Immingham Green Energy Terminal

TR030008

Volume 6

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Appendix 2.A: Waste Hierarchy Assessment

Planning Act 2008

Regulation 5(2)(a)

Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009 (as amended)

September 2023

Infrastructure Planning

Planning Act 2008

The Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009 (as amended)

Immingham Green Energy Terminal

Development Consent Order 2023

6.4 Environmental Statement Appendices

Appendix 2.A: Waste Hierarchy Assessment

Regulation Reference	APFP Regulation 5(2)(a)
Planning Inspectorate Case Reference	TR030008
Application Document Reference	TR030008/APP/6.4
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Revision 1	21 September 2023	DCO Application

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1. Introduction

1.1. Background

1.1.1. The Immingham Green Energy Terminal (hereafter "the Project") will comprise the construction, operation and maintenance of a multi-user terminal to facilitate the import and export of liquid bulk, together with the associated development. The terminal consists of a jetty and associated loading/unloading infrastructure, pipelines and metering systems. The Project would be located on the eastern side of the Port of Immingham (hereafter "the Port").

1.1.2. The Project is described in further detail in **Chapter 2: The Project** of the Environmental Statement ("ES") **[TR030008/APP/6.2]**.

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

1.1.4. A Development Consent Order ("DCO") is required for the Project. The DCO will 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 2009 ("MCAA") (Ref 1-1).

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:

a. **Section 1**: Introduction
b. **Section 2**: Sets out the dredge requirement
c. **Section 3**: Provides a review of the policy
d. **Section 4**: Outlines the dredge material characterisation
e. **Section 5**: WHA
f. **Section 6**: Presents the overall WHA and BPEO conclusion

2. Dredge Requirement

2.1.1. The Project will require a capital dredge. The maximum spatial extent of the dredge is estimated to be approximately 10,000m², dredged into existing bathymetry which varies across the area between 12m below Chart Datum ("CD") to 14.5m below CD. The berthing area with appropriate side slopes would be dredged to a maximum of 14.5m below CD, including an allowance for the general tolerances of the dredging equipment.

2.1.2. The majority of the berth pocket does not require any deepening as it is already below the required depth (i.e., 14.5m 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 2.5m over a small area, with an extrapolated average lowering of 0.4m. The location of the dredge area is shown on **Figure 2.7 [TR030008/APP/6.3]**).

2.1.3. It is estimated that a maximum of approximately 4,000m³ of material in total will be removed during construction of the Project. This *in situ* volume predominantly flat alluvial deposits such as unconsolidated (silts, sands and gravel) of up to 3,900m³, and consolidated (e.g. glacial till with limited chalk inclusion) of up to 100m³.

2.1.4. During operation of the Project, maintenance dredging will potentially be required in the same way as currently occurs at the Port. The modelling of the scheme (as reported in **Chapter 16: Physical Processes [TR030008/APP/6.2]**) indicates that the berth pocket, once dredged, will remain swept clear of deposited material by the flood and ebb tidal flows (in much the same way the existing Immingham Oil Terminal berths are). Consequently, the need for future maintenance dredging within the new berth pocket is expected to be very limited (if required at all).

2.1.5. Should maintenance dredging be required, it is proposed to be incorporated within the maintenance dredge licence for Immingham (L/2014/00429/1) as part of the renewal of the licence at the end of 2025.

2.1.6. Further information on the dredge requirements for the Project can be found in **Chapter 2: The Project [TR030008/APP/6.2]**).

3. Policy Review

3.1. Overview

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(Ref 1-2), the 1996 Protocol (Ref 1-3), the OSPAR Convention 1992 (Ref 1-4) and the Waste (England and Wales) Regulations 2011 (as amended)[1](Ref 1-5).

3.1.2. 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 (Ref 1-14) and the Marine Policy Statement (Ref 1-13) (see **Section 3.2**).

3.2. Marine Policy Statement

3.2.1. The UK Government Sustainable Development Strategy sets out the need for all Government policy to be in line with the principles of sustainable development (Ref 1-6). 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.

3.2.2. 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”) (Ref 1-7) 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"* (Ref 1-7).

3.2.3. 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 of the MPS).

[1] The Waste (England and Wales) Regulations 2011 (Ref 1-5) transposed the EU Waste Framework Directive (2008/98/EC) (Ref 1-8) into law in England and Wales. When the UK left the EU these Regulations were amended by the Waste (Miscellaneous Amendments) (EU Exit) (No. 2) Regulations 2019) Ref 1-9).

3.2.4. 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"*.

3.3. East Inshore and East Offshore Marine Plans

3.3.1. The marine elements of the Project are located within the East Inshore Marine Plan Area. The East Inshore Marine Plan (adopted in April 2014) (Ref 1-8) sets out the approach to managing the East Inshore area, its resources and the activities and interactions that occur within the area.

3.3.2. 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."*

3.4. Waste legislation and policy

3.4.1. The relevant legislation in England and Wales is the Waste (England and Wales) Regulations 2011 (as amended)[1] (Ref 1-5). While the UK left the European Union ("EU") on 31 January 2020, the UK continues to be committed to meeting high environmental standards. The main provisions of the Waste Framework Directive (2008/98/EC) (Ref 1-9) have been retained in English law through the Waste (Miscellaneous Amendments) (EU Exit) (No. 2) Regulations 2019 (Ref 1-10).

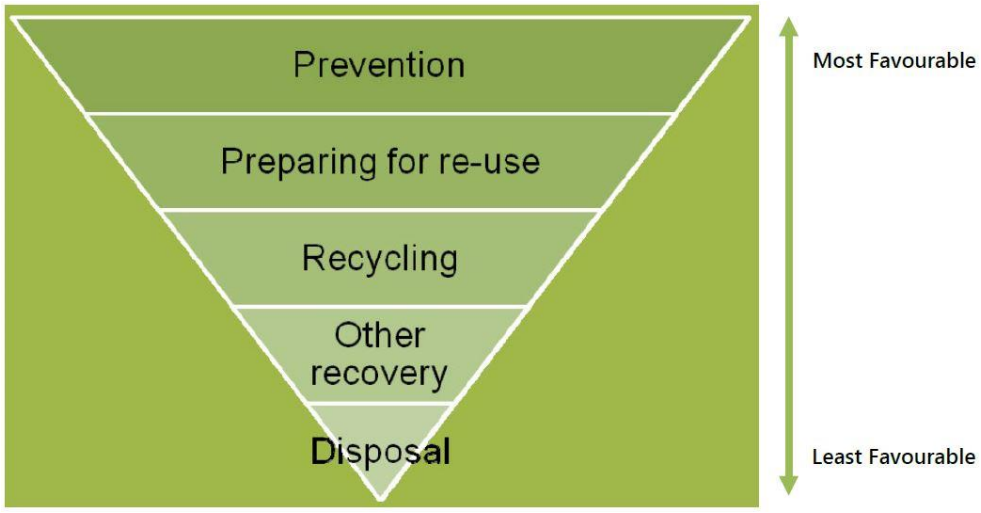
3.4.2. The revised Waste Framework Directive (2008/98/EC) (Ref 1-9) repealed earlier versions, providing a general framework of waste management requirements and setting the basic waste management definitions for the EU. It lays down measures to protect the environment and human health by preventing 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.

3.4.3. 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 **Plate 1** and **Table 1**). The WHA (and therefore the determination of the BPEO) are strongly governed by the waste hierarchy.

3.4.4. 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.

3.4.5. 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 3**).

Plate 1: Waste Hierarchy



Source: Adapted from Ref 1-11

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. (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.

3.4.6. 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 (Ref 1-7).

3.4.7. 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:

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

3.4.8. 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:

a. Marine disposal in licensed deposit sites.
b. Land based disposal in terrestrial landfill (possibly after treatment such as incineration).

3.4.9. 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. Material characteristics and sampling

4.1.1. The bed material in the proposed dredge area consists of predominantly flat alluvial deposits such as unconsolidated (silts, sands and gravel) of up to 3,900m³, and consolidated (e.g. glacial till with limited chalk inclusion) of up to 100m³. 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 berth that will need maintenance dredging (if required) 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 1,200kg/m³ or less. Material from current maintenance dredging at the Port, riverside berths, Outer Harbour and approaches is taken to the Clay Huts (HU060) licensed disposal site.

4.1.2. In February 2023 the MMO, in consultation with Centre for Environment, Fisheries and Aquaculture Science (Cefas), provided a Sample Plan (SAM/2022/00110) in relation to the sediment sampling campaign for the Project. In February 2023 sediment samples were collected from eight stations (1 to 8) across the proposed dredge area, including subsurface samples (see **Figure 17.3 [TR030008/APP/6.3]**.

4.1.3. The sampling regime and analysis was undertaken based on the Sample Plan with some additional determinands sampled[2]. Sediment samples were analysed by an MMO-approved laboratory for the following physical and chemical parameters:

a. Particle size analysis (“PSA”)
b. Trace metals
c. Polycyclic aromatic hydrocarbons (“PAHs”)
d. Polychlorinated biphenyls (“PCBs”)
e. Total hydrocarbon content (“THC”)
f. Organochlorine pesticides (“OCPs”)

4.1.4. The results of the physical and chemical analyses undertaken on the samples are presented below in **Section 4.2** and **Section 4.3** respectively.

[2] It is noted that the MMO did not stipulate sampling of organotins, THC or PDBEs. These were sampled as a precaution to avoid any potential risk of delay to programme at a later stage.

4.2. Physical analysis

4.2.1. The PSA results are presented in **Table 2**. Sediments from most sampling locations were dominated by silt material with limited amounts of gravel. Samples from Sample 1 (1m), Sample 2 (2m), and Sample 3 (1m) were predominantly comprised of sand. Sample 2 (0m), Sample 7 (0mm), and Sample 8 (0m and 2.9m) were predominantly comprised of gravel.

Table 2: PSA results from sediment samples collected in February 2023

Sample	Depth (m)	Visual Appearance	Particle Size Distribution (%)		
			Gravel (>2mm)	Sand (2mm – 63 µm)	Silt (<63 µm)
Sample 1	0	Odourless Brown Mud with Organic Matter.	0.39	16.25	83.36
Sample 1	1	Odourless Brown Gravelly Sandy Mud with Organic Matter.	1.91	52.30	45.79
Sample 1	2.2	Odourless Brown Gravelly Mud.	8.26	14.19	77.55
Sample 2	0	Odourless Brown Gravelly Sandy Mud with Shell Fragments.	49.45	8.79	41.76
Sample 2	1	Odourless Brown Gravelly Mud.	6.96	15.49	77.56
Sample 2	2	Odourless Brown Gravelly Muddy Sand.	2.58	61.59	35.83
Sample 2	2.95	Odourless Brown Sandy Mud.	0.00	21.59	78.41
Sample 3	0	Brown Mud with Organic Matter and a Peat Odour.	0.00	37.51	62.49
Sample 3	1	Odourless Brown Muddy Sand.	0.00	60.13	39.87
Sample 3	2	Odourless Brown Gravelly Mud.	10.46	10.71	78.84
Sample 3	2.5	Odourless Brown Gravelly Mud.	11.93	12.58	75.48
Sample 4	0	Odourless Brown Sandy Mud.	0.00	20.09	79.91
Sample 4	1	Odourless Brown Mud.	0.00	17.23	82.77
Sample 4	2	Odourless Brown Mud.	0.00	15.53	84.47
Sample 4	3	Odourless Brown Sandy Mud.	0.00	40.04	59.96
Sample 4	4	Odourless Brown Mud.	0.00	0.00	100.00
Sample 5	0	Odourless Brown Mud.	0.00	20.27	79.73

Sample	Depth (m)	Visual Appearance	Particle Size Distribution (%)		
			Gravel (>2mm)	Sand (2mm – 63 µm)	Silt (<63 µm)
Sample 5	1	Odourless Brown Sandy Mud.	0.00	32.08	67.92
Sample 5	2	Odourless Brown Mud.	0.00	24.55	75.45
Sample 5	3	Odourless Brown Sandy Mud.	0.00	2.23	97.77
Sample 5	4	Odourless Brown Gravelly Sandy Mud.	9.57	5.38	85.05
Sample 6	0	Odourless Brown Mud.	0.00	13.94	86.06
Sample 6	1	Brown Mud with a Peat Odour.	0.00	13.34	86.66
Sample 6	2	Brown Sandy Mud with a Peat Odour.	0.00	37.24	62.76
Sample 6	3	Odourless Brown Gravelly Mud.	4.87	5.84	89.29
Sample 6	4	Odourless Brown Sandy Mud.	0.00	0.00	100.00
Sample 7	0	Odourless Brown Muddy Gravel.	80.07	11.06	8.87
Sample 7	1	Odourless Brown Sandy Mud.	0.00	1.76	98.24
Sample 7	1.4	Odourless Brown-White Gravelly Mud.	20.20	8.42	71.37
Sample 8	0	Odourless White Muddy Gravel.	47.44	6.16	46.40
Sample 8	1	Odourless Brown Gravelly Mud.	5.98	2.36	91.66
Sample 8	2	Odourless Brown Gravelly Mud.	4.20	10.72	85.09
Sample 8	2.9	Odourless Other Muddy Gravel.	72.45	4.46	23.09

4.3. Chemical analysis

4.3.1. 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 (Ref 1-12)[3].

[3] It is noted that Action Levels in the UK are currently being reviewed but have yet to be formally adopted (Cefas, 2020 within the Ref 1-12). The comparison of results is therefore made against the current Action Levels. Where Action Levels are not formally adopted for certain determinands comparison has been made with published literature where appropriate.

4.3.2. 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.

4.3.3. A summary of sediment quality (chemical analysis) of samples from the dredge area is provided in **Chapter 17: Marine Water and Sediment Quality** of the ES **[TR/030008/APP/6.2]**. Contaminant concentrations were generally low, with most values below the respective Cefas Guideline AL1 or marginally exceeding AL1. There were no instances where the concentration exceeded the respective AL2 (or a sample concentration was close to exceeding this threshold).

4.3.4. Trace metal concentrations were typically below AL1 in most samples, with some minor exceedances of AL1 for some metals (mainly in Samples 4, 5 and 6). Most individual PAHs were found to be below AL1, though some samples exceeded AL1, particularly in Samples 4, 5 and 6. There is currently no AL2 for individual or total PAHs.

4.3.5. PCB concentrations were low, mostly below the LOD, and both the sum of International Council for the Exploration of the Sea (ICES) 7 and the sum of 25 congeners were below AL1 for all samples. OCP concentrations were also often below the LOD in most samples; dieldrin concentrations were below AL1 in all samples, and p,p'-Dichlorodiphenyltrichloroethane (“DDT”) concentrations were predominantly below AL1 in most samples, with some minor exceedances of AL1.

4.3.6. 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 4**.

5. Waste Hierarchy Assessment

5.1. Overview

5.1.1. As described in **Section 1**, 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 Project.

5.2. Prevention

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

a. Do Nothing (i.e., do not undertake maintenance dredging).

b. Reduce the dredging requirement and hence the volume of dredge arisings.

5.2.2. 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 **Chapter 3: Need and Alternatives [TR030008/APP/6.2]**). The need for the Project arises in response to the Government's strategy to deliver the UK's legally binding net zero obligations, which requires the delivery of new infrastructure to support meeting those obligations. The Project would directly support the aims of the Government's decarbonisation strategy, through the production and delivery of green hydrogen. Integral to this is the requirement for port infrastructure that can provide a deep water berth to accommodate vessels to import ammonia and liquefied carbon dioxide and import or export other energy products.

5.2.3. To cease any future maintenance dredging during operation of the Project would ultimately restrict the safe navigation of any vessel to the Project and therefore inhibit the delivery of green hydrogen. Future maintenance dredging (if required) is therefore essential for the ongoing operations of the Project which will support the employment of people directly on the port estate and jobs in the local area.

5.2.4. The dredging requirement has been optimised/minimised to facilitate safe and efficient navigation of vessels that will use the proposed IGET and is consistent with marine plan policies. This means a minimum depth required in the proposed berth of 14.5m below CD.

5.2.5. 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 berth at a safe navigable depth is the overriding priority. This is linked to the size of vessels and careful consideration of available water depths. The Applicant uses 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 Project will be reduced where possible through optimisation of campaigns.

5.2.6. 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 Project.

5.3. Re-use, recycling and other recovery

Preparing for reuse

5.3.1. 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.

5.3.2. 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

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

a. Habitat restoration

b. Beach management

c. Construction

Habitat restoration

5.3.4. 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.

5.3.5. There are currently no known habitat restoration schemes in the vicinity of the Project 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. The Applicant has 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, the Applicant would be willing to participate in discussions in the future should projects be identified.

Beach management

5.3.6. 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.

5.3.7. 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

5.3.8. 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

5.3.9. The dredge material throughout the Project 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.

5.4. Disposal

Landfill

5.4.1. 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 February 2023 (see **Section 1**) 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

5.4.2. The dredged material is suitable for disposal in the sea at an appropriate licensed disposal site (see **Section 1**).

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

5.4.4. 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 **Chapter 16: Physical Processes [TR/030008/APP/6.2]**). The changes caused by disposal are anticipated to be short lived, localised and negligible.

5.4.5. 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 Project 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 consolidatated material and HU060 (Clay Huts) will be used to dispose of unconsolidated material for the capital dredge (see **Chapter 2: The Project [TR/030008/APP/6.2]**).

6.1.3. Maintenance dredging of the new berth pocket, if required, would be carried out in the same way as current operations, where material will be placed at HU060 (see **Chapter 2: The Project [TR/030008/APP/6.2]**). The existing disposal licence has sufficient capacity within the licensed disposal limits to accommodate the very limited maintenance dredging quantities estimated for this Project. This will be incorporated within the maintenance dredge licence for Immingham (L/2014/00429/1) as part of the renewal of the licence at the end of 2025.

6.1.4. The following rationale has been used for disposal site selection:

a. 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.

b. These disposal sites are characterised for the purpose of receiving the materials that are intended to be deposited there, and have the capacity to receive the volumes that are proposed.

c. 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.

d. 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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Ref 1-6 HM Government, (2005). Securing the Future Delivering UK Sustainable Development Strategy. Her Majesty's Government.

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Ref 1-8 East Inshore and East Offshore Marine Plans (publishing.service.gov.uk) (accessed August 2022).

Ref 1-9 Waste Framework Directive (2008/98/EC) — European Environment Agency (europa.eu) (accessed August 2022).

Ref 1-10 The Waste (Miscellaneous Amendments) (EU Exit) (No. 2) Regulations 2019 (accessed August 2022).

Ref 1-11 Department for Environment, Food and Rural Affairs (Defra). (2011). Guidance on applying the Waste Hierarchy. (accessed August 2022).

Ref 1-12 Marine Management Organisation. (2014). Marine Licencing: sediment analysis and sample plans. [Online] (accessed February 2023).

Ref 1-13 The Stationery Office Limited (2011). UK Marine Policy Statement.

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