Material change for a better environment

Environment Agency

Marine sediments from capital and maintenance dredging

Technical report

on the beneficial use of marine sediments from capital and maintenance dredging in land-based projects

Contents

Executive summary	01
1. Introduction	03
2. Material and the dredging process	05
3. Current legislative position	08
4. Management routes and treatment techniques	12
5. Key markets	16
6. Quality controls and standards	17
7. Risk management and mitigation	19
8. Findings	20
9. Recommendations	21
Appendix A: Technical Advisory Group membership	22
Appendix B: Technical Advisory Group terms of reference	23
Appendix C: Definitions	25
Appendix D: References and information sources	27

Executive summary

Background

The Waste Protocols Project is a joint initiative between the Environment Agency and WRAP (Waste & Resources Action Programme), in collaboration with industry. It is funded by the Department for Environment, Food and Rural Affairs (Defra) as a business resource efficiency activity.

The aim of the Waste Protocols Project is to provide guidance to business on a number of waste streams that will:

- clarify the point at which the material can be regarded as fully recovered from waste into a product or material that can be either reused by the business or industry or sold into other markets; or
- confirm to the business community what waste management controls remain to regulate the reuse of the treated waste material.

Marine sediments from capital and maintenance dredging (MSCMD) are one of the waste streams which the Waste Protocols Project has addressed. During 2008, we set up a Technical Advisory Group (TAG) to bring together representatives from the Environment Agency, WRAP and industry. The aim of a quality protocol for these materials would be to clarify the point at which they would be regarded as having ceased to be waste. The project board asked the TAG to consider if this would be feasible.

Findings

The TAG identified the main markets for MSCMD as:

- land raising as part of port development;
- land raising for other projects, for example housing;
- land reclamation/capping;
- flood and coast protection (above the level of mean high water springs).

There is a view that the development of these markets has been compromised by the stigma of MSCMD being **waste**.

While initially supportive of developing a quality protocol, it became apparent to the TAG during the review that this is not the best course of action. It mainly attributed this to:

- difficulties in producing a generic risk assessment for the material;
- insufficient data to measure the actual risk of using MSCMD; and
- a lack of evidence to demonstrate the majority of MSCMD are able to meet European standards for aggregates, or other recognised standards. This makes it difficult to show that materials have lost their **waste** characteristics.

Producing generic criteria to demonstrate end-of-waste status for MSCMD may limit the amount of material that could reasonably be accepted under a quality protocol. The potential stigma of **failing** an initial risk assessment may actually inhibit the beneficial use of some quantities of MSCMD.

The TAG considers most MSCMD could be beneficially reused in land-based projects (this is current practice, under an environmental permit or exemption).

It could be possible on a case-by-case basis to demonstrate that MSCMD has ceased to be waste, negating the need for further waste management controls. For the Environment Agency to regard the material as having ceased to be waste, it would need to be satisfied that the MSCMD in question has been converted into a distinct marketable product which can be used in the same way as the virgin material it replaces with no worse environmental effects.

For MSCMD to be beneficially used as a waste in a recovery operation, or to demonstrate that they have ceased to be waste, a site-specific risk assessment is required.

Recommendations

Therefore on the basis of available information, the TAG recommends that:

1. The project team do not develop a quality protocol, at least for the time being. This could be reviewed if the following became available:
   - A recognised and achievable product standard for MSCMD[1];
   - Appropriate leaching data;
   - Gathered using leaching tests with a liquid to sold ratio agreed with by the Environment Agency;
   - Measured against the correct limit of detection.
2. A working group is set up to consider the development of a voluntary code of practice to cover the options for MSCMD.
3. During the 2010 review of the Quality Protocol for the Production of Aggregates from Inert Waste, the acceptable input list should consider including the inert fraction of MSCMD.

1 Standards already exist for a number of aggregate products, which the inert fraction of MSCMD is likely to meet. However the majority of material is not covered by existing product standards.

1. Introduction

1.1. The Waste Protocols Project is a joint initiative between the Environment Agency and WRAP (Waste & Resources Action Programme), in collaboration with industry. It is funded by the Department for Environment, Food and Rural Affairs (Defra) as a business resource efficiency activity.

1.2. Uncertainty over the point at which waste has been fully recovered and ceases to be waste within the meaning of Article 1(1)(a) of the EU Waste Framework Directive (Waste FD) (2006/12/EC) has inhibited the development and marketing of materials produced from waste which could be used beneficially without damaging human health and the environment. In some cases, this uncertainty has also inhibited the recovery and recycling of waste and its diversion from landfill.

1.3. Interpretation of EU legislation is ultimately a matter for the courts. There is now a substantial body of case law on the interpretation of the definition of waste in Article 1(1)(a) of the Waste FD. Drawing on the principles established in this case law, it is possible to identify the point at which certain wastes cease to be waste and therefore when the Waste FD's waste management controls no longer apply. The Waste Protocols Project identifies this point for the waste streams it examines.

1.4. More specifically, depending on the circumstances surrounding a waste stream, the project seeks to:

- produce a quality protocol. This identifies the point at which waste, having been the subject of a complete recovery operation, may become a non-waste product or material that can be used by businesses or supplied into other markets, enabling such fully recovered products to be used without the need for waste management controls; and
- produce a statement that confirms to the business community what waste management controls they must comply with to use the treated waste material.

1.5. The project team selected marine sediments from capital and maintenance dredging (MSCMD) as one of the waste streams to address. In line with the process, a Technical Advisory Group (TAG) was established, bringing together representatives from the Environment Agency, WRAP and industry. Appendix A shows a list of TAG members and Appendix B gives its terms of reference.

1.6. For MSCMD to cease to be waste, it is necessary to demonstrate that they have been fully recovered into a distinct marketable product which can be used in the same way as the virgin material they replace with no worse environmental effects.

1.7. The TAG considered, in particular, whether MSCMD could be made into a distinct product which:

- has a market and certainty of use;
- meets an appropriate standard (for example an identified specification) requiring no further processing before being used; and
- can be used without undermining the Waste FD's and Water Framework Directive's (Water FD) aims of protecting human health and the environment.

1.8. To investigate the last point the TAG considered, where applicable, whether the waste-derived product could be used in the same way as the virgin material it replaced, with no worsened environmental effects.

1.9. The objectives of this report are to:

- describe the TAG's progress on this topic;
- set out the TAG's findings;
- provide recommendations to the project board and the Environment Agency on what steps are needed to meet the project's aims as stated in section 1.4.

1.10. The TAG's objectives were to:

- identify the major markets and end uses for MSCMD on land;
- identify the current legislative framework governing the production, handling, storage, transportation and use of MSCMD on land;
- source analytical data on the composition of the material produced;
- review available standards and specifications;
- assess relative risks to human health and the environment from using MSCMD, and any necessary mitigation methods;
- consider ways forward for each of the major markets and (where strictly-defined conditions are met) for certain end uses, whether MSCMD could be regarded as fully recovered.

1.11. The information contained in this report has been provided by representatives of the TAG, unless otherwise referenced.

2. Material and the dredging process

What are marine sediments from capital and maintenance dredging (MSCMD)?

2.1. Marine sediments from capital and maintenance dredging (MSCMD) are considered to be waste under Article 1(a) of the Waste FD. They are therefore subject to waste management legislation.

2.2. Maintenance dredging is carried out in ports and navigation channels, to remove the natural build-up of sand, silt and gravel in previously-dredged areas.

2.3. Capital dredging is the initial deepening of an area such as a channel, harbour or berthing facility. It can also include excavation of underground channels for cables, tunnels and other civil engineering works.

This report concerns sediments from these two types of dredging activities.

2.4. This report does not cover:

- Environmental or remedial dredging. This is the removal of contaminated sediments when a spill, survey, toxic effect or historical record identifies them as potentially posing a risk to human health, fisheries or the environment.
- Materials extracted from the seabed for the primary purpose of providing commercial supplies of material for use in construction. Materials extracted for the primary purpose of providing commercial supplies are considered virgin material and are therefore not subject to waste regulation.
- The use or placement of MSCMD in the marine environment (below the level of mean high water springs) which is subject to a different regulatory regime (see Section 3).

Volumes of MSCMD

2.5. Specific data on the arisings of MSCMD is not routinely collected. However, data is available in the form of quantities for all dredged material disposed of to licensed marine sites. Anecdotal evidence suggests the supply of material from maintenance dredging is relatively consistent, whereas capital dredging volumes vary as they are often associated with port development projects [10].

2.6. The majority of dredgings are disposed of or reused under the Food and Environment Protection Act (FEPA) 1985. Between 2005 and 2007, an average of 19,407,702m^3 per year was disposed of to sea under FEPA licences [10]. Figure 1 reflects estimated volumes of material expected to be dredged from potential capital projects planned in the UK between 2009 and 2014 [10].

Figure 1: Proposed capital dredging projects 2009–2014

Project name/location	Volume (est) million m^3	Material type	Programme	Status
London Gateway Port, Thames Estuary	30	Sand, silt, gravel, clay	2010–2013	Consented
Bristol Deep Sea Container Terminal, Severn Estuary	24	Sand, gravel, silt, mudstone (marl)	2012–2015	Environmental statement approved
Southampton Approach Channel, Southampton Water	11.6	Sand, gravel, silt	Late 2009/ early 2010–2012	Environmental statement submitted
Medway Approach Channel Deepening, Thames Estuary	7	Sand	2012–2015	Scoping report in preparation
Teesport	3	Sand, boulder clay, marl	TBC	Environmental statement submitted
Port of Fleetwood, Wyre Estuary	2.6	Silt, sand, clay	TBC	Environmental statement in preparation

Source: Financial Impact Assessment [10]

The dredging process

2.7. Dredging involves the removal or dispersal of sediments on the sea floor through suction, scraping, cutting or jetting. Generally it can be categorised into three types – mechanical, hydraulic or suction dredging. This section has been included to give some context to the types of dredging carried out in the UK, although is by no means an exhaustive list.

2.8. **Suction dredging** acts like a giant vacuum cleaner, sucking material from the sea floor. There are two main types of suction dredgers:

- **Trailer suction hopper dredger** [20]. This sucks material into the **hopper** of the dredger or a barge. Heavier materials such as rocks, gravel and sand sink to the bottom of the hopper, while finer material rises to the top. When the hopper is filled, water is discharged through an overflow pipe below the water-line, taking with it the finer materials. This process is discussed in more detail in 4.21. Dredged material may also be sprayed or **rainbowed** from the pipeline onto inter-tidal areas or land.
- **Cutter suction dredger** [22]. This uses a cutter head to loosen material on the sea floor before pumping material through a pipe onto a barge, or a marine disposal/ discharge site or land.

2.9. **Mechanical dredging** [22] involves the use of heavy, mechanical equipment working from a barge or the shoreline. These may include:

- **Bucket ladder dredger**. This is a **bucket** or sometimes several, attached to a chain that picks up sediments. Buckets can vary in size from 200 to 1,000 litres.
- **Grab dredge**. This involves the use of a crane, whereby material is **grabbed** from the sea floor and loaded onto a barge. This system is able to pick up heavy objects like rocks and boulders.
- **Backhoes and dipper dredgers**. These have evolved from common land-based hydraulic backhoe excavators. Whereas land-based machines are mounted on a tracked or wheeled undercarriage, these types of dredgers are normally mounted on a fabricated pedestal at one end of a spud-rigged pontoon [2].

2.10. **Hydrodynamic dredging** [22] methods rely on the injection of water to disturb settled sediments. This causes them to re-enter the water column and be redistributed, mainly by current and gravity flow. The most common type of hydrodynamic dredge is water injection, which is frequently used in the Port of London. This type of system does not result in dredging sediments being brought to the surface, and therefore has only limited relevance in the context of this report.

3. Current legislative position

3.1. The statutory control of dredging operations is complex. A number of regulatory authorities have responsibilities including, but not limited to, navigation and harbour authorities, Marine Management Organisation (MMO, previously the Marine Fisheries Agency) the Welsh Assembly Government in Wales and/or the Environment Agency in England.

3.2. MSCMD are considered waste when extracted.[2] Hence, the purpose of this section is to set out the waste management controls applicable to the disposal, recovery, storage and transport of MSCMD. For further information contact the Environment Agency on 08708 506 506 or visit www.environment-agency.gov.uk

3.3. The TAG has also sought to identify other key legislation which may be relevant.

3.4. Although we include the main legislative provisions, a full explanation is beyond the scope of this report.

Excavation of material

3.5. Many navigation port and harbour authorities operate under local acts which empower them to undertake, and in some cases licence third parties to undertake, dredging works within their jurisdiction.

3.6. The **Harbour Act 1964** ensures the various harbour authorities undertake and authorise dredging through a local **Harbour Act** or **Harbour Order**. These powers do not cover the disposal of material at sea as this is done under the **Food and Environment Protection Act 1985** (refer to 3.24).

3.7. Other authorities, developers and others proposing to dredge normally need to obtain consent under the **Coast Protection Act 1949**.[3]

3.8. A proposal to dredge within a harbour area, either under local powers or the Coast Protection Act 1949, may be subject to the requirements of the **Marine Works (Environmental Impact Assessment) Regulations 2007**.

3.9. Proposals to dredge materials within or adjacent to a European conservation site (Special Area of Conservation, Special Protection Area or Ramsar site), may require an **Appropriate Assessment** under the **Conservation (Natural Habitats &c) Regulations 1994 or Offshore Marine Conservation (Natural Habitats) Regulations 2007**.

3.10. Dredging in main rivers, ordinary water courses and coastal waters are likely to require consent under local byelaws made under the **Land Drainage Act 1991** or the **Water Resources Act 1991**. This consent may not be required if a marine licence under the **Marine & Coastal Access Act 2009** (refer to 3.27) is also required for the dredging.

Waste management controls for disposal and recovery of dredgings

3.11. Under the **Environmental Permitting (England and Wales) Regulations 2007** any disposal or recovery of waste requires an environmental permit subject to certain exclusion and exemptions. These regulations apply in England and Wales, including the sea adjacent to England and Wales out as far as the seaward boundary of the territorial sea. It is anticipated that from 6 April 2010 permitting and exemptions will be dealt with under the Environmental Permitting (England and Wales) Regulations 2010.

3.12. The Environmental Permitting system, distinguishes between a 'recovery' and 'disposal' activity when waste is deposited. Whether an activity constitutes disposal or recovery depends on a legal test, which derives from the Waste FD and extensive European

2 Materials extracted as capital or maintenance dredging (MSCMD) are waste under Article 1(a) of the Waste Framework Directive and are therefore subject to waste management legislation. This definition does not include materials extracted for the primary purpose of providing commercial supplies as these are not waste.

3 The Marine & Coastal Access Act 2009 contains provisions to consolidate and modernise the Food and Environmental Protection Act 1985 and the Coast Protection Act 1949 into one Marine Licence.

case law.[4] The Landfill Directive requirements do not apply to recovery activities and therefore conditions for disposal and recovery permits are different. This regulatory system takes a risk-proportionate approach to waste activity, enabling waste recovery to take place with reduced compliance obligations.

3.13. There is an exclusion from the 2007 regulations, and thus from the need for an environmental permit. This is where a waste activity forms part of an operation which is either subject of a licence under **Part II of the Food and Environment Protection Act 1985** or where section 7 of that act applies. This exclusion is included in the 2010 regulations.

3.14. There are also certain activities which are potentially exempt from the need to obtain a permit. There is a revised scheme for exemptions which comes into effect from 6 April 2010. For exemptions registered before 6 April 2010, transitional provisions will apply.

3.15. Under the 2007 Regulations, to be exempt the activity must:
- meet the requirements in paragraph 3(1) of Schedule 2;
- fall within a description in Part 1 of Schedule 3; and
- ensure the type and quantity of waste submitted to the waste operation, and the method of disposal or recovery, is consistent with the need to attain the relevant objectives[5] in Article 4(1) of the Waste FD.

3.16. Descriptions in Part 1 of Schedule 3 include the following which may be applicable to dredged material[6]:
- Paragraph 7 – waste for the benefit of land;
- Paragraph 9 – land reclamation or improvement;
- Paragraph 25 – waterway dredging;
- Paragraph 19 – waste for construction.

3.17. From 6 April 2010, a waste operation will be exempt from needing an environmental permit if:
- the waste operation falls within a description in Part 2 of Schedule 3;
- the conditions specified in Part 2 of Schedule 3 are met in relation to the description;
- the establishment or undertaking is registered in relation to the waste operation; and
- the type and quantity of waste submitted to the waste operation and the method of disposal or recovery is consistent with the need to attain the relevant objectives[5] in Article 4(1) of the Waste FD.

3.18. Descriptions in Part 2 of Schedule 3 include the following that may be applicable to dredged material:
- T5 – screening and blending of waste; and
- U1 – use of waste in construction.[7]

3.19. It is an offence to operate without an environmental permit or exemption where one is required. It also an offence not to comply with permit conditions.

3.20. **Section 33 of the Environmental Protection Act 1990** makes it an offence to cause or knowingly permit the deposit of waste on land[8], and to submit waste to a disposal or recovery operation, unless it is under and in accordance with a waste management licence or an environmental permit. It is also an offence to treat, keep or dispose of waste in a manner likely to cause pollution of the environment or harm to human

4 For full guidance on understanding the Landfill Directive and how this interacts with the Environmental Permitting Regulations (England and Wales) 2007 see http://www.environment-agency.gov.uk/business/sectors/108918.aspx
5 These objectives mean: without risk to water, air, soil and plants and animals; without causing a nuisance through noise or odours; and without adversely affecting the countryside or places of special interest.
6 For more information on the potentially exempt activities see http://www.environment-agency.gov.uk/business/topics/permitting/32322.aspx
7 The quantity limit for use of dredging waste under this system is 5,000 tonnes within a three-year period.
8 Defined so as to include land covered by waters where the land is above the low water mark of ordinary spring tides.

health. These provisions do not apply to a waste operation which is or forms part of an operation subject to a licence under **Part II of the Food and Environment Protection Act 1985**.

Waste management controls – duty of care and transportation

3.21. Section 34 of the **Environmental Protection Act 1990** imposes a duty of care on any person who imports, produces, carries, keeps, treats or disposes of waste. It imposes a duty of care on all persons in the waste management chain to take all reasonable measures to ensure that waste is safely and legally disposed of, specifically, to ensure that no offence is made by anyone else in the waste chain. Waste must be safely contained.

3.22. Waste may only be transferred to authorised persons and a waste transfer note must be completed by the two parties when the waste changes hands. These notes must be kept for a minimum of two years. An **authorised person** includes a holder of an environmental permit and a registered waste carrier under the Control of Pollution (Amendment) Act 1989.

3.23. **The Control of Pollution (Amendment) Act 1989** requires that waste carriers are registered with the Environment Agency if they transport their own building and demolition waste or carry such waste on behalf of third parties. There is an exemption which relates to waste which is loaded for disposal at sea which is either licensed or exempt under the Food and Environmental Protection Act 1985.

Legislation which applies whether or not the dredged material is waste

3.24. **The Food and Environment Protection Act 1985** requires that a licence is obtained to dispose of, or place for beneficial purposes, dredged material in the sea.[9] It also sets out exemptions.

3.25. **The Coast Protection Act 1949** states that consent is normally required for the deposit of any material on any part of the sea shore below the level of mean high water springs. Exemptions are set out in the act.[10] Part II of this act is about navigational safety.

3.26. Proposals to dispose or use dredged materials within or adjacent to a European Conservation site may require an **Appropriate Assessment** under the **Conservation (Natural Habitats &c) Regulations 1994**.

3.27. The **Water Resources Act 1991** makes provisions for the requirement of discharge of dredging to controlled waters.[11]

3.28. **The Marine and Coastal Access Act 2009** introduces a new strategic planning framework for the marine environment across England and Wales. Marine plans will be underpinned by a UK-wide Marine Policy Statement (MPS). They will set out in detail how the MPS will apply in specific parts of UK waters, and guide licensing decisions for activities in the marine area (marine plans will apply up to the level of mean high water springs). The new Marine Management Organisation (MMO) will be responsible for producing marine plans and issuing marine licences in England and UK offshore areas. The existing licensing regime as described in this document will be replaced by a streamlined unified licensing procedure. In Wales the Welsh Assembly Government will manage marine planning and the issuing of marine licences. The licensing system under the Act will cover the areas that used to be separately governed by the **Food**

9 **The sea** is defined by section 24 of the Food Environment Protection Act (1985) as including any area submerged at mean high water springs (MHWS). It also includes, so far as the tide flows at mean high water springs, an estuary or arm of the sea and the waters of any channel, creek, bay or river.

10 The Marine & Coastal Access Act contains provisions to consolidate and modernise the Food and Environmental Protection Act 1985 and the Coast Protection Act 1949.

11 Draft Environmental Permitting (England and Wales) Regulations 2010 make provisions for this activity to be permitted under an environmental permit.

and Environment Protection Act 1985 and the **Coast Protection Act 1949**, as well as additional activities in relation to dredging, depositing and construction in marine waters.

3.29. Under Part IV of the recent **Marine and Coastal Access Act 2009**, the act of dredging (as well as disposal of dredged material) will be licensable. However, dredging covered by **Harbour Orders or local Harbour Acts** (refer to 3.6) will not be licensable under Part IV.

3.30. The Marine Strategy Framework Directive (MSFD) came into force in July 2008 and must be transposed by July 2010. MSFD requires **good environmental status** (GEnvS) to be achieved in the marine environment by 2020, including designing and implementing programmes of measures. Determination of GEnvS must be made at a regional seas scale. Member States are required to co-operate with other Member States as part of the implementation process. MSFD overlaps geographically with the Water FD in coastal waters (to one nautical mile), however Water FD objectives take precedence here. The Marine and Coastal Access Act will provide the management tools with which to implement MSFD.

3.31. The Water FD has been in force since December 2000 and was transposed via regulations for England and Wales in December 2003. The first River Basin Management Plans, relating to each river basin district (including the transitional and coastal waters for that district), were published on 22 December 2009. They detail the environmental objectives, including status, of all water bodies and the measures to be applied to them. The Water FD applies to all waters out to one nautical mile. It requires that Member States aim to achieve **good status** or **good ecological potential** by 2015 and ensure that there is no deterioration in status in water bodies. There are also provisions relating to reducing pollution from priority substances and ceasing or phasing out emissions, discharges and losses of priority hazardous substances. Priority substances and priority hazardous substances are defined by Directive 2008/105/EC. Programmes of measures must be established by December 2009 and made operational by December 2012 to meet the environmental objectives of the Water FD.

Other consents

3.32. There may be other consents required for proposed works relating to dredged material, such as planning permission under the Town and Country Planning Act 1990.

4. Management routes and treatment techniques

Management routes for dredged material

4.1. The decision-making process for determining how MSCMD should be managed is complex. It is driven by several interlinking factors, categorised as follows:

- Regulatory framework;
- Environmental quality criteria;
- Geotechnical quality criteria;
- Supply and demand issues; and
- Costs.

Regulatory framework

4.2. Regulatory controls on the transport, treatment, recovery, use and/or disposal of MSCMD are covered in Chapter 3. There is a view that being labelled **waste** has inhibited the growth of markets for MSCMD. Anecdotal evidence suggests developers may be discouraged by their legal liabilities to build on land that has, what is regarded as a **waste stigma** attached to it, regardless of the actual risks associated with **clean** MSCMD.

4.3. There are existing legal mechanisms that encourage industry to explore alternatives to disposal at sea or on land. MSCMD can only be disposed of at sea if it meets its requirements under a Food and Environment Protection Act (FEPA) licence. This system is designed to protect the marine environment and the living resources it supports – including human health. Under the Part II of the FEPA licensing system the UK is able to meet some of its commitments to the following conventions:

- Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter, 1972 (London Convention) and its 1996 Protocol [14]; and
- Convention on the Protection of the Marine Environment of the North-East Atlantic 1998 (the OSPAR Convention) [19].

4.4. The London Convention and its protocol contribute to the international control of marine pollution and dumping at sea. The OSPAR convention applies to the governments of 15 contracting parties and the European Community and is the legal instrument that guides international protection of the marine environment of the North-East Atlantic. Signatories to both are obliged to ensure any activity that involves disposal at sea does not cause unnecessary pollution to the marine environment. In addition sea disposal can only occur if beneficial reuse is not possible.

4.5. The FEPA licensing process is based on the principles in these conventions. The licensing assessment method uses a weight-of-evidence approach based on a number of lines of evidence. These include chemical assessment to decide on the best management option and in particular if it is suitable for sea disposal (assuming that no alternatives can be identified). The Centre for Environment, Fisheries and Aquaculture Science (Cefas) conducts all chemical assessment. Cefas is an executive agency of Defra and scientific advisor to the Marine and Fisheries Agency (MFA) and the Welsh Assembly Government, the licensing authorities in England and Wales respectively. Material is then measured against benchmarks, which are called action **levels**. In the UK action levels are not designated as standards in legislation. They therefore do not constitute **pass/fail** criteria but are used in the weight-of-evidence approach. In general, contaminant concentrations in dredged material are considered as follows[12] [8]:

- Below action level 1 material is generally suitable for beneficial re-use or sea disposal;
- Between action level 1 and 2 material requires further site-specific assessment to determine whether a licence for sea disposal or beneficial reuse can be issued;
- Above action level 2 material is generally unsuitable for ocean disposal.

12 The framework for these action levels is subject to change, but was accurate at time of publication.

Environmental quality criteria

4.6. The physical, chemical and biological characteristics of MSCMD determine the options for end use, particularly if there is risk of contaminants leaching into the environment. These contaminants could have an impact on:

- plant, animal and human health;
- surface water contamination; and
- groundwater contamination.

4.7. The Water FD and the Groundwater Directive aim to protect and where necessary improve water quality from harm that may be caused by the placement and resultant leaching of any product, material or waste to land. The directives set upper limits on the amount of substances that can be safely leached into the environment. These thresholds must not be exceeded if an operator is to fulfil its legal obligations.

4.8. Other legal provisions also set environmental thresholds. The FEPA system, for example, may prevent MSCMD from being disposed of at sea or put to beneficial re-use if any specific substance limits are exceeded.

4.9. For MSCMD to be considered as having ceased to be waste and therefore be used on land without waste controls, it must be fully recovered. This means it must be a distinct, marketable product which can be used in the same way as the virgin material it replaces, with no worse environmental effects.

Geotechnical quality criteria

4.10. Mechanical and physical characteristics of material also affect proposed end use. For MSCMD to be recognised as a distinct, marketable product it must demonstrably exhibit the right geotechnical properties such as grain size, permeability and strength to show that it is suitable for its intended use.

4.11. There are numerous aggregate product standards and specifications (including bespoke project specifications) that set geotechnical quality criteria which define the performance of an aggregate product. It may be possible for some MSCMD to meet a selection of these aggregate standards and/or specifications. This is discussed in Chapter 6.

Supply and demand issues

4.12. The market forces of supply and demand influence whether or not MSCMD can be beneficially reused. Capital dredgings in particular are produced intermittently and in large volumes with varying composition [10]. This inconsistency in supply does not match levels of demand. Where there is no demand, MSCMD must be sent for disposal, unless there are sufficient intermediate waste storage facilities available. The MFA has attempted to address this by keeping a register of proposed dredging projects and their potential end users to streamline supply and demand [16]. Other agencies could take an active lead in identifying reuse potential in areas around projects, such as the Environment Agency's work in Southampton.

4.13. Treatment of MSCMD, if required, can also be slow in comparison to the rate of supply. In some cases supply could exceed the capacity of the treatment facility. However, the majority of MSCMD does not need extensive treatment. For larger projects physical separation measures are often sufficient, such as lagoons, which are easily incorporated into a site.

Cost issues

4.14. One of the biggest drivers encouraging developers to use MSCMD is that this material is not liable for Aggregate Levy Tax [12]. It can therefore be significantly cheaper for a developer to purchase MSCMD as opposed to virgin aggregate, even taking into account the costs associated with appropriate controls for the storage, transportation and use of the material. Competition from the supply of recycled aggregate from inert construction and demolition waste, which also has this tax benefit, can negate the Aggregates Levy Tax advantage.

4.15. The quality of material brought onto land is dictated by the applicable specification required. How demanding this specification is influences the price of the material and, as a result, its competitiveness against virgin and other recycled materials.

MSCMD in coastal flood management

4.16. There are no industry recognised standards for use of MSCMD in flood or coastal defence. There are, however, important lessons to be learned from the maintenance and development of flood defences on foreshores.

4.17. Beaches and foreshores are extremely important in flood defence. They protect the land behind them from exceptionally high tides and high impact wave activity, as well as providing an amenity and conservation resource.

4.18. Maintenance and beach recharge on foreshores is covered by FEPA licensing processes. Materials deposited onshore (above the level of mean high water springs) are not covered by a FEPA licence and require one or more environmental permits/exemptions. Although areas governed by FEPA are outside the scope of this document, there are important synergies and lessons to be taken from foreshore management when considering the use of MSCMD in defence work further back on land behind beaches. We are currently working with Defra, in partnership with industry, to revise the Beach Management Manual Report 153, originally published by CIRIA (Construction Industry Research and Information Association) in 1996 [9]. The updated CIRIA manual will be published summer 2010. It will provide useful and relevant guidance to help coastal managers, practitioners and regulators to find a balance that enables beach recharge to meet the needs of communities and costal protection.

4.19. Currently on beaches and foreshores dredged material used for maintenance and restoration are matched on a fitness for purpose basis, comparing characteristics such as granularity and chemical composition. Good management systems enable successful integration of varying sized layers to create a **natural** beach. If such an approach can be used to match MSCMD above the level of mean high water springs, with land being prepared to augment defences it would strengthen the case for recycling these materials rather than using virgin sources. The practices deployed by FEPA for use of fine grained material for salt marsh restoration could also apply to use of MSCMD in land based projects.

Treatment techniques

4.20. The treatment techniques outlined in this section are those commonly used to treat MSCMD in the UK.

Treatment using a trailer suction hopper dredger

4.21. This technique fills the hopper with a mixture of dredged material and water. Heavier materials such as gravel and sand sink to the bottom of the hopper, while finer materials take longer to settle. An overflow mechanism allows the loading of the vessel with the dredged material and water mixture to continue after the hopper is full. Water and some finer material is discharged from the top of the hopper while loading with the mixture, which creates a net gain in material load and coarseness. This allows the selection of specific size fractions. To discharge from the vessel, sea or river water is pumped into the hopper and mixed with the dredged material. This mixture is then hydraulically pumped onto land.

4.22. The TAG propose that full treatment of MSCMD may be possible in a trailer suction hopper dredger, where the sediment is **clean** as determined by the extracting licence. In the event that this is possible in any particular case, the sediments brought to land may no longer require waste controls.[13] Testing against recognised standards and specifications would be required in the hopper before material was pumped to land.

Treatment using dewatering/separation fields

4.23. This process acts as a particle separation technique and takes place in lagoons. Water is removed through drains, run-off and evaporation, while layers of materials settle into size fractions before being mechanically moved to their final location. This process is not expensive compared with other dewatering/separation techniques, but it requires large areas of land. It is common for the supply of material to outweigh the capacity of the lagoon. Mechanical dredging systems are more suited to natural dewatering as they do not bring excess water onto land, although this is significantly more expensive than other technologies. Generally in the UK materials are pumped hydraulically into lagoons.

Treatment using hydrocyclones

4.24. Hydrocyclones [20] are commonly used in commercial and mineral dredging operations to separate sands and fines in water. A slurry mixture is added to a conical shaped chamber, which then uses centrifugal force, to spin heavier material to the sides and out through the bottom. It is not currently used on a large scale by MSCMD dredging contractors.

13 See 8.7 for further information or our position statement on marine sediments from dredging in land-based projects at http://www.environment-agency.gov.uk/business/regulation/99685.aspx

5. Key markets

5.1. MSCMD can be used in a number of market applications, which the TAG has considered. To demonstrate that the material has ceased to be waste, its use must be certain and there must be a market for the product.

5.2. The market analysis within the financial impact assessment [10] identifies the most significant markets for MSCMD as:

- land raising as part of port development;
- land raising for other projects, for example housing;
- land reclamation/capping; and
- flood and coast protection (above the level of mean high water springs).

5.3. Other potential uses such as brick manufacture and the addition of MSCMD as aggregate filler in concrete or a raw material in cement manufacture have been investigated. However, these uses are not currently considered to be viable markets for large volumes of MSCMD and therefore have not been included.

5.4. It was decided that other beneficial uses would not be considered as they were either below the level of mean high water springs (MHWS – see 3.23) and therefore remain subject to a FEPA licence, or they are not currently viable markets for large amounts of MSCMD. The markets that have not been considered include:

- beach nourishment;
- habitat creation/replenishment;
- brick manufacturing; and
- use of MSCMD in concrete or cement manufacture.

6. Quality controls and standards

6.1. MSCMD are not generally tested against any nationally-recognised standards for the use of material on land. This inhibits potential management routes for recovered materials. In recognition of this gap **project-specific** standards are often employed. These project-specific standards are generally comprehensive but the lack of a national approach means that end uses are not clearly defined and the evidence is hard to map, both for the risk assessment and the financial impact assessment.

6.2. One requirement of being able to demonstrate that waste has been converted into a distinct marketable product is that it is suitable for a recognised use. This relates to a producer being able to demonstrate the performance of their waste-derived material. If material meets a recognised standard or specification, its suitability for specific uses can be assessed.

Applicable product standards relative to end markets

6.3. There are numerous aggregate standards and engineering specifications applicable to virgin and recycled aggregates. Some of these may be applicable to MSCMD in the specified end uses.

Use of MSCMD in land-raising applications

6.4. For unbound applications such as embankments, structural fill and back fill with or without capping, the following standards/specifications may be used:

- **BS-EN 13242: 2002**. Aggregates for unbound and hydraulically-bound materials for use in civil engineering work and road construction;
- **BS-EN 13285:2003** Unbound mixtures; and/ or
- **Specification for Highway Works series 500/600/800** which is the grouping of specifications, within the Highways Agency's Specification for Highway Works (SHW). This applies to aggregates used in drainage, earthworks, and road pavements (unbound, cement and hydraulically bound).

Use of MSCMD in land reclamation/capping applications

6.5. For unbound and hydraulically-bound mixtures such as capping layers, the following standards/specifications may be applicable:

- **BS-EN 13242: 2002**. Aggregates for unbound and hydraulically-bound materials for use in civil engineering work and road construction;
- **BS-EN 14227**. Hydraulically-bound mixtures: specifications;
- **Specification for Highway Works series 800**. This is the grouping of specifications, within the Highways Agency's Specification for Highway Works (SHW). This applies to aggregates used in road pavements, unbound, cement and other hydraulically-bound mixtures.

Use of MSCMD for flood and coastal protection

6.6. There are no industry recognised standards for use of MSCMD in flood or coastal defence. There are, however, important lessons to be learned from the maintenance and development of flood defences on foreshores. Please see 4.16 for more information.

7. Risk management and mitigation

Material description

7.1. Generally MSCMD can be characterised by their particle size into one of the following groups:

Material type	Threshold size
Boulders	>200mm
Cobbles	<200mm
Gravel	<60mm
Sand	<2.00mm
Silt	<0.063mm
Clay	<0.002mm

Reference: Department of Transport [3]

7.2. MSCMD are generally a mixture of the above. Maintenance dredging tends to contain finer, mobile materials such as sands, silts and some gravel. In comparison, capital dredging tends to contain more geological material such as rock, clay, sand, gravel and silt. The geological and environmental setting, rather than the type of dredging, determines the materials' physical characteristics.

7.3. MSCMD can also contain a variety of chemical and biological contaminants, particularly if they are dredged from navigational channels close to human populations. Generally finer materials contain more pollutants due to the larger surface area and greater proportion of organic material in the fine fraction [8]. They are also more likely to leach contaminants into the environment due to a greater surface area. However, capital dredged material, other than the surface layers of maintenance like material, very often consist of previously unexposed geological material that is generally uncontaminated. These materials can be of rock, clay, sand etc and are often bulky or cohesive in nature.

Risk assessment conducted for the TAG

7.4. The Environment Agency commissioned a risk assessment on behalf of the TAG. Its purpose was to assess the relative levels of risks to human health and the environment arising from the use of MSCMD in land-based projects.

7.5. The consultants found it is not possible to devise one generic risk assessment for MSCMD in the markets identified in paragraph 5.2. This is due to a number of factors including:

- Marine sediments are not a uniform material. They differ greatly as a function of source material, hydrodynamics and diagenetic processes. For example the organic carbon content of UK marine sediments can vary from 0.26% to 7.38%, which has an impact on the bioavailability of contaminants.
- Certain substances are only present at particular sites and would only need to be tested for on a case-by-case basis. For example, sediments dredged from an estuary in which there is consent for discharge of silver salts would require silver to be added to the suite of FEPA determinands, because silver ions are highly toxic to aquatic life at quite low concentrations. However, in normal circumstances testing for silver would add unnecessary costs to the price of a dredging activity.
- It is difficult to define a precise range of end-use scenarios, as MSCMD are applied in varying volumes across an array of geographical locations with differing geological and site-sensitivity characteristics. Also, the Environment Agency's position on Soil Guideline Values (SGVs) for human health risks and Soil Screening Values (SSVs) for ecological risks were not complete at the time of work. These two factors meant risks to human health and other terrestrial receptors could not be assessed.

- Data on MSCMD through the FEPA licensing system (which is used to asses sea disposal routes) is not appropriate data to assess suitability of material in land-based applications. There is a lack of data on leaching based on an appropriate solid-to-liquid ratio, and some data are collected using inappropriate limits of detection. These factors make it difficult to compare results against various environmental limits (for example environmental quality standards in the Water FD) and to draw conclusions on the actual environmental risk posed by the material.

7.6. It may be possible for the larger sediment size fractions of MSCMD to meet European standards for aggregates. These standards are harmonised across Europe under the Construction Products Directive, which is currently developing a framework for assessing dangerous substances in construction materials. When these revisions are translated into new standards, MSCMD must be checked for compatibility with this framework. Although the indicative list of dangerous substances does not currently contain elements likely to be found in MSCMD, once the list is finalised the materials must be checked against it.

7.7. Generic release from waste regulations, through use of a quality protocol, could be possible for relatively uncontaminated MSCMD. To account for variances in end-use scenarios and the sediments themselves, however, a generic approach would need to be highly conservative. This may lead to an unintended outcome as MSCMD that **fails** the first tier of a generic risk assessment may be stigmatised as **contaminated** and therefore disposed of rather than used.

7.8. The report concluded that to maximise the amount of MSCMD that can be recycled in land-based projects, a site-specific risk assessment is more appropriate. This ensures the placement is suitable for its proposed end use as a non-waste where appropriate, or as a waste under a recovery permit.

8. Findings

8.1. The TAG identified the main markets for MSCMD as:
- land raising as part of port development;
- land raising for other projects, for example housing;
- land reclamation/capping; and
- flood and coast protection (above the level of mean high water springs).

8.2. The TAG's view is that the development of these markets has been compromised by the stigma of MSCMD being **waste**.

8.3. While initially supportive of developing a quality protocol, it became apparent to the TAG during the review that this is not the best course of action. It mainly attributed this to:
- difficulties in producing a generic risk assessment for the material, as discussed in section 7 above;
- insufficient data to measure the actual risk of using MSCMD; and
- a lack of evidence to demonstrate the majority of MSCMD are able to meet European standards for aggregates, or other recognised standards. This makes it difficult to show materials have lost their **waste** characteristics.

8.4. Producing generic criteria to enable MSCMD to demonstrate end-of-waste status would require a conservative approach. This may limit the amount of material that could reasonably be accepted under a quality protocol.

8.5. The TAG accepts the consultants' view [8] that this may lead to an unintended outcome. If all MSCMD that **fail** tier 1 of a risk assessment are automatically stigmatised as **contaminated** they may be dumped at sea or in landfill. This would inhibit beneficial use of MSCMD.

8.6. The TAG considers that much MSCMD could be beneficially used in land-based projects. Such use has historically been as a waste recovery operation under an environmental permit or exemption.

8.7. On a case-by-case basis it could be possible to demonstrate that the MSCMD in question would cease to be waste. For the Environment Agency to regard the material as having ceased to be waste, it would need to be satisfied that the MSCMD in question had been converted into a distinct, marketable product. It would need to be usable in the same way as the virgin material it replaced, with no worse environmental effects.

8.8. The TAG considers the operation of a trailer suction dredger could be regarded as a self-contained recovery unit, subject to compliance with specification and certainty of market, negating the need for waste management controls once it has been removed from the unit. For MSCMD to be beneficially used, either as a waste in a recovery operation or to demonstrate that the MSCMD has ceased to be waste, a site-specific risk assessment would be required to demonstrate suitability of use.

9. Recommendations

9.1. The TAG recommends that the Environment Agency does not develop a quality protocol, at least for the time being.

9.2. The TAG recommends that this could be reviewed if the following become available:
- a recognised and achievable product standard for MSCMD[14];
- appropriate leaching data:
  - gathered using leaching tests with an Environment Agency-agreed solid-to-liquid ratio;
  - measured against the correct limit of detection.

9.3. The TAG also recommends that a working group is set up to consider the development of a voluntary code of practice to cover the options available for MSCMD. The code would describe:
- beneficial use below the level of mean high water springs;
- beneficial use in land-based projects as a waste recovery activity;
- what the Environment Agency would require for it to be satisfied that the material has ceased to be waste;
- a method whereby a dredging operation could be a self-contained recovery process;
- good practice measures for use of MSCMD;
- guidance on using the aggregate fraction of MSCMD under the Quality Protocol for the Production of Aggregates from Inert Waste.

9.4. This code should also include requirements for site-specific risk assessments.

9.5. The TAG also recommends during the 2010 review of the Quality Protocol for the Production of Aggregates from Inert Waste, the acceptable input list should consider including the inert fraction of MSCMD.

14 Standards already exist for a number of aggregate products, which the inert fraction of MSCMD is likely to meet. However the majority of material is not covered by existing product standards.

Appendix A Technical Advisory Group membership

Organisation	Representative	Type of member
Centre for Environment, Fisheries and Aquaculture Science [CEFAS]	Andy Birchenough	Attending
Environment Agency	Becky Favager Susan Casper	Attending Attending
HR Wallingford (consultants in civil engineering and environmental hydraulics)	Nicola Clay Caroline Fletcher	Attending Attending
National Industrial Symbiosis Programme [NISP]	Robert Spencer	Attending
The Bristol Port Company	Anne Hayes	Attending
Port of London Authority	Katherine Harris	Attending
The Crown Estate	John Bingham Mark Wrigley	Attending Attending
Federation of Dredging Contractors	John McKenzie	Attending
Waste Protocols Project Team	Amy Colson Paul Murray Suzanne Laidlaw Sarah Clayton Mark Crane [WCA][15] Simone Aplin [RPS][16]	Attending Attending Attending Attending Attending Attending
WRAP [Waste Resources Action Programme]	John Barritt	Attending
Environment Agency Wales	Nia Owen	Corresponding
Natural England	Roger Morris	Corresponding
Federation of Dredging Contractors	Brian White	Corresponding

15 WCA Environmental Ltd. were commissioned by the Waste Protocols Project to write the *Risk Assessment of Recycled Materials from Marine Navigational Dredging* (see reference 8).

16 RPS Group plc. were commissioned by the Waste Protocols Project to write the Financial Impact Assessment of a *Quality Protocol for Marine Dredged Material* (see reference 7 and 10).

Appendix B Technical Advisory Group terms of reference

1.0. Mission statement

1.1. To produce a technical report, recognised by (and produced with the support of) industry. The technical report will contain sufficient information to enable the Environment Agency to determine if marine sediments from capital and maintenance dredging (MSCMD) should be regarded as having ceased to be waste at a specified point and therefore no longer subject to the requirements of the regulatory waste regime.

1.2. If this is unachievable, the technical report will contain sufficient information to enable the Environment Agency to confirm to the business community what legal obligations remain to control the reuse of the treated waste material.

2.0. Desired outcomes

2.1. The Technical Advisory Group (TAG) will aim to produce a technical report which identifies and establishes the point where:

- Materials are suitable for use without further treatment with due regard to the potential end use and location of placement;
- Contaminants present by virtue of the nature of the waste have been eliminated, reduced or assessed to a level where their presence is not significant;
- The dredged material will be fully suitable as a substitute for a virgin material and can be considered a **recovered product**;
- There is a market for the recovered product and it is certain to be used;
- The use of the recovered product will not result in greater harm to human health or the environment than a virgin equivalent.

2.2. To do this the TAG will consider:

- The current or future markets for recovered marine dredged materials from navigational dredging;
- Any existing industry standards and specifications which recovered marine dredged materials from navigational dredging can meet;
- Where standards or specifications do not exist, the TAG will identify alternatives and/or scope out a separate project for industry to produce a new standard or specification;
- Any potential impacts on human health or the environment which are associated with the use of the recovered products, and identify any necessary mitigation methods;
- Augmenting or developing existing standards if required;
- The requirement for certification and auditing/monitoring.

2.3. The TAG will provide input to a financial impact assessment (FIA). This will determine the costs and benefits of a change in the point that waste ceases to be waste (with the aid of the project economist). The TAG will need to provide information on end markets, potential end uses of the material, current prices and annual tonnages produced.

2.4. The TAG will provide input into the risk assessment (RA). This will determine if the material presents an acceptable risk to human health and the environment. The TAG will be required to submit sampling data and analyses from agreed specifications. If there are any gaps in the data, TAG members will have to provide data to fill them or suggest alternative sources of information.

2.5. The TAG will also contribute to the communications plan.

3.0. Limitations

3.1. Knowledge from the industry is vital in the production of the technical report, financial impact assessment and risk assessment. We expect that members of the TAG will willingly share information from their sector and be prepared to participate in writing and reviewing elements of the report. If this help is not forthcoming it may not be possible to fully develop a technical report in the timescale available.

3.2. Equally, if the information needed is not available, a technical report will be produced which highlights those evidence gaps identified.

3.3. It is intended that the technical report will provide sufficient evidence to the Environment Agency to support moving forward the point at which waste ceases to be waste. If this cannot be evidenced, the technical report will give reasons why the TAG feels this is not the best way forward. It is ultimately the Environment Agency which will decide this point.

3.4. Developing a BS standard for the material is outside the scope of this project.

Appendix C Definitions

Term	Description
Controlled waste	Controlled waste is household, commercial and industrial waste. Controlled waste is defined in section 30 of the Control of Pollution Act 1974, section 75 of the Environment Protection Act 1990 and the Controlled Waste Regulations 1992 (as amended). Paragraphs 9(2) and 10(3) to Schedule 4 of the Waste Management Licensing Regulations 1994 provide that any reference to 'waste' in Part I of the 1974 Act or Part II of the 1990 Act includes a reference to directive waste.
Duty of care	The duty of care is set out in section 34 of the Environmental Protection Act 1990 and associated regulations. It applies to anyone who is the holder of controlled waste. Persons concerned with controlled waste must ensure that the waste: ■ is managed properly; ■ is recovered or disposed of safely; ■ does not cause harm to human health or pollution of the environment; and ■ is transferred only to someone who is authorised to receive it. The duty applies to any person who produces, imports, carries, keeps, treats or disposes of controlled waste or, as a broker, has control of such waste.
Environment Agency	The Environment Agency is the leading public body for protecting and improving the environment in England and Wales. Its job is to make sure that air, land and water are looked after by everyone in today's society, so that tomorrow's generations inherit a cleaner, healthier world.
Mitigation measures	Measures put in place to reduce all potentially-significant effects.
Permit	Environmental permits or exemptions issued under the Environmental Permitting (England and Wales) Regulations 2007, which came into force on 6 April 2008. From 6 April 2008, the following automatically become environmental permits: ■ PPC permits issued under the Pollution Prevention and Control (England and Wales) Regulations 2000 (as amended); ■ Waste Management Licences (WMLs) issued under the Environmental Protection Act 1990 (as amended). Exemptions from the need for a WML, registered under Regulation 18 and Schedule 3 of the Waste Management Licensing Regulations 1994 (as amended) will now come under Schedule 3 of the Environmental Permitting (England and Wales) Regulations 2007 until 6 April 2010 and thereafter under the Environmental Permitting (England and Wales) (Amendment) (No.2) Regulations 2009. We anticipate, at the time of writing, that the Environmental Permitting (England and Wales) Regulations 2010 will be laid to come into force on 6 April 2010 immediately after the 2009 Regulations. If this is the case any environmental permit in force at that time will be come an environmental permit under the 2010 regulations. The 2010 regulations will also contain provisions relating to exemptions.
	continued

Term	Description
Quality protocol	A quality protocol sets out criteria for the production of a product from a specific waste type. Compliance with these criteria is considered sufficient to ensure that the recovered product may be used without risk to the environment or harm to human health, and therefore without the need for waste regulatory control. In addition, the quality protocol indicates how compliance may be demonstrated and points to best practice for the use of the recovered product.
Standard	A standard can be defined as a document established by consensus and approved by a recognised body. It provides for common and repeated use, rules, guidelines or characteristics for activities or their results, aimed at achieving the most order in a given context. Standards range from individual company standards to multinational (international) standards.
Recovery	Any operations provided for in Annex II, B of the Waste Framework Directive.
Test methods	Product and process testing that complies with recognised national or international standards issued by organisations such as BSI or CEN.
Waste	Waste is any substance or object that the holder discards, intends to discard or is required to discard. There have been a number of judgements by the European Court of Justice (ECJ) on the definition of waste. A summary of these judgements, which are legally binding, is available on the Defra website at http://www.defra.gov.uk/environment/waste/topics/ecj-definition.pdf
Waste carrier	A person who transports controlled waste within the UK, including journeys into and out of the UK.
Waste carrier registration	The Waste Framework Directive requires that establishments and undertakings that collect or transport waste on a professional basis, or which arrange for the disposal or recovery of waste (dealers or brokers), must be registered. This is implemented in UK legislation by the Control of Pollution (Amendment) Act 1989. Persons who carry waste as part of their business are required to be registered with the Environment Agency/SEPA/ Environment and Heritage Service (as appropriate).
Waste management controls	Legislative controls that govern the treatment, handling, containment, and storage of waste, for example Environmental Permitting Regulations (England and Wales) 2007.
WRAP [Waste & Resources Action Programme]	WRAP helps individuals, businesses and local authorities to reduce waste and recycle more, making better use of resources and helping to tackle climate change.

Appendix D References and information sources

[1] ABP Research and Consultancy Ltd, 1999. *Good practice guidelines for ports and harbours operating within or near UK marine sites*. Report for the UK Marine SACs Project, Task Manager, Geoff Radley, English Nature.

[2] Bray, R.N. Bates, A.D. & Land, J.M., 1996. *Dredging: a handbook for engineers*. 2nd ed. London: Elsevier Ltd.

[3] Burt, T N on behalf of Department for Transport. 1996. Guidelines for beneficial use of dredged material. Oxon HR Wallingford.

[4] Centre for Environment, Fisheries and Aquaculture Science (CEFAS), 2008. *Beneficial use of fine-grained maintenance dredged material* [Online]. Available from: http://www.cefas.co.uk/projects/determination-of-the-ecological-consequences-of-dredged-material-emplacement-(decode)/beneficial-use-of-fine-grained-maintenance-dredged-material.aspx [Accessed on 5 January 2009]

[5] Clay, N, Bray N and Hesk P (2008). *Maximising beneficial reuse through the use of a novel dredging contract*. Terra et Aqua, no. 111.

[6] Environment Agency (2010). A User Guide for Marine Dredged Activities – Clearing the Waters [Online]. Available from: http://www.environment-agency.gov.uk/marine

[7] Environment Agency (2009). *Financial Impact Assessment of a Quality Protocol for Marine Dredged Materials*. Report for the Waste Protocols Project.

[8] Environment Agency (2009). *Risk Assessment of Recycled Materials: Sediments from Capital and Maintenance Dredging*. Report for the Waste Protocols Project.

[9] Environment Agency (200?). *Scoping study: Updating the Beach Management Manual: Science Summary SC0600005*.[Online]. Available from: http://publications.environment-agency.gov.uk/pdf/SCHO1107BNLL-e-e.pdf [Accessed on 25 February 2010].

[10] Environment Agency (2010). *Summary Report on the Financial Impact Assessment of a Quality Protocol for Marine Sediments from Capital and Maintenance Dredging (MSCMD)*. Report for the Waste Protocols Project. Available from: http://www.environment-agency.gov.uk/business/topics/waste/114429.aspx

[11] Highley, D E, Hetherington, L E, Brown, T J, Harrison, D J and Jenkins, G O. 2007. *The strategic importance of the marine aggregate industry to the UK*. British Geological Survey Research Report, OR/07/019.

[12] HM Revenue and Customs. *Aggregates Levy background*. [Online]. Available from: http://customs.hmrc.gov.uk/channelsPortalWebApp/channelsPortalWebApp.portal?_nfpb=true&_pageLabel=pageExcise_InfoGuides&id=HMCE_PROD_010290&propertyType=document [Accessed on 13 October 2009]

[13] International Association for Dredging Contractors (IADC), 2009. *Facts about dredged material as a resource, an information up-date from the IADC, number 1*. [Online] IADC. Available from: http://www.iadc-dredging.com/images/stories/pdf/facts_about_dredged-material-as-a-resource.pdf [Accessed on 8 September 2009].

[14] International Maritime Organisation (IMO), 2002. *Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter, 1972*. [Online]. Available from: http://www.imo.org/Conventions/contents.asp?topic_id=258&doc_id=681 [Accessed on 1 October 2009].

[15] Marine and Fisheries Agency (MFA), 2007. *Types of activities: control of dredging operations.* [Online]. Available from: http://www.mfa.gov.uk/environment/works/consents-dredging.htm [Accessed on 26 August 2009].

[16] Marine and Fisheries Agency (MFA), 2007. *Beneficial and mitigating uses of dredged materials*. [Online]. Available from: http://www.mfa.gov.uk/environment/works/consents-dredging-beneficial.htm [Accessed in October 2009]

[17] MEMG (2003). Group Co-ordinating Sea Disposal Monitoring. *Final Report of the Dredging and Dredged Material Disposal Monitoring Task Team*. Sci. Ser., Aquat. Environ. Monit. Rep., CEFAS, Lowestoft, (55): 52pp.

[18] New Civil Engineer, 2004. *Mechanical drying plant planned to save on Antwerp port dredging cost*. [Online] Available from: http://www.nce.co.uk/mechanical-drying-plant-planned-to-save-on-antwerp-port-dredging-costs/742598.article# [Accessed on 7 September 2009].

[19] OSPAR Commission, 2009. *Welcome to the OSPAR Commission, protecting and conserving the North-East Atlantic and its resources*. [Online]. Available from: http://www.ospar.org/ [Accessed on 1 October 2009].

[20] PIANC, 2009. *Dredged material as a resource: options and constraints*. Report of the Environmental Commission working group, 104.

[21] Pugh, D (2008). Socio-economic indicators of marine-related activities in the UK economy. The Crown Estate, 68 pages.

[22] Royal Boskalis Westminster, 200?. *Fleet and equipment*. [Online] Available from: http://www.boskalis.com/vervolg_investor.php?pageID=119 [Accessed on 9 September 2009].

[23] Zentar, R, Abriak, N E, Dubois, V and Miraoui, M., 2009. *Beneficial use of dredged sediments in public works*. Environmental Technology, 30 (8), pp. 841–847.

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