
Rum2_TR_03	140294	803237	Rum2_TR_03_0005.JPG	X					
Rum2_TR_03	140298	803240	Rum2_TR_03_0006.JPG	X				1	7
Rum2_TR_03	140303	803242	Rum2_TR_03_0007.JPG	X				2	5
Rum2_TR_03	140305	803244	Rum2_TR_03_0008.JPG	X				0	10
Rum2_TR_03	140308	803246	Rum2_TR_03_0009.JPG	X				3	8
Rum2_TR_03	140313	803249	Rum2_TR_03_0010.JPG	X				0	2
Rum2_TR_03	140316	803250	Rum2_TR_03_0011.JPG	X				1	4
Rum2_TR_03	140319	803253	Rum2_TR_03_0012.JPG	X				6	9
Rum2_TR_03	140320	803255	Rum2_TR_03_0013.JPG	X				8	2
Rum2_TR_03	140324	803260	Rum2_TR_03_0014.JPG	X				0	6
Rum2_TR_03	140326	803263	Rum2_TR_03_0015.JPG	X				2	6
Rum2_TR_03	140327	803266	Rum2_TR_03_0016.JPG	X				4	5
Rum2_TR_03	140330	803275	Rum2_TR_03_0017.JPG	X				1	5
Rum2_TR_03	140330	803277	Rum2_TR_03_0018.JPG	X				3	7
Rum2_TR_03	140331	803279	Rum2_TR_03_0019.JPG	X				3	8
Rum2_TR_03	140330	803284	Rum2_TR_03_0020.JPG	X				3	4
Rum2_TR_03	140335	803289	Rum2_TR_03_0021.JPG	X				8	6
Rum2_TR_03	140350	803301	Rum2_TR_03_0022.JPG	X				2	8
Rum2_TR_03	140364	803323	Rum2_TR_03_0023.JPG	X				2	15
Rum2_TR_03	140364	803335	Rum2_TR_03_0024.JPG	X				3	5
Rum2_TR_03	140364	803341	Rum2_TR_03_0025.JPG	X				2	11
Rum2_TR_03	140368	803346	Rum2_TR_03_0026.JPG	X				6	4
Rum2_TR_03	140373	803351	Rum2_TR_03_0027.JPG	X				3	1
Rum2_TR_03	140387	803352	Rum2_TR_03_0028.JPG	X				2	2
Rum2_TR_03	140394	803355	Rum2_TR_03_0029.JPG	X				5	9

Transect	Easting	Northing	Photo Name	Predominant Physical Habitat			Nephrops	Burrows	
				Sandy Mud	Mixed Sediment	Bedrock		1-3cm	3-15cm
Rum2_TR_03	140397	803356	Rum2_TR_03_0030.JPG	X				5	3
Rum2_TR_03	140402	803363	Rum2_TR_03_0031.JPG	X				7	4
Rum2_TR_03	140404	803370	Rum2_TR_03_0032.JPG	X				1	5
Rum2_TR_03	140405	803378	Rum2_TR_03_0033.JPG	X				2	9
Rum2_TR_03	140415	803391	Rum2_TR_03_0034.JPG	X				6	9
Rum2_TR_03	140416	803396	Rum2_TR_03_0035.JPG	X				4	7
Rum2_TR_03	140418	803401	Rum2_TR_03_0036.JPG	X				4	2
Rum2_TR_03	140419	803410	Rum2_TR_03_0037.JPG	X				5	5
Rum2_TR_03	140420	803413	Rum2_TR_03_0038.JPG	X				0	2
Rum2_TR_03	140420	803416	Rum2_TR_03_0039.JPG	X				2	6
Rum2_TR_03	140421	803419	Rum2_TR_03_0040.JPG	X				6	4
Rum2_TR_03	140422	803422	Rum2_TR_03_0041.JPG	X				0	3
Rum2_TR_03	140425	803425	Rum2_TR_03_0042.JPG	X				6	6
Rum2_TR_03	140434	803430	Rum2_TR_03_0043.JPG	X				2	9
Rum2_TR_03	140440	803432	Rum2_TR_03_0044.JPG	X				2	3
Rum2_TR_03	140446	803436	Rum2_TR_03_0045.JPG	X				0	15
Rum2_TR_03	140449	803443	Rum2_TR_03_0046.JPG	X				6	8
Rum2_TR_03	140448	803446	Rum2_TR_03_0047.JPG	X				2	9
Rum2_TR_03	140448	803457	Rum2_TR_03_0048.JPG	X				3	9
Rum2_TR_03	140452	803464	Rum2_TR_03_0049.JPG	X				0	8
Rum2_TR_03	140464	803475	Rum2_TR_03_0050.JPG	X				1	5
Rum2_TR_03	140468	803477	Rum2_TR_03_0051.JPG	X				3	4
Rum2_TR_03	140472	803480	Rum2_TR_03_0052.JPG	X				9	0
Rum2_TR_03	140478	803483	Rum2_TR_03_0053.JPG	X				6	4
Rum2_TR_03	140482	803484	Rum2_TR_03_0054.JPG	X				7	0
Rum2_TR_03	140484	803486	Rum2_TR_03_0055.JPG	X				4	3
Rum2_TR_03	140486	803486	Rum2_TR_03_0056.JPG	X				2	5
Rum2_TR_03	140489	803489	Rum2_TR_03_0057.JPG	X				3	8
Rum2_TR_03	140493	803499	Rum2_TR_03_0058.JPG	X				12	3
Rum2_TR_03	140494	803502	Rum2_TR_03_0059.JPG	X				5	5
Rum2_TR_03	140495	803505	Rum2_TR_03_0060.JPG	X				0	7
Rum2_TR_03	140497	803507	Rum2_TR_03_0061.JPG	X				1	5
Rum2_TR_03	140500	803512	Rum2_TR_03_0062.JPG	X				5	5
Rum2_TR_03	140502	803514	Rum2_TR_03_0063.JPG	X				1	2
Rum2_TR_03	140507	803522	Rum2_TR_03_0064.JPG	X				4	6
Rum2_TR_03	140508	803524	Rum2_TR_03_0065.JPG	X				7	5
Rum2_TR_03	140510	803531	Rum2_TR_03_0066.JPG	X				6	3
Rum2_TR_03	140516	803544	Rum2_TR_03_0067.JPG	X				4	5
Rum2_TR_03	140523	803553	Rum2_TR_03_0068.JPG	X			X	8	3
Rum2_TR_03	140526	803554	Rum2_TR_03_0069.JPG	X				3	2
Rum2_TR_03	140552	803571	Rum2_TR_03_0070.JPG	X				2	5
Rum2_TR_03	140556	803575	Rum2_TR_03_0071.JPG	X				16	2
Rum2_TR_03	140558	803578	Rum2_TR_03_0072.JPG	X				0	0
Rum2_TR_03	140551	803599	Rum2_TR_03_0073.JPG	X				3	7
Rum2_TR_03	140549	803601	Rum2_TR_03_0074.JPG	X				8	2
Rum2_TR_03	140548	803610	Rum2_TR_03_0075.JPG	X				2	3
Rum2_TR_03	140548	803622	Rum2_TR_03_0076.JPG	X				9	3
Rum2_TR_03	140550	803629	Rum2_TR_03_0077.JPG	X				6	5
Rum2_TR_03	140552	803633	Rum2_TR_03_0078.JPG	X				5	2
Rum2_TR_03	140554	803637	Rum2_TR_03_0079.JPG	X				4	3
Rum2_TR_03	140559	803646	Rum2_TR_03_0080.JPG	X				1	6
Rum2_TR_03	140564	803650	Rum2_TR_03_0081.JPG	X				0	7
Rum2_TR_03	140569	803654	Rum2_TR_03_0082.JPG	X				0	4
Rum2_TR_03	140576	803659	Rum2_TR_03_0083.JPG	X				1	5
Rum2_TR_03	140580	803663	Rum2_TR_03_0084.JPG	X				6	6
Rum2_TR_03	140594	803676	Rum2_TR_03_0085.JPG	X				6	5
Rum2_TR_03	140597	803677	Rum2_TR_03_0086.JPG	X				6	3
Rum2_TR_03	140598	803677	Rum2_TR_03_0087.JPG	X				7	1
Rum2_TR_03	140601	803679	Rum2_TR_03_0088.JPG	X				11	3
Rum2_TR_03	140606	803680	Rum2_TR_03_0089.JPG	X				2	3
Rum2_TR_03	140613	803683	Rum2_TR_03_0090.JPG	X				9	4
Rum2_TR_03	140617	803686	Rum2_TR_03_0091.JPG	X				2	5
Rum2_TR_03	140619	803687	Rum2_TR_03_0092.JPG	X				6	5
Rum2_TR_03	140622	803689	Rum2_TR_03_0093.JPG	X				5	4
Rum2_TR_03	140622	803691	Rum2_TR_03_0094.JPG	X				3	4

Transect	Easting	Northing	Photo Name	Predominant Physical Habitat			Nephrops	Burrows	
				Sandy Mud	Mixed Sediment	Bedrock		1-3cm	3-15cm
Rum2_TR_03	140623	803695	Rum2_TR_03_0095.JPG	X				4	9
Rum2_TR_03	140622	803700	Rum2_TR_03_0096.JPG	X				2	5
Rum2_TR_03	140621	803702	Rum2_TR_03_0097.JPG	X				4	5
Rum2_TR_03	140620	803704	Rum2_TR_03_0098.JPG	X				11	1
Rum2_TR_03	140620	803704	Rum2_TR_03_0099.JPG	X				9	1
Rum2_TR_03	140619	803705	Rum2_TR_03_0100.JPG	X				1	10
Rum2_TR_03	140618	803704	Rum2_TR_03_0101.JPG	X				6	3
Rum2_TR_03	140539	803552	Rum2_TR_03_HDStill_01.JPG	X				0	16
Rum2_TR_03	140634	803694	Rum2_TR_03_HDStill_02.JPG	X				6	3
Rum2_TR_04_A	140582.5	803143.4	Rum2_TR_04_A_0001.JPG	X				2	2
Rum2_TR_04_A	140592.6	803157.3	Rum2_TR_04_A_0002.JPG	X				7	2
Rum2_TR_04_A	140611.3	803169.9	Rum2_TR_04_A_0003.JPG	X			X	4	2
Rum2_TR_04_A	140614.1	803172.9	Rum2_TR_04_A_0004.JPG	X				8	1
Rum2_TR_04_A	140617.5	803176.4	Rum2_TR_04_A_0005.JPG	X				0	6
Rum2_TR_04_A	140630.8	803200.5	Rum2_TR_04_A_0006.JPG	X				3	4
Rum2_TR_04_A	140635.8	803209.3	Rum2_TR_04_A_0007.JPG	X				6	1
Rum2_TR_04_A	140636.9	803211.2	Rum2_TR_04_A_0008.JPG	X			X	2	6
Rum2_TR_04_A	140642.0	803213.3	Rum2_TR_04_A_0009.JPG	X				3	3
Rum2_TR_04_A	140651.6	803216.3	Rum2_TR_04_A_0010.JPG	X				2	10
Rum2_TR_04_A	140657.4	803221.5	Rum2_TR_04_A_0011.JPG	X				6	4
Rum2_TR_04_A	140658.1	803223.1	Rum2_TR_04_A_0012.JPG	X				6	5
Rum2_TR_04_A	140658.1	803224.2	Rum2_TR_04_A_0013.JPG	X				2	8
Rum2_TR_04_A	140658.9	803226.4	Rum2_TR_04_A_0014.JPG	X				1	5
Rum2_TR_04_A	140662.0	803233.5	Rum2_TR_04_A_0015.JPG	X				1	8
Rum2_TR_04_A	140662.6	803234.4	Rum2_TR_04_A_0016.JPG	X				7	4
Rum2_TR_04_A	140664.5	803240.4	Rum2_TR_04_A_0017.JPG	X				7	9
Rum2_TR_04_A	140664.4	803243.4	Rum2_TR_04_A_0018.JPG	X				6	8
Rum2_TR_04_A	140665.3	803245.2	Rum2_TR_04_A_0019.JPG	X				3	8
Rum2_TR_04_A	140666.0	803247.2	Rum2_TR_04_A_0020.JPG	X				13	7
Rum2_TR_04_A	140665.9	803248.7	Rum2_TR_04_A_0021.JPG	X				0	10
Rum2_TR_04_A	140666.0	803249.8	Rum2_TR_04_A_0022.JPG	X				4	8
Rum2_TR_04_A	140666.2	803251.1	Rum2_TR_04_A_0023.JPG	X				1	6
Rum2_TR_04_A	140666.7	803252.4	Rum2_TR_04_A_0024.JPG	X				2	12
Rum2_TR_04_A	140666.7	803252.5	Rum2_TR_04_A_0025.JPG	X				3	8
Rum2_TR_04_A	140667.4	803253.8	Rum2_TR_04_A_0026.JPG	X				4	9
Rum2_TR_04_A	140668.4	803255.6	Rum2_TR_04_A_0027.JPG	X				5	7
Rum2_TR_04_A	140670.5	803257.7	Rum2_TR_04_A_0028.JPG	X				3	6
Rum2_TR_04_A	140671.4	803258.8	Rum2_TR_04_A_0029.JPG	X				5	6
Rum2_TR_04_A	140674.6	803261.0	Rum2_TR_04_A_0030.JPG	X				2	4
Rum2_TR_04_A	140681.0	803265.6	Rum2_TR_04_A_0031.JPG	X				1	7
Rum2_TR_04_A	140683.2	803267.9	Rum2_TR_04_A_0032.JPG	X				3	7
Rum2_TR_04_A	140684.9	803269.4	Rum2_TR_04_A_0033.JPG	X				1	9
Rum2_TR_04_A	140688.9	803273.3	Rum2_TR_04_A_0034.JPG	X				6	5
Rum2_TR_04_A	140692.3	803275.9	Rum2_TR_04_A_0035.JPG	X				4	6
Rum2_TR_04_A	140694.1	803277.8	Rum2_TR_04_A_0036.JPG	X				8	8
Rum2_TR_04_A	140699.7	803284.7	Rum2_TR_04_A_0037.JPG	X				7	10
Rum2_TR_04_A	140699.9	803286.5	Rum2_TR_04_A_0038.JPG	X				4	8
Rum2_TR_04_A	140740.4	803345.6	Rum2_TR_04_A_0039.JPG	X				5	7
Rum2_TR_04_A	140756.9	803370.4	Rum2_TR_04_A_0040.JPG	X				5	7
Rum2_TR_04_A	140778.9	803397.3	Rum2_TR_04_A_0041.JPG	X				9	5
Rum2_TR_04_A	140779.7	803398.4	Rum2_TR_04_A_0042.JPG	X				3	7
Rum2_TR_04_A	140805.6	803440.3	Rum2_TR_04_A_0043.JPG	X				4	9
Rum2_TR_04_A	140808.8	803450.5	Rum2_TR_04_A_0044.JPG	X				4	7
Rum2_TR_04_A	140809.7	803454.5	Rum2_TR_04_A_0045.JPG	X				0	8
Rum2_TR_04_A	140811.5	803458.9	Rum2_TR_04_A_0046.JPG	X				1	11
Rum2_TR_04_A	140811.8	803459.3	Rum2_TR_04_A_0047.JPG	X				1	11
Rum2_TR_04_A	140845.5	803495.1	Rum2_TR_04_A_0048.JPG	X				2	14
Rum2_TR_04_A	140840.2	803487.3	Rum2_TR_04_A_HDStill_01.JPG	X				2	10
Rum2_TR_04_A	140802.4	803443.6	Rum2_TR_04_A_HDStill_02.JPG	X				4	6
Rum2_TR_04_A	140803.6	803448.0	Rum2_TR_04_A_HDStill_03.JPG	X				3	3
Rum2_TR_04_A	140805.4	803452.3	Rum2_TR_04_A_HDStill_04.JPG	X				3	7
Rum2_TR_04_A	140700.9	803290.1	Rum2_TR_04_A_HDStill_05.JPG	X				6	5
Rum2_TR_04_A	140709.2	803305.4	Rum2_TR_04_A_HDStill_06.JPG	X				5	2
Rum2_TR_04_A	140725.5	803325.6	Rum2_TR_04_A_HDStill_07.JPG	X				5	7
Rum2_TR_04_A	140728.4	803331.7	Rum2_TR_04_A_HDStill_08.JPG	X				9	4

Transect	Easting	Northing	Photo Name	Predominant Physical Habitat			Nephrops	Burrows	
				Sandy Mud	Mixed Sediment	Bedrock		1-3cm	3-15cm
Rum2_TR_04_A	140737.2	803341.8	Rum2_TR_04_A_HDStill_09.JPG	X				2	8
Rum2_TR_04_A	140739.0	803348.4	Rum2_TR_04_A_HDStill_010.JPG	X				9	0
Rum2_TR_04_A	140755.8	803369.5	Rum2_TR_04_A_HDStill_011.JPG	X				5	4
Rum2_TR_04_A	140792.0	803417.2	Rum2_TR_04_A_HDStill_012.JPG	X				8	5
Rum2_TR_04_A	140797.7	803426.6	Rum2_TR_04_A_HDStill_013.JPG	X				4	7
Rum2_TR_04_A	140815.8	803464.5	Rum2_TR_04_A_HDStill_014.JPG	X				2	6
Rum2_TR_04_A	140825.1	803472.8	Rum2_TR_04_A_HDStill_015.JPG	X				0	7
Rum2_TR_04_A	140833.4	803481.4	Rum2_TR_04_A_HDStill_016.JPG	X				2	4
Rum2_TR_04_A	140836.2	803485.5	Rum2_TR_04_A_HDStill_017.JPG	X				5	6
Rum2_TR_04_A	140746.9	803358.9	Rum2_TR_04_A_HDStill_018.JPG	X				13	1
Rum2_TR_04_A	140770.0	803386.4	Rum2_TR_04_A_HDStill_019.JPG	X				6	8

** – due to poor visibility additional stills were taken from the HD Download Video to be included in the analysis*

Appendix VII – Macrofaunal Species List

Infaunal Species

2534 Rum2																				
AphiaID	Phylum	Taxa	Authority	Rum2_01	Rum2_02	Rum2_03	Rum2_04	Rum2_05	Rum2_06	Rum2_07	Rum2_08	Rum2_09	Rum2_10	Rum2_11	Rum2_12	Rum2_13	Rum2_14	Rum2_15	Rum2_16	Rum2_17
Infaunal Species																				
410724	Annelida	*Golfingia (Golfingia) vulgaris vulgaris*	(de Blainville, 1827)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
410749	Annelida	*Phascolion (Phascolion) strombus strombus*	(Montagu, 1804)	0	0	0	0	1	0	0	0	0	0	0	0	0	1	1	1	0
136063	Annelida	*Thysanocardia procera*	(Möbius, 1875)	0	0	3	0	2	0	0	0	0	0	0	1	0	0	0	1	0
146469	Annelida	*Abyssoninoe hibernica*	(McIntosh, 1903)	0	0	1	0	1	1	1	0	0	0	0	1	1	0	1	0	0
130240	Annelida	*Lumbrineris cingulata*	Ehlers, 1897	0	0	5	0	0	0	1	0	0	0	0	0	0	0	2	1	0
129856	Annelida	*Drilonereis filum*	(Claparède, 1868)	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
130116	Annelida	*Glycera alba*	(O.F. Müller, 1776)	2	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	2
130136	Annelida	*Glycinde nordmanni*	(Malmgren, 1866)	0	0	0	1	0	0	2	0	0	0	0	0	0	0	1	1	0
130140	Annelida	*Goniada maculata*	Örsted, 1843	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0
710680	Annelida	*Oxydromus flexuosus*	(Delle Chiaje, 1827)	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
130195	Annelida	*Podarkeopsis capensis*	(Day, 1963)	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
130359	Annelida	*Nephtys hombergii*	Savigny in Lamarck, 1818	5	2	2	0	0	0	3	0	0	0	0	0	0	0	0	0	3
130362	Annelida	*Nephtys incisa*	Malmgren, 1865	8	6	2	6	10	7	2	3	6	5	5	5	5	5	0	0	0
130363	Annelida	*Nephtys kersivalensis*	McIntosh, 1908	1	0	1	0	0	0	1	0	0	0	0	0	0	0	2	0	1
130375	Annelida	*Eunereis longissima*	(Johnston, 1840)	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
129446	Annelida	*Eumida*	Malmgren, 1865	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
130690	Annelida	*Sige fusigera*	Malmgren, 1865	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
571832	Annelida	*Harmothoe glabra*	(Malmgren, 1865)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0
236678	Annelida	*Pettibonesia furcosetosa*	(Loshamn, 1981)	0	0	0	0	0	0	1	0	0	2	1	1	0	0	0	0	0
130599	Annelida	*Pholoe baltica*	Örsted, 1843	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0
130601	Annelida	*Pholoe inornata*	Johnston, 1839	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0
131077	Annelida	*Sthenelais limicola*	(Ehlers, 1864)	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
196002	Annelida	*Syllis parapari*	San Martín & López, 2000	0	0	0	1	3	0	1	0	0	0	0	0	0	1	1	1	0
129613	Annelida	*Laonice*	Malmgren, 1867	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1745127	Annelida	*Prionospio multisetosa*	Delgado-Blas & Peraza, 2024	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0
131160	Annelida	*Prionospio multibranchiata*	Berkeley, 1927	0	0	1	0	5	0	2	0	1	0	0	0	0	0	0	0	0
1521915	Annelida	*Pseudopolydora nordica*	Radashevsky, 2021	0	1	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0
131169	Annelida	*Pseudopolydora pulchra*	(Carazzi, 1893)	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
131188	Annelida	*Spiophanes kroyeri*	Grube, 1860	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	2	0
129777	Annelida	*Ampharete falcata*	Eliason, 1955	0	0	1	1	2	0	0	0	0	0	0	0	0	0	0	0	0
129781	Annelida	*Ampharete lindstroemi*	Hessle, 1917	0	0	0	0	0	1	2	0	0	0	0	0	0	1	0	0	0
129784	Annelida	*Amphicteis gunneri*	(M. Sars, 1835)	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1
129240	Annelida	*Aphelochaeta*	Blake, 1991	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0
129242	Annelida	*Chaetozone*	Malmgren, 1867	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	2	1
129955	Annelida	*Chaetozone setosa*	Malmgren, 1867	0	1	1	0	0	0	2	0	0	0	0	0	0	0	0	2	0
884676	Annelida	*Kirkegaardia*	Blake, 2016	0	0	0	0	0	0	0	0	0	1	2	0	0	0	0	0	0
130100	Annelida	*Diplocirrus glaucus*	(Malmgren, 1867)	1	0	2	0	2	0	0	0	0	0	0	0	0	0	0	0	0
129808	Annelida	*Melinna palmata*	Grube, 1870	0	1	13	1	1	0	2	0	0	0	0	0	0	0	1	1	1
129710	Annelida	*Polycirrus*	Grube, 1850	1	3	4	2	4	1	2	1	1	1	0	0	2	1	6	5	4

129717	Annelida	*Terebellides*	Sars, 1835	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0
131575	Annelida	*Trichobranchus roseus*	(Malm, 1874)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	2
129211	Annelida	*Capitella*	Blainville, 1828	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
129892	Annelida	*Mediomastus fragilis*	Rasmussen, 1973	1	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0
129220	Annelida	*Notomastus*	M. Sars, 1851	6	5	7	1	2	2	7	0	2	1	0	3	1	0	2	4	2
129906	Annelida	*Peresiella clymenoides*	Harmelin, 1968	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
129233	Annelida	*Spiochaetopterus*	M Sars, 1856	1	0	4	0	0	0	1	0	0	0	0	0	0	0	2	5	2
130266	Annelida	*Magelona alleni*	Wilson, 1958	1	4	9	0	2	0	0	0	0	0	0	0	0	0	6	10	5
130270	Annelida	*Magelona minuta*	Eliason, 1962	0	0	0	0	1	0	0	0	0	0	2	0	0	0	0	0	0
130500	Annelida	*Ophelina acuminata*	Örsted, 1843	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
146949	Annelida	*Galathowenia*	Kirkegaard, 1959	0	0	2	0	2	0	1	0	0	0	0	0	0	0	0	0	0
130578	Annelida	*Levinsenia gracilis*	(Tauber, 1879)	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
130980	Annelida	*Scalibregma inflatum*	Rathke, 1843	0	0	2	0	1	0	1	0	0	0	0	0	0	0	0	0	0
101930	Arthropoda	*Ampelisca tenuicornis*	Liljeborg, 1856	1	0	0	0	0	0	1	0	0	0	0	0	0	0	1	1	0
236495	Arthropoda	*Apolochus neapolitanus*	(Della Valle, 1893)	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
103058	Arthropoda	*Bathyporeia elegans*	Watkin, 1938	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
101857	Arthropoda	*Pariambus typicus*	(Krøyer, 1845)	0	0	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0
101864	Arthropoda	*Phtisica marina*	Slabber, 1769	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
102462	Arthropoda	*Leucothoe lilljeborgi*	Boeck, 1861	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
102788	Arthropoda	*Abludomelita obtusata*	(Montagu, 1813)	0	0	8	1	4	1	8	3	0	0	3	0	0	1	4	0	3
110460	Arthropoda	*Iphinoe serrata*	Norman, 1867	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
110481	Arthropoda	*Diastylis laevis*	Norman, 1869	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0
110494	Arthropoda	*Diastyloides biplicatus*	(Sars G.O., 1865)	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
107477	Arthropoda	*Alpheus glaber*	(Olivi, 1792)	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
107729	Arthropoda	*Callianassa subterranea*	(Montagu, 1808)	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0
107292	Arthropoda	*Goneplax rhomboides*	(Linnaeus, 1758)	1	0	1	1	1	1	1	0	0	1	0	0	0	0	1	1	0
1750291	Arthropoda	*Polybius depurator*	(Linnaeus, 1758)	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
108344	Arthropoda	*Processa nouveli holthuisi*	Al-Adhub & Williamson, 1975	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
118445	Arthropoda	*Astacilla*	Cordiner, 1793	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0
136458	Arthropoda	*Tanaopsis graciloides*	(Lilljeborg, 1864)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
134723	Arthropoda	*Anoplodactylus petiolatus*	(Krøyer, 1844)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1
140103	Mollusca	*Hiatella arctica*	(Linnaeus, 1767)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
141433	Mollusca	*Abra alba*	(W. Wood, 1802)	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
141435	Mollusca	*Abra nitida*	(O. F. Müller, 1776)	7	1	1	3	5	5	2	6	1	0	0	2	4	0	0	1	0
140366	Mollusca	*Epilepton clarkiae*	(W. Clark, 1852)	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
345281	Mollusca	*Kurtiella bidentata*	(Montagu, 1803)	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	2	0
146952	Mollusca	*Tellimya ferruginosa*	(Montagu, 1808)	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0
152397	Mollusca	*Tellimya tenella*	(Lovén, 1846)	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0
140283	Mollusca	*Lucinoma borealis*	(Linnaeus, 1767)	1	1	0	0	0	0	1	0	0	0	0	0	0	0	1	1	0
140287	Mollusca	*Myrtea spinifera*	(Montagu, 1803)	0	1	2	0	1	1	2	0	0	0	0	0	0	0	1	4	2
141662	Mollusca	*Thyasira flexuosa*	(Montagu, 1803)	6	4	5	2	4	1	4	0	1	0	1	2	0	0	4	5	4
378492	Mollusca	*Varicorbula gibba*	(Olivi, 1792)	5	2	3	0	2	2	3	4	1	0	0	3	0	1	5	24	11
140589	Mollusca	*Nucula nitidosa*	Winckworth, 1930	2	4	0	0	0	0	1	0	0	0	0	1	0	0	0	1	0
140728	Mollusca	*Mysia undata*	(Pennant, 1777)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
141644	Mollusca	*Thracia convexa*	(W. Wood, 1815)	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
139106	Mollusca	*Chaetoderma nitidulum*	Lovén, 1844	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1
139112	Mollusca	*Falcidens crossotus*	Salvini-Plawen, 1968	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0
140250	Mollusca	*Scutopus ventrolineatus*	Salvini-Plawen, 1968	0	0	0	0	0	0	0	0	0	0	2	1	0	1	0	0	0

1381415	Mollusca	*Turritellinella tricarinata*	(Brocchi, 1814)	12	0	44	52	51	62	63	45	11	3	19	27	14	18	75	42	42
139476	Mollusca	*Cylichna cylindracea*	(Pennant, 1777)	0	0	2	0	0	0	0	0	0	0	0	0	0	0	2	5	2
156376	Mollusca	*Retusa umbilicata*	(Montagu, 1803)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
140129	Mollusca	*Hyala vitrea*	(Montagu, 1803)	2	27	0	0	0	1	0	1	1	0	0	0	15	0	0	0	0
139272	Mollusca	*Mangelia costata*	(Pennant, 1777)	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
847930	Mollusca	*Sorgenfreispira brachystoma*	(R. A. Philippi, 1844)	0	0	0	0	0	2	1	0	0	0	0	3	0	0	1	2	1
876821	Mollusca	*Tritia reticulata*	(Linnaeus, 1758)	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
1762	Mollusca	*Nudibranchia*	Cuvier, 1817	0	0	1	0	2	0	0	1	0	0	0	0	0	0	0	0	0
491650	Mollusca	*Brachystomia eulimoides*	(Hanley, 1844)	1	0	1	0	0	1	3	2	0	0	0	0	0	0	0	1	2
141033	Mollusca	*Ondina divisa*	(J. Adams, 1797)	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
124373	Echinodermata	*Brissopsis lyrifera*	(Forbes, 1841)	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0
1474372	Echinodermata	*Paraleptopentacta elongata*	(Düben & Koren, 1846)	0	0	3	0	5	1	1	0	0	0	0	0	0	0	0	0	1
125073	Echinodermata	*Amphiura chiajei*	Forbes, 1843	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	1	1
125080	Echinodermata	*Amphiura filiformis*	(O.F. Müller, 1776)	0	2	0	0	0	0	1	0	0	0	0	0	0	0	1	7	0

Epifaunal, Juveniles & Other Species

2534 Rum2																				
AphiaID	Phylum	Taxa	Authority	Rum2_01	Rum2_02	Rum2_03	Rum2_04	Rum2_05	Rum2_06	Rum2_07	Rum2_08	Rum2_09	Rum2_10	Rum2_11	Rum2_12	Rum2_13	Rum2_14	Rum2_15	Rum2_16	Rum2_17
Epifaunal Species																				
1360	Cnidaria	*Actiniaria*	Hertwig, 1882	5	0	56	0	17	15	27	10	1	0	0	3	2	2	24	0	10
1594	Cnidaria	*Bougainvilliidae*	Lütken, 1850	1	0	1	1	1	1	0	1	1	0	1	1	1	1	1	1	1
13551	Cnidaria	*Anthoathecata*	Cornelius, 1992	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
117736	Cnidaria	*Lovenella clausa*	(Lovén, 1836)	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0
1789435	Bryozoa	*Electra pilosa*	(Linnaeus, 1761)	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
111653	Bryozoa	*Triticella flava*	Dalyell, 1848	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
111022	Bryozoa	*Amathia*	Lamouroux, 1812	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Damaged or Fragmented Species																				
923	Annelida	*Maldanidae*	Malmgren, 1866	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Other Species																				
152391	Nemertea	*Nemertea*		1	1	7	0	6	0	2	0	0	0	0	0	0	0	0	6	5
128545	Phoronida	*Phoronis*	Wright, 1856	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	2	0
104906	Chordata	*Branchiostoma lanceolatum*	(Pallas, 1774)	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
793	Platyhelminthes	*Platyhelminthes*	Minot, 1876	0	0	0	0	2	0	0	0	0	0	1	0	0	0	0	0	0
Juvenile Species																				
129296	Annelida	*Glycera*	Lamarck, 1818	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
129370	Annelida	*Nephtys*	Cuvier, 1817	0	0	0	1	0	0	2	0	0	0	0	0	0	0	3	2	0
943	Annelida	*Sigalionidae*	Kinberg, 1856	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
106738	Arthropoda	*Paguridae*	Latreille, 1802	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
106928	Arthropoda	*Polybius*	Leach, 1820	0	1	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0
138474	Mollusca	*Abra*	Lamarck, 1818	23	12	0	6	2	0	0	0	0	1	1	0	0	0	0	0	0
138636	Mollusca	*Dosinia*	Scopoli, 1777	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	5
243	Mollusca	*Veneridae*	Rafinesque, 1815	1	2	0	0	0	0	0	0	0	0	0	1	0	0	1	4	0
382318	Mollusca	*Thracioidea*	Stoliczka, 1870 (1839)	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
137656	Mollusca	*Aporrhais*	da Costa, 1778	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
123084	Echinodermata	*Ophiuroidea*	Gray, 1840	1	0	16	0	0	0	1	0	0	0	0	0	1	0	3	2	0

Appendix VIII – Spearman's Correlation

Spearman's Correlation Coefficient (Two-tailed)

Number of Data Points	17
p=0.05, 95% Significant	0.485
p=0.01, 99% Significant	0.615
p=0.001, 99.9% Significant	0.748

	Water Depth (m)	Mean (mm)	Sorting	Skewness	Kurtosis	% Fines	% Sands	% Gravel	Total Organic Carbon (% dwt)	Number of Species (S)	Number of Individuals (N)	Richness (Margalef)	Evenness (Pielou's)	Shannon Wiener Diversity H'(	Simpson's Diversity (1-Lambda')
Water Depth (m)		-0.784	-0.367	-0.367	-0.492	0.776	-0.754	-0.460	0.895	-0.017	-0.110	-0.027	0.387	0.041	0.204
Mean (mm)			0.390	0.397	0.456	-0.953	0.887	0.449	-0.637	0.133	0.208	0.132	-0.103	0.093	0.037
Sorting				-0.466	0.659	-0.262	0.093	0.917	-0.303	-0.115	-0.143	-0.086	-0.127	-0.145	-0.076
Skewness					-0.461	-0.583	0.723	-0.434	-0.358	-0.138	0.007	-0.150	-0.216	-0.132	-0.238
Kurtosis						-0.331	0.115	0.836	-0.406	0.169	0.143	0.184	0.012	0.115	0.145
% Fines							-0.956	-0.324	0.661	-0.066	-0.172	-0.049	0.194	-0.022	0.083
% Sands								0.119	-0.608	0.103	0.220	0.083	-0.206	0.064	-0.078
% Gravel									-0.408	-0.069	-0.107	-0.032	-0.180	-0.107	-0.059
Total Organic Carbon (% dwt)										0.177	0.097	0.149	0.555	0.223	0.401
Number of Species (S)											0.959	0.988	0.208	0.981	0.798
Number of Individuals (N)												0.937	0.155	0.928	0.727
Richness (Margalef)													0.218	0.980	0.824
Evenness (Pielou's)														0.294	0.694
Shannon Wiener Diversity															0.853
Simpson's Diversity (1-Lambda')															

Appendix IX – Examples of Conspicuous Fauna

Conspicuous Fauna		
 Harbour Crab (*Liocarcinus depurator*)	 Norway lobster (*Nephrops norvegicus*)	 Common Starfish (*Asterias rubens*)
 Sand Brittle Star (*Ophiura albida*)	 Fish (Actinopterygii)	 Phosphorescent Sea Pen (*Pennatula phosphorea*)
 Mud Runner Crab (*Goneplax rhomboides*)	 Auger Shell (*Turritellinella tricarinata*)	 Grey Gurnard (*Chelidonichthys lastoviza*)
 Hermit Crab *Pagurus* sp.	 Common Goby (*Pomatoschistus microps*)	 Plumose Anemone (*Metridium senile*)

Appendix X – 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 of 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.