KEEPING BRITAIN TRADING

IMMINGHAM EASTERN RO-RO TERMINAL

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Associated British Ports

Immingham Eastern Ro-Ro Terminal

Waste Hierarchy Assessment

December 2022





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1 Introduction

1.1 Background

1.1.1 Associated British Ports (ABP), the owner and operator of the Port of Immingham, is proposing to construct a new roll-on/roll-off (Ro-Ro) facility within the Port. This is known as the Immingham Eastern Ro-Ro Terminal (IERRT). This facility is designed to service the embarkation and disembarkation of principally commercial cargo carried either by accompanied trailer or on unaccompanied trailers which will be collected at the port of disembarkation.

1.1.2 In summary, the proposed development, which is described in more detail below and in Chapter 2 and Chapter 3 in Volume 1 of the Environmental Statement (ES) (Application Document Reference Number 8.2), will comprise on the marine side, the construction of a new Ro-Ro jetty with three berths and, on the landside, the provision of an area for unit load/vehicle storage and necessary new Terminal buildings.

1.1.3 The proposed development will require a capital dredge of the new berthing area. During operation of IERRT, maintenance dredging will be required in the same way as currently occurs at the Port of Immingham.

1.1.4 ABP require a Development Consent Order (DCO) for the proposed development. A DCO may include as part of the Order, the terms of a marine licence as agreed with the Marine Management Organisation (MMO) and if the application for the DCO is approved, the marine licence will be "deemed" to have been issued under Part 4 of the Marine and Coastal Access Act (MCAA).

1.2 Report structure

1.2.1 This report provides a Waste Hierarchy Assessment (WHA) to determine the Best Practicable Environmental Option (BPEO) for the use/disposal of the dredged material that is required for the proposed development. The BPEO establishes, for a given set of objectives, the option that provides the most benefit or least damage to the environment as a whole, at an acceptable cost, in the long term as well as in the short term.

1.2.2 The report is structured as follows:

- Section 1: Introduction;
- Section 2: Sets out the dredge requirement;
- Section 3: Provides a review of the policy;
- Section 4: Outlines the dredge material characterisation;
- Section 5: Waste Hierarchy Assessment; and
- Section 6: Presents the overall WHA and BPEO conclusion.

2 Dredge Requirement

2.1.1 The proposed development will require a capital dredge of the new berthing area. The maximum spatial extent of the dredge is estimated at being approximately 70,000 m², dredged into existing bathymetry which varies across the area between 1.1 m above Chart Datum (CD) to 9 m below CD. The berthing area will have 1 in 4 side slopes, optimised to ensure stability, and will be dredged to a depth of 9 m below CD, with an allowance for the general tolerances of the dredging equipment. The area beneath the floating pontoons will be dredged to 6 m below CD. The majority of the berth pocket does not require any deepening as it is already below the required depth for the IERRT (i.e., 9 m below CD). Furthermore, over most of the area that does require dredging, only a relatively small amount of deepening is required. Therefore, in real terms the dredge represents a maximum deepening of 6.2 m over a small area, with an average lowering of 2.35 m. The location of the dredge area is shown on Figure 2.1 in Volume 2 of the ES (Application Document Reference Number 8.3).

2.1.2 It is estimated that a maximum of 190,000 m³ of material in total will be removed during construction of IERRT. This is estimated to consist of approximately 40,000 m³ of boulder clay, alongside 150,000 m³ of sand/silt (alluvium) *in situ*.

2.1.3 During operation of the IERRT development, maintenance dredging will be required in the same way as currently occurs at the Port of Immingham. It is proposed to be undertaken as part of the existing maintenance dredge licence for Immingham (L/2014/00429/1).

2.1.4 The total future maintenance dredge volume is estimated to be 120,000 m³ annually. This volume is considered to be a conservative estimate as it assumes that the modelled siltation rate is maintained throughout the year and assumes also that the accretion occurs entirely within the berth pockets themselves. In reality, this siltation rate would be expected to reduce as the berth pocket shallows and as the side slopes adjust to the new layout. Furthermore, part of the accretion is predicted to occur beneath the proposed piers and jetties (between the support piles), in areas where it will not directly affect depths within the vessel berths. The density of the newly settled material will be less than that from the consolidated bed dredged during the capital dredge campaign.

2.1.5 The estimated annual maintenance dredge volume (120,000 m³) will not be removed in a single maintenance dredge campaign. Maintenance dredge campaigns will be undertaken throughout the year during operation of the IERRT (with smaller volumes of material removed) as required for safe access to the berths.

2.1.6 Further information on the dredge requirements for the IERRT can be found in Chapter 2 and Chapter 3 of the ES.

3 Policy Review

3.1.1 Dredged material is classed as a waste material once removed and is strictly controlled as it enters the waste stream. Beneficial use and disposal of dredged material at sea are controlled Under the London Convention 1972, the 1996 Protocol, the OSPAR Convention 1992 and the revised EU Waste Framework Directive (2008/98/EC). Alternatives to disposal of the dredged material are to be explored and documented in the form of a BPEO assessment. Should this assessment identify a practical alternative to disposal of dredged material, this option should be further considered before consent for disposal at sea (or land) is made. Any identified locations for use and/or disposal also need to take account of the UK Government Sustainable Development Strategy and the Marine Policy Statement (see Section 3.1).

3.1 Marine Policy Statement

3.1.1 The UK Government Sustainable Development Strategy sets out the need for all Government policy to be in line with the principles of sustainable development (HM Government, 2005). These principles are expressed through the five high-level marine objectives which take forward the UK vision for the marine environment of 'clean, healthy, safe, productive and biologically diverse oceans and seas'. These high-level objectives are: (1) Achieving a sustainable marine economy; (2) Ensuring a strong healthy and just society; (3) Living within environmental limits; (4) Promoting good governance; and (5) Using sound science responsibly.

3.1.2 It is becoming increasingly important that space within the marine environment is utilised effectively to ensure activities can be undertaken in a sustainable manner with minimal conflict between users. The UK Marine Policy Statement (MPS) (HM Government, 2011) is the framework for preparing Marine Plans and taking decisions affecting the marine environment. The MPS indicates that, "*The Marine Plan should identify areas of constraint and locations where a range of activities may be accommodated. This will reduce real and potential conflict, maximise compatibility between marine activities and encourage co-existence of multiple uses*" (HM Government, 2011).

3.1.3 The policy specifically states that dredging "*is essential to the functioning of ports and marinas*" (Section 3.6.3), and the disposal can have "*benefit in maintaining sedimentary systems*" and suitable material at appropriate locations can have "*benefit in providing material for alternative uses, such as construction, beach nourishment or salt marsh restoration*" (Section 3.6.4).

3.1.4 Section 3.6.8 of the MPS states that "*applications to dispose of wastes must demonstrate that appropriate consideration has been given to the internationally agreed hierarchy of waste management options for sea disposal*".

3.2 East Inshore and East Offshore Marine Plans

3.2.1 The marine elements of the IERRT are located within the East Inshore Marine Plan Area. The East Inshore Marine Plan (adopted in April 2014) sets out the approach to managing the East Inshore area, its resources and the activities and interactions that occur within the area.

3.2.2 In paragraph 377, it states that "*where possible, dredged material should be reused or recycled before choosing to dispose at sea. Schemes for such re-use include replenishment of mudflats providing habitat and feeding grounds for wildlife and recharging of barrier beaches for coastal defence. Approved marine licences may stipulate this as a condition, and this is signposted in accordance with the Oslo/Paris Convention for the Protection of the Marine Environment of the North East Atlantic Guidance and the Waste Framework Directive.*"

3.3 Waste policy

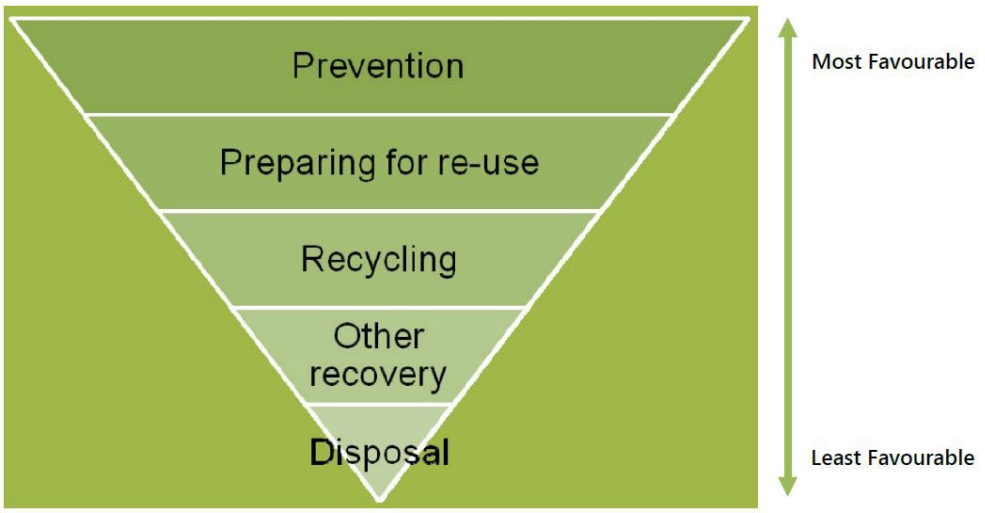
3.3.1 The Waste Framework Directive (75/442/EEC) was originally adopted in 1975, followed by substantial amendment in 1991 (91/156/EEC) and a codified version in 2006 (2006/12/EC).

3.3.2 The revised Waste Framework Directive (2008/98/EC) repealed earlier versions, providing a general framework of waste management requirements and sets the basic waste management definitions for the European Union (EU). It lays down measures to protect the environment and human health by preventing or reducing the adverse impacts of the generation and management of waste and by reducing overall impacts of resource use and improving the efficiency of such use. It defines 'waste' as any substance or object which the holder discards or intends or is required to discard.

3.3.3 Article 4 of the revised Waste Framework Directive sets out five steps for dealing with waste, ranked according to environmental impact, commonly referred to as the 'waste hierarchy' (see Figure 1 and Table 1). The WHA (and therefore the determination of the BPEO) are strongly governed by the waste hierarchy.

3.3.4 Prevention, which offers the best outcomes for the environment, is at the top of the priority order, followed by preparing for re-use, recycling, other recovery and disposal, in descending order of environmental preference.

3.3.5 The waste hierarchy places emphasis on waste prevention or minimisation of waste, followed where possible by re-use of the material. For any dredging project, the *in situ* characteristics of the material (physical and chemical), the method and frequency of dredging (and any subsequent processing), determines its characteristics for consent through the waste hierarchy (Section 4).



Source: Adapted from Defra (2011)

Figure 1. Waste hierarchy

Table 1. Stages of the waste hierarchy

Stage	Name (Article 4)	Definition (Article 3)
1	Prevention	Measures taken before a substance, material or product has become waste, that reduce: (a) The quantity of waste, including through the re-use of products or the extension of the life span of products; (b) The adverse impacts of the generated waste on the environment and human health; or (c) The content of harmful substances in materials and products.
2	Preparing for re-use	Any operation by which products or components that are not waste are used again for the same purpose for which they were conceived.
3	Recycling	Any recovery operation by which waste materials are reprocessed into products, materials or substances whether for the original or other purposes. It includes the reprocessing of organic material but does not include energy recovery and the reprocessing into materials that are to be used as fuels or for backfilling operations.
4	Other recovery (e.g., energy recovery)	Any operation, the principal result of which is waste serving a useful purpose by replacing other materials which would otherwise have been used to fulfil a particular function, or waste being prepared to fulfil that function, in the plant or in the wider economy. Annex II sets out a non-exhaustive list of recovery operations.
5	Disposal	Any operation which is not recovery even where the operation has as a secondary consequence the reclamation of substances or energy. Annex I sets out a non-exhaustive list of disposal operations.

3.3.6 This understanding is central for consideration of management options and determination of the BPEO for dealing with the management of dredged material. An applicant must take account of the waste hierarchy and consider alternative means of disposal of dredged material before applying for consent to dispose of dredged material at sea (HM Government, 2011).

3.3.7 Where prevention of the dredging is not possible, then the volume to be dredged should be minimised, then options for re-use of the material, recycling and other methods of recovery must be considered in the first instance. In the context of dredge material this could include, for example:

- Engineering uses, such as:
  - Aggregate for the construction industry;
  - Land creation and improvement;
  - Beach nourishment;
  - Construction of offshore berms;
  - Capping material; and
  - Temporary disposal at sea (e.g., in an aggregate site) for future re-use.
- Agriculture and product use:
  - Aquaculture; and
  - Construction material.
- Environmental enhancement:
  - Intertidal feeding/creation, e.g., islands for birds, mudflat and saltmarsh creation, fisheries habitat and wetland restoration.
- Post treatment of the dredge material to change its character prior to determining a potential use, for example:
  - Dewatering to create consolidated sediments;
  - Separation basins; to separate sediments into different size classes for different uses;
  - Soil manufacturing; and
  - Physio-chemical treatments of contaminated sediments.

3.3.8 Following such treatments, the material may be able to be used, for example, as topsoil or bricks etc. Should no practical and cost-effective solutions be identified, final options for the disposal of the dredged material are considered. These include:

- Marine disposal in licensed deposit sites; and
- Land based disposal in terrestrial landfill (possibly after treatment such as incineration).

3.3.9 Each of the stages in the waste hierarchy have been considered in turn, where practical, for the management of the dredge arisings within this assessment. This has also taken into account the respective policies as outlined above.

4 Dredge Material Characteristics

4.1.1 The bed material in the proposed dredge area consists mainly of silt with some clay and sand. The majority of the material *in situ* is likely to be firm with an average density of *circa* 1,350 kg/m³ at the surface and increasing in density with depth. The bed material is constantly re-distributed by shipping movements and currents which prevents consolidation of the bed. During operation of the proposed development, the density of the newly settled material in the berths that will need maintenance dredging will be less than that from the consolidated bed dredged during the capital dredge campaign. Average densities currently deposited at the disposal ground are of the order of 1,200 kg/m³ or less. Material from current maintenance dredging at the Port of Immingham, riverside berths, Outer Harbour and approaches is taken to the Clay Huts (HU060) licensed disposal site.

4.1.2 In September 2021, a sample plan (SAM/2021/00053) was provided in relation to the proposed IERRT by the Marine Management Organisation (MMO), prepared in consultation with Cefas. In October 2021, sediment samples were collected from ten stations (1 to 10) across the proposed dredge area comprising the proposed development, including subsurface samples (see Figure 8.3 to the ES).

4.1.3 The sampling regime and analysis was undertaken in accordance with the sample plan. Sediment samples were analysed by an MMO-approved laboratory for the following physical and chemical parameters:

- Particle size analysis (PSA);
- Trace metals;
- Organotins;
- Polycyclic aromatic hydrocarbons (PAHs);
- Polychlorinated biphenyls (PCBs);
- Total hydrocarbon content (THC);
- Polybrominated diphenyl ethers (PBDEs); and
- Organochlorine pesticides (OCPs).

4.1.4 The results of the physical and chemical analyses undertaken on the samples are presented below in Section 4.1 and 4.2 respectively.

4.1 Physical analysis

4.1.1 The PSA results are presented in Table 2. Sediments from most sampling locations were dominated by silt material. Samples from Sample 2 (3.8 m), Sample 3 (1 m), Sample 4 (2 m), Sample 5 (2 m), Sample 6 (4.10 m), and Sample 8 (1 m) were predominantly comprised of sand. With the exception of Sample 4 (2 m and 2.70 m), Sample 5 (4.70 m), Sample 9 (3 m), and Sample 10 (2.60 m), gravel comprised less than 10% of samples collected.

Table 2. Particle size analysis (PSA) results from sediment samples collected in October 2021

Sample	Depth (m)	Visual Appearance	Particle Size Distribution (%)		
			Gravel (>2 mm)	Sand (2 mm – 63 µm)	Silt (<63 µm)
1	0	Odourless Brown Mud.	0.00	7.28	92.71
	1	Odourless Brown Mud.	0.00	5.29	94.68
	2	Odourless Brown Mud.	0.00	16.57	83.42
	3	Odourless Brown Mud.	0.00	16.60	83.41
	4	Brown Sandy Mud with an Earthy Odour.	0.00	13.64	86.34
	4.70	Brown Sandy Mud with an Earthy Odour.	0.00	17.31	82.70
2	0	Odourless Brown Mud.	0.00	9.19	90.82
	1	Odourless Brown Mud.	0.00	18.04	81.97
	2	Brown Mud with an Earthy Odour.	0.00	0.00	100.00
	3	Brown Mud with an Earthy Odour.	0.00	11.56	88.44
	3.80	Odourless Brown Sandy Mud.	0.00	57.58	42.40
3	0	Odourless Brown Mud.	0.00	4.01	96.01
	1	Odourless Brown Muddy Sand.	0.00	93.25	6.74
	2	Odourless Brown Mud.	0.00	0.93	99.06
	3.10	Odourless Brown Gravelly Mud.	9.43	25.46	65.10
4	0	Odourless Brown Mud with Organic Matter.	0.10	27.80	72.09
	1	Odourless Brown Mud with Organic Matter.	0.05	30.42	69.50
	2	Odourless Brown Muddy Sandy Gravel.	39.44	41.63	18.94
	2.70	Odourless Brown Gravelly Mud.	10.37	24.36	65.25
5	0	Odourless Brown Mud.	0.00	8.80	91.19
	1	Odourless Brown Mud.	0.00	8.09	91.89
	2	Odourless Brown Muddy Sand.	0.00	77.00	23.01
	3	Odourless Brown Sandy Mud.	0.00	0.00	100.00
	4	Odourless Brown Gravelly Mud.	3.93	23.14	72.92
	4.7	Odourless Brown Gravelly Mud.	19.80	22.27	57.89
6	0	Odourless Brown Mud.	0.00	18.07	81.94
	1	Odourless Brown Mud.	0.00	17.34	82.67

Sample	Depth (m)	Visual Appearance	Particle Size Distribution (%)		
			Gravel (>2 mm)	Sand (2 mm – 63 µm)	Silt (<63 µm)
	2	Brown Mud with an Earthy Odour.	0.00	14.76	85.24
	3	Brown Mud with an Earthy Odour.	0.00	18.53	81.47
	4.10	Odourless Grey-Brown Gravelly Muddy Sand with Shell Fragments and Organic Matter.	9.60	70.79	19.61
7	0	Odourless Brown Mud.	0.00	11.77	88.22
	1	Brown Mud with an Earthy Odour.	0.00	17.62	82.38
	2	Brown Mud with an Earthy Odour.	0.00	35.84	64.17
	3	Brown Mud with an Earthy Odour.	0.00	31.16	68.80
	4	Odourless Brown Mud with Organic Matter.	0.00	36.24	63.77
	4.80	Odourless Brown Mud with Organic Matter.	0.00	14.89	85.13
8	0	Odourless Brown Gravelly Mud with Organic Matter.	4.00	10.91	85.09
	1	Odourless Brown Muddy Sand.	0.00	68.98	31.02
	2	Odourless Brown Sandy Mud.	0.00	16.51	83.51
	3	Odourless Brown Sandy Mud.	0.00	5.98	94.02
	3.65	Odourless Brown Sandy Mud.	0.00	0.56	99.43
9	0	Odourless Brown Mud.	0.00	3.16	96.82
	1	Odourless Brown Mud.	0.00	6.16	93.86
	2	Odourless Brown Mud.	0.00	5.56	94.47
	3	Odourless Brown Gravelly Mud.	10.21	8.60	81.18
	4	Odourless Brown Mud.	0.00	0.00	99.99
	4.60	Odourless Brown Mud.	0.00	0.00	100.00
10	0	Brown Mud with Organic Matter and an Anoxic Odour.	0.02	29.80	70.19
	1	Odourless Brown Gravelly Sandy Mud with Organic Matter.	0.55	62.86	36.60
	2	Odourless Brown Sandy Mud.	0.00	50.69	49.34
	2.60	Odourless Grey-Brown Muddy Sandy Gravel.	32.49	46.14	21.35

4.2 Chemical analysis

4.2.1 The UK has not adopted formal quantitative Environmental Quality Standards (EQSs) for sediments. In the absence of any quantified UK standards, therefore, common practice for characterising baseline sediment quality conditions is to compare against the Cefas Guideline Action Levels for the disposal of dredged material (MMO, 2014).

4.2.2 Cefas Guideline Action Levels are used as part of a 'weight of evidence' approach to assessing material suitability for disposal at sea. Cefas guidance indicates that, in general, contaminant levels below Action Level 1 (AL1) are of no concern. Material with contaminant levels above Action Level 2 (AL2), however, is generally considered unsuitable for disposal at sea whilst dredged material with contaminant levels between AL1 and AL2 requires further consideration before a decision can be made as to disposal. Consequently, the Action Levels should not be viewed as pass/fail thresholds, and it is also recognised that these guidelines are not statutory requirements.

4.2.3 A summary of sediment quality (chemical analysis) of samples from the dredge areas is provided in the Water and Sediment Quality chapter (Chapter 8) of the ES. Contaminant concentrations were generally low, with most values below the respective AL1 or marginally exceeding AL1. There were no instances where the concentration exceeded the respective AL2 (or whereby a sample concentration was close to exceeding this threshold). Trace metal concentrations were typically below AL1 in most samples, with some minor exceedances of AL1 for some metals (mainly in Sample 1 and Sample 6).

4.2.4 Organotins were consistently below the respective AL1, as were PCBs in most samples (with the exception of some sub-samples in Sample 1, Sample 2, Sample 6, and Sample 7). Numerous PAHs were found to be above AL1 (there is currently no AL2 for PAHs), particularly in Sample 1, Sample 6, Sample 7, and Sample 9. OCP concentrations were often below the Limit of Detection (LOD) in most samples and currently no ALs apply to OCPs. PBDE concentrations also appeared to be low in general with most below the LOD. Currently, no ALs apply to PBDEs, however, Cefas and Defra are proposing to introduce AL1s for these contaminants. A small proportion of surficial samples are above the proposed AL1 for BDE 99, BDE 100 and BDE 209 noting that these ALs are still subject to review and are not yet implemented. These values are considered typical of surface concentrations of PBDEs in the Humber Estuary.

4.2.5 Overall, sediment contaminant concentrations within the dredge area are relatively low and are generally either below, or marginally exceed, AL1, with no exceedances of (or contaminant concentrations close to) the respective AL2. Therefore, sediment contamination results suggest the material would be considered acceptable for disposal in the marine environment. This is considered further with regard to the BPEO in Section 5.

5 Waste Hierarchy Assessment

5.1.1 As described in Section 3 the waste hierarchy ranks waste management options according to the best environmental practice. The following section discusses the options, with respect to the management of the material arising from the capital and maintenance dredging required for the proposed IERRT.

5.1 Prevention

5.1.1 There are two main alternatives for the prevention of generating waste material, including:

1) Do Nothing (i.e., do not undertake maintenance dredging); and
2) Reduce the dredging requirement and hence the volume of dredge arisings.

5.1.2 The main approach to avoiding the generation of waste would be to not undertake the proposed dredging. To not undertake the capital dredge would render the project unviable. A full needs case is presented in the Need and Alternatives chapter (Chapter 4) of the ES. It states that there is an imperative need to provide additional appropriate Ro-Ro freight capacity within the Humber Estuary in order to meet the growing and changing nature of demand and thereby retain and strengthen the estuary's contribution to an effective, efficient, competitive and resilient UK Ro-Ro freight sector. To cease any future maintenance dredging during operation of the IERRT would ultimately restrict the safe navigation of any vessel to the IERRT and therefore inhibit the handling of Ro-Ro freight at the proposed Terminal, eliminating trades and services. Future maintenance dredging is therefore essential for the ongoing operations of the proposed IERRT which will support the employment of people directly on the port estate and jobs in the local area. The 'do nothing' scenario is therefore not appropriate. Further consideration of the 'do nothing' scenario, and why this is not appropriate, is provided in Chapter 4 of the ES.

5.1.3 The dredging requirement has been optimised/minimised to facilitate safe and efficient navigation of vessels that will use the proposed IERRT and is consistent with marine plan policies. This means a minimum depth required in the proposed berths of 9 m below CD.

5.1.4 Maintenance dredging on the Humber Estuary is carried out in response to planned and timely hydrographic surveys, linked to cyclic dredging programmes. The requirement to dredge is a direct cost to the operation of port facilities and is not undertaken without sufficient business need. As described in the previous paragraph, the need to keep navigation channels, approaches and berths at a safe navigable depth is the overriding priority. This is linked to the size of vessels and careful consideration of available water depths. ABP use proactive monitoring in the form of hydrographic survey, with scientific evaluation of deposition rates to predict future short-

term, and long-term dredging trends. The objective is to reduce the dredge burden whilst maintaining safe navigational access. In this way, the future dredge requirement at the proposed IERRT will be reduced where possible through optimisation of campaigns.

5.1.5 In summary, all measures to prevent and/or reduce the volume of waste generated by the project have been fully considered and the dredge management procedures outlined above provides the minimum dredge requirement for the proposed IERRT.

5.2 Re-use, recycling and other recovery

Preparing for re-use

5.2.1 Preparing for re-use is defined as any operation by which products or components that are not waste are used again for the same purpose for which they were conceived. This could potentially involve the dredged material being discharged directly into the Humber Estuary to restore local equilibrium to the sedimentary system (without significant processing costs). In fact, one of the main concerns relating to capital and maintenance dredging is the loss of fine material (predominantly silts) from estuaries to disposal sites outside of the system, therefore depleting material that could potentially contribute to accretion of the intertidal areas within the estuary.

5.2.2 In the case of the Humber Estuary, fine dredge material is usually deposited at licensed disposal sites within the estuary system which effectively meets the definition of re-using material. The disposal of material from the ports nearby in the estuary returns the material which has become cut off from the dynamics of the sedimentary system and prevents direct material loss. The location of the disposal sites is as close to the areas where the material is dredged as practically possible. However, the sites are located with sufficient distance to avoid direct recirculation back to the berth areas. In this way, the disposal activity has benefit as it returns the sediment to the natural system as close as possible to where it settled from the estuary dynamics as a result of the port infrastructure. This helps maintain the sediment budget and the functioning of estuary habitats.

Recycling

5.2.3 Potential recycling options identified have been divided into three specific types:

- Habitat restoration;
- Beach management; and
- Construction.

Habitat restoration

5.2.4 It is possible to recycle finer silt/clay dredge materials to encourage mudflat and saltmarsh habitat restoration. In this context, dredged material can be deposited and redistributed in the intertidal environment in a way that

supports the geomorphology and physical conditions that can facilitate and sustain the successful restoration of estuarine and coastal habitats.

5.2.5 There are currently no known habitat restoration schemes in the vicinity of the proposed development that would require fine dredged material. This is because habitat creation on the fringes of the Humber Estuary normally follows a process known as 'managed realignment' or 'regulated tidal exchange'. In either scenario, excavated tidal basins are created on fringing terrestrial land adjacent to the estuary to permit the ingress of tidal waters. These projects normally do not require further excavated arisings to be donated from another project. Secondly, dredged material can sometimes be used for saltmarsh recharge where it is pumped or sprayed on intertidal areas to raise the elevation of the foreshore in the tidal cycle and encourage saltmarsh formation. In the Humber Estuary, saltmarsh habitat is extensive given that the estuary is an accretionary system and, therefore, habitat creation of this type is not required. ABP have consulted with the Humber Nature Partnership on this matter, and it was confirmed they are not aware of any schemes around the estuary where dredged arisings could be used to benefit the ecology of the estuary. However, ABP would be willing to participate in discussions in the future should projects be identified.

Beach management

5.2.6 Beach Management schemes predominantly involve the nourishment and/or recycling of material to areas of foreshore in order to provide a natural form of flood defence. Material is usually of similar grading to the indigenous material.

5.2.7 The dredge material from the proposed development is consistently finer (silt) than that currently used for typical beach management schemes (sand and gravel). The dredge material is therefore currently unsuitable for recycling to beach management schemes, and there are none currently identified in the Humber Estuary. However, this will continue to be reviewed should any future initiatives require such material.

Construction

5.2.8 Dredge material can be suitable for use in construction. Appropriate potential uses include general raising of ground levels, road embankment construction and any situation where bulk infill might be required. However, the dredge material from the proposed development is not considered to be of a quality suitable for structural or indeed non-structural infill, by reason of its low potential load bearing capacity either on land or within the marine environment. Furthermore, de-watering the material prior to use for engineering purposes would be required which in itself poses difficulties. Therefore, use in engineering and reclamation projects is not considered appropriate and this option has been discounted.

Other recovery

5.2.9 The dredge material throughout the IERRT dredge area is predominantly coarse to fine silts, of which the remainder is mostly fine sand mixed with

silt, and, therefore, deemed of minimal value for other recovery processes, such as energy recovery or good quality aggregate. No further cost-effective uses in the marine environment to those highlighted above have therefore been identified. To use the material in a terrestrial environment would require large areas for de-watering and de-salination of the sediment to occur. Even after these processes, material is likely only suitable for agricultural use and thus of limited practicality. Therefore, given no realistic alternative uses have been identified, consideration of disposal options is required.

5.3 Disposal

Landfill

5.3.1 Disposal of material to land is not considered feasible due to practical, economic, and environmental costs. The results of chemical analysis from sediment samples collected in October 2021 (see Section 4) indicates that the dredged material does not contain levels of contamination that would restrict the material being disposed of in the marine environment.

Disposal at sea

5.3.2 The dredged material is suitable for disposal in the sea at an appropriate licensed disposal site (see Section 4).

5.3.3 There are several disposal sites that are used within the Humber Estuary. Sediment from the Port of Immingham is typically disposed of at disposal site HU056 (Holme Channel) for inerodible clay material, and HU060 (Clay Huts) for sand/silt (alluvium). This is based on the proximity of those sites to the Port, and their suitability and capacity to receive the dredged material.

5.3.4 During disposal, the deposited sediments are rapidly dispersed into the tidal flow joining the fine sediments that are already in suspension and pass in and out of the estuary on every tide. The environmental impacts of the disposal of dredge arisings from the proposed development at HU056 and HU060 have been modelled and fully assessed in the Physical Processes chapter (Chapter 7) of the ES. The changes caused by disposal are anticipated to be short lived, localised and negligible.

5.3.5 In addition, previous surveys of the deposit grounds over the last century indicate that most (if not all) of the deposited material has been dispersed throughout the system. Modelling of the dispersal from the deposit grounds indicates that the material relocated in these areas contributes to the sediment supply of the intertidal areas throughout the estuary. In addition, as no significant change in the bathymetry has occurred, the disposals have not changed the local hydrodynamics. This type of disposal of fine material has been called sediment cell maintenance (sustainable relocation), which is considered to be beneficial to the system compared to removal of fine silt sized sediment to land or taken out to sea into a different sediment system.

6 Conclusion

6.1.1 The WHA has not identified any immediate opportunities for the re-use of the dredge material needed to be removed for the proposed IERRT other than the sustainable relocation within the estuary, a practice that already occurs as part of ongoing maintenance dredging in the estuary. Nevertheless, ABP also regularly engage with stakeholders regarding potential beneficial uses for the maintenance dredged material taken from the Humber.

6.1.2 Without any alternative uses available at the present time, disposal in the marine environment at a licensed disposal ground is considered the BPEO. Optimum disposal locations are determined through consideration of practical, environmental and economic parameters which have been developed over a long timeframe. For the proposed development, disposal site HU056 (Holme Channel) will be used to dispose of inerodible clay material, and HU060 (Clay Huts) will be used to dispose of sand/silt (alluvium) material for the capital dredge (see Chapter 2 of the ES). The maintenance dredging would be carried out in the same was as current operations under the existing maintenance dredge licence, disposing of material at HU060 (see Chapter 3 of the ES). The existing maintenance dredge licence has sufficient capacity within the licensed disposal limits to accommodate the maintenance dredging required for this proposed development.

6.1.3 The following rationale has been used for disposal site selection:

- The sites have been selected to be as close as practical to the proposed development. This minimises transport time to each site and reduces the carbon footprint whilst minimising transportation cost;
- These disposal sites are characterised for the purpose of receiving the materials that are intended to be deposited there (inerodible clay and sand/silt alluvium), and have the capacity to receive the volumes that are proposed;
- The deposited sediment will remain in the same sedimentary system thus maintaining the overall sediment budget of the estuary, particularly for the finest sediment found on the intertidal areas; and
- As the sediment will not deplete the sedimentary system over time, less overall impact on the estuary morphological evolution is likely to occur and consequently less effect on the estuary features for which the Humber Estuary is internationally designated.

7 References

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8 Abbreviations/Acronyms

ABP	Associated British Ports
ABPmer	ABP Marine Environmental Research Ltd
AL	Action Level
BPEO	Best Practicable Environmental Option
CD	Chart Datum
Cefas	Centre for Environment, Fisheries and Aquaculture Science
DCO	Development Consent Order
Defra	Department for Environment, Food and Rural Affairs
EC	European Commission
EEC	European Economic Community
EQS	Environmental Quality Standard
ES	Environmental Statement
EU	European Union
HM	Her Majesty's His Majesty's
IERRT	Immingham Eastern Ro-Ro Terminal
LOD	Limit of Detection
M	Metre
MCAA	Marine and Coastal Access Act
MMO	Marine Management Organisation
MPS	Marine Policy Statement
OCP	Organochlorine pesticides

OSPAR	Convention for the Protection of the Marine Environment of the North-East Atlantic
PAHs	Polycyclic Aromatic Hydrocarbons
PBDE	Polybrominated Diphenyl Ethers
PCB	Polychlorinated Biphenyls
PSA	Particle Size Analysis
Ro-Ro	Roll-on/Roll-off
THC	Total Hydrocarbon Content
UK	United Kingdom
WHA	Waste Hierarchy Assessment

Cardinal points/directions are used unless otherwise stated.

SI units are used unless otherwise stated.

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