



Centre for Marine and Coastal Studies

Rhyl Flats Offshore Wind Farm Grab Survey Field Report

A report to
npower renewables Ltd

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1. Introduction

The Rhyl Flats Offshore Wind Farm area is located approximately 4 miles off the North Wales coastline within Liverpool Bay between the coastal resort towns of Towyn and Rhôs-on-Sea. Construction on the 30 2MW wind turbine array is scheduled to begin during late summer 2006 and continue through to the following year. The development should enter its post-construction phase in 2008.

A grab sampling survey was undertaken during October 2005 by the Centre for Marine and Coastal Studies (CMACS Ltd), during the pre-construction phase of the project, to provide information concerning the infaunal benthic populations and the sub-tidal sediment types in and around the development area as part of the 2005 baseline program (see Fig. 1 for site locations). Sites were selected so as to sample sediments within the Rhyl Flats development area representing different habitats, and up and down drift conditions. Site locations were also selected in the near-field area of the monopile foundations to determine scour effects and within the area affected by sediment transport and deposition. A collection of grab stations was also located along the proposed cable route and at several sites comparatively remote to the project area, both within and outside the tidal excursion. The latter were selected to assess far field effects and those outside the tidal excursion as controls.

These surveys will be repeated annually as part of the proposed monitoring required to comply with the conditions of the Food and Environmental Protection Act (FEPA) 1985: Part II (as amended) issued to 'npower renewables offshore Ltd' for the Rhyl Flats Offshore Wind Farm and dated the 5th February 2004. As wind farm construction is scheduled over the summer months, future monitoring will commence in September to coincide with the completion of construction.

This survey report details the preliminary observations made during the October 2005 survey and briefly describes the sub-tidal sediment types taken at grab stations in and around the Rhyl Flats development area. The presence of any large fauna and/or demersal fish species is also documented (see Figure. 1 for site locations).

These samples will be processed further in the laboratory and the data produced statistically analysed. These results will be interpreted further and discussed in the forthcoming project monitoring report to be produced in 2006.

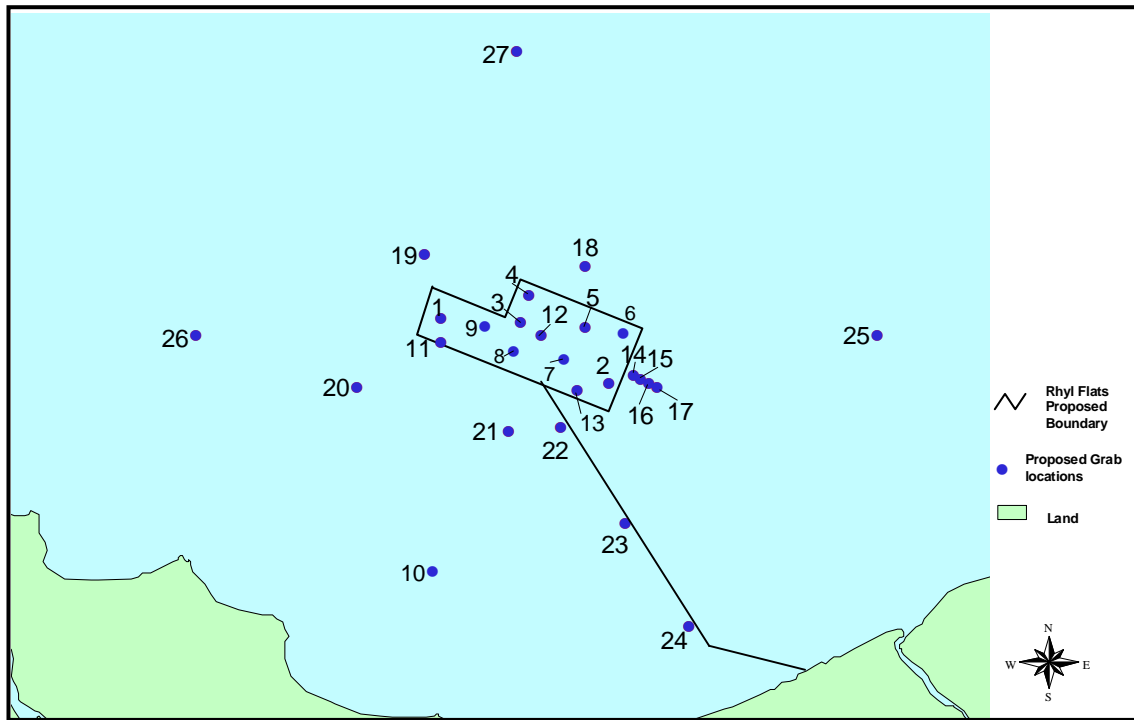


Figure 1: Site locations surveyed as part of the 2005 grab survey.

2. Methodology

The pre-construction monitoring survey was conducted using the research vessel RV 'Aquadynamic' operating out of Conwy marina (see Figure. 2). A total of 27 sites were sampled over a 3 day period returning to berth daily, the first stations being visited on the 7th and 9th of September. Poor weather and rough sea conditions precluded the immediate completion of the survey and the remaining sites were sampled and completed on the 3rd October.

Sub-tidal sediment samples were collected from grab stations within and outside the Rhyl Flats development area, and at three sites along the proposed cable route to determine scour effects within the near-field area of the development area and the far-field effects in areas influenced by sediment transport and deposition. Where possible, a total of three replicate samples were taken from each grab station to analyse faunal composition and a sub-sample was taken from each replicate to provide sediment for Particle Size Analysis (PSA).

All faunal samples were obtained using a 0.1m² Day grab. On occasions where large stones, cobbles or other objects prevented the grab 'jaws' from closing, the grab was emptied of any residues and re-deployed. These sites were invariably located on rocky ground composed mainly of large stones and rocks.

Firstly, the contents of each sample were photographed and the information concerning each grab (site number, date, time, estimated grab volume and a brief sediment description) documented. A small hand-held trowel was used to remove a suitable amount of sediment for PSA from each replicate, which was then decanted into a suitably labelled receptacle and placed into a cool sample storage container for transportation back to the laboratory to be frozen and later analysed. This resulted in three sediment samples being taken for PSA at each grab station. The remaining sediment was gently washed through a 1mm sieve and the residual contents back-washed into a labelled container to provide a faunal sample. Each sample was preserved using an appropriate amount of 10% formalin solution, resulting in a final concentration of approximately 5%. Consequently, three faunal samples were preserved from each grab station ready for transport back to the laboratory to be sorted, identified and analysed.



Figure. 2 Survey vessel RV 'Aquadynamic'

3. Preliminary observations

The following section details preliminary field observations made by the scientific surveyor during the fieldwork. Detailed results concerning faunal species and sediment characteristics at each site will be presented within the Rhyl Flats Monitoring Report 2006 following detailed laboratory analysis and interpretation.

Overall, 25 grab stations were successfully sampled retrieving 3 faunal and 3 PSA samples from each. On two occasions (site 4 & 18) the grab consistently returned to surface open, with the jaws prized apart by cobbles and large stones. Therefore, zero or only minimal amounts of sub-tidal sediment (below QC standards) were retrieved at these locations, at site 4 in the northern corner of the development area and at site 18 in the near-field area just north of the development area.

Sites inside and on the boundary of the Rhyl Flats development area were relatively consistent in sediment composition. The majority of the sub-tidal sediments collected were composed of sand of various grades. Most grab stations produced sediment consisting of coarse-medium sand, commonly associated with variable amounts of shell fragments. Some of the more conspicuous fauna were the mask crab (*Corystes cassivelanus*) at site 2, the sea potato (*Echinocardium cordatum*) at site 9 and the Lesser sand eel (*Ammodytes tobianus*) at site 3. Sites with finer sediments were sometimes associated with variable amounts of anoxic silt/clay, but this generally accounted for only a small fraction of the sediment composition (e.g. site 5, 7 and 9). Finer sediments were also more common at the boundary of the development area (sites 11 and 13), although were generally consistent with the main characteristics of the sediments retrieved within the project area. Successful sampling was prohibited at site 4 in the northern corner of the development area, suggesting the ground to be at least in part rocky, consistent with the large stones and cobbles in the jaws of the grab. The vessel's echosounder confirmed site 4 to be on a rocky mound. This was also the case at site 18, just northeast of site 4 in the near-field area of the development area.

The sites within the near-field area of the project area appear quite variable. The collection of grab stations to the east (sites 14-17) were mainly composed of coarse-medium sandy sediments mixed with shell fragments, although small amounts of anoxic clay were evident at site 17 furthest outside of the development area. The echinoderms *Ophiura ophiura* and *Echinocardium cordatum* were also recorded and an adult weever fish (*Echiichthys vipera*) was also caught intact in the grab. Sites 19-21 are situated a short distance outside the development area beginning in the northwest and following an anticlockwise track to just south of the development area. The majority of the sub-tidal sediments from these sites were finer and composed of anoxic clay and mud. This was especially the case at site 21 south of the project area, where sediments mainly consisted of anoxic clay and a strong smell of hydrogen sulphide (H₂S). The brittle star *O. ophiura* and the sea potato *E. cordatum* were also associated with these sediments. A buried female mask crab (*C. cassivelanus*) was also intact in a grab at site 21.

Sites along the proposed cable route graded from finer to coarser material inshore. The sediments furthest offshore and closest to the development area were consistent with site 21 mainly composed of fines and hydrogen sulphide smelling-clay. The sediment became noticeably coarser inshore.

The site furthest offshore was consistently composed of coarse sand (site 27). However, other sites remote to the Rhyl Flats development area were composed of finer material. Site 26 west of the development area and the nearest inshore, and site 10 were more consistent with medium-fine sand. Site 25 furthest east of the development area was also composed of fine sand with some anoxic mud also present.

4. Appendices

Appendix 4.1 Position data for each successful sub-tidal sample taken (All positions stated in latitude and longitude decimal degrees according to WGS 1984 and were taken using DGPS). (NR = not recorded).

Site and Sample No	Latitude	Longitude	Date	Time
1.1	N53.383208	W003.683818	11/09/2005	08:30:44
1.2	N53.383243	W003.683740	11/09/2005	08:36:43
1.3	N53.383153	W003.683479	11/09/2005	08:45:22
2.1	N53.369699	W003.620044	03/10/2005	16:08:15
2.2	N53.369675	W003.620080	03/10/2005	16:15:19
2.3	N53.369747	W003.620138	03/10/2005	16:19:32
3.1	N53.382778	W003.653646	11/09/2005	12:08:58
3.2	N53.382804	W003.653775	11/09/2005	12:15:03
3.3	N53.382700	W003.653899	11/09/2005	12:19:47
5.1	N53.382198	W003.629810	11/09/2005	12:48:20
5.2	N53.382172	W003.629641	11/09/2005	12:55:26
5.3	N53.382210	W003.629642	11/09/2005	13:08:07
6.1	N53.380983	W003.615304	03/10/2005	15:44:34
6.2	N53.381027	W003.615377	03/10/2005	15:50:56
6.3	N53.381041	W003.615501	03/10/2005	15:57:44
7.1	N53.374578	W003.637424	11/09/2005	13:17:00
7.2	N53.374584	W003.637472	11/09/2005	13:22:35
7.3	N53.374595	W003.637590	11/09/2005	13:27:56
8.1	N53.376397	W003.656161	11/09/2005	11:49:47
8.2	N53.376406	W003.656273	11/09/2005	11:56:37
8.3	N53.376391	W003.656312	11/09/2005	12:01:48
9.1	N53.382102	W003.667043	11/09/2005	11:26:23
9.2	N53.382110	W003.667085	11/09/2005	11:33:32
9.3	N53.382157	W003.667298	11/09/2005	11:40:11
10.1	N53.326717	W3.684682	07/09/2005	NR (see field notes for time on site)
10.2	N53.326799	W3.68461	07/09/2005	NR (see field notes for time on site)
10.3	N53.326605	W3.684215	07/09/2005	NR (see field notes for time on site)
11.1	N53.377782	W3.683872	07/09/2005	NR (see field notes for time on site)
11.2	N53.377857	W3.68368	07/09/2005	NR (see field notes for time on site)
11.3	N53.378053	W003.683786	11/09/2005	08:19:57
12.1	N53.380162	W003.646216	11/09/2005	12:26:27
12.2	N53.380099	W003.646100	11/09/2005	12:31:41
12.3	N53.380185	W003.646050	11/09/2005	12:39:54
13.1	N53.367799	W003.632147	03/10/2005	16:27:38
13.2	N53.367726	W003.632127	03/10/2005	16:31:22
13.3	N53.367759	W003.632076	03/10/2005	16:35:05
14.1	N53.371649	W003.611398	03/10/2005	15:23:23
14.2	N53.371692	W003.611278	03/10/2005	15:28:00
14.3	N53.371674	W003.611318	03/10/2005	15:36:26
15.1	N53.370785	W003.608337	03/10/2005	15:09:42
15.2	N53.370822	W003.608234	03/10/2005	15:14:51
15.3	N53.370816	W003.608192	03/10/2005	15:18:46
16.1	N53.369936	W003.605276	03/10/2005	14:53:59

Site and Sample No	Latitude	Longitude	Date	Time
16.2	N53.369961	W003.605262	03/10/2005	14:59:20
16.3	N53.370002	W003.605257	03/10/2005	15:03:15
17.1	N53.369099	W003.602144	03/10/2005	14:38:44
17.2	N53.369099	W003.602024	03/10/2005	14:44:06
17.3	N53.369097	W003.602247	03/10/2005	14:49:09
19.1	N53.397603	W003.690425	11/09/2005	09:02:48
19.2	N53.397545	W003.690233	11/09/2005	09:12:20
19.3	N53.397409	W003.690426	11/09/2005	09:20:09
20.1	N53.367634	W3.714675	07/09/2005	NR (see field notes for time on site)
20.2	N53.367549	W3.714927	07/09/2005	NR (see field notes for time on site)
20.3	N53.36755	W3.714882	07/09/2005	NR (see field notes for time on site)
21.1	N53.358522	W003.657237	11/09/2005	13:43:07
21.2	N53.358431	W003.657443	11/09/2005	13:51:24
21.3	N53.358499	W003.657457	11/09/2005	13:58:54
22.1	N53.359648	W003.637877	03/10/2005	16:42:31
22.2	N53.359620	W003.637821	03/10/2005	17:05:10
22.3	N53.359611	W003.637873	03/10/2005	17:15:01
23.1	N53.338380	W003.612897	03/10/2005	17:32:59
23.2	N53.338357	W003.612927	03/10/2005	17:38:15
23.3	N53.338355	W003.612955	03/10/2005	17:43:21
24.1	N53.315362	W003.588022	03/10/2005	18:00:37
24.2	N53.315282	W003.588311	03/10/2005	18:05:42
24.3	N53.315249	W003.588145	03/10/2005	18:10:50
25.1	N53.381874	W003.519831	03/10/2005	13:49:22
25.2	N53.381951	W003.519784	03/10/2005	14:00:30
25.3	N53.381909	W003.519600	03/10/2005	14:12:29
26.1	N53.378484	W3.775537	07/09/2005	NR (see field notes for time on site)
26.2	N53.37825	W3.775557	07/09/2005	NR (see field notes for time on site)
26.3	N53.378345	W3.775245	07/09/2005	NR (see field notes for time on site)
27.1	N53.443880	W003.657440	11/09/2005	10:00:49
27.2	N53.443786	W003.657718	11/09/2005	10:09:33
27.3	N53.443898	W003.657820	11/09/2005	10:15:16

Appendix 4.1 contd.

Appendix 4.2 Preliminary field observations of sub-tidal sediment type and any conspicuous fauna (NR = not recorded).

Site	Date	Time	Rep	Fix	Size (Est L)	Notes
1	11/09/2005	08:28	1.1	12	5	Medium sand/lots of small shell fragments
			1.2	13	7	Medium sand/lots of small shell fragments
			1.3	14	7	Medium sand/a little anoxic mud/shell frag
2	03/10/2005	16:08	2.1	71	7	Coarse/med sand/Mask crab <i>Corystes cassivellanus</i>
			2.2	72	6	Coarse/med sand
			2.3	73	7	Coarse/med sand
3	11/09/2005	12:08	3.1	32	8	Coarse/med sand
			3.2	33	7	Coarse/med sand/some silt
			3.3	34	7	Coarse/med sand/some silt/ Lesser sand eel
4	11/09/2005	10:58	4.1	22	/	Grab empty/jaws open except some <i>Alcyonium digitatum</i> (photo)/echosounder showed rocky mound
			4.2	23	/	No sample, jaws open (photo)
			4.3	24	4	Med sand/some anoxic silt/small sample but fauna sample taken, 4th attempt made but unsuccessful (photo)
5	11/09/2005	12:49	5.1	38	5	Coarse/med sand/ a little anoxic silt and small stones
			5.2	39	8	Coarse/med sand/ a little anoxic silt and small stones
			5.3	40	8	2nd attempt successful Medium sand/shell fragments
6	03/10/2005	15:43	6.1	68	7	Coarse/med sand
			6.2	69	8	Coarse/med sand plus some anoxic clay
			6.3	70	8	Coarse/med sand
7	11/09/2005	13:17	7.1	41	5	Medium/fine sand
			7.2	42	7	Medium/fine sand
			7.3	43	7	Medium/fine sand/some anoxic silt
8	11/09/2005	11:50	8.1	29	7	Coarse/med sand with some shell fragments
			8.2	30	6	Coarse/med sand with some shell fragments
			8.3	31	8	Medium sand with a little silt
9	11/09/2005	11:24	9.1	26	7	Medium/fine sand/some anoxic silt/shell fragments and <i>Echinocardium cordatum</i>
			9.2	27	7	Medium/fine sand/shell fragments
			9.3	28	8	Medium/fine sand/shell fragments
10	07/09/2005	NR	10.1	8	7	Fine sand and a little silt
			10.2	9	8	Fine sand and a little silt
			10.3	10	8	Fine sand and a little silt
11	07/09/2005	13:55	11.1	6	8	Medium sand/some shell fragments
			11.2	7	8	Medium sand/little shell fragments
			11.3	11	5	Grab problem and choppy 07/09, grab re-taken 11/09 08:15: Medium sand/plus shell fragments and lesser sand eel
12	11/09/2005	12:25	12.1	35	7	Medium sand/some shell fragments
			12.2	36	6	Medium sand/some shell fragments
			12.3	37	5	Medium sand/some shell fragments
13	03/10/2005	16:25	13.1	74	6	Coarse/med sand
			13.2	75	7	Coarse/med sand plus some anoxic silt
			13.3	76	7	Coarse/med sand plus some anoxic silt
14	03/10/2005	15:23	14.1	65	6	Medium sand plus a little anoxic clay
			14.2	66	8	Coarse/med sand plus <i>Ophiura ophiura</i> , <i>Echinocardium cordatum</i> and x1 Weaver fish
			14.3	67	7	Medium sand plus a little anoxic clay
15	03/10/2005	15:07	15.1	62	7	Coarse/med sand plus some shell fragments

Site	Date	Time	Rep	Fix	Size (Est L)	Notes
			15.2	63	6	Coarse/med sand plus some shell fragments
			15.3	64	7	Coarse/med sand plus some shell fragments
16	03/10/2005	14:54	16.1	59	5	Coarse/med sand
			16.2	60	6	Coarse/med sand
			16.3	61	6	Coarse/med sand
17	03/10/2005	14:27	17.1	56	6	Medium/fine sand plus a little anoxic clay
			17.2	57	7	Medium/fine sand plus a little anoxic clay
			17.3	58	8	Medium/fine sand plus a little anoxic clay
18	11/09/2005	10:44	18.1	21	/	x3 attempts to successfully recover sediment
			18.2	/	/	Jaws locked open on each occasion by large cobbles and stones
			18.3	/	/	Photo taken to illustrate (labelled RF 11/09 18.1)
19	11/09/2005	08:55	19.1	15	3	3rd attempt successful/medium/fine sand plus some anoxic mud
			19.2	16	2	Silty fine sand and some anoxic mud
			19.3	17	4	2nd attempt successful/silty fine sand and some anoxic mud
20	07/09/2005	13:15	20.1	3	10	Anoxic clay and little sand
			20.2	4	10	Medium sand and a little clay
			20.3	5	10	Medium sand and a little clay
21	11/09/2005	13:44	21.1	44	7	Medium/fine sand/some anoxic silt/plus some shell fragments
			21.2	45	6	Medium/fine sand/lots of anoxic silt and mud/ H ₂ S smell plus <i>Ophiura ophiura</i> /plus some shell fragments
			21.3	46	6	Med/fine sand/lots of anoxic silt and mud/ H ₂ S smell plus <i>O. ophiura</i> , <i>E. cordatum</i> and <i>C. cassivelanus</i> (berried)/plus some shell fragments
22	03/10/2005	16:42	22.1	77	7	Medium/fine sand/lots of anoxic clay/ H ₂ S smell
			22.2	78	7	Medium/fine sand/some anoxic clay/ H ₂ S smell
			22.3	79	8	Medium/fine sand/some anoxic clay/ H ₂ S smell and crab species (damaged)
23	03/10/2005	17:33	23.1	80	5	Medium/fine sand and some anoxic mud
			23.2	81	7	Medium/fine sand and some anoxic mud
			23.3	82	5	Medium/fine sand and some anoxic mud
24	03/10/2005	18:00	24.1	83	5	Coarse sand
			24.2	84	5	Coarse sand
			24.3	85	6	Coarse sand
25	03/10/2005	13:50	25.1	53	5	Fine sand/mud and some anoxic silt/plus small stones
			25.2	54	5	Fine sand and some anoxic mud, plus <i>O. ophiura</i>
			25.3	55	6	Little fine sand, mainly anoxic clay
26	07/09/2005	12:44	26.1	0	6	Medium sand and fines
			26.2	1	7	Medium sand and fines
			26.3	2	7	Medium sand and fines
27	11/09/2005	09:59	27.1	18	7	Coarse/med sand
			27.2	19	5	Coarse/med sand
			27.3	20	5	Coarse/med sand

Appendix 4.2 contd.