

AUGUST 2001

## ENCLOSURE 4

### SCOPE OF WORK Sediment Testing Guidelines for Dredged Material Proposed for Disposal In Federal Project Disposal Areas by Applicants

#### 1. INTRODUCTION

The purpose of this work is to provide a chemical inventory of dredged material proposed to be placed in Federal Project disposal areas by applicants.

#### 2. OBJECTIVES OF THE WORK

The objective of this sampling and testing work are:

- ◆ Collect sediment samples which adequately characterize the project dredged materials.
- ◆ Analyze the dredged material samples chemically and physically in order to provide information to determine if the sediments are contaminated.
- ◆ Document the field sampling and results of physical and chemical analyses of sediments, and quality control measures.

#### 3.0 SAMPLING AND ANALYSIS PLANS AND PROCEDURES

**3.1 General Methodology.** The proposed experimental design to accomplish the objectives is presented in Table 1.

**3.2 Sample Locations.** Samples will be taken at representative locations. Sample locations where depths are already at or below project depth will not be selected. Thus, sample locations will be selected to ensure that representative maintenance or new work dredged materials are sampled.

**Collection of Dredged Material Samples.** Sample collections must be accomplished by qualified personnel. Composite samples are acceptable if they contribute to better representation of the material to be dredged. Debris will be discarded from the sample.

**Core Samples:** At each sample station, the water depth to the top of sediment will be determined. This may be done using a fathometer, lead line, or other depth-measuring device. Depths recorded must be corrected to mlw or applicable local datum either through the use of a tide gauge or tide table. Tide gauges are available on specific day markers in the project area. A core will then be retrieved and will be examined and measured. Sample material obtained from below the project dredging depth will be discarded. Sample sediments collected from between the top of sediment and limit of dredging will be described and retained. Multiple cores will be taken and composited until sufficient sample for all analyses is retrieved. The composited sample will be thoroughly mixed before material for individual analyses is taken.

**Table 1.** Experimental design for the evaluation of dredged materials.

**FIELD COLLECTIONS:** The number of samples and locations will vary from project to project. The goal of sampling will be to take samples that are representative of each major shoal location

**SAMPLE TYPE:** core or grab depending on type of dredging and shoal present

**PHYSICAL PARAMETERS:** Grain Size  
Total Solids  
Total Organic Carbon

**CHEMICAL PARAMETERS:** Total Petroleum Hydrocarbons  
Petroleum Hydrocarbons by MADEP  
Polynuclear Aromatic Hydrocarbons (PAHs)  
Pesticides  
Metals  
Other contaminants of concern on a case by case basis

**Grab Samples:** At each sample station, the water depth to the top of sediment will be determined as above. Grab samples will not be taken from areas already at or below project depth. A grab will then be retrieved and will be examined. Multiple grabs may be taken and composited until sufficient sample for all analyses is retrieved. The composited sample will be thoroughly mixed before material for individual analyses is taken.

**Both Grabs and Cores:** Effort will be made to sample "least contaminated" material first in order to minimize cross contamination of samples by sampling equipment. In this case that is believed to mean that sampling will sequentially move from the outer channel into the basin. Equipment must be cleaned (decontaminated) between sample locations to minimize cross contamination possibilities. Direct body contact with the samples will be avoided.

**3.4 Sediment Analyses.** The sediment samples will usually come from an estuarine environment; therefore, steps must be taken to control salt interferences. The sediment samples will be analyzed for the parameters listed in Table 2, which also specifies test methods and target detection limits. Table 3 provides the data quality objectives for the sediment chemical analyses. Table 4 indicates the holding time restrictions.

**3.5 Quality Assurance.** These sediment evaluations will be conducted in a manner consistent with quality assurance / quality control program guidelines described in the Ecological Evaluation of Dredged Material Proposed for Ocean Disposal (USEPA/USACE 1991) (the Green Book) and the Regional Implementation Manual, Requirements and Procedures for Evaluation of the Ocean Disposal of Dredged Material in Southeastern Atlantic and Gulf Coastal Waters (USEPA/USACE 1993) (the RIM). Work that does not meet data quality objectives may not be acceptable for the purposes of the Consent or License Agreements.

**3.6 Sample Custody and Field Lab Documentation.** All samples will be handled in a manner to preclude the contamination or loss of any of the sampled sediments. The samples shall be sealed in appropriate sample containers to minimize the loss of moisture and prevent possible contamination. The samples shall be kept cold, but not frozen until delivered to the laboratory.

## 4. DATA REPORTING

**4.1 Data Record.** The data record will consist of sample locations, chemical analytical results, and the results of quality control measurements. All data should be checked for accuracy before submission.

**4.2 Report Format.** The data obtained will be presented in graphical, tabular, and written text as appropriate. The report will undergo internal technical review and quality assurance review by persons with appropriate technical qualifications to ensure that the report meets the requirements specified in the technical work plan.

The report will consist of 8 1/2" by 11" pages with drawings folded, if necessary to this size. Three copies of the report shall be submitted to the Wilmington District. If the analyses and report are not in accordance with this scope of work, the Consent Agreement may be denied.

The following plus any other appropriate, supporting, information will be included as appendices to the report:

1. Sample number and lab identification number for each sample.
2. Results of sample analyses on a dry weight basis. Analytes that were not detected will be reported as less than the established (or achieved) detection limit
4. Surrogate recoveries
5. Results of method blanks
6. Results of replicate analyses, values obtained and calculated relative percent difference (RPD)
7. Results of analyses of standard reference materials (SRMs), certified values, values obtained, and percent difference (PD)
8. Results of matrix spike and matrix spike duplicates including expected and recovered spike, (PR), and comparisons between the matrix spike and matrix spike duplicate as relative percent difference (RPD).
9. Batch comparability of surrogate and/or matrix spike recoveries
10. A summary of all Quality Assurance indicators for each parameter analyzed indicating the overall integrity and usefulness of the data. A case narrative, including account of any problems or deviations that may have influenced analytical results or data quality should be included.

## **5. SCHEDULE OF WORK**

The laboratory services must be performed in accordance with method mandated holding times.

## **6. APPLICANT RESPONSIBILITIES**

(a). All equipment, materials, and transportation (including vessel for sample collection) required to accomplish the work described herein.

(b). All professional and technical services required to collect field samples, transport them to the laboratory, perform indicated chemical and physical analyses, perform data and quality control reviews, and prepare a report on the results.

(c). Accomplish work in a professional manner with appropriate quality control. Work deemed inadequate or nonconforming may be rejected by the Corps of Engineers for the purposes of a Consent Agreement.

**Table 2.** List of Analytes, methods, and target detection limits for sediment chemical analyses. Test method is EPA 1994, unless stated otherwise.

<u>Analyte</u>	<u>Test Method</u>	<u>Detection Limit (all are dry wt)</u>
<b>Physical parameters</b>		
Grain size	Plumb 1981	1.0%
Total solids	Plumb 1981	1.0% solids
Total Organic Carbon	9060	0.1%
<b>Metals</b>		
Antimony	6010 or 7000s	0.1 mg/kg
Arsenic	"	0.1 mg/kg
Beryllium	"	0.1 mg/kg
Cadmium	"	0.1 mg/kg
Chromium	"	0.1 mg/kg
Copper	"	0.1 mg/kg
Lead	"	0.1 mg/kg
Mercury	7471	0.05 mg/kg
Nickel	6010 or 7000s	0.3 mg/kg
Selenium	"	0.2 mg/kg
Silver	"	0.4 mg/kg
Thallium	"	0.2 mg/kg
Zinc	"	1.1 mg/kg

Note: ICP/MS is EPA Method 6010 / GFAA methods are EPA Method series 7000s

**Pesticides**

Aldrin	8080	10.0 ug/kg
?-BHC	8080	10.0 ug/kg
Chlordane	8080	10.0 ug/kg
4,4'-DDD	8080	10.0 ug/kg
4,4'-DDE	8080	10.0 ug/kg
4,4'-DDT	8080	10.0 ug/kg
Dieldrin	8080	10.0 ug/kg
Endosulfan & derivatives	8080	10.0 ug/kg
Endrin & derivatives	8080	10.0 ug/kg
Heptachlor & derivatives	8080	10.0 ug/kg
Methoxychlor	8080	20.0 ug/kg
Toxaphene	8080	30.0 ug/kg

**PAHs**

Acenaphthene	8270, 8310, 8100	30.0 ug/kg
Acenaphthylene	8270, 8310, 8100	30.0 ug/kg
Anthracene	8270, 8310, 8100	30.0 ug/kg
Benzo(a)anthracene	8270, 8310, 8100	30.0 ug/kg
Benzo(b)fluoranthene	8270, 8310, 8100	30.0 ug/kg
Benzo(a)pyrene	8270, 8310, 8100	30.0 ug/kg

**Table 2.** (contd). List of Analytes, methods, and target detection limits for sediment chemical analyses. Test method is EPA 1994, unless stated otherwise.

<b>Analyte</b>	<b>Test Methods</b>	<b>Detection Limit (all are dry wt)</b>
<b>PAHs</b>		
Benzo(g,h,i)perylene	8270, 8310, 8100	30.0 ug/kg
Chrysene	8270, 8310, 8100	30.0 ug/kg
Dibenzo(a,h)anthracene	8270, 8310, 8100	30.0 ug/kg
Fluoranthene	8270, 8310, 8100	30.0 ug/kg
Fluorene	8270, 8310, 8100	30.0 ug/kg
Indeno(1,2,3-cd)pyrene	8270, 8310, 8100	30.0 ug/kg
Napthalene	8270, 8310, 8100	30.0 ug/kg
Methylnapthalene	8270, 8310, 8100	30.0 ug/kg
Phenanthrene	8270, 8310, 8100	30.0 ug/kg
Pyrene	8270, 8310, 8100	30.0 ug/kg
<b>Analyte</b>		
<b>Methods</b>		
<b>Limit (dry wt)</b>		
Total Organic Carbon	9060	4000 mg/kg
Total Petroleum Hydrocarbon	9071	25 mg/kg
MADEP EPH/VPH	MADEP	method specific
(Volatile Organics VPH - Alkanes-Aromatics + Extractables EPH Alkane - Aromatics)		

**Table 3.** Data Quality Objectives for sediment chemical analyses. Method quality control measures specific to the analytical method should be followed.

<u>Parameter and Method</u>	<u>QC Measurement</u>	<u>Frequency</u>	<u>Acceptable Limits</u>
<b><u>Organics</u></b>			
	Method Blank	1 per 20 samples	< Method Detection Limit (MDL)
	Surrogate Internal Standards	Each sample	40%-120% (Percent Recovery)
	Matrix Spike(MS)/MS Duplicate	1 per 10 samples	40%-120% (Percent Recovery) ?30% Relative Percent Difference (RPD) between MS/MSD)
	Std Reference Material (SRMs) (if available)	1 per 20	?30% Percent Difference from Cert Value
<b><u>Metals</u></b>			
	Method Blank	1 per 20 samples	< 3X Detection Limit (DL)
	Matrix Spike	1 per 10 samples	75-125% Percent Recovery
	Laboratory Triplicates	1 per 10 samples	?20% RSD
	SRMs	1 per 20 samples	?30% Difference (PD) from cert. value
<b><u>Other Parameters</u></b>			
Grain Size	Lab Triplicate	1 per 10 samples	?20% RSD
TOC	Lab Triplicate	1 per 10 samples	?10% RSD
Total Solids	Lab Triplicate	1 per 10 samples	?20% RSD

**Table 4.** Specified sample holdings times for sediments for sediment chemical analyses. Holding times begin the day of sampling. Samples for chemical analyses shall be stored at 4°C until submittal to the laboratory.

<u>Analysis</u>	<u>Holding Time</u>
Metals (except mercury)	6 months
Mercury	30 days
Organics	14 days to extraction - 40 days after extraction
TOC	6 months
Grain Size /Specific Gravity/Total Solids	not determined

## 8. REFERENCES

Plumb, R.H., Jr. 1981. Procedures for handling and chemical analysis of sediment and water samples, Technical Report EPA/CE-81-1, U.S. Environmental Protection Agency/Corps of Engineers Technical Committee on Criteria for Dredged and Fill Material. U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS.

U.S. Environmental Protection Agency. 1994. SW-846 test methods for evaluating solid waste. U.S. EPA, Office of Solid Waste and Emergency Response, Washington D.C. (or latest revision)