



TERMS OF REFERENCE FOR THE MANAGEMENT AND DISPOSAL OF DREDGED MATERIAL

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Contents

Acronyms	4
Terminology	5
List of Figures and Tables.....	6
Background Information	7
1. Scope of this document.....	8
2. Legal Requirements	9
<i>London and Barcelona Conventions</i>	9
<i>Water Policy Framework Regulations</i>	11
<i>Marine Policy Framework Regulations</i>	12
3. Regulatory Process	13
4. Standards and Criteria.....	14
Part A - Assessment of Dredged Material	14
1. <i>Preliminary Assessment</i>	15
2. <i>Sampling and Analytical Requirements</i>	16
3. <i>Characterisation of dredged material</i>	19
A. <i>Physical Characterisation</i>	19
B. <i>Chemical Characterisation</i>	19
C. <i>Determining the nature of waste</i>	19
D. <i>Other Assessments</i>	20
<i>i. Biological disturbance and Hydrographical Changes</i>	20
<i>ii. Marine Litter (MSFD Descriptor 10)</i>	20
4. <i>Screening Assessment</i>	21
5. <i>Submission of Results</i>	22
6. <i>Mitigation measures</i>	22
Part B - Management of Dredged Material	22
1. <i>Shifting of material</i>	22
2. <i>Use of dredged material in construction projects</i>	23
3. <i>Storage of Waste prior to disposal</i>	23
4. <i>Methods of Disposal</i>	23
A. <i>Open Sea Disposal</i>	23
B. <i>Alternative Disposal Options</i>	24
<i>i. Landfilling</i>	24

<i>ii. Export</i>	24
<i>iii. Other Treatment and Disposal Options</i>	25
Annex I - Typical approach for the determination of physical and chemical parameters in marine sediments	26
Annex II - Sediment Sampling, Grain Size Analyses and Chemical Analyses	27
<i>References</i>	30

Acronyms

BOD – Biochemical Oxygen Demand

CLP Regulation - Classification, Labelling and Packaging Regulation, (EC) No 1272/2008

CN – Consignment Note

COD – Chemical Oxygen Demand

DLV – Dumping Limit Values

DO – Dissolved Oxygen

EIA – Environmental Impact Assessment

ERA – Environment and Resources Authority

GES – Good Environmental Status

MSFD – Marine Strategy Framework Directive

PA – Planning Authority

PAH – Poly Aromatic Hydrocarbons

PCB – Polychlorinated Biphenyl

TBT – Tributyltin

WFD – Water Framework Directive

Terminology

Dredging – means the activity by which dredged material is removed.

Dredged material - means any sedimentary formation (incl. clay, silt, sand gravel, rocks, and any indigenous parent rock material) removed from areas that are normally or regularly covered by water, by using dredging or other excavation equipment¹.

Sampling station – means the location at a given coordinate from which sampling points are taken.

Sampling point – means a point at a specified depth within a sampling station from which replicates are taken.

Replicate samples - means a number of samples taken simultaneously at the same sampling point in the same manner².

¹ UNEP(DEPI)/MED - Updated Guidelines on Management of Dredged Materials - Decision IG.23/12

² ISO 2004. ISO Standard 5667-19:2004 Water quality -- Sampling -- Part 19: Guidance on sampling of marine sediments. Geneva.

List of Figures and Tables

Figure 1: Delineation for Grid Sampling Area, Sampling Station, Sampling Point and Replicates 16

Table 1: Number of sampling stations to be analysed in relation to the amount of material to be dredged 17

Table 2: Chemical parameters and respective Limit Values 18

Table 3: Example of harmonised classification of hazardous substances pursuant to Regulation (EC) No 1272/2008. 20

Table 4: Screening assessment approach 22

Background Information

Dredging is the removal of material from the seabed, usually for maintenance of fairways for navigation of vessels or the development of port facilities³. To date, disposal of dredged material in Malta has been at sea.

If not properly managed, dredging can have significant environmental impacts associated with the dredging process itself as well as with the disposal of dredged material. During both activities, impacts may arise as a result of loss or disturbance of benthic habitats, an increase in turbidity, changes in water currents (or hydrographical conditions), and release of contaminants accumulated within the dredged sediments, all of which can negatively affect water quality and marine ecosystems at the dredged and disposal locations.

One of the major environmental risks relates to historical contamination in sediments, which is an issue of particular significance within harbours and ports such as Malta's Grand Harbour. Marine sediment acts as a sink for coastal water contaminants, including particulate matter and a variety of chemicals arising from port activities and industrial installations located within port areas. Harbour areas are also known to accumulate litter on the seabed, including litter associated with harbour-based activities as well as litter transported from the open sea.

Marine sediments would thus act as a source of contamination, which can be transported through the water column as a result of dredging activity. Sediment disturbance can also result in plume formation, the extent of which is dependent on the sediments' physical characteristics and prevailing hydrodynamic conditions at the time of dredging. Contaminants mobilised through such actions can result in water quality impairment and can be toxic to aquatic receptors, including shellfish and fish as well as negatively affect human health. Sediment data held by Malta's Environment and Resources Authority (hereafter referred to as ERA) on dredged material shows high levels of certain contaminants in certain sediments, which raises concerns regarding the proper management and disposal of such material.

Disposal of dredged material at sea leads to the dispersion of pollutants in association with suspended particles within the dredged material being transported and the release of pollutants from the dumpsite sediments. This produces effects in the marine water quality and marine biota through the dispersion of pollutants in association with suspended particles, and the release of pollutants from the dumpsite sediments. The presence of certain contaminants in the dredged material may make it unsuitable for such disposal. Within this context, disposal of dredged material needs to be subject to screening processes targeted at the prevention of further contamination in the marine environment.

³ Marine sediment waste arising from construction engineering projects and any other activity that extracts sea bed material to be disposed of at sea, such as but not limited to coring or piling, shall fall within scope of this guidance.

1. Scope of this document

While recognising the need for dredging activities for the proper operation of local ports and harbours, there is an equally important need to ensure that activities arising from related actions are sustainable and not detrimental to the environment. Dredging and dredged material treatment/disposal thus requires adequate planning, design and management to avoid the negative impacts, which may arise through inadequate handling of contaminated dredged material.

The aim of this document is to establish terms of reference that provide clear and consistent standards and criteria for the assessment of dredged material in order to facilitate and improve decision making for its management and disposal as part of the relevant permitting regimes. Application of these standards and criteria would contribute to the achievement of regional and EU policy objectives, particularly with respect to the prevention of contamination of the marine environment.

This document addresses the disposal of dredged material, with a focus on the management of contaminated sediments. It does not address the assessment processes required to inform decision-making processes related to the dredging activity itself nor the processes or practices to be employed to address environmental impacts associated with such activity. Assessment processes required as part of the permitting processes for dredging and good practice to be employed throughout such activity will be dealt with through separate documentation.

ERA shall revise the document as further scientific information becomes available.

2. Legal Requirements

London and Barcelona Conventions

Disposal at sea in Malta is mainly regulated via the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter, better known as the London Convention, together with the Convention for the Protection of the Marine Environment and the Coastal Region of the Mediterranean, referred to as the Barcelona Convention, the 1976 Protocol to the Barcelona Convention for the Prevention of Pollution of the Mediterranean Sea by Dumping from Ships and Aircrafts and the 1995 Amendments to the Protocol for the Prevention of Pollution of the Mediterranean Sea by Dumping from Ships and Aircraft.

The 1972 London Convention covers all seas, and all deliberate disposal of wastes other than that incidental to the normal operation of vessels, aircraft, platforms or other man-made structures at sea and their equipment,. Article 4 of this Convention identifies a list in Annex I, where waste is prohibited from being disposed of at sea. Dumping of matter listed in Annex II of this Convention is allowed only by special permit while dumping of matter listed in Annex III is allowed only by general permit. Exceptions are permitted only in the case of extreme emergency. The London Convention and its articles were amended in 1996. Article 4 and the related annexes provide an amended list of wastes for which the contracting parties shall prohibit, or require a permit for, dumping in the sea.

The 1976 Barcelona Convention specifies that contracting Parties shall, take all appropriate measures, individually or jointly, in accordance with the provisions of this Convention and those Protocols in force, to which they are party, to prevent, abate and combat pollution of the Mediterranean Sea area and to protect and enhance the marine environment. Article 7 to the 1976 Dumping Protocol indicates that all permits referred to in Articles 5 and 6 of the same protocol shall be issued only after careful consideration of all the factors set forth in Annex III to this Protocol which includes:

A. Characteristics and composition of the matter

1. Total amount and average compositions of matter dumped (e.g. per year).
2. Form (e.g. solid, liquid or gaseous).
3. Properties: physical (e.g. solubility and density), chemical and biochemical (e.g. oxygen demand, nutrients) and biological (e.g. presence of viruses, bacteria, yeasts, parasites).
4. Toxicity.
5. Persistence: physical, chemical and biological.
6. Accumulation and biotransformation in biological materials or sediments.
7. Susceptibility to physical, chemical and biochemical changes and interaction in the aquatic environment with other dissolved organic and inorganic materials.
8. Probability of production of taints or other changes reducing marketability of resources (fish, shellfish, etc.).

B. Characteristics of dumping site and method of deposit

1. Location (e.g. coordinates of the dumping area depth and distance from the coast), location in relation to other areas (e.g. amenity areas, spawning, nursery and fishing areas and exploitable resources).
2. Rate of disposal per specific period (e.g. quantity per day, per week, per month).
3. Methods of packaging and containment, if any.

4. Initial dilution achieved by proposed method of release, particularly the speed of the ship.
5. Dispersal characteristics (e.g. effects of currents tides and wind on horizontal transport and vertical mixing).
6. Water characteristics (e.g. temperature, pH, salinity, stratification, oxygen indices of pollution -- dissolved oxygen (DO), chemical oxygen demand (COD), biochemical oxygen demand (BOD), nitrogen present in organic and mineral form, including ammonia, suspended matter, other nutrients and productivity).
7. Bottom characteristics (e.g. topography, geochemical and geological characteristics and biological productivity).
8. Existence and effects of other dumping which have been made in the dumping area (e.g. heavy metal background reading and organic carbon content).
9. When issuing a permit for dumping, the Contracting Parties shall endeavour to determine whether an adequate scientific basis exists for assessing the consequences of such dumping in the area concerned, in accordance with the foregoing provisions and taking into account seasonal variations.

C. General considerations and conditions

1. Possible effects on amenities (e.g. presence of floating or stranded material, turbidity objectionable odour, discoloration and foaming).
2. Possible effects on marine life, fish and shellfish culture, fish stocks and fisheries, seaweed harvesting and culture.
3. Possible effects on other uses of the sea (e.g. impairment of water quality for industrial use, underwater corrosion of structures, interference with ship operations from floating materials, interference with fishing or navigation through deposit of waste or solid objects on the sea floor and protection of areas of special importance for scientific or conservation purposes).
4. The practical availability of alternative land-based methods of treatment, disposal or elimination or of treatment to render the matter less harmful for sea dumping.

In 1995, the Barcelona Convention was amended. The Protocols drawn up in line with this Convention aim to reduce pollution in the Mediterranean Sea, and protect and improve its marine environment, thereby contributing to its sustainable development. In 1995, Article 4 to the 1976 Dumping Protocol was amended as follows (providing a list of wastes that are allowed to be disposed at Sea):

1. The dumping of wastes or other matter, with the exception of those listed in paragraph 2 of this Article, is prohibited.
2. The following is the list referred to in the preceding paragraph:
 - (a) dredged material;
 - (b) fish waste or organic materials resulting from the processing of fish and other marine organisms;
 - (c) vessels, until 31 December 2000;
 - (d) platforms and other man-made structures at sea, provided that material capable of creating floating debris or otherwise contributing to pollution of the marine environment has been removed to the maximum extent, without prejudice to the provisions of this Protocol concerning Pollution Resulting from Exploration and Exploitation of the Continental Shelf, the Seabed and its Subsoil.

- (e) inert uncontaminated geological materials the chemical constituents of which are unlikely to be released into the marine environment.

Ratification Status

Malta ratified the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter, commonly referred to as the London Dumping Convention, on 28 December 1989. This Convention entered into force on 30 August 1975 (27 January 1991 for Malta).

Malta has not yet ratified the 1996 Protocol to the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter, commonly referred to as the 1996 London Protocol. The 1996 London Protocol entered into force on 24 March 2006.

Malta ratified the Protocol for the Prevention of Pollution of the Mediterranean Sea by Dumping from Ships and Aircraft to the Convention for the Protection of the Marine Environment and the Coastal Region of the Mediterranean, commonly referred to as the 1976 Dumping Protocol to the Barcelona Convention, on 30 December 1977. This Convention entered into force on 12 February 1978.

Malta accepted the Amendment to the Protocol for the Prevention of Pollution of the Mediterranean Sea by Dumping from Ships and Aircraft to the Convention for the Protection of the Marine Environment and the Coastal Region of the Mediterranean, commonly referred to as the 1995 Dumping Protocol to the Barcelona Convention, on 28 October 1999. To date, the 1995 Dumping Protocol to the Barcelona Convention has not yet entered into force.

Water Policy Framework Regulations

Directive 2000/60/EC – the Water Framework Directive, hereinafter referred to as the WFD, was transposed to Maltese law as Subsidiary Legislation 549.100 - the Water Policy Framework Regulations. These Regulations promote sustainable water use based on long-term protection of available water resources and aim at enhanced protection and improvement of the aquatic environment. They also aim to lead to a progressive reduction of pollution of all Maltese waters, including coastal waters and to ensure that there is no deterioration in ecological and chemical status:

- Ecological status, to be achieved up to 1 nautical mile, is defined by means of biological parameters and supporting physico-chemical and hydromorphological parameters
- Chemical status, to be achieved up to 12 nautical miles, is defined in terms of meeting environmental quality standards of all the substances included under the Environmental Quality Standards Directive 2013/39/EU, which has been transposed into national legislation as Subsidiary Legislation 549.100.

Malta designated 9 coastal water bodies under the first water catchment management plan cycle, for which good ecological and chemical status needs to be achieved in line with WFD requirements. Decision-making processes must thus be geared towards preventing deterioration in the status of coastal water bodies as a result of the disposal of dredged material at sea.

Disposal at sea in Malta is only permitted within the official spoil ground located 4km (approx. 2 nautical miles) off the Grand Harbour area. In line with WFD objectives, dumped material should not compromise the achievement of good chemical status in coastal waters. Malta's second Water

Catchment Management Plan⁴ pursuant to the WFD identifies the need for a study to enhance knowledge on the physical and chemical sediment attributes and marine benthic diversity at the National marine spoil ground and its surroundings⁵. This will ensure that future policy related to dumping of waste at sea is carried out on the basis of scientific knowledge.

The plan also includes a measure to publish terms of reference for the disposal of dredged material to be made accessible to industrial operators⁶. This protocol will be addressing the implementation of this measure.

Marine Policy Framework Regulations

Directive 2008/56/EC - the Marine Strategy Framework Directive, hereinafter referred to as 'MSFD', was transposed to Maltese law as Subsidiary Legislation 549.62 - the Marine Policy Framework Regulations. These Regulations call for the achievement of Good Environmental Status (hereinafter referred to as 'GES') in Maltese marine waters by 2020 through the development of marine strategies. The marine strategies shall be coherent across the marine region or sub-region and shall apply an ecosystem-based approach to the management of human activities with a view to ensure the sustainable use of marine goods and services by present and future generations.

Good Environmental Status is defined by eleven descriptors listed in Annex I of the Directive, covering both biological elements and sustained pressures of the marine environment. Through such descriptors, the MSFD integrates a wide range of international and EU commitments related to environmental protection in the marine environment including those related to waste disposal and pollution effects.

MSFD GES descriptors related to contamination of the marine environment are closely linked to the WFD requirements in terms of chemical status in coastal waters. The implementation of the MSFD however applies to all marine waters under jurisdictional rights, hence the need for management and disposal of dredged material to consider environmental impacts other than contamination. MSFD GES descriptors deemed relevant in terms of the assessment of impacts of the disposal of dredged material include:

- Descriptor 1: Biological Diversity is maintained. The quality and occurrence of habitats and the distribution and abundance of species are in line with prevailing physiographic, geographic and climatic conditions;
- Descriptor 6: Seafloor integrity is at a level that ensures that the structure and functions of the ecosystems are safeguarded and benthic ecosystems, in particular, are not adversely affected;
- Descriptor 7: Permanent alteration of hydrographical conditions does not adversely affect marine ecosystems;
- Descriptor 8: Concentrations of contaminants are at levels not giving rise to pollution effects;

⁴ Malta's second Water Catchment Management Plan; https://era.org.mt/en/Documents/2nd_Water_Catchment_Management_Plan-Malta_Water_in_Maltese_Islands.pdf

⁵ Measure KNO 1 - Study the impacts of the national spoil ground off Xghajra.

⁶ Measure SWM 5- Publish guidelines for the disposal of dredged material.

- Descriptor 10: Properties and quantities of marine litter do not cause harm to the coastal and marine environment.

Decision-making processes related to management and disposal of dredged material should thus consider the need to achieve GES in the marine environment. This should be performed in line with relevant GES descriptors, associated criteria, indicators, and the environmental targets as established by Malta throughout the MSFD implementation cycles.

3. Regulatory Process

All dredging requires development permission from the Planning Authority (PA) , in view of the fact that dredging is considered to be '*development*', which is defined in Cap 552 - the Development Planning Act, 2016, as "*the carrying out of building, engineering, quarrying, mining or other operations for the construction, demolition or alterations in, on, over, or under any land or the sea, the placing of advertisements, or the making of any material change in use of land or building and sea...*"

The disposal of the dredged material is subject to regulatory control, pursuant to waste management legislation.

A distinction can be made between **capital dredging**, which is usually carried out to create a new harbour, berth or waterway, or to deepen existing facilities in order to allow larger ships access, and **maintenance dredging**, which is carried out to maintain navigable waterways that have become silted, possibly making them too shallow for navigation. Any activity that involves material extraction from the seabed, including but not limited to coring or piling is also considered a form of maintenance dredging.

In addition to the two main dredging categories, the UNEP(DEPI)/MED - Updated guidelines on Management of Dredged Materials also include other dredging operations as follows:

- a) **Dredging to support coastal protection or management**⁷: includes the shifting of marine sediments for activities such as beach nourishment and construction of levees, dykes, jetties, etc.;
- b) **Environmental dredging**: includes the removal of contaminated sediment for the purpose of reducing risks to human health and the environment;
- c) **Restoration dredging**: to restore or create environmental features or habitats in order to establish ecosystem functions, benefits, and services, e.g. island habitat construction and nourishment and construction of offshore reefs, etc.; and
- d) **Dredging to support local and regional sediment processes**: includes engineering to reduce sedimentation, retaining sediment within the natural sediment system to support sediment-based habitats, shorelines and infrastructure⁸.

It should be noted that capital dredging may be subject to the environmental impact assessment procedure, depending on the location and/or scale of the dredging to be carried out. The EIA procedure has the aim of informing the decision making process by assessing the impacts of the

⁷ In cases where shifting of marine sediments (with no intention of disposal of dredged material at sea) is carried out, the full application of these terms of reference may not be necessary. However, ERA may apply other procedures in relation to water quality as deemed necessary

⁸ UNEP(DEPI)/MED - Updated Guidelines on Management of Dredged Materials - Decision IG.23/12

proposed development on the environment. In such cases, sampling of sediments, assessment of impacts and mitigation measures is likely to be carried out within the EIA framework.

If dredging is to be carried out in a site designated as a site of EU importance (i.e. Natura 2000 sites), the proposal would be subject to the Appropriate Assessment Process, which aims to assess the significance of the impacts of a proposed plan or project (either individually or in combination with other proposals) on said site.

Any dredging application needs to give due consideration to proper management and disposal of dredged material. The process involves assessment of the dredged materials, and proper management of the resultant waste. To date, permits for dredging and dumping are issued with conditions which include obligations of recordkeeping and reporting. The procedure on how one shall obtain a Consignment Permit and Consignment Note for the transfer of dredged material for the purposes of relocation within surface waters, disposal at sea or disposal in a local non-hazardous landfill may be found on the Environment and Resources Authority's website pursuant to the provisions of S.L. 549.63 - the Waste Regulations^{9/10}.

Any form of the **Waste Consignment Permit Application** and **Pre-notification Copy** shall be collected from and eventually sent to the following address:

Environment and Resources Authority
Hexagon House
Spencer Hill
Marsa MRS 1441.

4. Standards and Criteria

The decision-making process must ensure that the disposal of dredged material:

- is in line with the requirements of the London and Barcelona Conventions;
- enables achievement of good chemical status (or other established less stringent objectives) and does not result in deterioration in the status of coastal waters in line with the requirements of the EU Water Framework Directive;
- does not hinder the achievement of Good Environmental Status as required by the EU Marine Strategy Framework Directive.

This section outlines the assessment processes (Part A) and criteria (Part B) to inform and enable these decision-making processes.

Part A - Assessment of Dredged Material

When dredging works are envisaged, the applicant or a third party acting on their behalf shall communicate to ERA a short site history, identifying the past and current activities carried out in the vicinity, as well as information on the characteristics of the seabed where such activity is expected. Following such submission, ERA may exempt the applicant from carrying out the testing on the

⁹ <https://era.org.mt/en/Pages/waste-permits-cps.aspx>

¹⁰ <https://era.org.mt/en/Pages/Consignment%20Note%20Procedure.aspx>

dredged material, referred to in Sections 1 to 3 of Part A of these terms of reference, if the Authority is satisfied that at least one of the following criteria are met:

- (i) dredged material is composed of previously undisturbed inert geological material; and
- (ii) dredged material is composed almost exclusively of sand, gravel or rock; such materials are often found in areas of high wave currents¹¹

Should ERA determine that the activity is not exempt from testing requirements, a sampling plan outlining the requirements in accordance with Sections 1-2 of Part A of these terms of reference shall be submitted to ERA for approval. Furthermore, following assessment of the submitted information, ERA reserves the right to ask for a sampling plan and subsequent testing.

In cases where a dredging activity is the sole development activity for which a planning application has been submitted to the Planning Authority, the dredging sampling plan shall be communicated to ERA. Once approval of the sampling plan is communicated by ERA, the applicant may carry out sampling works and subsequent testing in line with the requirements laid down in Sections 2-3 of Part A. Results shall then be submitted to ERA, together with the fate of the dredged material in question. The results shall be validated by ERA and on that basis, guidance on the proposed fate of the dredged material shall be provided, prior to the issuance of a development permit by the Planning Authority. ERA may detract from the aforementioned procedure on a case-by-case basis taking into consideration the scale and nature of the project, as well as the location of the development.

In cases where dredging is one of the activities, *inter alia*, being carried out as part of the development, for which a development application has been submitted to the Planning Authority, the sampling plan shall be communicated and approved by ERA either:

- during the application process; or
- after the development permit has been issued by the Planning Authority.

In cases where the sampling plan is submitted after the issuance of a development permit, approval of said plan by ERA shall be sought prior to any sampling works, subsequent testing and the commencement of the actual dredging works. Any other non-dredging related works may still commence once a development permit has been issued by the Planning Authority.

1. Preliminary Assessment

Prior to the characterisation of dredged materials, the applicant or a third party acting on their behalf shall provide a sampling plan. This plan is to include a justification of the need for development and a characterisation of the area. The project is to be planned in an environmentally sound manner, in line with *Section 4 – Standards and Criteria* and should provide the following basic information:

- Technical reasons as to why the dredging activity is necessary;
- A brief history of the site;
- An identification of the uses of the land and sea in the area;
- The sources and type of pollution present in the development area;
- Estimates of any marine litter the dredged material may contain;
- Expected particle size distribution of the sediment being dredged;

¹¹ UNEP(DEPI)/MED - Updated Guidelines on Management of Dredged Materials - Decision IG.23/12

- A bathymetric map of the area in question;
- Whether the area is a designated site for conservation, is a habitat for protected species or falls within the Natura 2000 network; and
- Sampling and analytical requirements in accordance with Section 2 of Part A.

2. Sampling and Analytical Requirements

The decision-making process (performed prior to any dredging operation) of the development control procedure requires an assessment of the sediments to be dredged. The applicant shall carry out an *in situ* survey of the area, which is to be dredged. Sampling of sediments from the proposed dredging site should be representative of the vertical and horizontal distribution, as highlighted in Figure 1.

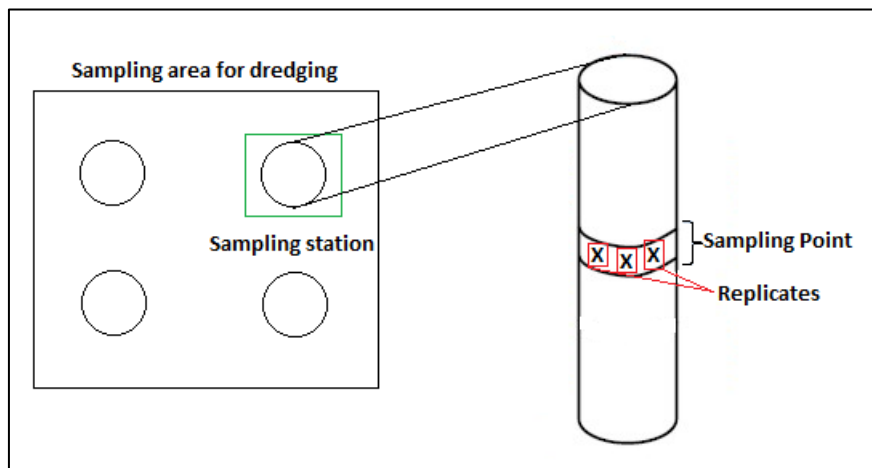


Figure 1: Delineation for Grid Sampling Area, Sampling Station, Sampling Point and Replicates

Due to the high variability in the physical, chemical and biological properties of sediments, an evaluation of sediment quality in a given area must be based on a sufficient number of samples. Positioning of sampling stations shall take into consideration the individual survey objectives, previous surveys in the area and local sediment type and hydrographic conditions. In this regard, Table 1 below provides a range of the number of sampling stations to be analysed in relation to the amount of material to be dredged. At least three (3) replicate samples are required to be taken from each sampling point and analysed separately to assess the extent of variation at the sampling point concerned. Where sampling of a sediment depth profile is recommended, at least three (3) replicate samples should be collected from three (3) different sampling points at different depths, including the superficial sediments, the deepest point and at the mid-point, depending in the depth of sample.

Table 1: Number of sampling stations to be analysed in relation to the amount of material to be dredged

Amount dredged (<i>d</i> in m ³)	Number of stations
$d \leq 5000\text{m}^3$	1-3
$5\ 000\text{m}^3 < d \leq 25\ 000\text{m}^3$	4-6
$25\ 000\text{m}^3 < d \leq 50\ 000\text{m}^3$	7-10
$50\ 000\text{m}^3 < d \leq 100\ 000\text{m}^3$	11-14
$100\ 000\text{m}^3 < d \leq 500\ 000\text{m}^3$	15-30
$500\ 000\text{m}^3 < d \leq 2\ 000\ 000\text{m}^3$	31-60
$d > 2\ 000\ 000\text{m}^3$	extra 10 per million m ³

The spatial extent of contamination may be mapped by placing sampling stations in several ways. Positioning of sampling stations should be carried out according to one of three main principles:

- Random: a pre-determined number of samples should be collected. Random sampling designs avoid bias in the results of sampling by randomly assigning and selecting sampling locations;
- Grid: in grid sampling the first sampling location is chosen randomly and all subsequent stations are placed at regular intervals (e.g. 20 m apart) throughout the study area; or
- Gradient: sampling stations should be arranged in sectors or along selected transects in relation to a contamination source.

The position of the sampling stations should be defined unambiguously. Positions should be defined using geographic co-ordinates with reference to the local geodetic system in use¹².

When applying the following sampling protocol, it shall be assumed that there is sufficient uniform sediment in the area to be dredged. ERA may require more samples to be collected, based on the site area and depths to be dredged. These are especially required in enclosed and semi-enclosed areas. The applicant, or his/her agent on the applicant's behalf, shall provide to ERA a description detailing the sampling rationale adopted in the proposed sampling plan.

Core samples should be taken in cases where the depth of dredging and expected vertical distribution of contaminants indicates that this is warranted. If this is not the case, grab samples will be sufficient. Sampling from the dumping vessel or barges is not allowed.

ERA reserves the right to request periodic testing of sediments where frequent dredging takes place especially where a specific dredging permit has been issued for a number of years by the Competent Authority.

¹² EN ISO 5667-19:2004 – Water Quality. Sampling. Guidance on Sampling in Marine Sediments.

The original samples should be retained until the permitting process has been completed. Further guidance on how sampling is to be carried out can be found in Annex II.

Chemical analysis is required for the substances listed in Table 2, which also includes Limit Values (DLVs) to be used to determine whether placement or disposal at sea can be considered.

Table 2: Chemical parameters and respective Limit Values

No. ¹³	Parameter ¹⁴	Level 1 Limit Values (mg/kg dry weight)	Level 2 Limit Values (mg/kg dry weight)
1	Arsenic	30	150
2	Cadmium	1	5
3	Copper	100	400
4	Mercury	0.6	3
5	Zinc	500	3000
6	Chromium	200	1000
7	Lead	120	600
8	Nickel	100	400
9	Polyaromatic Hydrocarbons (PAHs) ¹⁵	1	3
10	Tributyltin compounds (TBT) ¹⁶	0.06	
11	Polychlorinated Biphenyl (PCB – IUPAC numbers) ¹⁷	0.1	

ERA may revise the limit values included in Table 2 depending on emerging limits and studies for the parameters of concern. The list of contaminants to be assessed is also subject to changes on a case-by-case basis through the relevant permitting regimes.

In the case of capital dredging projects and taking into account the area to be dredged, ERA may exempt part of the dredged material (i.e. below the superficial layer) from testing requirements.

¹³ The parameter for Arsenic has been obtained from action levels established by Germany. All other limit values have been obtained from the action levels established by Spain.

¹⁴ CAS numbers for each parameter are provided in Annex II.

¹⁵ Sum of total of 6 PAH compounds: fluoranthene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(a)pyrene, benzo(ghi)perylene, indeno(1,2,3-cd)pyrene.

¹⁶ For parameters (10) and (11) only the level 2 dumping limit value are provided, since the limit 1 values for these substances cannot be detected by the available standard analytical methods on the market.

¹⁷ Sum of 7 PCB congeners: 28, 52, 101, 118, 138, 153 and 180.

3. Characterisation of dredged material

Sampling and characterisation of the dredged material is required to determine whether the said material is contaminated above a certain level. This in turn will influence the choice of dredging technology to be employed and the fate of the dredged material.

Prior to the issuing of any permit for dredging, the operator shall submit to ERA a study on the physical and chemical properties of the concerned material, as described hereunder. Annex I includes a flow chart depicting the typical approach for the determination of the physical and chemical properties of marine sediments.

A. Physical Characterisation

For all material to be dredged, the following information should be obtained:

- (i) Volume of dredged material
- (ii) Proposed method of dredging
- (iii) Determination of sediment characterisation by grain size analyses (Refer to Annex II)

B. Chemical Characterisation

In order for ERA to assess whether the material to be dredged can be disposed of in the marine environment and what effect it will potentially have on the marine environment, the following chemical analyses are to be carried out by the applicant or a third party acting on his behalf. The chemical characterisation will be the first step towards assessing the contamination level of the material.

The parameters to be analysed and the sampling procedures to be adopted during such sampling and analyses are indicated in the sections below and in Annex II.

If data from the same site had been previously collected, new measurements may not be required. This is subject to the following criteria being met:

- (i) The data is in line with the terms of reference stipulated in this document;
- (ii) The sampling and analyses has been carried out within the last 5 years, and
- (iii) There have been no new events of pollution due to which the quality of the material may have deteriorated.

Nonetheless, further sediment sampling may be required in areas where there is a tendency for sediments to show high levels of contamination (e.g. harbour areas) and in areas of sediment chemical heterogeneity. Such analyses will be required prior to the permit renewal procedure.

C. Determining the nature of waste

Following a compositional analysis on the dredged material, the applicant or a third party acting on their behalf is requested to determine the nature of the waste (i.e. whether it is of a hazardous or non-hazardous nature). A reasonable worst-case compound for each element identified from the compositional analysis, shall then be determined and for each of the said worst-case compound, the hazardous property and its related hazard statement shall be identified. The related hazard statements for the identified worst-case compounds shall be assessed and determined in line with the criteria laid down in Regulation (EC) No 1272/2008 (hereinafter referred to as the CLP Regulation). According to the CLP Regulation, a *hazard statement* means a code assigned to a hazard class and

category that describes the nature of the hazards of a hazardous substance or mixture, including, where appropriate, the degree of hazard.

In simple terms, each worst-case compound identified has a related hazard statement that can be obtained from the CLP regulation and the said hazard statement is in turn related to a hazardous property referred to in Schedule 3 of S.L. 549.63 - the Waste Regulations as per Table 3 below.

Table 3: Example of harmonised classification of hazardous substances pursuant to Regulation (EC) No 1272/2008.

Element	Worst-case compound	Hazard Class	Hazard Statement	Hazard Property
Arsenic	Diarsenic trioxide	Carc. 1A	H350	HP 7
		Acute Tox. 2 *	H300	HP 6
		Skin Corr. 1B	H314	HP 4
		Aquatic Acute 1	H400	HP 14
		Aquatic Chronic 1	H410	HP 14

Once the compositional analysis is carried out and the worst case compound, hazard statement and hazardous property of every parameter tested are identified, the applicant or a third party acting on his behalf shall determine the concentration of the compound of the respective element/parameter which constitutes a worst-case and then compare this determined concentration to the thresholds stipulated in Schedule 3 of S.L. 549.63 - the Waste Regulations. The waste would be classified as hazardous if it meets the conditions and/or exceeds the concentrations limits referred in Schedule 3 (as per definition provided above).

If chemical analysis results for a parameter under study:

- (i) Exceeds the concentration limits for all the identified hazard statements, the material is classified as hazardous;
- (ii) Does not exceed any concentration limits of the identified hazard statements, the material is classified as non-hazardous; and
- (iii) Exceeds the concentration limits for at least one of the identified hazard statement, the material is classified as hazardous for its related hazardous property.

The compositional analysis together with the HP criteria assessment shall then determine the management of the tested dredged material (Refer to Section 2 of Part B).

D. Other Assessments

i. Biological disturbance and Hydrographical Changes

Disposal of dredged material at sea can lead to impacts other than contamination by priority substances, for example effects on seabed habitats and hydrographical changes. This protocol acknowledges the need to address these impacts in relation to MSFD GES Descriptors 1, 6 and 7, and potentially Descriptor 2 on non-indigenous species.

ii. Marine Litter (MSFD Descriptor 10)

Apart from the accumulation of contaminants in sediments, harbour areas are also known to be associated with the presence of marine litter on the seabed. This could include both micro litter (<5mm) and macro litter, which would also end up in the dredged material.

Marine litter is defined as ‘any persistent, manufactured or processed solid material discarded, disposed of or abandoned in the marine and coastal environment’¹⁸. Based on this definition, ‘marine litter’ would consist of items made or used by people, such as plastics, wood, metals, glass, rubber, clothing and paper, deliberately discarded or unintentionally lost into the sea and on beaches.

The current data scenario with respect to marine litter in the Maltese Islands is limited. Therefore, guidance in relation to micro litter in dredged material requires further development.

On the other hand, the presence of macro litter in the dredged material would be more evident and all efforts should be made to eliminate litter in such material prior to relocation within surface waters and/or disposal at sea, should such relocation or disposal be considered based on the processes outlined above.

Within this context, the identification of marine litter items on the seabed targeted for dredging should be sought to the extent possible prior to the dredging activity. The number and type of litter items should be reported as litter items/m² or litter items/km². Litter categories included in the guidance on monitoring of marine litter in European Seas¹⁹ should be used for reporting litter items.

If technically possible, the macro litter should be removed before the dredging operations take place. Otherwise, the operator should outline methods to remove macro litter from the dredged material as part of the relevant permitting regime. Methodologies for removing such litter are outlined in “International Maritime Organisation, 2016; *Review of the current state of knowledge regarding Marine Litter in Wastes Dumped at Sea, under the London Convention and Protocol*, Office for the London Convention/Protocol and Ocean Affairs, London, UK. 35pp”²⁰.

4. Screening Assessment

Following the determination of the nature of waste in line with Sections 3(B) and 3(C) of Part A, if the waste in question is not classified as hazardous, then the disposal of the dredged material shall follow the 3-tier approach outlined in Table 4:

¹⁸ Galgani, F.; Fleet, D.; Van Franeker, J.; Katsanevakis, S.; Maes, T.; Mouat, J.; Oosterbaan, L.; Poitou, I.; Hanke, G.; Thompson, R.; Amato, E.; Birkun, A & Janssen, C. 2010. Marine Strategy Framework Directive Task Group 10 Report. Marine Litter. Zampoukas, N. EUR 24340 EN - 2010

¹⁹ Joint Research Centre 2013. Guidance on Monitoring of Marine Litter in European Seas - A guidance document within the Common Implementation Strategy for the Marine Strategy Framework Directive; MSFD Technical Subgroup on Marine Litter. ISBN 978-92-79-32709-4 (pdf); ISSN 1831-9424 (online)

²⁰ http://www.imo.org/en/OurWork/Environment/LCLP/newandemergingissues/Documents/Marine%20litter%20review%20for%20publication%20April%202016_final_ebook_version.pdf

Table 4: Screening assessment approach

Category	Concentrations²¹	Disposal option
I	Below Level 1	Disposal at sea may be permitted
II	Between Level 1 and Level 2	Further assessment shall be requested by ERA
III	Above Level 2	Disposal at sea is not considered, alternative disposal required

5. Submission of Results

Following the assessment of the dredged material in line with Part A of these terms of reference, the applicant or a third party acting on his behalf shall submit a report to ERA. This shall include:

- the results in line with Section 3 of Part A, above, including the original analysis certificates provided by the laboratory
- a concluding statement highlighting the nature of waste in line with Section 3(C) of Part A
- a detailed rationale highlighting the fate of the material selected in accordance with Section 4 - Part B – Management of Dredged Material.

6. Mitigation measures

Following the assessment carried out in Part A and the determination of the potential physical, chemical and biological impacts, the applicant is to provide a method statement, for approval, indicating the mitigation measures to be implemented on site in order to minimize, as much as possible, the adverse impacts resulting from the dredging operations.

The ERA reserves the right to request the applicant to engage, at the applicant's expense, an independent environmental monitor for monitoring of compliance with any permit in place and to ensure that works are carried out with the least possible impact on habitats, species and water quality

Part B - Management of Dredged Material

1. Shifting of material

Non-hazardous dredged material (excluding indigenous parent rock material) the), having all of its chemical constituents below Level 1 of the limit values specified in Table 2 above, may, on a case by case basis, be relocated inside surface waters for the purpose of managing waters and waterways. In this regard, the applicant is to notify ERA of the fate of such material when submitting the sampling plan in line with the requirements of Part A - Assessment of Dredged Material.

²¹ The concentrations shall refer to the assessment for each individual parameter. Therefore if the concentration for at least one parameter is greater than level 1, than the material is classified as category II or III, as applicable and depending on the concentration being assessed.

The transfer for the placement of dredged material within surface waters is subject to the Consignment Permit and Note Procedure.

2. Use of dredged material in construction projects

In line with the waste hierarchy laid down in the Waste Framework Directive, ERA encourages the use of dredged material within construction projects. This is applicable provided that the material is of a non-hazardous nature and contaminants present in the sediments are treated to ensure that no harm is done to human health and the environment.

Should applicants be interested in such activity, an Environmental Permit application shall be submitted to ERA together with the End-of-Waste Criteria declaration found in Schedule 10 of S.L. 549.63 – the Waste Regulations. The applicant shall ensure that the provisions of regulation 6 of the aforementioned regulations as well as any other criteria which the Authority sets out are met prior to achieving end-of waste status. One is to note that the necessary tests are to be carried out in order to ensure structural stability, prior to achieving an End-of-Waste status.

3. Storage of Waste prior to disposal

Dredged material stored on land at the site of generation for the purpose of subsequent transport to the chosen site of disposal, does not require a permit. However, if any hazardous dredged material pending disposal is stored offsite, the necessary permits for the collection, transfer and preliminary storage of the said material shall be obtained from ERA. The applicant is requested to notify ERA if storage on land, both on-site and off-site, is envisaged prior to disposal.

4. Methods of Disposal

The method of disposal of the dredged material is subject to the results obtained from the sampling and characterisation stage, i.e. the quantification and significance of contaminants present in the dredged material.

The disposal of contaminated material shall be considered on a case by case basis.

A. Open Sea Disposal

In Malta, disposal of waste at sea can only take place at the official spoil ground located 35°55.1'N, 14°34.0'E²² (outside the Grand Harbour). The transfer of dredged material, for its disposal at sea, regulated by ERA:

- (i) shall be covered by a Waste Consignment Permit and Note Procedure; and
- (ii) is subject to any fees as ERA requires pursuant to S.L. 549.07 – the Deposit of Wastes and Rubble (Fees) Regulations.

Disposal at sea of contaminated dredged material is only permitted after careful consideration of all the factors set forth in Annex III to the 1976 Protocol to the Barcelona Convention and the 1972 London Convention. The presence and levels of contaminants and marine litter in the dredged material may be such that open water disposal of the contaminated dredged material is not considered acceptable. In this context:

²² Schedule B II of Subsidiary Legislation 549.07 – the Deposit of Wastes and Rubble (Fees) Regulations

- (i) Dredged material that is classified as hazardous waste is prohibited from being disposed at sea;
- (ii) Dredged material that is not classified as hazardous but exceeds DLV 2 is prohibited from being dumped at sea; and
- (iii) Dredged material that is not classified as hazardous and does not exceed DLV 1 may be dumped at sea provided that macro litter is removed from the dredged material to the extent possible, prior to disposal at sea and then disposed of appropriately according to waste type.

In cases where disposal at sea is prohibited, treatment of the dredged material and alternative options for disposal must be sought.

B. Alternative Disposal Options

The other option currently available in Malta for disposal of contaminated dredged materials is landfilling, which is subject to specific legislation and regulatory frameworks. Alternatively, contaminated dredged material may be exported for recovery or disposal.

i. Landfilling

It should be noted that acceptability for landfilling at the non-hazardous landfill in Malta is subject to:

- (i) Classification of the material as non-hazardous. Non-hazardous wastes are wastes that do not exhibit one or more of the H codes set out in Schedule 3 of Subsidiary Legislation 549.63 - the Waste Regulations.
- (ii) Acceptability for disposal based on leachate testing carried out on the material, as stipulated in Subsidiary Legislation 549.29 - the Waste Management (Landfill) Regulations.
- (iii) Dewatering of the material prior to disposal.

The transfer of dredged material for the purposes of disposal on land in a local non-hazardous landfill is subject to the Waste Consignment Permit and Note Procedure. Additionally, the disposal of dredged material in local landfills is subject to the Waste Facilities' prior approval. Classification of the material as hazardous, or exceedance of the leachate parameters, would prohibit disposal in the landfill.

ii. Export

Any export of waste should be carried out pursuant to the requirements of Council Regulation (EC) No 1013/2006 of the European Parliament and of the Council of 14 June 2006 on shipments of waste. In terms of the European Commission Waste Shipments Regulation, transboundary movements of hazardous waste must follow the Written Notification Procedure pursuant to Article 4 of the said Regulations. These movements can only take place upon written notification by ERA, as the competent authority of dispatch, to the competent authorities of destination and transit (if applicable) through the use of this notification document.

Green list (non-hazardous) waste can be shipped under a lower level of control and accompanied by certain information laid down in Article 18 to the Waste Shipments Regulation.

Once all permits are in place, each shipment of hazardous waste destined for disposal or recovery must be accompanied by the movement/tracking document.

The detailed procedure governing trans-frontier shipment of waste is available on the ERA website²³.

iii. Other Treatment and Disposal Options

Any other proposal for treatment and subsequent disposal of the material would require specialised evaluation. Certain treatment and disposal options may require planning consent and / or the issue of an environmental permit.

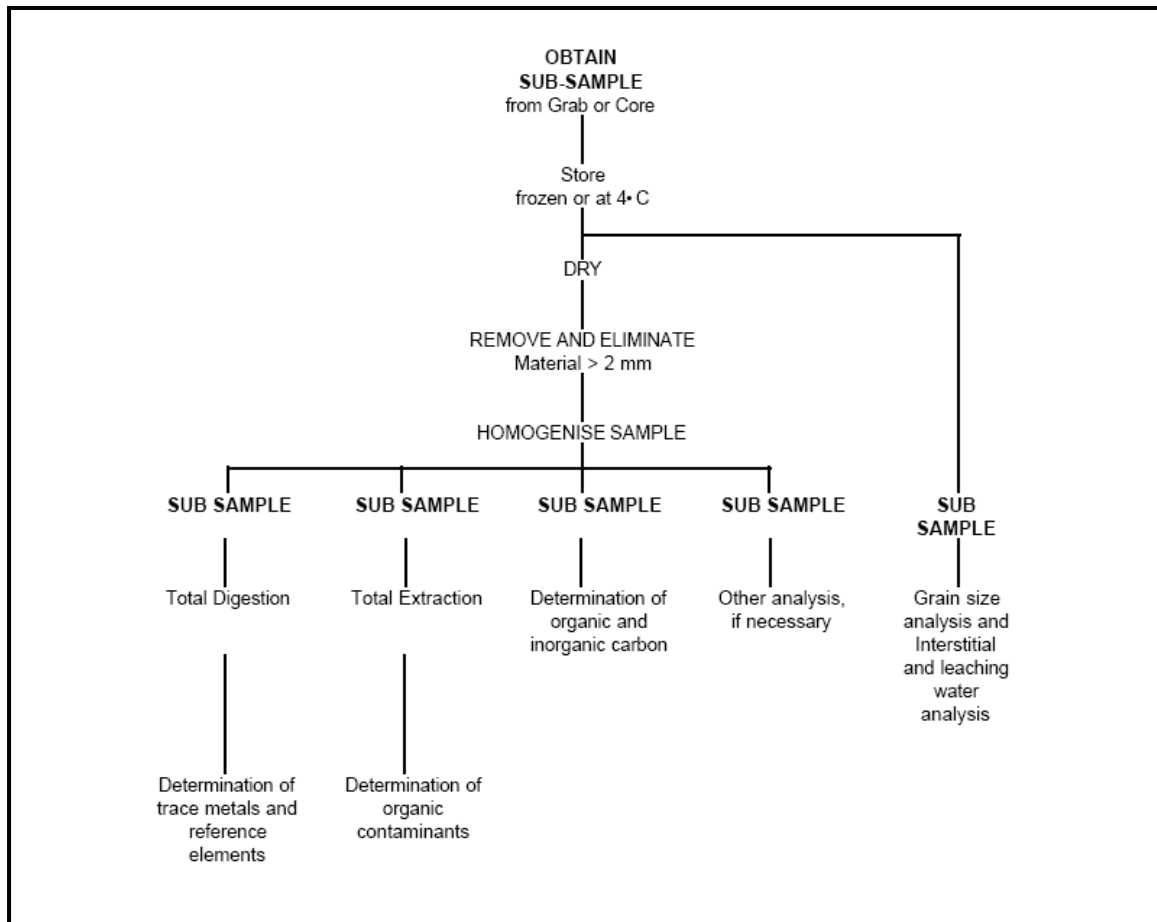
A method statement detailing the proposed treatment and disposal option would need to be submitted and reviewed through the development control process / environmental permitting process, as applicable. Such method statement should also include details of how the removal of marine litter from the dredged material shall be carried out.

Information on various treatment and disposal options for managing contaminated marine sediments is available in published literature. However, it should be noted that:

- The application of various options described in literature may be limited to specific contaminant groups and/or certain types of sediments. Hence, certain sediments may require the use of multiple technologies.
- A number of options described in literature may not be technically and economically feasible in the local context.

²³ <http://era.org.mt/en/Pages/WSR.aspx>

Annex I - Typical approach for the determination of physical and chemical parameters in marine sediments²⁴



²⁴ MAP Technical Reports Series No. 129

Annex II - Sediment Sampling, Grain Size Analyses and Chemical Analyses

This technical annex covers the physical and chemical analytical requirements necessary to implement Part A of these terms of reference (Assessment of Dredged Material).

Technical Aspects of Sediment Sampling

Of the ISO 5667 series of standards providing guidance on sampling techniques, the followings should be taken into account for sediment sampling (EC, 2010²⁵):

- Design of sampling programmes [ISO Standard 5667-1:2006²⁶];
- Preservation and handling of samples [ISO Standard 5667-3:2003²⁷];
- Sampling of marine sediments [ISO Standard 5667-19:2004²⁸].

Notwithstanding the importance of the general principle presented in the standards, which should be known by the staff carrying out the sampling, the exact procedure/equipment will always be dependent on the conditions at the actual sampling site. It is good practice to complete a sampling report, which includes a general description of collected samples including colour, homogeneity (presence or absence of stratification), presence or absence of animals (indication of bio-turbation), surface structures, odour and any visible contamination (e.g. oil sheen).

Furthermore, contamination during sampling, sample pre-treatment (sieving, homogenising, freeze drying) and storage of samples has to be avoided. Other sources of contaminant degradation (oxidation, photodegradation) should be minimised.

Grain Size Analyses

Sediments consist of a large range of particles, ranging from the very fine clays (<2 mm) to coarse pebbles and stones of several mm in size. Their surface is often coated by organic matter, which acts as a binding site for many pollutants and other compounds. The smaller the particle, the larger the relative surface area, that means that the greater part of many hazardous substances is contained in the finer sediment fractions, which are also the primary food sources for biota.

The grain size is therefore one of the most important factors controlling the distribution of natural and anthropogenic components in the sediments. Granulometry, that is, the determination of the different grain sizes within a sediment sample, provides the basis for meaningful comparisons of the occurrence of substances in sediments of various granulometry and texture within individual areas or among areas.

Granulometry is to be determined according to the method given in Buchanan (1984)²⁹ through the use of Endecott test-sieves agitated on a mechanical sieve shaker. The operator should present the

²⁵ European Commission, Environment 2010. Common Implementation Strategy for the Water Framework Directive (2000/60/EC). Guidance Document No: 25 Guidance on chemical monitoring of sediment and biota under the Water Framework Directive. Technical Report – 2010 – 041.

²⁶ ISO 2006. ISO Standard 5667-1:2006 Water quality -- Sampling -- Part 1: Guidance on the design of sampling programmes and sampling techniques. Geneva.

²⁷ ISO 2003. ISO Standard 5667-3:2003 Water quality -- Sampling -- Part 3: Guidance on the preservation and handling of water samples. Geneva.

²⁸ ISO 2004. ISO Standard 5667-19:2004 Water quality -- Sampling -- Part 19: Guidance on sampling of marine sediments. Geneva.

²⁹ Buchanan J.B. (1984). Sediment analyses. In: N.A. Holme & A.D. McIntyre [eds] *Methods for the study of marine benthos*; pp. 41-65. Oxford: Blackwell Scientific Publications.

different grain size fractions separated, the percentage contribution of each size fraction, the mean grain size and the sediment's overall classification calculated.

Technical Aspects of Chemical Analyses

Chemical analyses should be carried out on the fine fraction sample (<2mm) since this is the fraction in which contaminants tend to concentrate.

The sediment chemical analyses are to be carried out at a laboratory accredited to EN ISO/IEC 17025 or equivalent standard methods. The results are to fulfil the minimum analytical performance criteria in Article 4 of Directive 2009/90/EC, as transposed in Subsidiary Legislation 549.100 – the Water Policy Framework Regulations.

With the project proposal, the consultant is requested to indicate for each parameter, the proposed limits of detection. For all parameters, the limits of detection for the sediment analyses should meet 0.1mg/kg or lower. The limit of detection should always be lower than the limit values stipulated in Table 2 above. The results are to be presented as concentrations on dry sediment weight basis. The concentration levels of the chemical parameters recorded for the individual replicate samples are to be reported to ERA, in addition to the presentation of mean concentrations and standard deviation. For each individual replicate analysed samples, the laboratory certificated showing U = analytical uncertainty, K – coverage factor and R = recovery, are also to be reported to ERA. In selecting the appropriate analytical methods, the consultant shall clearly indicate where the required criteria cannot be achieved and propose feasible alternatives with justifications.

Chemical analyses in sediments are to be carried out in replicate sediment samples for the parameters indicated in the table 5 below:

Table 5: Parameters for chemical analyses in sediments

Parameter	CAS number
Load of Organic Matter (as Total Organic Carbon)	-
Arsenic (As)	7440-38-2
Cadmium (Cd)	7440-43-9
Copper (Cu)	7440-50-8
Mercury (Hg)	7439-97-6
Zinc (Zn)	7440-66-6
Chromium (Cr)	7440-47-3
Lead (Pb)	7439-92-1
Nickel (Ni)	7440-02-0
Polyaromatic Hydrocarbons (PAHs):	

Benzo(a)pyrene	50-32-8
Benzo(b)fluor-anthene	205-99-2
Benzo(k)fluor-anthene	207-08-9
Benzo(g,h,i)-perylene	191-24-2
Indeno(1,2,3-cd)-pyrene	193-39-5
Fluoranthene	206-44-0
Tributyl tin compounds (TBT)	36643-28-4
Polychlorinated Biphenyl (PCB – IUPAC numbers ³⁰)	-

³⁰ Sum of 7 PCB congeners: 28, 52, 101, 118, 138, 153 and 180.

References

Ospar Commission, Ospam Guidelines for the Management of Dredged Material (Reference number: 2004-08).

Ospar Commission (2008), Overview of Contracting Parties' National Action Levels for Dredged Material (2008 Update)

United Nations Environment Programme Mediterranean Action Plan (2017) Decision IG.23/12 Updated Guidelines on Management of Dredged Materials.