



Mersea Quarters Benthic Faunal Analysis and Particle
Size Analysis Report
For
Mersea Harbour Protection Trust

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Project Number	Report No.	Revision No.	Report Status	Date of Issue
XMHP101	001	005	Final	10/11/2015

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1. Introduction

Thomson Unicomarine were contracted by Carol Reid on behalf of the Mersea Harbours Protection Trust (MHPT) to undertake analysis of samples taken from the Blackwater estuary. These samples form part of a study looking into foreshore recharge in and around the Mersea Quarters.

Thomson Unicomarine provided coring equipment for taking samples which was completed by MHPT. Samples were delivered to our Guildford laboratory where they were analysed for benthic fauna and particle size. A total of 47 samples were provided, 24 for benthic faunal analysis and 23 for particle size analysis. We were also contracted to provide a short report detailing our methodology, raw results and an indication of likely biotopes for each of the 24 stations.

2. Methodology

2.1 Macrobiota analysis

Analysis of the macrobenthic samples was carried out according to the agreed specifications, using Thomson Unicomarine's standard operating procedures (TEM09, 2013). All biological analysis was conducted at Thomson Unicomarine's laboratory by Thomson Unicomarine staff with internal quality control procedures at each stage of the process.

After several days in preservative, the biological samples were sieved at 0.5 mm and all biota extracted using low power stereo microscopes. In-house quality control procedures were carried out, to reduce the risk of biota being missed. After these procedures were completed, the sediment residues (sediment from which biota had been extracted) were discarded. The extracted biota were preserved in 70% industrial denatured alcohol (IDA). Countable fauna removed from the sediment were identified to the most accurate taxonomic level practicable, usually species, and enumerated. Non-countable taxa, such as colonial fauna, plants and algae, were recorded as present ('P'). High power compound microscopes were used to confirm the identity of some species. For quality control purposes and to allow future taxonomic comparisons to be made, a reference collection of some of the taxa found was made for the project as a whole and will be kept at Thomson Unicomarine, along with the remaining extracted fauna, which are stored as one pot per sample for one year.

Subsampling

Due to the large volume of some sample material, subsampling was undertaken using the following method. We have internally verified our subsampling procedures in house down to fractions of 1/8th. All of the heavy material was picked through in full while the large volume of fine 'float' material was placed into a subsampling device ("quarteriser") to obtain a subsample. The entire float of the sample was washed into the "quarteriser" and water is added to approximately half the depth of the device. The bung was placed into the top of the device, which was then shaken to ensure equal division of the sediment between the four compartments. After shaking, any residue left on the bung and the sides of the "quarteriser" was rinsed into the device using a water bottle. The device was then left to stand undisturbed for several minutes, until all sediment in the sample settled. At this point, the cap from one of the quarters in the bottom of the device was removed and the quarter left to drain out into a bucket or sieve. The liquid, with its quarter of sediment is drained out slowly to prevent disturbance to the

partition, which would otherwise cause material to flow into the opened quarter from other compartments. The empty compartment is then carefully rinsed to add any animals left on the sides to the quarter. The remaining unpicked three quarter sample was retained separately and stored in 70% IDA. The quarter fraction was then picked under a stereomicroscope as per usual sorting methodology and the extracted fauna identified and enumerated as detailed. The figures are then multiplied by four and added to the existing fully counted data to give an estimate of the total count for each sample.

2.2 Particle Size Analysis

Analysis of the particle size samples was carried out according to the agreed specifications, using Thomson Unicomarine's standard operating procedures (TEM10, 2013). All analyses were conducted at Thomson Unicomarine's laboratory by Thomson Unicomarine staff with appropriate internal quality control procedures throughout the process. The sieve and laser data were merged to produce a continuous particle size distribution which was entered into the GRADISTAT program (Blott & Pye, 2001) to obtain derived statistics. PSA data were converted into simplified proportions of eight size categories (Wentworth, 1922).

3. Results

3.1 Faunal data

The data for the benthic fauna at each station can be found in the data matrix in Appendix 1.

3.2 Particle Size Analysis data

Particle size data is given on the Wentworth scale in Table 1 below and the raw data can be found in Appendix 2. The results of the particle size analysis showed the presence of 6 textural groups, of which 'Sandy Mud' was represented most frequently.

Table 1. Particle Size Analysis shown on Wentworth scale.

Station Code	Cob Marsh T1 SS1	Cob Marsh T1 SS2	Cob Marsh T1 SS3	Cob Marsh T2 SS1	Cob Marsh T2 SS2	Cob Marsh T2 SS3	Cob Marsh T2 SS4	Cob Marsh T2 SS5	Cob Marsh T3 SS1
pebble	11.86	0.00	0.00	37.24	28.91	11.45	0.00	0.00	24.98
granule	4.83	0.00	0.00	12.53	9.33	3.19	0.00	0.00	2.66
V. coarse sand	5.89	0.00	0.00	7.88	9.42	1.77	0.00	0.00	2.77
Coarse sand	39.01	19.78	10.43	15.73	19.89	4.39	2.67	3.95	37.37
Medium sand	25.36	40.71	26.87	24.14	29.31	45.52	27.98	14.00	19.52
Fine sand	1.58	10.36	9.20	2.49	3.15	27.05	21.09	7.78	0.69
V. fine sand	1.29	2.06	5.16	0.00	0.00	0.17	4.50	5.91	2.28
Silt Clay	10.18	27.10	48.34	0.00	0.00	6.45	43.76	68.35	9.72
	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Station Code	Cob Marsh T3 SS2	Cob Marsh T3 SS3	Cob Marsh T3 SS4	Old Hall T1 SS1	Old Hall T1 SS2	Old Hall T1 SS3	Old Hall T1 SS4	Old Hall T2 SS1	Old Hall T2 SS2
pebble	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.46	0.00
granule	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.98	0.00
V. coarse sand	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.26	0.00
Coarse sand	16.73	3.01	3.07	4.78	0.97	1.43	1.05	26.04	7.13
Medium sand	45.35	8.48	9.08	10.24	4.50	4.66	5.23	38.98	37.90
Fine sand	17.00	6.20	7.68	4.85	4.00	3.25	3.77	5.82	19.87
V. fine sand	0.48	7.30	10.32	8.42	5.78	5.53	12.35	0.52	6.42
Silt Clay	20.44	75.03	69.85	71.70	84.75	85.14	77.60	10.96	28.68
	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Station Code	Old Hall T2 SS3	Old Hall T2 SS5	Packing Marsh T1 SS2	Tollesbury Wick T1 SS1	Tollesbury Wick T1 SS2
pebble	0.00	0.00	60.95	0.00	9.21
granule	0.00	0.00	5.63	0.00	5.54
V. coarse sand	0.00	0.00	4.03	0.00	3.87
Coarse sand	4.25	0.10	13.68	1.20	22.17
Medium sand	56.70	1.75	10.12	4.94	48.76
Fine sand	27.39	2.59	0.10	4.75	7.32
V. fine sand	0.31	9.72	0.40	13.80	0.22
Silt Clay	11.35	85.85	5.09	75.31	2.91
	100.00	100.00	100.00	100.00	100.00

3.3 Biotopes

An indication of the biotopes at each of the sample stations is given in Table 2 below based on the faunal and particle size data without statistical analysis. Biotopes are assigned following the most recent classification (Connor *et al.*, 2004), and to corresponding EUNIS codes.

Table 2. Indicative biotopes at each sample station

Cob marsh T1-SS1 Lab ref:63660	LS.LSa.MoSa.OI Oligochaetes in littoral mobile sand
Cob marsh T1-SS2 Lab ref: 63661	LS.LMu.MEst.NhomMacStr <i>Nephtys hombergii</i> , <i>Macoma balthica</i> and <i>Streblospio shrubsolii</i> in littoral sandy mud
Cob marsh T1-SS3 Lab ref: 63662 (2 potential biotopes assigned)	LS.LMu.MEst Polychaete/bivalve-dominated mid estuarine mud shores / LR.FLR.Eph.BLitX Barnacles and <i>Littorina</i> spp. on unstable eulittoral mixed substrata
Cob marsh T2-SS1 Lab ref: 63663	LS.LSa.St.Tal Talitrids on the upper shore and strandline
Cob marsh T2-SS2 Lab ref: 63664	LS.LMu Littoral mud
Cob marsh T2-SS3 Lab ref: 63665	LS.LSa.MuSa Polychaete/bivalve dominated muddy sandy shores
Cob marsh T2-SS4 Lab ref: 63666	LS.LMu.MEst.NhomMacStr <i>Nephtys hombergii</i> , <i>Macoma balthica</i> and <i>Streblospio shrubsolii</i> in littoral sandy mud
Cob marsh T2-SS5 Lab ref: 63667	LS.LBR.LMus.Myt.Sa <i>Mytilus edulis</i> beds on littoral sand
Old Hall T1-SS1 Lab ref: 63668	LS.LMu.UEst.Tben <i>Tubificoides benedii</i> and other oligochaetes in littoral mud
Old Hall T1-SS2 Lab ref: 63669	LS.LMu. Littoral mud (anoxic)
Old Hall T1-SS3 Lab ref:63670	LS.LMu. Littoral mud

Old Hall T2-SS1 Lab ref: 63671	LS.LMu. Littoral mud
Old Hall T2-SS2 Lab ref:63672	LS.LMu.MEst.NhomMacStr <i>Nephtys hombergii</i> , <i>Macoma balthica</i> and <i>Streblospio shrubsolii</i> in littoral sandy mud
Old Hall T2-SS3 Lab ref: 63673	LS.LMu.MEst.NhomMacStr <i>Nephtys hombergii</i> , <i>Macoma balthica</i> and <i>Streblospio shrubsolii</i> in littoral sandy mud
Packing marsh T1-SS1 Lab ref: 63674	LS. LSa.St.Tal Talitrids on the upper shore and strandline
Packing marsh T1-SS2 Lab ref: 63675	LS.LSa.St Strandline
Tollesbury Wick T1-SS1 Lab ref: 63676	LS.LMu.UEst.Hed.OI <i>Hediste diversicolor</i> and oligochaetes in littoral mud
Tollesbury Wick T1-SS2 Lab ref: 63677	LS.LMu.MEst.NhomMacStr <i>Nephtys hombergii</i> , <i>Macoma balthica</i> and <i>Streblospio shrubsolii</i> in littoral sandy mud
Cob marsh T3-SS1 Lab ref: 63736	LS.LSa.MoSa.OI Oligochaetes in littoral mobile sand
Cob marsh T3-SS2 Lab ref: 63737	LS.LMu.MEst.NhomMacStr <i>Nephtys hombergii</i> , <i>Macoma balthica</i> and <i>Streblospio shrubsolii</i> in littoral sandy mud
Cob marsh T3-SS3 Lab ref: 63738	LS.LMu.MEst.HedMacScr <i>Hediste diversicolor</i> , <i>Macoma balthica</i> and <i>Scrobicularia plana</i> in littoral sandy mud
Cob marsh T3-SS4 Lab ref: 63739	LS.LMu.MEst.HedMacScr <i>Hediste diversicolor</i> , <i>Macoma balthica</i> and <i>Scrobicularia plana</i> in littoral sandy mud
Old Hall T1-SS4 Lab ref: 63740	LS.LMu.UEst.Hed.Str <i>Hediste diversicolor</i> and <i>Streblospio shrubsolii</i> in littoral sandy mud
Old Hall T1-SS5 Lab ref: 63741	LS.LMu.MEst.HedMacScr <i>Hediste diversicolor</i> , <i>Macoma balthica</i> and <i>Scrobicularia plana</i> in littoral sandy mud

4. References

- Blott, S.J. & Pye, K., 2001. GRADISTAT: a grain size distribution and statistics package for the analysis of unconsolidated sediments. *Earth Surface Processes and Landforms*, 26, 1237-1248.
- Connor, D.W., Allen, J.H., Golding, N., Howell, K.L., Lieberknecht, L.M., Northen, K.O. & Reker, J.B., 2004. *The marine habitat classification for Britain and Ireland Version 04.05*. JNCC, Peterborough, ISBN 1 861 07561 8 (internet version).
- Wentworth, C.K., 1922. A scale of grade and class terms for clastic sediments. *Journal of Geology*, 30, 377-392.

Appendix 1

Appendix 1. MHPSMS15 Faunal Data

SDC	TaxonName	Cob Marsh T1_SS1	Cob Marsh T1_SS	Cob Marsh T1_SS3	Cob Marsh T2_SS1	Cob Marsh T2_SS2	Cob Marsh T2_SS3	Cob Marsh T2_SS4	Cob Marsh T2_SS5	Cob Marsh T3_SS1	Cob Marsh T3_SS2	Cob Marsh T3_SS3	Cob Marsh T3_SS4	Old hall T1_SS1	Old hall T1_SS2	Old hall T1_SS3	Old hall T1_SS4	Old hall T2_SS1	Old hall T2_SS2	Old hall T2_SS3	Old hall T2_SS5	Packing Marsh T1_SS1	Packing Marsh T1_SS2	Tollesbury Wick T1_SS1	Tollesbury Wick T1_SS2				
	ANIMALIA (eggs)	present												present															
G0001	NEMERTEA																												
HD0001	NEMATODA					4	1					1	7					4					1					1	16
P0025	Polynoidae (juv.)																												
P0091	Pholoe (juv.)																												
P0114	Phyllodocidae (juv.)																												
P0116	Eteone																												
P0116	Eteone (juv.)																												
P0178	Phyllodoce (juv.)																												
P0145	Phyllodoce mucosa (juv.)																												
P0255	Glycera (juv.)																												
P0265	Glycera tridactyla																												
P0285	Sphaerodoropsis																												
P0458	Nereididae																												
P0458	Nereididae (juv.)																												
P0462	Hediste diversicolor																												
P0462	Hediste diversicolor (juv.)																												
P0494	Nephtys																												
P0494	Nephtys (juv.)																												
P0499	Nephtys hombergii																												
P0720	Spionidae (juv.)																												
P0753	Polydora cornuta (juv.)																												
P0776	Pygospio elegans																												
P0776	Pygospio elegans (juv.)																												
P0783	Scolecopsis squamata																												
P0794	Spiophanes bombyx																												
P0794	Spiophanes bombyx (juv.)																												
P0797	Streblospio																												
P0822	Cirratulidae																												
P0822	Cirratulidae (juv.)																												
P0847	Tharyx species A																												
P0847	Tharyx species A (juv.)																												
P0906	Capitella (juv.)																												
P0931	Arenicola marina																												
P0993	Opheliidae (juv.)																												
P1118	Ampharetidae																												
P1120	Melinna (juv.)																												
P1124	Melinna palmata																												
P1124	Melinna palmata (juv.)																												
P1139	Ampharete lindstroemi (agg.)																												
	Fabriciidae																												
P1479	Baltidrilus costatus																												
P1490	Tubificoides benedii																												
P1498	Tubificoides pseudogaster (agg.)																												
P1501	Enchytraeidae	94			1	1					4	1					40					1					1		
	ACARI																												
	ARANEAE																												
R0015	THORACICA (juv.)																												
R0068	Austrorhynchus modestus																												
R0142	COPEPODA																												
R2413	MYODOCOPIIDA																												
R2432	Eusarsiella zostericola																												
S0230	Macarorchestia roffensis																												

Appendix 1. MHPSMS15 Faunal Data

SDC	TaxonName	Cob Marsh T1_SS1	Cob Marsh T1_SS	Cob Marsh T1_SS3	Cob Marsh T2_SS1	Cob Marsh T2_SS2	Cob Marsh T2_SS3	Cob Marsh T2_SS4	Cob Marsh T2_SS5	Cob Marsh T3_SS1	Cob Marsh T3_SS2	Cob Marsh T3_SS3	Cob Marsh T3_SS4	Old hall T1_SS1	Old hall T1_SS2	Old hall T1_SS3	Old hall T1_SS4	Old hall T2_SS1	Old hall T2_SS2	Old hall T2_SS3	Old hall T2_SS5	Packing Marsh T1_SS1	Packing Marsh T1_SS2	Tollesbury Wick T1_SS1	Tollesbury Wick T1_SS2
S0230	Macarorchestia roffensis (juv.)																								
S0423	Ampelisca	1																							
S0577	Aoridae (female)																								
S0550	Microprotopus maculatus																								
S0543	Melita palmata							2	11																
S0651	Pariambus typicus								1																
S0805	Cyathura carinata			7				11	6																
S0805	Cyathura carinata (juv.)	1		4			1	7	7		2	16	6					11	12	1	8			15	
S0851	Eurydice affinis																								
S0871	Lekanesphaera rugicauda		4				1		1					1											
S0884	Jaera (juv.)	1		4																					
S0885	Jaera albifrons								12																
S0890	Jaera praeheirsuta			1																					
S1197	Bodotria scorioides			1																					
S1276	BRACHYURA (megalopa)								1																
S1594	Carcinus maenas																								
S1594	Carcinus maenas (juv.)			2																					
	COLLEMBOLA																								
	INSECTA		1	1																					
	Chironomidae (larva)									1		8							1		1				
	Dolichopodidae (larva)									6	16	4												2	
W0046	POLYPLACOPHORA (juv.)	1		4																					
W0077	Lepidochitona			4																					
W0077	Lepidochitona (juv.)								7																
W0079	Lepidochitona cinerea								9																
W0088	GASTROPODA																								
W0305	Littorina saxatilis			1																					
W0305	Littorina saxatilis (juv.)			9																					
W0385	Peringia ulvae	54	1929	307	2	393	121	2	113	99	82	28	4	1	2	19	28			443	33			41	
W0385	Peringia ulvae (juv.)																			58				10	138
W1002	Odostomia turrita/plicata agg.					1																			
W1002	CEPHALASPIDEA																								
W1002	CEPHALASPIDEA (juv.)																								
W1077	Retusa obtusa	2	17	1		14				1										5				5	
W1077	Retusa obtusa (juv.)																								1
W1127	Alderia modesta											16													
W1127	Alderia modesta (juv.)																								
W1560	BIVALVIA					1																			
W1560	BIVALVIA (juv.)			1																					
W1695	Mytilus edulis								1		2														
W1938	Cardiidae (juv.)		1						1																
	Parvicardium pinnulatum		2	1																					
	Parvicardium pinnulatum (juv.)			3																					
W2029	Macoma balthica		10																						
W2029	Macoma balthica (juv.)		16	5				1																	1
W2058	Abra (juv.)																								
W2012	Abra tenuis		29	4		6	1	2		6	1	1												2	
W2012	Abra tenuis (juv.)																							3	1
ZA0003	Phoronis																								
ZS0002	CHLOROPHYCEAE				present					present	present	present													

Appendix 2

Appendix 2. Raw PSA Data and Size class statistics

µm	phi	Sample											
		Cob Marsh T1 SS1	Cob Marsh T1 SS2	Cob Marsh T1 SS3	Cob Marsh T2 SS1	Cob Marsh T2 SS2	Cob Marsh T2 SS3	Cob Marsh T2 SS4	Cob Marsh T2 SS5	Cob Marsh T3 SS1	Cob Marsh T3 SS2	Cob Marsh T3 SS3	
63000	-6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
45000	-5.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
31500	-5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
22400	-4.5	0.00	0.00	0.00	6.82	7.68	4.09	0.00	0.00	6.99	0.00	0.00	0.00
16000	-4	0.00	0.00	0.00	4.57	4.92	1.00	0.00	0.00	6.76	0.00	0.00	0.00
11200	-3.5	2.12	0.00	0.00	9.92	6.55	1.92	0.00	0.00	3.14	0.00	0.00	0.00
8000	-3	3.27	0.00	0.00	8.38	4.86	2.25	0.00	0.00	3.56	0.00	0.00	0.00
5600	-2.5	2.69	0.00	0.00	7.56	4.90	2.19	0.00	0.00	2.44	0.00	0.00	0.00
4000	-2	1.57	0.00	0.00	6.98	5.11	1.79	0.00	0.00	2.09	0.00	0.00	0.00
2800	-1.5	2.21	0.00	0.00	5.55	4.21	1.40	0.00	0.00	1.54	0.00	0.00	0.00
2000	-1	2.47	0.00	0.00	4.10	4.18	1.02	0.00	0.00	1.12	0.00	0.00	0.00
1400	-0.5	2.36	0.00	0.00	3.77	5.24	0.75	0.00	0.00	1.40	0.00	0.00	0.00
1000	0	3.08	0.00	0.00	3.11	5.27	0.47	0.00	0.00	1.37	0.00	0.00	0.00
707	0.5	2.81	0.00	0.00	12.62	14.62	3.92	0.00	0.97	17.35	0.00	0.00	0.00
500	1	17.95	4.99	10.43	14.74	17.78	16.99	2.67	2.22	20.02	16.73	3.01	0.00
353.6	1.5	21.06	14.79	14.61	9.40	11.53	28.54	11.26	2.28	14.11	23.47	4.60	0.00
250	2	16.93	21.83	12.26	2.49	3.11	21.26	16.72	1.94	5.41	21.88	3.87	0.00
176.8	2.5	8.43	18.88	6.61	0.00	0.04	5.80	14.22	2.06	0.57	13.08	3.10	0.00
125	3	1.58	8.77	2.59	0.00	0.00	0.16	6.87	2.59	0.12	3.92	3.09	0.00
83.39	3.5	0.00	1.59	1.98	0.00	0.00	0.00	2.18	3.11	0.95	0.14	3.45	0.00
62.5	4	0.23	0.40	3.09	0.00	0.00	0.54	2.23	3.83	1.31	0.31	3.75	0.00
44.19	4.5	1.03	1.60	4.03	0.00	0.00	1.09	3.83	5.16	1.13	1.43	4.29	0.00
31.25	5	1.17	2.56	4.45	0.00	0.00	0.72	4.40	6.99	1.06	1.80	5.38	0.00
22.097	5.5	1.09	2.68	4.72	0.00	0.00	0.39	4.08	8.71	1.20	1.80	6.76	0.00
15.625	6	1.14	2.74	5.00	0.00	0.00	0.44	3.86	9.81	1.32	1.96	7.93	0.00
11.049	6.5	1.25	2.99	5.19	0.00	0.00	0.59	4.07	10.13	1.30	2.26	8.69	0.00
7.813	7	1.30	3.19	5.21	0.00	0.00	0.61	4.41	9.68	1.13	2.44	9.01	0.00
5.524	7.5	1.21	3.11	4.95	0.00	0.00	0.53	4.47	8.56	0.90	2.36	8.71	0.00
3.906	8	1.01	2.76	4.35	0.00	0.00	0.42	4.09	7.02	0.64	2.03	7.62	0.00
2.762	8.5	0.74	2.26	3.49	0.00	0.00	0.36	3.38	5.47	0.44	1.56	5.94	0.00
1.953	9	0.52	1.76	2.62	0.00	0.00	0.32	2.62	3.96	0.30	1.12	4.27	0.00
1.381	9.5	0.36	1.30	1.84	0.00	0.00	0.28	1.90	2.65	0.21	0.76	2.84	0.00
0.977	10	0.26	0.89	1.23	0.00	0.00	0.17	1.30	1.66	0.11	0.51	1.79	0.00
0.691	10.5	0.16	0.57	0.79	0.00	0.00	0.01	0.84	0.86	0.00	0.34	1.09	0.00
0.488	11	0.01	0.27	0.43	0.00	0.00	0.00	0.45	0.33	0.00	0.09	0.58	0.00
0.345	11.5	0.00	0.06	0.15	0.00	0.00	0.00	0.14	0.00	0.00	0.00	0.24	0.00
0.244	12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.173	12.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.122	13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.086	13.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Appendix 2. Raw PSA Data and Size class statistics

Cob Marsh T3 SS4	Old Hall T1 SS1	Old Hall T1 SS2	Old Hall T1 SS3	Old Hall T1 SS4	Old Hall T2 SS1	Old Hall T2 SS2	Old Hall T2 SS3	Old Hall T2 SS5	Packing Marsh T1 SS2	Tollesbury Wick T1 SS1	Tollesbury Wick T1 SS2
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	22.26	0.00	0.39
0.00	0.00	0.00	0.00	0.00	1.80	0.00	0.00	0.00	11.56	0.00	0.76
0.00	0.00	0.00	0.00	0.00	1.36	0.00	0.00	0.00	11.67	0.00	3.39
0.00	0.00	0.00	0.00	0.00	1.31	0.00	0.00	0.00	9.47	0.00	4.68
0.00	0.00	0.00	0.00	0.00	2.00	0.00	0.00	0.00	5.98	0.00	3.21
0.00	0.00	0.00	0.00	0.00	2.22	0.00	0.00	0.00	3.29	0.00	2.34
0.00	0.00	0.00	0.00	0.00	2.75	0.00	0.00	0.00	2.34	0.00	2.26
0.00	0.00	0.00	0.00	0.00	2.84	0.00	0.00	0.00	1.82	0.00	1.61
0.00	0.00	0.00	0.00	0.00	3.41	0.00	0.00	0.00	2.21	0.00	2.01
0.00	0.00	4.99	4.99	0.00	4.63	0.00	3.07	2.67	3.26	2.67	20.16
3.07	4.78	14.79	14.79	1.05	21.40	7.13	4.73	11.26	10.42	11.26	28.19
4.73	6.11	21.83	21.83	2.84	23.22	17.15	4.35	16.72	7.62	16.72	20.57
4.35	4.13	18.88	18.88	2.39	15.76	20.75	3.76	14.22	2.50	14.22	6.93
3.76	2.39	8.77	8.77	1.61	5.53	14.22	3.92	6.87	0.10	6.87	0.39
3.92	2.47	1.59	1.59	2.16	0.28	5.65	4.69	2.18	0.00	2.18	0.00
4.69	3.60	0.40	0.40	4.56	0.00	2.72	5.49	2.23	0.09	2.23	0.21
5.49	4.69	1.60	1.60	7.58	0.49	3.60	6.13	3.83	0.30	3.83	0.47
6.13	5.60	2.56	2.56	9.29	1.14	4.33	6.85	4.40	0.28	4.40	0.28
6.85	6.56	2.68	2.68	9.10	1.09	3.57	7.67	4.08	0.28	4.08	0.12
7.67	7.41	2.74	2.74	8.09	0.95	2.62	8.40	3.86	0.40	3.86	0.22
8.40	7.84	2.99	2.99	7.46	0.97	2.43	8.80	4.07	0.56	4.07	0.38
8.80	7.87	3.19	3.19	7.53	1.04	2.75	8.59	4.41	0.67	4.41	0.42
8.59	7.67	3.11	3.11	7.86	1.06	2.98	7.55	4.47	0.70	4.47	0.33
7.55	7.24	2.76	2.76	7.71	1.01	2.82	5.81	4.09	0.65	4.09	0.22
5.81	6.43	2.26	2.26	6.72	0.92	2.34	3.93	3.38	0.53	3.38	0.16
3.93	5.22	1.76	1.76	5.14	0.79	1.73	2.49	2.62	0.38	2.62	0.17
2.49	3.92	1.30	1.30	3.63	0.69	1.21	1.57	1.90	0.25	1.90	0.12
1.57	2.67	0.89	0.89	2.39	0.59	0.83	1.02	1.30	0.17	1.30	0.02
1.02	1.67	0.57	0.57	1.48	0.44	0.58	0.68	0.84	0.13	0.84	0.00
0.68	1.00	0.27	0.27	0.87	0.22	0.39	0.39	0.45	0.08	0.45	0.00
0.39	0.52	0.06	0.06	0.41	0.07	0.15	0.11	0.14	0.01	0.14	0.00
0.11	0.22	0.00	0.00	0.14	0.00	0.03	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Appendix 2. Raw PSA data and Size Class statistics

Sediment*	mm	phi f	Sample					
			Cob Marsh T1 SS1	Cob Marsh T1 SS2	Cob Marsh T1 SS3	Cob Marsh T2 SS1	Cob Marsh T2 SS2	Cob Marsh T2 SS3
V. coarse gravel	>32<64	<-5>-6	0.00	0.00	0.00	0.00	0.00	0.00
Coarse gravel	>16<32	<-4>-5	2.12	0.00	0.00	6.82	7.68	4.09
Medium gravel	>8<16	<-3>-4	5.96	0.00	0.00	14.49	11.47	2.93
Fine gravel	>4<8	<-2>-3	3.79	0.00	0.00	15.94	9.76	4.44
V. fine gravel	>2<4	<-1>-2	4.83	0.00	0.00	12.53	9.33	3.19
V. coarse sand	>1<2	<0>-1	5.89	0.00	0.00	7.88	9.42	1.77
Coarse sand	>0.5<1	<1>0	39.01	19.78	10.43	15.73	19.89	4.39
Medium sand	>0.25<0.5	<2>1	25.36	40.71	26.87	24.14	29.31	45.52
Fine sand	>0.125<0.25	<3>2	1.58	10.36	9.20	2.49	3.15	27.05
V. fine sand	>0.0625<0.125	<4>3	1.29	2.06	5.16	0.00	0.00	0.17
V. coarse silt	>0.03125<0.0625	<5>4	2.24	5.18	8.38	0.00	0.00	1.61
Coarse silt	>0.015625<0.03125	<6>5	2.39	5.74	9.72	0.00	0.00	1.11
Medium silt	>0.007813<0.015625	<7>6	2.51	6.31	10.40	0.00	0.00	1.02
Fine silt	>0.003906<0.007813	<8>7	1.75	5.02	9.30	0.00	0.00	1.14
V. fine silt	>0.001953<0.003906	<5>5	0.87	3.06	6.10	0.00	0.00	0.78
Clay	<0.001953	>9	0.43	1.79	4.44	0.00	0.00	0.78
Statistics**	Mean (phi)		0.467	2.873	4.101	-0.958	-0.52	1.28
	Sorting		2.220	2.422	2.786	2.062	2.10	1.95
	Skewness		-0.066	0.672	0.224	-0.023	-0.46	-0.36
	Kurtosis		3.019	0.927	0.667	0.642	0.69	3.24
	% Silt/Clay		10.18	27.10	48.34	0.00	0.00	6.45
	Textural Group*		<i>Gravelly Muddy Sand</i>	<i>Muddy Sand</i>	<i>Muddy Sand</i>	<i>Sandy Gravel</i>	<i>Sandy Gravel</i>	<i>Gravelly Sand</i>

Sediment*	mm	phi f	Sample					
			Old Hall T1 SS1	Old Hall T1 SS2	Old Hall T1 SS3	Old Hall T1 SS4	Old Hall T2 SS1	Old Hall T2 SS2
V. coarse gravel	>32<64	<-5>-6	0.00	0.00	0.00	0.00	0.00	0.00
Coarse gravel	>16<32	<-4>-5	0.00	0.00	0.00	0.00	0.00	0.00
Medium gravel	>8<16	<-3>-4	0.00	0.00	0.00	0.00	3.16	0.00
Fine gravel	>4<8	<-2>-3	0.00	0.00	0.00	0.00	3.30	0.00
V. fine gravel	>2<4	<-1>-2	0.00	0.00	0.00	0.00	4.98	0.00
V. coarse sand	>1<2	<0>-1	0.00	0.00	0.00	0.00	6.26	0.00
Coarse sand	>0.5<1	<1>0	4.78	0.97	1.43	1.05	26.04	7.13
Medium sand	>0.25<0.5	<2>1	10.24	4.50	4.66	5.23	38.98	37.90
Fine sand	>0.125<0.25	<3>2	4.85	4.00	3.25	3.77	5.82	19.87
V. fine sand	>0.0625<0.125	<4>3	8.42	5.78	5.53	12.35	0.52	6.42
V. coarse silt	>0.03125<0.0625	<5>4	12.03	8.90	9.97	18.18	2.21	7.80
Coarse silt	>0.015625<0.03125	<6>5	15.25	15.70	15.96	15.55	1.92	5.06
Medium silt	>0.007813<0.015625	<7>6	15.54	19.95	19.15	15.39	2.10	5.74
Fine silt	>0.003906<0.007813	<8>7	13.67	18.24	18.52	14.43	1.93	5.16
V. fine silt	>0.001953<0.003906	<5>5	9.14	12.49	12.73	8.77	1.48	2.94
Clay	<0.001953	>9	6.07	9.47	8.81	5.29	1.32	1.98
Statistics**	Mean (phi)		5.259	6.347	6.336	5.671	1.00	3.13
	Sorting		2.676	2.248	2.238	2.183	1.99	2.26
	Skewness		-0.166	-0.159	-0.167	0.002	0.04	0.62
	Kurtosis		0.924	1.142	1.139	0.975	3.16	1.00
	% Silt/Clay		71.70	84.75	85.14	77.60	10.96	28.68
	Textural Group*		<i>Sandy Mud</i>	<i>Sandy Mud</i>	<i>Sandy Mud</i>	<i>Sandy Mud</i>	<i>Gravelly Muddy Sand</i>	<i>Muddy Sand</i>

* GRADISTAT classification system (Blott, S. J. & Pye, K., 2001). ** Folk & Ward

Appendix 2. Raw PSA data and Size Class statistics

Cob Marsh T2 SS4	Cob Marsh T2 SS5	Cob Marsh T3 SS1	Cob Marsh T3 SS2	Cob Marsh T3 SS3	Cob Marsh T3 SS4
0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	13.75	0.00	0.00	0.00
0.00	0.00	6.70	0.00	0.00	0.00
0.00	0.00	4.53	0.00	0.00	0.00
0.00	0.00	2.66	0.00	0.00	0.00
0.00	0.00	2.77	0.00	0.00	0.00
2.67	3.95	37.37	16.73	3.01	3.07
27.98	14.00	19.52	45.35	8.48	9.08
21.09	7.78	0.69	17.00	6.20	7.68
4.50	5.91	2.28	0.48	7.30	10.32
8.14	9.44	2.17	3.20	9.57	12.84
7.94	13.06	2.52	3.76	14.69	16.08
8.49	15.51	2.43	4.70	17.70	17.39
8.56	14.29	1.54	4.39	16.32	13.36
6.01	9.21	0.74	2.68	10.21	6.42
4.63	6.85	0.33	1.70	6.53	3.76
3.93	5.19	-0.46	2.68	5.61	5.15
2.64	2.79	2.94	2.18	2.56	2.40
0.55	-0.19	-0.27	0.68	-0.22	-0.16
0.71	0.76	1.34	2.28	0.95	0.91
43.76	68.35	9.72	20.44	75.03	69.85
<i>Muddy Sand</i>	<i>Sandy Mud</i>	<i>Muddy Sandy Gravel</i>	<i>Muddy Sand</i>	<i>Sandy Mud</i>	<i>Sandy Mud</i>

Old Hall T2 SS3	Old Hall T2 SS5	Packing Marsh T1 SS2	Tollesbury Wick T1 SS1	Tollesbury Wick T1 SS2	
0.00	0.00	0.00	0.00	0.00	
0.00	0.00	22.26	0.00	0.00	
0.00	0.00	23.23	0.00	1.15	
0.00	0.00	15.45	0.00	8.07	
0.00	0.00	5.63	0.00	5.54	
0.00	0.00	4.03	0.00	3.87	
4.25	0.10	13.68	1.20	22.17	
56.70	1.75	10.12	4.94	48.76	
27.39	2.59	0.10	4.75	7.32	
0.31	9.72	0.40	13.80	0.22	
3.48	15.55	0.56	16.86	0.74	
1.89	15.58	0.96	14.53	0.34	
2.22	17.15	1.37	15.39	0.80	
1.96	17.46	1.18	14.20	0.55	
1.02	11.90	0.63	8.78	0.33	
0.77	8.20	0.39	5.55	0.14	
1.88	6.24	-1.97	5.63	0.77	
1.14	2.01	2.58	2.23	1.37	
0.39	-0.02	0.54	0.00	-0.48	
2.71	0.87	0.79	0.94	1.90	
11.35	85.85	5.09	75.31	2.91	
<i>Muddy Sand</i>	<i>Sandy Mud</i>	<i>Muddy Sandy Gravel</i>	<i>Sandy Mud</i>	<i>Gravelly Sand</i>	