



Rampion Offshore Wind Farm



ES Section 7 – Benthos and Sediment Quality - Appendix 7.1

RSK Environment Ltd

Document 6.3.7i

December 2012

APFP Regulation 5(2)(a)

Revision A

E.ON Climate & Renewables UK Rampion Offshore Wind Limited

**RAMPION OFFSHORE
WINDFARM**

CABLE LANDFALL

**INTERTIDAL
ECOLOGY SURVEY**

**E.ON CLIMATE &
RENEWABLES**

**P41318
December 2011**

RSK General Notes

Project No: P41318

Title: Rampion Offshore Windfarm Cable Landfall Intertidal Ecology

Client: E.ON Climate & Renewables

Issue Date: December 2011

Issuing Office: Helsby

Authorised by:	Alec Moore	Project Author	Date:	9th December 2011
Authorised by:	David Watson	Project QA Rep	Date:	9th December 2011

AM	DW	9 December 2011	E	00	Final
AM	DW	9 September 2011	E	00	Draft for comment
AUTHOR	CHECKED	DATE ISSUED	ISSUED POST / ELECTRONIC	REV	PURPOSE OF ISSUE

CONTENTS

1. Executive summary	1
2. Introduction.....	2
3. Methods.....	3
3.1 General.....	3
3.2 Biotope walkover survey	3
3.3 Sediment sampling	3
3.3.1 General	3
3.3.2 Surface sediment physico-chemistry and chemistry	4
3.3.3 Benthic infauna	5
4. Results & discussion	6
4.1 Survey success.....	6
4.2 Sediment physico-chemistry	6
4.2.1 Particle size analysis.....	6
4.2.2 Total organic carbon	6
4.2.3 Metals.....	6
4.2.4 Tributyltin.....	9
4.2.5 Total petroleum hydrocarbons (TPH)	9
4.2.6 Polycyclic aromatic hydrocarbons (PAHs).....	9
4.3 Benthic infauna	11
4.3.1 Univariate	11
4.4 Biotope descriptions	11
4.4.1 Shingle	11
4.4.2 Coarse sediment.....	13
4.4.3 Sand.....	13
4.4.4 Cobbles & algal turf.....	14
4.4.5 Groynes.....	14
4.4.6 Upper shore stations (stations ending -U)	14
4.4.7 Mid-shore stations (stations ending -M).....	15
4.4.8 Lower shore stations (stations ending -L)	15
4.5 Other observations	15
4.5.1 Outfalls and debris	15
4.5.2 Human users of the intertidal	16
4.5.3 Birds	17
5. References	18

FIGURES

Figure 3.1: Folk scale of sediment classification	4
Figure 4.1: Flat platform at top of shingle beach, separating the A259 Worthing-Brighton road. A band of patchy growth of orache <i>Atriplex</i> sp. demarcates where the flat platform starts sloping seaward (looking ~WSW towards East Worthing; TN1)	12
Figure 4.2: Sea kale <i>Crambe maritima</i>	12
Figure 4.3: Rippled wet sand with lugworm <i>Arenicola marina</i> casts (foreground), typical of much of the mid- and lower shore. Looking upshore ~N.	13
Figure 4.4: Cobbles with a sand covering, with macroalgae & standing water.	14

Figure 4.5: Upper shore site (CRU), showing coarse gravel substrate (foreground)	15
Figure 4.6: Outfall to west of indicative cable route (TN18)	16
Figure 4.7: Rusting section of pipe ca. 10m long on indicative cable route (TN14)	16

TABLES

Table 4.1: Particle size and total organic carbon data for Rampion landfall sediments, May 2011.	7
Table 4.2: Chemical analysis data for Rampion landfall sediments, May 2011	7
Table 4.3: Comparison of observed sediment metal concentrations to international standards.....	9
Table 4.5: Comparison of observed PAH levels in sediments to international standards.....	10
Table 4.6: Univariate indices for benthic infauna communities (per station)	11

APPENDIX 1: BIOTOPE MAP, TARGET NOTES & TARGET NOTE/SAMPLING POSITIONS

APPENDIX 2: RAW SEDIMENT PHYSICO-CHEMISTRY DATA

APPENDIX 3: RAW BENTHIC INVERTEBRATE DATA

1. EXECUTIVE SUMMARY

An ecological survey was conducted on the 18-19th May 2011 to provide baseline environmental information on the intertidal landfall area for the export cable of the proposed Rampion Offshore Windfarm. The survey comprised a walkover survey of habitats and features of interest present, and sampling of sediment for laboratory analysis of benthic communities, particle size, and chemical contamination. Sampling was conducted on the low water of a Spring tide.

Sediments on the upper intertidal were dominated by gravel, while those on mid- and lower shore stations comprised medium sand. Fine sediment of $<63\ \mu\text{m}$ was either absent or present in very low ($\sim 0.01\%$) quantities.

Concentrations of metals were notably elevated at the lower shore station to the west of the cable route (WRL), and the levels of copper, nickel and particularly chromium at this station were above international ecological quality standards. Levels of tributyltin, TPHs and most PAHs were below detection limits across the survey area. Higher levels of PAHs were recorded on the upper shore stations, although none were of particular concern.

Benthic communities were typical of those expected for sand and gravel shorelines, with abundance and species richness being relatively low. Upper shore benthic communities were dominated by turbellarian and nematode worms, with some terrestrial arthropods also recorded. Mid- and lower- shore communities were broadly similar and mostly comprised small polychaetes and crustaceans associated with clean sand. No rare, unusual or protected benthic invertebrates of conservation interest were recorded.

The biotope survey mostly recorded habitats that are widespread, extensive and typical along the Sussex and English Channel coast. No exposed intertidal chalk (a Sussex BAP priority habitat) was recorded. Vegetated shingle is also a Sussex BAP priority habitat; the survey recorded some shingle with limited vegetation showing signs of anthropogenic damage, the site is not a recognised location for this habitat. No other habitats of particular conservation interest were recorded.

The beach in the vicinity of the landfall has been modified by human activity resulting in the presence of large rock groynes, small wooden groynes, and at least two large discharge pipes (possibly for stormwater or sewage). Human activities observed at the time of the survey included bait digging, walking, running and dog walking, and farther afield, kite-surfing. Some existing litter and other debris were also recorded. Birds noted on the intertidal at the time of the survey included ringed plover *Charadrius hiaticula*.

2. INTRODUCTION

RSK have been contracted by E.ON to produce an Environmental Statement for the proposed Rampion Offshore Windfarm in the English Channel, offshore of Brighton. It is currently proposed that the electricity export cable will make landfall in the intertidal area between East Worthing and South Lancing. This report describes the ecological survey that was performed on the intertidal area, to characterise existing habitats and features of interest. This information will form part of the ecological baseline description in the EIA.

It should be noted that this report is primarily concerned with intertidal (i.e. marine) organisms, and does not include detailed information on the maritime plant communities found at the most landward part of the shoreline. This aspect is addressed in more detail in a separate report (RSK Carters Ecological, 2011).

3. METHODS

3.1 General

The survey was conducted by three RSK Environment Ltd personnel (Alec Moore, Andrew Page and Ciaran McLaverty) over the period 18-19th May 2011, to coincide with the low water of Spring tides. The survey, all of which was conducted on foot, was split into two parts:

- **Biotope walkover survey** was conducted during the evening of Wednesday 18th May (low water 18:45, 0.5m above CD, based on Shoreham tides);
- **Sediment sampling** was conducted during the low tide on the morning of 19th May (07:09, 0.4m).

3.2 Biotope walkover survey

This survey was performed using methodology similar to Marine Intertidal Phase 1 Biotope Mapping methodology (Wyn *et al.*, 2006), directly annotating features of interest onto A3 aerial photography of the landfall area. Photographs were taken and target notes were made for a number of aspects including the following:

- Approximate habitat boundaries;
- Sediment/substrate type;
- Sediment/substrate physical features;
- Fauna;
- Flora; and
- Existing human influences.

The positions of all target notes were recorded using a hand-held differential GPS unit (Trimble GeoXT, accurate to ~1m or less). A table of all target notes, and positions, is provided in **Appendix 1**.

Biotope descriptions are based on visual observations from the walkover survey, and laboratory analysis of both sediment particle size and benthic infauna. Biotope descriptions used in this report are those according to The Marine Habitat Classification for Britain and Ireland Version 04.05 (Connor *et al.*, 2004). In many cases **detailed biotope types cannot be designated**, particularly where samples were not taken for analysis of benthic infauna.

3.3 Sediment sampling

3.3.1 General

All sediment samples were collected on foot at the following stations which were selected to represent the intertidal environment around the landfall area (see **Appendix 1**):

- **“Cable route”*** (3 stations)
 - Upper shore (CRU)
 - Mid shore (CRM)
 - Lower shore (CRL)

- **Western Reference** (parallel to “cable route”, at 50m distance): 3 stations
 - Upper shore (WRU)
 - Mid shore (WRM)
 - Lower shore (WRL)
- **Eastern Reference** (parallel to “cable route”, at 50m distance): 3 stations
 - Upper shore (ERU)
 - Mid shore (ERM)
 - Lower shore (ERL)

*NB As the engineering design is an ongoing process, no fixed cable route for the intertidal area was available at the time of the survey. Instead, an indicative “cable route” was extrapolated from a proposed onshore route.

“Upper shore” stations were selected on-site, and were located at the most landward point where the most recent tide had left damp sediment. “Lower shore” stations were then taken near the waterline around the time of low water. “Mid shore” stations were located by estimating the approximate half-way point between “upper” and “lower” using the GPS unit.

3.3.2 Surface sediment physico-chemistry and chemistry

Samples of the surface 5 cm of sediment were taken for laboratory analysis. Samples for particle size, total organic carbon, metals, tributyltin, and organics were taken using a disposable plastic spoon and combined into a plastic 1L pot provided by the analytical laboratory. Samples were then despatched to, and analysed by, the Environment Agency’s National Laboratory Service, U.K. Raw sediment data are presented in **Appendix 2**.

Sediments are classified according to Folk (1954) (**Figure 3.1**) based on their relative contents of gravel (>2mm), sand (>63µm to 2mm) and mud (<63µm).

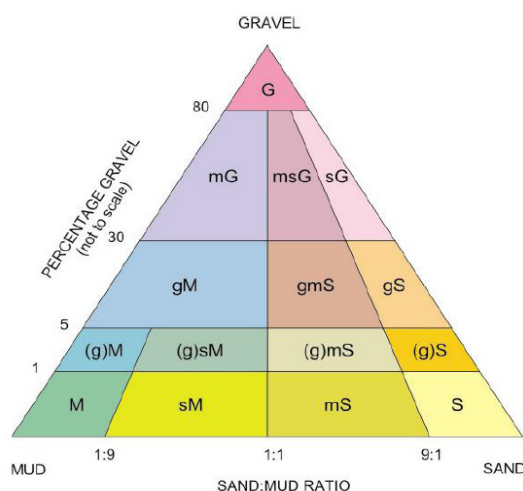


Figure 3.1: Folk scale of sediment classification

3.3.3 Benthic infauna

Three (A-C) faunal sample replicates were collected at each station using a hand-held plastic core of 10.5cm diameter, pushed down to a depth of 20 cm. Sediment was then placed in double-labelled plastic buckets, transported to a specialist benthic analytical laboratory (EMU Ltd.), and fixed at the laboratory with 4% formaldehyde solution within 4-5 hours of being taken. Contents of two replicates were then sieved over a 0.5 mm aperture sieve and subject to detailed taxonomic analysis, with the third replicate being retained for possible future analysis. Several univariate ecological indices were calculated on a 'per station' basis data using PRIMER v.6 as follows:

- **Shannon-Wiener Diversity Index (H')** - a widely used measure of diversity, providing an integrated index of species richness and relative abundance (Shannon & Weaver, 1963).

$$H' = -\sum_{i=1}^s \left[\frac{n_i}{n} \right] \ln \left[\frac{n_i}{n} \right] = -\sum_{i=1}^s p_i \ln(p_i)$$

Where n = the number of individuals in a sample of a population
 n_i = the number of individuals of the i th species in a sample of a population
 p_i = the proportion of the total count arising from the i th species

- **Pielou's Evenness Index (J')** - incorporating the Shannon-Wiener Index and providing a measure of the evenness of the distribution of individuals amongst the different species in each sample (Pielou, 1966).

$$J' = \frac{H'(\text{observed})}{H'_{\max}}$$

Where $H'_{\max}$ = the maximum possible diversity which could be achieved if all species were equally abundant (=logS)

- **Simpson's Dominance Index (C)** – a measure of dominance, essentially the reverse of evenness (Simpson, 1949).

$$C = \sum_{i=1}^s \left(\frac{n_i}{N} \right)^2$$

Where: n_i = number of individuals in the i th species
 N = total number of individuals
 S = total number of species

Raw benthic invertebrate data are presented in **Appendix 3**.

4. RESULTS & DISCUSSION

4.1 Survey success

All survey work and sampling was completed successfully within the low water periods with no health or safety incidents. Complete core samples for benthic analysis could only be taken on the upper shore stations; the presence of cobbles below the surface at other stations allowed only half (all lower shore, and CRM and ERM) or three-quarters (WRM) core samples to be taken.

4.2 Sediment physico-chemistry

4.2.1 Particle size analysis

Summary particle size analysis (PSA) data from surface sediment samples are presented in **Table 4.1**. All sediment samples recorded were composed mainly of gravel (>2mm) or sand (>63µm-2mm) particles, with very little mud (<63µm) present in any of the samples. The majority of stations were classified as Sand under Folk (1954), with the exception of the following:

- ERU and WRU, classified as sandy gravel; and
- CRU, classified as gravel.

Mean/median sediment grain size values decreased from the upper to the lower shore. Upper shore grain sizes were found to be considerably larger than those recorded elsewhere, attributable to the band of shingle and coarse gravel that was present at all three upper shore stations (see Figure 4.5). Sediment grain sizes recorded at the mid and lower stations were very much similar, and predominantly composed of medium-fine sand.

4.2.2 Total organic carbon

Total Organic Carbon (TOC) results, as % by weight of surface sediments are presented in **Table 4.1**. TOC was present in levels below the Minimum Reporting Value (MRV) of 0.1%, or marginally above this, at five of the nine stations, most of which were either mid- or lower shore stations. The highest values recorded were both on upper shore stations WRU (0.6%) and ERU (0.36%). However, TOC levels at these stations would normally be expected to be low, due to the larger grain sizes recorded. This may suggest the TOC levels in upper shore stations are being influenced by the presence of detrital material, which would be associated with the macroalgae found along the strand line,

4.2.3 Metals

Metals results, as mg/kg dry weight (µg/kg dry weight for tributyltin) are presented in **Table 4.2**.

Concentrations of metals showed some spatial patterns. Station CRU had the lowest concentration of most metals. Station WRL had the highest concentrations of most metals, mercury, cadmium, chromium, copper, lead, manganese, nickel and zinc being present at concentrations at least an order of magnitude greater than those recorded from other stations. The high concentrations found at this single station may be due to the large outfall pipe running adjacent to the WR stations, although usually any such discharge might be expected to result in a general elevation of concentrations throughout the area. It is possible that the contamination represents a limited source of contamination.

Other metals were notable in showing a general trend of greater concentration from upper-lower shore (chromium, copper, lead, manganese), while arsenic was in its highest concentrations on the upper shore stations. The occurrence of higher metal contamination lower on the shore would most likely relate to the finer grain sizes observed – the data have not been normalised to grain size.

Table 4.1: Particle size and total organic carbon data for Rampion landfall sediments, May 2011.

Station	% Gravel (>2mm)	% Sand (63µm-2mm)	% Mud (<63µm)	Average particle size (mm)		Classification (Folk, 1954)	TOC %
				Mean	Median		
WRU	69.34	30.66	0	4.9	4.67	Sandy gravel	0.60
WRM	0	100	0	0.157	0.15	Sand	<0.10
WRL	0	99.79	0.21	0.144	0.137	Sand	<0.10
ERU	64.14	35.85	0	5.46	5.1	Sandy gravel	0.36
ERM	0	100	0	0.176	0.168	Sand	<0.10
ERL	0	99.99	0.01	0.164	0.155	Sand	0.22
CRU	83.36	15.63	0	6.73	7.14	Gravel	0.24
CRM	0	99.99	0.01	0.159	0.153	Sand	<0.10
CRL	0	99.96	0.04	0.137	0.132	Sand	0.14

Lowest value; highest value

Table 4.2: Chemical analysis data for Rampion landfall sediments, May 2011

Analyte	Unit	WRU	WRM	WRL	CRU	CRM	CRL	ERU	ERM	ERL
Mercury	mg/kg	0.003	0.003	0.017	0.003	0.002	0.003	0.008	0.002	0.002
Arsenic		19	3.47	13.6	14.8	4.75	6.57	27.1	3.71	4.45
Cadmium		0.038	0.035	0.133	0.035	0.035	0.04	0.046	0.043	0.032
Chromium		3.76	51.4	2420	3.82	41.6	70.3	5.02	12.3	38.2
Copper		2.86	3.92	163	2.32	4.03	9.73	2.66	3.25	3.97
Lead		3.25	7.39	50.1	2.46	6.82	11.1	4.02	5.63	7.25
Lithium		5.94	6.64	8.15	5.85	6.89	8.2	5.77	6.44	6.67
Manganese		29.6	139	2090	18.8	129	235	45.4	87	141
Nickel		1.66	2.65	119	0.873	5.1	5.01	4.14	2.57	2.84
Tin		0.884	0.939	4.49	0.613	0.841	2.76	0.788	1.12	1
Vanadium		24.8	23.5	28.3	14.1	23.8	34.1	29.6	19.2	21.3
Zinc		15.2	18.7	190	13.4	21.9	29.3	30	16.1	19.6
Hydrocarbons >C10 - C12		<10	<10	<10	<10	<10	<10	<10	<10	<10
Hydrocarbons >C12 - C16		<10	<10	<10	<10	<10	<10	<10	<10	<10
Hydrocarbons >C16 - C21		<30	<30	<30	<30	<30	<30	<30	<30	<30
Hydrocarbons >C21 - C35		<50	<50	<50	<50	<50	<50	<50	<50	<50
Hydrocarbons >C35 - C44		<20	<20	<20	<20	<20	<20	<20	<20	<20

Analyte	Unit	WRU	WRM	WRL	CRU	CRM	CRL	ERU	ERM	ERL
Tributyltin	ug/kg	<3	<3	<3	<3	<3	<3	<3	<3	<3
Acenaphthene		1.03	0.639	<0.1	1.58	0.581	0.656	3.57	0.163	0.491
Acenaphthylene		<1	<1	<1	<1	<1	<1	<1	<1	<1
Anthracene : Dry Wt		<20	<20	<20	<20	<20	<20	<20	<20	<20
Benzo(a)anthracene		<20	<20	<20	<20	<20	<20	48.6	<20	<20
Benzo(a)pyrene		<20	<20	<20	<20	<20	<20	61.1	<20	<20
Benzo(b)fluoranthene		<20	<20	<20	20.7	<20	<20	60	<20	<20
Benzo(ghi)perylene		7.28	<6	<6	14.3	<6	<6	37	<6	<6
Benzo(k)fluoranthene		<20	<20	<20	<20	<20	<20	26.1	<20	<20
Chrysene		<30	<30	<30	<30	<30	<30	45.5	<30	<30
Coronene		<10	<10	<10	<10	<10	<10	<10	<10	<10
Dibenzo(ah)anthracene		<3	<3	<3	<3	<3	<3	5.37	<3	<3
Fluoranthene		<20	<20	<20	30.7	<20	<20	82.9	<20	<20
Fluorene		<10	<10	<10	<10	<10	<10	<10	<10	<10
Indeno(1,2,3-cd)pyrene		<30	<30	<30	<30	<30	<30	31	<30	<30
Naphthalene		<10	<10	<10	<10	<10	<10	<10	<10	<10
Phenanthrene		<20	<20	<20	<20	<20	<20	38.4	<20	<20
Pyrene		<20	<20	<20	28.6	<20	<20	74.9	<20	<20

Lowest value; highest value

It is useful to compare observed metal concentrations in sediment with the following internationally accepted values to place the findings into context and help to assess the degree of any anthropogenic contamination (**Table 4.3**).

OSPAR (North East Atlantic)

- Background Reference Concentration (BC); and
- Ecotoxicological Assessment Criteria (EAC), with lower and upper limits.

Environment Canada

- Threshold effects level (TEL): the concentration above which metals may start to be harmful to organisms; and
- Predicted effects level (PEL): the concentration above which metals are likely to become harmful to organisms.

Table 4.3: Comparison of observed sediment metal concentrations to international standards

Metal	This survey	OSPAR			Upper limit exceeded?	Environment Canada		PEL exceeded?
		BC	EAC limits			TEL	PEL	
			Lower	Upper				
	mg/kg dry weight							
As	3.47-27.1	15	1	10	Yes	7.24	41.6	No
Cd	0.032-0.133	0.2	0.1	1	No	0.676	4.21	No
Cr	3.76-2420	60	5	50	Yes	52.3	160	Yes
Cu	2.32-163	20	5	50	Yes	18.7	108	Yes
Hg	0.002-0.017	0.05	0.05	0.5	No	0.13	0.7	No
Ni	0.873-119	30	5	50	Yes	15.9	42.8	Yes
Pb	2.46-50.1	25	5	50	Yes	30.3	112	No
Zn	13.4-190	90	10	100	Yes	124	271	No

In the current study, the metal concentrations that were above both the OSPAR EAC limits and Environment Canada PEL were all recorded at station WRL, and were as follows:

- Copper: WRL had levels above (163mg/kg) the PEL (108mg/kg);
- Chromium: WRL had levels an order of magnitude (2420mg/kg) above the PEL (163mg/kg);
- Nickel: WRL had levels above (119mg/kg) the PEL (42.8mg/kg).

4.2.4 Tributyltin

Tributyltin results, as µg/kg dry weight are presented in **Table 4.2**. All stations had concentrations below the MRV of 3 µg /kg.

4.2.5 Total petroleum hydrocarbons (TPH)

TPH results as mg/kg dry weight are presented in **Table 4.2**. All stations had concentrations below the MRV of 10 mg/kg (C10-12 and C12-C16), 20 mg/kg (C35-C44), 30 mg/kg (C16-C21) or 50 mg/kg (C21-C35).

4.2.6 Polycyclic aromatic hydrocarbons (PAHs)

PAH results as µg/kg dry weight are presented in **Table 4.2**. Probably as a result of the lack of fine sediment in sample, the vast majority of stations had levels of individual PAHs at concentrations below the MRV. Exceptions to this were all upper shore stations: ERU (with the highest levels of most PAHs), CRU (5 PAHs detected) and WRU (2 PAHs detected). The occurrence of elevated PAHs along the upper shore may be explained by the proximity of the A259, which lies just to the back of the shore. This road provides a busy link between Worthing, Shoreham and Brighton, and would be a definite source of PAHs to the local receiving environment.

Acenaphthene was the only PAH detected across the survey area, at all but one station (WRL). Although higher than at some reference background concentrations, PAH levels were generally below international standards, and therefore are not of particular concern. (**Table 4.4**).

Table 4.4: Comparison of observed PAH levels in sediments to international standards

PAH	Environment Canada TEL	Environment Canada PEL	OSPAR		This survey maximum
	(µg/kg, ppb)	(µg/kg, ppb)	BC	BAC	
	µg/kg (ppb)				
Acenaphthene	6.7	88.9	-	-	3.57
Acenaphthylene	5.9	128	-	-	<1
Anthracene	46.9	245	3	5	<20
Benz(a)anthracene	74.8	693	9	16	48.6
Benzo(a)pyrene	88.8	763	15	30	61.1
Benzo(b)fluoranthene	No data	No data	-	-	60
Benzo(g,h,i)perylene	No data	No data	45	80	37
Benzo(k)fluoranthene	No data	No data	-	-	26.1
Chrysene	108	846	11	20	45.5
Dibenz(a,h)anthracene	6.2	135	-	-	<10
Fluoranthene	113	1494	20	39	5.37
Fluorene	21.2	144	-	-	82.9
Indeno(1,2,3,cd)pyrene	No data	No data	50	103	<10
Naphthalene	34.6	391	5	8	31
Phenanthrene	86.7	544	17	32	<10
Pyrene	153	1398	13	24	38.4

4.3 Benthic infauna

4.3.1 Univariate

Number of species and abundances are shown on a per station basis in **Table 4.5** per 0.02m².

Table 4.5: Univariate indices for benthic infauna communities (per station)

Station	Index					
	Number of Species	Number of individuals	Species Richness (d)	Pielou's Evenness (J')	Shannon Wiener (H' - log 2)	Simpson Diversity (C)
ERU	8	334	1.205	0.3991	1.197	0.3905
ERM	13	41	3.231	0.8021	2.968	0.8378
ERL	21	80	4.564	0.8298	3.645	0.8991
CRU	5	226	0.737	0.5058	1.174	0.4159
CRM	9	366	1.355	0.3974	1.26	0.5171
CRL	14	182	2.498	0.4702	1.79	0.5267
WRU	12	1007	1.591	0.3817	1.369	0.4816
WRM	15	53	3.526	0.8785	3.432	0.9028
WRL	19	149	3.597	0.6547	2.781	0.7194

Communities recorded at the upper and mid shore stations were typical of those found in an intertidal environment, characterised by lower numbers of species. Communities recorded along the lower shore stations were more typical of those found in subtidal environments. Species numbers per station ranged from 5 at CRU, to 21 at ERL, whilst abundances ranged from 41 at WRM, to 1007 at WRU.

Turbellarian worms and the oligochaete *Enchytraeidae* sp. dominated the upper shore communities. Here, large numbers of individual organisms were recorded at stations such as WRU, for a comparatively low number of species. Community structures such as this are characteristic of the upper reaches of the intertidal zone, where few species can exploit the harsher conditions found higher on the shore.

Mid-shore communities recorded at stations ERM and WRM were found to be relatively similar in terms of the number of individuals present, the species present, and their diversity. In contrast, station CRM contained relatively high numbers of capitellid polychaetes and nematodes, species that are indicative of more disturbed or stressed communities. Interestingly, CRM showed low levels of contaminants from the physico-chemical analyses, indicating a possible alternative source of disturbance to the benthic macro fauna.

Communities from the lower shore stations showed generally higher species numbers, along with higher diversity values (e.g. Shannon Wiener = 4.564 at ERL). Species recorded here were typical of UK sandy intertidal habitats, comprising spionid polychaetes and species from the amphipod genus *Bathyporeia*.

4.4 Biotope descriptions

A map of the survey area, along with target notes (TN), is provided in **Appendix 1**.

4.4.1 Shingle

The upper part of the shoreline in the vicinity of the proposed landfall is a raised shingle bank, separating the Worthing-Brighton Road (A259) and flatter sand areas on the mid and lower shore. The shingle is largely composed of flint, with some shells of the dead non-native slipper limpet *Crepidula fornicata* also present. This shingle habitat is similar to **LS.LCS.Sh.BarSh Barren littoral shingle**.

The most landward part of this bank is a flat platform approximately 10-15 m wide that is raised above the level of the road (**TN1**, as presented in **Figure 4.1**). The majority of the surface of this flat platform was bare shingle, with little or no vegetation present (possibly due to vehicle or pedestrian use), although maritime vegetation was recorded along either edge of the platform as follows (NB **The present report is not a detailed account of the maritime flora present; please see separate botanical report by RSK Carter Ecological (2011)**).

- On the landward edge of the platform nearest the road, there was a relatively well-developed community of maritime plants, including English stonecrop *Sedum anglicum* and bucks-horn plantain *Plantago coronopus*;
- On the seaward edge, where the flat platform sloped seaward, patchy growths of the maritime plant orache *Atriplex* sp. were recorded in a band of ~1-1.5m wide on edge of the flat platform **Figure 4.1**. Occasional isolated single plants of sea kale *Crambe maritima*, curled dock *Rumex crispus*, yellow-horned poppy *Glaucium flavum* and mayweed indet. *Tripleurospermum* sp. were also recorded.

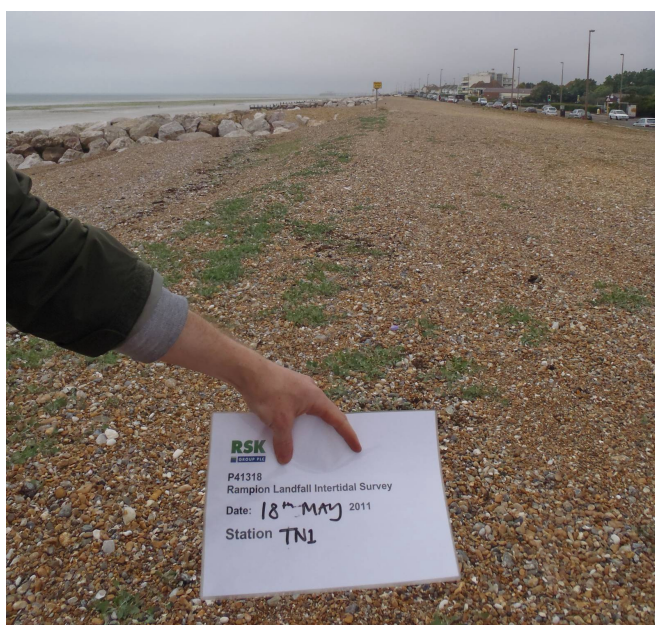


Figure 4.1: Flat platform at top of shingle beach, separating the A259 Worthing-Brighton Road. A band of patchy growth of orache *Atriplex* sp. demarcates where the flat platform starts sloping seaward (looking ~WSW towards East Worthing; TN1)



Figure 4.2: Sea kale *Crambe maritima*

Going seaward from the flat platform, there was a sloping shingle bank (approximately 10-15 m wide) that sloped more gently as it dipped seaward. A patchy strandline of desiccated drift material (including fucoid algae, eggcases of skates *Raja* sp., and dogfish *Scyliorhinus canicula*) and occasional plastic (sanitary items, discarded angling tackle) was present. Talitrid amphipods were notably absent from much of this strandline, though they were present in damp material containing drift ephemeral algae (e.g. *Ulva/Enteromorpha*) in areas more sheltered from the wind, next to the rock groyne. The strandline is consistent with **strandline (LS.LSa.St) (TN2)**.

4.4.2 Coarse sediment

Between the largely homogenous shingle (to landward) and sand (to seaward) was a band approximately 40m wide of heterogenous coarse sediment, comprising mostly sand and gravel. This habitat was also apparently barren, with no visible traces of biota. This habitat was similar to the broad classification of **LS.LCS.Sh Shingle (pebble) and gravel shores (TN3)**. There was a clear demarcation between this sloping, heterogenous coarse sediment, and the much flatter expanse of homogenous sand to seaward.

4.4.3 Sand

The vast majority of the intertidal area at low tide was rippled, medium sand, with abundant lugworm *Arenicola marina* casts present all over the shore (e.g. **Figure 4.3, TN11 & TN15**). Smaller, more abundant *A. marina* casts of juveniles were found to landward and sparser, larger casts were recorded near the low tide mark. Occasional sand mason *Lanice conchilega* tubes were also present. This habitat was broadly consistent with **LS.LSa.MoSa Barren or amphipod dominated fine sand shores** and **LS.LSa.FiSa Polychaete/amphipod dominated fine sand shores**.



Figure 4.3: Rippled wet sand with lugworm *Arenicola marina* casts (foreground), typical of much of the mid- and lower shore. Looking upshore ~N.

4.4.4 Cobbles & algal turf

Across the sandy areas of the lower shore were fairly extensive areas of exposed cobbles, slight hummocks (derived from sand-covered flint cobbles) and standing water, much of which was overgrown with algae (**Figure 4.4, TN12, TN13, TN16**). Algae were dominated by green filamentous species (including *Enteromorpha* and possibly *Chaetomorpha*); other species recorded included sea lettuce *Ulva lactuca*, bootlace weed *Chorda filum*, and sugar kelp *Laminaria saccharina*. Large lugworm *A. marina* casts were present in these areas.



Figure 4.4: Cobbles with a sand covering, with macroalgae & standing water.

4.4.5 Groynes

Two types of groynes were recorded, both of which were perpendicular to the beach. The rock groynes were a dominant feature of the beach and consisted of large (~2m diameter) imported boulders (one of these contained numerous fossils and may be of geological interest). These rock groynes were regularly spaced along the beach (at approximately 70m intervals).

On their upper part, the rock boulders were bare with no visible organisms growing, although there was a gradual increase of overgrowth as one progressed downshore. In addition to this downward increase in biota, there was greater coverage on the westward side of the groynes and on sheltered surfaces between boulders, reflecting more sheltered wave and wind conditions.

The biota at the top of the groynes in the spray zone was limited to a covering of black lichen (possibly *Verrucaria* sp.); going seaward, this was followed by a turf of the ephemeral algae *Enteromorpha* sp., with occasional tufts of sea lettuce *Ulva lactuca*. Going further still towards the end of the groyne, there were numerous small mussel *Mytilus edulis* lodged in crevices; barnacles; occasional limpet *Patella vulgata*; and flat wrack *Fucus spiralis*. Overall, the biota on the man-made groynes is consistent with the broad category of **LR.MLR Moderate energy littoral rock**.

4.4.6 Upper shore stations (stations ending -U)

These were characterised by gravel (CRU) or sandy gravel (ERU and WRU) with no fine material present. The infauna was of low diversity and dominated by turbellarian flatworms, enchytraeid oligochaete worms and acarid mites all of which were most abundant at WRU. A few individuals of other arthropod taxa normally associated with terrestrial environments were also recorded (mostly at WRU (i.e. millipede, insect, beetle, crane fly)), reflecting the close proximity of this station to soil and terrestrial vegetation on the uppermost part of the shingle. This biotope is likely to fall within the broad category of **LS.LCS.Sh.Bar.Sh Barren littoral shingle**. CRU is shown in **Figure 4.5**.



Figure 4.5: Upper shore site (CRU), showing coarse gravel substrate (foreground)

4.4.7 Mid-shore stations (stations ending -M)

All stations were classed as sand, either as 100% (WRM and ERM) or with an insignificant (0.01%) fine material content (CRM).

Biota was generally patchy and sparse, consisting mostly of small numbers of small worms (nematodes and polychaetes including phyllodocids, spionids and capitellids); and crustaceans associated with fine sand (i.e. amphipods *Urothoe* & *Bathyporeia*, cumacean *Bodotria pulchella*, shrimp *Crangon crangon*). CRM was notable both in that organisms were an order of magnitude more abundant than at WRM and ERM, and it had notably lower species richness (9) compared to WRM (15) and ERM (13). CRM had very high abundances of *Capitella* sp. polychaetes and nematode worms, which can indicate disturbed conditions, such as organic enrichment or pollution. The biotope is most similar to the broad categories of **LS.LSa.MoSa Barren or amphipod dominated fine sand shores** and **LS.LSa.FiSa Polychaete/amphipod dominated fine sand shores**.

4.4.8 Lower shore stations (stations ending -L)

The infauna recorded here was broadly similar to that found on the mid shore stations, consisting of a similar suite of small worms (nematodes and nephtyd, magelonid, spionid and capitellid polychaetes); crustaceans (i.e. amphipods *Urothoe* & *Bathyporeia*, cumacean *Bodotria pulchella*, shrimp *Crangon crangon*). Species composition, abundance and species richness was broadly similar at the three stations. The biotope is most similar to the broad categories of **LS.LSa.MoSa Barren or amphipod dominated fine sand shores** and **LS.LSa.FiSa. Polychaete/amphipod dominated fine sand shores**.

4.5 Other observations

4.5.1 Outfalls and debris

Three outfalls were recorded on the beach in the vicinity of the cable route. To the east, a large concrete structure (marked at its seaward limit by a navigational marker) extended from the upper shore. This outfall was actively discharging water that had a sewage odour. This outfall was encrusted with mussels and *Enteromorpha* (TN10). The terminal end of a further outfall was exposed in the beach, (TN 18, Figure 4.6) and although not apparently actively discharging at the time of the survey, there was a strong odour present.



Figure 4.6: Outfall to west of indicative cable route (TN18)

In addition, to the west of the cable route and outside of the survey area, a metal pipeline spanned the entire beach to the low water mark. In addition to these outfalls, a section of rusting pipe approximately 10m long was recorded directly on the indicative cable route (TN14, **Figure 4.7**).



Figure 4.7: Rusting section of pipe ca. 10m long on indicative cable route (TN14)

4.5.2 Human users of the intertidal

Human activities observed at the time of the survey included bait digging, walking, running and dog walking. Numerous kite surfers were using the beach and shallow inshore area approximately 1-2 km to the east.

4.5.3 Birds

Birds noted on the intertidal at the time of the survey were 1-2 ringed plover *Charadrius hiaticula* and several unidentified gulls *Larus* sp.

5. REFERENCES

Connor, D.W., Allen, J.H., Golding, N. Howell, K.L., Lieberknecht, L.M., Northen, K.O. and Reker, J.B. (2004) The Marine Habitat Classification for Britain and Ireland Version 04.05 JNCC, Peterborough.

RSK Carter Ecological (2011). Phase 2 Botanical survey of Rampion offshore wind farm onshore cable route. Produced for E.ON Climate & Renewables.

Wyn, G., Brazier, P., Birch, K., Bunker, A., Cooke, A., Jones, M., Lough, N., McMath, A. and Roberts, S. (2006) Handbook for Marine Intertidal Phase 1 Biotope Mapping Survey. Countryside Council for Wales.

Appendix 1: Biotope map, target notes & target note/sampling positions

Target note (TN) number	Note	WGS84 Decimal degrees		British National Grid	
		Longitude	Latitude	Easting	Northing
1	Flat berm backing onto road. Shingle/gravel consisting of flint & dead <i>Crepidula fornicata</i> shells. Some very dry macroalgae with dried eggcases of lesser spotted dogfish & unidentified skate species Sea kale Patchy band of maritime vegetation 1-1.5m wide Steep drop from flat berm downshore.	-0.335303	50.816598	517365.6	103215.6
2	Desiccated drift algae. Talitrid amphipods present where strandline was damp (e.g. next to boulder groynes), but conspicuously absent along most of the strandline.	-0.335193	50.816557	517373.5	103211.2
3	Wet line of most recent high tide; change from predominantly shingle to gravel/coarse sand.	-0.335134	50.816469	517377.9	103201.6
4	Point of change from bare rock groyne (landward) to overgrowth of <i>Enteromorpha/Ulva</i> /fucoids (seaward).	-0.334721	50.816410	517407.1	103195.7
5	Biota on sheltered E side of groyne comprising barnacles, <i>Fucus</i> sp., edible mussel <i>Mytilus edulis</i> in crevices, and occasional limpet <i>Patella vulgata</i> .	-0.334547	50.816255	517419.7	103178.7
6	Flat berm approximately 10-15m wide. Maritime vegetation present.	-0.333711	50.817144	517476.4	103278.9
7	Maritime vegetation landward of berm.	-0.333774	50.817269	517471.6	103292.7
8	Access point from road; shingle.	-0.332991	50.817528	517526.1	103322.6
9	Landward extent of (?stormwater) outfall. Pipework overgrown with mussels, barnacles, <i>Fucus ?spiralis</i> .	-0.333170	50.816864	517515.2	103248.6
10	Seaward extent of (?stormwater) outfall. Odour of sewage. Dense growths of mussels <i>Mytilus edulis</i> .	-0.332898	50.816508	517535.2	103209.5
11	Fine sand with <i>Arenicola</i> casts (some of which indicated anoxic sediment); occasional gravel on surface.	-0.333409	50.816430	517499.5	103200.0
12	Hummocks composed of flint cobbles covered in sand and overgrowth of macroalgae.	-0.333493	50.816318	517493.8	103187.4
13	Hummocks composed of flint cobbles covered in sand and overgrowth of macroalgae.	-0.333367	50.816098	517503.2	103163.1
13 – A	Border of 13.	-0.334279	50.815865	517439.7	103135.8
13 – B	Border of 13.	-0.334809	50.815609	517402.9	103106.5
13 – C	Border of 13.	-0.334662	50.815409	517413.8	103084.5
13 – D	Border of 13.	-0.334224	50.815211	517445.1	103063.2
13 – E	Border of 13.	-0.333426	50.815518	517500.6	103098.6
13 – F	Border of 13.	-0.334000	50.815474	517460.3	103092.8

13 – G	Border of 13.	-0.334079	50.815678	517454.2	103115.4
14	Large (~10m) rusting metal pipe on beach. Overgrown with <i>Enteromorpha</i> with some sugar kelp <i>Laminaria saccharina</i> .	-0.334123	50.815335	517451.9	103077.1
15	Rippled fine-medium sand with lugworm <i>Arenicola marina</i> casts.	-0.334234	50.815139	517444.6	103055.1
16	<i>Cladophora</i> and cobbles with pools of standing water, algae	-0.334126	50.815041	517452.5	103044.4
16 – A	Border of 16.	-0.334821	50.814738	517404.3	103009.6
16 – B	Border of 16.	-0.333857	50.814688	517472.3	103005.6
16 – C	Border of 16.	-0.333735	50.814581	517481.2	102993.9
16 – D	Border of 16.	-0.334113	50.814361	517455.1	102968.8
17	Waterline at 19:10.	-0.334028	50.814177	517461.5	102948.4
18	Outfall on beach with dark sediment and strong odour.	-0.335789	50.815548	517334.1	103098.1

Station	LOCATION	WGS84 Decimal degrees		British national grid		WGS84 UTM 30N		Date
		LONGITUDE	LATITUDE	EASTING	NORTHING	EASTING	NORTHING	
CRU	"Cable"	-0.335143	50.816462	517377.3	103200.8	687715.1	5632799.9	19/05/2011
CRM	"Cable"	-0.334254	50.815560	517442.2	103101.9	687781.3	5632701.8	19/05/2011
CRL	"Cable"	-0.333248	50.814670	517515.3	103004.6	687855.8	5632605.5	19/05/2011
ERU	East	-0.334502	50.816696	517421.9	103227.8	687759.3	5632827.5	19/05/2011
ERM	East	-0.333676	50.815797	517482.3	103129.1	687821.1	5632729.7	19/05/2011
ERL	East	-0.332559	50.814850	517563.3	103025.7	687903.5	5632627.3	19/05/2011
WRU	West	-0.335787	50.816308	517332.3	103182.6	687670.4	5632781.1	19/05/2011
WRM	West	-0.334739	50.815256	517408.8	103067.3	687748.4	5632666.8	19/05/2011
WRL	West	-0.333989	50.814493	517463.5	102983.7	687804.3	5632584.0	19/05/2011

Appendix 2: Raw particle size analysis data

Analyte	Units	MRV	ERU	ERM	ERL	CRU	CRM	CRL	WRU	WRM	WRL
Grain Size Fraction : > 8000 µ	%	0	19.2	0	0	37.8	0	0	32	0	0
Grain Size : 4000 to 7999 µ	%	0	44.6	0	0	44.3	0	0	22.1	0	0
Grain Size Fraction : 2000 to 3999 µ	%	0	33.4	0	0	13.2	0	0	15.4	0	0
Grain Size Fraction : 1000 to 2000 µ	%	0	2.26	0	0	3.18	0	0	10.9	0	0
Grain Size Fraction : 500 to 999 µ	%	0	0	0	0	0	0	0	13.9	0	0
Grain Size Fraction : 250 to 499 µ	%	0	0	10.7	7.3	0	4.13	0.66	5.93	3.98	2.53
Grain Size Fraction : 125 to 249 µ	%	0	0	71.1	66.8	0	71.3	57.3	0	68.9	58.5
Grain Size Fraction : 63 to 125 µ	%	0	0	18.2	25.9	0	24.6	42	0	27.1	38.8
Grain Size Fraction : < 63 µ	%	0	0	0	0.01	0	0.01	0.04	0	0	0.21
Grain Size Fraction : < 20 µ	%	0	0	0	0	0	0	0	0	0	0
Grain Size Inclusive Kurtosis	mm	-12	0.603	0.514	0.514	0.493	0.514	0.511	0.624	0.514	0.514
Grain Size Inclusive Mean	mm	0	4.99	0.167	0.155	6.41	0.153	0.132	3.27	0.151	0.137
Inclusive Graphic Skewness :- {SKI}	Unitless	-1	-0.1	0.01	0.01	-0.48	0	0.01	-0.48	0	0
Kurtosis	Unitless	-12	-1.07	0.58	0.64	-0.89	0.47	0.61	-1.52	0.54	0.52
Particle Diameter : Mean	mm	0	5.46	0.176	0.164	6.73	0.159	0.137	4.9	0.157	0.144
Particle Diameter : Median	mm	0	5.1	0.168	0.155	7.14	0.153	0.132	4.67	0.15	0.137
Sorting Coefficient	Unitless	-3	0.69	0.46	0.47	0.62	0.41	0.39	1.53	0.42	0.46

Appendix 3: Raw benthic invertebrate data

0.5mm Sieve – Totals per replicate																				
SDC	Species		CRL-1	CRL-2	CRM-1	CRM-2	CRU-1	CRU2	ERL-1	ERL-2	ERM-1	ERM-2	ERU-1	ERU-2	WRL-1	WRL-2	WRM-1	WRM-2	WRU-1	WRU-2
F0002	TURBELLARIA													37						
F0002	TURBELLARIA (Type A)																		2	6
F0002	TURBELLARIA (Type B)																			3
F0002	TURBELLARIA (Type C)						4	22					10	1					110	55
F0002	TURBELLARIA (Type D)																		1	
G0001	NEMERTEA											1								
HD0001	NEMATODA		6	116	99	115	3		7	9	3				1	7		9		
P0118	<i>Eteone longa</i>	agg	1	1					1						1		1			
P0145	<i>Anaitides mucosa</i>		1		1	3				1				1						
P0494	<i>Nephtys</i>	juv	3	5						1					1	2	1	1		
P0672	<i>Scoloplos armiger</i>				1															
P0720	<i>Spionidae</i>										1									
P0733	<i>Laonice bahusiensis</i>				1															
P0787	<i>Spio</i>									2	1							1		
P0789	<i>Spio decorata</i>															2				
P0791	<i>Spio martinensis</i>			1					4	3	2	5			2	2	1	2		
P0794	<i>Spiophanes bombyx</i>									2		1			1	6	1	1		
P0803	<i>Magelona</i>	juv							1						2	2				
P0805	<i>Magelona filiiformis</i>		1							1								1		
P0807	<i>Magelona mirabilis</i>														1					
P0903	<i>Capitellidae</i>								2											
P0906	<i>Capitella</i>		4	22	84	54			2	9	13	1			3	3				
P0929	<i>Arenicola</i>	juv	1												1					
P1179	<i>Terebellidae</i>	juv		2																
P1501	<i>Enchytraeidae</i>						100	69			1		177	80			7		377	319
Q0054	ACARIFORMES (Type A)						22	4					19	5			1		84	36
R0142	COPEPODA		2	9			1	1	1					1	6	70	1	5		
S0131	<i>Perioculodes longimanus</i>														2					
S0133	<i>Pontocrates altamarinus</i>								3							1				

0.5mm Sieve – Totals per replicate																				
SDC	Species		CRL-1	CRL-2	CRM-1	CRM-2	CRU-1	CRU2	ERL-1	ERL-2	ERM-1	ERM-2	ERU-1	ERU-2	WRL-1	WRL-2	WRM-1	WRM-2	WRU-1	WRU-2
S0135	<i>Pontocrates arenarius</i>		1	2					1	2					1	8				
S0138	<i>Synchelidium maculatum</i>														1					
S0250	<i>Urothoe poseidonis</i>										1						3	1		
S0451	<i>Bathyporeia</i>									1		1								
S0451	<i>Bathyporeia</i>	juv							3	11	1				3	1				
S0452	<i>Bathyporeia elegans</i>		1							2					1					
S0454	<i>Bathyporeia guilliamsoniana</i>			1																
S0455	<i>Bathyporeia nana</i>				2					1					2					
S0456	<i>Bathyporeia pelagica</i>									2	2	1								
S1196	<i>Bodotria pulchella</i>			2	4				5	2	5	1			6	10	3	7	1	
S1276	DECAPODA	larva																1		
S1385	<i>Crangon crangon</i>				1					1								1		
	MYRIAPODA												1						2	
	INSECTA				1													4	3	
	<i>Tipulidae</i>																		1	5
	COLEOPTERA																			1
	COLLEMBOLA												2							
W1695	<i>Mytilus edulis</i>	juv																		1
	Number of Species		10	10	9	3	5	4	11	16	10	7	5	6	17	12	9	12	9	8
	Number of Individuals		21	161	194	172	130	96	30	50	30	11	209	125	35	114	19	34	581	426

0.5mm Sieve – Totals per station											
SDC	Species		CRL	CRM	CRU	ERL	ERM	ERU	WRL	WRM	WRU
F0002	TURBELLARIA		0	0	0	0	0	37	0	0	0
F0002	TURBELLARIA (Type A)		0	0	0	0	0	0	0	0	8
F0002	TURBELLARIA (Type B)		0	0	0	0	0	0	0	0	3
F0002	TURBELLARIA (Type C)		0	0	26	0	0	11	0	0	165
F0002	TURBELLARIA (Type D)		0	0	0	0	0	0	0	0	1
G0001	NEMERTEA		0	0	0	0	1	0	0	0	0
HD0001	NEMATODA		122	214	3	16	3	0	8	9	0
P0118	<i>Eteone longa</i>	agg	2	0	0	1	0	0	1	1	0
P0145	<i>Anaitides mucosa</i>		1	4	0	1	0	1	0	0	0
P0494	<i>Nephtys</i>	juv	8	0	0	1	0	0	3	2	0
P0672	<i>Scoloplos armiger</i>		0	1	0	0	0	0	0	0	0
P0720	<i>Spionidae</i>		0	0	0	0	1	0	0	0	0
P0733	<i>Laonice bahusiensis</i>		0	1	0	0	0	0	0	0	0
P0787	<i>Spio</i>		0	0	0	2	1	0	0	1	0
P0789	<i>Spio decorata</i>		0	0	0	0	0	0	2	0	0
P0791	<i>Spio martinensis</i>		1	0	0	7	7	0	4	3	0
P0794	<i>Spiophanes bombyx</i>		0	0	0	2	1	0	7	2	0
P0803	<i>Magelona</i>	juv	0	0	0	1	0	0	4	0	0
P0805	<i>Magelona filiformis</i>		1	0	0	1	0	0	0	1	0
P0807	<i>Magelona mirabilis</i>		0	0	0	0	0	0	1	0	0
P0903	<i>Capitellidae</i>		0	0	0	2	0	0	0	0	0
P0906	<i>Capitella</i>		26	138	0	11	14	0	6	0	0
P0929	<i>Arenicola</i>	juv	1	0	0	0	0	0	1	0	0
P1179	<i>Terebellidae</i>	juv	2	0	0	0	0	0	0	0	0
P1501	<i>Enchytraeidae</i>		0	0	169	0	1	257	0	7	696
Q0054	ACARIFORMES (Type A)		0	0	26	0	0	24	0	1	120
R0142	COPEPODA		11	0	2	1	0	1	76	6	0
S0131	<i>Perioculodes longimanus</i>		0	0	0	0	0	0	2	0	0

0.5mm Sieve – Totals per station											
SDC	Species		CRL	CRM	CRU	ERL	ERM	ERU	WRL	WRM	WRU
S0133	<i>Pontocrates altamarinus</i>		0	0	0	3	0	0	1	0	0
S0135	<i>Pontocrates arenarius</i>		3	0	0	3	0	0	9	0	0
S0138	<i>Synchelidium maculatum</i>		0	0	0	0	0	0	1	0	0
S0250	<i>Urothoe poseidonis</i>		0	0	0	0	1	0	0	4	0
S0451	<i>Bathyporeia</i>		0	0	0	1	1	0	0	0	0
S0451	<i>Bathyporeia</i>	juv	0	0	0	14	1	0	4	0	0
S0452	<i>Bathyporeia elegans</i>		1	0	0	2	0	0	1	0	0
S0454	<i>Bathyporeia guilliamsoniana</i>		1	0	0	0	0	0	0	0	0
S0455	<i>Bathyporeia nana</i>		0	2	0	1	0	0	2	0	0
S0456	<i>Bathyporeia pelagica</i>		0	0	0	2	3	0	0	0	0
S1196	<i>Bodotria pulchella</i>		2	4	0	7	6	0	16	10	1
S1276	DECAPODA	larva	0	0	0	0	0	0	0	1	0
S1385	<i>Crangon crangon</i>		0	1	0	1	0	0	0	1	0
	MYRIAPODA		0	0	0	0	0	1	0	0	2
	INSECTA		0	1	0	0	0	0	0	4	3
	<i>Tipulidae</i>		0	0	0	0	0	0	0	0	6
	COLEOPTERA		0	0	0	0	0	0	0	0	1
	COLLEMBOLA		0	0	0	0	0	2	0	0	0
W1695	<i>Mytilus edulis</i>	juv	0	0	0	0	0	0	0	0	1
	Number of Species		14	9	5	21	13	8	19	15	12
	Number of Individuals		182	366	226	80	41	334	149	53	1007