the
INSTITUTE
of
ESTUARINE
and
COASTAL
STUDIES

UNIVERSITY OF Hull
Institute of Estuarine and Coastal Studies

Firth of Forth (Round 3) Offshore Wind Farm Development: Survey Report Benthic Services – Export Cable Route

Report to Seagreen Wind Energy Ltd.

Institute of Estuarine and Coastal Studies
University of Hull

12th July 2012

Author(s): T. M. Smith, M. J. Bailey, A. Leighton & S. Thomson

Report: ZBB776-ECR-F-2012

Institute of Estuarine & Coastal Studies (IECS)
The University of Hull
Cottingham Road
Hull
HU6 7RX
UK

Tel: +44 (0)1482 464120
Fax: +44 (0)1482 464130

E-mail: iecs@hull.ac.uk

Web site: http://www.hull.ac.uk/iecs

Seagreen Wind Energy Ltd.

Firth of Forth (Round 3) Offshore Wind Farm Development: Survey Report Benthic Services – Export Cable Route

12th July 2012

Reference Number: ZBB776-ECR-F-2012

This report has been prepared by the Institute of Estuarine and Coastal Studies, with all reasonable care, skill and attention to detail as set within the terms of the Contract with the client.

We disclaim any responsibility to the client and others in respect of any matters outside the scope of the above.

This is a confidential report to the client and we accept no responsibility of whatsoever nature to third parties to whom this report, or any part thereof, is made known. Any such parties rely on the report at their own risk.

TABLE OF CONTENTS

1. INTRODUCTION

SSE Renewables (SSER) and Fluor (UK) Ltd under the Limited company of Seagreen Wind Energy have been awarded the Firth of Forth Round 3 Zone for offshore wind development. Seagreen aim to deliver a generation capacity of 3.5GW across an area of 2,852km^2 with the development being undertaken in three phases.

The Institute of Estuarine & Coastal Studies (IECS) was commissioned by Seagreen Wind Energy Limited to undertake an offshore benthic survey. This survey work and associated sample analysis was designed to enable characterisation of the benthic and epibenthic ecology of the area, the physical characteristics of the sample sites and the chemical properties of the sediments sampled.

In order to provide adequate sampling coverage of the proposed development site, Seagreen Wind Energy Ltd, in conjunction with Royal Haskoning, identified 19 benthic sampling sites, 5 contaminant sampling sites, 3 epibenthic trawl sites and 13 video line sites within the export cable route (ECR) area. All survey work was completed during April and June 2011 and the subsequent sample analysis completed by September 2011.

This report documents the survey work completed along the export cable route and the sediment, infaunal and epifaunal results. Analysis of the data is outside the scope of this report.

2. METHODS

2.1 Benthic Infaunal Samples

2.1.1 SAMPLE COLLECTION

The benthic and epibenthic surveys along the proposed cable route were undertaken during two separate deployments, the first in April onboard MV Clupea and the second in June onboard SV Chartwell. A total of 19 benthic stations were identified by Seagreen in the ECR area. A mini Hamon grab was deployed to collect a single replicate sample for infaunal analysis (Plate 1), from which a PSA sample was also taken, as per the specification. A second grab was collected for contaminant analysis. A full survey log was maintained throughout the survey detailing time of sampling, position (DGPS derived), station, water depth, volume of sample, physical characteristics of the sample, digital image number (cross referencing (QA)), presence of *Sabellaria spinulosa* and any other relevant features.

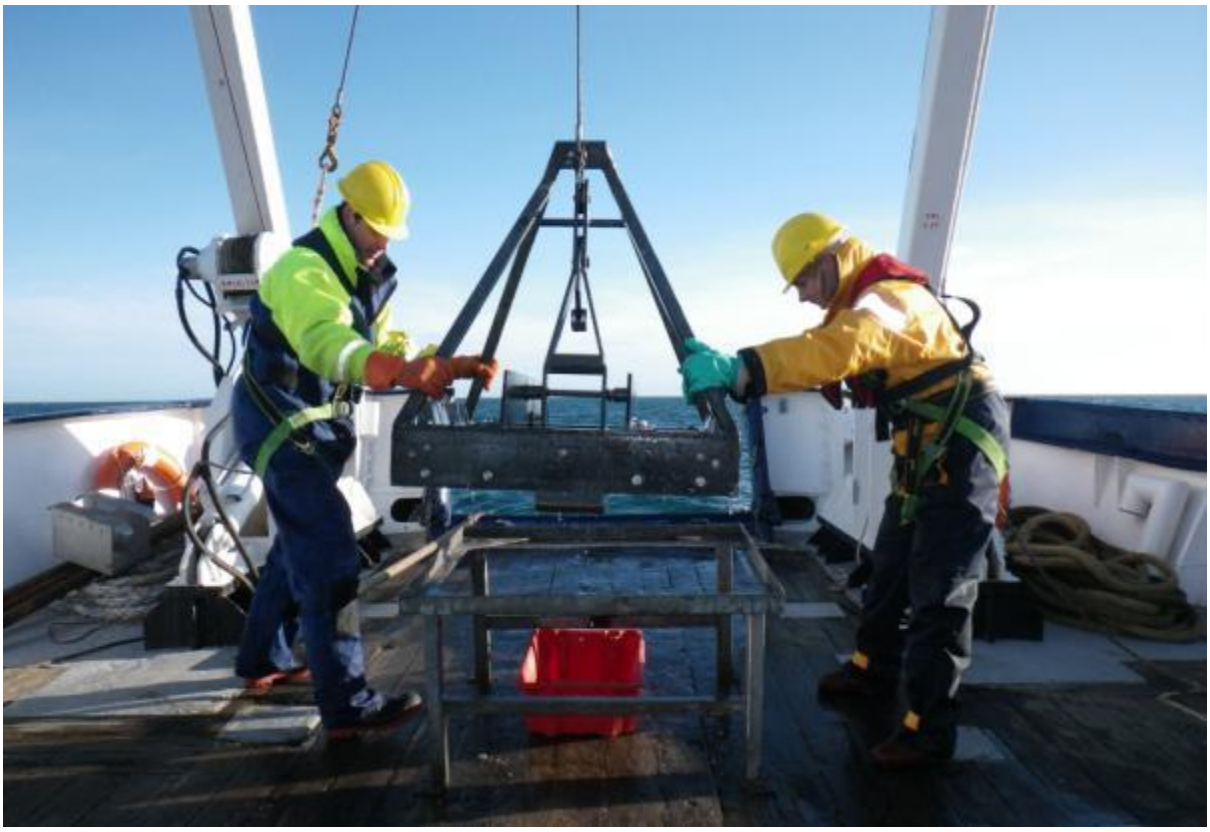


Plate 1. Retrieval of mini hamon grab on board MV Clupea

The infaunal samples were processed on a sequential basis utilising a nested sieving technique. Each acceptable sample was removed from the grab, photographed with an internal label, placed into a hopper and sieved onboard through a nest of 5mm and 1mm sieves. A nested sieve approach was used in order to separate large sediment types and reduce damage to invertebrates. The sieved residue was gently back-washed into a sealable container and borax buffered 4% formo-saline solution containing Rose Bengal vital stain was added as a fixative. Each sample was labelled clearly on the bucket and the internal label placed in the container, noting the client, survey, date and station number.

The PSA and organic carbon samples were stored in separate plastic bags, which were clearly labelled, and frozen onboard the vessel. The samples were kept frozen during transportation back to the IECS laboratory. The IECS methodology followed the protocol given by Rees *et al* (1990)[1] & (1993)[2], Davies *et al.* (2001)[3], Boyd (2002)[4] and Proudfoot *et al.* (2004)[5].

Valid Sample Criteria

Samples comprising hard substrata (e.g. broken shell, rocks or gravel) were rejected if a minimum sample volume of 5 litres was not achieved. When samples were within these limits, each sample was photographed (digital image) and subsequently processed. Five attempts were made at each site to collect a valid infaunal sample, however if a sample with a volume of <4 litres was retained the VideoRay was deployed at the site in order to obtain supporting video footage of the seabed.

2.1.2 POST SURVEY ANALYSIS

Benthic infaunal samples

General Requirements

All members of IECS undertaking the sample sorting and taxonomic analysis phases of the laboratory work were qualified marine biologists or ecologists. Those staff carrying out the taxonomic analysis have at least eight years marine biological experience with a wide range of experience in the field of benthic sample analysis and interpretation. The analyses were quality checked by the Senior Benthic Taxonomists who have had more than 10 years experience.

Sample Sorting

The procedure for sieving and sorting benthic core samples was as follows:

[1] Rees, H.L., Moore, D. C., Pearson, T. H., Elliot, M., Service, M., Pomfret, J. and Johnson, D. (1990). *Procedures for the monitoring of marine benthic communities at UK sewage sludge disposal sites*. Scottish Fisheries Information Pamphlet, No. 18: 78pp

[2] Rees, H.L. and Service, M.A. (1993). Development of improved strategies for monitoring the epibenthos at sewage sludge disposal sites. In: *Analysis and interpretation of benthic community data at sewage sludge disposal sites*. Aquatic Environmental Monitoring Report, MAFF Directorate of Fisheries Research, Lowestoft, No. 37: 55-61.

[3] Davies, J., Baxter, J., Bradley, M., Connor, D., Khan, J., Murray, E., Sanderson, W., Turnbull, C. & Vincent, M. (2001) *Marine Monitoring Handbook*, 405pp. JNCC Peterbrough, UK.

[4] Boyd, S.E. (2002). *Guidelines for the conduct of benthic studies at aggregate dredging sites*. Department for Transport, Local Government and the Regions (DTLR)/CEFAS: London, UK. 117 pp.

[5] Proudfoot, R.K, Elliott, M., Dyer, M.F., Barnett, B.E., Allen, J.H., Proctor, N.V., Cutts, N.D., Nikitik, C., Turner, G., Breen, J., Hemingway, K.L. and Mackie, T (1997). Proceedings of the Humber benthic field methods workshop, University of Hull.

Formalin was decanted from the sample through a 212µm sieve using appropriate exposure prevention controls as detailed in the Health & Safety documentation. Material retained on the sieve was washed back into the sample. The sample was then washed through 1mm mesh stainless steel sieve of 20cm diameter, to remove excess preservative as well as fine mud and sand particles. The residue from the 1mm sieve was then gently washed into a white tray. Water was added to the tray and the contents examined by eye using a 1.5x illuminated magnifier. Large specimens were removed and sorted into major phyla. The fauna derived were retained and stored by group in appropriately labelled containers, preserved using 70% IMS and passed on for taxonomic identification. Sieves and trays were washed thoroughly between samples to ensure there was no contamination of subsequent samples. During the sample processing phase a sample proforma was completed to include client, project, area, sample number, date, name of sorter and identifier, description of residue characteristics, notable features, sieve mesh size, whether or not sub-sampling was undertaken and whether any problems were encountered.

Taxonomic Identification

Identification was carried out using Olympus SZX7 and SZ40 zoom microscopes with 10X and 20X eyepieces, giving a maximum magnification of up to 80X. An additional 2X objective was used to increase the potential magnification to 160X. Olympus BX41 compound microscopes were used for further magnification, if necessary, up to 1000X.

Identification of infaunal samples was to the highest possible taxonomic separation (i.e. species). During identification, all individuals were initially separated into families, with part animals being assigned to families where possible. The macrofaunal animals were identified to species level using standard taxonomic keys, low and high power stereoscopic microscopes and dissection when necessary. Incomplete animals without anterior ends were not recorded as individuals to be included in the quantitative dataset. However they were identified where possible and recorded as being present. Similarly, motile and colonial sessile epibenthic taxa and meiofauna were recorded but not included in the main quantitative data set.

IECS follow strict AQC procedures. In addition, regular cross reference identification was carried out by IECS' Senior taxonomists throughout the identification process. As IECS is part of the NMBAQC Scheme, the identification of any difficult specimens can be undertaken following consultation and external verification from David Hall (Unicomarine). However, this service was not required during the processing stages.

The taxonomic literature used is essentially as given in and expanded from Rees *et al.* (1990)[6] and reporting nomenclature used Howson, C.M. & Picton, B.E., (1997)[7] and the World Register of Marine Species (WoRMS).

[6] Rees, H.L., Moore, D. C., Pearson, T. H., Elliot, M., Service, M., Pomfret, J. and Johnson, D. (1990). Procedures for the monitoring of marine benthic communities at UK sewage sludge disposal sites. *Scottish Fisheries Information Pamphlet,* No. 18: 78pp

[7] Howson CM and Picton BE (1997). *The species directory of the marine fauna and flora of the British Isles and surrounding seas*. Ulster museum and the Marine Conservation Society.

Particle Size Analysis (PSA) samples

The particle size analysis was carried out by a combination of dry sieving and laser particle size analysis (for the fraction <1mm) using a Malvern Mastersizer 2000. The sediment samples were then split with one sub-sample being passed through a 1mm sieve to remove the larger size classes of sediment. The <1mm fraction of the sample was then analysed using the Malvern Mastersizer 2000 and the >1mm fraction discarded. The second sub-sample was passed through a nest of sieves, including 1mm, 1.4mm, 2mm, 2.8mm, 5.6mm and 11.2mm. Each fraction, including the <1mm fraction, was then oven dried at 85°C for 24 hours and weighed. Data generated from these methods of analysis was merged and used to derive statistics such as mean grain size, bulk sediment classes (% silt, sand & gravel), skewness and sorting coefficient. These methods are consistent with the procedures identified at the NMBAQC PSA workshop on laboratory methods, which was held at the Cefas Lowestoft laboratory in July 2009.

Organic Carbon Samples

Organic carbon was expressed as loss on ignition (percentage), following combustion at 475°C for four hours. The sample was oven dried at 85°C until the weight stabilised (± 0.001g) and the weight recorded. The sample was then placed in a muffle furnace, at 475°C, for four hours. Once the sample had cooled, it was re-weighed and the difference between the two weights was expressed as a percentage of the total sediment.

Sediment contaminant samples

Contaminant samples were collected from the grab samples by scooping sediment directly into the containers. Nitrile gloves were worn to prevent sample contamination. Samples to test for organics were taken in glass containers as hydrocarbons can be lost through plastic. Samples to test for volatiles were collected in smaller containers so there was less headspace for them to be lost in. Samples for inorganics were taken using plastic containers. The containers used for each test were:

- EPH by FID — 250g glass jar
- GRO by GC-FID — 60g glass jar
- Metals by iCap-OES — Plastic container
- Organotins — Plastic container
- PAH by GCMS — 250g glass jar
- PCBs by GCMS — 250g glass jar

2.2 Epifaunal Trawls

2.2.1 SAMPLE COLLECTION

A VideoRay system was deployed at each of the epifaunal trawl stations before sampling took place to verify the absence of any significant amount of habitat of conservation interest (i.e. *Sabellaria* biogenic reef). Full details of the drop down video sampling programme is the subject of a separate report (ZBB776-ECRDDV-D-2011).

Following the deployment of the VideoRay a 2m beam trawl with a 5m long net and 40mm mesh liner inside and 5mm (knot to knot) square mesh cod-end liner was deployed along the same line. The trawl was lowered from the survey vessel to the seabed at the predetermined start point and towed for approximately 10-20 minutes over a path of approximately 500m while maintaining a speed of between 1-1.5 knots. The 2m Beam trawl comprised of two 60mm x 500mm x 500mm steel detachable shoes, with a 2120mm steel tube brace. A tickler chain was attached to the footrope to provide extra weight to ensure valid samples were obtained. The beam trawl was operated from the stern of the survey vessel using a towing line approximately three times the depth of the area. The trawl line was logged using DGPS at the start (lock of the winch) and end of the trawl (engagement of the winch). The 1m cod end with 5mm mesh was hauled aboard with the aid of a lifting rope to ensure the cod end could be lifted independently of the beam. A single tow was carried out at each identified trawl line.

The cod end was opened over a large fish box to contain the whole catch; the net was checked for any remaining epifauna and fish, before the cod end was re-fastened prior to redeployment at the next trawl site. The catch was roughly sorted on board with the fish species separated from the epifaunal invertebrates. A survey log was maintained at all times recording survey date, water depth at the start of the trawl line, time in and out of water, GPS position (using Magellan ProMark3 GPS) and speed of survey vessel during trawling along with weather and sea condition and digital images. IECS experience indicates that the quality of the catch greatly deteriorates under rough sea conditions. As such, IECS operated the beam trawl within a weather window consisting of wave heights less than 1.5m and wind speed of less than F3.

Photographs of all catches were taken after any large debris had been removed. Any large specimens were identified onboard the vessel, recorded, photographed and then returned to the water. The remaining catch was transferred to a clean labelled bucked and fixed using 4% formalin. The fixed epifaunal invertebrates and fish were transferred to the IECS laboratory where they were separated to species level where possible and enumerated with examples of each species retained for a reference collection. The taxonomic literature used is essentially as given in Wheeler (1969[8], 1978[9]) and Whitehead *et al.* (1984[10]). All fish were measured to the millimetre (rounding down) (total length or an appropriate measure in case of species with extreme body shape; i.e. skates and rays). If catches were large, any species present at low density were identified and removed before a subsample was taken for length distribution of the more abundant species. A subsample (ca. 30-50 fish) was measured to enable length frequency analysis. Any other observations from individual trawls (e.g. high amounts of shell, rocks, cobbles, weed and other debris, presence of ray egg cases, whelk eggs etc) were recorded on the survey log.

[8] Wheeler, A. 1969. *The fishes of the British Isles and North West Europe*. Michigan State University Press, 613pp.

[9] Wheeler, A. 1977. *Key to the Fishes of Northern Europe*. Frederick Warne, London. 380pp.

[10] Whitehead, P.J.P., Bauchot, M.L., Hureau, J.-C., Nielsen, J. And Tortonese, E. (Eds.) 1984. *Fishes of the North-eastern Atlantic and the Mediterranean*, Vol. 1-3. UNESCO.

3. RESULTS

3.1 Survey Summary and Area Map

The benthic and epibenthic surveys along the proposed cable route were undertaken during two separate deployments, the first in April onboard MV Clupea and the second in June onboard SV Chartwell. In total, 19 infaunal grab sites and 5 sediment contaminant sites were identified along the proposed cable route (Figures 1 & 2). All 5 contaminant samples were collected, however only 16 infaunal, Particle Size Analysis (PSA) and Organic Carbon (OC) samples were collected. All sites for the epibenthic and video trawls were successfully sampled.

Survey logs for both the infaunal and epifaunal sampling programmes are given in Appendices 1-3, 5 and 6 detailing time and position of samples, sediment type, notable features and infaunal sample volumes.

The weather conditions were recorded throughout the survey deployments (Table 1).

Table 1. Weather conditions recorded while on site along the proposed export cable route.

Date	Time	Swell (m)	Wind (Beaufort scale)	Comments
19/04/2011	06:25	1.5	2	
19/04/2011	13:05	1.5	0	
19/04/2011	23:43	1	4	
20/04/2011	06:00	0.5	0	Heavy fog, Visibility 100m maximum.
20/04/2011	16:43	1	1	Fog lifted.
20/04/2011	19:30	0.5	1	
21/04/2011	04:53	0.5	2	
21/04/2011	08:06	0.5	2	
27/06/2011	10.30	<0.5	2	
27/06/2011	18:00	0.5+	3	

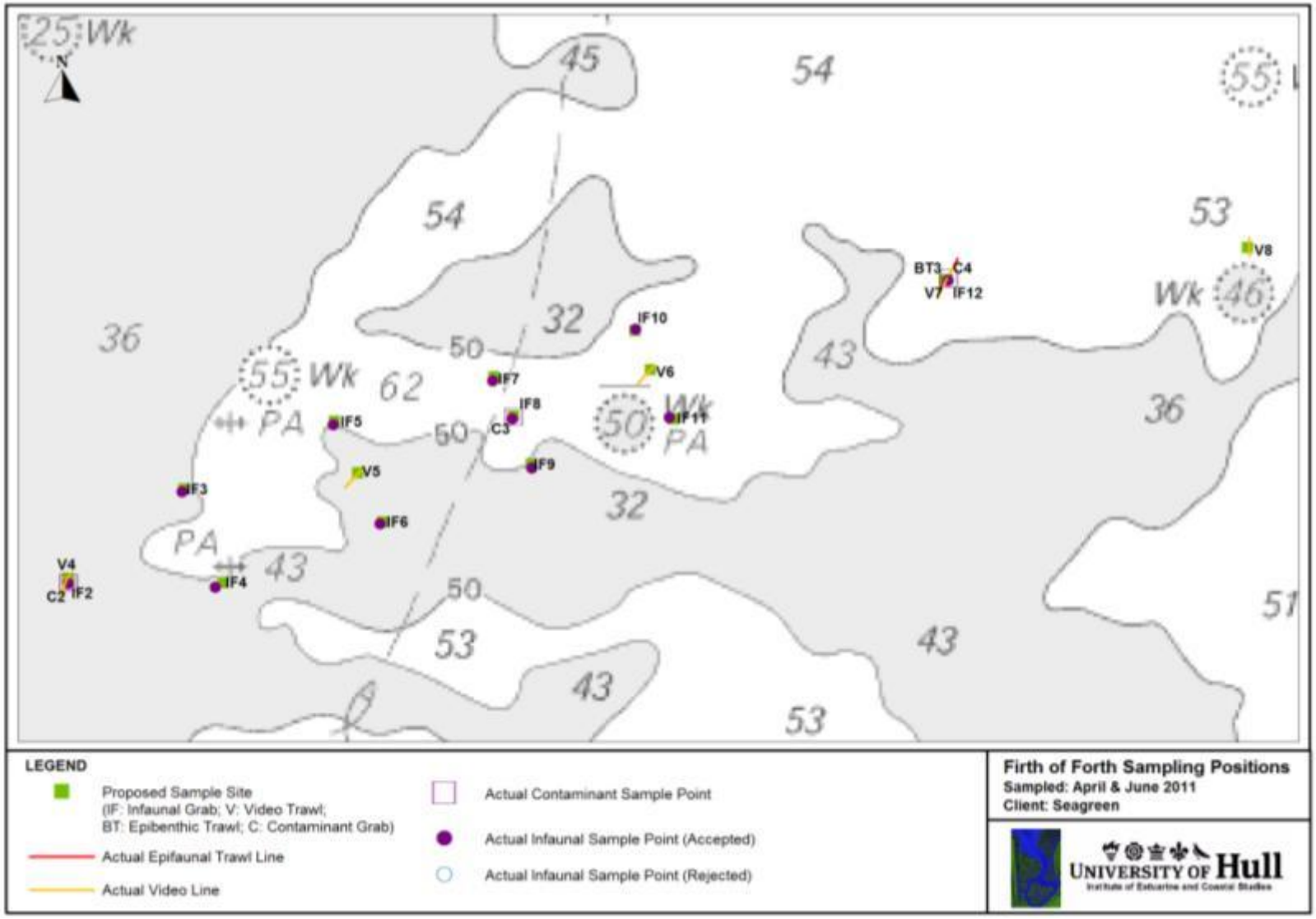


Figure 1 Proposed and completed sampling locations along the export cable route (east section)

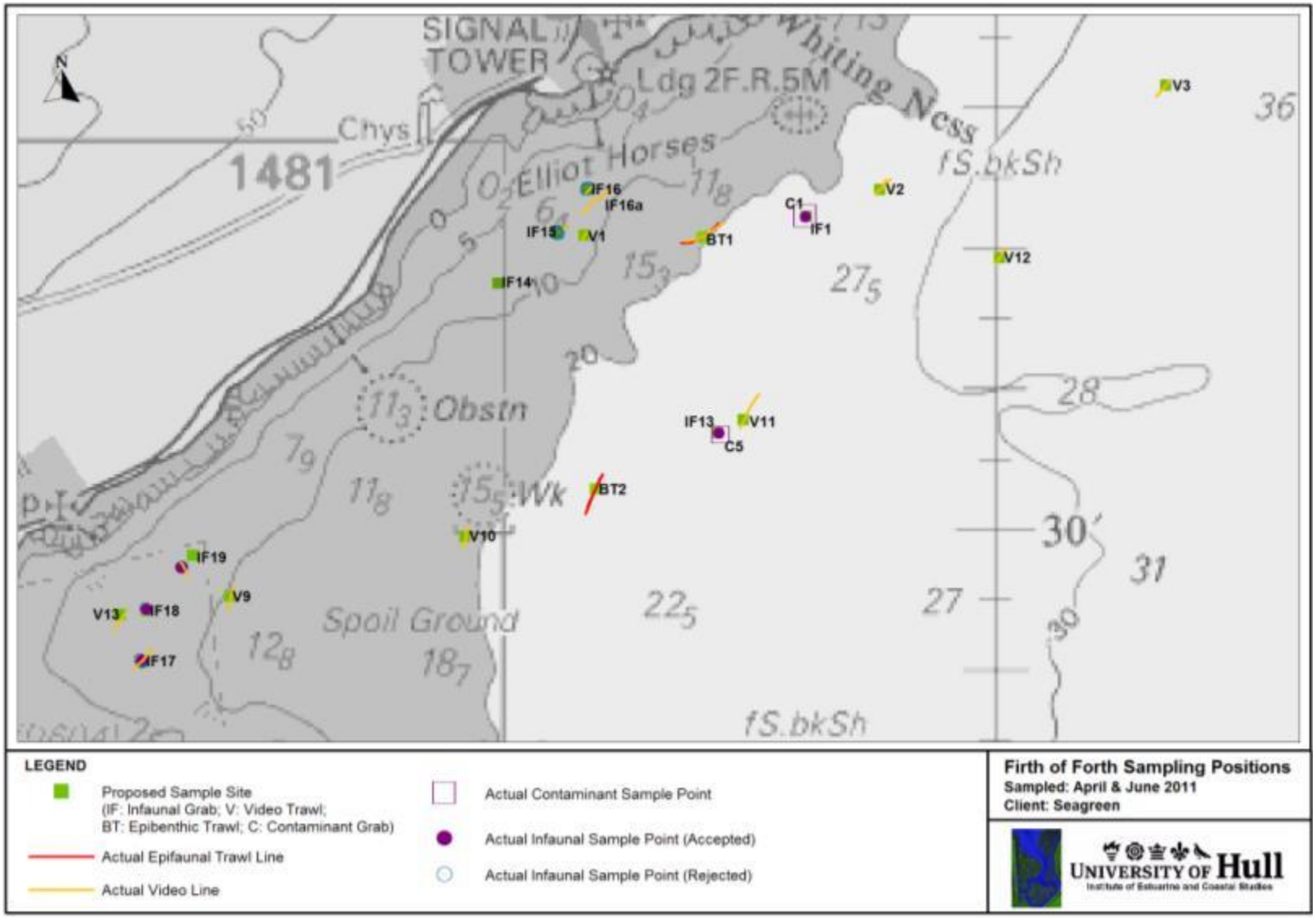


Figure 2 Proposed and completed sampling locations along the export cable route (west section)

3.2 Benthic Infaunal Data

3.2.1 INFAUNAL GRAB SAMPLING

Towards the inshore section of the proposed ERC numerous marker buoys for static fishing gear were observed (Plate 2a & 2b). Close communication was maintained during the survey between the IECS survey team, the Fisheries Liaison Officers (FLO) and Seagreen Ltd. No fishing gear was present within the boundary of the ERC, however sites IF14, IF16, IF17 and IF19 were located outside the ERC boundary and as such it was not possible to survey the proposed sampling locations at sites IF14 and IF19 due to the presence of fishing gear. Where possible, and following communication with Seagreen Ltd, the sites were repositioned closer to the cable route, and away from any fishing gear.

Plate 2a. Numerous marker buoys and flags located along the Arbroath coast

Plate 2b. Marker buoy and flag located near to the proposed export cable route

Plate 2. Static fishing gear encountered within the export cable route

Infaunal samples containing <5 litres of sediment were classed as being undersized. Where necessary 5 attempts were made at each site to collect an infaunal sample of adequate size, however undersized samples were retained at 5 sites (IF2, IF13, IF17, IF18 & IF19) (Appendix 2). Infaunal samples containing 4-5 litres were classed as acceptable, however at 3 sites (IF2, IF17 & IF19) the infaunal samples contained <4 litres. At these sites the VideoRay was deployed in order to gain additional information upon the nature of the seabed and support the information derived from the undersized grabs. Footage collected from Site IF19 confirm the presence of flat expanses of sand with some coarse shell punctuated by outcrops of bedrock and boulders with dense *Alcyonium spp, Asterias rubens* and Hydroids (Plate 3f). Footage from Site IF2 (Plate 3a) showed rippled sand while Site IF17 (Plate 3e) revealed sand and shell similar to that separating the rocky outcrops at the other infaunal grab stations.

No benthic samples were retained from Sites IF15 and IF16 despite 5 attempts to collect samples. The majority of the attempts at these sites did not retain any sediment, with the exception of two attempts at site IF15 where a single cobble was retained during the first attempt and a very small amount of gravel was retained during the fourth attempt (Appendix 2). Therefore, a VideoRay was deployed at sites IF15 & IF16 to confirm the sediment type.

At Site IF16 footage displayed two areas of boulders and cobbles with *Alcyonium spp,* Asteriidae and Hydroids separated by an area of flat sand with some coarse shell (Plate 3c).

Additional video footage was collected starting in the vicinity of site IF16 and travelling towards Site IF14 (Video line No. 16a), in order to provide a cross section of the sediment types across the proposed ECR. The trawl line was positioned to avoid static fishing gear in the area, however the camera became stuck on rocks and was hauled to the surface. Twelve minutes of video footage was recorded which displayed areas of bedrock, boulders and cobbles separated by flat sand with some coarse shell (Plate 3d).

At site IF15 only 3 minutes of video footage was recorded before the camera became caught on bedrock/boulders. The vessel came to an abrupt stop and efforts were made to retrieve the camera, as such the camera was not deployed in this area to gain more footage due to health and safety concerns. However, the footage collected displayed an expanse of bedrock and boulders (Plate 3b).

The difficulties encountered while trying to collect viable grab samples along inshore sections of the ECR, combined with video footage and an abundance of static fishing gear in the area, all suggests the area is dominated by sections of firm ground eg. bedrock and boulders.

A complete survey log was maintained throughout both deployments (Appendices 1-3) and photographs were taken of each sample (Appendix 7). The full infaunal species list for the export cable route is given in Appendix 4.

Plate 3a: Still image recorded from site IF2

Plate 3b: Still image recorded from site IF15

Plate 3c: Still image recorded from site IF16

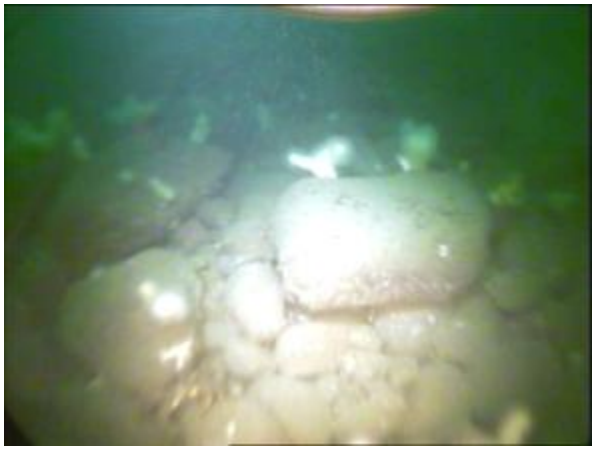


Plate 3d: Still image recorded from site IF16a

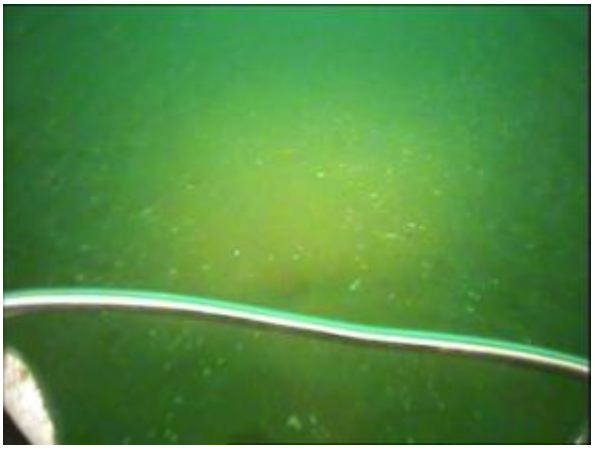


Plate 3e. Still image recorded from site IF17

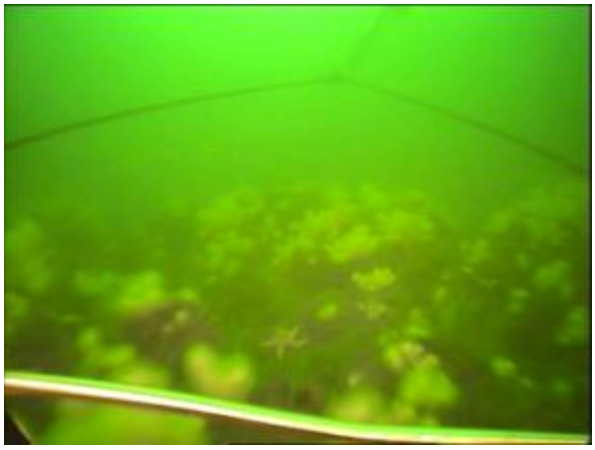


Plate 3f. Still image recorded from site IF19

Plate 3. Sediment images captured at infaunal sample sites including possible cobble and bedrock reef habitats.

3.2.2 Species and Habitats of Conservation Interest

No areas containing *Sabellaria* reef were identified along the export cable route.

Stony reef habitat was identified at V1 and IF15. Footage from IF15 revealed extensive bedrock and boulders (Plate 3b) before the camera became caught under a large rock. Due to health and safety concerns no further footage was collected from this station and the camera was only dropped down at V1 to confirm the presence of bedrock before being retrieved. V1 was the only video trawl site to contain significant amounts of bedrock.

Further possible stony reef was identified at IF16, IF16a and IF19 (Plate 3c,d and f). These stations contained stretches of sand and shell with patchy, but sometimes extensive, areas of matrix supported cobbles, boulders and bedrock.

3.2.3 Proposed and Actual Co-ordinates

Proposed and actual survey coordinates were recorded for each site and the distance between them noted (Appendix 3). All samples were taken within 50m of the proposed sampling position with the exception of three infaunal grab sites (IF4, IF9 & IF19). Site IF4 was positioned in close proximity to a wreck, and Site IF19 was surrounded by static fishing gear, therefore both sites were relocated (115m and 217m respectively). Site IF9 was 51m from the proposed sample location therefore the sample was accepted.

3.3 Particle Size Analysis and Organic Content Data

Summarised statistics for Particle Size Analysis (PSA) and organic content (OC) are given in Table 2.

Table 2. Export cable route PSA summary and organic carbon

Site	Textural Group	Composition (%)			% OC	Descriptive Statistics (Folk and Ward Method) (µm)				Descriptive Statistics (Folk and Ward Method) (ø)			
		Gravel	Sand	Mud		Mean	Sorting	Skewness	Kurtosis	Mean	Sorting	Skewness	Kurtosis
IF1	Slightly Gravelly Muddy Sand	13.8	89.5	10.3	1.05	275.2	2.307	-0.377	1.686	1.862	1.206	0.377	1.686
IF2	Slightly Gravelly Muddy Sand	5.1	69.3	30.6	1.69	70.39	2.666	-0.437	1.565	3.828	1.415	0.437	1.565
IF3	Slightly Gravelly Muddy Sand	0.6	68.5	30.8	1.93	72.26	2.942	-0.357	1.509	3.791	1.557	0.357	1.509
IF4	Slightly Gravelly Muddy Sand	2.9	68.3	28.8	1.72	102.0	4.395	-0.245	1.146	3.293	2.136	0.245	1.146
IF5	Slightly Gravelly Muddy Sand	1.7	62.6	35.8	2.21	62.22	3.871	-0.344	1.245	4.006	1.953	0.344	1.245
IF6	Gravelly Muddy Sand	10.2	77.8	12.0	1.31	364.5	4.232	-0.183	1.768	1.456	2.081	0.183	1.768
IF7	Slightly Gravelly Muddy Sand	0.2	67.6	32.2	1.97	66.18	3.296	-0.460	1.263	3.917	1.721	0.460	1.263
IF8	Slightly Gravelly Muddy Sand	1.5	70.2	28.2	1.91	78.87	3.583	-0.436	1.263	3.664	1.841	0.436	1.263
IF9	Slightly Gravelly Sand	0.6	93.7	5.7	1.13	322.6	1.872	-0.262	1.889	1.632	0.904	0.262	1.889
IF10	Slightly Gravelly Muddy Sand	2.6	77.0	20.4	1.39	136.1	3.841	-0.475	1.511	2.877	1.942	0.475	1.511
IF11	Slightly Gravelly Muddy Sand	1.2	73.3	25.5	1.83	83.79	3.815	-0.525	1.323	3.577	1.932	0.525	1.323
IF12	Slightly Gravelly Sand	1.2	89.7	9.1	1.20	239.0	2.194	-0.341	2.348	2.065	1.133	0.341	2.348
IF13	Slightly Gravelly Sand	0.2	94.1	5.7	1.13	152.6	1.693	-0.096	1.029	2.712	0.760	0.096	1.029
IF17	Slightly Gravelly Sand	1.0	93.6	5.4	0.68	198.4	1.807	-0.227	1.808	2.334	0.854	0.227	1.808
IF18	Slightly Gravelly Sand	1.2	91.7	7.0	0.74	193.6	1.941	-0.261	2.001	2.369	0.957	0.261	2.001
IF19	Slightly Gravelly Sand	0.1	91.3	8.6	0.90	152.5	1.832	-0.172	1.141	2.713	0.873	0.172	1.141

3.4 Sediment Contaminant Data

Sediment contaminant results are given in Appendix 10.

3.5 Epibenthic Trawl Data

An enumerated species list for the epibenthic trawl stations is presented in Table 3. The high total abundance recorded at BT1 was due to large numbers of the common starfish *Asterias rubens.*

Photographs of the epibenthic trawl samples are presented in Appendix 8 and fish length measurements from the epibenthic trawls are given in Appendix 9.

Table 3. Species list for the export cable route epibenthic trawl stations.

MCS Code		Taxon	Taxon Qualifier	BT1	BT2	BT3
Y	185	Flustridae		P		P
D	597	*Alcyonium*	Species	P		P
D	662	ACTINARIA		4		1
P	1324	Serpulidae		P		
S	1377	*Pandalus montagui*		25	10	4
S	1384	*Crangon allmanni*			5	161
S	1386	*Crangon bispinosus neglecta*				3
S	1457	*Pagurus bernhardus*		1		2
S	1462	*Pagurus prideaux*				2
S	1471	*Galathea dispersa*		1		6
S	1474	*Galathea nexa*				2
S	1532	*Macropodia rostrata*		8		
S	1566	*Cancer pagurus*		1		
S	1580	*Liocarcinus depurator*		12	1	7
S	1581	*Liocarcinus holsatus*		19		5
S	1589	*Necora puber*		2		
W	1771	*Pecten maximus*				1
W	2166	*Hiatella arctica*		1		
W	2329	*Sepiola atlantica*			1	1
ZB	26	*Astropecten irregularis*				6
ZB	83	*Henricia oculata*		1		
ZB	100	*Asterias rubens*		1358	88	77
ZB	124	*Ophiothrix fragilis*		19		2
ZB	147	*Ophiopholis aculeata*				1
ZB	170	*Ophiura ophiura*		8	464	
ZB	172	*Ophiura sarsi*				1
ZB	198	*Echinus esculentus*		1		
ZD		ASCIDIACEA		P		P
ZG	116	*Gadus morhua*		3		
ZG	123	*Merlangius merlangus*				1
ZG	265	*Eutrigla gurnardus*		1		
ZG	281	*Myxocephalus scorpius*		3		
ZG	291	*Agonus cataphractus*			4	5
ZG	442	*Ammodytes*	Species			1
ZG	453	*Callionymus maculatus*				3
ZG	477/480	*Pomatoschistus lozanoi / norvegicus*			3	4
ZG	567	*Hippoglossoides platessoides*			1	4
ZG	572	*Limanda limanda*		28	41	7
ZG	578	*Pleuronectes platessa*		12	18	3
Total Abundance				**1508**	**636**	**310**
No. Quantitative Taxa				**20**	**11**	**25**
No. Colonial Taxa				**4**	**0**	**3**
Total Taxa				**24**	**11**	**28**

APPENDIX 1. BENTHIC SURVEY LOG INCLUDING SEDIMENT DESCRIPTION & NOTABLE FEATURES

ID	Sample type	Sample description	Sand eels present	*Sabellaria* present	Comments
IF1	Infaunal	Fine sand with a fine shell and a little course shell.	No	No	
C1	Contaminant	Fine sand with a fine shell and a little course shell.	No	No	
IF2	Infaunal	Very fine mud and sand, washing out of grab.	No	No	
C2	Contaminant	Mud and fine sand.	No	No	
IF3	Infaunal	Mud and fine sand with a little coarse shell.	No	No	
IF4	Infaunal	Mud and fine sand.	No	No	Repositioned due to presence of a wreck
IF5	Infaunal	Mud and fine sand with a little coarse shell.	No	No	
IF6	Infaunal	Medium and coarse sand with some coarse shell and a little mud.	No	No	
IF7	Infaunal	Mud and Fine sand with a little coarse shell.	No	No	
IF8	Infaunal	Mud and fine sand.	No	No	
C3	Contaminant	Mud and fine sand.	No	No	
IF9	Infaunal	Fine sand and shell with a little coarse cand and shell.	No	No	
IF10	Infaunal	Mud, fine sand and shell with a little coarse shell.	No	No	
IF11	Infaunal	Mud and Fine sand with a little coarse shell.	No	No	
IF12	Infaunal	Fine sand and shell with some coarse shell.	No	No	
C4	Contaminant	Fine sand and shell with some coarse shell.	No	No	
IF13	Infaunal	Fine sand, fine shell and a little coarse shell.	No	No	
C5	Contaminant	Fine sand, fine shell and a little coarse shell.	No	No	
IF14	Infaunal	No infaunal sample	No	No	
IF15	Infaunal	No infaunal sample	No	No	
IF16	Infaunal	No infaunal sample	No	No	
IF17	Infaunal	Fine sand with fine and course shell.	No	No	
IF18	Infaunal	Fine sand with fine and course shell.	No	No	
IF19	Infaunal	Fine sand with fine and course shell.	No	No	Repositioned due to presence of static fishing gear

APPENDIX 2. BENTHIC SURVEY LOG INCLUDING SAMPLE VOLUME

ID	Sample Type	Date	Time	Sea bed depth (m)	No. of rejected samples	Volume of Grab (Litres)	PSA sample collected	Undersized infaunal sample accepted	Supporting video footage collected
IF1	Infaunal	27/06/2011	09:44	27	0	5	Yes	No	No
C1	Contaminant	27/06/2011	09:50	27	0	4.5	No	n/a	No
IF2	Infaunal	19/04/2011	15:50	47	4	3.5	Yes	Yes	No
C2	Contaminant	19/04/2011	16:26	47	4	2.3	No	n/a	No
IF3	Infaunal	19/04/2011	15:23	54	0	6.75	Yes	No	No
IF4	Infaunal	19/04/2011	10:10	48	1	9.5	Yes	No	No
IF5	Infaunal	19/04/2011	14:49	64	0	13.25	Yes	No	No
IF6	Infaunal	19/04/2011	14:23	49	1	6	Yes	No	No
IF7	Infaunal	19/04/2011	13:46	63	0	11.6	Yes	No	No
IF8	Infaunal	19/04/2011	13:03	64	0	9.6	Yes	No	No
C3	Contaminant	19/04/2011	13:10	64	0	9.6	No	No	No
IF9	Infaunal	19/04/2011	11:52	50	1	5.25	Yes	No	No
IF10	Infaunal	19/04/2011	10:43	63	3	5.25	Yes	No	No
IF11	Infaunal	19/04/2011	11:19	68	1	8	Yes	No	No
IF12	Infaunal	19/04/2011	09:35	55	1	7.2	Yes	No	No
C4	Contaminant	19/04/2011	09:28	55	0	7.2	No	No	No
IF13	Infaunal	19/04/2011	18:42	25	4	4.25	Yes	Yes	No
C5	Contaminant	19/04/2011	19:46	25	4	2.25	No	No	No
IF14	Infaunal	27/06/2011	No infaunal sample collected						
IF15	Infaunal	27/06/2011	No infaunal sample collected						
IF16	Infaunal	27/06/2011	No infaunal sample collected						
IF17	Infaunal	27/06/2011	12:18	11	4	2.8	Yes	Yes	
IF18	Infaunal	27/06/2011	12:01	10.8	4	4.1	Yes	Yes	
IF19	Infaunal	27/06/2011	13:06	10.8	4	3.1	Yes	Yes	

APPENDIX 3. BENTHIC SAMPLE COORDINATES (PROPOSED AND ACTUAL)

ID	Sample type	Proposed grab coordinates (WGS 84)		Actual grab coordinates (WGS 84)		Distance between actual & proposed coordinates
		Lat (N)	Long(W)	Lat(N)	Long(W)	
IF1	Infaunal	56.537248	-2.540594	56.537180	-2.540723	11
C1	Contaminant	56.537248	-2.540594	56.537280	-2.540775	12
IF2	Infaunal	56.564721	-2.401945	56.564429	-2.402164	35
C2	Contaminant	56.564722	-2.401936	56.564542	-2.402093	22
IF3	Infaunal	56.575476	-2.377822	56.575099	-2.378126	46
IF4	Infaunal	56.564573	-2.369506	56.564053	-2.371121	Repositioned 115m from site due to presence of a wreck
IF5	Infaunal	56.583299	-2.346020	56.575099	-2.378126	49
IF6	Infaunal	56.571598	-2.336014	56.571381	-2.336477	38
IF7	Infaunal	56.588453	-2.312492	56.588020	-2.312755	51
IF8	Infaunal	56.583901	-2.308316	56.583577	-2.308624	41
C3	Contaminant	56.583901	-2.308316	56.583880	-2.308425	7
IF9	Infaunal	56.578343	-2.304682	56.577899	-2.304457	51
IF10	Infaunal	56.593855	-2.282823	56.593976	-2.282678	16
IF11	Infaunal	56.583610	-2.274776	56.583698	-2.275504	46
IF12	Infaunal	56.599790	-2.217015	56.599665	-2.216896	16
C4	Contaminant	56.599790	-2.217015	56.599889	-2.216729	21
IF13	Infaunal	56.511547	-2.559524	56.511488	-2.559247	19
C5	Contaminant	56.511517	-2.559633	56.511350	-2.558972	41
IF14	Infaunal	56.529335	-2.606597	No infaunal sample collected		n/a
IF15	Infaunal	56.535280	-2.593833	No infaunal sample collected		n/a
IF16	Infaunal	56.540419	-2.587337	No infaunal sample collected		n/a
IF17	Infaunal	56.484362	-2.683135	56.484518	-2.683172	17
IF18	Infaunal	56.490431	-2.682036	56.490590	-2.682092	17
IF19	Infaunal	56.496999	-2.672193	56.495548	-2.674572	Repositioned 217m from site due to static fishing gear

APPENDIX 4. BENTHIC INFAUNAL SPECIES LIST

MCS code		Taxon	Taxon qualifier	IF1	IF2	IF3	IF4	IF5	IF6	IF7	IF8	IF9	IF10	IF11	IF12	IF13	IF17	IF18	IF19
D	155	*Corymorpha nutans*		5															
D	240	*Leuckartiara octona*														P			
D	287	*Merona cornucopiae*													P				
D	336	*Lovenella clausa*													P	P		P	P
D	413	*Diphasia*																P	
D	424	*Hydrallmania falcata*							P										
D	433	*Sertularia*	spp.												P				
D	519	*Obelia dichotoma*							P										
D	521	*Obelia longissima*							P										
D	597	*Alcyonium digitatum*							P										
D	759	*Edwarsiidae*				1			1				1		2				
F	2	TURBELLARIA								1	1			2	1				
G	1	NEMERTEA		2	4	1	2	1	6	1	4	2	1	4	2		1		1
N	28	*Thysanocardia procera*									2								
P	19	*Aphrodita aculeata*					1												
P	44	*Enipo kinbergi*					1												
P	49	*Gattyana cirrosa*																1	
P	50	*Harmothoe*							1									1	
P	-	*Malmgrenia darbouxi*				1	2		1		1			2					
P	-	*Pholoe baltica*					2		1				1		1				
P	92	*Pholoe inornata*							1										
P	104	*Sigalion mathildae*														4		5	2
P	109	*Sthenelais limicola*			1			1	1		1	2		1		1			
P	141	*Anaitides groenlandica*															1		
P	143	*Anaitides longipes*					1												
P	117/118	*Eteone flava/ longa*															1	1	3
P	164	*Eumida bahusiensis*				1													
P	167	*Eumida sanguinea*							3										
P	176	*Paranaitis kosteriensis*						1											
P	256	*Glycera alba*		1					1						1				
P	260	*Glycera lapidum*										2							
P	263/ -	*Glycera rouxii/unicornis*						1			1								
P	268	*Glycinde nordmanni*					1		3										
P	271	*Goniada maculata*				2	1		1				1	2	1		1	2	
P	291	*Sphaerodorum gracilis*			1														

MCS code		Taxon	Taxon qualifier	IF1	IF2	IF3	IF4	IF5	IF6	IF7	IF8	IF9	IF10	IF11	IF12	IF13	IF17	IF18	IF19
P	313	*Ophiodromus flexuosus*					1								1				
P	319	*Podarkeopsis capensis*							1		1					1			
P	380	*Eusyllis blomstrandi*							1										
P	434	*Autolytus*	sp.						1										
P	475	*Nereis longissima*					1												
P	494	*Nephtys*	juvenile						4				1					1	
P	495	*Nephtys assimilis*													1				
P	498	*Nephtys cirrosa*													4		1		
P	499	*Nephtys hombergii*			2	1	2	2		1	2				1	1			1
P	502	*Nephtys kersivalensis*					1			2	1		1				1	1	
P	-	*Lumbrineris cingulata*	Prev. *L. gracilis*						20	1	1				8				
P	597	*Notocirrus scoticus*							1										
P	665	*Orbinia (Orbinia) sertulata*												1					
P	672	*Scoloplos armiger*		6		1	1						3	2					1
P	685	*Aricidea (Acmira) cerrutii*										1			1				
P	693	*Levinsenia gracilis*					1				1								
P	699	*Paradoneis lyra*					1								1				
P	718	*Poecilochaetus serpens*						1	2		1	1			1				
P	733	*Laonice bahusiensis*							2										
P	747	*Minuspio cirrifera*						2											
P	754	*Dipolydora flava*												1					
P	779	*Scolelepis bonnieri*		1													1	2	
P	789	*Spio decorata*		*3*													4	6	4
P	794	*Spiophanes bombyx*		*10*		1		1		1	2			4	6	1	18	25	17
P	796	*Spiophanes kroyeri*				1		4	1					1					
P	804	*Magelona alleni*				1	1		2		3			1					
P	805	*Magelona filiformis*												1		1	2	5	1
P	-	*Magelona johnstoni*														2	14	24	30
P	-	*Aphelochaeta*	sp. A							1			1						
P	-	*Cirratulus caudatus*								1									
P	-	*Chaetozone christiei*		2											2	1	8	3	2
P	831	*Chaetozone zetlandica*							1					1					
P	834	*Chaetozone setosa*				2		1	1					3					
P	846	*Tharyx killariensis*					1		2			2							
P	878	*Diplocirrus glaucus*			2	6	1	1	5		2		1	8	1				
P	919	*Mediomastus fragilis*										1							
P	920	*Notomastus*				1		1	2	1		3		1	1			1	
P	925	*Peresiella clymenoides*				1	3	3	1				1	3					
P	927	*Pseudonotomastus southerni*					1						1	2					

MCS code		Taxon	Taxon qualifier	IF1	IF2	IF3	IF4	IF5	IF6	IF7	IF8	IF9	IF10	IF11	IF12	IF13	IF17	IF18	IF19
P	313	*Ophiodromus flexuosus*					1								1				
P	319	*Podarkeopsis capensis*							1		1					1			
P	380	*Eusyllis blomstrandi*							1										
P	434	*Autolytus*	sp.						1										
P	475	*Nereis longissima*					1												
P	494	*Nephtys*	juvenile						4				1					1	
P	495	*Nephtys assimilis*													1				
P	498	*Nephtys cirrosa*													4		1		
P	499	*Nephtys hombergii*			2	1	2	2		1	2				1	1			1
P	502	*Nephtys kersivalensis*					1			2	1		1				1	1	
P	-	*Lumbrineris cingulata*	Prev. *L. gracilis*						20	1	1				8				
P	597	*Notocirrus scoticus*							1										
P	665	*Orbinia (Orbinia) sertulata*												1					
P	672	*Scoloplos armiger*		6		1	1						3	2					1
P	685	*Aricidea (Acmira) cerrutii*										1			1				
P	693	*Levinsenia gracilis*					1				1								
P	699	*Paradoneis lyra*					1								1				
P	718	*Poecilochaetus serpens*						1	2		1	1			1				
P	733	*Laonice bahusiensis*							2										
P	747	*Minuspio cirrifera*						2											
P	754	*Dipolydora flava*												1					
P	779	*Scolelepis bonnieri*		1													1	2	
P	789	*Spio decorata*		*3*													4	6	4
P	794	*Spiophanes bombyx*		*10*		1		1		1	2			4	6	1	18	25	17
P	796	*Spiophanes kroyeri*				1		4	1					1					
P	804	*Magelona alleni*				1	1		2		3			1					
P	805	*Magelona filiformis*												1		1	2	5	1
P	-	*Magelona johnstoni*														2	14	24	30
P	-	*Aphelochaeta*	sp. A							1			1						
P	-	*Cirratulus caudatus*								1									
P	-	*Chaetozone christiei*		2											2	1	8	3	2
P	831	*Chaetozone zetlandica*							1					1					
P	834	*Chaetozone setosa*				2		1	1					3					
P	846	*Tharyx killariensis*					1		2			2							
P	878	*Diplocirrus glaucus*			2	6	1	1	5		2		1	8	1				
P	919	*Mediomastus fragilis*										1							
P	920	*Notomastus*				1		1	2	1		3		1	1			1	
P	925	*Peresiella clymenoides*				1	3	3	1				1	3					
P	927	*Pseudonotomastus southerni*					1						1	2					

MCS code		Taxon	Taxon qualifier	IF1	IF2	IF3	IF4	IF5	IF6	IF7	IF8	IF9	IF10	IF11	IF12	IF13	IF17	IF18	IF19
P	944	*Praxillura longissima*													1				
P	953	*Clymenella cincta*					1												
P	958	*Clymenura johnstoni*							1			6			2				
P	963	*Euclymene lumbricoides*							2										
P	964	*Euclymene oerstedii*				1			1				1						
P	990	*Rhodine gracilior*					2		1				1	1					
P	999	*Ophelia borealis*										12	2		16				
P	1014	*Ophelina acuminata*							1										
P	1027	*Scalibregma inflatum*		1															
P	1093	*Galathowenia oculata*				3	1		1		3	2	1		1				
P	1098	*Owenia fusiformis*		28	3	1	1							2	3			1	
P	1102	*Amphictene auricoma*				2	2							2					
P	1107	*Lagis koreni*		4	1		2					1					1	10	1
P	1147	*Anobothrus gracilis*				1			5		1	3		3					
P	1178	*Trichobranchus roseus*					2	2		3	3			4					
P	1195	*Lanice conchilega*		5					1								1	3	1
P	1215	*Phisidia aurea*							2										
P	1233	*Lysilla loveni*					1												
P	1235	*Polycirrus*	juv./indet.					1			1			1					
P	1239	*Polycirrus denticulatus*							1						1				
P	1241	*Polycirrus latidens/medusa*										1							
P	1264	*Chone*										1							
P	1334	*Hydroides norvegica*							1										
P	1425	Tubificidae					1												
P	1524	*Grania*	sp.									1							
Q	44	*Anoplodactylus petiolatus*													1				
R	2426	*Cylindroleberis mariae*							1										
S	44	*Gastrosaccus spinifer*															1	1	1
S	131	*Perioculodes longimanus*		1													1		
S	138	*Synchelidium maculatum*															1		
S	140	*Westwoodilla caecula*				1	1		1										
S	248	*Urothoe elegans*		5					2										
S	254	*Harpinia antennaria*			4	1	3			1	2		1	7		3			
S	257	*Harpinia pectinata*				2				1									
S	301	*Lepidepecreum longicorne*							1			1							
S	328	*Scopelocheirus hopei*							1										
S	360	*Argissa hamatipes*		1							1								
S	427	*Ampelisca brevicornis*			2					1					2				1
S	440	*Ampelisca tenuicornis*			1	3	4	2	1		2			1					

MCS code		Taxon	Taxon qualifier	IF1	IF2	IF3	IF4	IF5	IF6	IF7	IF8	IF9	IF10	IF11	IF12	IF13	IF17	IF18	IF19
S	452	*Bathyporeia elegans*		1		1							1		1	1	1	2	2
S	459	*Bathyporeia tenuipes*														1			
S	489	*Megaluropus agilis*															1		
S	505	*Cheirocratus intermedius*						1											
S	539	*Gammaropsis cornuta*							1										
S	541	*Gammaropsis maculata*							1										
S	583	*Autonoe longipes*										1							
S	619	*Siphonoecetes striatus*											1			1			
S	657	*Phtisica marina*							1										
S	949	*Arcturella*	sp. indet.				2												
S	1142	*Tanaopsis graciloides*												1					
S	1208	*Eudorella truncatula*								2									
S	1210	*Eudorellopsis deformis*														1			
S	1248	*Diastylis bradyi*															2	1	
S	-	*Diastylis goodsiri*												1					
S	1415	*Callianassa subterranea*					1						1	1					
S	1449	*Anapagurus laevis*						1											
S	1457	*Pagurus bernhardus*							1										
S	1552	*Corystes cassivelaunus*																1	
S	1580	*Liocarcinus depurator*							1										
W	8	*Chaetoderma nitidulum*			1	2	4			1	3			2		1			
W	270	*Turritella communis*			3	2	2	1			2								
W	985	*Turbonilla (Pyrgiscus) crenata*											3		1				
W	1028	*Cylichna cylindracea*			1						2								
W	1519	*Antalis entalis*			1										1	1			
W	1569	*Nucula (Nucula) nitidosa*		1	1											12	9	4	5
W	1577	*Nuculoma tenuis*													1				
W	1715	*Crenella decussata*										1							
W	1827	*Myrtea spinifera*						1											
W	1829	*Lucinoma borealis*					1	4			2		2	4		1			
W	1837	*Thyasira (Thyasira) flexuosa*		1	6	16	20	16	4	11	24			10		2			
W	1898	*Devonia perrieri*					1												
W	1902	*Tellimya ferruginosa*				1								1		2	5		
W	1906	*Mysella bidentata*		4		2	9						2	19		1			
W	1972	*Mactra stultorum*		1															1
W	1978	*Spisula subtruncata*			3								1			2			
W	1984	*Lutraria lutraria*	juvenile																1
W	2006	*Phaxas pellucidus*		6			4	1			2			1			6	2	1
W	2019	*Fabulina fabula*		3												1	29	49	32

MCS code		Taxon	Taxon qualifier	IF1	IF2	IF3	IF4	IF5	IF6	IF7	IF8	IF9	IF10	IF11	IF12	IF13	IF17	IF18	IF19
W	2023	*Moerella pygmaea*										1							
W	2051	*Gari (Psammobia) fervensis*			1							2	1		1				
W	2059	*Abra alba*		6													1	2	2
W	2061	*Abra nitida*			2	1	3	7		2	3								
W	2062	*Abra prismatica*		4			1					12	6		11	1			2
W	2072	*Arctica islandica*		1	1	1					3	1							1
W	2098	*Chamelia striatula*		2	27	25	6				6	10		1		8	5	6	10
W	2104	*Timoclea ovata*													1				
W	2130	*Dosinia (Asa) exoleta*					1				1	4				1		1	1
W	2139	*Mysia undata*			1			1											
W	2147	*Mya (Mya) truncata*		8	1	2	1											1	
W	2157	*Corbula gibba*												1					
W	2229	*Thracia convexa*				1	1				1			2					
W	2231	*Thracia phaseolina*			2											1	10	13	6
W	2239	*Cochlodesma praetenue*		2					1			11	2		2	10			
Y	165	*Eucratea loricata*							P					P					
Y	187	*Flustra foliacea*													P				
Y	194	*Securiflustra securifrons*													P				
Y	310	*Cribrilina punctata*													P				
ZA	3	*Phoronis*			1	1					1			1		119			
	149	*Amphiura*	juvenile	5	2											7	1	5	1
ZB	151	*Amphiura brachiata*														1		1	
ZB	154	*Amphiura filiformis*		5	3	13	27		2		2		9	2	6	27			
ZB	165	*Ophiuridae*	juvenile								1								
	167	*Ophiocten affinis*		8											1				
ZB	168	*Ophiura albida*		*2*		2	2		3				1						
ZB	170	*Ophiura ophiura*			3											1	2		
ZB	212	*Echinocyamus pusillus*										3			1				
ZB	223	*Echinocardium cordatum*			1									1		3	1	1	
ZB	292/296	*Leptosynapta bergensis/inhaerens*				1	1							3					
ZB	279	*Leptopentacta elongata*				1			1										
ZD	85	*Ascidiella scabra*							1										
ZD	99	STOLIDOBRANCHIATA	juvenile						1										
ZD	112	*Polycarpa fibrosa*													1				
Total Abundance				135	82	108	134	58	109	32	90	88	49	112	91	221	131	182	131
Colonial Species				0	0	0	0	0	5	0	0	0	0	1	6	2	0	2	1
Quantitative Species				32	29	39	50	25	56	17	36	27	28	42	38	33	30	32	27
Total Species				32	29	39	50	25	61	17	36	27	28	43	44	35	30	34	28

APPENDIX 5. VIDEO AND EPIFAUNAL TRAWL LOG

Trawl site	Trawl type	Date	Length (m)	Duration (hh:mm:ss)	Time (hh:mm:ss)		Proposed Start Position (WGS 84)		Actual Start Position (WGS 84)		Actual End Position (WGS 84)	
					Start	End	Long (W)	Lat (N)	Long (W)	Lat (N)	Long (W)	Lat (N)
V1	Video	27/06/2011	5	00:00:26	18:26:06	18:26:32	-2.588206	56.534993	Within 50m of the proposed start position			
V2	Video	27/06/2011	289	00:09:00	17:44:00	17:53:00	-2.524736	56.540408	-2.522495	56.541652	-2.525928	56.539947
V3	Video	20/04/2011	289	00:10:30	20:43:55	20:54:25	-2.463455	56.552772	-2.462468	56.553467	-2.465503	56.551485
V4	Video	20/04/2011	309	00:10:20	20:03:40	20:14:00	-2.402264	56.565079	-2.401755	56.565777	-2.403701	56.563223
V5	Video	20/04/2011	338	00:11:15	19:09:50	19:21:05	-2.341149	56.577333	-2.340178	56.577852	-2.344002	56.57567
V6	Video	20/04/2011	327	00:08:25	18:24:50	18:33:15	-2.279503	56.589314	-2.278633	56.589874	-2.28229	56.587736
V7	Video	20/04/2011	504	00:22:05	16:51:40	17:13:45	-2.217595	56.599676	-2.219264	56.597682	-2.215395	56.60167
V8	Video	20/04/2011	237	00:12:40	13:18:05	13:30:45	-2.153775	56.603512	-2.153521	56.602537	-2.153386	56.604644
V9	Video	21/04/2011	333	00:12:10	05:52:50	06:05:00	-2.664148	56.492122	-2.664824	56.490436	-2.663258	56.493263
V10	Video	21/04/2011	320	00:11:40	06:34:55	06:46:35	-2.613794	56.499247	-2.614398	56.497767	-2.613203	56.500544
V11	Video	21/04/2011	513	00:17:40	07:24:15	07:41:55	-2.554046	56.513101	-2.55477	56.512152	-2.550746	56.516171
V12	Video	20/04/2011	238	00:10:35	21:28:20	21:38:55	-2.499096	56.532312	-2.497777	56.533422	-2.49995	56.531658
V13	Video	27/06/2011	261	00:09:00	15:50:00	15:59:00	-2.687700	56.489929	-2.686602	56.490146	-2.689106	56.488365
BT1	Epifaunal	27/06/2011	594				-2.562880	56.534804	-2.559547	56.536491	-2.567407	56.534135
BT2	Epifaunal	21/04/2011	507	00:20:40	09:05:20	09:26:00	-2.585741	56.504908	-2.584196	56.506734	-2.587664	56.502613
BT3	Epifaunal	20/04/2011	499	00:13:45	17:38:45	17:52:30	-2.217592	56.599676	-2.218921	56.598361	-2.214896	56.602257

APPENDIX 6. VIDEO AND EPIFAUNAL TRAWL SAMPLE DESCRIPTION

Trawl site	Trawl type	Date	Comments
V1	Video	27/06/2011	Bedrock with Dead men's fingers, Starfish and Hyrdroids
V2	Video	27/06/2011	Mixed sediment, cobbles and muddy sand with Dead men's fingers and Hydroids
V3	Video	20/04/2011	Rippled sand, Starfish, Sand eels.
V4	Video	20/04/2011	Rippled sand, Starfish, boulder >1m, Sunstar.
V5	Video	20/04/2011	Flat sand and shell, Dead men's fingers, hermit crab, 1m rock.
V6	Video	20/04/2011	Rippled sand, some coarse shell, Dead men's fingers, starfish, crab.
V7	Video	20/04/2011	Rippled sand, some coarse shell, Sand eels.
V8	Video	20/04/2011	Rippled sand, poor visability due to suspended sediment, Sand eels.
V9	Video	21/04/2011	Rippled sand, some coarse shell, poor visability due to suspended sediment.
V10	Video	21/04/2011	Rippled muddy sand, very poor visability due to suspended sediment.
V11	Video	21/04/2011	Muddy sand, very poor visability due to suspended sediment
V12	Video	20/04/2011	Rippled sand, Starfish, Dead men's fingers.
V13	Video	27/06/2011	Rippled sand with some coarse shell.
BT1	Video	27/06/2011	Muddy sand changing to boulders, cobbles and muddy sand
BT1	Epifaunal	27/06/2011	Two boulders. Predominantly Dead men's fingers and Starfish with some flatfish and other epifauna
BT2	Video	21/04/2011	Muddy sand, very poor visability
BT2	Epifaunal	21/04/2011	Starfish, Brittlestars and flatfish with some dislodged kelp
BT3	Video	20/04/2011	Mega-ripples. Rippled sand with some coarse shell and Sand eels
BT3	Epifaunal	20/04/2011	Predominantly Flustra and Dead men's fingers with fish and other epifauna

APPENDIX 7. BENTHIC GRAB PHOTOGRAPHS (EXPORT CABLE ROUTE)

Infaunal Grab Sample No. IF1

Contamination Grab Sample No. C1

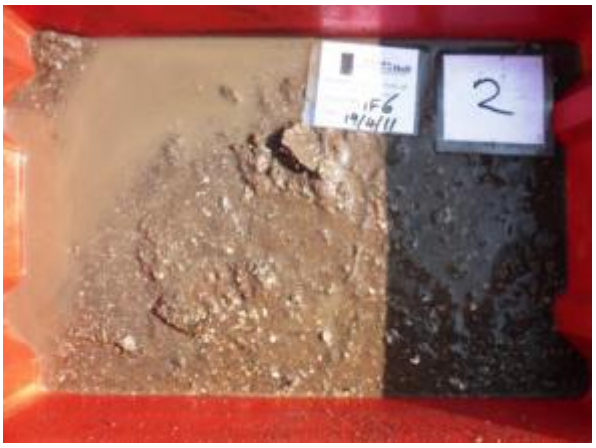
Infaunal Grab Sample No. IF2

Contamination Grab Sample No. C2

Infaunal Grab Sample No. IF3

Infaunal Grab Sample No. IF4

Infaunal Grab Sample No. IF5

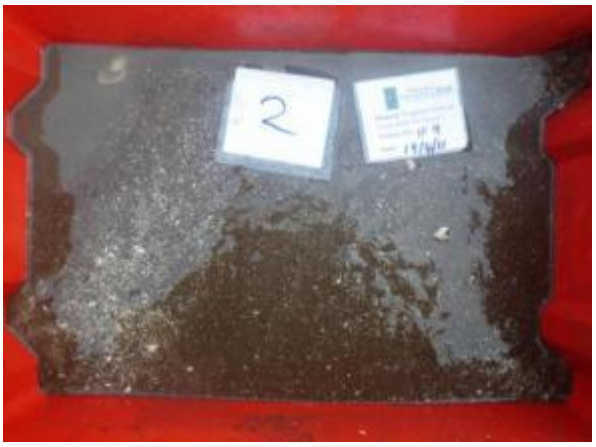


Infaunal Grab Sample No. IF6

Infaunal Grab Sample No. IF7

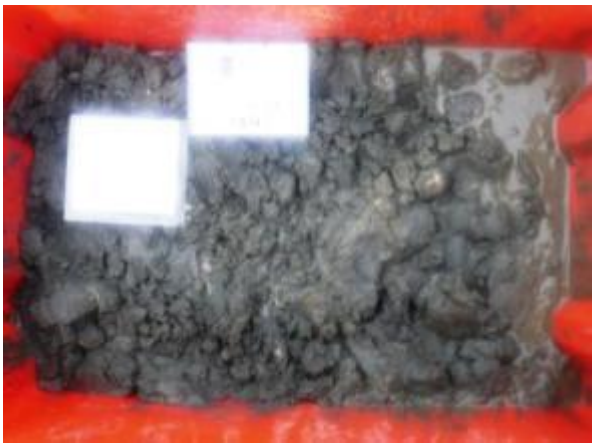
Infaunal Grab Sample No. IF8

Contaminant Grab Sample No. C3



Infaunal Grab Sample No. IF9

Infaunal Grab Sample No. IF10



Infaunal Grab Sample No. IF11

Infaunal Grab Sample No. IF12

Contaminant Grab Sample No. C4

Infaunal Grab Sample No. IF13

Contaminant Grab Sample No. C5

No sample collected

Infaunal Grab Sample No. IF14

Infaunal Grab Site No. IF15 (example of rejected infaunal grab attempt)

Infaunal Grab Site No. IF15 (example of rejected infaunal grab attempt)

No sample collected

Infaunal Grab Sample No. IF16

Infaunal Grab Sample No. IF17

Infaunal Grab Sample No. IF18

Infaunal Grab Sample No. IF19

APPENDIX 8. EPIBENTHIC TRAWL PHOTOGRAPHS

Epibenthic Trawl Sample No. 1

Epibenthic Trawl Sample No. 2

Epibenthic Trawl Sample No. 3

APPENDIX 9. EPIBENTHIC TRAWL FISH LENGTH MEASUREMENTS

Site	Species	Length (mm)
BT1	*Limanda limanda*	144
BT1	*Limanda limanda*	156
BT1	*Limanda limanda*	36
BT1	*Limanda limanda*	94
BT1	*Limanda limanda*	106
BT1	*Limanda limanda*	97
BT1	*Limanda limanda*	103
BT1	*Limanda limanda*	100
BT1	*Limanda limanda*	96
BT1	*Limanda limanda*	90
BT1	*Limanda limanda*	136
BT1	*Limanda limanda*	106
BT1	*Limanda limanda*	94
BT1	*Limanda limanda*	110
BT1	*Limanda limanda*	95
BT1	*Limanda limanda*	103
BT1	*Limanda limanda*	72
BT1	*Limanda limanda*	148
BT1	*Limanda limanda*	179
BT1	*Limanda limanda*	165
BT1	*Limanda limanda*	224
BT1	*Limanda limanda*	154
BT1	*Limanda limanda*	164
BT1	*Limanda limanda*	144
BT1	*Limanda limanda*	165
BT1	*Limanda limanda*	148
BT1	*Limanda limanda*	145
BT1	*Limanda limanda*	200
BT1	*Myxocephalus scorpius*	209
BT1	*Myxocephalus scorpius*	171
BT1	*Myxocephalus scorpius*	118
BT1	*Pleuronectes platessa*	126
BT1	*Pleuronectes platessa*	130
BT1	*Pleuronectes platessa*	130
BT1	*Pleuronectes platessa*	106
BT1	*Pleuronectes platessa*	139
BT1	*Pleuronectes platessa*	129
BT1	*Pleuronectes platessa*	125
BT1	*Pleuronectes platessa*	167
BT1	*Pleuronectes platessa*	146
BT1	*Pleuronectes platessa*	127

Site	Species	Length (mm)
BT1	*Pleuronectes platessa*	147
BT1	*Pleuronectes platessa*	166
BT1	*Eutrigla gurnardus*	124
BT1	*Gadus morhua*	57
BT1	*Gadus morhua*	47
BT1	*Gadus morhua*	50
BT2	*Limanda limanda*	206
BT2	*Limanda limanda*	139
BT2	*Limanda limanda*	179
BT2	*Limanda limanda*	64
BT2	*Limanda limanda*	111
BT2	*Limanda limanda*	127
BT2	*Limanda limanda*	183
BT2	*Limanda limanda*	113
BT2	*Limanda limanda*	127
BT2	*Limanda limanda*	113
BT2	*Limanda limanda*	206
BT2	*Limanda limanda*	67
BT2	*Limanda limanda*	237
BT2	*Limanda limanda*	175
BT2	*Limanda limanda*	118
BT2	*Limanda limanda*	116
BT2	*Limanda limanda*	127
BT2	*Limanda limanda*	73
BT2	*Limanda limanda*	152
BT2	*Limanda limanda*	199
BT2	*Limanda limanda*	121
BT2	*Limanda limanda*	71
BT2	*Limanda limanda*	70
BT2	*Limanda limanda*	129
BT2	*Limanda limanda*	68
BT2	*Limanda limanda*	133
BT2	*Limanda limanda*	126
BT2	*Limanda limanda*	65
BT2	*Limanda limanda*	53
BT2	*Limanda limanda*	65
BT2	*Limanda limanda*	55
BT2	*Limanda limanda*	127
BT2	*Limanda limanda*	115
BT2	*Limanda limanda*	220
BT2	*Limanda limanda*	40
BT2	*Limanda limanda*	115

Site	Species	Length (mm)
BT2	*Limanda limanda*	68
BT2	*Limanda limanda*	76
BT2	*Limanda limanda*	80
BT2	*Limanda limanda*	62
BT2	*Limanda limanda*	68
BT2	*Hippoglossoides platessoides*	225
BT2	*Pleuronectes platessa*	142
BT2	*Pleuronectes platessa*	110
BT2	*Pleuronectes platessa*	100
BT2	*Pleuronectes platessa*	85
BT2	*Pleuronectes platessa*	85
BT2	*Pleuronectes platessa*	93
BT2	*Pleuronectes platessa*	88
BT2	*Pleuronectes platessa*	86
BT2	*Pleuronectes platessa*	86
BT2	*Pleuronectes platessa*	89
BT2	*Pleuronectes platessa*	110
BT2	*Pleuronectes platessa*	126
BT2	*Pleuronectes platessa*	89
BT2	*Pleuronectes platessa*	88
BT2	*Pleuronectes platessa*	87
BT2	*Pleuronectes platessa*	77
BT2	*Pleuronectes platessa*	116
BT2	*Pleuronectes platessa*	90
BT2	*Agonus cataphractus*	52
BT2	*Agonus cataphractus*	65
BT2	*Agonus cataphractus*	56
BT2	*Agonus cataphractus*	70
BT2	*Pomatoschistus norvegicus / lozanoi*	48
BT2	*Pomatoschistus norvegicus / lozanoi*	47
BT2	*Pomatoschistus norvegicus / lozanoi*	41
BT3	*Merlangius merlangus*	195
BT3	*Hippoglossoides platessoides*	192
BT3	*Hippoglossoides platessoides*	166
BT3	*Hippoglossoides platessoides*	130
BT3	*Hippoglossoides platessoides*	97
BT3	*Pleuronectes platessa*	194
BT3	*Pleuronectes platessa*	121
BT3	*Pleuronectes platessa*	254
BT3	*Limanda limanda*	180
BT3	*Limanda limanda*	130
BT3	*Limanda limanda*	117

Site	Species	Length (mm)
BT3	*Limanda limanda*	135
BT3	*Limanda limanda*	118
BT3	*Limanda limanda*	105
BT3	*Limanda limanda*	72
BT3	*Agonus cataphractus*	76
BT3	*Agonus cataphractus*	74
BT3	*Agonus cataphractus*	79
BT3	*Agonus cataphractus*	60
BT3	*Agonus cataphractus*	68
BT3	*Callionymus maculatus*	90
BT3	*Callionymus maculatus*	50
BT3	*Callionymus maculatus*	49
BT3	*Ammodytes*	126
BT3	*Pomatoschistus norvegicus / lozanoi*	50
BT3	*Pomatoschistus norvegicus / lozanoi*	49
BT3	*Pomatoschistus norvegicus / lozanoi*	44
BT3	*Pomatoschistus norvegicus / lozanoi*	47

APPENDIX 10. SEDIMENT CONTAMINANT RESULTS

ALcontrol Laboratories

Unit 7-8 Hawarden Business Park
Manor Road (off Manor Lane)
Hawarden
Deeside
CH5 3US
Tel: (01244) 528700
Fax: (01244) 528701
email: mkt@alcontrol.com
Website: www.alcontrol.com

University of Hull
Department of Geography
University of Hull
Cottingham Road
Hull
South Yorkshire
HU6 7RX

Attention: Ann Leighton

CERTIFICATE OF ANALYSIS

Date:	05 August 2011
Customer:	H_UNIHULL_HUL
Sample Delivery Group (SDG):	110725-52
Your Reference:	ZBB776
Location:	Firth of Forth - Cable Route
Report No:	143792

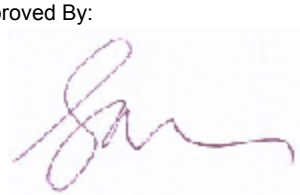
This report has been revised and directly supersedes 142887 in its entirety.

We received 5 samples on Friday July 22, 2011 and 5 of these samples were scheduled for analysis which was completed on Friday August 05, 2011. Accredited laboratory tests are defined within the report, but opinions, interpretations and on-site data expressed herein are outside the scope of ISO 17025 accreditation.

Should this report require incorporation into client reports, it must be used in its entirety and not simply with the data sections alone.

All chemical testing (unless subcontracted) is performed at ALcontrol Hawarden Laboratories.

Approved By:



Sonia McWhan

Operations Manager

CERTIFICATE OF ANALYSIS

SDG:	110725-52	**Location:**	Firth of Forth - Cable Route	**Order Number:**	FJ023335
Job:	H_UNIHULL_HUL-6	**Customer:**	University of Hull	**Report Number:**	143792
Client Reference:	ZBB776	**Attention:**	Ann Leighton	**Superseded Report:**	142887

Received Sample Overview

Lab Sample No(s)	Customer Sample Ref.	AGS Ref.	Depth (m)	Sampled Date
3948650	C1-ECR			27/06/2011
3948651	C2-ECR			19/04/2011
3948652	C3-ECR			19/04/2011
3948654	C4-ECR			19/04/2011
3948655	C5-ECR			19/04/2011

Only received samples which have had analysis scheduled will be shown on the following pages.

CERTIFICATE OF ANALYSIS

SDG:	110725-52	**Location:**	Firth of Forth - Cable Route	**Order Number:**	FJ023335
Job:	H_UNIHULL_HUL-6	**Customer:**	University of Hull	**Report Number:**	143792
Client Reference:	ZBB776	**Attention:**	Ann Leighton	**Superseded Report:**	142887

SOLID

Results Legend

X **Test**

N **No Determination Possible**

			Lab Sample No(s)									
			3948650		3948651		3948652		3948654		3948655	
			Customer Sample Reference									
			C1-ECR		C2-ECR		C3-ECR		C4-ECR		C5-ECR	
			AGS Reference									
			Depth (m)									
			Container									
			250g Amber Jar (AL	60g VOC (ALE215)	250g Amber Jar (AL	60g VOC (ALE215)	250g Amber Jar (AL	60g VOC (ALE215)	250g Amber Jar (AL	60g VOC (ALE215)	250g Amber Jar (AL	60g VOC (ALE215)
EPH by FID	All	NDPs: 0 Tests: 5	X		X		X		X		X	
GRO by GC-FID (S)	All	NDPs: 0 Tests: 5		X		X		X		X		X
Metals by iCap-OES (Soil)	Arsenic	NDPs: 0 Tests: 5	X		X		X		X		X	
	Cadmium	NDPs: 0 Tests: 5	X		X		X		X		X	
	Chromium	NDPs: 0 Tests: 5	X		X		X		X		X	
	Copper	NDPs: 0 Tests: 5	X		X		X		X		X	
	Lead	NDPs: 0 Tests: 5	X		X		X		X		X	
	Mercury	NDPs: 0 Tests: 5	X		X		X		X		X	
	Nickel	NDPs: 0 Tests: 5	X		X		X		X		X	
	Selenium	NDPs: 0 Tests: 5	X		X		X		X		X	
	Zinc	NDPs: 0 Tests: 5	X		X		X		X		X	
Organotins on soils*	All	NDPs: 0 Tests: 5	X		X		X		X		X	
PAH by GCMS	All	NDPs: 0 Tests: 5	X		X		X		X		X	
PCBs by GCMS	All	NDPs: 0 Tests: 5	X		X		X		X		X	
Sample description	All	NDPs: 0 Tests: 5	X		X		X		X		X	

CERTIFICATE OF ANALYSIS

SDG:	110725-52	**Location:**	Firth of Forth - Cable Route	**Order Number:**	FJ023335
Job:	H_UNIHULL_HUL-6	**Customer:**	University of Hull	**Report Number:**	143792
Client Reference:	ZBB776	**Attention:**	Ann Leighton	**Superseded Report:**	142887

Sample Descriptions

Grain Sizes

very fine	<0.063mm	**fine**	0.063mm - 0.1mm	**medium**	0.1mm - 2mm	**coarse**	2mm - 10mm	**very coarse**	>10mm

Lab Sample No(s)	Customer Sample Ref.	Depth (m)	Colour	Description	Grain size	Inclusions	Inclusions 2
3948650	C1-ECR		Dark Brown	Sand	0.1 - 2 mm	None	None
3948651	C2-ECR		Dark Brown	Silt	0.063 - 0.1 mm	None	None
3948652	C3-ECR		Dark Brown	Sand	0.1 - 2 mm	None	None
3948654	C4-ECR		Dark Brown	Sand	0.1 - 2 mm	None	None
3948655	C5-ECR		Dark Brown	Silt	0.063 - 0.1 mm	None	None

These descriptions are only intended to act as a cross check if sample identities are questioned, and to provide a log of sample matrices with respect to MCERTS validation. They are not intended as full geological descriptions.

We are accredited to MCERTS for sand, clay and loam/topsoil, or any of these materials - whether these are derived from naturally ocurring soil profiles, or from fill/made ground, as long as these materials constitute the major part of the sample.

Other coarse granular materials such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.

CERTIFICATE OF ANALYSIS

SDG:	110725-52	**Location:**	Firth of Forth - Cable Route	**Order Number:**	FJ023335
Job:	H_UNIHULL_HUL-6	**Customer:**	University of Hull	**Report Number:**	143792
Client Reference:	ZBB776	**Attention:**	Ann Leighton	**Superseded Report:**	142887

Results Legend

#	ISO17025 accredited.
M	*m*CERTS accredited.
§	Non-conforming work.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	Subcontracted test.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed

Component	LOD/Units	Method	Customer Sample R	C1-ECR	C2-ECR	C3-ECR	C4-ECR	C5-ECR
			Depth (m)	.	.	.	.	.
			Sample Type	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid
			Date Sampled	27/06/2011	19/04/2011	19/04/2011	19/04/2011	19/04/2011
			Date Received	22/07/2011	22/07/2011	22/07/2011	22/07/2011	22/07/2011
			SDG Ref	110725-52	110725-52	110725-52	110725-52	110725-52
			Lab Sample No.(s)	3948650	3948651	3948652	3948654	3948655
			AGS Reference					
EPH Surrogate % recovery**	%	TM061		96.3 M	105 #	103 M	103 M	101 #
EPH Range >C10 - C40	<35 mg/kg	TM061		424 M	86.9 #	<35 M	<35 M	36.2 #
PCB congener 28	<3 µg/kg	TM168		<3 M	<3 #	<3 M	<3 M	<3 #
PCB congener 52	<3 µg/kg	TM168		<3 M	<3 #	<3 M	<3 M	<3 #
PCB congener 101	<3 µg/kg	TM168		<3 M	<3 #	<3 M	<3 M	<3 #
PCB congener 118	<3 µg/kg	TM168		<3 M	<3 #	<3 M	<3 M	<3 #
PCB congener 138	<3 µg/kg	TM168		<3 M	<3 #	<3 M	<3 M	<3 #
PCB congener 153	<3 µg/kg	TM168		<3 M	<3 #	<3 M	<3 M	<3 #
PCB congener 180	<3 µg/kg	TM168		<3 M	<3 #	<3 M	<3 M	<3 #
Sum of detected PCB 7 Congeners	µg/kg	TM168		none detected	none detected	none detected	none detected	none detected
PCB congener 105	<3 µg/kg	TM168		<3 M	<3 #	<3 M	<3 M	<3 #
PCB congener 156	<3 µg/kg	TM168		<3 M	<3 #	<3 M	<3 M	<3 #
Arsenic	<0.6 mg/kg	TM181		10.3 M	4.72 #	12.3 M	9 M	4.99 #
Cadmium	<0.02 mg/kg	TM181		0.383 M	0.293 #	0.27 M	0.277 M	0.245 #
Chromium	<0.9 mg/kg	TM181		17.6 M	90.6 #	23.8 M	21.4 M	19.5 #
Copper	<1.4 mg/kg	TM181		5.86 M	85.9 #	15.5 M	9.54 M	9.08 #
Lead	<0.7 mg/kg	TM181		16.3 M	8.92 #	6.39 M	9.42 M	6.56 #
Mercury	<0.14 mg/kg	TM181		<0.14 M	<0.14 #	<0.14 M	<0.14 M	<0.14 #
Nickel	<0.2 mg/kg	TM181		11.5 M	14.3 #	10.1 M	6.78 M	7.74 #
Selenium	<1 mg/kg	TM181		<1 #	<1 #	<1 #	<1 #	<1 #
Zinc	<1.9 mg/kg	TM181		31.1 M	47.9 #	22.5 M	21.9 M	23.1 #

CERTIFICATE OF ANALYSIS

SDG:	110725-52	**Location:**	Firth of Forth - Cable Route	**Order Number:**	FJ023335
Job:	H_UNIHULL_HUL-6	**Customer:**	University of Hull	**Report Number:**	143792
Client Reference:	ZBB776	**Attention:**	Ann Leighton	**Superseded Report:**	142887

GRO by GC-FID (S)

Results Legend	
#	ISO17025 accredited.
M	*m*CERTS accredited.
§	Non-conforming work.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	Subcontracted test.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed

Component	LOD/Units	Method	Customer Sample R	C1-ECR	C2-ECR	C3-ECR	C4-ECR	C5-ECR
			Depth (m)	.	.	.	.	.
			Sample Type	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid
			Date Sampled	27/06/2011	19/04/2011	19/04/2011	19/04/2011	19/04/2011
			Date Received	22/07/2011	22/07/2011	22/07/2011	22/07/2011	22/07/2011
			SDG Ref	110725-52	110725-52	110725-52	110725-52	110725-52
			Lab Sample No.(s)	3948650	3948651	3948652	3948654	3948655
			AGS Reference					
GRO >C5-C12	<44 µg/kg	TM089		<44	<44	<44	<44	<44
Methyl tertiary butyl ether (MTBE)	<5 µg/kg	TM089		<5 #	<5 #	<5 #	<5 #	<5 #
Benzene	<10 µg/kg	TM089		<10 M	<10 #	<10 M	<10 M	<10 #
Toluene	<2 µg/kg	TM089		<2 M	<2 #	<2 M	<2 M	<2 #
Ethylbenzene	<3 µg/kg	TM089		<3 M	<3 #	<3 M	<3 M	<3 #
m,p-Xylene	<6 µg/kg	TM089		<6 M	<6 #	<6 M	<6 M	<6 #
o-Xylene	<3 µg/kg	TM089		<3 M	<3 #	<3 M	<3 M	<3 #
sum of detected mpo xylene by GC	µg/kg	TM089		none detected	none detected	none detected	none detected	none detected
sum of detected BTEX by GC	µg/kg	TM089		none detected	none detected	none detected	none detected	none detected

CERTIFICATE OF ANALYSIS

SDG:	110725-52	**Location:**	Firth of Forth - Cable Route	**Order Number:**	FJ023335
Job:	H_UNIHULL_HUL-6	**Customer:**	University of Hull	**Report Number:**	143792
Client Reference:	ZBB776	**Attention:**	Ann Leighton	**Superseded Report:**	142887

Organotins on soils*

Results Legend	
#	ISO17025 accredited.
M	*m*CERTS accredited.
§	Non-conforming work.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	Subcontracted test.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed

Component	LOD/Units	Method	Customer Sample R	C1-ECR	C2-ECR	C3-ECR	C4-ECR	C5-ECR
			Depth (m)	.	.	.	.	.
			Sample Type	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid
			Date Sampled	27/06/2011	19/04/2011	19/04/2011	19/04/2011	19/04/2011
			Date Received	22/07/2011	22/07/2011	22/07/2011	22/07/2011	22/07/2011
			SDG Ref	110725-52	110725-52	110725-52	110725-52	110725-52
			Lab Sample No.(s)	3948650	3948651	3948652	3948654	3948655
			AGS Reference					
Tributyl tin*	<0.02 µg/kg	SUB		<5	<5	<5	<5	<5
Triphenyl tin*	<0.05 µg/kg	SUB		<50	<50	<50	<50	<50
Dibutyl tin*	<0.02 µg/kg	SUB		<5	<5	<5	<5	<5
Tetrabutyl tin*	<0.02 µg/kg	SUB		<5	<5	<5	<5	<5

CERTIFICATE OF ANALYSIS

SDG:	110725-52	**Location:**	Firth of Forth - Cable Route	**Order Number:**	FJ023335
Job:	H_UNIHULL_HUL-6	**Customer:**	University of Hull	**Report Number:**	143792
Client Reference:	ZBB776	**Attention:**	Ann Leighton	**Superseded Report:**	142887

PAH by GCMS

Results Legend

#	ISO17025 accredited.
M	*m*CERTS accredited.
§	Non-conforming work.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	Subcontracted test.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed

Component	LOD/Units	Method	Customer Sample R	C1-ECR	C2-ECR	C3-ECR	C4-ECR	C5-ECR
			Depth (m)	.	.	.	.	.
			Sample Type	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid
			Date Sampled	27/06/2011	19/04/2011	19/04/2011	19/04/2011	19/04/2011
			Date Received	22/07/2011	22/07/2011	22/07/2011	22/07/2011	22/07/2011
			SDG Ref	110725-52	110725-52	110725-52	110725-52	110725-52
			Lab Sample No.(s)	3948650	3948651	3948652	3948654	3948655
			AGS Reference					
Naphthalene-d8 % recovery**	%	TM218		92.1	96.1	93.4	93.8	94.9
Acenaphthene-d10 % recovery**	%	TM218		91.5	95.4	93.2	92.4	94.2
Phenanthrene-d10 % recovery**	%	TM218		88.2	91.8	89.6	88.8	90.2
Chrysene-d12 % recovery**	%	TM218		83.3	86.7	84.6	83.6	85.1
Perylene-d12 % recovery**	%	TM218		83.8	87.3	84	82.8	84.3
Naphthalene	<9 µg/kg	TM218		<9 M	<9 #	15.1 M	<9 M	<9 #
Acenaphthylene	<12 µg/kg	TM218		<12 M	<12 #	<12 M	<12 M	<12 #
Acenaphthene	<8 µg/kg	TM218		<8 M	<8 #	<8 M	<8 M	<8 #
Fluorene	<10 µg/kg	TM218		<10 M	<10 #	<10 M	<10 M	<10 #
Phenanthrene	<15 µg/kg	TM218		24.9 M	<15 #	31 M	<15 M	<15 #
Anthracene	<16 µg/kg	TM218		<16 M	<16 #	<16 M	<16 M	<16 #
Fluoranthene	<17 µg/kg	TM218		25.2 M	<17 #	<17 M	<17 M	<17 #
Pyrene	<15 µg/kg	TM218		24.4 M	23.4 #	<15 M	<15 M	<15 #
Benz(a)anthracene	<14 µg/kg	TM218		<14 M	<14 #	<14 M	<14 M	<14 #
Chrysene	<10 µg/kg	TM218		<10 M	13.5 #	<10 M	<10 M	<10 #
Benzo(b)fluoranthene	<15 µg/kg	TM218		<15 M	23.8 #	<15 M	<15 M	<15 #
Benzo(k)fluoranthene	<14 µg/kg	TM218		<14 M	<14 #	<14 M	<14 M	<14 #
Benzo(a)pyrene	<15 µg/kg	TM218		<15 M	<15 #	<15 M	<15 M	<15 #
Indeno(1,2,3-cd)pyrene	<18 µg/kg	TM218		<18 M	<18 #	<18 M	<18 M	<18 #
Dibenzo(a,h)anthracene	<23 µg/kg	TM218		<23 M	<23 #	<23 M	<23 M	<23 #
Benzo(g,h,i)perylene	<24 µg/kg	TM218		<24 M	<24 #	<24 M	<24 M	<24 #
PAH, Total Detected USEPA 16	<118 µg/kg	TM218		<118	<118	<118	<118	<118

CERTIFICATE OF ANALYSIS

SDG:	110725-52	**Location:**	Firth of Forth - Cable Route	**Order Number:**	FJ023335
Job:	H_UNIHULL_HUL-6	**Customer:**	University of Hull	**Report Number:**	143792
Client Reference:	ZBB776	**Attention:**	Ann Leighton	**Superseded Report:**	142887

Extractable Petroleum Hydrocarbons (EPH) By GC-FID

EPH (DRO) (C10-C40)

Sample No	Customer Sample Ref.	Depth	Matrix (mg/kg)	EPH	Interpretation
3981233	C5-ECR		SOLID	36.2	No Identification Possible
3981367	C4-ECR		SOLID	<35.0	No Identification Possible
3981443	C3-ECR		SOLID	<35.0	No Identification Possible
3981493	C2-ECR		SOLID	86.9	No Identification Possible
3981840	C1-ECR		SOLID	424	PAHS

Extractable Petroleum Hydrocarbons (formally Diesel Range Organics) :- Any compound extractable in n-hexane within the carbon range C10-C40, includes Aliphatic (Min Oil), Aromatic (PAHs) and naturally occurring compounds.

CERTIFICATE OF ANALYSIS

SDG:	110725-52	**Location:**	Firth of Forth - Cable Route	**Order Number:**	FJ023335
Job:	H_UNIHULL_HUL-6	**Customer:**	University of Hull	**Report Number:**	143792
Client Reference:	ZBB776	**Attention:**	Ann Leighton	**Superseded Report:**	142887

Table of Results - Appendix

REPORT KEY

Results expressed as (e.g.) 1.03E-07 is equivalent to 1.03x10-7

NDP	No Determination Possible	#	ISO 17025 Accredited	*	Subcontracted Test	M	MCERTS Accredited
NFD	No Fibres Detected	PFD	Possible Fibres Detected	»	Result previously reported (Incremental reports only)	EC	Equivalent Carbon (Aromatics C8-C35)

Note: Method detection limits are not always achievable due to various circumstances beyond our control

Method No	Reference	Description	Wet/Dry Sample [1]	Surrogate Corrected
PM001		Preparation of Samples for Metals Analysis		
PM024	Modified BS 1377	Soil preparation including homogenisation, moisture screens of soils for Asbestos Containing Material		
SUB		Subcontracted Test		
TM061	Method for the Determination of EPH,Massachusetts Dept.of EP, 1998	Determination of Extractable Petroleum Hydrocarbons by GC-FID (C10-C40)		
TM089	Modified: US EPA Methods 8020 & 602	Determination of Gasoline Range Hydrocarbons (GRO) and BTEX (MTBE) compounds by Headspace GC-FID (C4-C12)		
TM168	EPA Method 8082, Polychlorinated Biphenyls by Gas Chromatography	Determination of WHO12 and EC7 Polychlorinated Biphenyl Congeners by GC-MS in Soils		
TM181	US EPA Method 6010B	Determination of Routine Metals in Soil by iCap 6500 Duo ICP-OES		
TM218	Microwave extraction – EPA method 3546	Microwave extraction - EPA method 3546		

[1] Applies to Solid samples only. DRY indicates samples have been dried at 35°C. NA = not applicable.

CERTIFICATE OF ANALYSIS

SDG:	110725-52	**Location:**	Firth of Forth - Cable Route	**Order Number:**	FJ023335
Job:	H_UNIHULL_HUL-6	**Customer:**	University of Hull	**Report Number:**	143792
Client Reference:	ZBB776	**Attention:**	Ann Leighton	**Superseded Report:**	142887

Test Completion Dates

Lab Sample No(s)	3948650	3948651	3948652	3948654	3948655
Customer Sample Ref.	C1-ECR	C2-ECR	C3-ECR	C4-ECR	C5-ECR
AGS Ref.					
Depth					
Type	SOLID	SOLID	SOLID	SOLID	SOLID
EPH by FID	01-Aug-2011	01-Aug-2011	01-Aug-2011	01-Aug-2011	01-Aug-2011
GRO by GC-FID (S)	30-Jul-2011	30-Jul-2011	30-Jul-2011	30-Jul-2011	01-Aug-2011
Metals by iCap-OES (Soil)	29-Jul-2011	29-Jul-2011	29-Jul-2011	29-Jul-2011	29-Jul-2011
Organotins on soils*	05-Aug-2011	05-Aug-2011	05-Aug-2011	05-Aug-2011	05-Aug-2011
PAH by GCMS	29-Jul-2011	29-Jul-2011	29-Jul-2011	29-Jul-2011	29-Jul-2011
PCBs by GCMS	01-Aug-2011	01-Aug-2011	01-Aug-2011	01-Aug-2011	01-Aug-2011
Sample description	28-Jul-2011	28-Jul-2011	28-Jul-2011	28-Jul-2011	28-Jul-2011

RPS Mountainheath

2 Shaftesbury Industrial Centre, Icknield Way, Letchworth, Hertfordshire SG6 1HE

T +44 (0)1462 480400 **F** +44 (0)1462 480403 **E** rpsmh@rpsgroup.com **W** www.mountainheath.com

Analytical Report

ALcontrol Hawarden
Unit7-8, Hawarden Business Park
Manor Road (off Manor Lane)
Hawarden, Deeside
Flintshire, CH5 3US

Report No:	11-23799/1
Date Received:	27/07/2011
Date Tested:	02/08/2011 to 05/08/2011
Date Issued:	05/08/2011
Page:	1 of 2

For the attention of: Alcontrol Chester (Schedulers) **By email**

5 soil samples received from ALcontrol Hawarden (O/N: 179683; Project: 110725-52) in 100ml amber glass jars were analysed as shown below. Analytical methods employed are available on request. Results are reported on an as received basis unless otherwise specified.

Laboratory reference	Client reference	Other reference	tributyltin (low level) ug/kg Sn 56573-85-4	triphenyltin (low level) ug/kg Sn 668-34-8	tetrabutyltin (low level) ug/kg Sn
193196	3955788	n/a	< 5.0	< 50.0	< 5.0
193197	3955821 C2	n/a	< 5.0	< 50.0	< 5.0
193198	3955876	n/a	< 5.0	< 50.0	< 5.0
193199	3955909	n/a	< 5.0	< 50.0	< 5.0
193200	3955951	n/a	< 5.0	< 50.0	< 5.0

Laboratory reference	Client reference	Other reference	dibutyltin (low level) ug/kg Sn 1002-53-5
193196	3955788 C1-ECR	n/a	< 5.0
193197	3955821 C2 ECR	n/a	< 5.0
193198	3955876 C3-ECR	n/a	< 5.0
193199	3955909 C4-ECR	n/a	< 5.0
193200	3955951 C5-ECR	n/a	< 5.0

Robin T R Macdonald
Operational Director

SDG:	110725-52	**Location:**	Firth of Forth - Cable Route	**Order Number:**	FJ023335
Job:	H_UNIHULL_HUL-6	**Customer:**	University of Hull	**Report Number:**	143792
Client Reference:	ZBB776	**Attention:**	Ann Leighton	**Superseded Report:**	142887

Appendix

1. Results are expressed on a dry weight basis (dried at 35ºC) for all soil analyses except for the following: NRA Leach tests, flash point, ammonium as NH4 by the BRE method, VOC TICS, SVOC TICS, TOF-MS SCAN/SEARCH and TOF-MS TICS.

2. Samples will be run in duplicate upon request, but an additional charge may be incurred.

3. If sufficient sample is received a sub sample will be retained free of charge for 30 days after analysis is completed (e-mailed) for both soil jars, tubs and volatile jars. All waters and vials will be discarded 10 days after the analysis is completed (e-mailed). All material removed during an asbestos containing material screen and analysed for the presence of asbestos will be retained for a period of 6 months after the analysis date. All samples received and not scheduled will be disposed of one month after the date of receipt unless we are instructed to the contrary. Once the initial period has expired, a storage charge will be applied for each month or part thereof until the client cancels the request for sample storage. ALcontrol Laboratories reserve the right to charge for samples received and stored but not analysed.

4. With respect to turnaround, we will always endeavour to meet client requirements wherever possible, but turnaround times cannot be absolutely guaranteed due to so many variables beyond our control.

5. We take responsibility for any test performed by sub-contractors (marked with an asterisk). We endeavour to use UKAS/MCERTS Accredited Laboratories, who either complete a quality questionnaire or are audited by ourselves. For some determinands there are no UKAS/MCERTS Accredited Laboratories, in this instance a laboratory with a known track record will be utilised.

6. When requested, the individual sub sample scheduled will be screened in house for the presence of large asbestos containing material fragments/pieces. If no asbestos containing material is found this will be reported as 'no asbestos containing material detected'. If asbestos containing material is detected it will be removed and analysed by our documented in house method TM048 based on HSG 248 (2005), which is accredited to ISO17025. If asbestos containing material is present no further analysis will be undertaken. At no point is the fibre content of the soil sample determined.

7. If no separate volatile sample is supplied by the client, the integrity of the data may be compromised if the laboratory is required to create a sub-sample from the bulk sample -similarly, if a headspace or sediment is present in the volatile sample. This will be flagged up as an invalid VOC on the test schedule or recorded on the log sheet.

8. If appropriate preserved bottles are not received preservation will take place on receipt. However, the integrity of the data may be compromised.

9. NDP -No determination possible due to insufficient/unsuitable sample.

10. Metals in water are performed on a filtered sample, and therefore represent dissolved metals -total metals must be requested separately.

11. Results relate only to the items tested.

12. LODs for wet tests reported on a dry weight basis are not corrected for moisture content.

13. **Surrogate recoveries** -Most of our organic methods include surrogates, the recovery of which is monitored and reported. For EPH, MO, PAH, GRO and VOCs on soils the result is not surrogate corrected, but a percentage recovery is quoted. Acceptable limits for most organic methods are 70 -130 %.

14. **Product analyses** -Organic analyses on products can only be semi-quantitative due to the matrix effects and high dilution factors
employed.

15. Phenols monohydric by HPLC include phenol, cresols (2-Methylphenol, 3-Methylphenol and 4-Methylphenol) and Xylenols (2,3 Dimethylphenol, 2,4 Dimethylphenol, 2,5 Dimethylphenol, 2,6 Dimethylphenol, 3,4 Dimethyphenol, 3,5 Dimethylphenol).

16. Total of 5 speciated phenols by HPLC includes Phenol, 2,3,5-Trimethyl Phenol, 2-Isopropylphenol, Cresols and Xylenols (as detailed in 15).

17. Stones/debris are not routinely removed. We always endeavour to take a representative sub sample from the received sample.

18. In certain circumstances the method detection limit may be elevated due to the sample being outside the calibration range. Other factors that may contribute to this include possible interferences. In both cases the sample would be diluted which would cause the method detection limit to be raised.

19. Mercury results quoted on soils will not include volatile mercury as the analysis is performed on a dried and crushed sample.

20. For the BSEN 12457-3 two batch process to allow the cumulative release to be calculated, the volume of the leachate produced is measured and filtered for all tests. We therefore cannot carry out any unfiltered analysis. The tests affected include volatiles GCFID/GCMS and all subcontracted analysis.

21. For all leachate preparations (NRA, DIN, TCLP, BSEN 12457-1, 2, 3) volatile loss may occur, as we do not employ zero headspace extraction.

22. We are accredited to MCERTS for sand, clay and loam/topsoil, or any of these materials -whether these are derived from naturally occurring soil profiles, or from fill/made ground, as long as these materials constitute themajor part of the sample. Other coarse granular material such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.

23. Analysis and identification of specific compounds using GCFID is by retention time only, and we routinely calibrate and quantify for benzene, toluene, ethylbenzenes and xylenes (BTEX). For total volatiles in the C4 -C10 range, the total area of the chromatogram is integrated and expressed as ug/kg or ug/l. Although this analysis is commonly used for the quantification of gasoline range organics (GRO), the system will also detect other compounds such as chlorinated solvents, and this may lead to a falsely high result with respect to hydrocarbons only. It is not possible to specifically identify these non-hydrocarbons, as standards are not routinely run for any other compounds, and for more definitive identification, volatiles by GCMS should be utilised.

SOLID MATRICES EXTRACTION SUMMARY

ANALYSIS	D/C OR WET	EXTRACTION SOLVENT	EXTRACTION METHOD	ANALYSIS
SOLVENT EXTRACTABLE MATTER	D&C	DCM	SOXTHERM	GRAVIMETRIC
CYCLOHEXANE EXT. MATTER	D&C	CYCLOHEXANE	SOXTHERM	GRAVIMETRIC
THIN LAYER CHROMATOGRAPHY	D&C	DCM	SOXTHERM	IATROSCAN
ELEMENTAL SULPHUR	D&C	DCM	SOXTHERM	HPLC
PHENOLS BY GCMS	WET	DCM	SOXTHERM	GCMS
HERBICIDES	D&C	HEXANE/ACETONE	SOXTHERM	GCMS
PESTICIDES	D&C	HEXANE/ACETONE	SOXTHERM	GCMS
EPH (DRO)	D&C	HEXANE/ACETONE	END OVER END	GCFID
EPH (MIN OIL)	D&C	HEXANE/ACETONE	END OVER END	GCFID
EPH (CLEANED UP)	D&C	HEXANE/ACETONE	END OVER END	GCFID
EPH CWG BY GC	D&C	HEXANE/ACETONE	END OVER END	GCFID
PCB TOT / PCB CON	D&C	HEXANE/ACETONE	END OVER END	GCMS
POLYAROMATIC HYDROCARBONS (MS)	WET	HEXANE/ACETONE	MICROWAVE TM218.	GCMS
C8-C40 (C8-C40) EZ FLASH	WET	HEXANE/ACETONE	SHAKER	GCEZ
POLYAROMATIC HYDROCARBONS RAPID GC	WET	HEXANE/ACETONE	SHAKER	GCEZ
SEMI VOLATILE ORGANIC COMPOUNDS	WET	DCM/ACETONE	SONICATE	GCMS

LIQUID MATRICES EXTRACTION SUMMARY

ANALYSIS	EXTRACTION SOLVENT	EXTRACTION METHOD	ANALYSIS
PAH MS	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GCMS
EPH	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GC FID
EPH CWG	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GC FID
MINERAL OIL	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GC FID
PCB 7 CONGENERS	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GCMS
PCB TOTAL	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GCMS
SVOC	DCM	LIQUID/LIQUID SHAKE	GCMS
FREE SULPHUR	DCM	SOLID PHASE EXTRACTION	HPLC
PEST OCP/OPP	DCM	LIQUID/LIQUID SHAKE	GCMS
TRIAZINE HERBS	DCM	LIQUID/LIQUID SHAKE	GCMS
PHENOLS MS	DCM	SOLID PHASE EXTRACTION	GCMS
TPH by INFRARED (IR)	TCE	LIQUID/LIQUID SHAKE	HPLC
MINERAL OIL by IR	TCE	LIQUID/LIQUID SHAKE	HPLC
GLYCOLS	NONE	DIRECT INJECTION	GCMS

Identification of Asbestos in Bulk Materials & Soils

The results for identification of asbestos in bulk materials are obtained from supplied bulk materials or those identified as potentially asbestos containing during sample description which have been examined to determine the presence of asbestos fibres using Alcontrol Laboratories (Hawarden) in-house method of transmitted/polarised light microscopy and central stop dispersion staining, based on HSG 248 (2005).

The results for identification of asbestos in soils are obtained from a homogenised sub sample which has been examined to determine the presence of asbestos fibres using Alcontrol Laboratories (Hawarden) in-house method of transmitted/polarised light microscopy and central stop dispersion staining, based on HSG 248 (2005).

Asbestos Type	Common Name
Chrysotile	White Asbestos
Amosite	Brown Asbestos
Crocidolite	Blue Asbestos
Fibrous Actinolite	-
Fibrous Anthophyllite	-
Fibrous Tremolite	-

Visual Estimation Of Fibre Content

Estimation of fibre content is not permitted as part of our UKAS accredited test other than: -
Trace -Where only one or two asbestos fibres were identified.

Further guidance on typical asbestos fibre content of manufactured products can be found in HSG 264.

The identification of asbestos containing materials and soils falls within our schedule of tests for which we hold UKAS accreditation, however opinions, interpretations and all other information contained in the report are outside the scope of UKAS accreditation.

the
INSTITUTE
of
ESTUARINE
and
COASTAL
STUDIES

UNIVERSITY OF Hull
Institute of Estuarine and Coastal Studies

Firth of Forth (Round 3) Offshore Wind Farm Development: Post Survey Report Benthic Services

Report to Seagreen Wind Energy Ltd.

Institute of Estuarine and Coastal Studies
University of Hull

12th July 2012

**Author(s): M. J. Bailey,
A. Leighton, T. M. Smith & S. Thomson**

Report: ZBB776-P1-F-2012

Institute of Estuarine & Coastal Studies (IECS)
The University of Hull
Cottingham Road
Hull
HU6 7RX
UK

Tel: +44 (0)1482 464120
Fax: +44 (0)1482 464130

E-mail: iecs@hull.ac.uk

Web site: http://www.hull.ac.uk/iecs

Seagreen Wind Energy Ltd.

Firth of Forth (Round 3) Offshore Wind Farm Development: Post Survey Report Benthic Services

12th July 2012

Reference Number: ZBB776-P1-F-2012

TABLE OF CONTENTS

1. INTRODUCTION

SSE Renewables (SSER) and Flour (UK) Ltd under the Limited company of Seagreen Wind Energy have been awarded the Firth of Forth Round 3 Zone for offshore wind developments. Seagreen aim to deliver a generation capacity of 3.5GW across an area of 2,852km^2 with the development being undertaken in three phases.

The Institute of Estuarine & Coastal Studies (IECS) was commissioned by Seagreen Wind Energy Limited to undertake an offshore benthic survey. This survey work and associated sample analysis was designed to enable characterisation of the benthic and epibenthic ecology of the area, the physical characteristics of the sample sites, and the chemical properties of sediments sampled.

In order to provide adequate sampling coverage of the proposed development site Seagreen Wind Energy Ltd., in conjunction with Royal Haskoning, identified 150 benthic sampling sites and 50 video and epibenthic trawl sites within the Phase 1 area, in addition to 3 Met Mast sites across the Phase 1 & 2 areas. All survey work was completed between February and April 2011 and the subsequent sample analysis completed by August 2011.

The following report documents the survey work completed in the Phase 1 area and the sediment, infaunal and epifaunal results. Data analysis was not included within the scope of this report.

2. METHODS

2.1 Benthic Infaunal Samples

2.1.1 SAMPLE COLLECTION

A total of 150 benthic stations were identified by Seagreen in the Phase 1 area as well as three Met Mast sites across Phases 1 and 2. A mini Hamon grab was deployed to collect a single replicate sample for infaunal analysis (Plate 1), from which a PSA sample was also taken, as per the specification. A second grab was collected for contaminant analysis. A full survey log was maintained throughout the survey detailing time of sampling, position (DGPS derived), station, water depth, volume of sample, physical characteristics of the sample, digital image number (cross referencing (QA)), presence of *Sabellaria spinulosa* and any other relevant features.

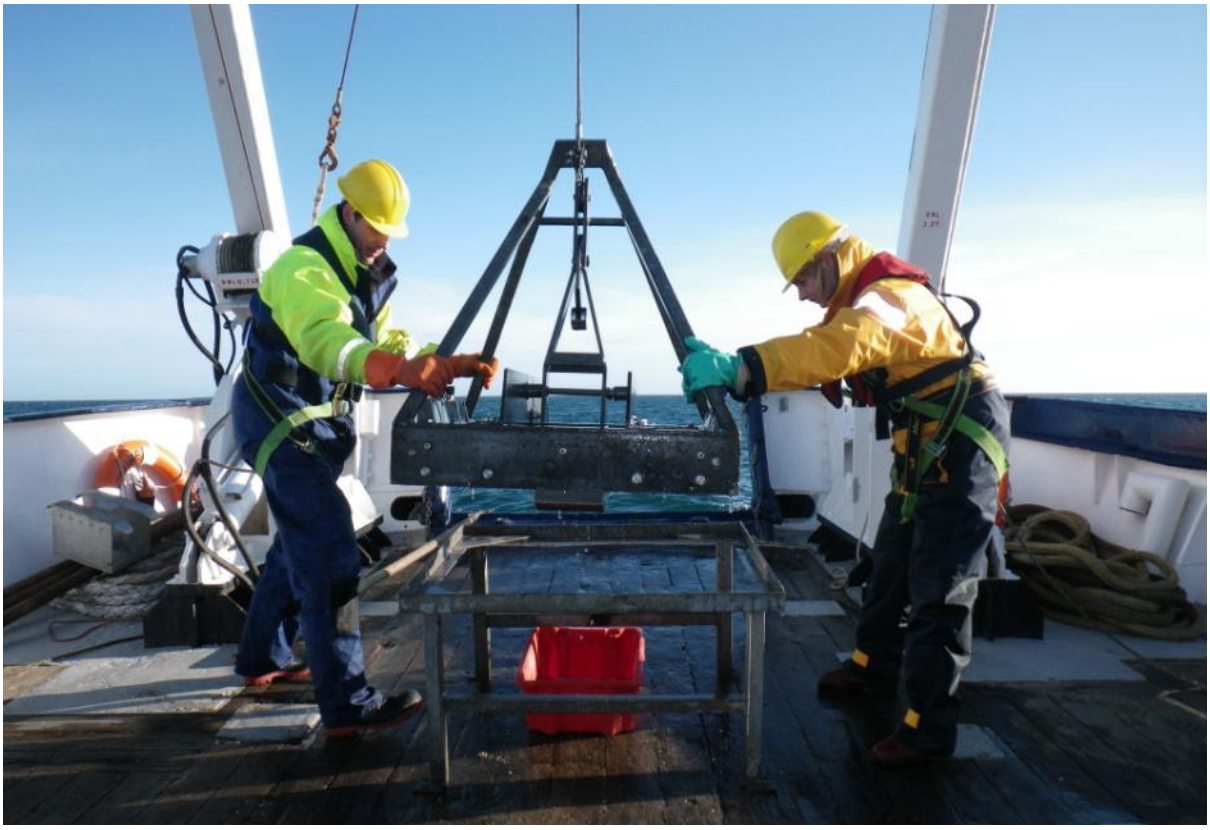


Plate 1. Retrieval of mini hamon grab on board MV Clupea.

The infaunal samples were processed on a sequential basis utilising a nested sieving technique. Each acceptable sample was removed from the grab, photographed with an internal label, placed into a hopper and sieved onboard through a nest of 5mm and 1mm sieves. A nested sieve approach was used in order to separate large sediment types and reduce damage to invertebrates. The sieved residue was gently back-washed into a sealable container and borax buffered 4% formo-saline solution containing Rose Bengal vital stain added as a fixative. Each sample was labelled clearly on the bucket and the internal label placed in the container, noting the client, survey, date and station number.

The PSA and organic carbon samples were stored in separate plastic bags, which were clearly labelled, and frozen onboard the vessel. The samples were kept frozen during transportation back to the IECS laboratory. At the laboratory the samples were stored in the freezer. The IECS methodology followed the protocol given by Rees *et al*. (1990)[1] & (1993)[2], Davies *et al.* (2001)[3], Boyd (2002)[4] and Proudfoot *et al.* (2004)[5].

Valid Sample Criteria

Samples comprising hard substrata (e.g. broken shell, rocks or gravel) were rejected if a minimum sample volume of 5 litres was not achieved. When samples were within these limits, each sample was photographed (digital image) and subsequently processed. Five attempts were made at each site to collect a valid infaunal sample, however if a sample with a volume of <4 litres was retained, the VideoRay was deployed at the site in order to obtain supporting video footage of the seabed.

2.1.2 POST SURVEY ANALYSIS

Benthic infaunal samples

General Requirements

All members of IECS undertaking the sample sorting and taxonomic analysis phases of the laboratory work were qualified marine biologists or ecologists. Those staff carrying out the taxonomic analysis had at least eight years marine biological experience with a wide range of expertise in the field of benthic sample analysis and interpretation. The analyses were quality checked by the Senior Benthic Taxonomist who has more than 10 years experience.

Sample Sorting

The procedure for sieving and sorting benthic core samples was as follows:

Formalin was decanted from the sample through a 212µm sieve using appropriate exposure prevention controls as detailed in the Health & Safety documentation. Material retained on the sieve was washed back into the sample. The sample was subsequently washed through

[1] Rees, H.L., Moore, D.C., Pearson, T.H., Elliot, M., Service, M., Pomfret, J. & Johnson, D. (1990). *Procedures for the monitoring of marine benthic communities at UK sewage sludge disposal sites*. Scottish Fisheries Information Pamphlet, No. 18: 78pp.

[2] Rees, H.L. & Service, M.A. (1993). Development of improved strategies for monitoring the epibenthos at sewage sludge disposal sites. In: *Analysis and interpretation of benthic community data at sewage sludge disposal sites*. Aquatic Environmental Monitoring Report, MAFF Directorate of Fisheries Research, Lowestoft, No. 37: 55-61.

[3] Davies, J., Baxter, J., Bradley, M., Connor, D., Khan, J., Murray, E., Sanderson, W., Turnbull, C. & Vincent, M. (2001) *Marine Monitoring Handbook*, 405pp. JNCC Peterborough, UK.

[4] Boyd, S.E. (2002). *Guidelines for the conduct of benthic studies at aggregate dredging sites*. Department for Transport, Local Government and the Regions (DTLR)/CEFAS: London, UK. 117 pp.

[5] Proudfoot, R.K, Elliott, M., Dyer, M.F., Barnett, B.E., Allen, J.H., Proctor, N.V., Cutts, N.D., Nikitik, C., Turner, G., Breen, J., Hemingway, K.L. & Mackie, T. (1997). *Proceedings of the Humber benthic field methods workshop*, University of Hull.

a 20cm diameter 1mm mesh stainless steel sieve to remove excess fixative as well as fine mud and sand particles. The residue from the 1mm sieve was then gently washed into a white tray. Water was added to the tray and the contents examined by eye using a 1.5x illuminated magnifier. Large specimens were removed and sorted into major phyla. The fauna derived were retained and stored by group in appropriately labelled containers, preserved using 70% Industrial Methylated Spirits (IMS) and passed on for identification.

Sieves and trays were washed thoroughly between samples to ensure there was no contamination of subsequent samples. During the sample processing phase a sample proforma was completed to include client, project, area, sample number, date, name of sorter and identifier, description of residue characteristics, notable features, sieve mesh size and whether any problems were encountered.

Taxonomic Identification

Identification was undertaken using Olympus SZX7 and SZ40 zoom microscopes with 10x and 20x eyepieces, giving a maximum magnification of up to 80x. An additional 2x objective was used to increase the potential magnification to 160x. Olympus BX41 compound microscopes were used for further magnification if necessary, up to 1000x.

Identification of infaunal samples was to the highest possible taxonomic separation (i.e. species). During identification, all individuals were initially separated into families, with part animals being assigned to families where possible. The macrofaunal animals were identified to species level using standard taxonomic keys, low and high power stereoscopic microscopes and dissection when necessary. Incomplete animals without anterior ends were not recorded as individuals to be included in the quantitative dataset. However, they were identified where possible and recorded as being present. Similarly, motile and colonial sessile epibenthic taxa and meiofauna were recorded but not included in the main quantitative data set.

IECS follow strict AQC procedures. In addition, regular cross reference identification was carried out by IECS' Senior taxonomists throughout the identification process. As IECS is part of the NMBAQC Scheme, the identification of any difficult specimens could have been undertaken following consultation and external verification from David Hall (Thomson Unicomarine). However, this service was not required during the processing stage.

The taxonomic literature used was essentially as given in and expanded from Rees *et al.* (1990)[6] and reporting nomenclature used Howson and Picton (1997)[7] and the World Register of Marine Species (WoRMS).

[6] Rees, H.L., Moore, D.C., Pearson, T.H., Elliot, M., Service, M., Pomfret, J. & Johnson, D. (1990). Procedures for the monitoring of marine benthic communities at UK sewage sludge disposal sites. *Scottish Fisheries Information Pamphlet,* No. 18: 78pp.

[7] Howson, C.M. & Picton, B.E. (1997). *The species directory of the marine fauna and flora of the British Isles and surrounding seas*. Ulster museum and the Marine Conservation Society.

Particle Size Analysis (PSA) samples

The particle size analysis was carried out using a combination of dry sieving and laser particle size analysis (for the fraction <1mm) using a Malvern Mastersizer 2000. The sediment samples were then split with one sub-sample being passed through a 1mm sieve to remove the larger size classes of sediment. The <1mm fraction of the sample was subsequently analysed using the Malvern Mastersizer 2000 and the >1mm fraction discarded. The second sub-sample was passed through a nest of sieves, including 1mm, 1.4mm, 2mm, 2.8mm, 5.6mm and 11.2mm. Each fraction, including the <1mm fraction, was then oven dried at 85°C for 24 hours and weighed. Data generated from these methods of analysis was merged and used to derive statistics such as mean grain size, bulk sediment classes (% silt, sand & gravel), skewness and sorting coefficient. These methods are consistent with the procedures identified at the NMBAQC PSA workshop on laboratory methods, which was held at the Cefas Lowestoft laboratory in July 2009.

Organic Carbon samples

Organic carbon was expressed as loss on ignition (percentage), following combustion at 475°C for four hours. The sample was oven dried at 85°C until the weight stabilised (± 0.001g) and the weight recorded. The sample was then placed in a muffle furnace at 475°C for four hours. Once the sample had cooled, it was re-weighed and the difference between the two weights was expressed as a percentage of the total sediment.

Sediment Contaminant samples

Contaminant samples were collected from the grab samples by scooping sediment directly into the containers. Nitrile gloves were worn to prevent sample contamination. Samples to test for organics were taken in glass containers as hydrocarbons can be lost through plastic. Samples to test for volatiles were collected in smaller containers so there was less headspace for them to be lost in. Samples for inorganics were taken using plastic containers. The containers used for each test were:

- EPH by FID — 250g glass jar
- GRO by GC-FID — 60g glass jar
- Metals by iCap-OES — Plastic container
- Organotins — Plastic container
- PAH by GCMS — 250g glass jar
- PCBs by GCMS — 250g glass jar

2.2 Epifaunal Trawl Samples

2.2.1 SAMPLE COLLECTION

A VideoRay system was deployed at each of the epifaunal trawl stations before sampling took place to verify the absence of any significant amount of habitat of conservation interest (i.e. *Sabellaria* biogenic reef) and provide additional information on the nature of the seabed. Full details of the drop down video sampling programme are the subject of a separate report (ZBB776-DDV-F-2012).

Following the deployment of the VideoRay, a 2m beam trawl with a 5m long net and 40mm mesh liner inside and 5mm (knot to knot) square mesh cod-end liner was deployed in close proximity to the video line. The trawl was lowered from the survey vessel to the seabed at the predetermined start point and towed for approximately 10-20 minutes over a path of approximately 500m while maintaining a speed of between 1 - 1.5 knots. The 2m Beam trawl was comprised of two 60mm x 500mm x 500mm steel detachable shoes, with a 2120mm steel tube brace. A tickler chain was attached to the footrope to provide extra weight to ensure valid samples were obtained.

The beam trawl was operated from the stern of the survey vessel using a towing line approximately three times the depth of the area. The trawl line was logged using DGPS at the start (lock of the winch) and end of the trawl (engagement of the winch). The 1m cod end with 5mm mesh was hauled aboard with the aid of a lifting rope to ensure the cod end could be lifted independently of the beam. A single tow was carried out at each identified trawl line.

The cod end was opened over a large fish box to contain the whole catch; the net was checked for any remaining epifauna and fish, before the cod end was re-fastened prior to redeployment at the next trawl site. The catch was roughly sorted on board with the fish species separated from the epifaunal invertebrates. A survey log was maintained at all times recording survey date, water depth at the start of the trawl line, time in and out of water, DGPS position (using Magellan ProMark3 GPS) and speed of survey vessel during trawling along with weather and sea condition and digital images.

IECS experience indicates that the quality of the catch greatly deteriorates under rough sea conditions. As such, IECS operated the beam trawl within a weather window resulting in wave heights less than 1.5m and wind speed of less than F3.

Photographs of all catches were taken after any large debris had been removed. Any large specimens were identified onboard the vessel, recorded, photographed and then returned to the water. The remaining catch was transferred to a clean labelled bucket and fixed using 4% formo-saline solution.

The fixed epifaunal invertebrates and fish were transferred to the IECS laboratory where they were separated to species level where possible and enumerated with examples of each species retained for a reference collection. The taxonomic literature used is essentially as given in Wheeler (1969[8], 1978[9]) and Whitehead *et al.* (1984[10]). All fish were measured to the millimetre below (total length or an appropriate measure in case of species with extreme body shape; i.e. skates and rays). If catches were large, any species present at low density were identified and removed before a subsample was taken for length distribution of the more abundant species. A subsample (*c*. 30-50 fish) were measured to enable length frequency analysis. Any other observations from individual trawls (e.g. high amounts of shell, rocks, cobbles, weed and other debris, presence of ray egg cases, whelk eggs etc.) were recorded on the survey log.

[8] Wheeler, A. (1969). *The fishes of the British Isles and North West Europe*. Michigan State University Press, 613pp.

[9] Wheeler, A. (1977). *Key to the Fishes of Northern Europe*. Frederick Warne, London. 380pp.

[10] Whitehead, P.J.P., Bauchot, M.L., Hureau, J.-C., Nielsen, J. & Tortonese, E. (Eds.) (1984). *Fishes of the North-eastern Atlantic and the Mediterranean*, Vol. 1-3. UNESCO.

3. RESULTS

3.1 Survey Summary and Area Map

3.1.1 BENTHIC SURVEY

Over the course of four separate deployments between February and April 2011, the IECS survey team sampled all 153 benthic sites identified as priority sites, including sites G0 to G149 within the Phase 1 area and the three Met Mast sampling locations in Phases 1 and 2 (Figure 1). In total, 147 benthic infaunal and 147 PSA samples were collected, stored appropriately and returned to the IECS laboratory. In addition, 46 contaminant samples were collected.

No infaunal samples were retrieved from 6 sites (G34, G58, G123, G125, G135 and MM2) despite 5 attempts to collect a sample. In addition, no contaminant samples were retrieved from 3 sites (G56, G103 and G123), despite 5 attempts. At all 8 sites only a small amount of sediment was retrieved (<1 litre) due to the presence of either cobbles, boulders or compacted sediments. However, an approximate assessment of the sediment type was recorded and a VideoRay was deployed at each site to collect supporting video footage

At all sites where an infaunal sample was retained with a volume of <4 litres or no infaunal sample was collected, additional video footage was collected. Still images from the video footage and a sediment description are provided (Appendix 3). Edited video footage collected at each site has been provided on DVD.

The position of site G126 was moved approximately 60m from the original site and a benthic infaunal and PSA samples collected, as the original site was located in close proximity to a wreck. As such, both the skipper and survey team agreed that no survey equipment could be deployed at the original site for Health and Safety reasons, as well as the potential risk of damage or loss of survey equipment.

3.1.2 EPIBENTHIC SURVEY

A total of 50 video and epibenthic trawl sites were identified across the Phase 1 area. Video trawls were undertaken at all 50 proposed sites. However, during the video trawls *Sabellaria* was initially identified at sites V3 and V7, therefore no epibenthic trawls were undertaken at these sites (Figure 2).

A complete survey log was maintained throughout all deployments and photographs taken of each sample (Appendix 1 & 2). Survey logs are documented in the Post Survey reports (ZBB776-PSv1-F-2012 to ZBB776-PSv4-F-2012)

3.1.3 SUPPORTING VIDEO FOOTAGE

Infaunal samples containing <5 litres of sediment were classed as being undersized. Where necessary 5 attempts were made at each site to collect an infaunal sample of adequate size, however undersized samples were retained from 24 of the 147 sites where infaunal samples were retained. Infaunal samples containing 4 to 5 litres were classed as acceptable, however at 16 sites the infaunal samples contained <4 litres. At these sites the VideoRay was deployed in order gain additional information on the nature of the sea bed and support the undersized grab samples.

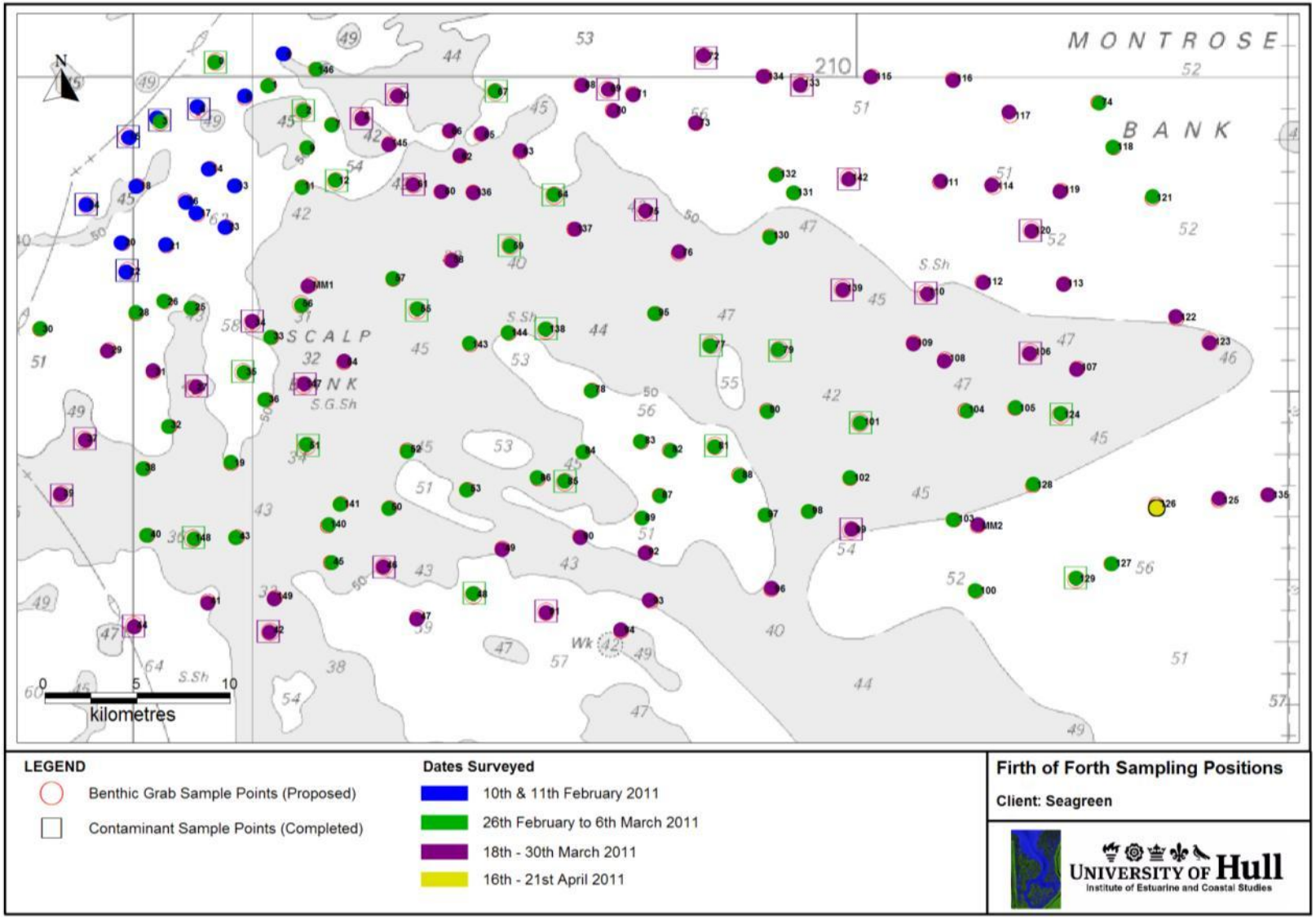


Figure 1. Proposed and actual benthic sample locations.

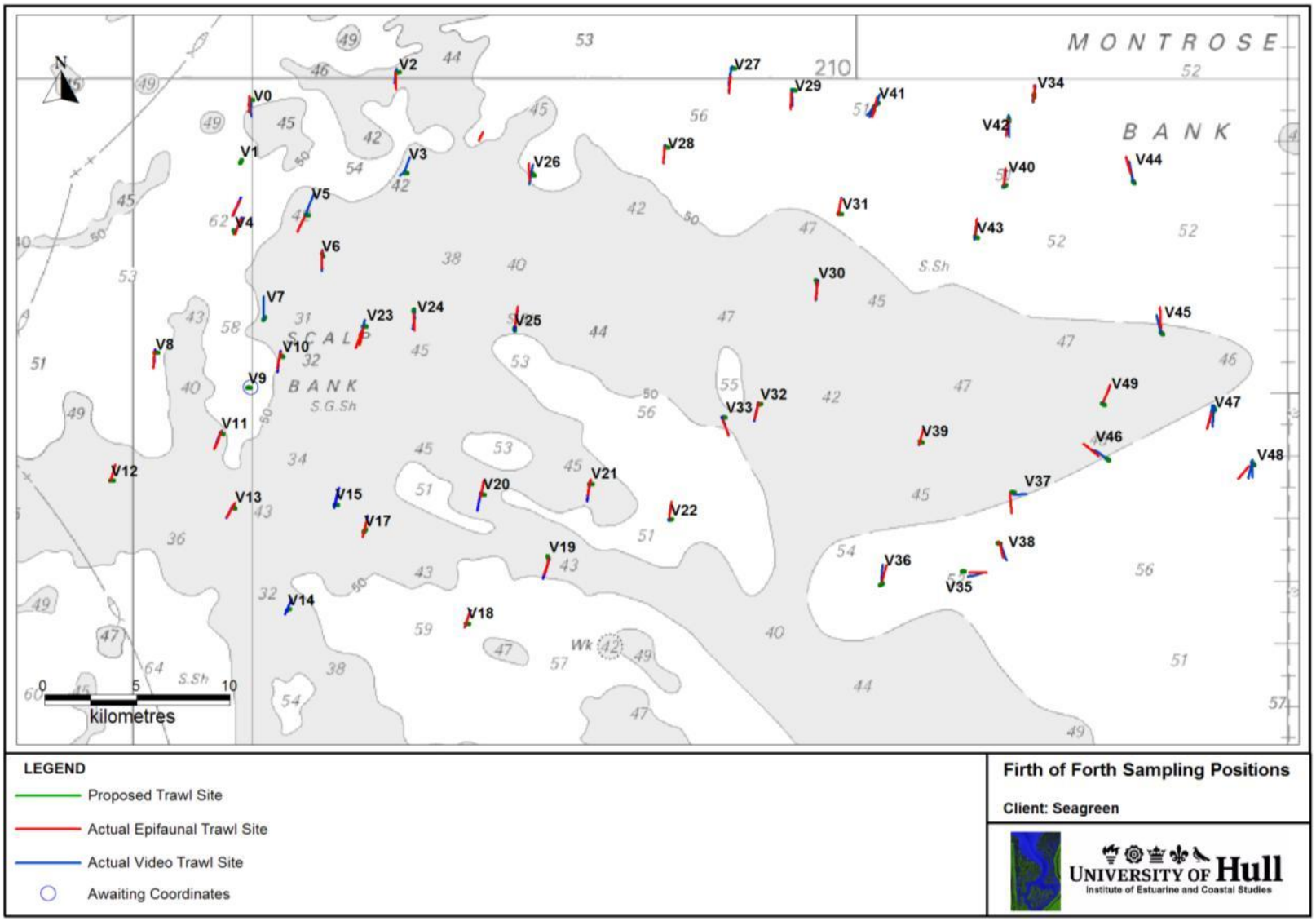


Figure 2. Proposed and actual video and epifaunal trawl locations.

3.2 Benthic Infaunal Data

Species diversity ranged from 11 to 141 species with an average of 54 species per sample. Abundance ranged from 20 to 939 individuals, with an average of 208, though 3 samples had 6,537, 8,560 and 9625 individuals, due to very high numbers of fish larvae and eggs.

The benthic infaunal dataset is not included within the appendix of this report, as it is too extensive. Therefore an electronic copy in excel format has been forwarded to Seagreen Wind Energy Ltd.

Two main community types across are evident across the Phase 1 area. The first, and most common community type recorded is associated with sandy mixed sediments resulting in low abundances and medium to high species diversity. The community is polychaete dominated in terms of abundance and diversity, and shares many species from the more sandy low diversity community. However, the mixed nature of the sediment allows encrusting fauna such as Hydroids, Bryozoans and Ascidians to flourish which also have their own associated fauna. Common species found from this community include the polychaetes *Pholoe spp.*, *Eulalia spp.*, *Eumida sanguinea*, *Glycera lapidum*, *Polydora spp.*, *Cirratulus cirratus, Pomatoceros triqueter*, *Hydroides norvegica*, *Ampharete lindstroemi*, *Polycirrus spp.*; the bivalves *Cochlodesma praetenue, Astarte montagui*, *Timoclea ovata*, *Dosinia exoleta*, *Hiatella arctica*; and the ascidian *Ascidiella scabra*.

The second community type is associated with sandy sediments resulting in low abundance and diversity values. Again this community is polychaete dominated though there is a higher proportion of Amphipoda and Bivalves. Common species found from this community include the polychaetes *Ophelia borealis*, *Chaetozone christiei*, *Spiophanes bombyx, Spio armata*, *Nephtys cirrosa*, the amphipod *Bathyporeia spp.*, and the bivalves *Abra prismatica*, *Cochlodesma praetenue*, *Moerella pygmaea* and *Spisula* spp. *Ammodytes spp.* is also present in a large number of these samples.

3.2.1 SPECIES OF CONSERVATION INTEREST

Species of conservation importance identified across the Phase 1 area include the reef forming species *Sabellaria spinulosa* and *Modiolus modiolus*, as well as the bivalve *Arctica islandica*. Both *S. Spinulosa* and *A. islandica* were identified in the OSPAR list of Threatened and/or Declining Species and Habitats (Region II - Greater North Sea) and have been identified at sites across the survey area (Figure 3). *A. islandica* was recorded at 22 sites, however only juveniles were found, with a maximum abundance of 4 specimens per 0.1m^2 grab sample. Abundance values for *S. spinulosa* range from 1 - 488 individuals per grab sample with small aggregations attached to pebbles. *M. modiolus* beds are listed as a habitat of conservation importance in the Priority Marine Features for Scottish territorial waters. However, only a single specimen has been recorded (site 103) and there has been no evidence of *M. modiolus* beds across the survey area.

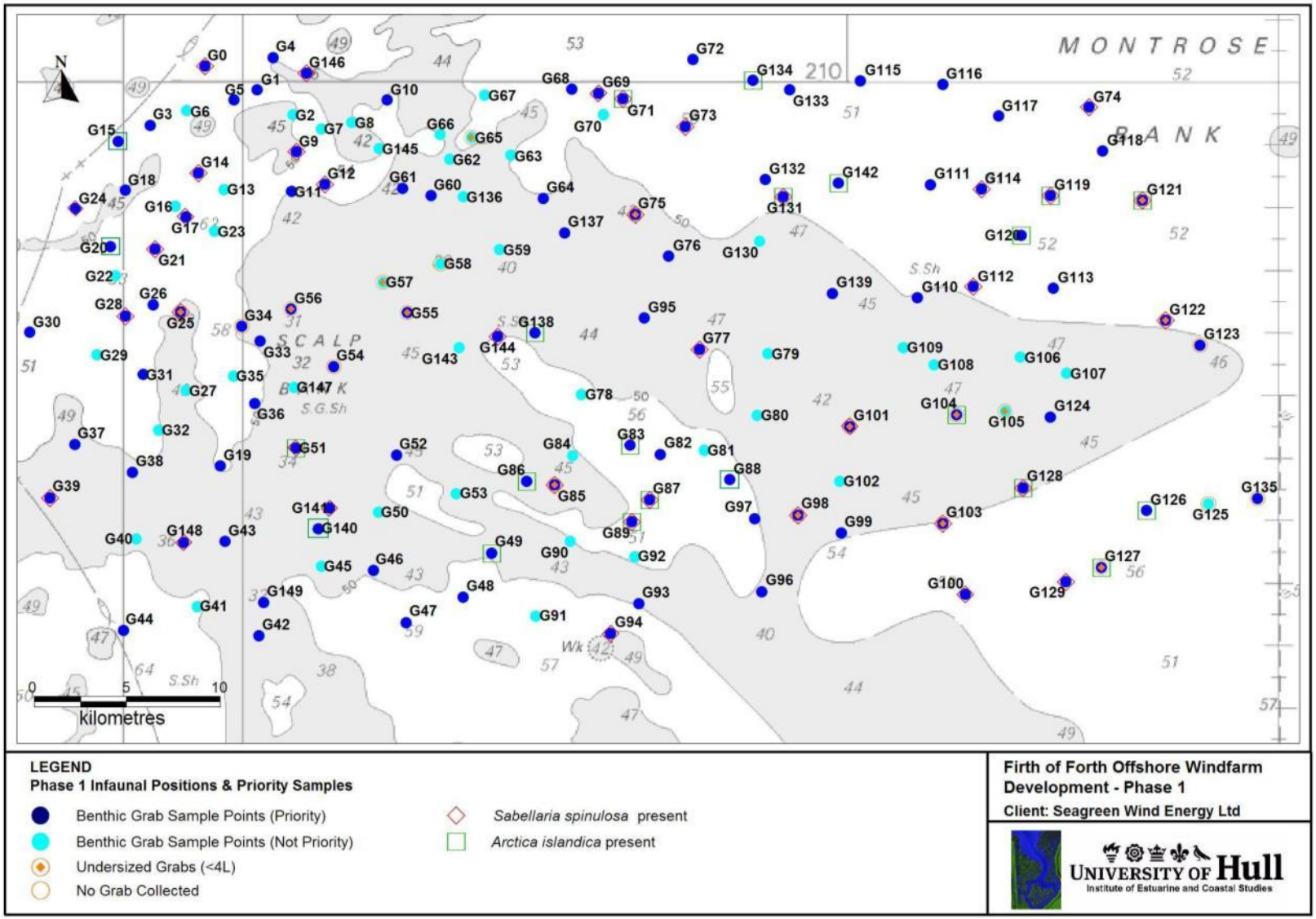


Figure 3. Species of conservation importance in the Phase 1 area.

3.3 Epibenthic Trawl Data

A diverse epifaunal community was recorded across the Phase 1 area with a total of 130 taxa identified within the epifaunal trawl samples. The most abundant taxa recorded included *Crangon allmanni*, *Pandalina brevirostris* and *Pandalus montagui* (shrimp), *Asterias rubens* (common starfish), *Ophiothrix fragilis* (common brittlestar) and *Galathea intermedia* (squat lobster). In terms of fish species the most abundant species were *Ammodytes* spp. (Sand eel), *Agonus cataphractus* (Pogge), *Limanda limanda* (Dab) and *Pomatoschistus lozanoi / norvegicus* (Lozano's goby / Norway goby). The full epibenthic dataset is provided in excel format.

A subsample of all fish species was retained and total length measurements recorded. All length measurements are provided in excel format.

3.4 Particle Size Analysis and Organic Content Data

Summarised statistics for Particle Size Analysis (PSA) and Organic Content (OC) are provided in Table 1. Full PSA data is provided in excel format. The Phase 1 area was dominated by sandy sediments containing varying degrees of gravel. Large boulders were occasionally recorded in sandy areas. The organic content of sediments collected was low, ranging from 0.20% to 2.49% with an average of 0.98%.

3.5 Sediment Contaminant Data

Sediment contaminant results are provided in Appendix 4.

Table 1. Particle Size Analysis and Organic Content Summary.

Site	Textural Group	Composition (%)			OC (%)	Descriptive Statistics (Folk and Ward Method) (µm)				Descriptive Statistics (Folk and Ward Method) (ø)			
		Gravel	Sand	Mud		Mean	Sorting	Skewness	Kurtosis	Mean	Sorting	Skewness	Kurtosis
G0	Gravelly Sand	14.6	78.0	7.4	0.81	392.8	4.623	0.265	2.127	1.348	2.209	-0.265	2.127
G1	Slightly Gravelly Sand	0.3	94.6	5.1	0.96	265.2	1.961	-0.191	1.603	1.915	0.972	0.191	1.603
G3	Slightly Gravelly Sand	0.2	90.1	9.7	0.88	185.2	2.099	-0.351	2.184	2.433	1.070	0.351	2.184
G4	Slightly Gravelly Sand	0.6	99.4	0.0	1.09	404.8	1.510	0.025	0.998	1.305	0.595	-0.025	0.998
G5	Slightly Gravelly Sand	1.6	97.1	1.3	1.22	311.7	1.859	0.189	1.228	1.682	0.894	-0.189	1.228
G9	Gravelly Sand	14.8	79.3	5.9	0.64	481.7	3.605	0.243	1.646	1.054	1.850	-0.243	1.646
G10	Gravelly Sand	10.1	89.9	0.0	1.05	469.9	2.367	0.376	1.360	1.090	1.243	-0.376	1.360
G11	Gravelly Sand	5.3	93.5	1.2	0.75	329.4	1.896	0.262	1.689	1.602	0.923	-0.262	1.689
G12	Gravelly Sand	8.3	83.6	8.1	0.72	335.2	3.179	-0.002	2.670	1.577	1.669	0.002	2.670
G14	Gravelly Sand	12.2	81.1	6.7	1.58	376.3	3.977	0.237	2.309	1.410	1.992	-0.237	2.309
G15	Slightly Gravelly Sand	3.1	91.0	5.9	1.31	266.1	2.392	-0.100	1.973	1.910	1.258	0.100	1.973
G17	Slightly Gravelly Sand	0.3	95.6	4.1	1.28	279.1	1.526	-0.064	1.028	1.841	0.610	0.064	1.028
G18	Slightly Gravelly Sand	1.1	98.9	0.0	1.32	332.6	1.480	0.054	1.015	1.588	0.565	-0.054	1.015
G19	Slightly Gravelly Sand	0.8	99.2	0.0	1.58	552.0	1.558	-0.078	0.882	0.857	0.639	0.078	0.882
G20	Slightly Gravelly Sand	0.2	99.8	0.0	1.21	314.6	1.448	0.037	0.977	1.669	0.534	-0.037	0.977
G21	Gravelly Sand	20.2	71.9	8.0	1.41	523.0	5.362	0.236	1.326	0.935	2.423	-0.236	1.326
G24	Gravelly Sand	7.7	89.5	2.8	1.37	314.8	2.328	0.339	1.551	1.667	1.219	-0.339	1.551
G25	Gravelly Sand	22.7	74.3	3.0	1.31	681.6	3.920	0.280	0.940	0.553	1.971	-0.280	0.940
G26	Slightly Gravelly Sand	2.6	91.8	5.6	1.29	303.1	2.138	-0.123	1.959	1.722	1.096	0.123	1.959
G28	Gravelly Muddy Sand	29.1	62.4	8.5	0.94	1083.5	8.681	0.239	1.157	-0.116	3.118	-0.239	1.157
G30	Slightly Gravelly Sand	0.5	99.5	0.0	0.99	344.2	1.521	0.046	0.962	1.539	0.605	-0.046	0.962
G31	Slightly Gravelly Sand	3.5	92.4	4.2	0.99	334.7	1.872	0.161	1.589	1.579	0.904	-0.161	1.589
G33	Slightly Gravelly Sand	0.8	99.2	0.0	1.85	466.9	1.622	-0.015	0.927	1.099	0.697	0.015	0.927
G34	Sandy Gravel	48.3	50.1	1.6	1.19	1999.6	6.726	0.154	0.634	-1.000	2.750	-0.154	0.634
G36	Slightly Gravelly Sand	1.3	97.5	1.3	1.29	337.4	1.682	0.070	1.102	1.567	0.750	-0.070	1.102
G37	Slightly Gravelly Sand	0.8	99.2	0.0	0.71	397.3	1.563	0.066	1.037	1.332	0.644	-0.066	1.037
G38	Gravelly Sand	12.6	87.4	0.0	0.83	459.1	2.897	0.546	2.912	1.123	1.535	-0.546	2.912
G39	Slightly Gravelly Muddy Sand	3.6	86.5	9.9	1.61	329.2	3.076	-0.162	2.101	1.603	1.621	0.162	2.101
G42	Sandy Gravel	41.7	57.1	1.2	0.69	1799.1	5.265	0.432	0.634	-0.847	2.396	-0.432	0.634
G43	Slightly Gravelly Sand	3.3	95.8	0.9	0.63	457.6	1.901	0.153	1.131	1.128	0.927	-0.153	1.131

Site	Textural Group	Composition (%)			OC (%)	Descriptive Statistics (Folk and Ward Method) (µm)				Descriptive Statistics (Folk and Ward Method) (ø)			
		Gravel	Sand	Mud		Mean	Sorting	Skewness	Kurtosis	Mean	Sorting	Skewness	Kurtosis
G44	Slightly Gravelly Sand	1.8	90.0	8.2	1.04	244.2	2.468	-0.194	1.827	2.034	1.303	0.194	1.827
G46	Slightly Gravelly Sand	2.9	94.1	3.0	0.56	293.3	1.597	0.042	1.132	1.770	0.675	-0.042	1.132
G47	Slightly Gravelly Sand	0.2	94.2	5.6	0.96	203.1	1.796	-0.286	1.912	2.300	0.845	0.286	1.912
G48	Slightly Gravelly Sand	0.3	91.9	7.8	0.94	209.8	1.992	-0.321	2.238	2.253	0.994	0.321	2.238
G49	Slightly Gravelly Sand	0.9	99.1	0.0	0.47	337.2	1.478	0.047	1.000	1.568	0.564	-0.047	1.000
G51	Slightly Gravelly Sand	1.0	99.0	0.0	1.30	395.5	1.561	0.071	1.053	1.338	0.642	-0.071	1.053
G52	Slightly Gravelly Sand	4.3	95.7	0.0	0.61	344.2	1.759	0.245	1.517	1.539	0.815	-0.245	1.517
G54	Sandy Gravel	40.7	54.6	4.7	1.68	1491.6	4.622	-0.017	1.048	-0.577	2.209	0.017	1.048
G55	Sandy Gravel	34.9	65.1	0.0	0.82	1655.4	6.055	0.625	0.642	-0.727	2.598	-0.625	0.642
G56	Sandy Gravel	56.9	39.0	4.1	2.37	2685.9	6.948	-0.127	0.846	-1.425	2.797	0.127	0.846
G60	Slightly Gravelly Sand	1.2	98.8	0.0	0.90	445.5	1.592	0.056	1.016	1.167	0.671	-0.056	1.016
G61	Slightly Gravelly Sand	0.4	99.6	0.0	0.77	419.1	1.448	0.056	0.972	1.255	0.534	-0.056	0.972
G64	Slightly Gravelly Sand	3.3	96.7	0.0	1.32	527.1	1.867	0.385	1.234	0.924	0.901	-0.385	1.234
G68	Slightly Gravelly Sand	1.9	98.1	0.0	0.72	460.6	1.641	0.022	0.973	1.119	0.714	-0.022	0.973
G69	Gravelly Sand	7.9	92.1	0.0	1.21	480.6	2.232	0.423	1.317	1.057	1.159	-0.423	1.317
G71	Slightly Gravelly Sand	2.2	94.3	3.5	0.49	333.2	1.788	0.072	1.231	1.585	0.838	-0.072	1.231
G72	Slightly Gravelly Sand	3.0	97.0	0.0	0.93	369.2	1.775	0.140	1.188	1.438	0.828	-0.140	1.188
G73	Gravelly Sand	9.9	81.9	8.2	1.25	387.0	3.818	0.048	1.874	1.369	1.933	-0.048	1.874
G74	Gravelly Sand	20.9	73.2	5.9	1.13	550.8	5.743	0.413	1.398	0.860	2.522	-0.413	1.398
G75	Sandy Gravel	52.8	46.2	1.1	1.82	3736.9	7.215	0.176	0.528	-1.902	2.851	-0.176	0.528
G76	Slightly Gravelly Sand	1.7	98.3	0.0	0.73	551.9	1.713	0.112	0.996	0.858	0.777	-0.112	0.996
G77	Sandy Gravel	54.0	43.9	2.1	2.49	3484.9	6.487	-0.058	0.604	-1.801	2.698	0.058	0.604
G82	Slightly Gravelly Sand	4.1	95.9	0.0	0.44	303.5	1.792	0.218	1.488	1.720	0.842	-0.218	1.488
G83	Gravelly Sand	25.2	74.8	0.0	0.38	1232.2	6.060	0.631	1.015	-0.301	2.599	-0.631	1.015
G85	Gravelly Sand	6.4	86.6	6.9	0.70	371.9	2.965	-0.049	1.792	1.427	1.568	0.049	1.792
G86	Slightly Gravelly Sand	2.8	97.2	0.0	0.57	393.1	1.605	0.096	1.092	1.347	0.682	-0.096	1.092
G87	Sandy Gravel	49.9	47.6	2.5	0.63	2197.6	7.616	0.062	0.549	-1.136	2.929	-0.062	0.549
G88	Slightly Gravelly Sand	2.9	97.1	0.0	0.24	286.9	1.656	0.227	1.596	1.802	0.728	-0.227	1.596
G89	Slightly Gravelly Sand	0.8	95.9	3.3	0.59	308.2	1.642	-0.010	1.012	1.698	0.715	0.010	1.012
G93	Gravelly Sand	5.1	94.9	0.0	0.20	303.2	1.841	0.284	1.779	1.721	0.881	-0.284	1.779
G94	Gravelly Sand	5.7	94.3	0.0	0.88	411.0	1.965	0.232	1.319	1.283	0.974	-0.232	1.319

Site	Textural Group	Composition (%)			OC (%)	Descriptive Statistics (Folk and Ward Method) (µm)				Descriptive Statistics (Folk and Ward Method) (ø)			
		Gravel	Sand	Mud		Mean	Sorting	Skewness	Kurtosis	Mean	Sorting	Skewness	Kurtosis
G95	Slightly Gravelly Sand	3.4	96.6	0.0	0.67	472.6	1.713	0.081	1.111	1.081	0.777	-0.081	1.111
G96	Slightly Gravelly Sand	2.9	92.1	5.0	0.69	279.2	2.048	0.164	1.638	1.840	1.035	-0.164	1.638
G97	Gravelly Sand	16.2	83.8	0.0	0.68	513.1	3.434	0.588	1.753	0.963	1.780	-0.588	1.753
G98	Slightly Gravelly Sand	0.8	97.5	1.6	0.74	289.7	1.602	0.036	1.018	1.788	0.680	-0.036	1.018
G99	Slightly Gravelly Sand	4.9	95.1	0.0	0.65	290.8	1.883	0.273	1.677	1.782	0.913	-0.273	1.677
G100	Gravelly Sand	5.4	89.2	5.4	0.92	344.8	2.522	-0.001	1.649	1.536	1.335	0.001	1.649
G101	Gravelly Sand	25.7	72.4	1.9	1.62	926.3	3.327	0.151	1.054	0.110	1.734	-0.151	1.054
G103	Sandy Gravel	41.7	56.3	2.0	0.91	1833.6	8.017	0.517	0.534	-0.875	3.003	-0.517	0.534
G104	Gravelly Sand	5.4	94.6	0.0	1.31	605.8	1.888	0.189	1.038	0.723	0.917	-0.189	1.038
G110	Slightly Gravelly Sand	2.1	97.9	0.0	1.01	306.1	1.780	0.177	1.190	1.708	0.832	-0.177	1.190
G111	Slightly Gravelly Sand	3.8	92.5	3.7	0.78	274.4	1.837	0.245	1.756	1.866	0.877	-0.245	1.756
G112	Gravelly Sand	19.8	76.0	4.2	1.25	741.0	4.081	-0.114	1.098	0.432	2.029	0.114	1.098
G113	Gravelly Sand	13.4	82.6	3.9	1.09	474.9	3.120	0.258	0.798	1.074	1.642	-0.258	0.798
G114	Gravelly Sand	19.9	77.3	2.9	1.20	548.1	3.363	0.314	0.748	0.867	1.750	-0.314	0.748
G115	Gravelly Sand	5.8	92.1	2.1	1.03	653.8	2.202	-0.060	0.879	0.613	1.139	0.060	0.879
G116	Slightly Gravelly Sand	4.1	95.9	0.0	0.62	350.5	1.908	0.267	1.411	1.512	0.932	-0.267	1.411
G117	Gravelly Sand	8.0	89.9	2.1	1.21	482.1	2.656	0.176	0.811	1.053	1.409	-0.176	0.811
G118	Slightly Gravelly Sand	0.3	99.7	0.0	0.62	345.1	1.608	0.086	1.008	1.535	0.685	-0.086	1.008
G119	Gravelly Sand	9.9	86.6	3.5	0.75	310.9	2.566	0.434	2.130	1.686	1.359	-0.434	2.130
G120	Slightly Gravelly Sand	1.0	99.0	0.0	0.66	273.2	1.540	0.052	1.025	1.872	0.623	-0.052	1.025
G121	Sandy Gravel	45.2	53.6	1.1	0.74	2068.5	3.611	0.121	1.122	-1.049	1.853	-0.121	1.122
G122	Gravelly Sand	11.9	85.1	3.0	0.85	396.2	3.374	0.551	1.961	1.336	1.755	-0.551	1.961
G123	Sandy Gravel	48.0	48.5	3.4	2.11	1587.2	4.475	-0.145	1.412	-0.666	2.162	0.145	1.412
G124	Gravelly Sand	13.7	86.3	0.0	0.38	501.6	2.914	0.429	0.918	0.995	1.543	-0.429	0.918
G126	Gravelly Sand	8.0	87.1	4.9	0.64	338.6	2.390	0.229	1.972	1.562	1.257	-0.229	1.972
G127	Slightly Gravelly Sand	0.5	99.5	0.0	0.69	255.4	1.545	0.044	0.979	1.969	0.628	-0.044	0.979
G128	Slightly Gravelly Sand	1.9	98.1	0.0	0.53	238.0	1.561	0.097	1.045	2.071	0.643	-0.097	1.045
G129	Gravelly Sand	16.6	79.1	4.3	0.44	721.3	2.932	0.018	1.042	0.471	1.552	-0.018	1.042
G131	Slightly Gravelly Sand	2.3	93.8	4.0	0.80	276.9	1.908	0.122	1.415	1.852	0.932	-0.122	1.415
G132	Gravelly Sand	19.2	80.8	0.0	0.78	626.5	3.603	0.582	1.170	0.675	1.849	-0.582	1.170
G133	Slightly Gravelly Sand	1.9	97.7	0.3	0.65	363.8	1.740	0.154	1.174	1.459	0.799	-0.154	1.174

Site	Textural Group	Composition (%)			OC (%)	Descriptive Statistics (Folk and Ward Method) (µm)				Descriptive Statistics (Folk and Ward Method) (ø)			
		Gravel	Sand	Mud		Mean	Sorting	Skewness	Kurtosis	Mean	Sorting	Skewness	Kurtosis
G134	Slightly Gravelly Sand	3.4	96.6	0.0	0.53	334.0	1.667	0.179	1.304	1.582	0.737	-0.179	1.304
G137	Slightly Gravelly Sand	2.2	97.8	0.0	0.72	466.3	1.606	0.167	1.159	1.101	0.684	-0.167	1.159
G138	Slightly Gravelly Sand	2.4	97.6	0.0	0.44	416.2	1.601	0.165	1.255	1.265	0.679	-0.165	1.255
G139	Slightly Gravelly Sand	4.5	95.5	0.0	0.69	612.4	1.980	0.059	0.975	0.708	0.985	-0.059	0.975
G140	Slightly Gravelly Sand	2.1	97.9	0.0	0.72	340.8	1.658	0.178	1.221	1.553	0.729	-0.178	1.221
G141	Gravelly Sand	9.2	86.3	4.5	1.36	431.7	2.549	0.309	1.453	1.212	1.350	-0.309	1.453
G142	Slightly Gravelly Sand	0.7	99.3	0.0	1.47	376.1	1.635	0.096	1.023	1.411	0.709	-0.096	1.023
G144	Gravelly Sand	9.2	90.8	0.0	1.28	430.8	2.198	0.413	1.635	1.215	1.136	-0.413	1.635
G146	Gravelly Sand	12.1	85.2	2.7	0.85	502.0	3.241	0.467	2.344	0.994	1.696	-0.467	2.344
G148	Muddy Sandy Gravel	52.7	41.8	5.5	1.69	2799.1	9.275	-0.150	0.663	-1.485	3.213	0.150	0.663
G149	Muddy Sandy Gravel	58.6	36.5	5.0	1.98	5218.3	9.269	-0.699	0.604	-2.384	3.212	0.699	0.604

APPENDIX 1. BENTHIC GRAB PHOTOGRAPHS

Infaunal Grab Sample No. 0

Contaminant Grab Sample No. 0

Infaunal Grab Sample No. 1

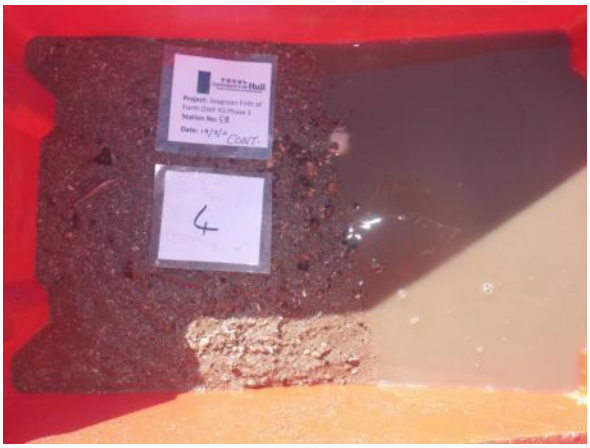
Infaunal Grab Sample No. 2

Contaminant Grab Sample No. 2

Infaunal Grab Sample No. 3

Infaunal Grab Sample No. 7

Infaunal Grab Sample No. 8



Contaminant Grab Sample No. 8

Infaunal Grab Sample No. 9

Infaunal Grab Sample No. 11

Infaunal Grab Sample No. 12

Contaminant Grab Sample No. 12

Infaunal Grab Sample No. 19

PSA Grab Sample No. 25

Infaunal Grab Sample No. 25

Infaunal Grab Sample No. 26

Infaunal Grab Sample No. 27

Contaminant Grab Sample No. 27

Infaunal Grab Sample No. 28

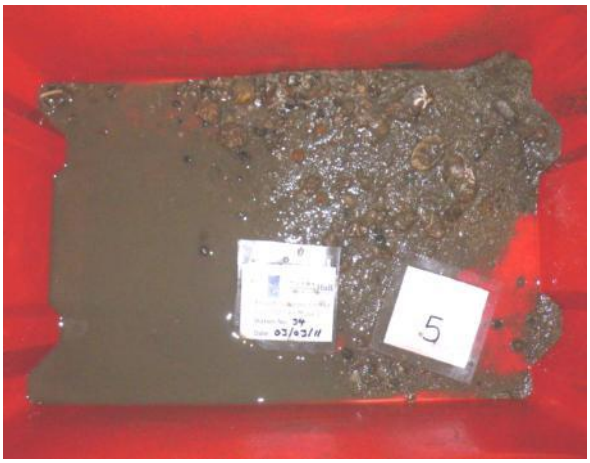
Infaunal Grab Sample No. 29

Infaunal Grab Sample No. 30

Infaunal Grab Sample No. 31

Infaunal Grab Sample No. 32

Infaunal Grab Sample No. 33

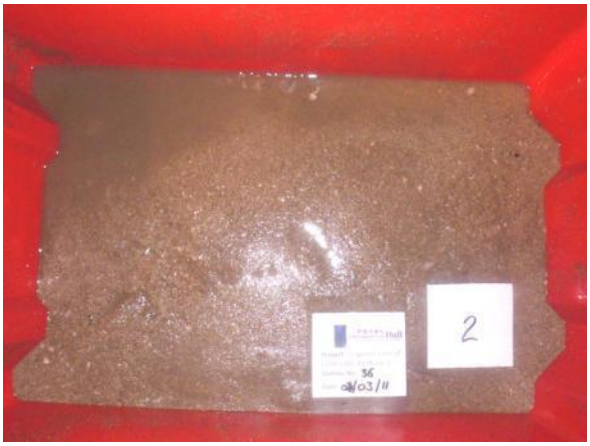


Contaminant Grab Sample No. 34

PSA Grab Sample No. 34

Infaunal Grab Sample No. 35

Contaminant Grab Sample No. 35



Infaunal Grab Sample No. 36

Infaunal Grab Sample No. 37

Contaminant Grab Sample No. 37

Infaunal Grab Sample No. 38

Infaunal Grab Sample No. 39

Contaminant Grab Sample No. 39

Infaunal Grab Sample No. 40

Infaunal Grab Sample No. 41

Infaunal Grab Sample No. 42

Contaminant Grab Sample No. 42

Infaunal Grab Sample No. 43

Infaunal Grab Sample No. 44

Contaminant Grab Sample No. 44

Infaunal Grab Sample No. 45

Infaunal Grab Sample No. 46

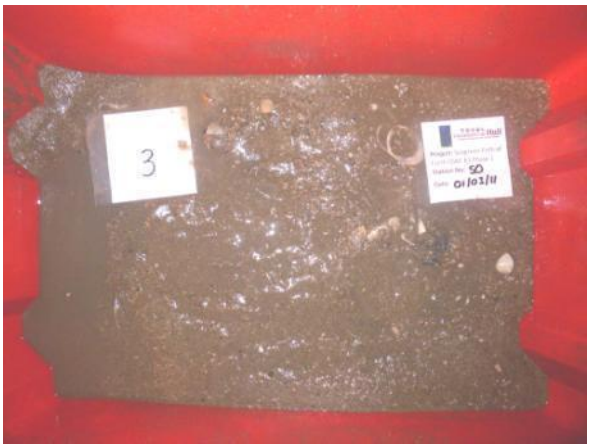
Contaminant Grab Sample No. 46

Infaunal Grab Sample No. 47

Infaunal Grab Sample No. 48

Contaminant Grab Sample No. 48

Infaunal Grab Sample No. 49



Infaunal Grab Sample No. 50

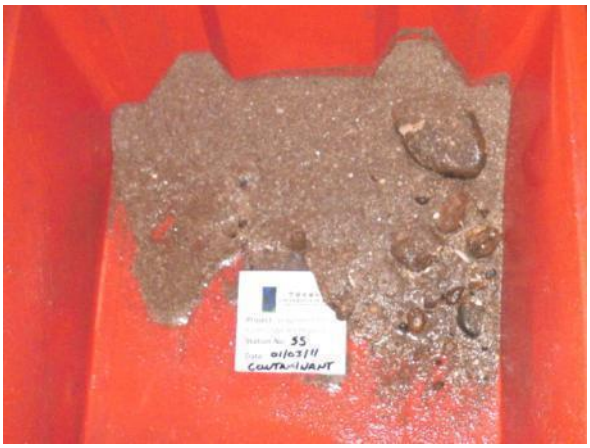
Infaunal Grab Sample No. 51

Contaminant Grab Sample No. 51

Infaunal Grab Sample No. 52

Infaunal Grab Sample No. 53

Infaunal Grab Sample No. 55



Contaminant Grab Sample No. 55

Infaunal Grab Sample No. 56

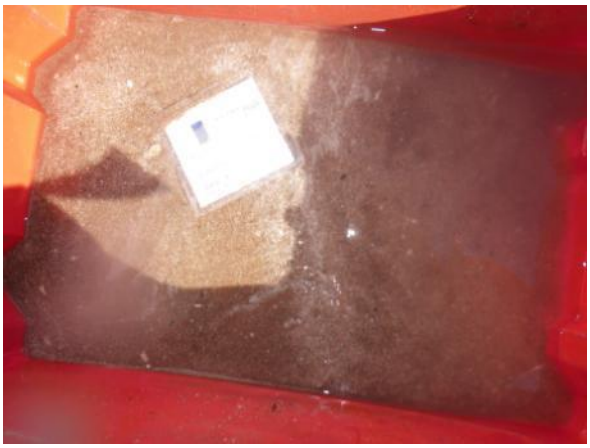
Infaunal Grab Sample No. 57

Infaunal Grab Sample No. 59

Contaminant Grab Sample No. 59

Infaunal Grab Sample No. 60

Infaunal Grab Sample No. 61



Contaminant Grab Sample No. 61

Infaunal Grab Sample No. 62

Infaunal Grab Sample No. 63

Infaunal Grab Sample No. 64

Contaminant Grab Sample No. 64

Infaunal Grab Sample No. 65

Infaunal Grab Sample No. 66

Infaunal Grab Sample No. 67

Contaminant Grab Sample No. 67

Infaunal Grab Sample No. 68

Infaunal Grab Sample No. 69

Contaminant Grab Sample No. 69

Infaunal Grab Sample No. 70

Infaunal Grab Sample No. 71

Infaunal Grab Sample No. 72

Infaunal Grab Sample No. 73

Infaunal Grab Sample No. 74

Infaunal Grab Sample No. 75

Contamination Grab Sample No. 75

Infaunal Grab Sample No. 76

Infaunal Grab Sample No. 77

Contaminant Grab Sample No. 77

Infaunal Grab Sample No. 78

Infaunal Grab Sample No. 79

Contaminant Grab Sample No. 79

Infaunal Grab Sample No. 80

Infaunal Grab Sample No. 81

Contaminant Grab Sample No. 81

Infaunal Grab Sample No. 82

Infaunal Grab Sample No. 83

Infaunal Grab Sample No. 84

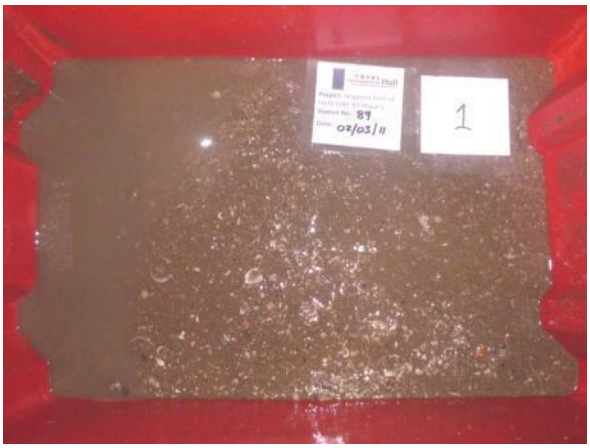
Infaunal Grab Sample No. 85

Contaminant Grab Sample No. 85

Infaunal Grab Sample No. 86

Infaunal Grab Sample No. 87

Infaunal Grab Sample No. 88



Infaunal Grab Sample No. 89

Infaunal Grab Sample No. 90

Infaunal Grab Sample No. 91

Contaminant Grab Sample No. 91

Infaunal Grab Sample No. 92

Infaunal Grab Sample No. 93

Infaunal Grab Sample No. 94

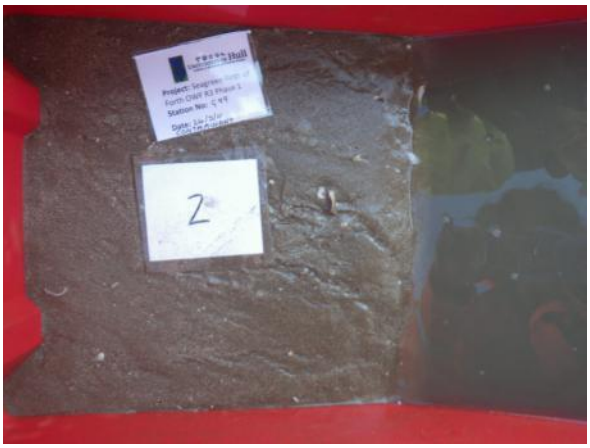
Infaunal Grab Sample No. 95

Infaunal Grab Sample No. 96

Infaunal Grab Sample No. 97

Infaunal Grab Sample No. 98

Infaunal Grab Sample No. 99



Contaminant Grab Sample No.99

Infaunal Grab Sample No. 100

Infaunal Grab Sample No. 101

Contaminant Grab Sample No. 101

Infaunal Grab Sample No. 102

Infaunal Grab Sample No. 103

Infaunal Grab Sample No. 104

Infaunal Grab Sample No. 105

Infaunal Grab Sample No. 106

Contaminant Grab Sample No. 106

Infaunal Grab Sample No. 107

Infaunal Grab Sample No. 108

Infaunal Grab Sample No. 109

Infaunal Grab Sample No. 110

Contaminant Grab Sample No. 110

Infaunal Grab Sample No. 111

Infaunal Grab Sample No. 112

Infaunal Grab Sample No. 113

Infaunal Grab Sample No. 114

Conaminant Grab Sample No. 114

Infaunal Grab Sample No. 115

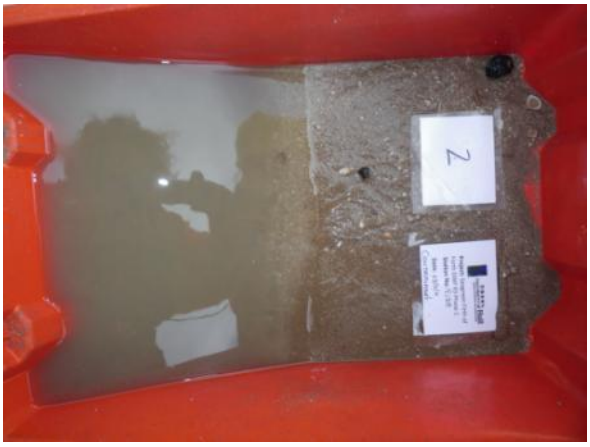
Infaunal Grab Sample No. 116

Infaunal Grab Sample No. 117

Infaunal Grab Sample No. 118

Infaunal Grab Sample No. 119

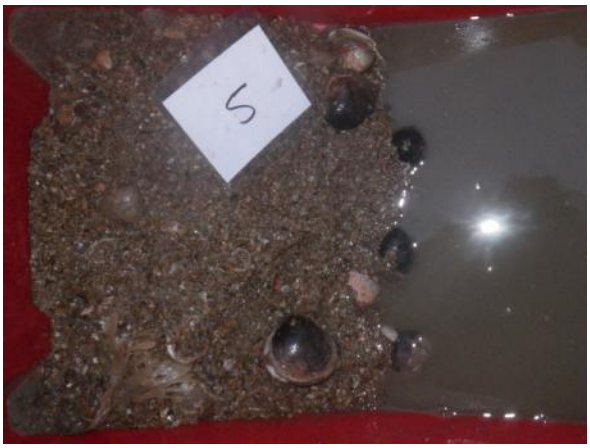
Infaunal Grab Sample No. 120



Contaminant Grab Sample No. 120

Infaunal Grab Sample No. 121

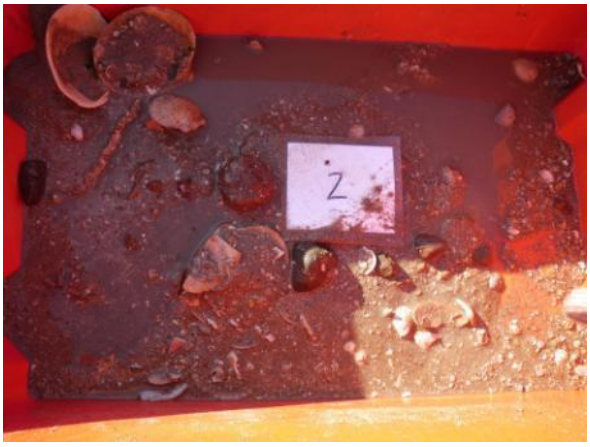
PSA Grab Sample No. 121



Infaunal Grab Sample No. 122

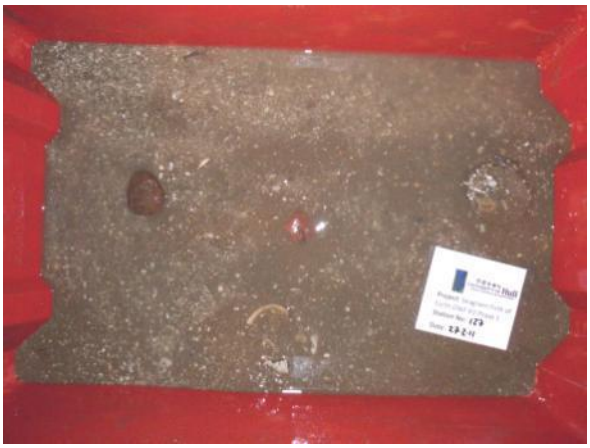
Infaunal Grab Sample No. 124

Contaminant Grab Sample No. 124



Infaunal Grab Sample No. 125

Infaunal Grab Sample No. 126



Infaunal Grab Sample No. 127

Infaunal Grab Sample No. 128

Infaunal Grab Sample No. 129

Contaminant Grab Sample No. 129

Infaunal Grab Sample No. 130

Infaunal Grab Sample No. 131

Infaunal Grab Sample No. 132

Infaunal Grab Sample No. 133

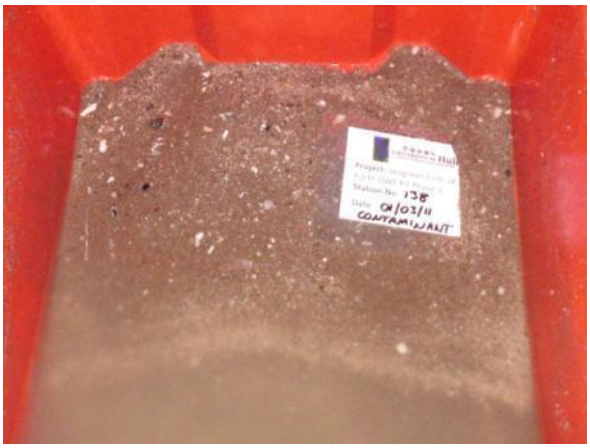
Contaminant Grab Sample No. 133

Infaunal Grab Sample No. 134

Infaunal Grab Sample No. 136

Infaunal Grab Sample No. 137

Infaunal Grab Sample No. 138



Contaminant Grab Sample No. 138

Infaunal Grab Sample No. 139

Contaminant Grab Sample No. 139

Infaunal Grab Sample No. 140

Infaunal Grab Sample No. 141

Infaunal Grab Sample No. 142

Contaminant Grab Sample No. 142

Infaunal Grab Sample No. 143

Infaunal Grab Sample No. 144

Infaunal Grab Sample No.145

Infaunal Grab Sample No. 146

Infaunal Grab Sample No. 147

Contamination Grab Sample No. 147

Infaunal Grab Sample No. 148

Contaminant Grab Sample No. 148

Infaunal Grab Sample No. 149

Infaunal Grab Sample No. MM1

Infaunal Grab Sample No. MM1 Phase 2

APPENDIX 2. EPIBENTHIC TRAWL PHOTOGRAPHS

Epibenthic Trawl Sample No. V0

Epibenthic Trawl Sample No. V1

Epibenthic Trawl Sample No. V2

Epibenthic Trawl Sample No. V4

Epibenthic Trawl Sample No. V5

Epibenthic Trawl Sample No. V6

Epibenthic Trawl Sample No. V8

Epibenthic Trawl Sample No. V9

Epibenthic Trawl Sample No. V10

Epibenthic Trawl Sample No. V11

Epibenthic Trawl Sample No. V12

Epibenthic Trawl Sample No. V13

Epibenthic Trawl Sample No. V15

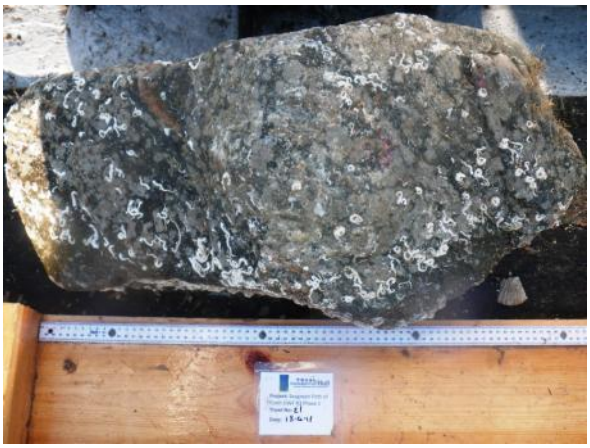
Epibenthic Trawl Sample No. V16

Epibenthic Trawl Sample No. V17

Epibenthic Trawl Sample No. V18

Epibenthic Trawl Sample No. V19

Epibenthic Trawl Sample No. V20



Epibenthic Trawl Sample No. V21

Epibenthic Trawl Sample No. V21

Epibenthic Trawl Sample No. V22

Epibenthic Trawl Sample No. V23

Epibenthic Trawl Sample No. V24

Epibenthic Trawl Sample No. V24

Epibenthic Trawl Sample No. V24

Epibenthic Trawl Sample No. V25

Epibenthic Trawl Sample No. V25

Epibenthic Trawl Sample No. V26

Epibenthic Trawl Sample No. V27

Epibenthic Trawl Sample No. V27

Epibenthic Trawl Sample No. V27

Epibenthic Trawl Sample No. V28

Epibenthic Trawl Sample No. V28

Epibenthic Trawl Sample No. V29

Epibenthic Trawl Sample No. V30

Epibenthic Trawl Sample No. V30

Epibenthic Trawl Sample No. V31

Epibenthic Trawl Sample No. V31

Epibenthic Trawl Sample No. V32

Epibenthic Trawl Sample No. V32

Epibenthic Trawl Sample No. V33

Epibenthic Trawl Sample No. V33

Epibenthic Trawl Sample No. V34

Epibenthic Trawl Sample No. V35

Epibenthic Trawl Sample No. V36

Epibenthic Trawl Sample No. V37

Epibenthic Trawl Sample No. V37

Epibenthic Trawl Sample No. V37

Epibenthic Trawl Sample No. V37

Epibenthic Trawl Sample No. V38

Epibenthic Trawl Sample No. V38

Epibenthic Trawl Sample No. V38

Epibenthic Trawl Sample No. V39

Epibenthic Trawl Sample No. V40

Epibenthic Trawl Sample No. V41

Epibenthic Trawl Sample No. V42

Epibenthic Trawl Sample No. V42

Epibenthic Trawl Sample No. V43

Epibenthic Trawl Sample No. V44

Epibenthic Trawl Sample No. V44

Epibenthic Trawl Sample No. V45

Epibenthic Trawl Sample No. V46

Epibenthic Trawl Sample No. V47

Epibenthic Trawl Sample No. V47

Epibenthic Trawl Sample No. V47

Epibenthic Trawl Sample No. V48

Epibenthic Trawl Sample No. V49

APPENDIX 3. VIDEO ANALYSIS RECORD SHEETS

Video analysis record sheets

Infaunal grab drop down video – G25

Video depth	51.3m
Sediment type	Mixed gravel and sand with occasional cobbles
Sediment image	

Infaunal grab drop down video – G34

Video depth	54.8m
Sediment type	Mixed gravel, sand and occasional cobbles
Sediment image	

Infaunal grab drop down video – G54

Video depth	Not recorded
Sediment type	Gravel, sand, cobbles and boulders Brittlestar bed
Sediment image	

Infaunal grab drop down video – G55

Video depth	46.8m
Sediment type	Rippled sand with some coarse shell
Sediment image	

Infaunal grab drop down video – G56

Video depth	35.1m
Sediment type	Matrix supported stony, cobbled sediment View partially obscured by dense brittlestars
Sediment image	

Infaunal grab drop down video – G57

Video depth	45.4m
Sediment type	Mixed sediment. Stony/gravel
Sediment image	

Infaunal grab drop down video – G58

Video depth	44m
Sediment type	Gravel and occasional cobbles
Sediment image	

Infaunal grab drop down video – G75

Video depth	42.9m
Sediment type	Sand, shell and gravel. Boulder with dense brittlestars.
Sediment image	

Infaunal grab drop down video – G85

Video depth	47.4m
Sediment type	Coarse gravel
Sediment image	

Infaunal grab drop down video – G98

Video depth	53.2m
Sediment type	Rippled sand and coarse shell with patchy gravelly sand
Sediment image	

Infaunal grab drop down video – G101

Video depth	42.6m
Sediment type	Changes from coarse gravel and pebbles (a) to mixed sand and gravel (b)
Sediment image	a:  b: 

Infaunal grab drop down video – G103

Video depth	46.7m
Sediment type	Gravel with sand (a) getting increasingly coarse with some cobbles (b)
Sediment image	 a:  b:

Infaunal grab drop down video – G104

Video depth	51m
Sediment type	Mixed gravel with sand
Sediment image	

Infaunal grab drop down video – G105

Video depth	53.3m
Sediment type	Mixed gravel, coarse shell and sand
Sediment image	

Infaunal grab drop down video – G114

Video depth	54m
Sediment type	Mixed gravel, sand and shell
Sediment image	

Infaunal grab drop down video – G121

Video depth	51.4m
Sediment type	Mixed gravel, sand and shell
Sediment image	

Infaunal grab drop down video – G122

Video depth	56.6m
Sediment type	Sand, coarse shell and gravel
Sediment image	

Infaunal grab drop down video – G123

Video depth	49.7m
Sediment type	Mixed sand, gravel and shell (a) with an increasing gravel fraction (b)
Sediment image	 a:  b:

Infaunal grab drop down video – G125

Video depth	53.7m
Sediment type	Rippled sand with some shell and gravel
Sediment image	

Infaunal grab drop down video – G127

Video depth	57.2m
Sediment type	Rippled sand with some coarse shell and gravel
Sediment image	

Infaunal grab drop down video – G135

Video depth	55.9m
Sediment type	Rippled sand with some coarse shell and gravel
Sediment image	

Infaunal grab drop down video – MM2

Video depth	46.3m
Sediment type	Coarse gravel and pebbles with some sandier patches
Sediment image	

APPENDIX 4. SEDIMENT CONTAMINATION REPORT

This Page Left Blank Intentionally

ALcontrol Laboratories

Unit 7-8 Hawarden Business Park
Manor Road (off Manor Lane)
Hawarden
Deeside
CH5 3US
Tel: (01244) 528700
Fax: (01244) 528701
email: mkt@alcontrol.com
Website: www.alcontrol.com

University of Hull
Department of Geography
University of Hull
Cottingham Road
Hull
South Yorkshire
HU6 7RX

Attention: Ann Leighton

CERTIFICATE OF ANALYSIS

Date:	21 March 2011
Customer:	H_UNIHULL_HUL
Sample Delivery Group (SDG):	110215-30
Your Reference:	ZBB 776
Location:	Sea Green
Report No:	121410

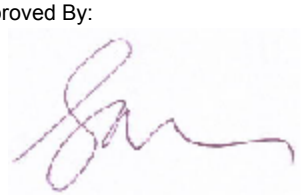
We received 5 samples on Tuesday February 15, 2011 and 5 of these samples were scheduled for analysis which was completed on Monday March 21, 2011. Accredited laboratory tests are defined within the report, but opinions, interpretations and on-site data expressed herein are outside the scope of ISO 17025 accreditation.

Should this report require incorporation into client reports, it must be used in its entirety and not simply with the data sections alone.

All chemical testing (unless subcontracted) is performed at ALcontrol Hawarden Laboratories.

Asbestos testing - we are not accredited for screening soil samples for asbestos fibres. We are only accredited to identify asbestos fibres in bulk material (ACM).

Approved By:



Sonia McWhan

Operations Manager

GROUP

This Page Left Blank Intentionally

CERTIFICATE OF ANALYSIS

SDG:	110215-30	**Location:**	Sea Green	**Order Number:**	FJ023335
Job:	H_UNIHULL_HUL-5	**Customer:**	University of Hull	**Report Number:**	121410
Client Reference:	ZBB 776	**Attention:**	Ann Leighton	**Superseded Report:**	

Received Sample Overview

Lab Sample No(s)	Customer Sample Ref.	AGS Ref.	Depth (m)	Sampled Date
2871958	G15		64.80	10/02/2011
2871954	G22		54.30	11/02/2011
2871955	G24		59.00	11/02/2011
2871956	G3		75.00	10/02/2011
2871957	G6		62.30	10/02/2011

Only received samples which have had analysis scheduled will be shown on the following pages.

CERTIFICATE OF ANALYSIS

SDG:	110215-30	**Location:**	Sea Green	**Order Number:**	FJ023335
Job:	H_UNIHULL_HUL-5	**Customer:**	University of Hull	**Report Number:**	121410
Client Reference:	ZBB 776	**Attention:**	Ann Leighton	**Superseded Report:**	

SOLID

Results Legend

X **Test**

N **No Determination Possible**

			Lab Sample No(s)	Customer Sample Reference	AGS Reference	Depth (m)	Container
			2871956	G3		75.00	250g Amber Jar
			2871956	G3		75.00	60g VOC
			2871957	G6		62.30	250g Amber Jar
			2871957	G6		62.30	60g VOC
			2871958	G15		64.80	250g Amber Jar
			2871958	G15		64.80	60g VOC
			2871954	G22		54.30	250g Amber Jar
			2871954	G22		54.30	60g VOC
			2871955	G24		59.00	250g Amber Jar
			2871955	G24		59.00	60g VOC
EPH by FID	All	NDPs: 0 Tests: 5	X		X		X		X		X	
GRO by GC-FID (S)	All	NDPs: 0 Tests: 5		X		X		X		X		X
Metals by iCap-OES (Soil)	Arsenic	NDPs: 0 Tests: 5	X		X		X		X		X	
	Cadmium	NDPs: 0 Tests: 5	X		X		X		X		X	
	Chromium	NDPs: 0 Tests: 5	X		X		X		X		X	
	Copper	NDPs: 0 Tests: 5	X		X		X		X		X	
	Lead	NDPs: 0 Tests: 5	X		X		X		X		X	
	Mercury	NDPs: 0 Tests: 5	X		X		X		X		X	
	Nickel	NDPs: 0 Tests: 5	X		X		X		X		X	
	Selenium	NDPs: 0 Tests: 5	X		X		X		X		X	
	Zinc	NDPs: 0 Tests: 5	X		X		X		X		X	
Organotins on soils*	All	NDPs: 0 Tests: 5	X		X		X		X		X	
PAH by GCMS	All	NDPs: 0 Tests: 5	X		X		X		X		X	
PCBs by GCMS	All	NDPs: 0 Tests: 5	X		X		X		X		X	
Sample description	All	NDPs: 0 Tests: 5	X		X		X		X		X	

CERTIFICATE OF ANALYSIS

SDG:	110215-30	**Location:**	Sea Green	**Order Number:**	FJ023335
Job:	H_UNIHULL_HUL-5	**Customer:**	University of Hull	**Report Number:**	121410
Client Reference:	ZBB 776	**Attention:**	Ann Leighton	**Superseded Report:**	

Sample Descriptions

Grain Sizes

very fine	<0.063mm	fine	0.063mm - 0.1mm	medium	0.1mm - 2mm	coarse	2mm - 10mm	very coarse	>10mm

Lab Sample No(s)	Customer Sample Ref.	Depth (m)	Colour	Description	Grain size	Inclusions	Inclusions 2
2871956	G3	75.00	Dark Brown	Sand	0.1 - 2 mm	None	None
2871957	G6	62.30	Dark Brown	Sand	0.1 - 2 mm	None	None
2871958	G15	64.80	Dark Brown	Sand	0.1 - 2 mm	None	None
2871954	G22	54.30	Dark Brown	Sand	0.1 - 2 mm	Stones	None
2871955	G24	59.00	Dark Brown	Sand	0.1 - 2 mm	None	None

These descriptions are only intended to act as a cross check if sample identities are questioned, and to provide a log of sample matrices with respect to MCERTS validation. They are not intended as full geological descriptions.

We are accredited to MCERTS for sand, clay and loam/topsoil, or any of these materials - whether these are derived from naturally ocurring soil profiles, or from fill/made ground, as long as these materials constitute the major part of the sample.

Other coarse granular materials such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.

CERTIFICATE OF ANALYSIS

SDG:	110215-30	**Location:**	Sea Green	**Order Number:**	FJ023335
Job:	H_UNIHULL_HUL-5	**Customer:**	University of Hull	**Report Number:**	121410
Client Reference:	ZBB 776	**Attention:**	Ann Leighton	**Superseded Report:**	

Results Legend

#	ISO17025 accredited.
M	*m*CERTS accredited.
§	Non-conforming work.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	subcontracted test.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of the individual compounds within the samples are not corrected for this recovery.

Component	LOD/Units	Method	Customer Sample R	G3	G6	G15	G22	G24
			Depth (m)	75.00	62.30	64.80	54.30	59.00
			Sample Type	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid
			Date Sampled	10/02/2011	10/02/2011	10/02/2011	11/02/2011	11/02/2011
			Date Received	15/02/2011	15/02/2011	15/02/2011	15/02/2011	15/02/2011
			SDG Ref	110215-30	110215-30	110215-30	110215-30	110215-30
			Lab Sample No.(s)	2871956	2871957	2871958	2871954	2871955
			AGS Reference					
EPH Surrogate % recovery**	%	TM061		102 M	97.7 M	108 M	104 M	103 M
EPH Range >C10 - C40	<35 mg/kg	TM061		49.7 M	53.5 M	47.6 M	38.4 M	52.4 M
PCB congener 28	<3 µg/kg	TM168		<3 M	<3 M	<3 M	<3 M	<3 M
PCB congener 52	<3 µg/kg	TM168		<3 M	<3 M	<3 M	<3 M	<3 M
PCB congener 101	<3 µg/kg	TM168		<3 M	<3 M	<3 M	<3 M	<3 M
PCB congener 118	<3 µg/kg	TM168		<3 M	<3 M	<3 M	<3 M	<3 M
PCB congener 138	<3 µg/kg	TM168		<3 M	<3 M	<3 M	<3 M	<3 M
PCB congener 153	<3 µg/kg	TM168		<3 M	<3 M	<3 M	<3 M	<3 M
PCB congener 180	<3 µg/kg	TM168		<3 M	<3 M	<3 M	<3 M	<3 M
PCBs, Total ICES 7	<3 µg/kg	TM168		<3	<3	<3	<3	<3
PCB congener 105	<3 µg/kg	TM168		<3 M	<3 M	<3 M	<3 M	<3 M
PCB congener 156	<3 µg/kg	TM168		<3 M	<3 M	<3 M	<3 M	<3 M
Arsenic	<0.6 mg/kg	TM181		5.24 M	6.78 M	5.99 M	14 M	10.7 M
Cadmium	<0.02 mg/kg	TM181		<0.02 M	<0.02 M	<0.02 M	<0.02 M	<0.02 M
Chromium	<0.9 mg/kg	TM181		15 M	13.8 M	15.4 M	13.6 M	13.3 M
Copper	<1.4 mg/kg	TM181		1.74 M	7.98 M	7.41 M	2.38 M	3.74 M
Lead	<0.7 mg/kg	TM181		5.23 M	5.33 M	5.96 M	10.5 M	12.2 M
Mercury	<0.14 mg/kg	TM181		<0.14 M	<0.14 M	<0.14 M	<0.14 M	<0.14 M
Nickel	<0.2 mg/kg	TM181		5.08 M	12.7 M	16.4 M	5.92 M	7.33 M
Selenium	<1 mg/kg	TM181		<1 #	<1 #	<1 #	<1 #	<1 #
Zinc	<1.9 mg/kg	TM181		20.1 M	21.8 M	21.1 M	18.5 M	21.7 M

CERTIFICATE OF ANALYSIS

SDG:	110215-30	**Location:**	Sea Green	**Order Number:**	FJ023335
Job:	H_UNIHULL_HUL-5	**Customer:**	University of Hull	**Report Number:**	121410
Client Reference:	ZBB 776	**Attention:**	Ann Leighton	**Superseded Report:**	

GRO by GC-FID (S)

Results Legend

#	ISO17025 accredited.
M	*m*CERTS accredited.
§	Non-conforming work.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	subcontracted test.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of the individual compounds within the samples are not corrected for this recovery.

Component	LOD/Units	Method	Customer Sample R	G3	G6	G15	G22	G24
			Depth (m)	75.00	62.30	64.80	54.30	59.00
			Sample Type	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid
			Date Sampled	10/02/2011	10/02/2011	10/02/2011	11/02/2011	11/02/2011
			Date Received	15/02/2011	15/02/2011	15/02/2011	15/02/2011	15/02/2011
			SDG Ref	110215-30	110215-30	110215-30	110215-30	110215-30
			Lab Sample No.(s)	2871956	2871957	2871958	2871954	2871955
			AGS Reference					
GRO >C5-C12	<44 µg/kg	TM089		<44	<44	<44	<44	<44
Methyl tertiary butyl ether (MTBE)	<5 µg/kg	TM089		<5 #	<5 #	<5 #	<5 #	<5 #
Benzene	<10 µg/kg	TM089		<10 M	<10 M	<10 M	<10 M	<10 M
Toluene	<2 µg/kg	TM089		<2 M	<2 M	<2 M	<2 M	<2 M
Ethylbenzene	<3 µg/kg	TM089		<3 M	<3 M	<3 M	<3 M	<3 M
m,p-Xylene	<6 µg/kg	TM089		<6 M	<6 M	<6 M	<6 M	<6 M
o-Xylene	<3 µg/kg	TM089		<3 M	<3 M	<3 M	<3 M	<3 M
m,p,o-Xylene	<10 µg/kg	TM089		<10	<10	<10	<10	<10
BTEX, Total	<10 µg/kg	TM089		<10	<10	<10	<10	<10

CERTIFICATE OF ANALYSIS

SDG:	110215-30	**Location:**	Sea Green	**Order Number:**	FJ023335
Job:	H_UNIHULL_HUL-5	**Customer:**	University of Hull	**Report Number:**	121410
Client Reference:	ZBB 776	**Attention:**	Ann Leighton	**Superseded Report:**	

Organotins on soils*

Results Legend

#	ISO17025 accredited.
M	*m*CERTS accredited.
§	Non-conforming work.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	subcontracted test.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of the individual compounds within the samples are not corrected for this recovery.

Component	LOD/Units	Method	Customer Sample R	G3	G6	G15	G22	G24
			Depth (m)	75.00	62.30	64.80	54.30	59.00
			Sample Type	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid
			Date Sampled	10/02/2011	10/02/2011	10/02/2011	11/02/2011	11/02/2011
			Date Received	15/02/2011	15/02/2011	15/02/2011	15/02/2011	15/02/2011
			SDG Ref	110215-30	110215-30	110215-30	110215-30	110215-30
			Lab Sample No.(s)	2871956	2871957	2871958	2871954	2871955
			AGS Reference					
Tributyl tin*	<0.02 mg/kg	SUB		<0.02	<0.02	<0.02	<0.02	<0.02
Triphenyl tin*	<0.05 mg/kg	SUB		<0.05	<0.05	<0.05	<0.05	<0.05
Dibutyl tin*	<0.02 mg/kg	SUB		<0.02	<0.02	<0.02	<0.02	<0.02
Tetrabutyl tin*	<0.02 mg/kg	SUB		<0.02	<0.02	<0.02	<0.02	<0.02

CERTIFICATE OF ANALYSIS

SDG:	110215-30	**Location:**	Sea Green	**Order Number:**	FJ023335
Job:	H_UNIHULL_HUL-5	**Customer:**	University of Hull	**Report Number:**	121410
Client Reference:	ZBB 776	**Attention:**	Ann Leighton	**Superseded Report:**	

PAH by GCMS

Results Legend

#	ISO17025 accredited.
M	*m*CERTS accredited.
§	Non-conforming work.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	subcontracted test.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of the individual compounds within the samples are not corrected for this recovery.

Component	LOD/Units	Method	Customer Sample R	G3	G6	G15	G22	G24
			Depth (m)	75.00	62.30	64.80	54.30	59.00
			Sample Type	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid
			Date Sampled	10/02/2011	10/02/2011	10/02/2011	11/02/2011	11/02/2011
			Date Received	15/02/2011	15/02/2011	15/02/2011	15/02/2011	15/02/2011
			SDG Ref	110215-30	110215-30	110215-30	110215-30	110215-30
			Lab Sample No.(s)	2871956	2871957	2871958	2871954	2871955
			AGS Reference					
Naphthalene-d8 % recovery**	%	TM218		114	113	113	113	104
Acenaphthene-d10 % recovery**	%	TM218		114	112	113	112	102
Phenanthrene-d10 % recovery**	%	TM218		111	109	110	110	99.1
Chrysene-d12 % recovery**	%	TM218		111	109	109	110	99.2
Perylene-d12 % recovery**	%	TM218		113	111	110	113	98.9
Naphthalene	<9 µg/kg	TM218		<9 M	<9 M	<9 M	<9 M	14.6 M
Acenaphthylene	<12 µg/kg	TM218		<12 M	<12 M	<12 M	<12 M	<12 M
Acenaphthene	<8 µg/kg	TM218		<8 M	<8 M	<8 M	<8 M	<8 M
Fluorene	<10 µg/kg	TM218		<10 M	<10 M	<10 M	<10 M	<10 M
Phenanthrene	<15 µg/kg	TM218		<15 M	<15 M	<15 M	<15 M	<15 M
Anthracene	<16 µg/kg	TM218		<16 M	<16 M	<16 M	<16 M	<16 M
Fluoranthene	<17 µg/kg	TM218		<17 M	<17 M	<17 M	<17 M	<17 M
Pyrene	<15 µg/kg	TM218		<15 M	<15 M	<15 M	<15 M	<15 M
Benz(a)anthracene	<14 µg/kg	TM218		<14 M	<14 M	<14 M	<14 M	<14 M
Chrysene	<10 µg/kg	TM218		<10 M	<10 M	<10 M	<10 M	<10 M
Benzo(b)fluoranthene	<15 µg/kg	TM218		<15 M	<15 M	<15 M	<15 M	<15 M
Benzo(k)fluoranthene	<14 µg/kg	TM218		<14 M	<14 M	<14 M	<14 M	<14 M
Benzo(a)pyrene	<15 µg/kg	TM218		<15 M	<15 M	<15 M	<15 M	<15 M
Indeno(1,2,3-cd)pyrene	<18 µg/kg	TM218		<18 M	<18 M	<18 M	<18 M	<18 M
Dibenzo(a,h)anthracene	<23 µg/kg	TM218		<23 M	<23 M	<23 M	<23 M	<23 M
Benzo(g,h,i)perylene	<24 µg/kg	TM218		<24 M	<24 M	<24 M	<24 M	<24 M
Polyaromatic hydrocarbons, Total	<118 µg/kg	TM218		<118 M	<118 M	<118 M	<118 M	<118 M

CERTIFICATE OF ANALYSIS

SDG:	110215-30	**Location:**	Sea Green	**Order Number:**	FJ023335
Job:	H_UNIHULL_HUL-5	**Customer:**	University of Hull	**Report Number:**	121410
Client Reference:	ZBB 776	**Attention:**	Ann Leighton	**Superseded Report:**	

Extractable Petroleum Hydrocarbons (EPH) By GC-FID

EPH (DRO) (C10-C40)

Sample No	Customer Sample Ref.	Depth	Matrix (mg/kg)	EPH	Interpretation
3047439	G15	64.80	SOLID	47.6	No Identification Possible
3091095	G6	62.30	SOLID	53.5	No Identification Possible
3091135	G3	75.00	SOLID	49.7	No Identification Possible
3091146	G24	59.00	SOLID	52.4	PAHS
3091160	G22	54.30	SOLID	38.4	No Identification Possible

Extractable Petroleum Hydrocarbons (formally Diesel Range Organics) :- Any compound extractable in n-hexane within the carbon range C10-C40, includes Aliphatic (Min Oil), Aromatic (PAHs) and naturally occurring compounds.

CERTIFICATE OF ANALYSIS

SDG:	110215-30	**Location:**	Sea Green	**Order Number:**	FJ023335
Job:	H_UNIHULL_HUL-5	**Customer:**	University of Hull	**Report Number:**	121410
Client Reference:	ZBB 776	**Attention:**	Ann Leighton	**Superseded Report:**	

Table of Results - Appendix

REPORT KEY

Results expressed as (e.g.) 1.03E-07 is equivalent to 1.03x10-7

NDP	No Determination Possible	#	ISO 17025 Accredited	*	Subcontracted Test	M	MCERTS Accredited
NFD	No Fibres Detected	PFD	Possible Fibres Detected	»	Result previously reported (Incremental reports only)	EC	Equivalent Carbon (Aromatics C8-C35)

Note: Method detection limits are not always achievable due to various circumstances beyond our control

Method No	Reference	Description	Wet/Dry Sample [1]	Surrogate Corrected
PM001		Preparation of Samples for Metals Analysis		
PM024	Modified BS 1377	Soil preparation including homogenisation, moisture screens of soils for Asbestos Containing Material		
SUB		Subcontracted Test		
TM061	Method for the Determination of EPH,Massachusetts Dept.of EP, 1998	Determination of Extractable Petroleum Hydrocarbons by GC-FID (C10-C40)		
TM089	Modified: US EPA Methods 8020 & 602	Determination of Gasoline Range Hydrocarbons (GRO) and BTEX (MTBE) compounds by Headspace GC-FID (C4-C12)		
TM168	EPA Method 8082, Polychlorinated Biphenyls by Gas Chromatography	Determination of WHO12 and EC7 Polychlorinated Biphenyl Congeners by GC-MS in Soils		
TM181	US EPA Method 6010B	Determination of Routine Metals in Soil by iCap 6500 Duo ICP-OES		
TM218	Microwave extraction – EPA method 3546	Microwave extraction - EPA method 3546		

[1] Applies to Solid samples only. DRY indicates samples have been dried at 35°C. NA = not applicable.

CERTIFICATE OF ANALYSIS

SDG:	110215-30	**Location:**	Sea Green	**Order Number:**	FJ023335
Job:	H_UNIHULL_HUL-5	**Customer:**	University of Hull	**Report Number:**	121410
Client Reference:	ZBB 776	**Attention:**	Ann Leighton	**Superseded Report:**	

Test Completion Dates

Lab Sample No(s)	2871956	2871957	2871958	2871954	2871955
Customer Sample Ref.	G3	G6	G15	G22	G24
AGS Ref.					
Depth	75.00	62.30	64.80	54.30	59.00
Type	SOLID	SOLID	SOLID	SOLID	SOLID
EPH by FID	17-Mar-2011	17-Mar-2011	16-Mar-2011	17-Mar-2011	17-Mar-2011
GRO by GC-FID (S)	16-Mar-2011	16-Mar-2011	16-Mar-2011	16-Mar-2011	16-Mar-2011
Metals by iCap-OES (Soil)	11-Mar-2011	11-Mar-2011	11-Mar-2011	11-Mar-2011	11-Mar-2011
Organotins on soils*	21-Mar-2011	21-Mar-2011	21-Mar-2011	21-Mar-2011	21-Mar-2011
PAH by GCMS	16-Mar-2011	16-Mar-2011	16-Mar-2011	16-Mar-2011	14-Mar-2011
PCBs by GCMS	12-Mar-2011	13-Mar-2011	13-Mar-2011	12-Mar-2011	12-Mar-2011
Sample description	09-Mar-2011	09-Mar-2011	09-Mar-2011	09-Mar-2011	09-Mar-2011

RPS Mountainheath

2 Shaftesbury Industrial Centre, Icknield Way, Letchworth, Hertfordshire SG6 1HE

T +44 (0)1462 480400 **F** +44 (0)1462 480403 **E** rpsmh@rpsgroup.com **W** www.mountainheath.com

Analytical Report

ALcontrol Hawarden
Unit7-8, Hawarden Business Park
Manor Road (off Manor Lane)
Hawarden, Deeside
Flintshire, CH5 3US

Report No:	11-21714/1
Date Received:	10/03/2011
Date Tested:	14/03/2011 to 18/03/2011
Date Issued:	18/03/2011
Page:	1 of 2

For the attention of: Tracy Dykes

By email

5 soil samples received from ALcontrol Hawarden (O/N: 168049; Project: 110215-30) in 100ml amber glass jars were analysed as shown below. Analytical methods employed are available on request. Results are reported on an as received basis unless otherwise specified.

Laboratory reference			184304 3031717 G24-59.00	184305 3031739 G22-54.30	184306 3031810 G3-75.00
dibutyltin	*[1002-53-5]*	mg/kg Sn	< 0.02	< 0.02	< 0.02
tetrabutyltin	*[1461-25-2]*	mg/kg Sn	< 0.02	< 0.02	< 0.02
tributyltin	*[56573-85-4]*	mg/kg Sn	< 0.02	< 0.02	< 0.02
triphenyltin	*[668-34-8]*	mg/kg Sn	< 0.05	< 0.05	< 0.05

Laboratory reference			184307 3031857 G6-62.30	184308 3031889 G15-64.80
dibutyltin	*[1002-53-5]*	mg/kg Sn	< 0.02	< 0.02
tetrabutyltin	*[1461-25-2]*	mg/kg Sn	< 0.02	< 0.02
tributyltin	*[56573-85-4]*	mg/kg Sn	< 0.02	< 0.02
triphenyltin	*[668-34-8]*	mg/kg Sn	< 0.05	< 0.05

Emma Winter
Laboratory Manager

SDG:	110215-30	**Location:**	Sea Green	**Order Number:**	FJ023335
Job:	H_UNIHULL_HUL-5	**Customer:**	University of Hull	**Report Number:**	121410
Client Reference:	ZBB 776	**Attention:**	Ann Leighton	**Superseded Report:**	

Appendix

1. Results are expressed on a dry weight basis (dried at 35ºC) for all soil analyses except for the following: NRA Leach tests, flash point, ammonium as NH4 by the BRE method, VOC TICS, SVOC TICS, TOF-MS SCAN/SEARCH and TOF-MS TICS.

2. Samples will be run in duplicate upon request, but an additional charge may be incurred.

3. If sufficient sample is received a sub sample will be retained free of charge for 30 days after analysis is completed (e-mailed) for both soil jars, tubs and volatile jars. All waters and vials will be discarded 10 days after the analysis is completed (e-mailed). All material removed during an asbestos containing material screen and analysed for the presence of asbestos will be retained for a period of 6 months after the analysis date. All samples received and not scheduled will be disposed of one month after the date of receipt unless we are instructed to the contrary. Once the initial period has expired, a storage charge will be applied for each month or part thereof until the client cancels the request for sample storage. ALcontrol Laboratories reserve the right to charge for samples received and stored but not analysed.

4. With respect to turnaround, we will always endeavour to meet client requirements wherever possible, but turnaround times cannot be absolutely guaranteed due to so many variables beyond our control.

5. We take responsibility for any test performed by sub-contractors (marked with an asterisk). We endeavour to use UKAS/MCERTS Accredited Laboratories, who either complete a quality questionnaire or are audited by ourselves. For some determinands there are no UKAS/MCERTS Accredited Laboratories, in this instance a laboratory with a known track record will be utilised.

6. When requested, the individual sub sample scheduled will be screened in house for the presence of large asbestos containing material fragments/pieces. If no asbestos containing material is found this will be reported as 'no asbestos containing material detected'. If asbestos containing material is detected it will be removed and analysed by our documented in house method TM048 based on HSG 248 (2005), which is accredited to ISO17025. If asbestos containing material is present no further analysis will be undertaken. At no point is the fibre content of the soil sample determined.

7. If no separate volatile sample is supplied by the client, the integrity of the data may be compromised if the laboratory is required to create a sub-sample from the bulk sample -similarly, if a headspace or sediment is present in the volatile sample. This will be flagged up as an invalid VOC on the test schedule or recorded on the log sheet.

8. If appropriate preserved bottles are not received preservation will take place on receipt. However, the integrity of the data may be compromised.

9. NDP -No determination possible due to insufficient/unsuitable sample.

10. Metals in water are performed on a filtered sample, and therefore represent dissolved metals -total metals must be requested separately.

11. A table containing the date of analysis for each parameter is not routinely included with the report, but is available upon request.

12. Results relate only to the items tested

13. **Surrogate recoveries** -Most of our organic methods include surrogates, the recovery of which is monitored and reported. For EPH, MO, PAH, GRO and VOCs on soils the result is not surrogate corrected, but a percentage recovery is quoted. Acceptable limits for most organic methods are 70 -130 %.

14. **Product analyses** -Organic analyses on products can only be semi-quantitative due to the matrix effects and high dilution factors
employed.

15. Phenols monohydric by HPLC include phenol, cresols (2-Methylphenol, 3-Methylphenol and 4-Methylphenol) and Xylenols (2,3 Dimethylphenol, 2,4 Dimethylphenol, 2,5 Dimethylphenol, 2,6 Dimethylphenol, 3,4 Dimethyphenol, 3,5 Dimethylphenol).

16. Total of 5 speciated phenols by HPLC includes Phenol, 2,3,5-Trimethyl Phenol, 2-Isopropylphenol, Cresols and Xylenols (as detailed in 14).

17. Stones/debris are not routinely removed. We always endeavour to take a representative sub sample from the received sample.

18. Our MCERTS accreditation for PAHs by GCMS applies to all product types apart from Kerosene, where naphthalene only is not
accredited.

19. In certain circumstances the method detection limit may be elevated due to the sample being outside the calibration range. Other factors that may contribute to this include possible interferences. In both cases the sample would be diluted which would cause the method detection limit to be raised.

20. Mercury results quoted on soils will not include volatile mercury as the analysis is performed on a dried and crushed sample.

21. For the BSEN 12457-3 two batch process to allow the cumulative release to be calculated, the volume of the leachate produced is measured and filtered for all tests. We therefore cannot carry out any unfiltered analysis. The tests affected include volatiles GCFID/GCMS and all subcontracted analysis.

22. For all leachate preparations (NRA, DIN, TCLP, BSEN 12457-1, 2, 3) volatile loss may occur, as we do not employ zero headspace extraction.

23. We are accredited to MCERTS for sand, clay and loam/topsoil, or any of these materials -whether these are derived from naturally occurring soil profiles, or from fill/made ground, as long as these materials constitute themajor part of the sample. Other coarse granular material such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.

24. Analysis and identification of specific compounds using GCFID is by retention time only, and we routinely calibrate and quantify for benzene, toluene, ethylbenzenes and xylenes (BTEX). For total volatiles in the C4 -C10 range, the total area of the chromatogram is integrated and expressed as ug/kg or ug/l. Although this analysis is commonly used for the quantification of gasoline range organics (GRO), the system will also detect other compounds such as chlorinated solvents, and this may lead to a falsely high result with respect to hydrocarbons only. It is not possible to specifically identify these non-hydrocarbons, as standards are not routinely run for any other compounds, and for more definitive identification, volatiles by GCMS should be utilised.

SOLID MATRICES EXTRACTION SUMMARY

ANALYSIS	D/C OR WET	EXTRACTION SOLVENT	EXTRACTION METHOD	ANALYSIS
SOLVENT EXTRACTABLE MATTER	D&C	DCM	SOXTHERM	GRAVIMETRIC
CYCLOHEXANE EXT. MATTER	D&C	CYCLOHEXANE	SOXTHERM	GRAVIMETRIC
THIN LAYER CHROMATOGRAPHY	D&C	DCM	SOXTHERM	IATROSCAN
ELEMENTAL SULPHUR	D&C	DCM	SOXTHERM	HPLC
PHENOLS BY GCMS	WET	DCM	SOXTHERM	GC-MS
HERBICIDES	D&C	HEXANE/ACETONE	SOXTHERM	GC-MS
PESTICIDES	D&C	HEXANE/ACETONE	SOXTHERM	GC-MS
EPH (DRO)	D&C	HEXANE/ACETONE	END OVER END	GC-FID
EPH (MIN OIL)	D&C	HEXANE/ACETONE	END OVER END	GC-FID
EPH (CLEANED UP)	D&C	HEXANE/ACETONE	END OVER END	GC-FID
EPH CWG BY GC	D&C	HEXANE/ACETONE	END OVER END	GC-FID
PCB TOT / PCB CON	D&C	HEXANE/ACETONE	END OVER END	GC-MS
POLYAROMATIC HYDROCARBONS (MS)	WET	HEXANE/ACETONE	MICROWAVE TM218.	GC-MS
C8-C40 (C8-C40) EZ FLASH	WET	HEXANE/ACETONE	SHAKER	GC-EZ
POLYAROMATIC HYDROCARBONS RAPID GC	WET	HEXANE/ACETONE	SHAKER	GC-EZ
SEMI VOLATILE ORGANIC COMPOUNDS	WET	DCM/ACETONE	SONICATE	GC-MS

LIQUID MATRICES EXTRACTION SUMMARY

ANALYSIS	EXTRACTION SOLVENT	EXTRACTION METHOD	ANALYSIS
PAH-MS	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GC-MS
EPH	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GC FID
EPH CWG	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GC FID
MINERAL OIL	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GC FID
PCB 7 CONGENERS	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GC-MS
PCB TOTAL	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GC-MS
SVOC	DCM	LIQUID/LIQUID SHAKE	GC-MS
FREE SULPHUR	DCM	SOLID PHASE EXTRACTION	HPLC
PEST OCP/OPP	DCM	LIQUID/LIQUID SHAKE	GC-MS
TRIAZINE HERBS	DCM	LIQUID/LIQUID SHAKE	GC-MS
PHENOLS-MS	DCM	SOLID PHASE EXTRACTION	GC-MS
TPH by INFRARED (IR)	TCE	LIQUID/LIQUID SHAKE	HPLC
MINERAL OIL by IR	TCE	LIQUID/LIQUID SHAKE	HPLC
GLYCOLS	NONE	DIRECT INJECTION	GC-MS

Identification of Asbestos in Bulk Materials

The results for asbestos identification for soil samples are obtained from possible Asbestos Containing Material, removed during the 'Screening of soils for Asbestos Containing Materials', which have been examined to determine the presence of asbestos fibres using Alcontrol Laboratories (Hawarden) in-house method of transmitted/polarised light microscopy and central stop dispersion staining, based on HSG 248 (2005).

Asbestos Type	Common Name
Chrysotile	White Asbestos
Amosite	Brown Asbestos
Crocidolite	Blue Asbestos
Fibrous Actinolite	-
Fibrous Anthophyllite	-
Fibrous Tremolite	-

Visual Estimation Of Fibre Content

Estimation of fibre content is not permitted as part of our UKAS accredited test other than: -
Trace -Where only one or two asbestos fibres were identified.

Further guidance on typical asbestos fibre content of manufactured products can be found in HSG 264.

The identification of asbestos containing materials falls within our schedule of tests for which we hold UKAS accreditation, however opinions, interpretations and all other information contained in the report are outside the scope of UKAS accreditation.

ALcontrol Laboratories

Unit 7-8 Hawarden Business Park
Manor Road (off Manor Lane)
Hawarden
Deeside
CH5 3US
Tel: (01244) 528700
Fax: (01244) 528701
email: mkt@alcontrol.com
Website: www.alcontrol.com

University of Hull
Department of Geography
University of Hull
Cottingham Road
Hull
South Yorkshire
HU6 7RX

Attention: Ann Leighton

CERTIFICATE OF ANALYSIS

Date:	22 March 2011
Customer:	H_UNIHULL_HUL
Sample Delivery Group (SDG):	110309-48
Your Reference:	ZBB 776
Location:	Sea Green
Report No:	121539

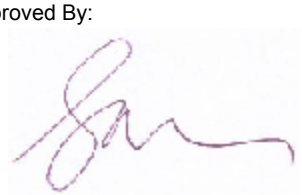
We received 20 samples on Wednesday March 09, 2011 and 20 of these samples were scheduled for analysis which was completed on Tuesday March 22, 2011. Accredited laboratory tests are defined within the report, but opinions, interpretations and on-site data expressed herein are outside the scope of ISO 17025 accreditation.

Should this report require incorporation into client reports, it must be used in its entirety and not simply with the data sections alone.

All chemical testing (unless subcontracted) is performed at ALcontrol Hawarden Laboratories.

Asbestos testing - we are not accredited for screening soil samples for asbestos fibres. We are only accredited to identify asbestos fibres in bulk material (ACM).

Approved By:



Sonia McWhan

Operations Manager

GROUP

This Page Left Blank Intentionally

CERTIFICATE OF ANALYSIS

SDG:	110309-48	**Location:**	Sea Green	**Order Number:**	FJ023335
Job:	H_UNIHULL_HUL-5	**Customer:**	University of Hull	**Report Number:**	121539
Client Reference:	ZBB 776	**Attention:**	Ann Leighton	**Superseded Report:**	

Received Sample Overview

Lab Sample No(s)	Customer Sample Ref.	AGS Ref.	Depth (m)	Sampled Date
3030228	0		58.00	05/03/2011
3030232	02		52.50	06/03/2011
3030212	101		43.70	26/02/2011
3030233	12		53.10	06/03/2011
3030213	124		55.40	27/02/2011
3030215	129		54.50	27/02/2011
3030220	138		50.40	01/03/2011
3030227	148		40.00	04/03/2011
3030223	34		49.40	03/03/2011
3030224	35		61.90	03/03/2011
3030221	48		62.00	02/03/2011
3030225	51		39.40	04/03/2011
3030219	55		46.20	01/03/2011
3030231	59		42.80	05/03/2011
3030230	64		49.00	05/03/2011
3030234	67		56.70	06/03/2011
3030216	77		49.80	28/02/2011
3030218	79		52.90	28/02/2011
3030217	81		53.50	28/02/2011
3030222	85		46.40	02/03/2011

Only received samples which have had analysis scheduled will be shown on the following pages.

CERTIFICATE OF ANALYSIS

SDG:	110309-48	**Location:**	Sea Green	**Order Number:**	FJ023335
Job:	H_UNIHULL_HUL-5	**Customer:**	University of Hull	**Report Number:**	121539
Client Reference:	ZBB 776	**Attention:**	Ann Leighton	**Superseded Report:**	

SOLID

Results Legend

X **Test**

N **No Determination Possible**

			Lab Sample No(s)	Customer Sample Reference	AGS Reference	Depth (m)	Container
EPH by FID	All	NDPs: 0 Tests: 20	3030228	0		58.00	250g Amber Jar
GRO by GC-FID (S)	All	NDPs: 0 Tests: 20	3030228	0		58.00	60g VOC
Metals by iCap-OES (Soil)	Arsenic	NDPs: 0 Tests: 20	3030228	0		58.00	250g Amber Jar
	Cadmium	NDPs: 0 Tests: 20	3030228	0		58.00	250g Amber Jar
	Chromium	NDPs: 0 Tests: 20	3030228	0		58.00	250g Amber Jar
	Copper	NDPs: 0 Tests: 20	3030228	0		58.00	250g Amber Jar
	Lead	NDPs: 0 Tests: 20	3030228	0		58.00	250g Amber Jar
	Mercury	NDPs: 0 Tests: 20	3030228	0		58.00	250g Amber Jar
	Nickel	NDPs: 0 Tests: 20	3030228	0		58.00	250g Amber Jar
	Selenium	NDPs: 0 Tests: 20	3030228	0		58.00	250g Amber Jar
	Zinc	NDPs: 0 Tests: 20	3030228	0		58.00	250g Amber Jar
Organotins on soils*	All	NDPs: 0 Tests: 20	3030228	0		58.00	250g Amber Jar
PAH by GCMS	All	NDPs: 0 Tests: 20	3030228	0		58.00	250g Amber Jar
PCBs by GCMS	All	NDPs: 0 Tests: 20	3030228	0		58.00	250g Amber Jar
Sample description	All	NDPs: 0 Tests: 20	3030228	0		58.00	250g Amber Jar

Lab Sample No(s)	Customer Sample Reference	Depth (m)	Container
3030232	02	52.50	60g VOC
3030232	02	52.50	250g Amber Jar
3030233	12	53.10	60g VOC
3030233	12	53.10	250g Amber Jar
3030223	34	49.40	60g VOC
3030223	34	49.40	250g Amber Jar
3030224	35	61.90	60g VOC
3030224	35	61.90	250g Amber Jar
3030221	48	62.00	60g VOC
3030221	48	62.00	250g Amber Jar
3030225	51	39.40	60g VOC
3030225	51	39.40	250g Amber Jar
3030219	55	46.20	60g VOC
3030219	55	46.20	250g Amber Jar
3030231	59	42.80	60g VOC
3030231	59	42.80	250g Amber Jar
3030230	64	49.00	60g VOC
3030230	64	49.00	250g Amber Jar
3030234	67	56.70	60g VOC
3030234	67	56.70	250g Amber Jar
3030216	77	49.80	60g VOC
3030216	77	49.80	250g Amber Jar
3030218	79	52.90	60g VOC
3030218	79	52.90	250g Amber Jar
3030217	81	53.50	60g VOC
3030217	81	53.50	250g Amber Jar
3030222	85	46.40	60g VOC
3030222	85	46.40	250g Amber Jar
3030212	101	43.70	60g VOC
3030212	101	43.70	250g Amber Jar
3030213	124	55.40	60g VOC
3030213	124	55.40	250g Amber Jar
3030215	129	54.50	60g VOC
3030215	129	54.50	250g Amber Jar
3030220	138	50.40	60g VOC
3030220	138	50.40	250g Amber Jar
3030227	148	40.00	60g VOC
3030227	148	40.00	250g Amber Jar

CERTIFICATE OF ANALYSIS

SDG:	110309-48	**Location:**	Sea Green	**Order Number:**	FJ023335
Job:	H_UNIHULL_HUL-5	**Customer:**	University of Hull	**Report Number:**	121539
Client Reference:	ZBB 776	**Attention:**	Ann Leighton	**Superseded Report:**	

Sample Descriptions

Grain Sizes

very fine	<0.063mm	fine	0.063mm - 0.1mm	medium	0.1mm - 2mm	coarse	2mm - 10mm	very coarse	>10mm

Lab Sample No(s)	Customer Sample Ref.	Depth (m)	Colour	Description	Grain size	Inclusions	Inclusions 2
3030228	0	58.00	Dark Brown	Sandy Clay	0.1 - 2 mm	Stones	None
3030232	02	52.50	Dark Brown	Sand	0.1 - 2 mm	Stones	None
3030233	12	53.10	Light Brown	Sand	0.1 - 2 mm	Stones	N/A
3030223	34	49.40	Dark Brown	Sand	0.1 - 2 mm	Stones	N/A
3030224	35	61.90	Light Brown	Sand	0.1 - 2 mm	None	None
3030221	48	62.00	Dark Brown	Sand	0.1 - 2 mm	None	None
3030225	51	39.40	Light Brown	Sand	0.1 - 2 mm	Stones	None
3030219	55	46.20	Light Brown	Sand	0.1 - 2 mm	Stones	N/A
3030231	59	42.80	Light Brown	Sand	0.1 - 2 mm	Stones	N/A
3030230	64	49.00	Light Brown	Sand	0.1 - 2 mm	Stones	N/A
3030234	67	56.70	Light Brown	Sand	0.1 - 2 mm	Stones	None
3030216	77	49.80	Light Brown	Sand	0.1 - 2 mm	Stones	N/A
3030218	79	52.90	Dark Brown	Sand	0.1 - 2 mm	None	None
3030217	81	53.50	Light Brown	Sand	0.1 - 2 mm	Stones	N/A
3030222	85	46.40	Light Brown	Sand	0.1 - 2 mm	Stones	N/A
3030212	101	43.70	Light Brown	Sand	0.1 - 2 mm	Stones	N/A
3030213	124	55.40	Light Brown	Sand	0.1 - 2 mm	Stones	N/A
3030215	129	54.50	Light Brown	Sand	0.1 - 2 mm	Stones	N/A
3030220	138	50.40	Dark Brown	Sand	0.1 - 2 mm	None	None
3030227	148	40.00	Light Brown	Sand	0.1 - 2 mm	Stones	N/A

These descriptions are only intended to act as a cross check if sample identities are questioned, and to provide a log of sample matrices with respect to MCERTS validation. They are not intended as full geological descriptions.

We are accredited to MCERTS for sand, clay and loam/topsoil, or any of these materials - whether these are derived from naturally ocurring soil profiles, or from fill/made ground, as long as these materials constitute the major part of the sample.

Other coarse granular materials such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.

CERTIFICATE OF ANALYSIS

SDG:	110309-48	**Location:**	Sea Green	**Order Number:**	FJ023335
Job:	H_UNIHULL_HUL-5	**Customer:**	University of Hull	**Report Number:**	121539
Client Reference:	ZBB 776	**Attention:**	Ann Leighton	**Superseded Report:**	

Results Legend

#	ISO17025 accredited.
M	*m*CERTS accredited.
§	Non-conforming work.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	subcontracted test.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of the individual compounds within the samples are not corrected for this recovery.

Component	LOD/Units	Method	Customer Sample R	0	02	12	34	35	48
			Depth (m)	58.00	52.50	53.10	49.40	61.90	62.00
			Sample Type	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid
			Date Sampled	05/03/2011	06/03/2011	06/03/2011	03/03/2011	03/03/2011	02/03/2011
			Date Received	09/03/2011	09/03/2011	09/03/2011	09/03/2011	09/03/2011	09/03/2011
			SDG Ref	110309-48	110309-48	110309-48	110309-48	110309-48	110309-48
			Lab Sample No.(s)	3030228	3030232	3030233	3030223	3030224	3030221
			AGS Reference						
EPH Surrogate % recovery**	%	TM061		101 M	110 M	107 M	103 M	103 M	107 M
EPH Range >C10 - C40	<35 mg/kg	TM061		<35 M	37.4 M	<35 M	38.5 M	73.1 M	<35 M
PCB congener 28	<3 µg/kg	TM168		<3 M	<3 M	<3 M	<3 M	<3 M	<3 M
PCB congener 52	<3 µg/kg	TM168		<3 M	<3 M	<3 M	<3 M	<3 M	<3 M
PCB congener 101	<3 µg/kg	TM168		<3 M	<3 M	<3 M	<3 M	<3 M	<3 M
PCB congener 118	<3 µg/kg	TM168		<3 M	<3 M	<3 M	<3 M	<3 M	<3 M
PCB congener 138	<3 µg/kg	TM168		<3 M	<3 M	<3 M	<3 M	<3 M	<3 M
PCB congener 153	<3 µg/kg	TM168		<3 M	<3 M	<3 M	<3 M	<3 M	<3 M
PCB congener 180	<3 µg/kg	TM168		<3 M	<3 M	<3 M	<3 M	<3 M	<3 M
PCBs, Total ICES 7	<3 µg/kg	TM168		<3	<3	<3	<3	<3	<3
PCB congener 105	<3 µg/kg	TM168		<3 M	<3 M	<3 M	<3 M	<3 M	<3 M
PCB congener 156	<3 µg/kg	TM168		<3 M	<3 M	<3 M	<3 M	<3 M	<3 M
Arsenic	<0.6 mg/kg	TM181		8.84 M	10.5 M	15.2 M	11.1 M	29.9 M	5.48 M
Cadmium	<0.02 mg/kg	TM181		<0.02 M	<0.02 M	<0.02 M	<0.02 M	<0.02 M	<0.02 M
Chromium	<0.9 mg/kg	TM181		16.6 M	11.3 M	11 M	17.9 M	13.2 M	13.7 M
Copper	<1.4 mg/kg	TM181		2.66 M	1.8 M	1.4 M	3.49 M	1.41 M	<1.4 M
Lead	<0.7 mg/kg	TM181		10.7 M	6.11 M	7.32 M	24.5 M	12.5 M	4.61 M
Mercury	<0.14 mg/kg	TM181		<0.14 M	<0.14 M	<0.14 M	<0.14 M	<0.14 M	<0.14 M
Nickel	<0.2 mg/kg	TM181		9.5 M	4.32 M	5.27 M	8.58 M	4.7 M	3.29 M
Selenium	<1 mg/kg	TM181		<1 #	<1 #	<1 #	<1 #	<1 #	<1 #
Zinc	<1.9 mg/kg	TM181		23.6 M	14.5 M	13.8 M	26 M	17.9 M	12 M

CERTIFICATE OF ANALYSIS

SDG:	110309-48	**Location:**	Sea Green	**Order Number:**	FJ023335
Job:	H_UNIHULL_HUL-5	**Customer:**	University of Hull	**Report Number:**	121539
Client Reference:	ZBB 776	**Attention:**	Ann Leighton	**Superseded Report:**	

Results Legend

#	ISO17025 accredited.
M	*m*CERTS accredited.
§	Non-conforming work.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	subcontracted test.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of the individual compounds within the samples are not corrected for this recovery.

Component	LOD/Units	Method	Customer Sample R	51	55	59	64	67	77
			Depth (m)	39.40	46.20	42.80	49.00	56.70	49.80
			Sample Type	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid
			Date Sampled	04/03/2011	01/03/2011	05/03/2011	05/03/2011	06/03/2011	28/02/2011
			Date Received	09/03/2011	09/03/2011	09/03/2011	09/03/2011	09/03/2011	09/03/2011
			SDG Ref	110309-48	110309-48	110309-48	110309-48	110309-48	110309-48
			Lab Sample No.(s)	3030225	3030219	3030231	3030230	3030234	3030216
			AGS Reference						
EPH Surrogate % recovery**	%	TM061		102 M	104 M	102 M	104 M	105 M	99.2 M
EPH Range >C10 - C40	<35 mg/kg	TM061		36.6 M	<35 M	103 M	37.8 M	<35 M	53.5 M
PCB congener 28	<3 µg/kg	TM168		<3 M	<3 M	<3 M	<3 M	<3 M	3.1 M
PCB congener 52	<3 µg/kg	TM168		<3 M	<3 M	<3 M	<3 M	<3 M	<3 M
PCB congener 101	<3 µg/kg	TM168		<3 M	<3 M	<3 M	<3 M	<3 M	<3 M
PCB congener 118	<3 µg/kg	TM168		<3 M	<3 M	<3 M	<3 M	<3 M	<3 M
PCB congener 138	<3 µg/kg	TM168		<3 M	<3 M	<3 M	<3 M	<3 M	<3 M
PCB congener 153	<3 µg/kg	TM168		<3 M	<3 M	<3 M	<3 M	<3 M	<3 M
PCB congener 180	<3 µg/kg	TM168		<3 M	<3 M	<3 M	<3 M	<3 M	<3 M
PCBs, Total ICES 7	<3 µg/kg	TM168		<3	<3	<3	<3	<3	3.1
PCB congener 105	<3 µg/kg	TM168		<3 M	<3 M	<3 M	<3 M	<3 M	<3 M
PCB congener 156	<3 µg/kg	TM168		<3 M	<3 M	<3 M	<3 M	<3 M	<3 M
Arsenic	<0.6 mg/kg	TM181		9.51 M	10.7 M	11.4 M	18.4 M	18.3 M	17.1 M
Cadmium	<0.02 mg/kg	TM181		<0.02 M	<0.02 M	<0.02 M	<0.02 M	<0.02 M	<0.02 M
Chromium	<0.9 mg/kg	TM181		8.53 M	8.19 M	14.3 M	5.5 M	9.93 M	14.6 M
Copper	<1.4 mg/kg	TM181		3.17 M	1.46 M	8.7 M	<1.4 M	<1.4 M	11.5 M
Lead	<0.7 mg/kg	TM181		8.25 M	4.75 M	12 M	7.31 M	7.5 M	9.59 M
Mercury	<0.14 mg/kg	TM181		<0.14 M	<0.14 M	<0.14 M	<0.14 M	<0.14 M	<0.14 M
Nickel	<0.2 mg/kg	TM181		5.82 M	4.17 M	14.7 M	7.73 M	4.58 M	9.99 M
Selenium	<1 mg/kg	TM181		<1 #	<1 #	<1 #	<1 #	<1 #	<1 #
Zinc	<1.9 mg/kg	TM181		30.1 M	13.7 M	25.3 M	13 M	14.6 M	49.1 M

CERTIFICATE OF ANALYSIS

SDG:	110309-48	**Location:**	Sea Green	**Order Number:**	FJ023335
Job:	H_UNIHULL_HUL-5	**Customer:**	University of Hull	**Report Number:**	121539
Client Reference:	ZBB 776	**Attention:**	Ann Leighton	**Superseded Report:**	

Results Legend

#	ISO17025 accredited.
M	*m*CERTS accredited.
§	Non-conforming work.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	subcontracted test.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of the individual compounds within the samples are not corrected for this recovery.

Component	LOD/Units	Method	Customer Sample R	79	81	85	101	124	129
			Depth (m)	52.90	53.50	46.40	43.70	55.40	54.50
			Sample Type	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid
			Date Sampled	28/02/2011	28/02/2011	02/03/2011	26/02/2011	27/02/2011	27/02/2011
			Date Received	09/03/2011	09/03/2011	09/03/2011	09/03/2011	09/03/2011	09/03/2011
			SDG Ref	110309-48	110309-48	110309-48	110309-48	110309-48	110309-48
			Lab Sample No.(s)	3030218	3030217	3030222	3030212	3030213	3030215
			AGS Reference						
EPH Surrogate % recovery**	%	TM061		100 M	109 M	103 M	90.1 M	101 M	102 M
EPH Range >C10 - C40	<35 mg/kg	TM061		<35 M	<35 M	<35 M	1380 M	89.9 M	42.7 M
PCB congener 28	<3 µg/kg	TM168		<3 M	<3 M	<3 M	<3 M	<3 M	<3 M
PCB congener 52	<3 µg/kg	TM168		<3 M	<3 M	<3 M	<3 M	<3 M	<3 M
PCB congener 101	<3 µg/kg	TM168		<3 M	<3 M	<3 M	<3 M	<3 M	<3 M
PCB congener 118	<3 µg/kg	TM168		<3 M	<3 M	<3 M	<3 M	<3 M	<3 M
PCB congener 138	<3 µg/kg	TM168		<3 M	<3 M	<3 M	<3 M	<3 M	<3 M
PCB congener 153	<3 µg/kg	TM168		<3 M	<3 M	<3 M	<3 M	<3 M	<3 M
PCB congener 180	<3 µg/kg	TM168		<3 M	<3 M	<3 M	<3 M	<3 M	<3 M
PCBs, Total ICES 7	<3 µg/kg	TM168		<3	<3	<3	<3	<3	<3
PCB congener 105	<3 µg/kg	TM168		<3 M	<3 M	<3 M	<3 M	<3 M	<3 M
PCB congener 156	<3 µg/kg	TM168		<3 M	<3 M	<3 M	<3 M	<3 M	<3 M
Arsenic	<0.6 mg/kg	TM181		8.37 M	12.9 M	7.76 M	9.37 M	11.2 M	8.35 M
Cadmium	<0.02 mg/kg	TM181		<0.02 M	<0.02 M	<0.02 M	<0.02 M	<0.02 M	<0.02 M
Chromium	<0.9 mg/kg	TM181		7.09 M	7.44 M	10.3 M	6.07 M	7.87 M	12.1 M
Copper	<1.4 mg/kg	TM181		<1.4 M	1.86 M	3.07 M	1.7 M	<1.4 M	<1.4 M
Lead	<0.7 mg/kg	TM181		3.65 M	4.78 M	4.58 M	8.27 M	4.17 M	5.25 M
Mercury	<0.14 mg/kg	TM181		<0.14 M	<0.14 M	<0.14 M	<0.14 M	<0.14 M	<0.14 M
Nickel	<0.2 mg/kg	TM181		2.71 M	2.91 M	4.35 M	3.13 M	1.46 M	2.29 M
Selenium	<1 mg/kg	TM181		<1 #	<1 #	<1 #	<1 #	<1 #	<1 #
Zinc	<1.9 mg/kg	TM181		8.51 M	11.6 M	13.8 M	13.8 M	8.61 M	10.1 M

CERTIFICATE OF ANALYSIS

SDG:	110309-48	**Location:**	Sea Green	**Order Number:**	FJ023335
Job:	H_UNIHULL_HUL-5	**Customer:**	University of Hull	**Report Number:**	121539
Client Reference:	ZBB 776	**Attention:**	Ann Leighton	**Superseded Report:**	

Results Legend

#	ISO17025 accredited.
M	*m*CERTS accredited.
§	Non-conforming work.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	subcontracted test.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of the individual compounds within the samples are not corrected for this recovery.

Component	LOD/Units	Method	Customer Sample R	138	148				
			Depth (m)	50.40	40.00				
			Sample Type	Soil/Solid	Soil/Solid				
			Date Sampled	01/03/2011	04/03/2011				
			Date Received	09/03/2011	09/03/2011				
			SDG Ref	110309-48	110309-48				
			Lab Sample No.(s)	3030220	3030227				
			AGS Reference						
EPH Surrogate % recovery**	%	TM061		107 M	105 M				
EPH Range >C10 - C40	<35 mg/kg	TM061		<35 M	<35 M				
PCB congener 28	<3 µg/kg	TM168		<3 M	<3 M				
PCB congener 52	<3 µg/kg	TM168		<3 M	<3 M				
PCB congener 101	<3 µg/kg	TM168		<3 M	<3 M				
PCB congener 118	<3 µg/kg	TM168		<3 M	<3 M				
PCB congener 138	<3 µg/kg	TM168		<3 M	<3 M				
PCB congener 153	<3 µg/kg	TM168		<3 M	<3 M				
PCB congener 180	<3 µg/kg	TM168		<3 M	<3 M				
PCBs, Total ICES 7	<3 µg/kg	TM168		<3	<3				
PCB congener 105	<3 µg/kg	TM168		<3 M	<3 M				
PCB congener 156	<3 µg/kg	TM168		<3 M	<3 M				
Arsenic	<0.6 mg/kg	TM181		11.8 M	4.35 M				
Cadmium	<0.02 mg/kg	TM181		<0.02 M	<0.02 M				
Chromium	<0.9 mg/kg	TM181		8.25 M	8.92 M				
Copper	<1.4 mg/kg	TM181		<1.4 M	1.93 M				
Lead	<0.7 mg/kg	TM181		4.69 M	5.24 M				
Mercury	<0.14 mg/kg	TM181		<0.14 M	<0.14 M				
Nickel	<0.2 mg/kg	TM181		4.71 M	3.64 M				
Selenium	<1 mg/kg	TM181		<1 #	<1 #				
Zinc	<1.9 mg/kg	TM181		12.5 M	17.6 M				

CERTIFICATE OF ANALYSIS

SDG:	110309-48	**Location:**	Sea Green	**Order Number:**	FJ023335
Job:	H_UNIHULL_HUL-5	**Customer:**	University of Hull	**Report Number:**	121539
Client Reference:	ZBB 776	**Attention:**	Ann Leighton	**Superseded Report:**	

GRO by GC-FID (S)

Results Legend

#	ISO17025 accredited.
M	*m*CERTS accredited.
§	Non-conforming work.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	subcontracted test.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of the individual compounds within the samples are not corrected for this recovery.

Component	LOD/Units	Method	Customer Sample R	0	02	12	34	35	48
			Depth (m)	58.00	52.50	53.10	49.40	61.90	62.00
			Sample Type	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid
			Date Sampled	05/03/2011	06/03/2011	06/03/2011	03/03/2011	03/03/2011	02/03/2011
			Date Received	09/03/2011	09/03/2011	09/03/2011	09/03/2011	09/03/2011	09/03/2011
			SDG Ref	110309-48	110309-48	110309-48	110309-48	110309-48	110309-48
			Lab Sample No.(s)	3030228	3030232	3030233	3030223	3030224	3030221
			AGS Reference						
GRO >C5-C12	<44 µg/kg	TM089		<44	<44	<44	<44	<44	<44
Methyl tertiary butyl ether (MTBE)	<5 µg/kg	TM089		<5 #	<5 #	<5 #	<5 #	<5 #	<5 #
Benzene	<10 µg/kg	TM089		<10 M	<10 M	<10 M	<10 M	<10 M	<10 M
Toluene	<2 µg/kg	TM089		<2 M	<2 M	<2 M	<2 M	<2 M	<2 M
Ethylbenzene	<3 µg/kg	TM089		<3 M	<3 M	<3 M	<3 M	<3 M	<3 M
m,p-Xylene	<6 µg/kg	TM089		<6 M	<6 M	<6 M	<6 M	<6 M	<6 M
o-Xylene	<3 µg/kg	TM089		<3 M	<3 M	<3 M	<3 M	<3 M	<3 M
m,p,o-Xylene	<10 µg/kg	TM089		<10	<10	<10	<10	<10	<10
BTEX, Total	<10 µg/kg	TM089		<10	<10	<10	<10	<10	<10

CERTIFICATE OF ANALYSIS

SDG:	110309-48	**Location:**	Sea Green	**Order Number:**	FJ023335
Job:	H_UNIHULL_HUL-5	**Customer:**	University of Hull	**Report Number:**	121539
Client Reference:	ZBB 776	**Attention:**	Ann Leighton	**Superseded Report:**	

GRO by GC-FID (S)

Results Legend

#	ISO17025 accredited.
M	*m*CERTS accredited.
§	Non-conforming work.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	subcontracted test.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of the individual compounds within the samples are not corrected for this recovery.

Component	LOD/Units	Method	Customer Sample R	51	55	59	64	67	77
			Depth (m)	39.40	46.20	42.80	49.00	56.70	49.80
			Sample Type	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid
			Date Sampled	04/03/2011	01/03/2011	05/03/2011	05/03/2011	06/03/2011	28/02/2011
			Date Received	09/03/2011	09/03/2011	09/03/2011	09/03/2011	09/03/2011	09/03/2011
			SDG Ref	110309-48	110309-48	110309-48	110309-48	110309-48	110309-48
			Lab Sample No.(s)	3030225	3030219	3030231	3030230	3030234	3030216
			AGS Reference						
GRO >C5-C12	<44 µg/kg	TM089		<44	<44	<44	<44	<44	<44
Methyl tertiary butyl ether (MTBE)	<5 µg/kg	TM089		<5 #	<5 #	<5 #	<5 #	<5 #	<5 #
Benzene	<10 µg/kg	TM089		<10 M	<10 M	<10 M	<10 M	<10 M	<10 M
Toluene	<2 µg/kg	TM089		<2 M	<2 M	<2 M	<2 M	<2 M	<2 M
Ethylbenzene	<3 µg/kg	TM089		<3 M	<3 M	<3 M	<3 M	<3 M	<3 M
m,p-Xylene	<6 µg/kg	TM089		<6 M	<6 M	<6 M	<6 M	<6 M	<6 M
o-Xylene	<3 µg/kg	TM089		<3 M	<3 M	<3 M	<3 M	<3 M	<3 M
m,p,o-Xylene	<10 µg/kg	TM089		<10	<10	<10	<10	<10	<10
BTEX, Total	<10 µg/kg	TM089		<10	<10	<10	<10	<10	<10

CERTIFICATE OF ANALYSIS

SDG:	110309-48	**Location:**	Sea Green	**Order Number:**	FJ023335
Job:	H_UNIHULL_HUL-5	**Customer:**	University of Hull	**Report Number:**	121539
Client Reference:	ZBB 776	**Attention:**	Ann Leighton	**Superseded Report:**	

GRO by GC-FID (S)

Results Legend

#	ISO17025 accredited.
M	*m*CERTS accredited.
§	Non-conforming work.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	subcontracted test.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of the individual compounds within the samples are not corrected for this recovery.

Component	LOD/Units	Method	Customer Sample R	79	81	85	101	124	129
			Depth (m)	52.90	53.50	46.40	43.70	55.40	54.50
			Sample Type	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid
			Date Sampled	28/02/2011	28/02/2011	02/03/2011	26/02/2011	27/02/2011	27/02/2011
			Date Received	09/03/2011	09/03/2011	09/03/2011	09/03/2011	09/03/2011	09/03/2011
			SDG Ref	110309-48	110309-48	110309-48	110309-48	110309-48	110309-48
			Lab Sample No.(s)	3030218	3030217	3030222	3030212	3030213	3030215
			AGS Reference						
GRO >C5-C12	<44 µg/kg	TM089		<44	<44	<44	<44	<44	<44
Methyl tertiary butyl ether (MTBE)	<5 µg/kg	TM089		<5 #	<5 #	<5 #	<5 #	<5 #	<5 #
Benzene	<10 µg/kg	TM089		<10 M	<10 M	<10 M	<10 M	<10 M	<10 M
Toluene	<2 µg/kg	TM089		<2 M	<2 M	<2 M	<2 M	<2 M	<2 M
Ethylbenzene	<3 µg/kg	TM089		<3 M	<3 M	<3 M	<3 M	<3 M	<3 M
m,p-Xylene	<6 µg/kg	TM089		<6 M	<6 M	<6 M	<6 M	<6 M	<6 M
o-Xylene	<3 µg/kg	TM089		<3 M	<3 M	<3 M	<3 M	<3 M	<3 M
m,p,o-Xylene	<10 µg/kg	TM089		<10	<10	<10	<10	<10	<10
BTEX, Total	<10 µg/kg	TM089		<10	<10	<10	<10	<10	<10

CERTIFICATE OF ANALYSIS

SDG:	110309-48	**Location:**	Sea Green	**Order Number:**	FJ023335
Job:	H_UNIHULL_HUL-5	**Customer:**	University of Hull	**Report Number:**	121539
Client Reference:	ZBB 776	**Attention:**	Ann Leighton	**Superseded Report:**	

GRO by GC-FID (S)

Results Legend

#	ISO17025 accredited.
M	*m*CERTS accredited.
§	Non-conforming work.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	subcontracted test.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of the individual compounds within the samples are not corrected for this recovery.

Component	LOD/Units	Method	Customer Sample R	138	148
			Depth (m)	50.40	40.00
			Sample Type	Soil/Solid	Soil/Solid
			Date Sampled	01/03/2011	04/03/2011
			Date Received	09/03/2011	09/03/2011
			SDG Ref	110309-48	110309-48
			Lab Sample No.(s)	3030220	3030227
			AGS Reference		
GRO >C5-C12	<44 µg/kg	TM089		<44	<44
Methyl tertiary butyl ether (MTBE)	<5 µg/kg	TM089		<5 #	<5 #
Benzene	<10 µg/kg	TM089		<10 M	<10 M
Toluene	<2 µg/kg	TM089		<2 M	<2 M
Ethylbenzene	<3 µg/kg	TM089		<3 M	<3 M
m,p-Xylene	<6 µg/kg	TM089		<6 M	<6 M
o-Xylene	<3 µg/kg	TM089		<3 M	<3 M
m,p,o-Xylene	<10 µg/kg	TM089		<10	<10
BTEX, Total	<10 µg/kg	TM089		<10	<10

CERTIFICATE OF ANALYSIS

SDG:	110309-48	**Location:**	Sea Green	**Order Number:**	FJ023335
Job:	H_UNIHULL_HUL-5	**Customer:**	University of Hull	**Report Number:**	121539
Client Reference:	ZBB 776	**Attention:**	Ann Leighton	**Superseded Report:**	

Organotins on soils*

Results Legend

#	ISO17025 accredited.
M	*m*CERTS accredited.
§	Non-conforming work.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	subcontracted test.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of the individual compounds within the samples are not corrected for this recovery.

Component	LOD/Units	Method	Customer Sample R	0	02	12	34	35	48
			Depth (m)	58.00	52.50	53.10	49.40	61.90	62.00
			Sample Type	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid
			Date Sampled	05/03/2011	06/03/2011	06/03/2011	03/03/2011	03/03/2011	02/03/2011
			Date Received	09/03/2011	09/03/2011	09/03/2011	09/03/2011	09/03/2011	09/03/2011
			SDG Ref	110309-48	110309-48	110309-48	110309-48	110309-48	110309-48
			Lab Sample No.(s)	3030228	3030232	3030233	3030223	3030224	3030221
			AGS Reference						
Tributyl tin*	<0.02 mg/kg	SUB		<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Triphenyl tin*	<0.05 mg/kg	SUB		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Dibutyl tin*	<0.02 mg/kg	SUB		<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Tetrabutyl tin*	<0.02 mg/kg	SUB		<0.02	<0.02	<0.02	<0.02	<0.02	<0.02

CERTIFICATE OF ANALYSIS

SDG:	110309-48	**Location:**	Sea Green	**Order Number:**	FJ023335
Job:	H_UNIHULL_HUL-5	**Customer:**	University of Hull	**Report Number:**	121539
Client Reference:	ZBB 776	**Attention:**	Ann Leighton	**Superseded Report:**	

Organotins on soils*

Results Legend

#	ISO17025 accredited.
M	*m*CERTS accredited.
§	Non-conforming work.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	subcontracted test.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of the individual compounds within the samples are not corrected for this recovery.

Component	LOD/Units	Method	Customer Sample R	51	55	59	64	67	77
			Depth (m)	39.40	46.20	42.80	49.00	56.70	49.80
			Sample Type	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid
			Date Sampled	04/03/2011	01/03/2011	05/03/2011	05/03/2011	06/03/2011	28/02/2011
			Date Received	09/03/2011	09/03/2011	09/03/2011	09/03/2011	09/03/2011	09/03/2011
			SDG Ref	110309-48	110309-48	110309-48	110309-48	110309-48	110309-48
			Lab Sample No.(s)	3030225	3030219	3030231	3030230	3030234	3030216
			AGS Reference						
Tributyl tin*	<0.02 mg/kg	SUB		<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Triphenyl tin*	<0.05 mg/kg	SUB		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Dibutyl tin*	<0.02 mg/kg	SUB		<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Tetrabutyl tin*	<0.02 mg/kg	SUB		<0.02	<0.02	<0.02	<0.02	<0.02	<0.02

CERTIFICATE OF ANALYSIS

SDG:	110309-48	**Location:**	Sea Green	**Order Number:**	FJ023335
Job:	H_UNIHULL_HUL-5	**Customer:**	University of Hull	**Report Number:**	121539
Client Reference:	ZBB 776	**Attention:**	Ann Leighton	**Superseded Report:**	

Organotins on soils*

Results Legend

#	ISO17025 accredited.
M	*m*CERTS accredited.
§	Non-conforming work.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	subcontracted test.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of the individual compounds within the samples are not corrected for this recovery.

Component	LOD/Units	Method	Customer Sample R	79	81	85	101	124	129
			Depth (m)	52.90	53.50	46.40	43.70	55.40	54.50
			Sample Type	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid
			Date Sampled	28/02/2011	28/02/2011	02/03/2011	26/02/2011	27/02/2011	27/02/2011
			Date Received	09/03/2011	09/03/2011	09/03/2011	09/03/2011	09/03/2011	09/03/2011
			SDG Ref	110309-48	110309-48	110309-48	110309-48	110309-48	110309-48
			Lab Sample No.(s)	3030218	3030217	3030222	3030212	3030213	3030215
			AGS Reference						
Tributyl tin*	<0.02 mg/kg	SUB		<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Triphenyl tin*	<0.05 mg/kg	SUB		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Dibutyl tin*	<0.02 mg/kg	SUB		<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Tetrabutyl tin*	<0.02 mg/kg	SUB		<0.02	<0.02	<0.02	<0.02	<0.02	<0.02

CERTIFICATE OF ANALYSIS

SDG:	110309-48	**Location:**	Sea Green	**Order Number:**	FJ023335
Job:	H_UNIHULL_HUL-5	**Customer:**	University of Hull	**Report Number:**	121539
Client Reference:	ZBB 776	**Attention:**	Ann Leighton	**Superseded Report:**	

Organotins on soils*

Results Legend	
#	ISO17025 accredited.
M	*m*CERTS accredited.
§	Non-conforming work.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	subcontracted test.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of the individual compounds within the samples are not corrected for this recovery.

Component	LOD/Units	Method	Customer Sample R	138	148
			Depth (m)	50.40	40.00
			Sample Type	Soil/Solid	Soil/Solid
			Date Sampled	01/03/2011	04/03/2011
			Date Received	09/03/2011	09/03/2011
			SDG Ref	110309-48	110309-48
			Lab Sample No.(s)	3030220	3030227
			AGS Reference		
Tributyl tin*	<0.02 mg/kg	SUB		<0.02	<0.02
Triphenyl tin*	<0.05 mg/kg	SUB		<0.05	<0.05
Dibutyl tin*	<0.02 mg/kg	SUB		<0.02	<0.02
Tetrabutyl tin*	<0.02 mg/kg	SUB		<0.02	<0.02

CERTIFICATE OF ANALYSIS

SDG:	110309-48	**Location:**	Sea Green	**Order Number:**	FJ023335
Job:	H_UNIHULL_HUL-5	**Customer:**	University of Hull	**Report Number:**	121539
Client Reference:	ZBB 776	**Attention:**	Ann Leighton	**Superseded Report:**	

PAH by GCMS

Results Legend

#	ISO17025 accredited.
M	*m*CERTS accredited.
§	Non-conforming work.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	subcontracted test.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of the individual compounds within the samples are not corrected for this recovery.

Component	LOD/Units	Method	Customer Sample R	0	02	12	34	35	48
			Depth (m)	58.00	52.50	53.10	49.40	61.90	62.00
			Sample Type	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid
			Date Sampled	05/03/2011	06/03/2011	06/03/2011	03/03/2011	03/03/2011	02/03/2011
			Date Received	09/03/2011	09/03/2011	09/03/2011	09/03/2011	09/03/2011	09/03/2011
			SDG Ref	110309-48	110309-48	110309-48	110309-48	110309-48	110309-48
			Lab Sample No.(s)	3030228	3030232	3030233	3030223	3030224	3030221
			AGS Reference						
Naphthalene-d8 % recovery**	%	TM218		104	96.5	100	99.7	99.1	104
Acenaphthene-d10 % recovery**	%	TM218		105	95.5	100	98.8	97.4	104
Phenanthrene-d10 % recovery**	%	TM218		103	93.6	99.3	97.4	94.5	102
Chrysene-d12 % recovery**	%	TM218		116	96.5	101	98.3	92.9	111
Perylene-d12 % recovery**	%	TM218		130	101	111	104	88.7	123
Naphthalene	<9 µg/kg	TM218		<9 M	<9 M	<9 M	<9 M	<9 M	<9 M
Acenaphthylene	<12 µg/kg	TM218		<12 M	<12 M	<12 M	<12 M	<12 M	<12 M
Acenaphthene	<8 µg/kg	TM218		<8 M	<8 M	<8 M	<8 M	<8 M	<8 M
Fluorene	<10 µg/kg	TM218		<10 M	<10 M	<10 M	<10 M	<10 M	<10 M
Phenanthrene	<15 µg/kg	TM218		<15 M	<15 M	<15 M	<15 M	<15 M	<15 M
Anthracene	<16 µg/kg	TM218		<16 M	<16 M	<16 M	<16 M	<16 M	<16 M
Fluoranthene	<17 µg/kg	TM218		<17 M	<17 M	<17 M	<17 M	<17 M	<17 M
Pyrene	<15 µg/kg	TM218		<15 M	<15 M	<15 M	<15 M	<15 M	<15 M
Benz(a)anthracene	<14 µg/kg	TM218		<14 M	<14 M	<14 M	<14 M	<14 M	<14 M
Chrysene	<10 µg/kg	TM218		<10 M	<10 M	<10 M	<10 M	<10 M	<10 M
Benzo(b)fluoranthene	<15 µg/kg	TM218		<15 M	<15 M	<15 M	<15 M	<15 M	<15 M
Benzo(k)fluoranthene	<14 µg/kg	TM218		<14 M	<14 M	<14 M	<14 M	<14 M	<14 M
Benzo(a)pyrene	<15 µg/kg	TM218		<15 M	<15 M	<15 M	<15 M	<15 M	<15 M
Indeno(1,2,3-cd)pyrene	<18 µg/kg	TM218		<18 M	<18 M	<18 M	<18 M	<18 M	<18 M
Dibenzo(a,h)anthracene	<23 µg/kg	TM218		<23 M	<23 M	<23 M	<23 M	<23 M	<23 M
Benzo(g,h,i)perylene	<24 µg/kg	TM218		<24 M	<24 M	<24 M	<24 M	<24 M	<24 M
Polyaromatic hydrocarbons, Total	<118 µg/kg	TM218		<118 M	<118 M	<118 M	<118 M	<118 M	<118 M

CERTIFICATE OF ANALYSIS

SDG:	110309-48	**Location:**	Sea Green	**Order Number:**	FJ023335
Job:	H_UNIHULL_HUL-5	**Customer:**	University of Hull	**Report Number:**	121539
Client Reference:	ZBB 776	**Attention:**	Ann Leighton	**Superseded Report:**	

PAH by GCMS

Results Legend

#	ISO17025 accredited.
M	*m*CERTS accredited.
§	Non-conforming work.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	subcontracted test.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of the individual compounds within the samples are not corrected for this recovery.

Component	LOD/Units	Method	Customer Sample R	51	55	59	64	67	77
			Depth (m)	39.40	46.20	42.80	49.00	56.70	49.80
			Sample Type	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid
			Date Sampled	04/03/2011	01/03/2011	05/03/2011	05/03/2011	06/03/2011	28/02/2011
			Date Received	09/03/2011	09/03/2011	09/03/2011	09/03/2011	09/03/2011	09/03/2011
			SDG Ref	110309-48	110309-48	110309-48	110309-48	110309-48	110309-48
			Lab Sample No.(s)	3030225	3030219	3030231	3030230	3030234	3030216
			AGS Reference						
Naphthalene-d8 % recovery**	%	TM218		97.7	115	100	91.8	105	107
Acenaphthene-d10 % recovery**	%	TM218		97.6	114	99.6	89.7	103	109
Phenanthrene-d10 % recovery**	%	TM218		93.2	112	96.5	86.1	99.9	107
Chrysene-d12 % recovery**	%	TM218		91.6	114	91.6	82.2	99.1	107
Perylene-d12 % recovery**	%	TM218		88.5	123	95.8	81.4	95.5	117
Naphthalene	<9 µg/kg	TM218		<9 M	<9 M	<9 M	<9 M	<9 M	<9 M
Acenaphthylene	<12 µg/kg	TM218		<12 M	<12 M	<12 M	<12 M	<12 M	<12 M
Acenaphthene	<8 µg/kg	TM218		<8 M	<8 M	<8 M	<8 M	<8 M	<8 M
Fluorene	<10 µg/kg	TM218		<10 M	<10 M	<10 M	<10 M	<10 M	<10 M
Phenanthrene	<15 µg/kg	TM218		<15 M	<15 M	<15 M	<15 M	<15 M	<15 M
Anthracene	<16 µg/kg	TM218		<16 M	<16 M	<16 M	<16 M	<16 M	<16 M
Fluoranthene	<17 µg/kg	TM218		<17 M	<17 M	<17 M	<17 M	<17 M	<17 M
Pyrene	<15 µg/kg	TM218		<15 M	<15 M	<15 M	<15 M	<15 M	<15 M
Benz(a)anthracene	<14 µg/kg	TM218		<14 M	<14 M	<14 M	<14 M	<14 M	<14 M
Chrysene	<10 µg/kg	TM218		<10 M	<10 M	<10 M	<10 M	<10 M	<10 M
Benzo(b)fluoranthene	<15 µg/kg	TM218		<15 M	<15 M	<15 M	<15 M	<15 M	<15 M
Benzo(k)fluoranthene	<14 µg/kg	TM218		<14 M	<14 M	<14 M	<14 M	<14 M	<14 M
Benzo(a)pyrene	<15 µg/kg	TM218		<15 M	<15 M	<15 M	<15 M	<15 M	<15 M
Indeno(1,2,3-cd)pyrene	<18 µg/kg	TM218		<18 M	<18 M	<18 M	<18 M	<18 M	<18 M
Dibenzo(a,h)anthracene	<23 µg/kg	TM218		<23 M	<23 M	<23 M	<23 M	<23 M	<23 M
Benzo(g,h,i)perylene	<24 µg/kg	TM218		<24 M	<24 M	<24 M	<24 M	<24 M	<24 M
Polyaromatic hydrocarbons, Total	<118 µg/kg	TM218		<118 M	<118 M	<118 M	<118 M	<118 M	<118 M

CERTIFICATE OF ANALYSIS

SDG:	110309-48	**Location:**	Sea Green	**Order Number:**	FJ023335
Job:	H_UNIHULL_HUL-5	**Customer:**	University of Hull	**Report Number:**	121539
Client Reference:	ZBB 776	**Attention:**	Ann Leighton	**Superseded Report:**	

PAH by GCMS

Results Legend

#	ISO17025 accredited.
M	*m*CERTS accredited.
§	Non-conforming work.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	subcontracted test.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of the individual compounds within the samples are not corrected for this recovery.

Component	LOD/Units	Method	Customer Sample R	79	81	85	101	124	129
			Depth (m)	52.90	53.50	46.40	43.70	55.40	54.50
			Sample Type	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid
			Date Sampled	28/02/2011	28/02/2011	02/03/2011	26/02/2011	27/02/2011	27/02/2011
			Date Received	09/03/2011	09/03/2011	09/03/2011	09/03/2011	09/03/2011	09/03/2011
			SDG Ref	110309-48	110309-48	110309-48	110309-48	110309-48	110309-48
			Lab Sample No.(s)	3030218	3030217	3030222	3030212	3030213	3030215
			AGS Reference						
Naphthalene-d8 % recovery**	%	TM218		99.9	106	98.1	103	110	104
Acenaphthene-d10 % recovery**	%	TM218		100	105	97.9	100	108	103
Phenanthrene-d10 % recovery**	%	TM218		99.1	101	95.7	98.4	105	100
Chrysene-d12 % recovery**	%	TM218		99.6	100	98	93.6	102	96.9
Perylene-d12 % recovery**	%	TM218		104	97.7	103	97.9	106	100
Naphthalene	<9 µg/kg	TM218		<9 M	<9 M	<9 M	17.9 M	15.5 M	11.5 M
Acenaphthylene	<12 µg/kg	TM218		<12 M	<12 M	<12 M	<12 M	<12 M	<12 M
Acenaphthene	<8 µg/kg	TM218		<8 M	<8 M	<8 M	10.7 M	<8 M	<8 M
Fluorene	<10 µg/kg	TM218		<10 M	<10 M	<10 M	<10 M	<10 M	<10 M
Phenanthrene	<15 µg/kg	TM218		<15 M	<15 M	<15 M	<15 M	<15 M	<15 M
Anthracene	<16 µg/kg	TM218		<16 M	<16 M	<16 M	<16 M	<16 M	<16 M
Fluoranthene	<17 µg/kg	TM218		<17 M	<17 M	<17 M	<17 M	<17 M	<17 M
Pyrene	<15 µg/kg	TM218		<15 M	<15 M	<15 M	<15 M	<15 M	<15 M
Benz(a)anthracene	<14 µg/kg	TM218		<14 M	<14 M	<14 M	<14 M	<14 M	<14 M
Chrysene	<10 µg/kg	TM218		<10 M	<10 M	<10 M	<10 M	<10 M	<10 M
Benzo(b)fluoranthene	<15 µg/kg	TM218		<15 M	<15 M	<15 M	<15 M	<15 M	<15 M
Benzo(k)fluoranthene	<14 µg/kg	TM218		<14 M	<14 M	<14 M	<14 M	<14 M	<14 M
Benzo(a)pyrene	<15 µg/kg	TM218		<15 M	<15 M	<15 M	<15 M	<15 M	<15 M
Indeno(1,2,3-cd)pyrene	<18 µg/kg	TM218		<18 M	<18 M	<18 M	<18 M	<18 M	<18 M
Dibenzo(a,h)anthracene	<23 µg/kg	TM218		<23 M	<23 M	<23 M	<23 M	<23 M	<23 M
Benzo(g,h,i)perylene	<24 µg/kg	TM218		<24 M	<24 M	<24 M	<24 M	<24 M	<24 M
Polyaromatic hydrocarbons, Total	<118 µg/kg	TM218		<118 M	<118 M	<118 M	<118 M	<118 M	<118 M

CERTIFICATE OF ANALYSIS

SDG:	110309-48	**Location:**	Sea Green	**Order Number:**	FJ023335
Job:	H_UNIHULL_HUL-5	**Customer:**	University of Hull	**Report Number:**	121539
Client Reference:	ZBB 776	**Attention:**	Ann Leighton	**Superseded Report:**	

PAH by GCMS

Results Legend

#	ISO17025 accredited.
M	*m*CERTS accredited.
§	Non-conforming work.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	subcontracted test.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of the individual compounds within the samples are not corrected for this recovery.

Component	LOD/Units	Method	Customer Sample R	138	148
			Depth (m)	50.40	40.00
			Sample Type	Soil/Solid	Soil/Solid
			Date Sampled	01/03/2011	04/03/2011
			Date Received	09/03/2011	09/03/2011
			SDG Ref	110309-48	110309-48
			Lab Sample No.(s)	3030220	3030227
			AGS Reference		
Naphthalene-d8 % recovery**	%	TM218		101	117
Acenaphthene-d10 % recovery**	%	TM218		101	119
Phenanthrene-d10 % recovery**	%	TM218		95.6	117
Chrysene-d12 % recovery**	%	TM218		93.6	114
Perylene-d12 % recovery**	%	TM218		86.2	128
Naphthalene	<9 µg/kg	TM218		<9 M	<9 M
Acenaphthylene	<12 µg/kg	TM218		<12 M	<12 M
Acenaphthene	<8 µg/kg	TM218		<8 M	<8 M
Fluorene	<10 µg/kg	TM218		<10 M	<10 M
Phenanthrene	<15 µg/kg	TM218		<15 M	<15 M
Anthracene	<16 µg/kg	TM218		<16 M	<16 M
Fluoranthene	<17 µg/kg	TM218		<17 M	<17 M
Pyrene	<15 µg/kg	TM218		<15 M	<15 M
Benz(a)anthracene	<14 µg/kg	TM218		<14 M	<14 M
Chrysene	<10 µg/kg	TM218		<10 M	<10 M
Benzo(b)fluoranthene	<15 µg/kg	TM218		<15 M	<15 M
Benzo(k)fluoranthene	<14 µg/kg	TM218		<14 M	<14 M
Benzo(a)pyrene	<15 µg/kg	TM218		<15 M	<15 M
Indeno(1,2,3-cd)pyrene	<18 µg/kg	TM218		<18 M	<18 M
Dibenzo(a,h)anthracene	<23 µg/kg	TM218		<23 M	<23 M
Benzo(g,h,i)perylene	<24 µg/kg	TM218		<24 M	<24 M
Polyaromatic hydrocarbons, Total	<118 µg/kg	TM218		<118 M	<118 M

CERTIFICATE OF ANALYSIS

SDG:	110309-48	**Location:**	Sea Green	**Order Number:**	FJ023335
Job:	H_UNIHULL_HUL-5	**Customer:**	University of Hull	**Report Number:**	121539
Client Reference:	ZBB 776	**Attention:**	Ann Leighton	**Superseded Report:**	

Extractable Petroleum Hydrocarbons (EPH) By GC-FID

EPH (DRO) (C10-C40)

Sample No	Customer Sample Ref.	Depth	Matrix (mg/kg)	EPH	Interpretation
3048141	129	54.50	SOLID	42.7	No Identification Possible
3048321	101	43.70	SOLID	1380	PAHS
3050062	51	39.40	SOLID	36.6	No Identification Possible
3050175	67	56.70	SOLID	<35.0	No Identification Possible
3051644	35	61.90	SOLID	73.1	PAHS
3054618	79	52.90	SOLID	<35.0	No Identification Possible
3054630	138	50.40	SOLID	<35.0	No Identification Possible
3054648	48	62.00	SOLID	<35.0	No Identification Possible
3054676	0	58.00	SOLID	<35.0	No Identification Possible
3054729	02	52.50	SOLID	37.4	No Identification Possible
3056569	85	46.40	SOLID	<35.0	No Identification Possible
3056753	55	46.20	SOLID	<35.0	No Identification Possible
3056797	12	53.10	SOLID	<35.0	No Identification Possible
3056835	148	40.00	SOLID	<35.0	No Identification Possible
3056900	81	53.50	SOLID	<35.0	No Identification Possible
3056934	77	49.80	SOLID	53.5	No Identification Possible
3056964	34	49.40	SOLID	38.5	No Identification Possible
3060035	64	49.00	SOLID	37.8	No Identification Possible
3091083	59	42.80	SOLID	103	PAHS
3091103	124	55.40	SOLID	89.9	PAHS

Extractable Petroleum Hydrocarbons (formally Diesel Range Organics) :- Any compound extractable in n-hexane within the carbon range C10-C40, includes Aliphatic (Min Oil), Aromatic (PAHs) and naturally occurring compounds.

CERTIFICATE OF ANALYSIS

SDG:	110309-48	**Location:**	Sea Green	**Order Number:**	FJ023335
Job:	H_UNIHULL_HUL-5	**Customer:**	University of Hull	**Report Number:**	121539
Client Reference:	ZBB 776	**Attention:**	Ann Leighton	**Superseded Report:**	

Table of Results - Appendix

REPORT KEY

Results expressed as (e.g.) 1.03E-07 is equivalent to 1.03x10-7

NDP	No Determination Possible	#	ISO 17025 Accredited	*	Subcontracted Test	M	MCERTS Accredited
NFD	No Fibres Detected	PFD	Possible Fibres Detected	»	Result previously reported (Incremental reports only)	EC	Equivalent Carbon (Aromatics C8-C35)

Note: Method detection limits are not always achievable due to various circumstances beyond our control

Method No	Reference	Description	Wet/Dry Sample [1]	Surrogate Corrected
PM001		Preparation of Samples for Metals Analysis		
PM024	Modified BS 1377	Soil preparation including homogenisation, moisture screens of soils for Asbestos Containing Material		
SUB		Subcontracted Test		
TM061	Method for the Determination of EPH,Massachusetts Dept.of EP, 1998	Determination of Extractable Petroleum Hydrocarbons by GC-FID (C10-C40)		
TM089	Modified: US EPA Methods 8020 & 602	Determination of Gasoline Range Hydrocarbons (GRO) and BTEX (MTBE) compounds by Headspace GC-FID (C4-C12)		
TM168	EPA Method 8082, Polychlorinated Biphenyls by Gas Chromatography	Determination of WHO12 and EC7 Polychlorinated Biphenyl Congeners by GC-MS in Soils		
TM181	US EPA Method 6010B	Determination of Routine Metals in Soil by iCap 6500 Duo ICP-OES		
TM218	Microwave extraction – EPA method 3546	Microwave extraction - EPA method 3546		

[1] Applies to Solid samples only. DRY indicates samples have been dried at 35°C. NA = not applicable.

CERTIFICATE OF ANALYSIS

SDG:	110309-48	**Location:**	Sea Green	**Order Number:**	FJ023335
Job:	H_UNIHULL_HUL-5	**Customer:**	University of Hull	**Report Number:**	121539
Client Reference:	ZBB 776	**Attention:**	Ann Leighton	**Superseded Report:**	

Test Completion Dates

Lab Sample No(s)	3030228	3030232	3030233	3030223	3030224	3030221	3030225	3030219	3030231	3030230
Customer Sample Ref.	0	02	12	34	35	48	51	55	59	64
AGS Ref.										
Depth	58.00	52.50	53.10	49.40	61.90	62.00	39.40	46.20	42.80	49.00
Type	SOLID	SOLID	SOLID	SOLID	SOLID	SOLID	SOLID	SOLID	SOLID	SOLID
EPH by FID	16-Mar-2011	16-Mar-2011	16-Mar-2011	16-Mar-2011	16-Mar-2011	16-Mar-2011	16-Mar-2011	16-Mar-2011	17-Mar-2011	16-Mar-2011
GRO by GC-FID (S)	16-Mar-2011	22-Mar-2011	16-Mar-2011	16-Mar-2011	22-Mar-2011	16-Mar-2011	17-Mar-2011	17-Mar-2011	22-Mar-2011	16-Mar-2011
Metals by iCap-OES (Soil)	15-Mar-2011	15-Mar-2011	15-Mar-2011	15-Mar-2011	14-Mar-2011	15-Mar-2011	14-Mar-2011	15-Mar-2011	14-Mar-2011	15-Mar-2011
Organotins on soils*	21-Mar-2011	21-Mar-2011	21-Mar-2011	21-Mar-2011	21-Mar-2011	21-Mar-2011	21-Mar-2011	21-Mar-2011	21-Mar-2011	21-Mar-2011
PAH by GCMS	14-Mar-2011	16-Mar-2011	16-Mar-2011	16-Mar-2011	15-Mar-2011	14-Mar-2011	15-Mar-2011	16-Mar-2011	12-Mar-2011	12-Mar-2011
PCBs by GCMS	13-Mar-2011	13-Mar-2011	14-Mar-2011	14-Mar-2011	13-Mar-2011	13-Mar-2011	13-Mar-2011	14-Mar-2011	13-Mar-2011	13-Mar-2011
Sample description	09-Mar-2011	09-Mar-2011	09-Mar-2011	09-Mar-2011	09-Mar-2011	09-Mar-2011	09-Mar-2011	09-Mar-2011	09-Mar-2011	09-Mar-2011

Lab Sample No(s)	3030234	3030216	3030218	3030217	3030222	3030212	3030213	3030215	3030220	3030227
Customer Sample Ref.	67	77	79	81	85	101	124	129	138	148
AGS Ref.										
Depth	56.70	49.80	52.90	53.50	46.40	43.70	55.40	54.50	50.40	40.00
Type	SOLID	SOLID	SOLID	SOLID	SOLID	SOLID	SOLID	SOLID	SOLID	SOLID
EPH by FID	16-Mar-2011	16-Mar-2011	16-Mar-2011	16-Mar-2011	16-Mar-2011	17-Mar-2011	17-Mar-2011	16-Mar-2011	16-Mar-2011	16-Mar-2011
GRO by GC-FID (S)	16-Mar-2011	16-Mar-2011	17-Mar-2011	22-Mar-2011	16-Mar-2011	17-Mar-2011	17-Mar-2011	16-Mar-2011	22-Mar-2011	17-Mar-2011
Metals by iCap-OES (Soil)	14-Mar-2011	15-Mar-2011	15-Mar-2011	15-Mar-2011	15-Mar-2011	14-Mar-2011	14-Mar-2011	11-Mar-2011	15-Mar-2011	15-Mar-2011
Organotins on soils*	21-Mar-2011	21-Mar-2011	21-Mar-2011	21-Mar-2011	21-Mar-2011	21-Mar-2011	21-Mar-2011	21-Mar-2011	21-Mar-2011	21-Mar-2011
PAH by GCMS	15-Mar-2011	16-Mar-2011	16-Mar-2011	15-Mar-2011	16-Mar-2011	13-Mar-2011	12-Mar-2011	12-Mar-2011	15-Mar-2011	16-Mar-2011
PCBs by GCMS	13-Mar-2011	14-Mar-2011	13-Mar-2011	14-Mar-2011	13-Mar-2011	13-Mar-2011	13-Mar-2011	13-Mar-2011	13-Mar-2011	14-Mar-2011
Sample description	09-Mar-2011	09-Mar-2011	09-Mar-2011	09-Mar-2011	09-Mar-2011	09-Mar-2011	09-Mar-2011	09-Mar-2011	09-Mar-2011	09-Mar-2011

RPS Mountainheath

2 Shaftesbury Industrial Centre, Icknield Way, Letchworth, Hertfordshire SG6 1HE

T +44 (0)1462 480400 **F** +44 (0)1462 480403 **E** rpsmh@rpsgroup.com **W** www.mountainheath.com

Analytical Report

ALcontrol Hawarden
Unit7-8, Hawarden Business Park
Manor Road (off Manor Lane)
Hawarden, Deeside
Flintshire, CH5 3US

Report No:	11-21745/1
Date Received:	11/03/2011
Date Tested:	14/03/2011 to 18/03/2011
Date Issued:	18/03/2011
Page:	1 of 7

For the attention of: Tracy Dykes

By email

20 soil samples received from ALcontrol Hawarden (O/N: 168084; Project: 110309-48) in 100ml amber glass jars were analysed as shown below. Analytical methods employed are available on request. Results are reported on an as received basis unless otherwise specified.

Laboratory reference			184472 3034633 64-49.0	184473 3034707 59-42.80	184474 3035777 101-43.70
dibutyltin	*[1002-53-5]*	mg/kg Sn	< 0.02	< 0.02	< 0.02
tetrabutyltin	*[1461-25-2]*	mg/kg Sn	< 0.02	< 0.02	< 0.02
tributyltin	*[56573-85-4]*	mg/kg Sn	< 0.02	< 0.02	< 0.02
triphenyltin	*[668-34-8]*	mg/kg Sn	< 0.05	< 0.05	< 0.05

Laboratory reference			184475 3035810 124-55.40	184476 3035986 129-54.50	184477 3036035 35-61.90
dibutyltin	*[1002-53-5]*	mg/kg Sn	< 0.02	< 0.02	< 0.02
tetrabutyltin	*[1461-25-2]*	mg/kg Sn	< 0.02	< 0.02	< 0.02
tributyltin	*[56573-85-4]*	mg/kg Sn	< 0.02	< 0.02	< 0.02
triphenyltin	*[668-34-8]*	mg/kg Sn	< 0.05	< 0.05	< 0.05

Laboratory reference			184478 3036066 51-39.40	184479 3036068 0-58.00	184480 3036090 77-49.80
dibutyltin	*[1002-53-5]*	mg/kg Sn	< 0.02	< 0.02	< 0.02
tetrabutyltin	*[1461-25-2]*	mg/kg Sn	< 0.02	< 0.02	< 0.02
tributyltin	*[56573-85-4]*	mg/kg Sn	< 0.02	< 0.02	< 0.02
triphenyltin	*[668-34-8]*	mg/kg Sn	< 0.05	< 0.05	< 0.05

Laboratory reference			184481 3036108 48-62.00	184482 3036118 67-56.70	184483 3036119 81-53-50
dibutyltin	*[1002-53-5]*	mg/kg Sn	< 0.02	< 0.02	< 0.02
tetrabutyltin	*[1461-25-2]*	mg/kg Sn	< 0.02	< 0.02	< 0.02
tributyltin	*[56573-85-4]*	mg/kg Sn	< 0.02	< 0.02	< 0.02
triphenyltin	*[668-34-8]*	mg/kg Sn	< 0.05	< 0.05	< 0.05

Laboratory reference			184484 3036150 55-46.20	184485 3036181 85-46.40	184486 3036217 34-49.90
dibutyltin	*[1002-53-5]*	mg/kg Sn	< 0.02	< 0.02	< 0.02
tetrabutyltin	*[1461-25-2]*	mg/kg Sn	< 0.02	< 0.02	< 0.02
tributyltin	*[56573-85-4]*	mg/kg Sn	< 0.02	< 0.02	< 0.02
triphenyltin	*[668-34-8]*	mg/kg Sn	< 0.05	< 0.05	< 0.05

Laboratory reference			184487 3036242 148-40.0	184488 3036268 12-53.10	184489 3036355 138-50.40
dibutyltin	*[1002-53-5]*	mg/kg Sn	< 0.02	< 0.02	< 0.02
tetrabutyltin	*[1461-25-2]*	mg/kg Sn	< 0.02	< 0.02	< 0.02
tributyltin	*[56573-85-4]*	mg/kg Sn	< 0.02	< 0.02	< 0.02
triphenyltin	*[668-34-8]*	mg/kg Sn	< 0.05	< 0.05	< 0.05

Laboratory reference			184490 3036464 79-52.90	184491 3036554 02-52.50
dibutyltin	*[1002-53-5]*	mg/kg Sn	< 0.02	< 0.02
tetrabutyltin	*[1461-25-2]*	mg/kg Sn	< 0.02	< 0.02
tributyltin	*[56573-85-4]*	mg/kg Sn	< 0.02	< 0.02
triphenyltin	*[668-34-8]*	mg/kg Sn	< 0.05	< 0.05

Emma Winter
Laboratory Manager

SDG:	110309-48	**Location:**	Sea Green	**Order Number:**	FJ023335
Job:	H_UNIHULL_HUL-5	**Customer:**	University of Hull	**Report Number:**	121539
Client Reference:	ZBB 776	**Attention:**	Ann Leighton	**Superseded Report:**	

Appendix

1. Results are expressed on a dry weight basis (dried at 35ºC) for all soil analyses except for the following: NRA Leach tests, flash point, ammonium as NH4 by the BRE method, VOC TICS, SVOC TICS, TOF-MS SCAN/SEARCH and TOF-MS TICS.

2. Samples will be run in duplicate upon request, but an additional charge may be incurred.

3. If sufficient sample is received a sub sample will be retained free of charge for 30 days after analysis is completed (e-mailed) for both soil jars, tubs and volatile jars. All waters and vials will be discarded 10 days after the analysis is completed (e-mailed). All material removed during an asbestos containing material screen and analysed for the presence of asbestos will be retained for a period of 6 months after the analysis date. All samples received and not scheduled will be disposed of one month after the date of receipt unless we are instructed to the contrary. Once the initial period has expired, a storage charge will be applied for each month or part thereof until the client cancels the request for sample storage. ALcontrol Laboratories reserve the right to charge for samples received and stored but not analysed.

4. With respect to turnaround, we will always endeavour to meet client requirements wherever possible, but turnaround times cannot be absolutely guaranteed due to so many variables beyond our control.

5. We take responsibility for any test performed by sub-contractors (marked with an asterisk). We endeavour to use UKAS/MCERTS Accredited Laboratories, who either complete a quality questionnaire or are audited by ourselves. For some determinands there are no UKAS/MCERTS Accredited Laboratories, in this instance a laboratory with a known track record will be utilised.

6. When requested, the individual sub sample scheduled will be screened in house for the presence of large asbestos containing material fragments/pieces. If no asbestos containing material is found this will be reported as 'no asbestos containing material detected'. If asbestos containing material is detected it will be removed and analysed by our documented in house method TM048 based on HSG 248 (2005), which is accredited to ISO17025. If asbestos containing material is present no further analysis will be undertaken. At no point is the fibre content of the soil sample determined.

7. If no separate volatile sample is supplied by the client, the integrity of the data may be compromised if the laboratory is required to create a sub-sample from the bulk sample -similarly, if a headspace or sediment is present in the volatile sample. This will be flagged up as an invalid VOC on the test schedule or recorded on the log sheet.

8. If appropriate preserved bottles are not received preservation will take place on receipt. However, the integrity of the data may be compromised.

9. NDP -No determination possible due to insufficient/unsuitable sample.

10. Metals in water are performed on a filtered sample, and therefore represent dissolved metals -total metals must be requested separately.

11. A table containing the date of analysis for each parameter is not routinely included with the report, but is available upon request.

12. Results relate only to the items tested

13. **Surrogate recoveries** -Most of our organic methods include surrogates, the recovery of which is monitored and reported. For EPH, MO, PAH, GRO and VOCs on soils the result is not surrogate corrected, but a percentage recovery is quoted. Acceptable limits for most organic methods are 70 -130 %.

14. **Product analyses** -Organic analyses on products can only be semi-quantitative due to the matrix effects and high dilution factors
employed.

15. Phenols monohydric by HPLC include phenol, cresols (2-Methylphenol, 3-Methylphenol and 4-Methylphenol) and Xylenols (2,3 Dimethylphenol, 2,4 Dimethylphenol, 2,5 Dimethylphenol, 2,6 Dimethylphenol, 3,4 Dimethyphenol, 3,5 Dimethylphenol).

16. Total of 5 speciated phenols by HPLC includes Phenol, 2,3,5-Trimethyl Phenol, 2-Isopropylphenol, Cresols and Xylenols (as detailed in 14).

17. Stones/debris are not routinely removed. We always endeavour to take a representative sub sample from the received sample.

18. Our MCERTS accreditation for PAHs by GCMS applies to all product types apart from Kerosene, where naphthalene only is not
accredited.

19. In certain circumstances the method detection limit may be elevated due to the sample being outside the calibration range. Other factors that may contribute to this include possible interferences. In both cases the sample would be diluted which would cause the method detection limit to be raised.

20. Mercury results quoted on soils will not include volatile mercury as the analysis is performed on a dried and crushed sample.

21. For the BSEN 12457-3 two batch process to allow the cumulative release to be calculated, the volume of the leachate produced is measured and filtered for all tests. We therefore cannot carry out any unfiltered analysis. The tests affected include volatiles GCFID/GCMS and all subcontracted analysis.

22. For all leachate preparations (NRA, DIN, TCLP, BSEN 12457-1, 2, 3) volatile loss may occur, as we do not employ zero headspace extraction.

23. We are accredited to MCERTS for sand, clay and loam/topsoil, or any of these materials -whether these are derived from naturally occurring soil profiles, or from fill/made ground, as long as these materials constitute themajor part of the sample. Other coarse granular material such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.

24. Analysis and identification of specific compounds using GCFID is by retention time only, and we routinely calibrate and quantify for benzene, toluene, ethylbenzenes and xylenes (BTEX). For total volatiles in the C4 -C10 range, the total area of the chromatogram is integrated and expressed as ug/kg or ug/l. Although this analysis is commonly used for the quantification of gasoline range organics (GRO), the system will also detect other compounds such as chlorinated solvents, and this may lead to a falsely high result with respect to hydrocarbons only. It is not possible to specifically identify these non-hydrocarbons, as standards are not routinely run for any other compounds, and for more definitive identification, volatiles by GCMS should be utilised.

SOLID MATRICES EXTRACTION SUMMARY

ANALYSIS	D/C OR WET	EXTRACTION SOLVENT	EXTRACTION METHOD	ANALYSIS
SOLVENT EXTRACTABLE MATTER	D&C	DCM	SOXTHERM	GRAVIMETRIC
CYCLOHEXANE EXT. MATTER	D&C	CYCLOHEXANE	SOXTHERM	GRAVIMETRIC
THIN LAYER CHROMATOGRAPHY	D&C	DCM	SOXTHERM	IATROSCAN
ELEMENTAL SULPHUR	D&C	DCM	SOXTHERM	HPLC
PHENOLS BY GCMS	WET	DCM	SOXTHERM	GC-MS
HERBICIDES	D&C	HEXANE/ACETONE	SOXTHERM	GC-MS
PESTICIDES	D&C	HEXANE/ACETONE	SOXTHERM	GC-MS
EPH (DRO)	D&C	HEXANE/ACETONE	END OVER END	GC-FID
EPH (MIN OIL)	D&C	HEXANE/ACETONE	END OVER END	GC-FID
EPH (CLEANED UP)	D&C	HEXANE/ACETONE	END OVER END	GC-FID
EPH CWG BY GC	D&C	HEXANE/ACETONE	END OVER END	GC-FID
PCB TOT / PCB CON	D&C	HEXANE/ACETONE	END OVER END	GC-MS
POLYAROMATIC HYDROCARBONS (MS)	WET	HEXANE/ACETONE	MICROWAVE TM218.	GC-MS
C8-C40 (C8-C40) EZ FLASH	WET	HEXANE/ACETONE	SHAKER	GC-EZ
POLYAROMATIC HYDROCARBONS RAPID GC	WET	HEXANE/ACETONE	SHAKER	GC-EZ
SEMI VOLATILE ORGANIC COMPOUNDS	WET	DCM/ACETONE	SONICATE	GC-MS

LIQUID MATRICES EXTRACTION SUMMARY

ANALYSIS	EXTRACTION SOLVENT	EXTRACTION METHOD	ANALYSIS
PAH-MS	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GC-MS
EPH	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GC FID
EPH CWG	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GC FID
MINERAL OIL	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GC FID
PCB 7 CONGENERS	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GC-MS
PCB TOTAL	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GC-MS
SVOC	DCM	LIQUID/LIQUID SHAKE	GC-MS
FREE SULPHUR	DCM	SOLID PHASE EXTRACTION	HPLC
PEST OCP/OPP	DCM	LIQUID/LIQUID SHAKE	GC-MS
TRIAZINE HERBS	DCM	LIQUID/LIQUID SHAKE	GC-MS
PHENOLS-MS	DCM	SOLID PHASE EXTRACTION	GC-MS
TPH by INFRARED (IR)	TCE	LIQUID/LIQUID SHAKE	HPLC
MINERAL OIL by IR	TCE	LIQUID/LIQUID SHAKE	HPLC
GLYCOLS	NONE	DIRECT INJECTION	GC-MS

Identification of Asbestos in Bulk Materials

The results for asbestos identification for soil samples are obtained from possible Asbestos Containing Material, removed during the 'Screening of soils for Asbestos Containing Materials', which have been examined to determine the presence of asbestos fibres using Alcontrol Laboratories (Hawarden) in-house method of transmitted/polarised light microscopy and central stop dispersion staining, based on HSG 248 (2005).

Asbestos Type	Common Name
Chrysotile	White Asbestos
Amosite	Brown Asbestos
Crocidolite	Blue Asbestos
Fibrous Actinolite	-
Fibrous Anthophyllite	-
Fibrous Tremolite	-

Visual Estimation Of Fibre Content

Estimation of fibre content is not permitted as part of our UKAS accredited test other than: -
Trace -Where only one or two asbestos fibres were identified.

Further guidance on typical asbestos fibre content of manufactured products can be found in HSG 264.

The identification of asbestos containing materials falls within our schedule of tests for which we hold UKAS accreditation, however opinions, interpretations and all other information contained in the report are outside the scope of UKAS accreditation.