

Immingham Green Energy Terminal

Preliminary Environmental Information Report

Appendix 9.A – Benthic Survey Report

Associated British Ports

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1 Introduction

- 1.1.1 This report has been prepared by ABPmer for Associated British Ports (ABP) and provides a summary of the results of subtidal benthic sampling undertaken in July 2022 as part of the Immingham Green Energy Terminal Project (also referred to as the project).
- 1.1.2 The survey methodology is detailed in Section 2 and the results of the survey are presented in Section 3. An overall summary is then provided in Section 4.

2 Methodology

2.1 Subtidal benthic sampling

- 2.1.1 The subtidal grab sampling survey was undertaken on the 1 July 2022. The sampling methods followed the established and recognised procedures outlined in the Recommended Operational Guidelines (ROG) for Grab Sampling and Sorting and Treatment of Samples (Ref 1) and the Marine Monitoring Handbook, Procedural Guideline No 3-9 (Ref 2).
- 2.1.2 Eight stations were sampled with the location of these stations shown in Plate 1. At each station, a benthic sample was collected using a 0.1m² Day Grab for macrofauna analysis (faunal composition, abundance and biomass). An additional sample was also taken at each station for Particle Size Analysis (PSA) and Total Organic Carbon (TOC).
- 2.1.3 At each site, up to three attempts were made to retrieve a suitable sample (i.e. a grab containing sufficient volume of sediment for analysis). The sediment depths within the grab which were used for sample acceptance were a minimum of 7 cm for a muddy or soft sediments and 5 cm for hard packed or coarse sediments. Anything less than these values was only retained if no other viable sample was collected.
- 2.1.4 Each grab sample was photographed upon successful retrieval and transferred into a labelled plastic bucket. All infaunal samples were immediately delivered to laboratory once the survey was complete, where samples were sieved (using a 0.5 mm sieve) and fixed ahead of analysis.

2.2 Laboratory analysis

- 2.2.1 The benthic macrofaunal analysis was undertaken by Hull Marine Laboratory. The laboratory is Marine Biological Analytical Quality Control Scheme (NMBAQC) accredited. The PSA and TOC elements of the benthic ecology analysis were conducted by the ABPmer in-house NMBAQC accredited laboratory.
- 2.2.2 Faunal samples were sorted from the sieve residue using low power binocular microscopes. All of the macroinfaunal specimens were identified to a species level (where practicable) and enumerated. This work was undertaken in adherence with ISO 16665 standards (Ref 3) and the NMBAQC Scheme Guidelines.

2.2.3 The PSA sample analysis was undertaken by ABPmer using the NMAQC standardised methodology. The analysis was carried out using a Mastersizer laser diffractor which produces detailed sedimentary profiles for fine sediments (clay, sand, and silts). The TOC analysis was carried out using an elemental analyser.

3 Results

3.1.1 The results of the sampling are described below, including key characterising species and any species of particular note (such as protected species of non-native species)¹. The laboratory results are presented in Annex A (faunal analysis) and Annex B (PSA and TOC). Summary information on the sedimentary and ecological conditions at the sites based on these results is presented in **Table 1**.

3.1.2 The sediment from samples collected from the area of the Immingham Green Energy Terminal consisted of sandy mud and mud (Image 1). The TOC in the samples ranged between approximately 3% and 6% (**Table 1**).



Plate 1 – Station 1 sample (mud)

¹ As is standard practice for benthic analysis, the data in the report is presented as m² rather than per 0.1m² grab.

Table 1

Area	Station	Sediment Type	TOC (%)	No. of Taxa (per m ²)	No. of Individuals (per m ²)	Total Biomass (g per m ²)	Key Characterising Species (Number per m ² shown in brackets)	
Immingham Green Energy Terminal	1	Mud	6.45	8	190	0.02	<i>Tubificoides swirencoides</i>	(60)
							<i>Nephtys spp</i>	(40)
							<i>Diastylis rathkei</i>	(20)
							<i>Nematoda</i>	(20)
							<i>Streblospio shrubsolii</i>	(20)
							<i>Corophium volutator</i>	(10)
						<i>Macoma balthica</i>	(10)	
						<i>Nephtys hombergii</i>	(10)	
	2	Mud	6.34	2	30	0.05	<i>Nematoda</i>	(20)
							<i>Diastylis rathkei</i>	(10)
	3	Mud	5.37	1	10	<0.01	<i>Streblospio shrubsolii</i>	(10)
	4	Sandy Mud	4.38	2	120	0.06	<i>Nephtys spp</i>	(110)
							<i>Diastylis rathkei</i>	(10)
	5	Sandy Mud	3.07	2	70	0.03	<i>Nephtys spp</i>	(60)
							<i>Scoloplos armiger</i>	(10)
	6	Sandy Mud	3.77	5	100	1.79	<i>Nephtys spp</i>	(60)
							<i>Arenicola marina</i>	(10)

Area	Station	Sediment Type	TOC (%)	No. of Taxa (per m ²)	No. of Individuals (per m ²)	Total Biomass (g per m ²)	Key Characterising Species (Number per m ² shown in brackets)	
							<i>Austrominius modestus</i>	(10)
							<i>Scoloplos armiger</i>	(10)
	7	Sandy Mud	4.50	3	80	0.11	<i>Nephtys spp</i>	(40)
							<i>Diastylis rathkei</i>	(20)
							<i>Nematoda</i>	(20)
	8	Sandy Mud	3.67	4	110	0.03	<i>Nephtys spp</i>	(80)
							<i>Mytilus edulis</i>	(10)
							<i>Nematoda</i>	(10)
							<i>Tubificoides swirencoides</i>	(10)

- 3.1.3 The samples collected were highly impoverished with the number of taxa found in the samples ranging from one (Station 3) to 8 (Station 1), and the number of individuals from 10 organisms per m² (Station 3) to 190 organisms per m² (Station 1). The range in total species biomass in the samples was between <1 and 1.8 grams per m².
- 3.1.4 The faunal samples were characterised by a low numbers of species (occurring in low abundances) including polychaetes (such *Nephtys* spp, *Streblospio shrubsolii* and *Scoloplos armiger*), nematodes, oligochaetes *Tubificoides* spp and the crustacean *Diastylis rathkei*. All the species recorded from the samples in this area were considered commonly occurring in the region and not protected.
- 3.1.5 The faunal assemblage recorded is considered characteristic of subtidal habitats in this section of the Humber Estuary. For example, subtidal benthic surveys undertaken in the Immingham area in 2009, 2010, 2016 and 2021 predominantly recorded mud or muddy sand habitat which was generally impoverished (with a low number of taxa occurring at the majority of sites). The most commonly recorded infaunal species (generally recorded in low abundances) were the polychaetes *Capitella capitata*, *Streblospio shrubsolii*, *Pygospio elegans*, *Polydora cornuta*, oligochaetes *Tubificoides* spp., mud shrimp *Corophium volutator*, and nematodes (Ref 4; Ref 5; Ref 6; Ref 7).

4 Conclusion

- 4.1.1 The subtidal benthic samples consisted predominantly of mud or sandy mud. Samples were typically impoverished and characterised by commonly occurring polychaetes, oligochaetes, nematodes and crustaceans.
- 4.1.2 No subtidal species considered nationally rare or protected were recorded, with the assemblages observed considered characteristic of estuarine communities found more widely in the Humber Estuary.

5 References

- Ref 1 Guerra, M.T and Freitas, R. (2013). Recommended Operational Guidelines (ROG) for grab sampling and sorting and treatment of samples. Mesh Atlantic.
- Ref 2 Thomas, N.S. (2000). Procedural Guideline No. 3-9 Quantitative sampling of sublittoral sediment biotopes and species using remote-operated grabs. In Davies J., Baxter J., Bradley M., Connor D., Khan J., Murray E., Sanderson W., Turnbull C. & Vincent M. 2001. Marine Monitoring Handbook, 405 pp.
- Ref 3 ISO 16665: (2014) Water quality -- Guidelines for quantitative sampling and sample processing of marine soft-bottom macrofaunal. International Organization for Standardization.
- Ref 4 ABPmer, (2022). Immingham Eastern Ro-Ro Terminal, Preliminary Environmental Information Volume 3 Appendices, ABPmer Report No. R.3783. A report produced by ABPmer for Associated British Ports, January 2022.
- Ref 5 ABPmer. (2009). Humber Estuary: Environmental Management and Monitoring Plan: Data 2009. R. 1587.

- Ref 6 Institute of Estuarine and Coastal Studies (IECS). South Humber Channel Marine Studies: Intertidal and Subtidal Benthic & Fish Surveys 2010: Report to Yorkshire Forward.
- Ref 7 Able UK Limited. (2021). Able Marine Energy Park (Material Change 2 – Tr030006). Updated Environmental Statement: Chapter 10: Aquatic Ecology.

6 Abbreviations/Acronyms

ABP	Associated British Ports
ISO	International Organization for Standardization
LOI	Loss on Ignition
NMBAQC	National Marine Biological Analytical Quality Control Scheme
PSA	Particle Size Analysis
ROG	Recommended Operational Guidelines
TOC	Total Organic Carbon
UK	United Kingdom

Cardinal points/directions are used unless otherwise stated.

SI units are used unless otherwise stated.

Annex A Results

A.1 Laboratory Macrofauna Results

MCS	Code	Species	Qualifier	1	2	3	4	5	6	7	8
HD	1	Nematoda		2	2					2	1
P	494	<i>Nephtys</i>	juv.	4			11	6	6	4	8
P	499	<i>Nephtys hombergii</i>		1							
P	672	<i>Scoloplos armiger</i>						1	1		
P	799	<i>Streblospio shrubsolii</i>		2		1					
P	931	<i>Arenicola marina</i>							1		
P	1500	<i>Tubificoides swirencoides</i>		6							1
P	1500	<i>Tubificoides swirencoides</i>	fragment								
R	68	<i>Austrominius modestus</i>							1		
S	616	<i>Corophium volutator</i>		1							
S	1253	<i>Diastylis rathkei</i>		2	1		1			2	
W	1695	<i>Mytilus edulis</i>	juv.								1
W	2029	<i>Macoma balthica</i>		1					1		

MCS	Code	Species	Qualifier	1	2	3	4	5	6	7	8
			Total number of taxa	8	2	1	2	2	5	3	4
			Total abundance	19	3	1	12	7	10	8	11
			Total abundance (m²)	190	30	10	120	70	100	80	110

MCS	Code	Species	Qualifier	1	2	3	4	5	6	7	8
HD	1	Nematoda		0.0001	0.0001					0.0001	0.0001
P	494	Nephtys	juv.	0.0009			0.0028	0.0013	0.0021	0.0016	0.0021
P	499	Nephtys hombergii		0.0036							
P	672	Scoloplos armiger						0.0018	0.0002		
P	799	Streblospio shrubsolii		0.0001		0.0001					
P	931	Arenicola marina							0.1728		
P	1500	Tubificoides swirencoides		0.0034							0.0001
P	1500	Tubificoides swirencoides	fragment		0.0001						
R	68	Austrominius modestus							-		
S	616	Corophium volutator		0.0001							

MCS	Code	Species	Qualifier	1	2	3	4	5	6	7	8
S	1253	Diastylis rathkei		0.0072	0.0049		0.0031			0.0097	
W	1695	Mytilus edulis	juv.								0.0003
W	2029	Macoma balthica		0.0014					0.0042		
			Total biomass	0.0168	0.0051	0.0001	0.0059	0.0031	0.1793	0.0114	0.0026
			Total biomass (m²)	0.168	0.051	0.001	0.059	0.031	1.793	0.114	0.026

A.2 Laboratory Sediment Results

Station/ Site	Treatment	Textural Group Classification	Folk & Ward Description	Folk & Ward Sorting	Mean μm	Mean phi	Sorting Coefficient	Skewness	Kurtosis	Major Sediment Fractions			LOI (%)
										% Gravel	% Sand	% Mud	
1	Sediment	(g)sM: Slightly Gravelly Sandy Mud	Coarse Silt	Very Poorly Sorted	28.291031	5.1435114	2.786320744	- 0.0210008	0.8747969	3.67	29.52	66.81	6.826
1a	Sediment	M: Mud	Fine Silt	Very Poorly Sorted	7.769049	7.0080462	2.108022442	0.0734555	1.1099952	0.00	3.31	96.69	6.447
2a	Sediment	M: Mud	Medium Silt	Very Poorly Sorted	8.168257	6.9357561	2.245173439	0.0281518	1.1373683	0.00	5.89	94.11	6.344

Station/ Site	Treatment	Textural Group Classification	Folk & Ward Description	Folk & Ward Sorting	Mean μm	Mean ϕ	Sorting Coefficient	Skewness	Kurtosis	Major Sediment Fractions			LOI (%)
3a	Sediment	M: Mud	Fine Silt	Very Poorly Sorted	6.966788	7.1652907	2.224682554	0.0899214	1.0330138	0.00	3.68	96.32	5.371
4	Sediment	sM: Sandy Mud	Coarse Silt	Very Poorly Sorted	20.065340	5.6391506	2.634709064	0.1168150	0.8275377	0.00	28.90	71.10	4.381
5a	Sediment	sM: Sandy Mud	Coarse Silt	Very Poorly Sorted	27.749737	5.1713821	2.594529127	0.4273032	0.8088530	0.00	42.65	57.35	3.069
6a	Sediment	sM: Sandy Mud	Coarse Silt	Very Poorly Sorted	23.605438	5.4047369	2.573018788	0.3363517	0.8078763	0.00	36.24	63.76	3.766
7a	Sediment	sM: Sandy Mud	Coarse Silt	Very Poorly Sorted	17.920189	5.8022703	2.652072077	0.2404522	0.8481365	0.00	28.49	71.51	4.504
8	Sediment	sM: Sandy Mud	Coarse Silt	Very Poorly Sorted	30.565298	5.0319616	2.540186337	0.4663132	0.8789882	0.00	44.57	55.43	3.669