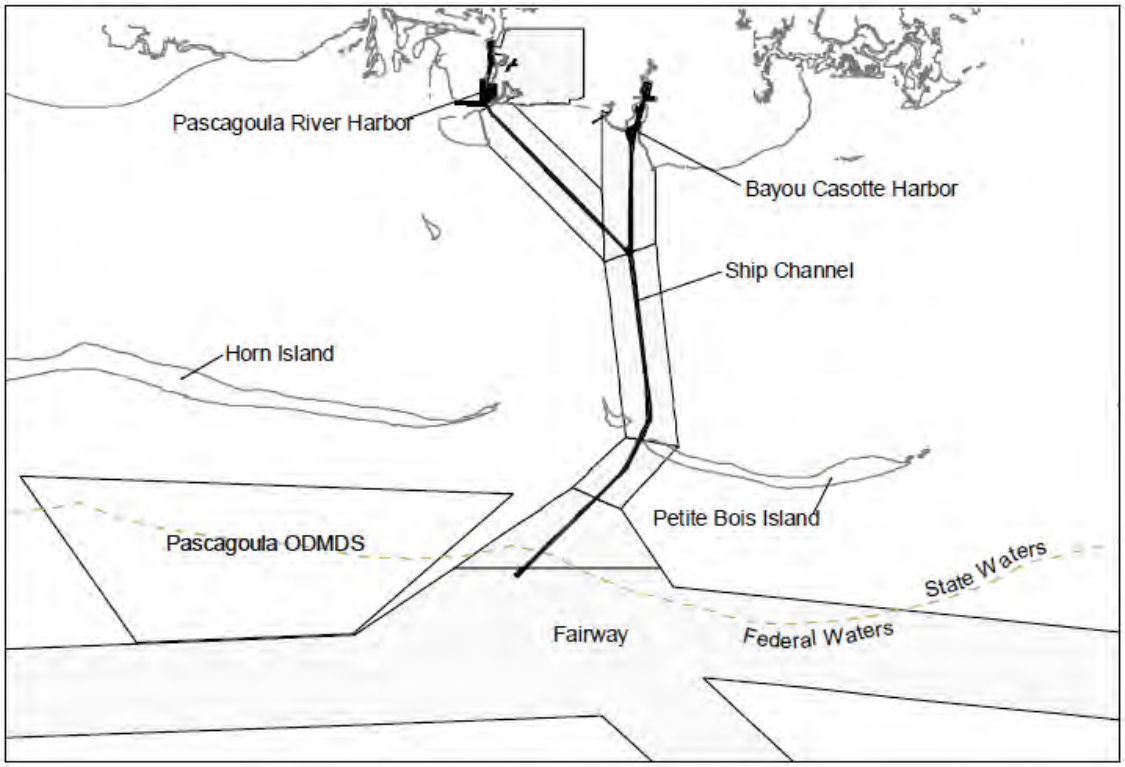
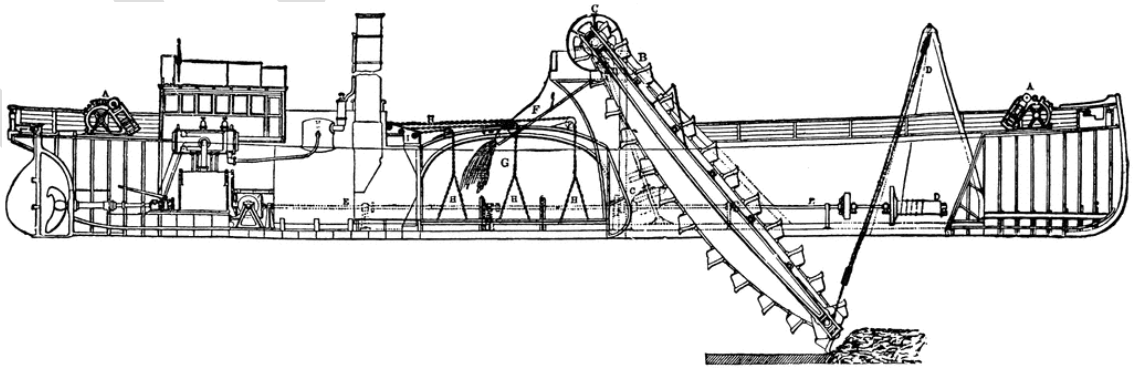
May 2016

Pascagoula
OCEAN DREDGED MATERIAL DISPOSAL SITE

U.S. Army Corps of Engineers

SITE MANAGEMENT AND MONITORING PLAN





The following Site Management and Monitoring Plan (SMMP) for the Pascagoula Ocean Dredged Material Disposal Site (ODMDS) has been developed and agreed to pursuant to the Water Resources Development Act (WRDA) Amendments of 1992 to the Marine Protection, Research, and Sanctuaries Act (MPRSA) of 1972 for the management and monitoring of ocean disposal activities, as resources allow, by the U.S. Environmental Protection Agency (EPA) and the U.S. Army Corps of Engineers (USACE).

John J. Chytka Date	Heather McTeer Toney Date
Colonel, Corps of Engineers	Regional Administrator
District Commander	U.S. Environmental Protection Agency
P.O. Box 2288	Region 4
Mobile, Alabama	Atlanta, Georgia

This plan is effective from the date of signature for a period not to exceed 10 years. The plan shall be reviewed and revised more frequently if site use and conditions at the site indicate a need for revision.

PASCAGOULA OCEAN DREDGED MATERIAL DISPOSAL SITE

SITE MANAGEMENT AND MONITORING PLAN

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF APPENDICES

PASCAGOULA OCEAN DREDGED MATERIAL DISPOSAL SITE

SITE MANAGEMENT AND MONITORING PLAN

1.0 INTRODUCTION.

It is the responsibility of the EPA and USACE under the MPRSA of 1972 to manage and monitor ODMDSs designated by EPA pursuant to Section 102 of the MPRSA. The goal of this management is to ensure ocean dredged material disposal activities will not unreasonably degrade the marine environment or endanger human health or economic potential. As part of this responsibility, a SMMP was originally developed as part of the designation process and was published in July 1991 as part of the *Final Environmental Impact Statement for the Designation of an Ocean Dredged Material Disposal Site Located Offshore Pascagoula, Mississippi* (FEIS) to specifically address the disposal of dredged material into the Pascagoula ODMDS. This plan will include past monitoring results and will comply with provisions in WRDA of 1992 and a 2007 Memorandum of Understanding (MOU) between EPA, Region 4 and USACE, South Atlantic Division (SAD). Upon finalization of this SMMP, these provisions shall be requirements for all dredged material disposal activities at the Pascagoula ODMDS. **All Section 103 (MPRSA) ocean disposal permits and concurrences shall be conditioned as necessary to assure consistency with the SMMP.**

This SMMP has been prepared in accordance with the *Guidance Document for Development of Site Management Plans for Ocean Dredged Material Disposal Sites* (EPA & USACE, 1996). This document provides a framework for the development of SMMPs required by MPRSA and WRDA of 1992. The SMMP may be modified if it is determined that such changes are warranted as a result of information obtained during the monitoring process. The SMMP will be reviewed and revised as needed or every 10 years, whichever time period is shorter.

1.1 Site Management and Monitoring Plan Team. An interagency SMMP team has been established to assist EPA and the USACE in managing this SMMP. The team consists of the following agencies and their respective representatives:

USACE, Mobile District
Ms. Jennifer Jacobson
Ms. Caree Kovacevich

Port of Pascagoula
Mr. Randy Joplin

Mississippi Department of Environmental Quality
Ms. Florance Bass

EPA Region 4
Dr. Wade Lehmann

Mississippi Department of Marine Resources
Mr. Jan Boyd
Mr. Jamie Miller

Mississippi Secretary of State,
Land Division

National Oceanic and Atmospheric Administration
Fisheries
Mr. Roy Crabtree
Mr. David Bernhart

U.S. Coast Guard
District Commander
Eighth District

Other agencies, such as the National Marine Fisheries Service (NMFS) and the U.S. Fish and Wildlife Service (USFWS), will be asked to participate where appropriate. The SMMP team will assist EPA and the USACE in evaluating existing monitoring data, type of disposal (i.e., operations and maintenance (O&M) vs. new work), quality of material (i.e., sand vs. mud vs. silt/clay), location of disposal within the Pascagoula ODMDS, and quantity of material. The team will assist EPA and the USACE on deciding appropriate monitoring techniques, level of monitoring, significance of results, and potential management options.

Specific responsibilities of EPA and the USACE, Mobile District are:

EPA: EPA is responsible for designating and/or de-designating MPRSA Section 102 ODMDSs, for evaluating environmental effects from disposal of dredged material at these sites and for reviewing and concurring on dredged material suitability determinations.

USACE: The USACE is responsible for evaluating dredged material suitability, issuing MPRSA Section 103 permits, regulating site use, selecting MPRSA Section 103(b) ocean disposal sites if no suitable EPA designated site is available, and developing and implementing disposal monitoring programs. All of the above activities are handled by the Planning & Environmental Division of the Mobile District. The exception to this is Regulatory Division, Mobile District is responsible for: issuing MPRSA Section 103 permits, evaluating dredged material suitability and submitting Section 103 Evaluation Reports for Regulatory projects.

2.0 SITE MANAGEMENT.

Management of the ODMDS involves a broad range of activities including regulating schedule of use, quantity, and physical/chemical characteristics of dredged material placed at the site. It also involves establishing disposal controls, conditions and requirements to avoid and minimize potential impacts to the marine environment. Finally, ODMDS management involves monitoring site environs to verify unanticipated or significant adverse effects are not occurring from past or continued use of the site and that permit/concurrence conditions are met.

Section 228.3 of the Ocean Dumping Regulations (40 CFR §220 - 229) states "management of a site consists of regulating times, rates, and methods of disposal and quantities and types of materials disposed of; developing and maintaining effective ambient monitoring programs for the site; conducting disposal site evaluation studies; and recommending modifications in site use and/or designation". The plan may be modified if it is determined that such changes are warranted as a result of information obtained through the monitoring process. MPRSA, as amended by WRDA of 1992, provides SMMPs shall include but not be limited to:

- A baseline assessment of conditions at the site;
- A program for site monitoring;
- Special management conditions or practices to be implemented at each site

necessary for the protection of the environment;
- Consideration of the quantity and physical/chemical characteristics of dredged materials placed at the site;
- Consideration of anticipated site use over the long-term; and
- A schedule for review and revision of the plan.

2.1 <u>Disposal Site Characteristics</u>. The Pascagoula ODMDS is located within the area surrounded by Horn Island to the north, the Pascagoula Entrance channel to the east, the navigation safety fairway to the south, and a north-south line running through Dog Keys Pass to the west (**Figure 1**). The Pascagoula ODMDS encompasses an area of approximately 18.5 square nautical miles (nmi^2) ranging in depth from approximately -30 feet Mean Lower Low Water (MLLW) in the north to over -52 feet MLLW in the southern section. The center coordinates for the site are 30°10'09"N and 88°39'12"W. The corner coordinates of the Pascagoula ODMDS are North American Datum (NAD) 27:

Latitude 30°12’06” N	Longitude 88°44’30” W
Latitude 30°11’42” N	Longitude 88°33’24” W
Latitude 30°08’30” N	Longitude 88°37’00” W
Latitude 30°08’18” N	Longitude 88°41”54” W

State Plane 2301 Mississippi East

30.2016667°	-088.7416667°
30.1950000°	-088.5566667°
30.1416667°	-088.6166667°
30.1383333°	-088.6983333°

It is intended that the Pascagoula ODMDS will be utilized for maintenance and new work material from the Pascagoula Harbor Federal navigation project and possibly by private entities, such as the Jackson County Port Authority (JCPA), Port of Gulfport, Northrop Grumman (formerly known as Ingalls Shipbuilding), and Chevron Refinery.

Much of this use is projected to occur in the future and therefore the exact nature and quantity of material, timing of disposal, and type of equipment to be used are unknown. Physical and biological conditions at the Pascagoula ODMDS are described in the *Final Environmental Impact Statement for the Designation of an Ocean Dredged Material Disposal Site located Offshore Pascagoula, Mississippi* (EPA, 1991).

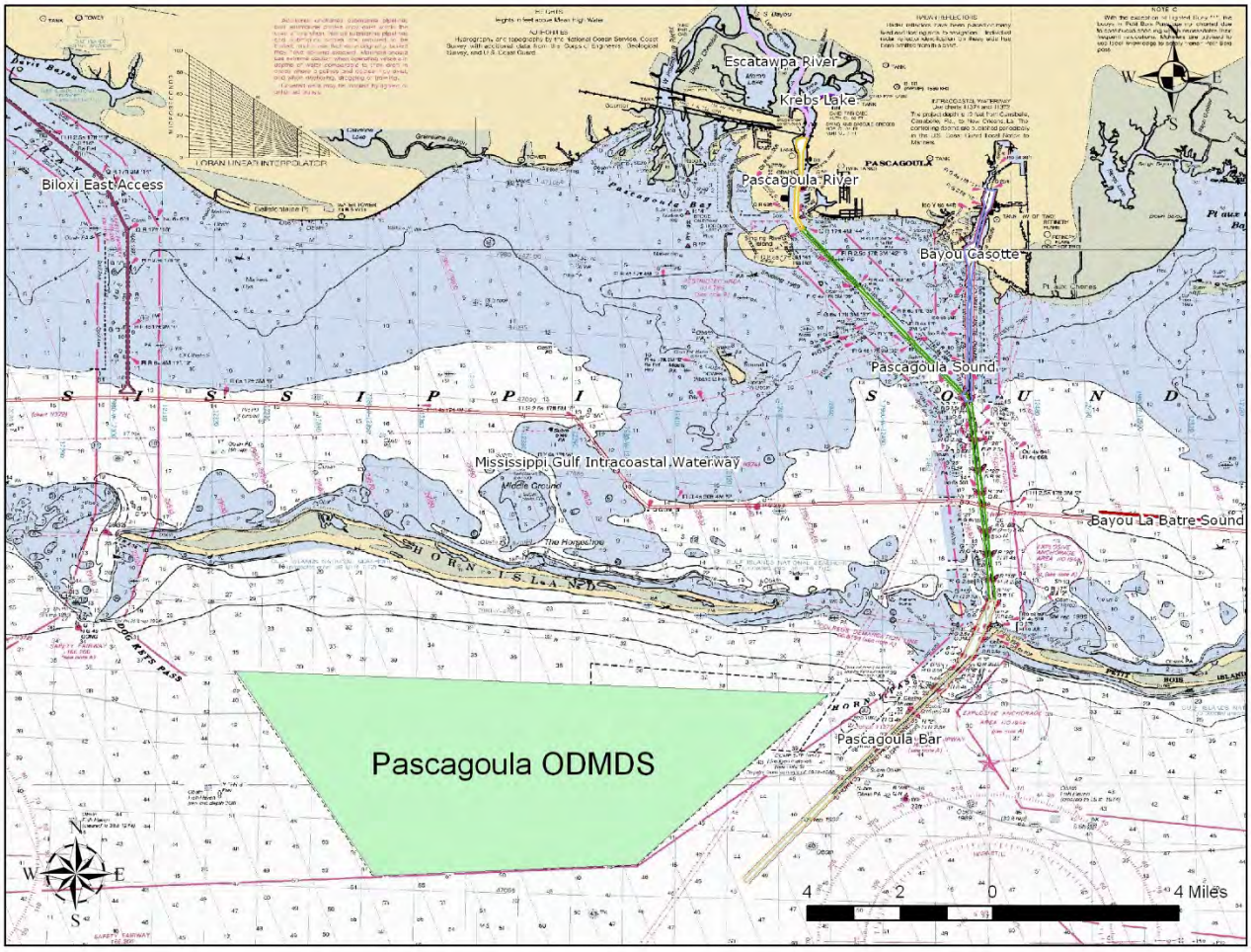


Figure 1: Pascagoula ODMDS Vicinity Map

2.2 <u>Management Objectives</u>. Appropriate management of an ODMDS is aimed at assuring disposal activities will not unreasonably degrade or endanger human health, welfare, the marine environment or economic potentialities (MPRSA §103(a)). There are three primary objectives in managing the Pascagoula ODMDS:

- Protection of the marine environment, living resources, and human health and welfare;
- Documentation of disposal activities at the Pascagoula ODMDS and provision of information which is useful in managing dredged material disposal activities; and
- Provide for beneficial use of dredged material whenever practical.

The objective of the SMMP is to provide guidelines in making management decisions necessary to fulfill mandated responsibilities to protect the marine environment

as discussed previously. Risk-free decision-making is an impossible goal; however, an appropriate SMMP can narrow the uncertainty. The following sections provide the framework for meeting these objectives.

2.3 Disposal History and Dredged Material Volumes. It is intended that the Pascagoula ODMDS will be used for disposal of dredged material (both maintenance and/or new work material) from the Pascagoula Harbor and vicinity. The primary user of the ODMDS will be the USACE for maintenance of the Pascagoula Harbor Federal navigation project. In 1985, the Port of Pascagoula Special Management Area (SMA) Plan was prepared to implement a strategy for management of the port. Included in this plan was a long-term plan for placement of dredged material from maintenance of the Federal project and JCPA facilities. In 1986, the plan was modified to include the need for ocean disposal of approximately 650,000 cubic yards (cys) of maintenance material from the federally-authorized navigation project every other year. The modification was made necessary due to construction of Naval Station Pascagoula at an area previously used for disposal of dredged material, which has since closed.

Also in 1985, the USACE completed studies on the improvement of the Federal Deep-Draft Navigation channel at Pascagoula. These studies recommended improvements, which would result in approximately 14 million cys of new work dredged material being transported to the Pascagoula ODMDS for placement. The WRDA 1986 authorized these improvements. In addition, the construction of the access channel and turning basin at Naval Station Pascagoula required the dredging of approximately 1 million cys of material with subsequent maintenance of approximately 250,000 cys every other year. Initially, this material was to be placed in the remaining disposal area on Singing River Island (SRI), the location of the station. However, due to the size and condition of this site, materials from the Navy channels were not placed at SRI but rather at the ODMDS. Since then, a semi-confined placement area for dredged material was completed in 2014 adjacent to SRI.

Due to the large size of this site (approximately 18.5 nmi^2) and the projected dredged material volumes (3-5 million cys) over the next 10 years, capacity is not a concern at this time. If volumes exceed projections by more than 25%, capacity will be considered. A small portion of the ODMDS has historically been utilized for placement of dredged material as shown in **Table 1** and **Figure 2**. Disposal history can also be found at the Ocean Disposal Database maintained by the Engineer Research and Development Center (ERDC) (http://el.erdc.usace.army.mil/odd/).

Table 1. Dredged material placement at the Pascagoula ODMDS

Year	Volume (cys)	Material Type	Project
2005	121,000	O&M: Mixture	Civil Works Channel (Pascagoula Bar)
2006	672,500	O&M: Mixture	Civil Works Channel (Pascagoula Bar)
2007	N/A		
2008	1,489,100	O&M: Mixture	Civil Works (Pascagoula Bar & Horn Island Pass)
2009	152,700	O&M: Mixture	Civil Works Channel (Pascagoula Bar)
2010	N/A		
2011	248,726	O&M: Mixture	Civil Works Channel (Horn Island Pass)
2012	N/A		
2013	1,216,428	O&M: Mixture	Civil Works Channel (Pascagoula Bar)
2014	875,067	NW and O&M: Mixture	Civil Works Channel (Pascagoula Bar)
2015	N/A		

(O&M = Operations & Maintenance; NW = New Work; cys = cubic yards)

Future volumes and rates of placement, predominantly from Federal interests, are expected to range approximately 530,000 cys per year. Short-term (5-year) projected placement volumes are shown in **Table 2**. Civil works maintenance projects for Pascagoula Harbor are anticipated to account for approximately 100% of the total volume of material to be placed at the ODMDS.

Table 2. Projected Volume of Dredged Material Disposed in the Pascagoula ODMDS (5-year estimates)

Year	Type of Action	Source	Volume(cys)	Sponsor	Composition
2016	NA	None anticipated	NA	NA	NA
2017	O&M	Civil Works Channel	530,000	JCPA	O&M: Mixture
2017*	O&M	Civil Works Channel	3,900,000*	Gulfport Harbor	O&M: Mixture
2018*	O&M	Civil Works Channel	3,900,000*	Gulfport Harbor	O&M: Mixture
2018	O&M	Civil Works Channel	530,000	JCPA	O&M: Mixture
2019	NA	None anticipated	NA	NA	NA
2020	O&M	Civil Works Channel	530,000	JCPA	O&M: Mixture

*Tentative action

The Pascagoula ODMDS is believed to be a dispersive site, particularly during active hurricane seasons. Storm events occurring in the vicinity of the Pascagoula ODMDS since 2004 are listed in **Table 3**. However, the dispersiveness of the site and consequently the capacity of the ODMDS have yet to be determined. Future monitoring may be incorporated to address this issue, should mounding or effects outside the disposal site boundaries be observed.

Table 3: Storm Activity in the Vicinity of the Pascagoula ODMDS

Storm	Year
Ivan[1]	2004
Arlene[2]	2005
Cindy[2]	2005
Dennis[1]	2005
Katrina[1]	2005
Tammy[2]	2005
Alberto[2]	2006
Fay[2]	2008
Gustav[1]	2008
Claudette[2]	2009
Ida[1]	2009
Bonnie[2]	2010
Isaac[1]	2012
Andrea[2]	2013

[1]Hurricane, [2]Tropical Storm

2.4 <u>Material Suitability</u>. Maintenance and new work dredged material is expected to be placed at the site. This material will consist of mixtures of silts, clays, and sands in varying percentages. Sediments dredged from navigation channels in the Pascagoula Harbor

include an ocean source (sandy, littoral materials), river source (fine-grained sands, silts, and clays derived from easily eroded soils from the upper Pascagoula River basin), and mixtures of both. Shoals occur where specific physical factors promote deposition or movement of sediments. These factors may vary spatially and temporally.

The USACE Beneficial Use of Dredged Material Engineer Manual (EM) 1110-2-5026 requires dredged material be maximized within the coastal system. The disposition of any significant quantities of beach compatible sand from future projects will be determined on a project-by-project basis. Utilization of any significant quantities of beach compatible dredged material for beach nourishment is strongly encouraged and supported by the USACE and EPA. In fact, the USACE manages dredged material under its Regional Sediment Management (RSM) initiative to be used beneficially and remain within the natural sediment budget. As part of this management tool, dredging and disposal operations are evaluated based upon the entirety of the coastal system rather than individually. Disposition of non-beach quality sand should be planned to allow the material to be placed so that it will be within or accessible to the sand-sharing system, to the maximum extent practical, and following the provisions of the Clean Water Act.

There is no general restriction regarding the type of material that may be placed at the site. However, the suitability of dredged material for ocean disposal must be verified by the USACE and agreed to (concurred) by EPA prior to disposal. Verification will be valid for three years from the time last verified. Verification will involve the following:

1) A case-specific evaluation against the exclusion criteria (40 CFR 227.13(b));
2) A determination of the necessity for testing including bioassay (toxicity and bioaccumulation) testing for non-excluded material based on the potential for contamination of the sediment since last tested; and
3) Carrying out the testing (where needed) and determining that the non-excluded, tested material is suitable for ocean disposal.

Verification documentation for suitability and EPA concurrence will be completed prior to use of the ODMDS. Documentation will be in the form of a MPRSA Section 103 Evaluation. Potential testing and evaluation will follow procedures outlined in the 1991 EPA/USACE Dredged Material Testing Manual (Green Book) and 2008 Southeast Regional Implementation Manual (SERIM) or appropriate updated versions. This includes how dredging projects will be subdivided into project segments for sampling and analysis. The MPRSA Section 103 Evaluation will be in the form outlined in Appendix C of the SERIM. Water Quality Compliance determinations will be made using the short-term fate of dredged material (STFATE-ADDAMS) model. Only material determined to be suitable and in compliance with Ocean Dumping Criteria (40 CFR §227) through the verification process by the USACE and EPA, Region 4 can be disposed in the ODMDS.

2.5 Timing of Disposal. Between April 1 and November 30 monitoring and precautions necessary to protect sea turtles and Gulf sturgeon, as described in *Section 2.6*, are required on hopper dredges. Additionally, if new information indicates that endangered or threatened species are being adversely impacted, additional restrictions may be imposed.

2.6 Disposal Techniques. To protect sea turtles and Gulf sturgeon, the NMFS requires monitoring according to guidance outlined in the *Final Regional Biological Opinion for Hopper Dredging of Channels and Sand Mining Areas in the Gulf of Mexico by Galveston, New Orleans, Mobile, and Jacksonville Districts* (NMFS, 2003, amended 2005 and 2007).

In addition, standard surveillance and evasive measures to protect sea turtles, Gulf sturgeon and marine mammals shall be employed during all placement operations at the ODMDS.

Due to the predominant current regime in the area, the site is considered to be dispersive, so that erosion and off-site dispersion is expected to occur. Based on the results of the sediment mapping study and current studies, it is desirable to predetermine the disposal methodologies and locations within the ODMDS for placement of dredged material, at least until sufficient monitoring information has been collected to provide assurance that dispersion does not result in adverse impacts. Since currents tend to be predominantly west-southwest or west-northwest in the proposed area, initial placement of fine-grained material will be made in the easternmost portions of the ODMDS, to the extent practicable, in order to ensure the material does not migrate offsite.

It also appears, based on geology of the area and analysis of the sediment mapping data, that finer-grained material is more predominant in the central and southernmost portions of the ODMDS. When possible, consideration should also be given to placement of finer grained-material in this area, with coarser material being placed in the northern portion of the ODMDS.

Benefits associated with the construction of a submerged berm, wave energy reduction and habitat creation, were investigated as part of the National Underwater Berm Demonstration Project at Mobile, Alabama. As a result, this type of disposal proved to be beneficial. Although no significant environmental resources have been identified in the vicinity of the Pascagoula ODMDS, this technique may prove beneficial if segregation of different types of material within the ODMDS is deemed appropriate by USACE.

2.7 <u>Disposal Location</u>. Disposal shall occur no less than 330 feet (100 meters) inside the site boundaries to comply with 40 CFR §227.28. Although mounding is desirable at the Pascagoula ODMDS, placement methods shall prevent mounding of dredged materials from becoming a navigation hazard. Dredged material shall be placed so that at no point will depths less than -25 feet MLLW occur (i.e., a clearance of 25 feet above the bottom will be maintained). To maximize ODMDS capacity and promote the desired mounding of material, the placement shall be in specified disposal zones and placed repeatedly at one location; however, at no point shall this mounding obstruct navigation. When necessary, the USACE in consultation with EPA Region 4 will specify zones (**Figure 2**) within the ODMDS for dredged material from each specific ocean disposal activity. Depths at the time of placement will be monitored to detect if adjustments of disposal methods are needed to prevent unacceptable mounding (navigation hazards). The physical removal or leveling of material above -25 feet MLLW is a management alternative should mounds greater than those elevations occur.

Additionally, while there are currently no active offshore oil and gas lease blocks within the Pascagoula ODMDS boundaries, there could be in the foreseeable future. In the event that a lease block is activated within the ODMDS boundaries, and exploration and/or extraction activities are initiated, all subsequent dredged material disposal zones will be specified so as to maintain a minimum 1,300-foot buffer from oil and gas rigs.

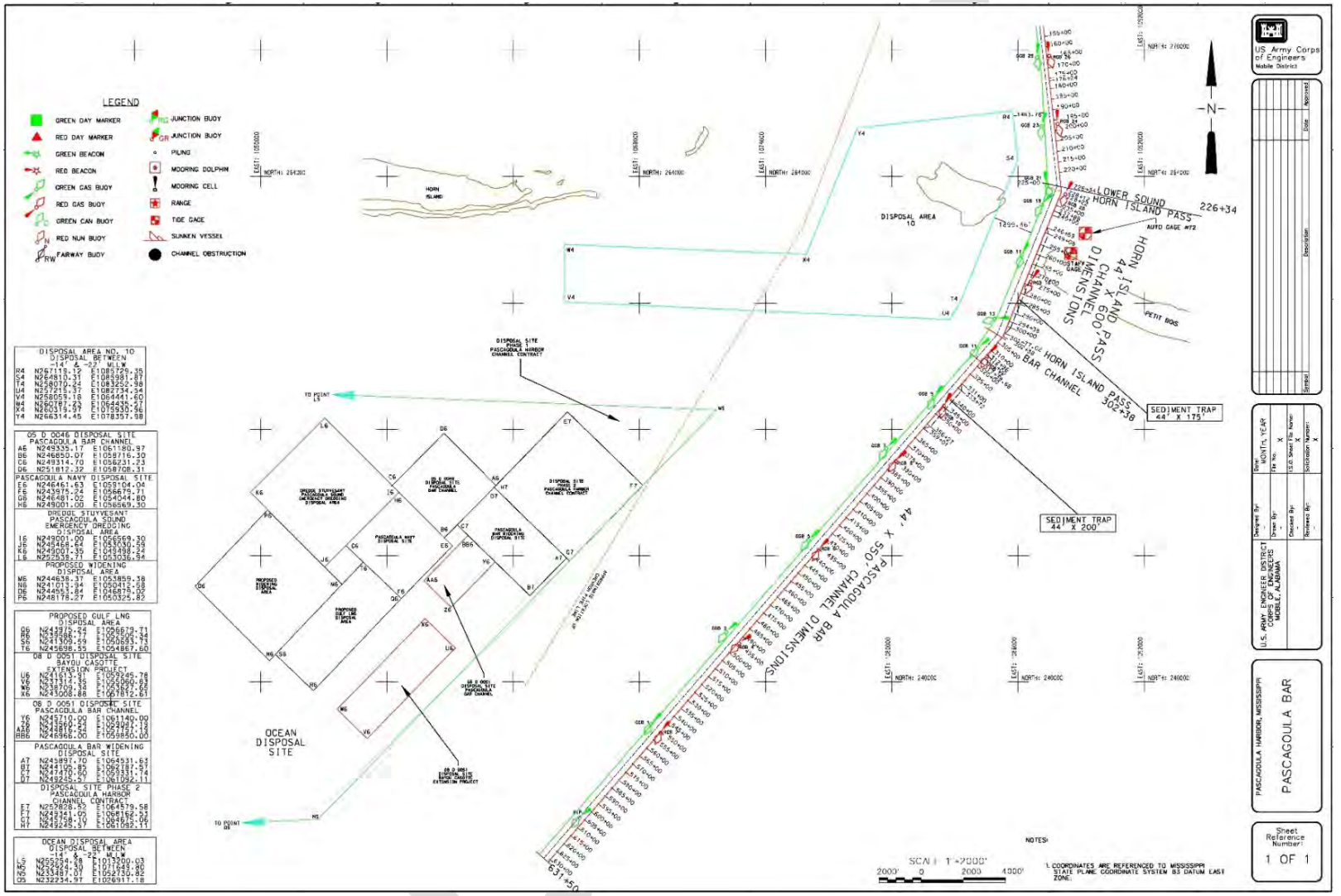


Figure 2: Map of Pascagoula ODMDS and utilized cells

2.8 Permit and Contract Conditions. The Pascagoula ODMDS is intended for use by a number of entities including the USACE, JCPA, Northrup Grumman, Chevron Refinery, etc. Each of these users will have different needs relative to quantity, type of material, timing, etc.; therefore partitioning of the site for specific users may be an appropriate management technique. This could facilitate monitoring and surveillance of individual disposal activities; however, it may not be the most appropriate management technique if beneficial results are desired as previously described.

Pre and post-disposal monitoring requirements described under *Section 3.0 Site Monitoring* will be included as permit conditions on all MPRSA Section 103 permits and will be incorporated in the contract language for all Federal projects. A summary of the management and monitoring requirements to be included are listed in **Table 3**. Appendix B contains a template for standard permit conditions for MPRSA 103 permits for the Pascagoula ODMDS and Appendix C contains a template for standard contract conditions for Civil Works project use of the ODMDS.

Table 3. Summary of Permit and Contract Conditions

Condition	Reference
Dredged Material Suitability and Term of Verification	Pascagoula ODMDS SMMP Section 2.4
Disposal within Appropriate Zones	Pascagoula ODMDS SMMP Section 2.7
Disposal Monitoring and Recording of Disposal Locations	Pascagoula ODMDS SMMP Section 3.2
Post Bathymetric Surveys within 30 days of Project Completion	Pascagoula ODMDS SMMP Section 3.3
Reporting Requirements: Daily & Monthly Operations Reports and Disposal Summary Reports within 90 Days of Project Completion	Pascagoula ODMDS SMMP Section 3.5

2.9 Permit Process. All ocean placement of dredged material, with exception of Federal Civil Works projects, requires an ocean dumping permit issued by the USACE pursuant to Section 103 of the MPRSA. A summary of the permitting process can be found in 33 CFR § 320-325.

2.10 Information Management of Dredged Material Placement Activities. As discussed in the following sections, a substantial amount of diverse data regarding use of the Pascagoula ODMDS and the effects of disposal is required from many sources (EPA, USACE, Navy, JCPA). If this information is readily available and in a useable format it can be used to answer many questions typically asked about a disposal site:

- What is being dredged?
- How much is being dredged?

- Where did the dredged material come from?
- Where was the dredged material placed?
- Was material dredged correctly? Placed correctly?
- What will happen to the environment at the disposal site?

As part of site management, EPA and the USACE will investigate alternatives for appropriate data management. The USACE has an Ocean Disposal Database maintained by ERDC. This database provides quantities placed at the Pascagoula ODMDS along with chemical, physical, and biological information, and whether the project is civil works or a privately permitted action.

The Mobile District Spatial Data Branch (CESAM-OP-J) has created an online Sediment Sampling Mapping Module that has capacity to organize and access all data relating to core borings and sediment testing activity. This application will allow users to retrieve detailed sediment sample properties (e.g. X, Y locations, harbor bottom elevations, top of rock elevation, or material characteristics) correlating with all relevant sediment testing (chemical, biological, or physical) results, and link related documents such as core borings, gradation curves or sediment testing reports.

In an attempt to streamline data sharing, EPA Region 4 and USACE, SAD has agreed on an eXtensible Markup Language (XML) standard for sharing of disposal monitoring data (see also *Section 3.5*).

3.0 <u>SITE MONITORING.</u> The MPRSA establishes the need for including a monitoring program as part of the SMMP. Site monitoring is conducted to ensure the environmental integrity of a disposal site and the surrounding areas are unharmed and to verify compliance with site designation criteria, any special management conditions, and with permit/concurrence requirements. Monitoring programs should be flexible, cost effective, and based on scientifically sound procedures and methods to meet site-specific monitoring needs. A monitoring program should have the ability to detect environmental change as a result of disposal activities and assist in determining compliance. The intent of the program is to provide the following:

(1) Information indicating whether the disposal activities are occurring in compliance with permit and site restrictions,

(2) Information concerning short-term and long-term environmental impacts of disposal; and/or

(3) Information indicating short-term and long-term fate of materials placed in the marine environment.

The main purpose of a disposal site monitoring program is to determine whether dredged material site management practices, including disposal operations need to be changed to avoid significant adverse impacts.

3.1 Baseline Monitoring. The Pascagoula ODMDS was designated in 1991. Biological, chemical, and physical studies of the Pascagoula ODMDS were conducted during the designation process. Results of investigations presented in the designation FEIS and

subsequent surveys listed in Table 4 will serve as the main body of data for the monitoring of impacts associated with the of the Pascagoula ODMDS.

Table 4. Surveys and Studies Conducted at the Pascagoula ODMDS

Survey/Study Title	Conducted By:	Date	Purpose	Results
Analysis & Synthesis of Oceanic Conditions in the Mississippi Sound Offshore Region	USACE	March 1984	Determine the direction and amount of sediment transport from a dredged material disposal site.	Circulation patterns within the site are controlled by astronomical tides, winds, and freshwater discharges.
Field Survey of the Pascagoula ODMDS (*Analysis & Synthesis of Oceanic Conditions in the Mississippi Sound Offshore Region*)	USACE	March 1984	Video, Bathymetry, Hydrography, Water Quality, Sediment Benthic Survey, Tissue Analysis	Baseline Survey
Sediment Mapping	UGA Center for Applied Isotopes for EPA	1987	Characterization of bottom sediments using continuous sediment sampling system	Baseline Survey
Pascagoula ODMDS Benthic Communities Study	USACE	July 1991	Benthic community characterization	Baseline analysis
Bathymetric Surveys	USACE		Monitor bathymetry changes	Database
Post Disposal Sediment Mapping at the Pascagoula ODMDS	EPA/UGA Center for Applied Isotope Studies	1999	GIMS/CS3 Chemical Evaluation	Database
Benthic Community Assessment	EPA	1999	Benthic community characterization	Database no significant changes observed
Sediment Quality Assessment for Lead	EPA	2001	Characterize Lead concentrations in ODMDS	Database, Lead concentrations below 30 mg/kg
Western Area Sediment Characterization	EPA	2003	Physical/Chemical Characterization of Sediments in Western half of ODMDS	Baseline Survey no anomalies observed
Status and Trends Assessment (40 CFR §228.13)	EPA	2006	To determine the physical, chemical, geological, and biological structure of the ODMDS	Benthic community is viable and healthy and in recovery with no adverse effects of disposal of dredged material.

Evaluation of Dredged Material from Pascagoula Harbor Post Deepwater Horizon Oil Spill	USACE	2010	Evaluate suitability of proposed dredged material for ocean disposal post oil spill.	Results of PAH and TPH testing of surface sediments showed no discernible evidence that sediment quality had been impacted by the Deepwater Horizon Oil spill.
Evaluation of Proposed Dredged Material from Pascagoula Bar Channel, Pascagoula, MS	USACE	2012	Evaluate suitability of proposed dredged material from Pascagoula Bar Channel for ocean disposal.	Results of the sediment testing would be expected to meet exclusionary criteria for placement at the ODMDS.
Bathymetric Survey	USACE	11/2014	Post-disposal surveys. O&M dredging of Pascagoula Harbor.	Material from O&M dredging of Pascagoula Harbor placed within ODMDS.

3.2 Disposal Monitoring. For all disposal activities, an electronic tracking system (ETS) must be utilized. The ETS will provide surveillance of the transportation and disposal of dredged material. The ETS will be maintained and operated to continuously track the horizontal location and draft condition (accuracy ± 0.1 foot) of the disposal vessel (i.e. hopper or scow) from the point of dredging to the disposal site and return to the point of dredging. Data shall be collected at least every 0.25 nautical mile or every 4 minutes during travel to and from the Pascagoula ODMDS and twelve seconds or every 30 feet of travel, while the hull status is open within the Pascagoula ODMDS. In addition to the continuous tracking data, the following trip information shall be electronically recorded for each dredging and disposal cycle:

a. Load Number
b. Disposal Vessel Name and Type (e.g. hopper, scow)
c. Estimated volume of Load
d. Description of Material Placed
e. Source of Dredged Material
f. Date, Time and Location at Initiation and Completion of Disposal Event

It is expected that disposal monitoring will be conducted utilizing the Dredging Quality Management (DQM) system for Civil Works projects [see http://dqm.usace.army.mil/ Specifications/Index. aspx], although other systems are acceptable. Disposal monitoring and ETS data will be reported to EPA Region 4 on a weekly basis (within 1 week of disposal) utilizing the XML specification and protocol per *Section 3.5*. EPA Region 4 and USACE, Mobile District shall be notified within 24 hours if disposal occurs outside of the Pascagoula ODMDS or specified disposal zone, or if excessive leakage occurs.

3.3 Post-Disposal Monitoring. The USACE or other site user will conduct a bathymetric survey within 30 days after disposal project completion. [Surveys will not be required for projects less than 50,000 cys]. Surveys will conform to the minimum performance

standards for Corps of Engineers Hydrographic Surveys as described in the USACE Engineering Manual, EM1110-2-1003, *Hydrographic Surveying*, dated November 30, 2013 [http://www.publications.usace.army.mil/Portals/76/Publications/EngineerManuals/EM_1110-2-1003.pdf] or updates. Surveys will be taken along lines spaced at 500-foot intervals or less. The minimum performance standards from Table 3-1 in *Hydrographic Surveying* shall be followed. Horizontal location of the survey lines and depth sounding points will be determined by an automated positioning system utilizing a differential global positioning system. The vertical datum will be referenced to prescribed MLLW datum. The horizontal datum should be referenced to the local State Plane Coordinate System (SPCS) for the Pascagoula area (zone 2301 Mississippi East) or in Geographical Coordinates (latitude-longitude). The horizontal reference datum should be the NAD 1983.

The number and length of transects required will be sufficient to encompass the Pascagoula ODMDS and a 500-foot wide area around the disposal zone. The survey area may be reduced on a case-by-case basis if disposal zones are specified and adhered to.

3.4 Material Tracking and Disposal Effects Monitoring. Surveys can be used to address possible changes in bathymetric, sedimentological, chemical, and biological aspects of the Pascagoula ODMDS and surrounding area as a result of placement of dredged material at the site.

3.4.1 Summary of Results of Past Monitoring Surveys. The *Final Environmental Impact Statement for the Designation of an Ocean Dredged Material Disposal Site located Offshore Pascagoula, Mississippi* and **Table 4** provide past surveys at the Pascagoula ODMDS. Results of investigations presented in the FEIS, and subsequent surveys will serve as the main body of baseline data for monitoring of impacts associated with the use of the Pascagoula ODMDS. This baseline data includes the following surveys: benthic macroinvertebrates, fisheries, water and sediment chemistry, sediment mapping, physical oceanographic conditions, and bathymetry. No adverse impacts to benthic infauna within the ODMDS or surrounding area have been observed.

Monitoring of the Pascagoula ODMDS was completed in April 2006 (USEPA, 2008). Results of this survey indicate the benthic community is viable and while some significant differences were found when comparing the actively-used part of the site to that which has never been used, there were no discernable differences when the area dumped on was compared to areas outside the ODMDS. A cursory review of the data indicates differences seen between the various zones, particularly patterns that emerge in the sediment metals data, are a result of the wide disparity between these zones in the percentage of the silt/clay fraction making up sediments found in each location. In March 2016, a Status & Trends Assessment is tentatively scheduled to be performed by the EPA.

3.4.2 Future Monitoring Surveys. Based on the type and volume of material placed and impacts of concern, various monitoring surveys can be used to examine if, and the direction, placed dredged material is moving, and what environmental effect the material is having on the site and adjacent areas.

Within 30 days of completion of a disposal event, detailed bathymetric surveys of the disposal area will be completed. The interagency team will meet, if necessary, to review the results of these efforts and determine the need for additional information. This need will be based on observance of any anomalies (i.e. potential cultural resources) or potential adverse impacts associated with a specific event. If the results of the bathymetric

surveys do not indicate any anomalies or adverse impacts, no additional monitoring will be required for the disposal event. Reassessment of the site will be undertaken in accordance with 40 CFR §228.13 approximately every 10 years. Status and trend assessments include characterization of water quality, benthic communities, and sediment size/chemistry allowing for identification and interpretation of changes in community structure. Additional surveys for water quality, sediment mapping, or the use of remote sensing equipment may also be required.

At the current time, no nearby biological resources have been identified that are of concern for potential impact. The Pascagoula ODMDS is at least one nautical mile from all known fish havens and artificial reefs. The site has been designated as a dispersive site. This means that it is expected that material will be moved outside the site boundaries. It is also expected that this material will not move in distinct mounds, but instead will blend with the surrounding environment causing a progressive transition to sediments containing a higher percentage of silt and clay. Changes in sediment composition will likely alter the benthic community structure. However, based on previous benthic studies, it is unlikely that permanent or long-term adverse impacts will result due to changes in sediment composition. Future surveys, as outlined in **Table 5,** will focus on determining the rate and direction of placed dredge material dispersal and the capacity of the ODMDS. Should future placement at the ODMDS result in unacceptable adverse impacts, further studies may be required to determine persistence of these impacts, extent of the impacts within the marine system, and/or possible means of mitigation. In addition, the management plan presented may require revision based on the outcome of any monitoring program.

Table 5: Pascagoula ODMDS Monitoring Strategies and Thresholds for Action

Goal	Technique	Sponsor	Rationale	Frequency	Threshold for Action	Management Options	
						Threshold Not Exceeded	Threshold Exceeded
Monitor Bathymetric Trends	Bathymetry	Site User	Determine the extent of the disposal mound and major bathymetric changes	Post disposal	Disposal mound occurs outside ODMDS boundaries	Continue Monitoring	-Modify disposal method/placement -Restrict disposal volumes -Enlarge site
Benthic Effects Monitoring	Sediment Mapping (Gamma/ CS^3)	EPA	Determine aerial influence of dredged material	Completed	Communities under the influence of dredged material outside the site have significant differences in diversity/ richness/biomass from those not under dredged material influence after one-year recovery period.	Discontinue monitoring unless disposal quantities, type of material or frequency of use significantly changes	-Limit quantity of dredged material to prevent impacts outside boundaries -Create berms to retard dredged material movement -Cease site use
	Benthic Survey	EPA	Determine impact of dredged material on benthic community	Completed			
Long-Term Fate	Modeling	EPA/ USACE	Determine dispersiveness of site and aerial extent of impact	As resources allow	Aerial extent of impact reaches resources of concern and/or increases over time.	Continue to use site without restrictions	-Restrict disposal volumes -Create berms to retard dredged material transport -Cease site use / Designate new site
	Current Meter & Wave Gauge	EPA/ USACE/ Site Users					
	Erosional Analysis	EPA					
	Precision Bathymetry and Sidescan	USACE/ EPA					
	Regional Grain Size Analysis	USACE /Site Users					
Site Capacity	Information from Long Term Fate	EPA/ USACE/ Site Users	Determine dispersiveness of site and long and short term capacity	-As resources allow -Prior to any project in excess of 3 million cubic yards	New work volumes exceed estimated capacity	Continue to use site without restrictions	-Enlarge site or designate additional site for new work
					Maintenance volumes exceed estimated capacity	Continue to use site without restrictions	-Enlarge site or designate additional site for new work
					New work volumes exceed estimated capacity	Continue to use site without restrictions	-Enlarge site or designate additional site for new work
Ensure Safe Navigation Depth	Bathymetry	Site User	Determine height of mound and any excessive mounding	Post disposal	Mound height > -40 feet mean lower low water (MLLW)	Continue Monitoring	-Modify disposal method/placement -Restrict disposal volumes
					Mound height > -25 feet MLLW	Continue Monitoring	- Physically level material

Table 5 (Continued). ODMDS Monitoring Strategies and Thresholds for Action

Goal	Technique	Sponsor	Rationale	Frequency	Threshold for Action	Management Options	
						Threshold Not Exceeded	Threshold Exceeded
Ensure Safe Navigation Depth	Bathymetry	Site User	Determine height of mound and any excessive mounding	Post disposal	Mound height > -40 feet mean lower low water (MLLW)	Continue Monitoring	-Modify disposal method/placement -Restrict disposal volumes
					Mound height > -25 feet MLLW	Continue Monitoring	- Physically level material
Compliance	Disposal Site Use Records	Site User	-Ensure management requirements are being met -To assist in site monitoring	Daily during the project	Disposal records required by SMMP are not submitted or are incomplete	Continue Monitoring	-Restrict site use until requirements are met
					Review of records indicates a dump occurred outside ODMDS boundary	Continue Monitoring	-Notify EPA Region 4/USACE, and investigate why egregious dump(s) occurred. Take appropriate enforcement action.
					Review of records indicates a dump occurred in the ODMDS but not in target area	Continue Monitoring	-Direct placement to occur as specified.

3.5 Reporting and Data Formatting. Disposal monitoring data shall be provided electronically by the USACE Project Manager to EPA Region 4. Disposal monitoring data shall be provided to EPA Region 4 electronically on a weekly basis (within one week of disposal event). Data shall be provided per the EPA Region 4 XML format and delivered as an attachment to an email to: DisposalData.R4@epa.gov. The XML format is available from EPA Region 4.

Disposal summary reports shall be provided to EPA, Region 4 within 90 days after project completion. These reports should include: vessel name, disposal start and end dates and times; dredging project; volume disposed, number of loads completed, type of material disposed; contractor conducting the work, permit and/or contract number; identification of any misplaced material; and dates of bathymetric surveys of the Pascagoula ODMDS. Disposal summary reports should be accompanied by the bathymetry survey results (contour plot and X, Y, Z ASCII data file). These reports can be accessed by USACE personnel at the DQM Website: http://dqm-portal.usace.army.mil.

The user will be required to prepare and submit to the USACE daily reports of operations and a monthly report of operations for each month or partial month's work. The user is also required to notify the USACE and the EPA within 24 hours (or next business day) if a violation of the permit and/or contract conditions occur during placement operations. In the case of large new work projects where the material is expected to consist of stiff clays, it is recommended that mid-project bathymetric surveys be conducted of the placement area to ensure that mounding limits are not exceeded.

4.0 ANTICIPATED SITE USE. It is anticipated that there will be a need for use of the Pascagoula ODMDS for many years. The anticipated site is projected for dredged material placement of approximately 530,000 cys of dredged material on a 2 to 3 year basis (not including tentative actions). This projection is based on shoaling rates, past dredging records, currently available dredged material placement options, and USACE planning documents.

5.0 MODIFICATION OF THE PASCAGOULA ODMDS SMMP. If results of monitoring surveys or validation reports from other sources indicate continued use of the Pascagoula ODMDS would lead to unacceptable effects, then ODMDS management will be modified to mitigate those effects. The SMMP will be reviewed and updated at least every 10 years or if necessary due to significant use changes. For example, the SMMP will be reviewed if the quantity or type of dredged material placed on site changes significantly or if conditions at the site indicate a need for revision. The plan should be updated in conjunction with activities authorizing use of the site.

6.0 IMPLEMENTATION OF THE PASCAGOULA ODMDS SMMP. This plan shall be effective from date of signature for a period not to exceed 10 years. The plan shall be reviewed and revised more frequently if site use and conditions at the site indicates a need for revision. The EPA and USACE shall share responsibility for implementation of the SMMP. Site users may be required to undertake monitoring activities as a condition of their permit. The USACE will be responsible for implementation of the SMMP for Federal new work and maintenance projects.

7.0 REFERENCES.

Fredette, Thomas J., Nelson, David A., Clausner, James E., and Anders, Fred J. 1990. *Guidelines for Physical and Biological Monitoring of Aquatic Dredged Material Disposal Sites*, Technical Report D-90-12, US Army Engineer Waterways Experiment Station, Vicksburg, MS.

Pequegnat, Willis E., Gallaway, Benny J., and Wright, Thomas D., 1990. *Revised Procedural Guide for Designation Surveys of Ocean Dredged Material Disposal Sites*, Technical Report D-90-8, US Army Engineer Waterways Experiment Station, Vicksburg, MS.

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U.S. Environmental Protection Agency and U.S. Army Corps of Engineers, 1996. *Guidance Document for Development of Site Management Plans for Ocean Dredged Material Disposal Sites*, February 1996. Prepared by Environmental Protection Agency Office of Water and Department of Army United States Army Corps of Engineers.

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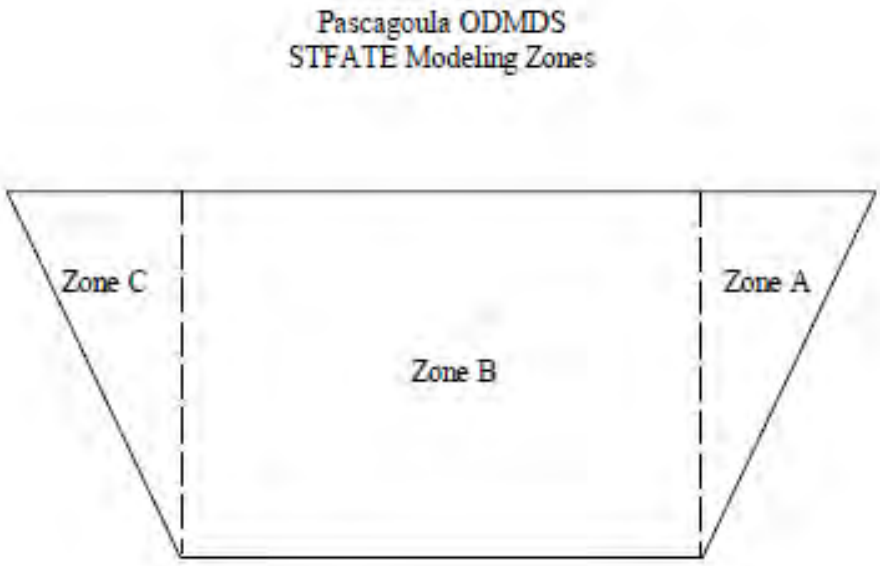
U.S. Environmental Protection Agency and U.S. Army Corps of Engineers, 1996. *Guidance Document for Development of Site Management Plans for Ocean Dredged Material Disposal Sites*, February 1996. Prepared by Environmental Protection Agency Office of Water and Department of Army United States Army Corps of Engineers.

U.S. Environmental Protection Agency Region 4 and U.S. Army Corps of Engineers South Atlantic Division, 1993. *Regional Implementation Manual Requirements and Procedures for Evaluation of the Ocean Disposal of Dredged Material in Southeastern Atlantic and Gulf Coastal Waters*, May 1993.

APPENDIX A

WATER COLUMN EVALUATIONS NUMERICAL MODEL (STFATE) INPUT PARAMETERS

Water Column Evaluations Numerical Model
(STFATE) Input Parameters Pascagoula
ODMDS



Water Column Evaluations
Numerical Model (STFATE) Input Parameters
Pascagoula ODMDS Zone A

SITE DESCRIPTION

Parameter	Value	Units
Number of Grid Points (left to right)	45	
Number of Grid Points (top to bottom)	45	
Spacing Between Grid Points (left to right)	600	ft
Spacing Between Grid Points (top to bottom)	600	ft
Constant Water Depth	46	ft
Roughness Height at Bottom of Disposal Site	.005[1]	ft
Slope of Bottom in X-Direction	0	Deg.
Slope of Bottom in Z-Direction	0	Deg.
Number of Points in Ambient Density Profile Point	2	
Ambient Density at Depth = 5 ft	1.0174	g/cc
Ambient Density at Depth = 44 ft	1.0230	g/cc
Ambient Density at Depth = 75 ft	1.0271	g/cc

AMBIENT VELOCITY DATA

Parameter	Value	Units
Profile	2-Point at constant depth	
X-Direction Velocity at Depth = 10 ft	-0.232	ft/sec
Z-Direction Velocity at Depth = 10 ft	-0.232	ft/sec
X-Direction Velocity at Depth = 40 ft	-0.116	ft/sec
Z-Direction Velocity at Depth = 40 ft	+0.116	ft/sec

DISPOSAL OPERATION DATA

Parameter	Value	Units
Location of Disposal Point from Top of Grid	8,500[2]	ft
Location of Disposal Point from Left Edge of Grid	8,200[2]	ft
Dumping Over Depression	0	

INPUT, EXECUTION AND OUTPUT

Parameter	Value	Units

Location of the Upper Left Corner of the Disposal Site - Distance from Top Edge	2,000	ft
Location of the Upper Left Corner of the Disposal Site - Distance from Left Edge	2,000	ft
Location of the Lower Right Corner of the Disposal Site - Distance from Top Edge	21,500	ft
Location of the Lower Right Corner of the Disposal Site - Distance from Left Edge	20,500	ft
Duration of Simulation	14,400	sec
Long Term Time Step	600	sec

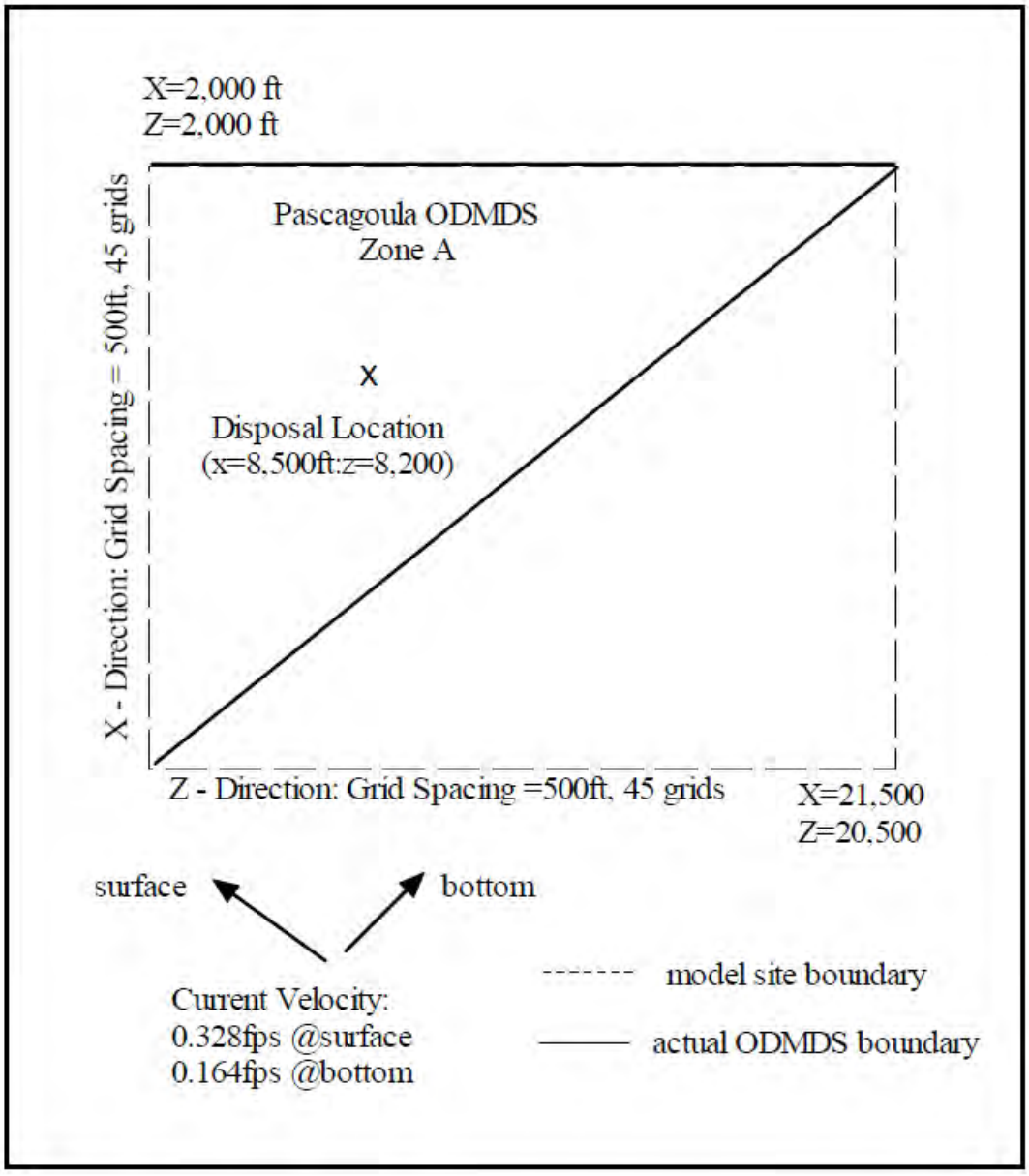
COEFFICIENTS

Parameter	**Keyword**	**Value**
Settling Coefficient	BETA	0.000[1]
Apparent Mass Coefficient	CM	1.000[1]
Drag Coefficient	CD	0.500[1]
Form Drag for Collapsing Cloud	CDRAG	1.000[1]
Skin Friction for Collapsing Cloud	CFRIC	0.010[1]
Drag for an Ellipsoidal Wedge	CD3	0.100[1]
Drag for a Plate	CD4	1.000[1]
Friction Between Cloud and Bottom	FRICTN	0.010[1]
4/3 Law Horizontal Diffusion Dissipation Factor	ALAMDA	0.001[1]
Unstratified Water Vertical Diffusion Coefficient	AKYO	Pritchard Expression
Cloud/Ambient Density Gradient Ratio	GAMA	0.250[1]

Turbulent Thermal Entrainment	ALPHAO	0.235[1]
Entrainment in Collapse	ALPHAC	0.100[1]
Stripping Factor	CSTRIP	0.003[1]

[1]Model default value
[2]Represents center of zone A. Dredged material requiring disposal in another location in order to meet the dilution criteria must be brought to the attention of EPA and the USACE.

Typical dilution achieved after 4 hours = 500:1
Plume does not reach site boundaries within 4 hours


X=2,000 ft
Z=2,000 ft
Pascagoula ODMDS
Zone A
X
Disposal Location
(x=8,500ft:z=8,200)
X - Direction: Grid Spacing = 500ft, 45 grids
Z - Direction: Grid Spacing =500ft, 45 grids
X=21,500
Z=20,500
surface
bottom
Current Velocity:
0.328fps @surface
0.164fps @bottom
model site boundary
actual ODMDS boundary

Water Column Evaluations
Numerical Model (STFATE) Input Parameters
Pascagoula ODMDS Zone B

SITE DESCRIPTION

Parameter	Value	Units
Number of Grid Points (left to right)	45	
Number of Grid Points (top to bottom)	45	
Spacing Between Grid Points (left to right)	600	ft
Spacing Between Grid Points (top to bottom)	600	ft
Constant Water Depth	46	ft
Roughness Height at Bottom of Disposal Site	.005[1]	ft
Slope of Bottom in X-Direction	0	Deg.
Slope of Bottom in Z-Direction	0	Deg.
Number of Points in Ambient Density Profile Point	2	
Ambient Density at Depth = 5 ft	1.0174	g/cc
Ambient Density at Depth = 46 ft	1.0230	g/cc

AMBIENT VELOCITY DATA

Parameter	Value	Units
Profile	2-Point at constant depth	
X-Direction Velocity at Depth = 10 ft	-0.232	ft/sec
Z-Direction Velocity at Depth = 10 ft	-0.232	ft/sec
X-Direction Velocity at Depth = 40 ft	-0.116	ft/sec
Z-Direction Velocity at Depth = 40 ft	+0.116	ft/sec

DISPOSAL OPERATION DATA

Parameter	Value	Units
Location of Disposal Point from Top of Grid	13,500[2]	ft
Location of Disposal Point from Left Edge of Grid	14,500[2]	ft
Dumping Over Depression	0	

INPUT, EXECUTION AND OUTPUT

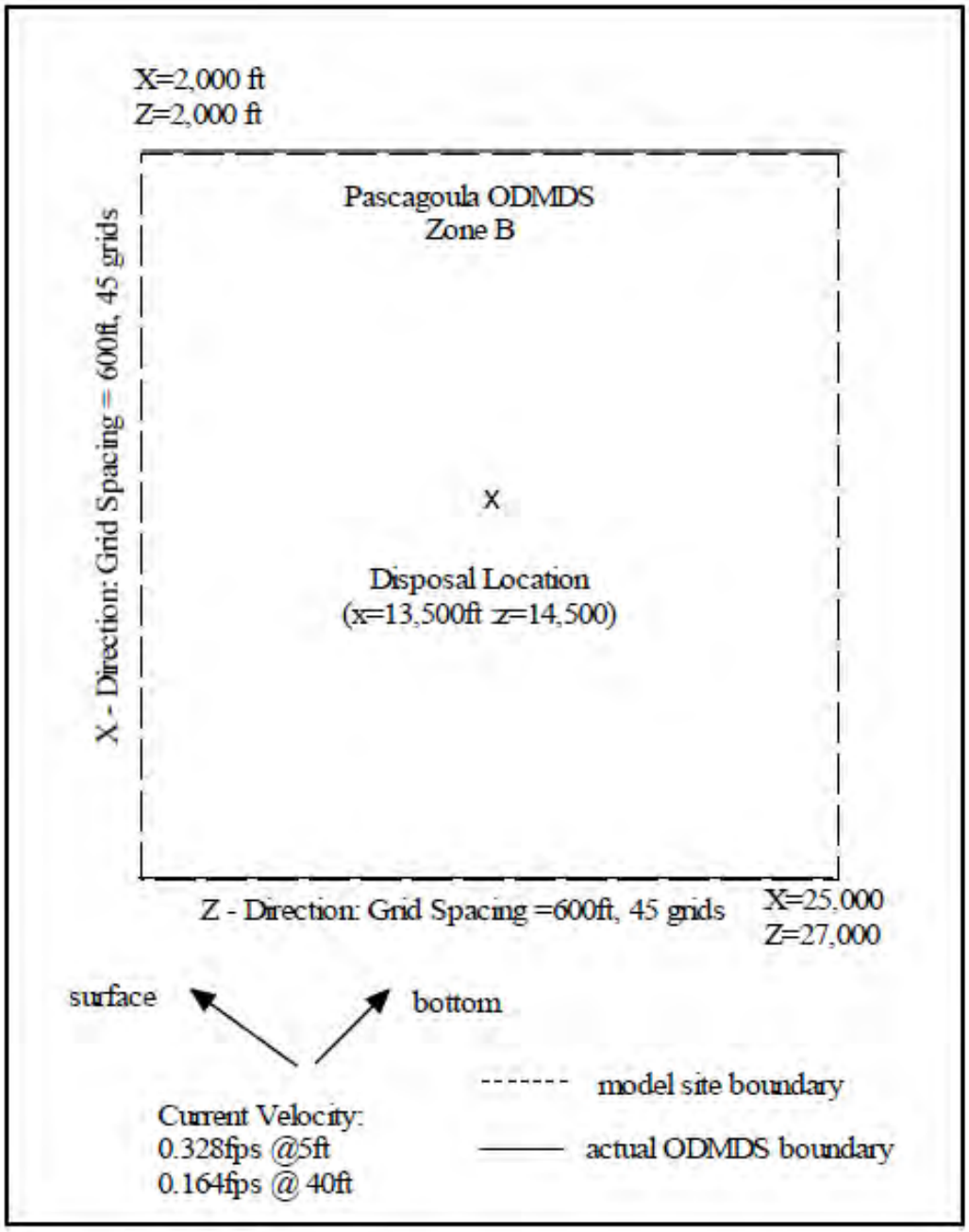
Parameter	Value	Units
Location of the Upper Left Corner of the Disposal Site - Distance from Top Edge	2,000	ft
Location of the Upper Left Corner of the Disposal Site - Distance from Left Edge	2,000	ft
Location of the Lower Right Corner of the Disposal Site - Distance from Top Edge	25,000	ft
Location of the Lower Right Corner of the Disposal Site - Distance from Left Edge	27,000	ft
Duration of Simulation	14,400	sec
Long Term Time Step	600	sec

COEFFICIENTS

Parameter	Keyword	Value
Settling Coefficient	BETA	0.000[1]
Apparent Mass Coefficient	CM	1.000[1]
Drag Coefficient	CD	0.500[1]
Form Drag for Collapsing Cloud	CDRAG	1.000[1]
Skin Friction for Collapsing Cloud	CFRIC	0.010[1]
Drag for an Ellipsoidal Wedge	CD3	0.100[1]
Drag for a Plate	CD4	1.000[1]
Friction Between Cloud and Bottom	FRICTN	0.010[1]
4/3 Law Horizontal Diffusion Dissipation Factor	ALAMDA	0.001[1]
Unstratified Water Vertical Diffusion Coefficient	AKYO	Pritchard Expression
Cloud/Ambient Density Gradient Ratio	GAMA	0.250[1]
Turbulent Thermal Entrainment	ALPHAO	0.235[1]
Entrainment in Collapse	ALPHAC	0.100[1]
Stripping Factor	CSTRIP	0.003[1]

[1]Model default value
[2]Represents center of zone B. Dredged material requiring disposal in another location in order to meet the dilution criteria must be brought to the attention of EPA and the USACE.

Typical dilution achieved after 4 hours = 500:1
Plume does not reach site boundaries within 4 hours


X=2,000 ft
Z=2,000 ft
Pascagoula ODMDS
Zone B
X - Direction: Grid Spacing = 600ft, 45 grids
X
Disposal Location
(x=13,500ft z=14,500)
Z - Direction: Grid Spacing =600ft, 45 grids
X=25,000
Z=27,000
surface
bottom
Current Velocity:
0.328fps @5ft
0.164fps @ 40ft
model site boundary
actual ODMDS boundary

Water Column Evaluations
Numerical Model (STFATE) Input Parameters
Pascagoula ODMDS Zone C

SITE DESCRIPTION

Parameter	Value	Units
Number of Grid Points (left to right)	45	
Number of Grid Points (top to bottom)	45	
Spacing Between Grid Points (left to right)	400	ft
Spacing Between Grid Points (top to bottom)	600	ft
Constant Water Depth	47	ft
Roughness Height at Bottom of Disposal Site	.005[1]	ft
Slope of Bottom in X-Direction	0	Deg.
Slope of Bottom in Z-Direction	0	Deg.
Number of Points in Ambient Density Profile Point	2	
Ambient Density at Depth = 5 ft	1.0174	g/cc
Ambient Density at Depth = 47 ft	1.0230	g/cc

AMBIENT VELOCITY DATA

Parameter	Value	Units
Profile	2-Point at constant depth	
X-Direction Velocity at Depth = 10 ft	-0.232	ft/sec
Z-Direction Velocity at Depth = 10 ft	-0.232	ft/sec
X-Direction Velocity at Depth = 40 ft	-0.116	ft/sec
Z-Direction Velocity at Depth = 40 ft	+0.116	ft/sec

DISPOSAL OPERATION DATA

Parameter	Value	Units
Location of Disposal Point from Top of Grid	9,660[2]	ft
Location of Disposal Point from Left Edge of Grid	11,200[2]	ft
Dumping Over Depression	0	

INPUT, EXECUTION AND OUTPUT

Parameter	Value	Units
Location of the Upper Left Corner of the Disposal Site - Distance from Top Edge	2,000	ft
Location of the Upper Left Corner of the Disposal Site - Distance from Left Edge	2,000	ft
Location of the Lower Right Corner of the Disposal Site - Distance from Top Edge	25,000	ft
Location of the Lower Right Corner of the Disposal Site - Distance from Left Edge	15,800	ft
Duration of Simulation	14,400	sec
Long Term Time Step	600	sec

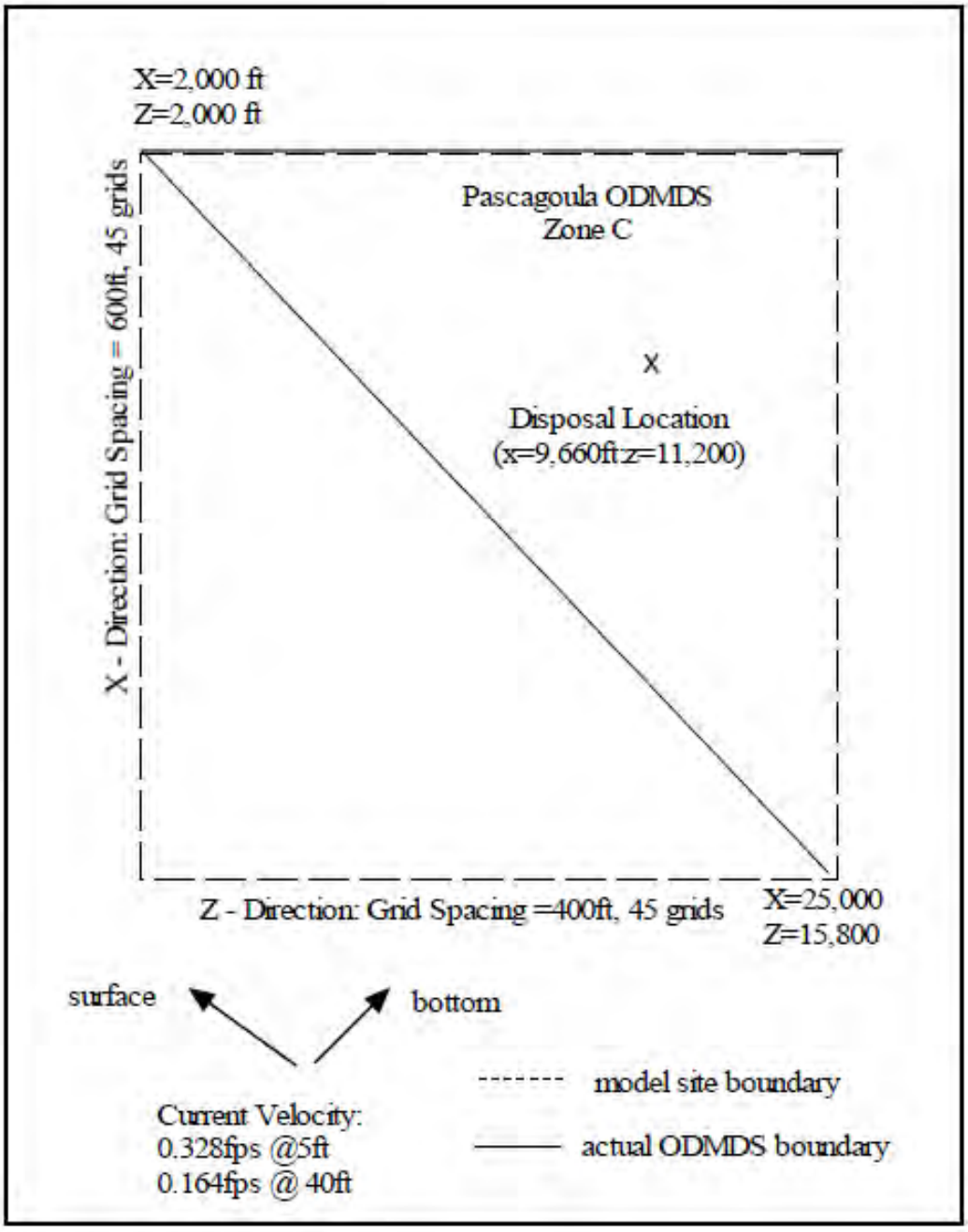
COEFFICIENTS

Parameter	Keyword	Value
Settling Coefficient	BETA	0.000[1]
Apparent Mass Coefficient	CM	1.000[1]
Drag Coefficient	CD	0.500[1]
Form Drag for Collapsing Cloud	CDRAG	1.000[1]
Skin Friction for Collapsing Cloud	CFRIC	0.010[1]
Drag for an Ellipsoidal Wedge	CD3	0.100[1]
Drag for a Plate	CD4	1.000[1]
Friction Between Cloud and Bottom	FRICTN	0.010[1]
4/3 Law Horizontal Diffusion Dissipation Factor	ALAMDA	0.001[1]
Unstratified Water Vertical Diffusion Coefficient	AKYO	Pritchard Expression
Cloud/Ambient Density Gradient Ratio	GAMA	0.250[1]

Turbulent Thermal Entrainment	ALPHAO	0.235[1]
Entrainment in Collapse	ALPHAC	0.100[1]
Stripping Factor	CSTRIP	0.003[1]

[1]Model default value
[2]Represents center of zone C. Dredged material requiring disposal in another location in order to meet the dilution criteria must be brought to the attention of EPA and the USACE.

Typical dilution achieved after 4 hours = 500:1
Plume does not reach site boundaries within 4 hours


X=2,000 ft
Z=2,000 ft
Pascagoula ODMDS
Zone C
X
Disposal Location
(x=9,660ft z=11,200)
X - Direction: Grid Spacing = 600ft, 45 grids
Z - Direction: Grid Spacing =400ft, 45 grids
X=25,000
Z=15,800
surface
bottom
Current Velocity:
0.328fps @5ft
0.164fps @ 40ft
model site boundary
actual ODMDS boundary

APPENDIX B

GENERIC SPECIAL CONDITIONS FOR
MPRSA SECTION 103 PERMITS
PASCAGOULA ODMDS

I. DISPOSAL OPERATIONS

A. For this permit, the term disposal operations shall mean: navigation of any vessel used in disposal operations, transportation of dredged material from the dredging site to the Pascagoula ODMDS, proper disposal of dredged material at the disposal area within the Pascagoula ODMDS, and transportation of the hopper dredge or disposal barge or scow back to the dredging site.

B. The boundary coordinates of the Pascagoula ODMDS is defined as the rectangle delineated by the following latitude/longitude and State Plane Coordinate system (zone 2301 Mississippi East) NAD 83 coordinates:

Latitude 30°12'06" N	**Longitude 88°44'30" W**
Latitude 30°11'42" N	**Longitude 88°33'24" W**
Latitude 30°08'30" N	**Longitude 88°37'00" W**
Latitude 30°08'18" N	**Longitude 88°41"54" W**

State Plane 2301 Mississippi East

30.2016667°	**-088.7416667°**
30.1950000°	**-088.5566667°**
30.1416667°	**-088.6166667°**
30.1383333°	**-088.6983333°**

C. No more than [NUMBER] cubic yards of dredged material excavated at the location defined in [REFERENCE LOCATION IN PERMIT] are authorized for disposal at the Pascagoula ODMDS. The permittee agrees and understands that all dredged material will be placed in such a manner that its highest point will not exceed –25 feet MLLW.

D. The permittee shall use an electronic positioning system to navigate to and from the Pascagoula ODMDS. For this section of the permit, the electronic positioning system will be as per the DQM specifications. If the electronic positioning system fails or navigation problems are detected, all disposal operations shall cease until the failure or navigation problems are corrected.

E. The permittee shall certify the accuracy of the electronic positioning system proposed for use during disposal operations at the Pascagoula ODMDS. The certification shall be accomplished by providing current certification documentation from the National DQM Program for scow and hopper dredge instrumentation systems. The National DQM certification is valid for one year from the date of certification.

F. The permittee shall not allow any water or dredged material placed in a hopper dredge

or disposal barge or scow to flow over the sides or leak from such vessels during transportation to the Pascagoula ODMDS. In addition, the permittee understands that no debris is to be placed in the Pascagoula ODMDS.

G. A disposal operations inspector and/or captain of any tug boat, hopper dredge or other vessel used to transport dredged material to the Pascagoula ODMDS shall insure compliance with disposal operation conditions defined in this permit.

1. If the disposal operations inspector or the captain detects a violation, he shall report the violation to the permittee immediately.

2. The permittee shall contact the U.S. Army Corps of Engineers (USACE), Mobile District's Regulatory Branch at (251) 690-2658 and EPA Region 4 at (404) 562-9395 to report the violation within twenty-four (24) hours after the violation occurs. A complete written explanation of any permit violation shall be included in the post-dredging report.

H. When dredged material is placed at the ODMDS, no portion of the hopper dredge, disposal barge, or scow shall be outside the boundaries of the Pascagoula ODMDS as defined in Special Condition B. Additionally, disposal shall occur within a specified disposal zone defined as [DEFINE COORDINATES AND SIZE OF DISPOSAL ZONE].

I. The permittee shall use an automated disposal verification system that is certified by the National DQM program to continuously track the horizontal location and draft condition of the disposal vessel (hopper dredge or disposal barge or scow) to and from the Pascagoula ODMDS. This real-time information is available on-line to the Mobile District and will be provided to the EPA Region 4 via an FTP site on a weekly basis.

J. The permittee shall conduct a bathymetric survey of the Pascagoula ODMDS within two months prior to project disposal and within 30 days following project completion.

1. The number and length of the survey transects shall be sufficient to encompass the Pascagoula ODMDS and a 1500-foot wide area around the site. Transects shall be spaced at 500-foot intervals or less.

2. Vertical accuracy of the survey shall be ±0.5 feet. Horizontal location of the survey lines and depth sounding points will be determined by an automated positioning system utilizing either microwave line of site system or differential global positioning system. The vertical datum shall be mean lower low water (mllw) and the horizontal datum shall use Mississippi State Plane or latitude and longitude coordinates (North American Datum 1983). State Plane coordinates shall be reported to the nearest 0.10- foot and latitude and longitude coordinates shall be reported as degrees and decimal minutes to the nearest 0.01 minutes.

K. The permittee has read and agrees to assure that they are in compliance with the requirements of the Pascagoula ODMDS Site Management and Monitoring Plan (SMMP).

II. REPORTING REQUIREMENTS

A. The permittee shall send USACE, Mobile District's Coastal Environment Team and EPA Region 4's Oceans, Wetlands and Streams Protection Branch (61 Forsyth Street, Atlanta, GA 30303) a notification of commencement of work at least thirty (30) days before initiation of any dredging operations authorized by this permit and referenced by the permit number. In addition, the permittee agrees to contact the U.S.Coast Guard (Marine Safety Office) at 251-441-5674 prior to disposing of any material in the ocean disposal site.

B. The permittee shall submit to USACE weekly disposal monitoring reports. These reports shall contain the information described in Special Condition I.1.

C. The permittee shall develop and send one (1) copy of the disposal summary report to the Mobile District's Regulatory Branch and one (1) copy of the disposal summary report to EPA Region 4 documenting compliance with all general and special conditions defined in this permit. The disposal summary report shall be sent within 90 days after completion of the disposal operations authorized by this permit. The disposal summary report shall include the following information:

1. The report shall indicate whether all general and special permit conditions were met. Any violations of the permit shall be explained in detail.

2. The disposal summary report shall include the following information: USACE permit number, actual start date and completion date of dredging and disposal operations, total cubic yards disposed at the Pascagoula ODMDS, locations of disposal events, and pre and post disposal bathymetric survey results (in hard and electronic formats).

III. PERMIT LIABILITY

A. The permittee shall be responsible for ensuring compliance with all conditions of this permit.

B. The permittee and all contractors or other third parties who perform an activity authorized by this permit on behalf of the permittee shall be separately liable for a civil penalty of up to $50,000 for each violation of any term of this permit they commit alone or in concert with the permittee or other parties. This liability shall be individual, rather than joint and severable, and shall not be reduced in any fashion to reflect the liability assigned to and civil penalty assessed against the permittee or any other third party as defined in 33 U.S.C. Section 1415(a).

C. If the permittee or any contractor or other third party knowingly violates any term of this permit (either alone or in concert), the permittee, contractor or other party shall be individually liable for the criminal penalties set forth in 33 U.S.C. Section 1415(b).

APPENDIX C

GENERIC CONTRACT LANGUAGE FOR USE OF THE PASCAGOULA ODMDS

SECTION 35 20 23.23

NATIONAL DREDGING QUALITY MANAGEMENT PROGRAM
HOPPER DREDGE
4/30/15

PART 1 GENERAL

1.1 DESCRIPTION

The work under this contract requires use of the National Dredging Quality Management Program (DQM) to monitor the dredge's status at all times during the contract and manage data history.

This performance-based specification section identifies the minimum required output and precision and instrumentation requirements. The requirements may be satisfied using equipment and technical procedures selected by the Contractor.

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office responsible for review of the submittal for the Government. The following shall be submitted in accordance with Section 01 33 00, "SUBMITTAL PROCEDURES":

SD-01, Preconstruction Submittals

Dredge Plant Instrumentation Plan Revisions or Addendum; G, SAM-OP-J

SD-06, Test Reports

Data Appropriately Archived e-mail, section 3.2.10; G, XXX-XX-X *(enter local district)*

SD-07,Certificates

Letter of National Dredging Quality Management Program Certification; G,
XXX-XX-X *(enter local district)*

1.3 PAYMENT

No separate payment shall be made for installation, operation and maintenance of the DQM certified system as specified herein for the duration of the dredging operations; all

costs in connection therewith shall be considered a subsidiary obligation of the Contractor and covered under the contract unit prices for dredging in the bidding schedule.

1.4 NATIONAL DREDGING QUALITY MANAGEMENT PROGRAM CERTIFICATION

The Contractor is required to have a current certification from the DQM for the hopper dredge instrumentation system to be used under this contract. Criteria for certification shall be based on the most recent specification posted on the DQM website (http://dqm.usace.army.mil/Specifications/Index.aspx). Compliance with these criteria shall be verified by annual on-site quality assurance (QA) checks conducted by DQM Support Center Data Acquisition and Analysis Team, and by periodic review of the transmitted data. DQM Certification is valid for one year from the date of the annual QA checks. Certification is contingent upon the system's ability to continuously meet the performance requirements as outlined in sections 3.3 and 3.5. If issues with data quality are not corrected within 48 hours, the system certification shall be revoked and additional QA checks by the Data Acquisition Team may be necessary.

Annual DQM Certification shall be based on:

- A series of QA checks as described in Section 3.4 " Compliance Quality Assurance Checks"
- Verification of data acquisition and transfer (Section 3.3)
- Review of the Dredge Plant Instrumentation Plan (DPIP) as described in Section 1.5

The dredging contractor shall have personnel who are familiar with the system instrumentation and who have the ability to recalibrate the sensors on site during the QA process. The dredging contractor shall coordinate pickup times and locations and provide transportation to and from any platform with a DQM system to team personnel in a timely manner. As a general rule, Data Acquisition and Analysis Team personnel will come with PPE consisting of hardhats, steel toe boots, and life jackets. If additional safety equipment is needed, such as eye protection, safety harnesses, work gloves or personal location beacons, these items shall be provided to the team while on site. It is the dredging contractor's obligation to inform the QA team if the location designated for the QA checks has any site specific safety concerns prior to their arrival on site.

The owner or operator of the dredge shall contact the DQM at DQM-AnnualQA@rpsgroup.com on an annual basis, or at least three weeks prior to certification expiration, to schedule QA checks for renewal. This notification is meant to make the Data Acquisition Team aware of a target date for the annual QA checks for the dredge. At least one week prior to the target date, the dredging contractor shall contact the Data Acquisition team and verbally coordinate a specific date and location. The contractor shall then follow-up this conversation with a written e-mail confirmation. The owner/operator shall coordinate the QA checks with all local authorities, including but not limited to, the local USACE contracting officer.

Re-certification is required for any yard work which produces modification to displacement (i.e. change in dredge lines, repositioning or repainting hull marks), modification to bin volume (change in bin dimensions or addition or subtraction of structure) or changes in

sensor type or location; these changes shall be reported in the sensor log section of the DPIP. A system does not have to be transmitting data between jobs, however in order to retain its certification during this period, the system sensors or hardware should not be disconnected or removed from the dredge. If the system is powered down, calibration coefficients shall be retained.

1.5 DREDGE PLANT INSTRUMENTATION PLAN (DPIP)

The Contractor shall have a digital copy of the DPIP on file with the National DQM Support Center. The Contractor shall also maintain a copy of the DPIP on the dredge while working on site which is easily accessible to government personnel at all times. This document shall describe the sensors used, configuration of the system, how sensor data will be collected, how quality control on the data will be performed, and how sensors/data reporting equipment will be calibrated and repaired if they fail. A description of computed dredge specific data and how the sensor data will be transmitted to the DQM Database will also be included. The Contractor shall submit to the DQM Support Center any addendum or modifications made to the plan, subsequent to its original submission, prior to start of work.

The DPIP shall include the following as a minimum:
(DPIP must have table of contents in the following order and tabs separating sections)

Cover Page
- Dredge Name
- Date
- Photo of plant

Table of Contents

New page
- Dredge Contacts
- Dredging Company
  - Dredge Point of Contact on-site
  - Phone Number
  - e-mail address
- Dredge Monitoring System Provider
  - Dredge Monitoring System Point of Contact
  - Telephone Number
  - e-mail address

New page
- Table of dredge characteristics
  - Dimensions of dredge
  - Dimensions of hopper
  - Method of disposal
  - Capacity
  - Minimum and maximum digging depth
  - Minimum and maximum drafts and displacements
  - RPM and velocity range
  - ID of suction and discharge pipes

New page

Sensor data collection method

- Any averaging
- Route from sensors to DQM computer
- Internet connection type and provider

Sensor descriptions, locations and calibration methods

- Positioning system
  - Brand name, model and accuracy
  - Any calculation done external to the instrumentation
  - Sensor location with referenced dimensions
- Dredge heading instrumentation
  - Brand name, model and accuracy
  - Any calculation done external to the instrumentation
- Hull status
  - Brand name, model and accuracy
  - Any calculation done external to the instrumentation
  - Sensor location with referenced dimensions
  - Calibration procedure
- Draft
  - Brand name, model and accuracy
  - Any calculation done external to the instrumentation
  - Sensor location with referenced dimensions
  - Calibration procedure
- Ullage
  - Brand name, model and accuracy
  - Any calculation done external to the instrumentation
  - Sensor location with referenced dimensions
  - Calibration procedure
- Dragarm depths
  - Brand name, model and accuracy
  - Any calculation done external to the instrumentation
  - Sensor location with referenced dimensions
  - Calibration procedure
- Density
  - Brand name, model and accuracy
  - Any calculation done external to the instrumentation
  - Sensor location with referenced dimensions including pipe diameter
  - Calibration procedure
- Velocity
  - Brand name, model and accuracy
  - Any calculation done external to the instrumentation
  - Sensor location with referenced dimensions including pipe diameter
  - Calibration procedure
- Pump RPM
  - Brand name, model and accuracy
  - Any calculation done external to the instrumentation
  - Sensor location with referenced dimensions
  - Calibration procedure

- Pumpout (if instrumented)
    - o Brand name, model and accuracy
    - o Any calculation done external to the instrumentation
    - o Sensor location with referenced dimensions
    - o Calibration procedure

Calculated Parameters

- Displacement:
    - o Method used by Contractor to calculate displacement
    - o Tables listing (fresh and salt water) displacement as a function of draft in feet and tenths of feet
- Hopper Volume:
    - o Method used by Contractor to calculate hopper volume
    - o Table listing the hopper volume as a function of hopper ullage in feet and tenths of feet
    - o Description of datum for ullage sounding measurements
- Drag Head Position
    - o Method used by Contractor to calculate drag head position
- Load number
    - o Method used to increment load number

Quality Control

- Description of Contractors quality control process
- Log of sensor calibrations, repairs and modifications

Appendices

- Hydrostatic curves
- Certified Displacement and Volume Tables
- Legible Dimensioned Drawings of the Dredge with units in feet
    - o A typical plan of the dredge showing:
        - Overall dredge and hopper dimensions
        - Locations of required sensors referenced to uniform longitudinal and transverse reference points
        - Distance between the draft sensors
        - Distance between the ullage sensors
        - Dimensions of dragarm
    - o A profile view of the dredge showing:
        - Overall dredge and hopper dimensions
        - Distance between draft sensors and draftmarks
        - Locations of required sensors referenced to uniform vertical and longitudinal reference points
    - o Typical vessel cross section through the hopper
- Sensor manuals and certificates of calibration

Any changes to the computation methods shall be approved by the National Dredging Quality Management Program Support Center prior to their implementation.

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION

3.1 REQUIREMENTS FOR REPORTED DATA

The Contractor shall provide, operate and maintain all hardware and software to meet these specifications. The Contractor shall be responsible for replacement, repair and calibration of sensors and other necessary data acquisition equipment needed to supply the required data.

Repairs shall be completed within 48 hours of any sensor failure. Upon completion of a repair, replacement, installation, modification or calibration the Contractor shall notify the Contracting Office's Representative (COR). The COR may request re-calibration of sensors or other hardware components at any time during the contract as deemed necessary.

The Contractor shall keep a log of sensor repair, replacement, installation, modification and calibration in the dredge's onboard copy of the DPIP. The log shall contain a three-year history of sensor maintenance to include: the time of sensor failures (and subsequent repairs), the time and results of sensor calibrations, the time of sensor replacements, and the time that backup sensor systems are initiated to provide required data. It shall also contain the name of the person responsible for the sensor work.

Sensors installed shall be capable of collecting parameters within specified accuracies and resolutions indicated in the following subsections.

Reported sensor values for ullage, draft and draghead depth should represent a weighted average with the highest and lowest values not included in the calculated average for the given interval. This information should be documented in the DPIP sections that say "Calculations done external to the instrumentation".

3.1.1 Date and Time

The date and time shall be reported to the nearest second and referenced to UTC time based on a 24 hour format; mm/dd/yyyy hh:mm:ss. The reported time shall be the time reported by the GPS in the NMEA string.

3.1.2 Load Number

A load number shall document the end of a disposal event. Load numbering will begin at number 1 at the start of the contract, and will be incremented by 1 at the completion of each disposal event or emptying of the hopper. Whenever possible, the load number shall be calculated off of the sensors aboard the dredge, and shall be a mathematically repeatable routine. Efforts shall be made to include logic that avoids false load number increments while also not allowing the routine to miss any disposal event. If manual incrementing of the load number is in place, extra attention shall be paid to this value in the contractor's quality control process (section 3.5).

3.1.3 Horizontal Positioning

All locations shall be obtained using a Positioning System operating with a minimum accuracy level of 1 to 3 meters horizontal Circular Error Probable (CEP). Positions shall be reported as Latitude/Longitude WGS 84 in decimal degrees. West Longitude and South Latitude values are reported as negative.

3.1.3.1 Vessel Horizontal Positioning

Geographic coordinates of the vessel as indicated by the location of the GPS antenna.

3.1.3.2 Draghead Horizontal Positioning

Geographic coordinates of the heel on centerline of the draghead(s). Any offset calculations from the GPS antenna should be described in the DPIP.

3.1.4 Hull status

Open/closed status of the hopper dredge, corresponding to the split/non-split condition of a split hull hopper dredge shall be monitored. For dredges with hopper doors, the status of a single door that is the first opened during normal disposal operations may be monitored. An “OPEN” value shall indicate the hopper door is open, or in the case of split hull dredges, the hull is split. A “CLOSED” value indicates the hopper doors are closed, or in the case of split hull dredges, the hull is not split. *For this contract, hull status shall register closed prior to leaving the disposal area.*

3.1.5 Dredge Course

Dredge course-over-ground (COG) shall be provided using industry standard equipment. The Contractor shall provide dredge course over ground to the nearest whole degree with values from 000 (true north) to 359 degrees referenced to a clockwise positive direction convention.

3.1.6 Dredge Speed

Dredge speed-over-ground shall be provided in knots using industry standard equipment with a minimum accuracy of 1 knot and resolution to the nearest 0.1 knot.

3.1.7 Dredge Heading

Dredge heading shall be provided using industry standard equipment. The dredge heading shall be accurate to within 5 degrees and reported to the nearest whole degree, with values from 000 (true north) to 359 degrees referenced to a clockwise positive direction convention.

3.1.8 Tide

Tide data shall be obtained using appropriate equipment to give the water level with an accuracy of ± 0.1 feet and a resolution of 0.01 feet. Tide values above project datum described in the dredging specification shall be entered with a positive sign, those below with a negative sign.

3.1.9 Draft

All reported draft measurements shall be in feet, tenths and hundredths with an accuracy of ± 0.1 foot relative to observed physical draft readings. The measurements shall be reported at a resolution of two decimal places (hundredths of a foot). Reported forward draft value shall be equal to the sum of the visual forward port and starboard draft mark readings divided by 2. Reported aft draft value shall be equal to the sum of the visual aft port and starboard draft mark readings divided by 2. Forward draft, aft draft and average draft will be reported. Sensors shall be placed at an optimum location on the vessel to be reflective of observed physical draft mark readings at any trim or list. Minimum accuracies are conditional to relatively calm water. The sensor value reported shall be an average of at least 10 samples per event, remove at least one maximum value and one minimum value, and average the minimum 8 remaining values. When average draft is calculated for the purpose of determining displacement, significant digits for average draft shall be maintained such that if forward draft was 0.15 and aft draft was 0.1 then the average draft would be 0.125.

3.1.10 Hopper Ullage Sounding

All reported ullage soundings shall be in feet, tenths and hundredths with an accuracy of ± 0.1 foot with respect to the combing, and be representative of the forward and aft extents of the hopper as close to centerline as is possible. The measurements shall be reported at a resolution of two decimal places (hundredths of a foot). Forward ullage and aft ullage soundings will be reported. Sensors should be mounted so as to avoid discharge flume turbulence, foam and any structure that could produce sidelobe errors. If sensors must be offset from centerline of the hopper they should be offset to opposite sides of the vessel. If more than one fore or one aft sensor is used, they shall be placed near the corners of the hopper and the average value of the fore sensors and the average value of the aft sensors shall be reported The sensor value reported shall be an average of at least 10 samples per event, remove at least one maximum value and one minimum value, and average the minimum 8 remaining values. When average ullage is calculated for the purpose of determining hopper volume, significant digits for average ullage shall be maintained such that if forward ullage was 0.15 and aft ullage was 0.1 then the average ullage would be 0.125.

3.1.11 Hopper Volume

Hopper volume shall be reported in cubic yards, based on the most accurate method available for the dredge. The minimum standard of accuracy for hopper volume is interpolation from the certified hopper volume table, based on the average fore and aft ullage soundings.

3.1.12 Displacement

Dredge displacement shall be reported in long tons, based on the most accurate method available for the dredge. The minimum standard of accuracy for displacement is interpolation from the displacement table, based on the average draft. For this contract the density of water used to calculate displacement shall be_____ kg/cubic meter and shall be used for an additional interpolation between the fresh and salt water tables. *The water density used is project/location specific. 1000 kg/m^3 (1g/cm^3)- fresh water 1027 kg/m^3 - 1030 kg/m^3 (1.027g/cm^3 - 1.03g/cm^3)- salt water*

3.1.13 Empty Displacement

Empty displacement shall be reported in long tons, and shall be the lightship value of the dredge, or the weight of the dredge with no material in the hopper, adjusted for fuel and water consumption.

3.1.14 Draghead depths

Draghead depths shall be reported with an accuracy of ± 0.5 feet and a resolution to the nearest 0.1 feet as measured from the surface of the water with no tidal adjustments. Minimum accuracies are conditional to relatively calm water. The sensor value reported shall be an average of at least 10 samples per event, remove at least one maximum value and one minimum value, and average the minimum 8 remaining values.

3.1.15 Slurry Densities of Dragarms

A density metering device, calibrated according to the manufacturer's specifications, shall be used to record the slurry density of each dragarm to the nearest 0.0001 g/cc with an accuracy of ± 0.001g/cc. If the manufacture does not specify a frequency of re-calibration, calibration shall be conducted prior to commencement of work.

3.1.16 Slurry Velocities of Dragarms

A flow metering device, calibrated according to the manufacturer's specifications, shall be used to record the slurry velocity of each dragarm to the nearest 0.0001 fps with an accuracy of ± 0.001 fps. If the manufacture does not specify a frequency of re-calibration, calibration shall be conducted prior to commencement of work. The slurry velocity shall be measured in the same pipeline inside diameter as that used for the slurry density measurement.

3.1.17 Pump RPM

Pump RPM shall be measured with the highest level of accuracy that is standard on the vessel operational displays, either at the bridge, at the drag tenders controls, or in the engine room. Dredges with multiple pumps per side shall report RPM for the pump that best describes the dredging process (typically the outboard pump). If requirements of section 3.1.19 are determined based on pump RPM, then that value shall be reported.

3.1.18 Sea Suction Valve for Dragarm

If sea suction can be taken to bypass suction through the draghead, the sea suction location and valve status will be reported. The status of the valve will change from "closed" to "open" when the valve starts to open and will register "closed" when the valve is fully closed. When applicable, the state of the latch will be reported as "true" or "false". The sea suction location shall be reported in a standard non-changing name string of no more than 20 characters. These field values will always occur in the XML string as a set. The DQM system can only accommodate up to 4 unique sea suction locations. Suggested options for the naming convention can be found in the Example dataset in section 3.2.9, "Data Format".

3.1.19 Pumpout

When the hopper dredge is being pumped out, a "True" value shall be reported; when it is not, a "False" value shall be reported. The only permissible values are "TRUE" and "FALSE".

3.2 NATIONAL DREDGING QUALITY MANAGEMENT PROGRAM SYSTEM REQUIREMENTS

Contractors DQM system shall be capable of collecting, displaying, and transmitting information to the DQM Database. The applicable parameters from section 3.1 shall be recorded as events locally and continually transmitted to the DQM Database anytime an internet connection is available. The Dredge shall be equipped with a DQM computer system consisting of a computer, monitor, keyboard, mouse, data modem, UPS, and network hub. The computer system shall be a standalone system, exclusive to the DQM monitoring system, and will have USACE DQM software installed on it. If a hardware problem occurs, or if a part of the system is physically damaged, then the Contractor shall be responsible for repairing it within 48 hours of determination of the condition.

3.2.1 Computer Requirements

The Contractor shall provide a dedicated on-board computer for use by the Dredging Quality Management system. This computer shall run the Corps' software and receive data from the Contractor's data reporting interface. This computer must meet or exceed the following performance specifications:

CPU:	Intel or AMD processor with a (non-overclocked) clock speed of at least 3 gigahertz (GHz)
Hard drive:	250 gigabytes (GB); internal
RAM:	2 gigabytes
Ethernet adapter:	10 or 100 megabit (Mbit) internal network card with an RJ-45 connector

Video adapter:	Must support resolution of 1024x768 at 16 bit color depth
Keyboard:	Standard 101-key
Mouse:	Standard 2-button mouse
Monitor:	17 inch viewable display; must support 1024x768 resolution at 16 bit color depth
CD-ROM drive:	16X read speed/8X write speed
Ports:	2 free Serial ports with standard 9-pin connectors; 1 free USB port
Other hardware:	Category 5 (Cat-5) cable with standard RJ-45 plugs connecting the network adapter to the network hub; one spare cable

Contractor shall install a fully-licensed copy of Windows 7 Professional Operating System on the computer specified above. Contractor shall also install any necessary manufacturer-provided drivers for the installed hardware.

This computer shall be located and oriented to allow data entry and data viewing, as well as to provide access to data ports for connection of external hardware. Location and orientation shall be subject to Contracting Officer's Representative's approval.

3.2.2 Software

The DQM computer's primary function is to transmit data to the DQM shore side database. No other software which conflicts with this function shall be installed on this computer. The DQM computer will have the USACE provided DQMOBS (Dredge Quality Management Onboard Software) installed on it by DQM personnel along with USACE selected software for remote support and management.

3.2.3 Network Hub

The DQM computer shall communicate via IEEE 802.3 Ethernet and the TCP/IP networking protocol. The Contractor shall provide a network hub to allow the temporary addition of the Contracting Officer's representative's portable computer to the computer network. The hub shall provide a minimum of four RJ-45 ports that support Category 5 (Cat-5) cable with standard RJ-45 plugs connecting the network adapter to the network hub; one spare cable shall be available on site to plug into the network hub.

3.2.4 UPS

The Contractor shall supply an Uninterruptible Power Supply (UPS) for the computer and networking equipment. The UPS shall provide backup power at 1kVA for a minimum of 10 minutes. The UPS shall interface to the DQM computer to communicate UPS status. The

Contractor shall ensure that sufficient power outlets are available to run all specified equipment.

3.2.5 Internet Access

The Contractor shall maintain an internet connection capable of transmitting real time data to the DQM Server and supporting remote access, as well as enough additional band width to clear historically queued data when a connection is re-obtained. The telemetry system shall be always available and have connectivity in contract area. If connectivity is lost, unsent data shall be queued and transmitted upon restoration of connectivity. The Contractor shall acquire and install all necessary hardware and software to make the internet connection available for data transmission to the DQM web service. The hardware and software must be configured to allow the USACE DQM center remote access to this computer. Coordination between the dredging company's IT and DQM support may be required in order to configure remote access though any security, firewall, router, and telemetry systems. Telemetry systems must be capable of meeting these minimum reporting requirements in all operating conditions.

3.2.6 Data Routing Requirements

Onboard sensors shall continually monitor dredge conditions, operations and efficiency and route this information into the shipboard dredge-specific system computer (DSS) to assist in guiding dredge operations. Portions of this Contractor-collected information shall be routed to the DQM computer on a real-time basis. Standard sensor data shall be sent to the DQM computer via an RS-232 9600- or 19200-baud serial interface. The serial interface shall be configured as 8 bits no parity and no flow control.

3.2.7 Data Reporting Frequency

Data shall be logged as a series of events. Each event will consist of a data set containing dredge information as per section 3.1. Each set of measurements (i.e. time, position, etc…) will be considered an event. All required information in section 3.1 that are not an averaged variable (i.e. draft and ullage) shall be collected within one second of the reported time. A data string for an event shall be sent to the DQM computer every 6 to 12 seconds and this interval shall remain constant throughout the contract; data strings shall never be transmitted more frequently than once per every 5 seconds. Any averaged variable must be collected and computed within this sampling interval.

3.2.8 Data Format

Data shall be reported as an eXtensible Markup Language (W3C standard XML 1.0) document as indicated below. Line breaks and spaces are added for readability, but the carriage return, line feed character combination is only added to delineate records (HOPPER _DREDGING_DATA tag) for actual data transmission.

```
<?xml version="1.0"?>
<HOPPER_DREDGING_DATA version = “2.0”>
   <DREDGE_NAME> string32 </DREDGE_NAME>
     <HOPPER_DATA_RECORD>
```

<DATE_TIME> **time date string** </DATE_TIME>
<CONTRACT_NUMBER> string32</CONTRACT_NUMBER>
<LOAD_NUMBER> **integer string** </LOAD_NUMBER>
<VESSEL_X coord_type = "LL"> **floating point string** </VESSEL_X>
<VESSEL_Y coord_type = "LL"> **floating point string** </VESSEL_Y>
<PORT_DRAG_X coord_type = "LL"> **floating point string**</PORT_DRAG_X>
<PORT_DRAG_Y coord_type = "LL"> **floating point string**</PORT_DRAG_Y>
<STBD_DRAG_X coord_type = "LL"> **floating point string**</STBD_DRAG_X>
<STBD_DRAG_Y coord_type = "LL"> **floating point string**</STBD_DRAG_Y>
<HULL_STATUS> **OPEN/CLOSED string** </HULL_STATUS>
<VESSEL_COURSE> **floating point string** <VESSEL_COURSE >
<VESSEL_SPEED> **floating point string** </VESSEL_SPEED>
<VESSEL_HEADING> **floating point string** </VESSEL_HEADING>
<TIDE> **floating point string** </TIDE>
<DRAFT_FORE> **floating point string** </DRAFT_FORE>
<DRAFT_AFT> **floating point string** </DRAFT_AFT>
<ULLAGE_FORE> **floating point string** </ULLAGE_FORE>
<ULLAGE_AFT> **floating point string** </ULLAGE_AFT>
<HOPPER_VOLUME> **floating point string** </HOPPER_VOLUME>
<DISPLACEMENT> **floating point string** </DISPLACEMENT>
<EMPTY_DISPLACEMENT> **floating point string** </EMPTY_DISPLACEMENT>
<DRAGHEAD_DEPTH_PORT> **floating point string** </DRAGHEAD_DEPTH_PORT>
<DRAGHEAD_DEPTH_STBD> **floating point string** </DRAGHEAD_DEPTH_STBD>
<PORT_DENSITY> **floating point string** </PORT_DENSITY>
<STBD_DENSITY> **floating point string** </STBD_DENSITY>
<PORT_VELOCITY> **floating point string** </PORT_VELOCITY>
<STBD_VELOCITY> **floating point string** </STBD_VELOCITY>
<PUMP_RPM_PORT> **floating point string** </PUMP_RPM_PORT>
<PUMP_RPM_STBD> **floating point string** </PUMP_RPM_STBD>
<VALVE_1_LOCATION> **string32**</VALVE_1_LOCATION>
<VALVE_1_STATUS>**open/closed**</VALVE_1_STATUS>
<VALVE_1_LATCHED>**true/false**</VALVE_1_LATCHED>
<VALVE_2_LOCATION> **string32**</VALVE_2_LOCATION>
<VALVE_2_STATUS>**open/closed**</VALVE_2_STATUS>
<VALVE_2_LATCHED>**true/false**</VALVE_2_LATCHED>
<VALVE_3_LOCATION> **string32**</VALVE_3_LOCATION>
<VALVE_3_STATUS>**open/closed**</VALVE_3_STATUS>
<VALVE_3_LATCHED>**true/false**</VALVE_3_LATCHED>
<VALVE_4_LOCATION> **string32**</VALVE_4_LOCATION>
<VALVE_4_STATUS>**open/closed**</VALVE_4_STATUS>
<VALVE_4_LATCHED>**true/false**</VALVE_4_LATCHED>
<PUMP_OUT_ON> **true/false/unknown string** </PUMP_OUT_ON>
</HOPPER_DATA_RECORD>

</HOPPER_DREDGING_DATA>
Carriage return – ASCII value 13
Line Feed – ASCII value 10

Example

```
<?xml version="1.0"?>
<HOPPER_DREDGING_DATA version = "2.0">
  <DREDGE_NAME>Essayons</DREDGE_NAME>
    <HOPPER_DATA_RECORD>
        <DATE_TIME>04/11/2002 13:12:05</DATE_TIME>
       <CONTRACT_NUMBER>GDSNWP-11-G-0001</CONTRACT_NUMBER>
```

```
        <LOAD_NUMBER>102</LOAD_NUMBER>
        <VESSEL_X coord_type = "LL">-80.123333</VESSEL_X>
        <VESSEL_Y coord_type = "LL">10.123345</VESSEL_Y>
        <PORT_DRAG_X coord_type = "LL">-80.1233371</PORT_DRAG_X >
        <PORT_DRAG_Y coord_type = "LL">10.12335</PORT_DRAG_Y >
        <STBD_DRAG_X coord_type = "LL">-80.123339</STBD_DRAG_X >
        <STBD_DRAG_Y coord_type = "LL">10.123347</STBD_DRAG_Y >
        <HULL_STATUS>CLOSED</HULL_STATUS>
        <VESSEL_COURSE>258</VESSEL_COURSE>
        <VESSEL_SPEED>3.4</VESSEL_SPEED>
        <VESSEL_HEADING>302</VESSEL_HEADING>
        <TIDE>-0.1</TIDE>
        <DRAFT_FORE>10.05</DRAFT_FORE>
        <DRAFT_AFT>15.13</DRAFT_AFT>
        <ULLAGE_FORE>10.11</ULLAGE_FORE>
        <ULLAGE_AFT>10.22</ULLAGE_AFT>
        <HOPPER_VOLUME>2555.2</HOPPER_VOLUME>
        <DISPLACEMENT>4444.1</DISPLACEMENT>
        <EMPTY_DISPLACEMENT>2345.0</EMPTY_DISPLACEMENT>
        <DRAGHEAD_DEPTH_PORT>55.10</DRAGHEAD_DEPTH_PORT>
        <DRAGHEAD_DEPTH_STBD>53.21</DRAGHEAD_DEPTH_STBD
        <PORT_DENSITY>1.02</PORT_DENSITY>
        <STBD_DENSITY>1.03</STBD_DENSITY>
        <PORT_VELOCITY>22.1</PORT_VELOCITY>
        <STBD_VELOCITY>23.3</STBD_VELOCITY>
       <PUMP_RPM_PORT> 55 </PUMP_RPM_PORT>                <PUMP_RPM_STBD>
       54 </PUMP_RPM_STBD>
       <VALVE_1_LOCATION> Starboard Dragarm </VALVE_1_LOCATION>
       <VALVE_1_STATUS>open</VALVE_1_STATUS>
       <VALVE_1_LATCHED>true</VALVE_1_LATCHED>
       <VALVE_2_LOCATION> Port Dragarm</VALVE_2_LOCATION>
       <VALVE_2_STATUS> closed</VALVE_2_STATUS>
       <VALVE_2_LATCHED>false</VALVE_2_LATCHED>
       <VALVE_3_LOCATION>Port Sea Chest</VALVE_3_LOCATION>
       <VALVE_3_STATUS> closed</VALVE_3_STATUS>
       <VALVE_3_LATCHED>false</VALVE_3_LATCHED>
       <VALVE_4_LOCATION>Starboard Sea Chest</VALVE_4_LOCATION>
       <VALVE_4_STATUS>open </VALVE_4_STATUS>
       <VALVE_4_LATCHED> false</VALVE_4_LATCHED>
        <PUMP_OUT_ON>false</PUMP_OUT_ON>
       </HOPPER_DATA_RECORD>
</HOPPER_DREDGING_DATA>
<cr>
<lf>
<DREDGE_NAME>Essayons</DREDGE_NAME>
   <HOPPER_DATA_RECORD>
        <DATE_TIME>04/11/2002 13:12:10</DATE_TIME>
       <CONTRACT_NUMBER>GDSNWP-11-G-0001</CONTRACT_NUMBER>
```

```
        <LOAD_NUMBER>102</LOAD_NUMBER>
        <VESSEL_X coord_type = "LL">-80.123334</VESSEL_X>
        <VESSEL_Y coord_type = "LL">10.123346</VESSEL_Y>
        <PORT_DRAG_X coord_type = "LL">-80.1233372</PORT_DRAG_X >
        <PORT_DRAG_Y coord_type = "LL">10.12336</PORT_DRAG_Y >
        <STBD_DRAG_X coord_type = "LL">-80.123340</STBD_DRAG_X >
        <STBD_DRAG_Y coord_type = "LL">10.123348</STBD_DRAG_Y >
        <HULL_STATUS>CLOSED</HULL_STATUS>
        <VESSEL_COURSE>259</VESSEL_COURSE>
        <VESSEL_SPEED>3.5</VESSEL_SPEED>
        <VESSEL_HEADING>300</VESSEL_HEADING>
        <TIDE>-0.1</TIDE>
        <DRAFT_FORE>10.00</DRAFT_FORE>
        <DRAFT_AFT>15.15</DRAFT_AFT>
        <ULLAGE_FORE>10.15</ULLAGE_FORE>
        <ULLAGE_AFT>10.20</ULLAGE_AFT>
        <HOPPER_VOLUME>2555.5</HOPPER_VOLUME>
        <DISPLACEMENT>4444.0</DISPLACEMENT>
        <EMPTY_DISPLACEMENT>2345.0</EMPTY_DISPLACEMENT>
        <DRAGHEAD_DEPTH_PORT>55.15</DRAGHEAD_DEPTH_PORT>
        <DRAGHEAD_DEPTH_STBD>53.19</DRAGHEAD_DEPTH_STBD
        <PORT_DENSITY>1.00</PORT_DENSITY>
        <STBD_DENSITY>1.01</STBD_DENSITY>
        <PORT_VELOCITY>22.5</PORT_VELOCITY>
        <STBD_VELOCITY>23.3</STBD_VELOCITY>
       <PUMP_RPM_PORT> 55 </PUMP_RPM_PORT>                <PUMP_RPM_STBD>
       54 </PUMP_RPM_STBD>
       <VALVE_1_LOCATION> Starboard Dragarm </VALVE_1_LOCATION>
       <VALVE_1_STATUS>open</VALVE_1_STATUS>
       <VALVE_1_LATCHED>true</VALVE_1_LATCHED>
       <VALVE_2_LOCATION> Port Dragarm</VALVE_2_LOCATION>
       <VALVE_2_STATUS> closed</VALVE_2_STATUS>
       <VALVE_2_LATCHED>false</VALVE_2_LATCHED>
       <VALVE_3_LOCATION>Port Sea Chest</VALVE_3_LOCATION>
       <VALVE_3_STATUS> closed</VALVE_3_STATUS>
       <VALVE_3_LATCHED>false</VALVE_3_LATCHED>
       <VALVE_4_LOCATION>Starboard Sea Chest</VALVE_4_LOCATION>
       <VALVE_4_STATUS>open </VALVE_4_STATUS>
       <VALVE_4_LATCHED> false</VALVE_4_LATCHED>
        <PUMP_OUT_ON>false</PUMP_OUT_ON>
       </HOPPER_DATA_RECORD>
</HOPPER_DREDGING_DATA>
<cr>
<lf>
```

3.2.9 Data Reporting

The system shall transmit correctly formatted event data XML strings to the DQM Database continuously from mobilization until the last USACE post-dredging survey has been accepted. If the internet connection (section 3.2.6) is non-operable, manual backups from the dredge computer of the XML data string which would have been transmitted to the DQM computer over the serial connection shall be performed for each day the device is inoperable and submitted to the DQM center within 48 hours. This submission does not replace the requirement of correcting the issue affecting automatic transmission of data. In the event of data transfer, transmission, or hardware failure; a manually recorded disposal log shall be maintained. It shall consist of a series of events. These events are: start of dredging, end of dredging, pre-disposal and post-disposal events. Each event shall include: time stamp (GMT), position (Latitude and Longitude WGS84), draft, ullage, volume and displacement. Disposal logs shall be submitted on a daily basis to the Contracting Officer's Representative during the time when the system is not operational.

3.2.10 Contractor Data Backup

The Contractor shall maintain an archive of all data sent to the DQM computer during the dredging contract. The COR may require, at no increase in the contract price, that the Contractor provide a copy of these data covering specified time periods. The data shall be provided in the XML format which would have been transmitted to the DQM computer. There shall be no line breaks between the parameters; each record string shall be on separate line. Naming convention for the files shall be <dredgename>_<StartYYYYMMddhhmmss>_<EndYYYYMMddhhmmss>.txt . Data submission shall be via storage medium acceptable to the COR.

At the end of the dredging contact, the Contractor shall contact the National DQM Support Center prior to discarding the data to ensure it has been appropriately archived. The Contractor shall record in a separate section at the end of the dredge's on-board copy of the DPIP the following information:

a. Person who made the call
b. The date of the call
c. The DQM representative who gave permission to discard

The same day of the phone call and prior to discarding the data, the Contractor shall submit a "Data Appropriately Archived e-mail" to the local districts Contracting Officer's Representative with the above information, and Cc: the DQM Support Center representative providing permission. In addition to the above information, also include in the e-mail:

d. Project name and contract number
e. Dredge start and end dates
f. Name of hopper dredge

3.3 PERFORMANCE REQUIREMENTS

The Contractor's DQM system shall be fully operational at the start of dredging operations and fully certified prior to moving dredge material on the contract (see Section 1.4, National Dredging Quality Management Program Certification). To meet contract requirements for operability, in addition to certification, the Contractor's system shall provide a data string with values for all parameters while operating, as described within the specifications. Additionally, all hardware shall be compliant with hardware requirements (Section 3.2). Quality data strings are considered to be those providing values for all parameters reported when operating according to the specification. Repairs necessary to restore data return compliance shall be made within 48 hours. If the Contractor fails to report required data within the specified time window for dredge measurements (see Sections 3.2.7 "Data Measurement Frequency" and 3.2.9 "Data Reporting"); the system will be declared not fully operational, and the Contractor will be assessed liquidated damages equivalent to the additional oversight hours that would be required for Corps personnel to be on site from the first full day after the system is deemed not operational through to the time when the system is returned to fully operational status. For this contract, the liquidated damages shall be ***$***_____ per day. *(A spread sheet of how to calculate this is available at the DQM support center; this is NOT just the DQM day rate)*

3.4 COMPLIANCE QUALITY ASSURANCE CHECKS

Quality assurance checks are required prior to the commencement of dredging, and at the discretion of a COR periodically throughout the duration of the contract. Detailed instructions for performing these checks and a spreadsheet for recording the results are available at http://dqm.usace.army.mil/Certifications/Index.aspx . Incoming data shall be periodically reviewed to assure compliance with performance requirements outlined in section 3.3. In addition to making sure the data received meets the reporting requirements outlined in the sub sections under section 3.1, a more detailed description of some of the quality assurance methods are outlined below.

For annual instrumentation checks and compliance monitoring, the DQM Data Acquisition Team personnel attempt to be as flexible as possible in performing their checks so as not to delay work; however, in order to expedite matters as much as possible, it is necessary that they receive the support and cooperation of the local district and dredging contractor. The dredging contractor shall coordinate pickup times and locations and provide transportation to and from any platform with a DQM certified system in a timely manner. Calibrations to the sensors should already be performed before DQM personnel arrive on site.

3.4.1 Draft & Displacement Check

The COR shall periodically verify the accuracy of the fore and aft system reported draft values by comparing the vessel hull draft marks to the corresponding sensor readings indicated on the DQM screen. The vessel's hull draft reading shall be viewed from a contractor supplied auxiliary vessel circling the dredge. The COR shall review the difference between averaged drafts recorded by the instruments and those estimated from the draft marks to insure that the system is operating within the acceptable accuracy of

approximately ± 0.1 ft. in calm seas conditions. Reported draft values will be verified light, loaded, and at other intervals at the discretion of the COR. If sensors responsible for collecting draft values are not located on centerline, verification may be required under different trim and list conditions. If values are outside the acceptable range, the Contractor shall re-calibrate or repair system components as necessary. This check may be performed separately or as a part of the Water Load Test. For each system provided fore and aft draft, an average draft value will be calculated during the draft check, and the corresponding displacement will be verified longhand using the supplied draft/displacement tables.

3.4.2 Draghead Depth Check

The COR may require periodic calibration checks of the reported draghead depth using manual means such as tape measures or sounding lines to directly measure draghead depth. The Contractor shall furnish a steel tape, chain, or wire with clearly visible flags/tags placed at 1 foot increments within the operational range of the dragarm. These devices shall be capable of measuring the depth below the water surface to the lowest fixed point of each draghead (often the heel) with sufficient length to measure 5 feet more than the maximum project depth. Pressure sensors may be used to verify calibration of the draghead sensors only in areas where current flow past the vessel/dragarm cannot be reduced sufficiently to allow safe handling of manual measuring devices. Pressure sensors, used for this purpose shall be vented pressure gages and shall be subjected to an annual manufacturer's calibration. Prior to the dragarm depth check, the sensor shall be checked at a known depth, and may be required to be zeroed at this point according to manufacturer's specifications. Care shall be taken not to kink the cable or restrict the vent during deployment.

The COR shall review the draghead depth data to insure that the system is operating within acceptable accuracy, and may direct the Contractor to re-calibrate or repair system components as necessary. If a bubbler type system is used, weekly calibration of the draghead sensors is recommended, as they are sensitive to environmental conditions.

3.4.3 Ullage Sounding & Volume Check

The COR shall periodically check the reported hopper ullage sounding using a tape measure or other distance measuring device. The Contractor shall furnish a clearly readable weighted tape, marked in tenths of a foot, capable of measuring throughout the full range of hopper depth. The weight for this tape shall be a 6-inch diameter disk weighing between 2 and 3 pounds. The COR shall review the hopper dredge ullage sounding data to insure that the system is operating within acceptable accuracy (0.1 feet). Reported ullage soundings will be verified light, loaded, and at other intervals at the COR's discretion. Measurements can be taken from multiple locations along the combing or from sensor location at the COR's discretion. If values are outside the acceptable range, the Contractor shall re-calibrate or repair system components as necessary. This check may be performed separately or as a part of the Water Load Test. For each sensor provided fore and aft ullage sounding value, an average ullage sounding value will be calculated during the ullage sounding check, and the corresponding volume will be verified longhand using the supplied hopper volume tables.

3.4.4 Position Check

During the QA checks the reported position of the dredge shall be verified by comparison with readings from a handheld GPS receiver. Throughout the contract, the COR shall periodically take readings from an independent GPS to verify locations.

3.4.5 Water Load Test

Water Tests shall consist of pumping the hopper dredge out to its lowest level and then filling it to capacity with water, taking ullage and draft measurements at both levels to determine hopper dredge volume and displacement. The objective of the water test is to validate the dredge's reported displacement and hopper volumes. If the results of the water test indicate that the system is not operating within acceptable accuracy, the Contractor shall correct the deficiencies causing the error, and repeat the water test until the results are acceptable.

The Contractor shall provide a handheld refractometer with automatic temperature compensation to measure the hopper dredge water specific gravity during water tests. The refractometer shall be capable of measuring the hopper dredge water specific gravity with a resolution of 0.001 and minimum accuracy of $\pm$ 0.001. The Contractor shall also provide a water-sampling device to retrieve a sufficient volume of water from various depths in the hopper dredge to accurately determine specific gravity with the refractometer, and a sufficient volume of deionized water for calibration of the device.

3.5 CONTRACTOR QUALITY CONTROL

Dredging contractor shall designate a quality control systems manager (QCSM), who shall develop and maintain daily procedures to ensure the contractor's quality control (CQC) of the DQM system. These methods shall include a procedure by which data being collected is checked against known values, telemetry is verified to be functioning, and the DQM computer is verified to be on and the DQMOBS is running. The Contractor Quality Control Plan which describes these methods and procedures shall be included in the DPIP as per section 1.5 Table of Contents, item 27. This is the only section which shall be submitted to the local district and is a required submittal prior to the start of the contract. CQC Reports may be required at the discretion of the QAR daily. Annotations shall be made in the CQC Report documenting all actions taken on each day of work including all deficiencies found and corrective actions taken.

3.6 LIST OF ITEMS TO BE PROVIDED BY THE CONTRACTOR

DPIP	Sec 1.5 Dredge Plant Instrumentation Plan
DQM SYSTEM	
Sensor Instrumentation	Sec. 3.1 Specifications for Reported Data
DQM Computer	Sec. 3.2 National Dredging Quality Management System Requirements
DREDGE DATA	

Event documentation	Sec. 3.2.9 Data Reporting
Dredge Data Backups	Sec 3.2.10 Contractor Data Backups

QA EQUIPMENT ON DREDGE

Ullage tape	Sec. 3.4.3 Ullage Sounding & Volume Check
Dragarm depth chain	Sec. 3.4.2 Draghead Depth Check
Refractometer –measuring in grams/cubic centimeter with a resolution of 0.001 and a minimum accuracy of $\pm$ 0.001 with calibration water	Sec. 3.4.5 Water Load Test
Water sampling device	Sec. 3.4.5 Water Load Test