Appendix F

Dredged Material Management Plan

DREDGED MATERIAL MANAGEMENT PLAN

PORT OF GULFPORT EXPANSION PROJECT

Prepared for

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LIST OF ACRONYMS AND ABBREVIATIONS

µg	microgram
AD	after dredge
Baker	Michael Baker Jr., Inc.
BD	before dredge
BMC	Biloxi Marsh Complex
BMP	Best Management Practices
BP	before placement
BU	beneficial use
BUG	Beneficial Use Group
CFR	Code of Federal Regulations
CY	cubic yard
D/A	disposal area
DEM	Digital Elevation Model
DMMP	Dredged Material Management Plan
DU	dredge unit
EA	EA Engineering, Science, and Technology
EC_{50}	median effective (sub-lethal) concentration
EIS	Environmental Impact Statement
ELM	effects low range
ERM	effects range median
FNC	Federal Navigation Channel
kg	kilogram
KHz	kilohertz
LC_{50}	median lethal concentration
LF	linear foot
LPC	limiting permissible concentration
MCY	million cubic yards
MDEQ	Mississippi Department of Environmental Quality
MDMR	Mississippi Department of Marine Resources

mg	milligram
MLLW	mean lower low water
MPRSA	Marine Protection Research Sanctuary Act
MRL	method reporting level
MsCIP	Mississippi Coastal Improvement Program
MSL	mean sea level
MSPA	Mississippi State Port Authority
NA	Not Applicable
NAVD88	North American Vertical Datum of 1988
NEPA	National Environmental Policy Act
NOAA	National Oceanic and Atmospheric Administration
NOI	Notice of Intent
NRC	National Response Center
NWR	National Wildlife Refuge
O&M	Operations and Maintenance
ODMDS	Ocean Dredged Material Disposal Site
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
PEL	probable effects level
PGRP, Program	Port of Gulfport Restoration Program
Plan	Master Plan for the Beneficial Use of Dredged Material for Coastal Mississippi
Port	Port of Gulfport
Project	Port of Gulfport Expansion Project
SERIM	Southeast Regional Implementation Manual
SMMP	Site Management and Monitoring Plan
SP	solid phase
SPP	suspended particulate phase
STFATE	Short-Term FATE
STWAVE	STeady-State Spectral WAVE
SVOC	semi-volatile organic compound

TBS	T. Baker Smith
TEF	Toxic equivalency factors
TEL	threshold effects level
TEQ	toxicity equivalency quotient
TEU	Twenty-foot Equivalent Unit
Thompson	Thompson Engineering, Inc.
TOC	total organic carbon
TPH	total petroleum hydrocarbon
TS	total solids
URS	URS Corporation
USACE	U.S. Army Corps of Engineers
USCS	Unified Soil Classification System
USEPA	U.S. Environmental Protection Agency
USFDA	U.S. Food and Drug Administration
USFWS	U.S. Fish and Wildlife Service
Weeks	Weeks Marine, Inc.
WQC	water quality criteria

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EXECUTIVE SUMMARY

The Dredged Material Management Plan (DMMP) is being developed in conjunction with an Environmental Impact Statement (EIS) for the Port of Gulfport (Port) Expansion Project (the Project). The Port proposes to expand the existing West Pier (155 acres) and East Pier (14.5 acres) Terminal facilities, which would provide additional operational areas for future concessions at the Port. The West Pier expanded areas would be constructed up to +25 feet North American Vertical Datum of 1988 (NAVD88). The remaining areas, including the East Pier and a North Harbor Fill area, would be constructed to an elevation of +12 to +14 feet NAVD88. To accommodate the increased traffic and larger vessels associated with expanding the Port, the Project also includes creation of a Turning Basin adjacent to the existing Anchorage Basin and the expanded West Pier. Finally, a breakwater would also be constructed along the eastern side of the existing channel to provide additional storm protection for the expanded facilities.

This DMMP evaluates the placement options for the dredged material from the expansion of the piers, construction of the Turning Basin, and maintenance dredging events. The Project will require removal and placement of approximately 7.68 million cubic yards (MCY) of sediment for the expansion of the piers and the creation of the Turning Basin.

This DMMP evaluates numerous dredged material placement alternatives for the Project. One alternative is to use the dredged material as fill for the West Pier Terminal Expansion. Another option is to place the materials in an existing U.S. Environmental Protection Agency (USEPA) designated Ocean Dredged Material Disposal Site (ODMDS). At the time of this DMMP, there is one available USEPA-designated ODMDS—the Pascagoula ODMDS.

The Beneficial Use (BU) alternatives include placement at the Chandeleur Islands and Biloxi Marsh Complex (BMC) in St. Bernard Parish, Louisiana, for shoreline nourishment. Finally, an upland disposal site, would be used if the dredged material was determined unsuitable for BU or ODMDS placement. Currently, the Harrison County Development Commission dredged material disposal site on the Industrial Seaway has capacity for up to 750,000 CY. This site would be suitable for the East Pier Expansion dredged material. Because of the limited capacity at the Harrison County site, another upland placement site would be needed

for dredged material from the West Pier Expansion and Turning Basin construction. An upland disposal site 30 miles north of the Port in Stone County has been identified as a potential placement site for the dredged material.

The DMMP also includes placement alternatives for the material from the maintenance dredging of the proposed Turning Basin and West Pier, North Harbor, and East Pier berthing areas. The estimated 30-year maintenance quantity is between 14.6 and 40.3 MCY. Thin-layer placement in the open-water sites to the west of the Federal Navigation Channel (FNC) and placement in the Pascagoula ODMDS are two alternatives evaluated for the maintenance dredged material. Deer Island, which was one of the sites identified in the State of Mississippi BU Master Plan, was also evaluated as a placement option for the Turning Basin and West Pier, North Harbor, and East Pier berthing areas maintenance dredged material.

Dredged material placement sites are evaluated based on the cost associated with dredging; environmental consequences; cost and method of transport; and the available or estimated capacity. For the West and East Pier and the Turning Basin improvements, the BMC in St. Bernard Parish, Louisiana, is the recommended placement site for the dredged material. The Mississippi Department of Marine Resources (MDMR) submitted a permit application to the U.S. Army of Engineers (USACE) and Louisiana Department of Natural Resources in February 2016 to permit the BMC as a BU site for placement of the dredged materials. Thin-layer placement within the Mississippi Sound is the recommended alternative for the maintenance dredged material from the Turning Basin and West Pier, North Harbor, and East Pier berthing areas.

1 INTRODUCTION

The Dredged Material Management Plan (DMMP) is being developed in conjunction with an Environmental Impact Statement (EIS) for the Port of Gulfport (Port) Expansion Project (the Project). The DMMP will evaluate the management alternatives for the dredged material from the construction and maintenance of the Project. As outlined in the EIS, the proposed Project includes increasing the footprint of the existing West Pier, East Pier, North Harbor, and the Anchorage Basin.

1.1 Background

The Port of Gulfport, located in the Mississippi Sound in Harrison County, Mississippi, is approximately 5 miles south of Interstate 10 (I-10; Figure 1-1). The current operational facility is approximately 369 acres and was initially constructed in 1902 as part of the Gulf and Ship Island Railroad venture.

In 1998, the U.S. Army Corps of Engineers (USACE) issued a permit (Permit Number MS96-02828-U) to the Port for an 84-acre expansion to the existing West Pier Terminal. During construction of the first two phases of this project, Hurricane Katrina made landfall (August 29, 2005) on the Mississippi Gulf Coast. The storm significantly damaged the Port's existing infrastructure and the West Pier Expansion. Through available Community Development Block Grant funds, the Port has initiated the Port of Gulfport Restoration Program (PGRP, the Program), which aims to restore the facility to its pre-Katrina status and complete the renovations interrupted by the storm.

1.2 Project Description

On March 11, 2011, the USACE Mobile District filed a Notice of Intent (NOI), in accordance with the National Environmental Policy Act (NEPA) process, to develop an EIS for the Project. The Project, as described in the NOI (SAM-2009-1768-DMY, issued April 16, 2010), has been altered from its initial scope. Initially, approximately 700 acres of open water in the Mississippi Sound were proposed to be filled to expand the collective footprint of the Port. The modified Project scope entails filling a smaller footprint of approximately 282 acres. The reduced footprint decreases the overall amount of fill necessary for expansion and will no longer impact the existing Anchorage Basin or Federal Navigation Channel (FNC).

In addition, the proposed Project includes the construction of wharfs, bulkheads, terminal facilities, container storage areas, intermodal container transfer facilities, infrastructure and a breakwater, and dredging and dredged material placement (Federal Register 2011). The expanded terminal footprint will have a finished elevation of up to +25 North American Vertical Datum of 1988 (NAVD88) at the West Pier and +12 to +14 feet NAVD88 in the remaining areas to mitigate impacts to the Port's infrastructure. The total Project will require removal and placement of 7.68 million cubic yards (MCY) of sediment. Sections 1.2.1 to 1.2.5 provide a more detailed description the project components.

1.2.1 West Pier Terminal Expansion

The goal of the West Pier Terminal Expansion is to develop a multiuse concession that adjoins the southern end of the existing West Pier. The proposed expansion area will extend the West Pier footprint approximately 3,500 linear feet (LF), adding approximately 155 acres to the existing facility (Figure 1-2). The operations, storage, and berthing capacity of the expanded area will result in a potential through-put capacity of up to 1.7 million Twenty-foot Equivalent Units (TEUs) per year (CH2M HILL 2010b). Dredging for the West Pier includes removal of soft sediments prior to fill placement and 30-year maintenance dredging of the proposed berths.

1.2.2 East Pier Terminal Expansion

The East Pier Terminal Expansion proposes to add approximately 14.5 acres (Figure 1-2) for rail operations and additional warehouse storage space. An additional berth is proposed on the southwestern corner of the East Pier Expansion. The dredging for the East Pier includes removal of soft sediments prior to fill placement and 30-year maintenance dredging of the proposed berth.

1.2.3 North Harbor Fill Area

The Project proposes to fill approximately 9 acres of the former berth of the Copa Casino vessel in the North Harbor (Figure 1-2). The proposed design also includes construction of a new berthing area. The dredging for the North Harbor includes berth construction and future maintenance dredging.

1.2.4 Turning Basin Construction

The Turning Basin will support the increased traffic resulting from the West Pier Terminal Expansion. The proposed 85-acre Turning Basin is adjacent to the existing Anchorage Basin (Figure 1-2). The Turning Basin would be dredged to a depth of -36 feet mean lower low water (MLLW) plus 2 feet of advance maintenance and 2 feet of allowable overdepth. The DMMP evaluation includes the dredging associated with the Turning Basin construction and maintenance dredging.

1.2.5 Eastern Breakwater

A proposed breakwater along the eastern side of the FNC will provide storm protection to the Project berthing areas. The proposed 4,000 LF breakwater footprint (Figure 1-2) covers approximately 18 acres. A breach mid-way along the alignment of the structure will allow shallow-draft access to and from the FNC to the Bert Jones Yacht basin. Several breakwater alignments have been analyzed as part of the Project (Baker 2011) and are discussed in Section 4.4.

1.3 Purpose and Scope

The purpose of this DMMP is to evaluate the best material management alternatives for the placement of material dredged from the construction and maintenance of the Expansion Project. The main goals of the DMMP are as follows:

- Determine the dredging history for the Port
- Review sediment transport trends and shoaling rates
- Calculate volumes for dredging the West Pier and East Pier Expansion and Turning Basin construction alternatives
- Determine the sediment characteristics of the proposed dredge material
- Determine Beneficial Use (BU) criteria and alternatives
- Review the screening requirements and capacities for the existing U.S. Environmental Protection Agency (USEPA) Ocean Dredged Material Disposal Site (ODMDS)
- Develop and analyze alternatives for dredged material placement alternatives

For this DMMP, the dredged material placement alternative analysis is based on availability, placement logistics, and costs. A global assessment of the environmental impacts for each

alternative is beyond the scope of this DMMP. Such an analysis is relevant and included as part of an EIS to assess the effects of the proposed alternatives.

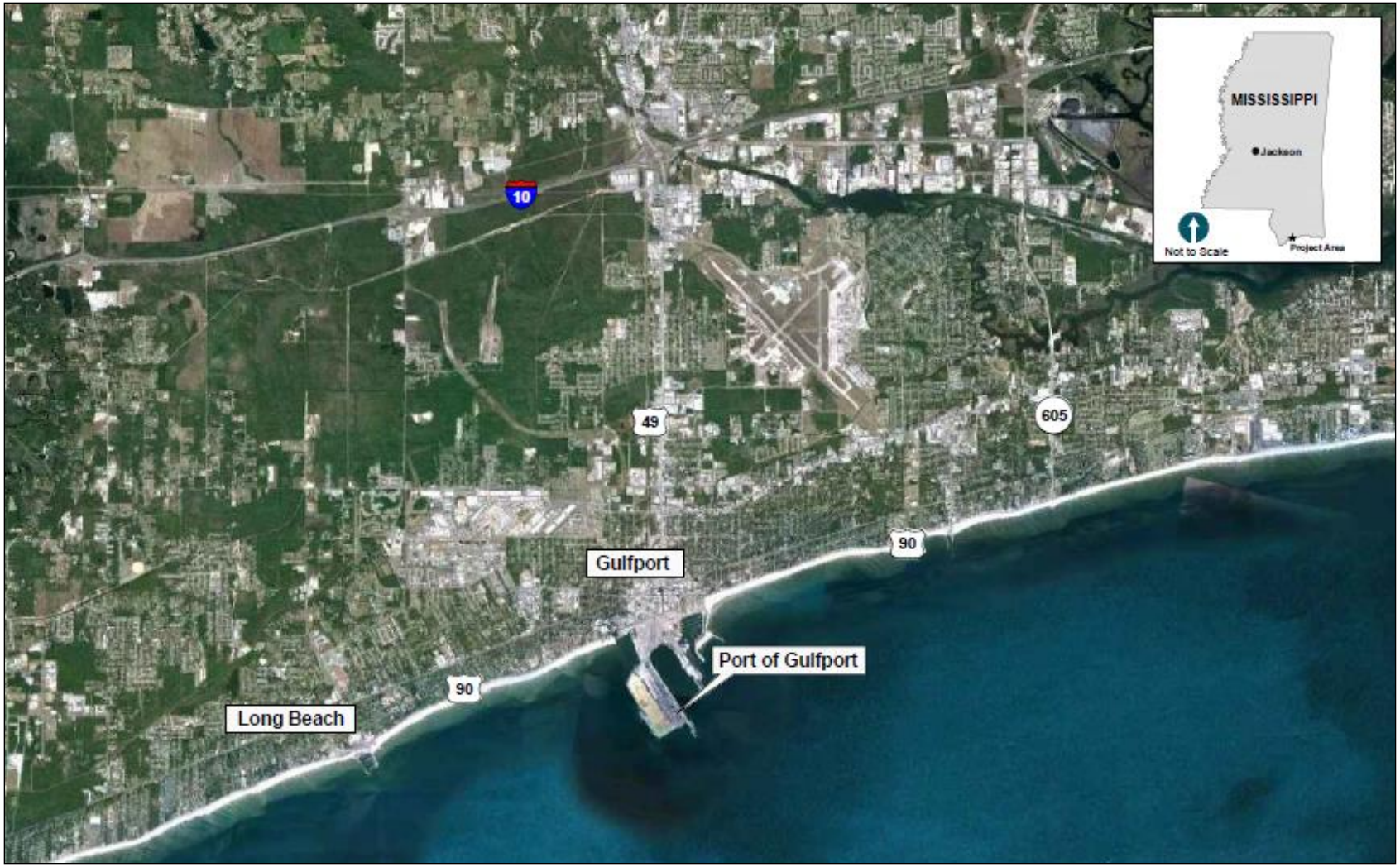

Figure 1-1

Port of Gulfport Location Map

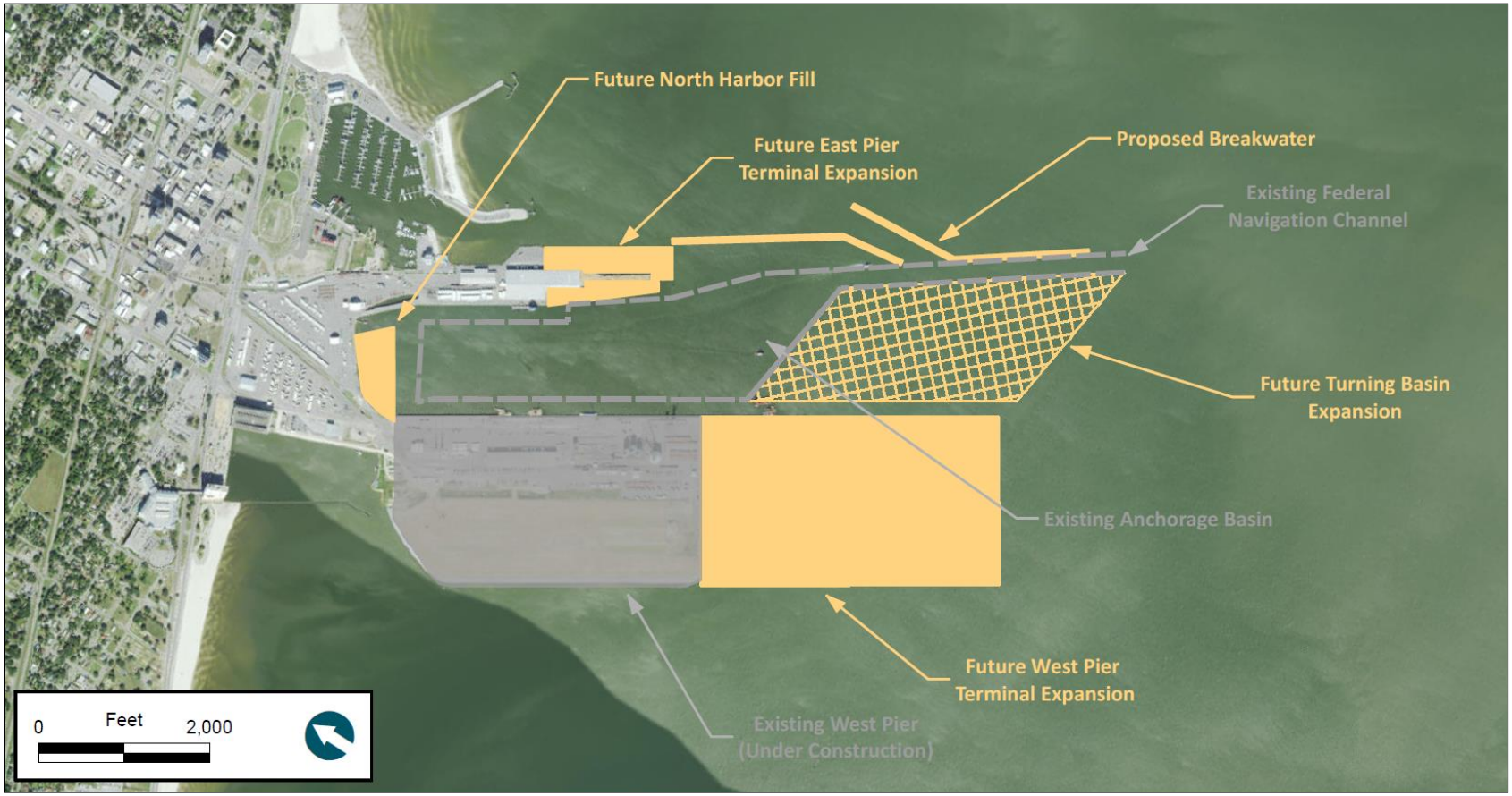

Figure 1-2

Port of Gulfport Proposed Expansion

2 EXISTING CONDITIONS

2.1 Port of Gulfport

The 264-acre Port of Gulfport consists of the West and East Pier Terminals, North Harbor, and berthing facilities. Facilities at the Port include rail, storage buildings, open container storage, dockside berths, off dock storage, open bulk and break-bulk storage, and a container freight station (MSPA 2015).

2.2 Anchorage Basin

The 105-acre Anchorage Basin extends from station 0+00 at the north to the entrance of the Sound Channel at station 50+75 and is divided into north and south sections. The northern section of the Anchorage Basin (station 0+00 to 15+49) has an authorized -32 feet MLLW maintenance depth and a width of 1,100 feet. The southern end (station 15+49 to 50+75) is authorized to be maintained at a depth of -36 feet MLLW with varying widths to accommodate the entrance at the Sound Channel; it is 1,360 feet at its widest point (USACE 2011).

2.3 Sound Channel

The 11-mile Sound Channel (station 50+75 to 610+34) of the FNC extends southward from the Port's Anchorage Basin and connects the Port with the deeper and wider Bar Channel. The Sound Channel segment is maintained at a depth of -36 feet MLLW and a width of 300 feet.

3 DREDGING HISTORY

To assess the shoaling rates for the proposed Turning Basin and West Pier, North Harbor, and East Pier berthing areas maintenance dredging, a comprehensive dredging history for the Gulfport Anchorage Basin and upper Sound Channel was developed for this DMMP.

The dredging history assessment for the Turning Basin construction includes an evaluation of all USACE dredging contracts from 1960 to 2011. The primary sources included the cutterhead dredging history cards (USACE 2011). The dredging history cards provide characteristic site data for each dredging event at the Port, including, but not limited to:

- Location
- Production rates
- Cubic yards (CY; net and gross)
- Dredged depth
- Disposal areas (D/A)

3.1 Historical Dredging Data

Table 3-1 provides a summary of the USACE historical dredging data from 1960 to 2015 for the Gulfport Sound Channel and the Anchorage Basin. Some of the USACE dredging events included removing material from the Bar and Gulf Channel segments. The USACE records did not contain any dredging history for the Port berths.

As shown in Table 3-1, the USACE has dredged the Sound Channel almost every year since 1960. From 1992 to 1993, the USACE deepened the channel to -36 feet MLLW (Sound Channel) and -40 feet MLLW (Bar and Gulf Channels), removing approximately 19 MCY of material from the channel. The last maintenance dredging event for the Anchorage Basin and upper Sound Channel was completed in July 2015. The USACE contractor removed 561,897 CY total from the 5,075-foot-long Anchorage Basin, with more than 324,000 CY dredged from the southern 1,650 feet of the area where the basin widens from 300 feet to 750 feet. They dredged 136,000 CY in the upper 2,025 feet of the Sound Channel. Due to funding, the USACE was unable to dredge the Anchorage Basin and the upper Sound Channel to maintenance depths. Therefore, the 2015 dredging volumes were not included in the Section 4 shoaling analysis calculations.

The maintenance dredging of the Port facilities is the responsibility of the Port and is currently addressed in the September 11, 2009, USACE permit SAM-2009-00433-JBM (USACE 2009b; Appendix A). The permit expires on August 7, 2019, and includes maintenance dredging for the berths along the north and south harbor and the commercial small craft harbor and entrance channel. The Port facility estimated cumulative maintenance dredging quantity for the 10-year period is 200,000 CY.

Table 3-1
Port of Gulfport Historical Dredging Information from 1960 to 2015

Dredging Dates		Gross Yardage (CY)	Dredging Location
Start	Finish		
March 1960	May 1960	991,471	Channel & Basin
May 1961	June 1961	824,955	Channel & Basin
October 1962	March 1963	8,793,914	Channel & Basin
January 1964	February 1964	3,458,638	Channel
January 1965	February 1965	4,340,836	Channel
December 1965	December 1965	1,658,042	Channel
October 1966	December 1966	4,223,603	Channel & Basin
December 1967	February 1968	5,065,915	Channel & Basin
June 1969	August 1969	5,931,005	Channel & Basin
July 1970	October 1970	4,914,935	Channel & Ship Island Point
August 1971	November 1971	5,081,368	Channel & Basin
February 1973	April 1973	3,909,741	Channel & Basin
June 1974	October 1974	5,212,956	Channel & Basin
March 1976	March 1976	4,440,132	Channel & Basin
May 1977	July 1977	3,225,888	Channel
December 1978	February 1979	2,570,847	Channel & Basin
January 1980	April 1980	3,192,053	Channel, Basin, Ship Island Point, & Borrow Area
December 1980	February 1981	4,351,263	Channel & Basin
August 1982	November 1982	5,085,470	Channel, Basin, Ship Island Point, & Bar Channel
October 1983	December 1983	5,296,500	Channel, Basin, & Ship Island Point
March 1985	June 1985	4,536,886	Channel, Basin, & Small Craft Harbor
September 1986	December 1986	5,062,411	Channel, Basin, Ship Island Point, & Bar Channel
April 1988	May 1988	5,975,889	Channel, Basin, & Bar Channel
July 1988	November 1988		

Dredging Dates		Gross Yardage (CY)	Dredging Location
Start	**Finish**		
August 1991	October 1991	4,659,961	Channel, Basin, Ship Island Point
May 1992	December 1993	18,899,845	Channel Deepening
June 1995	July 1995	2,469,212	Channel & Ship Island Point
September 1996	October 1996	9,073,044	Channel, Basin, Ship Island Point
November 1998	December 1998	4,883,333	Channel & Basin
January 2000	March 2000	2,909,800	Channel & Basin
July 2001	October 2001	3,030,326	Channel
January 2003	April 2003	4,249,413	Channel
July 2004	November 2004	2,739,041	Channel & Basin
November 2005	February 2006	2,157,483	Channel & Basin
September 2007	November 2007	5,105,006	Channel
March 2009	August 2009	5,171,419	Channel
April 2009	August 2009	2,145,713	Basin
March 2011	July 2011	1,881,000	Channel & Basin
March 2015	July 2015	697,897	Basin & Upper Sound Channel

4 SHOALING ANALYSIS

Shoaling was analyzed to estimate the dredging frequency of the proposed Turning Basin. Sediment transport rates in the Mississippi Sound region determine the shoaling rates and dredging frequency of the Anchorage Basin and Sound Channel. The USACE (1976) attributes the accumulation of silts and muds in the area of the Port to the relatively low-energy environment along the Mississippi Sound, which receives suspended and longshore sediment loads from the Mobile and the Pascagoula River basins. The processes reduce the overall energy of the predominate east-to-west current and resupply the Mississippi Sound with sediments from coastal runoff (USACE 1976).

A sediment transport analysis was performed for the USACE as part of the Mississippi Coastal Improvement Program (MsCIP) to quantify a regional sediment budget for the Mississippi Gulf Coast. The analysis presents a general assessment of the nearshore sediment transport rates along the Harrison County shoreline but does not address sediment transport within the Mississippi Sound (Rosati et al. 2009). In an effort to present localized shoaling rates for the site-specific areas of the Project, short- and long-term shoaling rates developed from the USACE FNC condition surveys and dredging history cards (Section 3) supplement the information presented in the sediment transport analysis. The history cards indicate a general east-to-west deposition into the channel.

4.1 MsCIP Sediment Transport Analysis

The MsCIP sediment transport analysis includes a comprehensive evaluation of the current coastal conditions and processes (Rosati et al. 2009). Comprehensive modeling was performed as part of the analysis to determine the typical annual wave climate along the Mississippi Gulf Coast shoreline and to develop longshore sediment transport rates. The model results were then used to calculate a sediment budget for the coastline areas. The analysis covers 135 years and indicates the following (Rosati et al. 2009):

- The general longshore sediment transport direction for the Mississippi mainland coast is east to west except in areas with high amounts of vegetation or manmade structures that alter the direction and intensity of the longshore transport.
- The long-term shoreline change (retreat and loss) along the Harrison County beach is 0.7 feet per year.

- The Harrison County shoreline is a stable system that is not prone to accretion or erosion.

The analysis did not investigate the local deposition of sediment along the Anchorage Basin or the FNC. For the DMMP shoaling analysis, the Anchorage Basin and the Sound Channel are assumed to be stable and steady state areas that do not experience erosion.

4.2 Turning Basin Short-Term Shoaling Rates

As part of the routine maintenance of the FNC, the USACE performs annual and sometimes semi-annual channel condition surveys to evaluate navigation conditions between dredging events. To determine the short-term shoaling rates for the proposed Turning Basin, an analysis of the 2006 to 2011 survey datasets was conducted for sections of the lower Anchorage Basin and upper Sound Channel. The period of analysis represents conditions immediately following Hurricane Katrina in 2005.

The USACE provided 2006 to 2011 condition survey data for the lower Anchorage Basin (27+00 to 50+74) and the upper Sound Channel (50+74 to 70+00). Some of the surveys provided by the USACE were performed as check surveys during regular maintenance dredging events; however, these datasets, identified by cross-referencing the collection date and the dredging event dates, are not used in this analysis. In addition to the USACE surveys, the 2011 maintenance dredging contractor, Weeks Marine, Inc. (Weeks), provided the after dredge (AD) survey data for the areas listed above.

The Weeks AD survey was used as a baseline condition for the short-term shoaling analysis. Each interim condition survey was compared to the "typical" AD survey cross section. The difference between the surveys was reported as a shoaling volume in CY. The shoaling rate (CY/Month) is the quotient of the dredged quantity and the time elapsed (months) between the dredging and survey events. The calculated shoaling rates were then divided by the total dredging length to provide a shoaling rate per LF as follows: CY/Month/LF. Once the results for each dredging event were calculated, they were averaged to formulate the short-term shoaling rates in Table 4-1. To complete the analysis, it was assumed Hurricane Katrina introduced large volumes of sediment into the channel and elevated the shoaling volumes.

This assumption can be validated by reviewing the dredging rates for the Anchorage Basin and Sound Channel pre- and post-Katrina. As shown in Figure 4-1, the pre-Katrina dredging rate was approximately 2,689,000 CY/year, and the post-Katrina dredging rate is greater than 1.5 times this rate at 4,072,000 CY/year. These increased dredging rates should therefore be considered when comparing the short-term shoaling rates presented in this section with the long-term rates presented in Section 4.3.

A total of 22 surveys were analyzed between channel stations 27+00 to 70+00 within the Project area: eight Anchorage Basin surveys and 14 Sound Channel surveys. Based on the results shown in Table 4-1, the Anchorage Basin and the Sound Channel experience localized sediment accumulation over time. The results do not contradict the analyses completed as part of the MsCIP studies (Rosati et al. 2009), as the Anchorage Basin and Sound Channel were grouped as an entire system, and the analyses considered the effects of dredging.

Table 4-1
USACE Conditions Survey Analysis (2006 to 2011)

Value	Location	
	Anchorage Basin	Sound Channel
Average Time Between Surveys (MONTH)	4.7	4.7
Net Sediment Shoaling Volume (CY)	128,108	28,932
Average Shoaling Rate (CY/MONTH/LF)	1.2	5.8

One item to note is that condition survey data in the Project areas of the existing Sound Channel are subject to variability due to a fluid mud layer, which can become resuspended in the water column as a result of vessel movement, winds, and tides (McAnally et al. 2007a, 2007b; USACE 2002, 2009a). Additionally, acoustic surveying methods are dependent on several factors, including the transducer frequency (24 versus 200 kilohertz [KHz]; USACE 2002). Resuspended fluid mud material could induce backscatter and indicate a "false bottom," which causes large inaccuracies when determining the bathymetry along a survey transect (McAnally et al. 2007b; Welp 2011[1]) and can ultimately affect the calculation

[1] The presentation by Welp (2011) provides a figure showing the difference in channel bottom elevation based on survey method. The total yardage for the test cross section was calculated, and the difference between the results of the 200 KHz and 41 KHz surveys is 286,150 CY.

of cumulative shoaling volumes. The effect on navigation cannot be completely assessed, as the USACE and vessel pilots have not quantified or defined "navigable" depth resulting from fluid mud impacts. For the shoaling rate analysis comparison of the before dredging (BD), AD, and condition surveys, it was assumed that all material, including any fluid mud, was removed from the dredging prism. Therefore, there was no need to increase the dredging quantities and shoaling rates to account for fluid mud.

4.3 Turning Basin Long-Term Shoaling Rates

The dredging dates and quantities from the Anchorage Basin and Sound Channel dredging history (Section 3) were used to estimate the long-term shoaling rates. The analysis includes all 16 maintenance dredging events from 1995 to 2009 channel deepening (ten events for the Sound Channel and six events for the Anchorage Basin).

Tables 4-2 and 4-3 summarize the results of the long-term shoaling analysis for the Gulfport Sound Channel and the Anchorage Basin. The large volume from the 1996 dredging event in Table 4-2 appears to be due to Hurricane Opal (1995). Figure 4-1 provides the cumulative dredging quantity for the Anchorage Basin and Sound Channel during this time period. The shoaling rate (CY/Month) is the quotient of the dredge quantity and the time elapsed (months) between the dredging events. The calculated shoaling rates were then divided by the total dredging length to provide a shoaling rate per LF as follows: CY/Month/LF. The CY/Month/LF values were then used to evaluate the potential shoaling rates for the Turning Basin construction. The estimated maintenance dredging rate for the Anchorage Basin and the Sound Channel from 1995 to 2009 is the slope of the trend line, 2.6 MCY per year, shown in Figure 4-1.

A summary of the calculated shoaling rates, including hurricane events, is provided in Table 4-4. In addition to the short- and long-term shoaling analyses described above, a short-term analysis (Table 4-5) was performed using the dredging quantity data provided by Weeks for the most recent dredging event for the Anchorage Basin and upper Sound Channel. The calculated shoaling rates are consistent with those displayed in the final years of the long-term analyses.

As shown in Table 4-4, the average shoaling rate since the completion of the 1992 deepening is 4 CY/Month/LF for the Anchorage Basin and 6 CY/Month/LF for the upper Sound Channel. Using the average shoaling rates, the average annual shoaling in the proposed 4,400 LF Turning Basin and berthing areas will vary from 211,000 to 317,000 CY per year. The estimated total shoaling over the 30-year life of the Turning Basin project ranges from 6.3 to 9.5 MCY. The shoaling will likely redistribute within the larger basin footprint based on the hydrodynamic forces within the revised system, including vessel traffic and wind and wave climates. The current shoaling pattern is from south to north, with the majority of the shoaling occurring in the southern third of the Anchorage Basin between dredging cycles. The soft channel muds and longshore sediments will deposit in the lessor tidal current area provided by the proposed turning basin.

Table 4-2

Gulfport Sound Channel Dredging Summary and Shoaling Rates

Dredge[1]			Stations[2]			Volume (CY)	Shoaling	
Start	Complete	Months Between Dredging Events[2]	Start	End	Length (LF)		CY/MON	CY/MON/LF
6/12/1995	7/6/1995	--	08+90	275+00	26,610	2,469,212	--	--
9/18/1996	10/25/1996	15	08+90	470+30	46,140	8,973,952[4]	598,263	13
11/2/1998	1/31/1999	25	08+90	430+50	42,160	4,883,333	195,333	4.6
1/14/2000	3/4/2000	12	08+90	444+95	43,605	2,799,500	233,292	5.4
7/14/2001	10/4/2001	17	08+90	00+00	40,551	3,030,326	178,254	4.4
1/11/2003	4/22/2003	16	08+90	440+00	43,110	**4,151,013**[5]	259,438	6
7/29/2004	11/22/2004	16	08+90	424+40	41,550	**2,678,141**[5]	167,384	4
11/17/2006	2/28/2006	24	08+90	305+51	29,661	**2,142,683**[5]	89,278	3
9/26/2007	11/24/2007	19	12+65	530+00	51,735	5,105,006	268,685	5.2
3/15/2009	8/15/2009	16	52+25	610+50	55,825	5,171,419	323,214	5.8

Notes:

1. Information provided in this table is compiled from the USACE dredging history cards.
2. Post-deepening (1992) Anchorage Basin stationing -40+33.43 (north Anchorage Basin) to 8+90 (entrance at south Anchorage Basin). Stationing for the harbor and channel areas was adjusted prior to dredging in 2009.Revised harbor stationing 0+00 (north Anchorage Basin) to 50+75 (entrance at south Anchorage Basin).
3. Calculated using complete date from previous dredge event and start date from next dredge event. Values are rounded up to the nearest month.
4. Increased quantity for 1996 dredging is assumed to be a result of Hurricane Opal.
5. Bolded dredging quantities are estimated from the total maintenance dredging quantity.

Table 4-3

Gulfport Anchorage Basin Dredging Summary and Shoaling Rates

Dredge[1]			Stations[2]			Volume (CY)	Shoaling	
Start	Complete	Months Between Dredging Events[3]	Start	End	Length (LF)		CY/MON	CY/MON/LF
9/18/1996	10/25/1996	--	08+90	-13+93[4]	2,283	99,092	--	--
1/14/2000	3/4/2000	39	08+90	-40+40	4,930	110,300	2,828	0.6
2/1/2003	2/28/2003	35	08+90	-21+21	3,011	**98,400**[7,8]	2,811	0.9
7/29/2004	11/22/2004	17	-01+30	-30+20	2,890	**60,900**[7,8]	3,582	1.2
11/17/2005	2/28/2006	12	08+90	00+00	890	**14,800**[7,8]	1,233	1.4
4/7/2009	5/16/2009	38	00+00	50+75	5,075	2,145,713[7,8]	56,466	11.1

Notes:

1. Information provided in this table is compiled from the USACE dredging history cards.
2. Post-deepening (1992) Anchorage Basin stationing -40+33.43 (north Anchorage Basin) to 8+90 (entrance at south Anchorage Basin). Stationing for the harbor and channel areas was adjusted prior to dredging in 2009. Revised harbor stationing 0+00 (north Anchorage Basin) to 50+75 (entrance at south Anchorage Basin).
3. Calculated using complete date from previous dredge event and start date from next dredge event. Values are rounded up to the nearest month.
4. Dredging history card value for 1996 maintenance dredging adjusted to indicate -13+93 end station for Anchorage Basin dredging.
7. Bolded dredging quantities are estimated from the total maintenance dredging quantity.
8. Increased quantity for 2009 dredging is assumed to be a result of Hurricane Katrina.

Table 4-4

Gulfport Upper Sound Channel and Anchorage Basin Dredging and Shoaling Rate Summary

Value	Unit	Upper Sound Channel			Anchorage Basin		
		Average	Maximum	Minimum	Average	Maximum	Minimum
Months	MONTH	18	25	12	29	39	12
Station Length	LF	43,816	55,825	29,661	3,360	5,075	890
Dredge Volume[1]	CY	4,326,153	8,973,952	2,142,683	486,023	2,145,713	14,800
Shoaling Rate	CY/MONTH	257,016	598,263	89,278	13,384	56,466	1,233
	CY/MONTH/LF	6	13	3	4	11.1	0.6

Note:

1. Extreme events are included in this analysis to provide an appropriate range to the maximum and average values.

Table 4-5

Gulfport Upper Sound Channel and Anchorage Basin Short-term Shoaling Rates

Location	Stations		Length (LF)	Volume (CY) [1]		From Dredge Date	To Dredge Date	Shoaling Rate (CY/MON/LF)
	Start	End		Design Depth[2]	Overdepth[3]			
Lower Anchorage Basin	24+00	50+75	2,675	393,740	208,490	5/16/2009	3/1/2011	10.5
Upper Sound Channel	50+75	72+00	2,125	82,010	45,220	8/15/2009	3/1/2011	3.2

Notes:

1. Survey data and quantities for short-term shoaling calculations were provided by Weeks.
2. Design depth is -36 feet MLLW plus 2 feet advanced maintenance (total design depth of -38 feet MLLW).
3. Overdepth is 2 feet.

4.4 Proposed East Breakwater

The Project design includes the addition of a breakwater along the eastern border of the FNC with an opening to allow shallow draft navigation access to the Bert Jones Yacht Basin. Because the proposed breakwater may influence shoaling rates, the DMMP includes an analysis of the breakwater design. Michael Baker Jr., Inc., (Baker) analyzed the impacts of the proposed breakwater and evaluated four alternatives. The Baker *East Breakwater Configuration Alternatives* analysis included three alternatives with breakwaters along the eastern boundary of the FNC and one alternative aligned with the southern boundary of the proposed Turning Basin construction (Baker 2011). The breakwater configuration shown in Figure 1-2 was not analyzed by Baker but is a combination of the alternatives based on Baker's assessment. The Baker (2011) alternatives are summarized as follows:

- **Alternative 1:** Two collinear breakwaters offset 350 feet from the Sound Channel and Anchorage Basin; a 580-foot-wide gap in the breakwater to accommodate the Small Craft Channel exiting the Bert Jones Yacht Basin on the eastern side of the Port
- **Alternative 2:** Two parallel, staggered breakwaters offset 400 feet and 650 feet from the Sound Channel and Anchorage Basin; a 250-foot-wide gap in the breakwater to accommodate the Small Craft Channel exiting the Bert Jones Yacht Basin on the eastern side of the Port
- **Alternative 3:** One breakwater south of the proposed Turning Basin construction offset at approximately 450 feet; the eastern edge of the breakwater would be 350 feet from the Sound Channel
- **Alternative 4:** One breakwater on the eastern side of the Small Craft Channel exiting the Bert Jones Yacht Basin; this alignment would extend farther south than Alternatives 1 and 2 to provide protection to the proposed Turning Basin construction and West Pier Terminal Expansion

Baker's analysis (Baker 2011) presented a site conceptual model of the nearshore area along the proposed breakwater alignments. To analyze the alternatives, Baker used the USACE STeady-state spectral WAVE (STWAVE) model. The model design parameters included a typical Mississippi Sound yearly event with a wind speed of 18 meters per second (40 miles per hour) and south (180 degrees) and east (85 degrees) wind scenarios. Initial model runs were performed to assess the baseline scenario (i.e., without breakwater protection) for the

two wind direction scenarios. The West Pier Terminal Expansion footprint and the Turning Basin construction were both included as part of the baseline model grid. As noted by Baker in their analysis, the STWAVE model is limited in areas with abrupt changes in bathymetry, such as in the Anchorage Basin and FNC. Therefore, further analysis using a phase resolving wave model would be necessary to assess the effects in such areas.

As described in Baker's analysis (Baker 2011), Alternative 4's breakwater alignment provides the greatest easterly event protection to the proposed Turning Basin and West Pier Terminal Expansion. Alternative 3 is the only one providing significant protection to the Anchorage Basin for events originating from the south. Baker proposes that both be utilized for the future expansion of the Port, providing the most conservative protection scheme. The breakwater configuration shown in Figure 1-2 is a combination of Alternatives 3 and 4.

Although localized effects of eddies and turbulent zones at the edges of the proposed breakwater have not been evaluated, Baker assumed that accretion could increase for these areas (Baker 2011). Alternative 4 is offset 650 feet from the Sound Channel, and while localized accretion is expected, it is not anticipated to result in extreme variations for the current shoaling rates experienced in the channel.

Overall, Baker's analysis concludes that constructing a breakwater is not likely to positively or negatively affect the deposition of littoral sand material in the vicinity of the Anchorage Basin or, in general, increase the deposition of fine and cohesive sediment at the Port. Baker summarized that it is likely that the fine and cohesive sediments will be affected by the alterations in Port geometry and vessel traffic (Baker 2011). The DMMP analysis presumed that these existing sediments within the Anchorage Basin will be redistributed over a larger area once the Turning Basin construction has been completed.

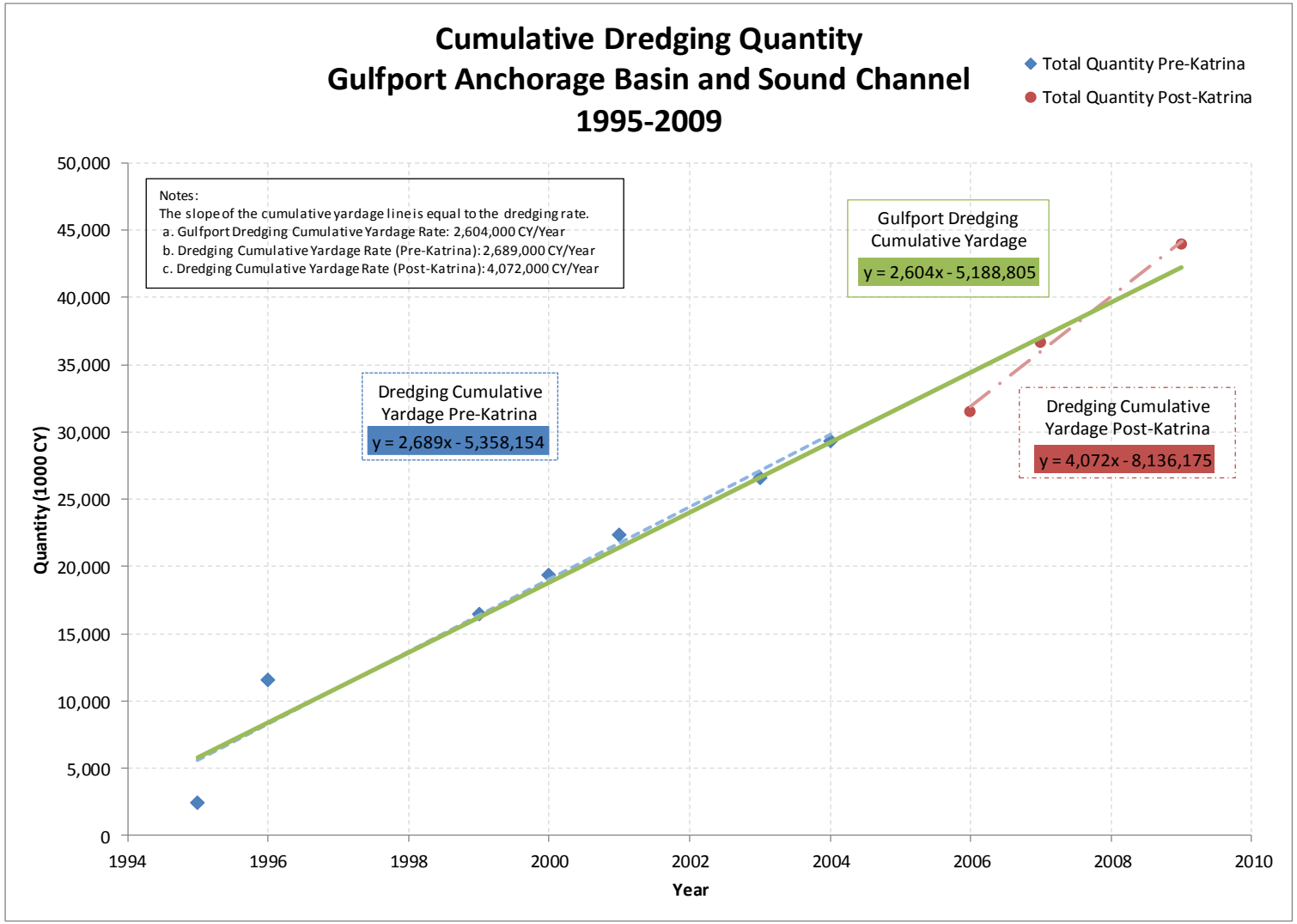

Figure 4-1

Cumulative Dredging Quantity Gulfport Anchorage Basin and Sound Channel

5 SEDIMENT CHARACTERIZATION

Characterization of the sediment chemical profile is required by both state and federal agencies prior to dredging and placement. This section discusses the available physical and chemical geotechnical data for the Project. This information will be used to determine if the proposed dredged material discussed in Section 6 meets the requirements for placement in BU sites and/or the ODMDS. The criteria that the dredged materials must meet for both placement options are discussed in Section 7. In addition to available data, the Port also conducted sediment sampling and testing in the Turning Basin and West Pier Terminal Expansion and berthing areas as required by USEPA in 2016.

5.1 General Sediment Geology in the Vicinity of the Project

The Port is located along the north shoreline of the Mississippi Sound (Figure 1-1). Research indicates that approximately 3,500 years ago, the Mississippi River passed on the eastern side of New Orleans and delivered sediment to the St. Bernard delta region as far east as the present-day Chandeleur Islands (Byrnes et al. 2011; Otvos and Giardino 2004). A visual representation of the sediment distribution from the 1976 Draft Environmental Impact Statement is shown in Figure 5-1 (USACE 1976). The nearshore sediments range from medium to coarse sands at the shoreline to a large area of silt and clay muds approximately 2 miles offshore.

The Otvos and Giardino (2004) geologic cross section (Figure 5-2) depicts the location and types of subsurface soils found along a transect extending south from the Gulfport Harbor area to Ship Island. The upper reach contains "Pleistocene marine and alluvial units," while the lower reach is described with upper layers (0 to 30 feet mean sea level [MSL][2]) of "very low salinity, mud, clay, sand mud" and a lower layer (30 feet to 65 feet MSL) of "Pleistocene marine and alluvial units" (Otvos and Giardino 2004).

5.2 Turning Basin and West Pier Terminal Geotechnical Studies

This section provides historical and recent geotechnical data from sediments collected in the Project area. Figure 5-3 shows the location of some of the historical boring locations. Figure

[2] Depths below 0 feet MSL are positive values.

5-4 shows the location of the DUs and sampling locations from the 2012 and 2016 Anchor QEA Turning Basin sediment sampling events described in Sections 5.2.4 and 5.2.5. Sample locations for the 2016 West Pier Terminal Expansion and berthing areas sediment collection, described in Section 5.2.6, are shown in Figure 5-5.

5.2.1 USACE Soil Classification Data

Seven borings from the historical boring logs and sediment test results from the USACE channel deepening (USACE 1992) and widening contract documents (USACE 2009a) were selected for evaluation based on their location to the proposed Turning Basin construction. The borings were classified using the Unified Soil Classification System (USCS), which describes the soil's grain size and texture. As shown in Table 5-1, the majority of the sample material is classified as OH, which is fine-grained medium to high plasticity organic silt and clay. Other materials that were identified include silty and clayey sands (SM and SC) and inorganic silts and clays (ML and CH).

Table 5-1
USACE Historical Boring Log Data Analyses

Boring ID	Year	Coordinates		Total Length (feet)	Total Material Length (feet)				
					Material Type[1]				
		Easting	Northing		ML	SM	CH	OH	SC
SS-2	1956	905641	308986	10.8	--	--	--	7.8	3
SS-3	1956	906400	308106	15.1	--	--	3.1	12	--
SS-4	1956	906891	307266	16.5	--	--	--	15	1.5
SS-5	1956	907491	306476	15.2	--	--	--	15.2	--
SS-6	1956	908241	305406	13.7	--	--	--	13.7	--
GSC-1-62	1962	906721	307686	10.5	--	--	10.5	--	--
GP-3-87	1987	908771	305046	13.2	4.2	9	--	--	--
			Total	**95**	**4.2**	**9**	**13.6**	**63.7**	**4.5**

Notes:
1. Material definitions from USACE Appendix A (1992, 2009a)
CH = inorganic clays of high plasticity, fat clays
ML = inorganic silts and very fine sands, rock flour, sandy silts, or clayey silts with slight plasticity
OH = organic clays of medium to high plasticity, organic silts
SC = clayey sands, sand-clay mixtures
SM = silty sands, sand-silt mixtures

The USACE (2011) dredging history cards classify the Anchorage Basin maintenance materials as soft to very soft silts and clays. For the 2011 FNC widening, the USACE performed acoustic density profiles along the channel to determine the soil type descriptions and density ranges of the materials adjacent to and along the channel bottom. The profiles along the Sound Channel bottom indicate the presence of fluid mud with estimated densities in the range of 1.00 to 1.20 grams per cubic centimeter (62.4 to 74.9 pounds per cubic foot; USACE 2009a). These values are consistent with those reported in available literature (McAnally et al. 2007a).

Because the Anchorage Basin was not part of the FNC widening project, the profiles do not extend into this area. However, it is reasonable to assume that fluid mud is also present in the Basin because fluid mud can result from agitation caused by local vessel traffic, regional hydrodynamics, dredged materials placed into open water, vertical entrainment, ambient and storm tidal conditions, or gravity flows (McAnally et al. 2007a).

5.2.2 USACE Sediment Grain Size Analysis

Prior to the 2011 widening project of the Sound and Gulf channels, EA Engineering, Science and Technology (EA) performed sediment characterization on the FNC for the USACE in 2004 (Figure 5-3). The *Sediment Quality Characterization of the Gulfport Harbor Federal Navigation Channel* report reviewed four alternatives: No Action (i.e., Continued Maintenance), Deepening, Widening, and Deepening/Widening (EA 2006). Table 5-2 provides a summary of the nine grain size analyses completed for the sediment characterization of the Anchorage Basin and upper portion of the Sound Channel. The sample IDs with "M" are for the No Action, or continued maintenance dredging alternative, "D" for Deepening, "W" for widening alternatives, and "DW" for Deepening/Widening.

Table 5-2
Sediment Characterization Grain Size Analyses (EA 2006)

Sample ID	Gravel (%)	Sand (%)	Silt (%)	Clay (%)
GH04-01-M-SED	0	23.3	23.1	53.6
GH04-01-D-SED	0.6	77	8.3	14.1
GH04-01-D-SEDREP	0	68.6	12.9	18.5
GH04-02-M-SED	0	10.2	20.9	68.9
GH04-02-D-SED	1.0	45.5	14.6	38.9
GH04-01/02-M-SED	0	16.8	18.8	64.4
GH04-01/02-D-SED	0	64.1	10.6	25.3
GH04-03-W-SED	0.1	73.9	4.3	21.8
GH04-03-DW-SED	2.4	43.5	17.5	36.5

5.2.3 Proposed Berth 7 Turning Basin West Pier Expansion Sediment Borings

Thompson Engineering (Thompson) and URS Corporation (URS) collected sediment samples to evaluate if the dredged material from the Berth 7 Turning Basin construction project met the requirements for ocean disposal; borings were collected and analyzed from nine locations (Figure 5-3) adjacent to the West Pier (Thompson/URS 2003). Table 5-3 provides the USCS grain size and the textural classifications from the analysis and shows all of the sediments were classified as inorganic low-plasticity silts.

Table 5-3
Sediment Characterization Grain Size Analyses (Thompson/URS 2003)

Boring ID	Textural Classification	Percent		
		Sand	Silt	Clay
09GP02-01	Gray Sandy Silt	32	24.1	43.9
GP02-02	Gray Sandy Silt	46.8	17.8	35.4
GP02-03	Gray Silt with Sand	28.9	27.3	43.8
GP02-03 (Duplicate)	Gray Silt with Sand	27.8	27.1	45.1
GP02-04	Gray Silt with Sand	20	26.9	53.1
GP02-05	Gray Sandy Silt	45.4	19.5	35.1
GP02-06	Gray Silt with Sand	22.7	25.4	51.9
GP02-07	Gray Silt with Sand	16.4	27.9	55.7
GP02-07 (DUP)	Gray Silt	10.3	27.3	62.4

Boring ID	Textural Classification	Percent		
		Sand	Silt	Clay
GP02-08	Gray Sandy Silt	35.7	21	43.3
GP02-09	Gray Silt	15	28.5	56.5

5.2.4 2012 Turning Basin Construction Sediment Study

Anchor QEA collected samples in November and December 2012 for the *Sampling and Analysis Report Gulfport Turning Basin* (Anchor QEA 2013). As shown in Figure 5-4, the sampling area was comprised of ten dredge units (DUs; Anchor QEA 2013). Three cores were collected from each DU to a depth of -40 feet MLLW and composited together to form a sample, for ten sediment samples (Anchor QEA 2013). Table 5-4 summarizes the grain size from the analysis of the composite samples and shows that samples were largely comprised of clay.

Table 5-4
Sediment Characterization Grain Size Analyses (Anchor QEA 2013)

Composite Sample ID	Percent		
	Sand	Silt	Clay
GP-DU1	36.4	17.6	46.0
GP-DU2	42.3	21.7	36.0
GP-DU3	46.1	18.1	35.8
GP-DU4	6.2	24.4	69.4
GP-DU5	2.8	25.2	72.0
GP-DU6	17.3	26.7	56.0
GP-DU7	10.6	21.9	67.5
GP-DU8	27.1	30.3	42.6
GP-DU9	10.6	28.0	61.4
GP-DU10	57.3	13.5	29.2

5.2.5 2016 Turning Basin Construction Sediment Study

As part of the USEPA-requested testing described in Section 5.3.2, Anchor QEA collected additional samples from 10 DUs (Figure 5-4) in August 2016. Three cores were collected from each DU to a depth of -40 feet MLLW and composited together to form a sample, for ten sediment samples (Anchor QEA 2017). The physical characteristics of sediment,

including grain size, Atterberg limits, total organic carbon (TOC), and total solids (TS), were analyzed for each DU. Table 5-5 summarizes the sediment physical characteristics of the composite samples and shows that samples were largely comprised of clay (Anchor QEA 2017).

5.2.6 2016 West Pier Terminal Expansion Sediment Study

The 2016 West Pier Terminal Expansion and Berthing Areas sampling event included collecting cores at specified locations in the West Pier Terminal Expansion Area and the proposed West Pier Berthing Area and sediment grab sampling at the USEPA-designated Pascagoula reference site RS-PAS-C. Anchor QEA collected samples from 15 DUs from the West Pier Terminal Expansion Area and from 2 DUs from the West Pier Berthing Areas (Figure 5-5; Anchor QEA 2017). Three individual locations were collected from each DU and composited to form one sample from each DU. The cores were analyzed for grain size, specific gravity, Atterberg limits, TOC, and TS. Table 5-5 summarizes the sediment physical characteristics of the composite samples and shows that samples were largely comprised of clay (Anchor QEA 2017).

Table 5-5
Sediment Physical Characteristics

Location	Sample ID	Grain Size (%)				Percent Solids
		Sand	Silt	Clay	Silt+Clay	
Turning Basin	GP-DU1-16	35.2	25.0	39.8	64.80	52.6
	GP-DU2-16	51.1	15.3	33.6	48.90	50.9
	GP-DU3-16	48.3	16.6	35.1	51.70	58.5
	GP-DU4-16	8.3	21.4	70.3	91.70	44.2
	GP-DU5-16	6.2	25.2	68.6	93.80	45.9
	GP-DU6-16	12.0	21.9	66.1	88.00	47.4
	GP-DU7-16	8.2	38.9	52.9	91.80	46.4
	GP-DU8-16	17.9	30.6	51.5	82.10	49.0
	GP-DU9-16	14.1	17.4	68.5	85.90	46.2
	GP-DU10-16	45.8	18.9	35.3	54.20	56.1
West Pier	WP-DU1-COMP	12.7	37.2	50.1	87.3	39.5
	WP-DU2-COMP	36.2	23.5	40.3	63.8	47.5
	WP-DU3-COMP	19.1	28.0	52.9	80.9	49.2
	WP-DU4-COMP	28.7	25.5	45.8	71.3	48.1
	WP-DU5-COMP	37.1	28.2	34.7	62.9	59.2
	WP-DU6-COMP	22.8	31.0	46.2	77.2	52.0
	WP-DU7-COMP	23.0	30.9	46.1	77.0	48.4
	WP-DU8-COMP	37.9	24.7	37.3	62.0	59.8
	WP-DU9-COMP	47.0	15.8	37.2	53.0	54.5
	WP-DU10-COMP	10.3	30.5	59.2	89.7	43.6
	WP-DU11-COMP	24.0	24.9	55.5	80.4	49.6
	WP-DU12-COMP	28.5	18.2	53.3	71.5	51.0
	WP-DU13-COMP	7.5	30.4	62.1	92.5	42.5
	WP-DU14-COMP	13.8	26.6	59.6	86.2	44.8
	WP-DU15-COMP	1.8	43.1	55.1	98.2	40.2
	WP-DU16-COMP	31.2	22.5	46.3	68.8	46.0
	WP-DU17-COMP	5.1	35.8	59.1	94.9	43.5
Pascagoula ODMDS	RS-PAS-C (for Turning Basin testing)	9.3	61.4	29.3	90.7	51.0
	RS-PAS-C (for West Pier testing)	19.7	43.0	37.3	80.3	41.9

5.3 Bulk Sediment Chemistry

5.3.1 2006 EA Study Report

The *Sediment Quality Characterization of the Gulfport Harbor Federal Navigation Channel* by EA (2006), described in Section 5.2.2, also included chemical analyses of bulk sediment, site water, standard elutriates, water column bioassays, and whole sediment bioassays. Testing results for arsenic, nickel, and total PCBs are provided in Table 5-6. Threshold effect levels (TEL) exceedances are documented in several samples; however, none of the samples tested exhibited analyte concentrations over the established probable effects level (PEL). All other analytes tested were below their respective TEL guidelines (EA 2006).

Table 5-6
Sediment Arsenic, Nickel, and Total PCBs Concentrations

Sample ID	Arsenic[1,2] TEL/PEL = 7.24/41.6 (mg/kg)	Nickel[1] TEL/PEL = 15.9/42.8 (mg/kg)	Total PCBs[1] TEL/PEL = 21.6/189 (µg/kg)
GB04-REF	6.4	4.9	6.8
GH04-01-M	**8**	14	15.3
GH04-01/02-M	**9.7**	15.8	4.7
GH04-02-M	**11.7**	**22.4**	10.1
GH04-03-W	5.6	8.9	1.7
GH04-01-D	1.7	4.9	3.9
GH04-01/02-W	3.2	3.6	2.2
GH04-02-D	6.2	5.6	**120.6**
GH04-03-DW	6.7	< 0.1	2

Notes:
1. The sample results in bold exceed the TEL for the prescribed analyte.
µg/kg = micrograms per kilogram
mg/kg = milligrams per kilogram

5.3.2 2013 Anchor QEA Turning Basin Sampling Report

As detailed in the Anchor QEA *Sampling and Analysis Report Gulfport Turning Basin* (2013), metals were detected at all ten DUs and both references at concentrations below their respective effects range median (ERM) values. Only two PAHs were detected above ERM values at one station, and one PAH was detected above the ERM value at one reference

(Anchor QEA 2013). Total petroleum hydrocarbons (TPHs), pesticides, organometallic compounds, and semi-volatile organic compounds (SVOCs) were either not detected at a level of concern or not detected at all in the samples from the Gulfport Turning Basin and reference locations (Anchor QEA 2013). Chemical analyses showed Gulfport sediments and reference sediments were similar and generally lacking in contaminants of concern (Anchor QEA 2013). Table 13 of the *Sampling and Analysis Report Gulfport Turning Basin* (Anchor QEA 2013) provides a summary of the sediment chemistry results.

In January 2016, the USEPA commented on the *Sampling and Analysis Report Gulfport Turning Basin* report (Anchor QEA 2013). USEPA Region 4's comments focused on the following three issues:

1. Low survival in the whole sediment bioassays with amphipods (*Leptocheirus plumulosus*)
2. Low survival in the bioaccumulation tests with clams (*Macoma nasuta*)
3. Reference tissues from the Pascagoula reference site were not analyzed for PAH; therefore, no statistical comparisons could be completed.

Based on the comments, the project team developed a modified testing program with USEPA input for the proposed dredged material for the Turning Basin (see Section 5.3.3).

5.3.3 2016 Anchor QEA Turning Basin Sampling

The modified testing was conducted in August 2016 in each of the same ten DUs evaluated in the 2012/2013 testing program and included the following components:

- Chemical analysis of sediment, including metals, PAHs, and dioxin and furan congeners
- Physical characterization of sediment, including grain size, Atterberg limits, TOC, and TS
- 10-day whole sediment bioassays with amphipods (*Leptocheirus plumulosus*) and polychaetes (*Neanthes areceodentata*) using project sediment
- 28-day bioaccumulation testing with clams (*Macoma nasuta*) and worms (*Nereis virens*)
- Tissue testing to evaluate the potential for bioaccumulation of chemical constituents

As shown in Table 5-7, the chemical analysis showed all constituent concentrations were below their respective ERM values for all 10 DUs and the reference site. All metals were detected in the composite samples at concentrations similar to or less than the concentrations reported at the reference site. Five DUs exceeded the effects range low (ERL) for arsenic. PAHs, SVOCs, pesticides, and dioxin and furan congeners were either not detected or detected at very low concentrations in the sediment composite samples. Detected concentrations for all these chemicals were similar to concentrations in the reference site and none were detected at concentrations greater than the ERL (Anchor QEA 2017).

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Table 5-7

Summary of 2012 and 2016 Results for Turning Basin Expansion Bulk Sediment, Standard Elutriate, and Toxicity Testing

Dredging Unit (DU)	SEDIMENT	STANDARD ELUTRIATE[i]		BIOASSAY TESTS								BIOACCUMULATION TESTS			
				WHOLE SEDIMENT		WATER COLUMN[i]						*M. nasuta*		*N. virens*	
				10-Day Mean Percent Survival[f]		*Menidia Beryllina*		*Americamysis bahia*		*Arbacia punctulata*					
	Comparison to Regional SQGs[a] ERL < Concen-tration > ERM[b]	Comparison to Water Quality Criteria (Acute)[c,d]	Maximum Dilution Required for all Exceeding Constituents to meet LPC[e]	*Leptocheirus plumulosus*	*Neanthes arenaceodentata*	96-hour LC50 (% elutriate)	Dilution Required to Comply with 0.01 LC50 within 4-hr	96-hour LC50 (% elutriate)	Dilution Required to Comply with 0.01 LC50 within 4-hr	48-hour EC50 (% elutriate)	Dilution Required to Comply with 0.01 EC50 within 4-hr	Project Area Mean Statistically > Day Zero Mean (p<0.05)	Project Area Mean Statistically > Reference Mean (p<0.05)	Project Area Mean Statistically > Day Zero Mean (p<0.05)	Project Area Mean Statistically > Reference Mean (p<0.05)
Reference Site (RS-PAS-C)	None	NT	NT	89%	88%	NT	NT	NT	NT	NT	NT	NA	NA	NA	NA
DU1	None	None	None	77%	92%	>100	None	>100	None	>100	None	OCDD, 1,2,3,4,6,7,8-HPCDD	None	Total Dioxin TEQ (Fish and Mammal)	None
DU2	None	None	None	88%	96%	>100	None	>100	None	>100	None	None	None	None	None
DU3	None	None	None	73%	96%	>100	None	>100	None	>100	None	None	None	None	None
DU4	Arsenic	None	None	78%	96%	>100	100[g]	>100	None	>100	None	None	None	None	None
DU5	Arsenic	Copper	1.6	79%	96%	>100	None	>100	None	>100	None	None	None	None	None
DU6	None	None	None	83%	92%	>100	None	>100	None	>100	100[h]	None	None	None	None
DU7	Arsenic	None	None	86%	92%	>100	None	>100	None	>100	100[h]	None	None	None	None
DU8	Arsenic	None	None	84%	100%	>100	None	>100	None	>100	100[h]	None	None	None	None
DU9	Arsenic	None	None	88%	92%	>100	100[g]	>100	None	>100	None	None	None	None	None
DU10	None	None	None	88%	92%	>100	None	>100	None	>100	100[h]	None	None	None	None

Notes:
a = Source: Long et al. 1995. Environmental Management 19 (1).
b = Exceedances were of the ERL only, none of the constituents exceeded the ERM
c = Source: USEPA, 2013. National Recommended Water Quality Criteria. Accessed online: https://www.epa.gov/wqc/national-recommended-water-quality-criteria-aquatic-life-criteria-table. Page last updated on October 20, 2016
d = Source: Mississippi Department of Environmental Quality, 2016. State of Mississippi Water Quality Criteria for Intrastate, Interstate, and Coastal Waters. Office of Pollution Control
e = Dilution required is to ensure all constituents are below acute WQC, which must occur within 4 hours to meet LPC.
f = None of the results for survival in test samples were statistically different from survival in the reference sample
g = Dilution required because survival in the 100 percent elutriate was significantly less than the control
h = Dilution required because normal development in the 100 percent elutriate was significantly less than the control
i = Standard elutriate and water column bioassay results are from the 2012/2013 Turning Basin investigation. All other results are from the 2016 investigation.

EC50 = mean effective concentration
ERL = effects range low
ERM = effects range medium
LC50 = mean lethal concentration
LPC = limiting permissible concentration
NT = not tested
SQG = sediment quality guide

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5.3.4 2016 Anchor QEA West Pier Terminal and Berthing Areas Sampling

All DUs and the reference site for the West Pier Terminal and Berthing areas were below ERM values (Table 5-8). All metals were detected at concentrations similar to the concentrations reported at the reference site. Seven of the DUs exceeded the ERL for arsenic. Butlytins, PAHs, pentachlorophenol, and dioxin and furan congeners were either not detected or detected at very low concentrations in the sediment sample. Detected concentrations for all these chemicals were similar to concentrations in the reference site and none were detected at concentrations greater than the ERL. DU 1 and 4 slightly exceeded the ERL for Total PCB congeners; DU 2 slightly exceeded the ERL for Dieldrin (Anchor QEA 2017).

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Table 5-8

Summary of 2016 Results for West Pier Terminal Expansion and Berthing Area Bulk Sediment, Standard Elutriate, and Toxicity Testing

Dredging Unit (DU)	SEDIMENT	STANDARD ELUTRIATE		BIOASSAY TESTS								STFATE MODEL RESULTS[g]		BIOACCUMULATION TESTS			
				WHOLE SEDIMENT		WATER COLUMN								*Macoma nasuta*		*Nereis virens*	
	Comparison to Regional SQGs[a]	Comparison to Water Quality Criteria (Acute)[c,d]	Maximum Dilution Required for all Exceeding Constituents to meet LPC[e]	10-Day Mean Percent Survival[f]		*Menidia Beryllina*		*Americamysis bahia*		*Arbacia punctulata*		Dilution Achieved	Modeled Volume (cy) Per Placement Event	Project Area Mean Statistically > Day Zero Mean (p<0.05)	Project Area Mean Statistically > Reference Mean (p<0.05)	Project Area Mean Statistically > Day Zero Mean (p<0.05)	Project Area Mean Statistically > Reference Mean (p<0.05)
	ERL < Concentration > ERM[b]			*Leptocheirus plumulosus*	*Neanthes arenaceodentata*	96-hour LC_{50} (% elutriate)	Dilution Required to Comply with 0.01 LC_{50} within 4-hr	96-hour LC_{50} (% elutriate)	Dilution Required to Comply with 0.01 LC_{50} within 4-hr	48-hour EC_{50} (% elutriate)	Dilution Required to Comply with 0.01 EC_{50} within 4-hr						
West Pier Terminal Expansion																	
Reference Site (RS-PAS-C)	None	NT	NT	87%	88%	NT	NT	NT	NT	NT	NT	NT	NT	NA	NA	NA	NA
DU1	Total PCBs	Copper	2.5	99%	100%	>100	None	>100	None	20.9	479	591	4,000	None	None	None	None
DU2	Dieldrin	Copper	1.7	96%	84%	>100	None	>100	None	20.0	501	689	4,000	Cadmium	None	None	None
DU3	None	Copper	1.6	93%	68%	>100	None	>100	None	21.9	458	713	4,000	Cadmium	None	1,2,3,4,6,7,8-HpCDD	None
DU4	Arsenic, Total PCBs	Copper	1.2	90%	96%	>100	None	>100	None	20.8	480	698	4,000	Cadmium	None	None	None
DU5	None	Copper	1.1	81%	92%	>100	None	>100	None	17.2	583	900	4,000	None	None	None	None
DU6	None	None	--	87%	92%	>100	None	>100	None	>100	None	757	4,000	Cadmium	None	None	None
DU7	None	None	--	97%	92%	>100	None	>100	None	6.76	1,479	1,700	1,250	None	None	None	None
DU8	None	Copper	1.1	87%	88%	>100	None	>100	None	10.4	960	1,016	3,500	None	None	None	None
DU9	None	None	--	92%	96%	>100	None	>100	None	8.69	1,151	1,159	2,500	Arsenic	None	None	None
DU10	Arsenic	None	--	93%	96%	>100	None	>100	None	12.2	818	861	2,750	None	None	None	None
DU11	None	None	--	89%	84%	>100	None	>100	None	0.97	10,309	11,764	150	None	None	None	None
DU12	None	None	--	94%	92%	>100	None	>100	None	3.83	2,611	2,761	750	None	None	None	None
DU13	Arsenic	Copper	1.8	100%	100%	>100	None	>100	None	19.6	510	624	4,000	None	None	None	None
DU14	Arsenic	None	--	96%	96%	>100	None	>100	None	23.7	423	653	4,000	None	None	None	None
DU15	Arsenic	None	--	94%	96%	>100	None	>100	None	21.9	456	601	4,000	None	None	None	None

Dredging Unit (DU)	SEDIMENT	STANDARD ELUTRIATE		BIOASSAY TESTS								STFATE MODEL RESULTS[g]		BIOACCUMULATION TESTS			
				WHOLE SEDIMENT		WATER COLUMN								*Macoma nasuta*		*Nereis virens*	
	Comparison to Regional SQGs[a]	Comparison to Water Quality Criteria (Acute)[c,d]	Maximum Dilution Required for all Exceeding Constituents to meet LPC[e]	10-Day Mean Percent Survival[f]		*Menidia Beryllina*		*Americamysis bahia*		*Arbacia punctulata*		Dilution Achieved	Modeled Volume (cy) Per Placement Event	Project Area Mean Statistically > Day Zero Mean (p<0.05)	Project Area Mean Statistically > Reference Mean (p<0.05)	Project Area Mean Statistically > Day Zero Mean (p<0.05)	Project Area Mean Statistically > Reference Mean (p<0.05)
	ERL < Concentration > ERM[b]			*Leptocheirus plumulosus*	*Neanthes arenaceodentata*	96-hour LC_{50} (% elutriate)	Dilution Required to Comply with 0.01 LC_{50} within 4-hr	96-hour LC_{50} (% elutriate)	Dilution Required to Comply with 0.01 LC_{50} within 4-hr	48-hour EC_{50} (% elutriate)	Dilution Required to Comply with 0.01 EC_{50} within 4-hr						
West Pier Berthing Area																	
DU16	Arsenic	Ammonia	1.1	94%	96%	>100	None	>100	None	29.2	343	670	4,000	None	None	None	None
DU17	Arsenic	None	--	82%	100%	>100	None	>100	None	21.6	462	636	4,000	None	None	None	None

Notes:
a = Source: Long et al. 1995. Environmental Management 19 (1).
b = Exceedances were of the ERL only, none of the constituents exceeded the ERM
c = Source: USEPA, 2013. National Recommended Water Quality Criteria. Accessed online: https://www.epa.gov/wqc/national-recommended-water-quality-criteria-aquatic-life-criteria-table. Page last updated on October 20, 2016
d = Source: Mississippi Department of Environmental Quality, 2016. State of Mississippi Water Quality Criteria for Intrastate, Interstate, and Coastal Waters. Office of Pollution Control
e = Dilution required is to ensure all constituents are below acute WQC, which must occur within 4 hours to meet LPC.
f = None of the results for survival in test samples were statistically different from survival in the reference sample
g = STFATE modeling conducted based on water column bioassay with the lowest EC50 or LC50
Orange shaded cells show survival was less than reference sample survival (88%) by more than 10 percent; however, the results were not statistically different from the reference sample
DUs highlighted in yellow will require best management practices and/or limited dredged material placement quantities to meet the requirements for placement at the Pascagoula ODMDS

cy = cubic yard
EC50 = mean effective concentration
ERL = effects range low
ERM = effects range median
HpCDD = Heptachlorodibenzo-p-dioxin
hr = hour
LC50 = mean lethal concentration
LPC = limiting permissible concentration
NA = not applicable
NT = not tested
SQG = sediment quality guidelines
STFATE = short-term fate

5.4 Site Water and Standard Elutriate Testing

5.4.1 2006 EA Study Report

The EA study (2006) detected concentrations of ammonia, phosphorus, aluminum, arsenic, chromium, nickel, selenium, zinc, two PCB congeners, and one dioxin congener (octachlorodibenzo-p-dioxin) in site water samples from the Gulfport Harbor. Elutriate testing showed the following:

- Concentrations of most target constituents were at the detection limit or at low levels similar to the water column concentration, which indicates that the sediments are not leaching these constituents into the water column
- Some samples had elevated concentrations of ammonia, cyanide, nickel, total PCBs, and several chlorinated pesticides (4',4'-DDT; 4',4'-DDD; dieldrin; endrin). However, "compliance with water quality criteria will quickly occur within the water column after placement" of the dredged material.
- None of the chlorinated pesticides that exceeded USEPA screening values in elutriates were detected in sediment from these locations (EA 2006).

The exceedances for each analyte are provided in Table 5-9.

Table 5-9
Standard Elutriate Exceedance Matrix

Analyte	Exceedance Criteria		Remarks
Ammonia[1]	Acute Chronic	3.10 mg/L 0.466 mg/L	Exceed by factors ranging from 3.9 to 12 (acute) and 26 to 80 (chronic)
Cyanide	Acute Chronic	1 µg/L 1 µg/L	Exceedance (8 µg/L) at one station: GH04-03-DW
Nickel	Chronic	8.2 µg/L	Minor exceedance (8.8 µg/L) at one station: GH04-03-W
Dieldrin	Chronic	0.0019 µg/L	Exceedances at stations GH04-01/02-M, GH04-03-W, GH04-03-DW by factors ranging from approximately 2 to 4
Endrin	Chronic	0.0023 µg/L	Exceedance by factors of approximately 4 and 1.4 for stations GH04-01/02-M and GH04-03-W, respectively

Analyte	Exceedance Criteria		Remarks
PCB[2]	None	30 ng/L	Concentration range (8.29 to 17 ng/L) comparable to the total PCB concentration in the site water (8.75 ng/L)

Notes:
1. EA (2006) calculated the USEPA acute (3.10 mg/L) and chronic (0.466 mg/L) criteria for determining the toxicity of ammonia to aquatic life based on measurements collected during the sampling event: salinity of 28 parts per thousand, a temperature of 28.9 degrees Celsius, and pH of 8.0 (measured at the mid-depth of the water column).
2. PCB non-detect concentration is equal to half of the minimum detection limit.

5.4.2 2013 Anchor QEA Turning Basin Sampling Report

The site water and elutriate testing is summarized in Table 12 of the *Sampling and Analysis Report Gulfport Turning Basin* (Anchor QEA 2013). The report noted the following for the site water:

- All analytes were below USEPA and Mississippi State water quality criteria.
- Ammonia, cyanide, and pesticides were not detected in the samples.
- Only total arsenic and total selenium were detected at concentrations greater than the method reporting limit (MRL).
- Dissolved arsenic and selenium were also detected in the site water.
- Total chromium (III and IV), dissolved lead, and pentachlorophenol were estimated at concentrations below the MRL. All other total and dissolved metals were not detected.

The Anchor QEA (2013) report noted the following for the elutriate testing:

- Ammonia and several total and dissolved metals, including arsenic, chromium (total), copper, lead, nickel, selenium, and zinc were detected above the MRL in one or more elutriate samples.
- Cadmium, chromium VI, mercury, and silver were not detected above the MRL in any elutriate sample.
- In all samples, cyanide, organometallic compounds, semivolatile organics, and pesticides were not detected in any of the elutriate samples. Dissolved copper in the GP-DU5-Comp elutriate sample exceeded the USEPA and Mississippi State water quality criteria by 2.3 times.

USEPA Region 4 concurred with the findings of the Anchor QEA (2013) report that the elutriate test results met the limiting permissible concentration (LPC) for ocean placement at the Pascagoula ODMDS.

5.4.3 2016 Anchor QEA Turning Basin Sampling

As detailed in the *Sampling and Analysis Plan/Quality Assurance Project Plan: Evaluation of Dredged Material for Ocean Placement, Gulfport Turning Basing Expansion* (Anchor QEA 2016a), USEPA Region 4 agreed with the standard elutriate testing results and therefore, no additional testing was necessary. Table 5-7 shows the testing results for the 2012/2013 sampling analysis.

5.4.4 2016 Anchor QEA West Pier Terminal Expansion and Berthing Areas Sampling

For the West Pier, metals and ammonia were the only constituents that were detected in the standard elutriate samples (Table 5-8). Only one metal, copper, was detected at a concentration that exceeded the USEPA or Mississippi State Acute Water Quality Criteria (WQC) for the protection of aquatic life. The copper concentration dilution requirements are shown in Table 5-8. This requirement is the dilution necessary for the concentrations to meet the LPC within four hours after placement of sediment at the Pascagoula ODMDS. For DU 16, ammonia was detected at a concentration that exceeded the USEPA or Mississippi State Acute WQC for the protection of aquatic life. The ammonia concentration indicated that a 1.1-fold dilution within four hours after placement of sediment at the Pascagoula ODMDS would be required to meet the LPC (Anchor QEA 2017).

5.5 Bioassay Testing

The purpose of bioassay testing (water column and whole sediment) is to evaluate the survival rates of test organisms exposed to the sediment elutriates and whole sediment. The criterion used for this evaluation is the LPC for each of the given analytes. LPCs are intended to establish a value for specific marine organisms at which no sub-lethal adverse effects are observed or substantial acute or chronic toxicity is detected; the evaluation considers median effective (sub-lethal) concentration (EC_{50}) or median lethal concentration (LC_{50}) (USEPA/USACE 1991; 2008). For water column testing, the USEPA/USACE (1991)

defines the LPC for ODMDS placement as equivalent to 0.01 of the EC_{50}/LC_{50} within a 4-hour dilution period after placement. In the case of whole sediment bioassay testing, if the tested sediments cause a mortality rate statistically greater than reference sediments and exceed the reference sediment mortality by at least 10 percent (amphipod tests are allowed 20 percent mortality), then the LPC of the tested sediments has not been fulfilled.

5.5.1 2006 EA Study Report

EA (2006) assessed the biological effects of sediment elutriate toxicity in three water column organisms (*A. punctulata* [ammonia-stripped], *A. bahia*, and *C. variegates*) as part of the sediment characterization. The lowest EC_{50}/LC_{50} value reported (GH04-03-DW) would require a dilution of approximately 111 fold to achieve the LPC. EA (2006) anticipated that dilution modeling (Short-Term FATE [STFATE]) would be performed to predict the on-site conditions at the disposal site after the material has been placed. Whole sediment testing results indicated survival rates of organisms (*N. arenaceodentata* [ammonia purged] and *L. plumulosus*) that were significantly lower than the reference, but not greater than 20 percent lower; therefore, the results of these bioassay tests indicated the sediments meet the LPC requirements.

5.5.2 2013 Anchor QEA Turning Basin Sampling Report

Anchor QEA bioassay testing consisted of solid phase (SP) tests with two species and suspended particulate phase (SPP) tests with three species. Sediment from Gulfport Turning Basin DUs and reference sites consisted of low TOC concentrations. Survival in the SP polychaete test was high. Survival in the initial SP amphipod test was consistently low in all sediments from the Gulfport Turning Basin, and it was hypothesized that the low TOC concentrations of the material confounded the test results.

Results of the SP and SPP bioassays and corresponding STFATE modeling indicated that sediments from the Gulfport Turning Basin were not acutely toxic to aquatic life and met the LPC requirements for ocean disposal. The report was submitted to USEPA for comment and approval. Comments received from USEPA Region 4 in 2016 stated that it did not concur with the findings and that additional sampling and testing were required.

5.5.3 2016 Anchor QEA Turning Basin Sampling

As detailed in the *Sampling and Analysis Plan/Quality Assurance Project Plan: Evaluation of Dredged Material for Ocean Placement, Gulfport Turning Basing Expansion* report (Anchor QEA 2016a), and stated in Section 5.4.3, USEPA Region 4 agreed that water column bioassay testing was not required because the results of the 2012/2013 investigation (Table 5-7) met the LPC for ocean placement at the Pascagoula ODMDS, and therefore, no additional elutriate testing was necessary. Additional sampling and new bioassay testing was required to determine sediment toxicity.

As shown in Table 5-7 survival in the whole sediment bioassays were not statistically different from the reference site for either the polychaete (*Neanthes arenaceodentata*) or amphipod (*Leptocheirus plumulosus*). Therefore, sediment from the Turning Basin meets the LPC requirement for benthic toxicity (Anchor QEA 2017).

5.5.4 2016 Anchor QEA West Pier Terminal Expansion and Berthing Areas Sampling

Table 5-8 contains the results of the bioassay and whole sediment testing for the West Pier Terminal and berthing areas. For all DUs, the LC50 for the mysid shrimp (*Americamysis bahia*) and inland silverside (*Menidia beryllina*) were both greater than 100 percent elutriate. Except for DU 6, the LC50 for the purple sea urchin (*Arbacia punctulata*) were less than the 100 percent elutriate. Table 5-8 shows the dilution requirements for the sediment to achieve the purple sea urchin LPC for water column toxicity for ocean placement at the Pascagoula ODMDS. STFATE modeling was performed using typical barge capacities for mechanical dredging (4,000 CY). The STFATE modeling results (Table 5-8) showed that the standard elutriates from most of the DUs would meet the water column toxicity LPC for 4,000 CY of material. Six of the DUs would meet the LPC with the limited placement quantities shown in Table 5-9.

For all the DUs, survival in the whole sediment bioassays was not statistically different from the reference site for either the polychaete (*Neanthes arenaceodentata*) or amphipod (*Leptocheirus plumulosus*). Therefore, sediment from West Pier Terminal and berthing areas meets the LPC requirement for benthic toxicity (Anchor QEA 2017).

5.6 Bioaccumulation

Bioaccumulation tests are designed to evaluate the potential for specific marine organisms (in this case, *Nereis virens* [sand worm] and *Macoma nasuta* [blunt-nose clam]) to be affected by chemicals found in sediments. For the EA 2006 study, neither test organism exhibited mortality that was significantly different than the reference sediment. Sand worms exposed to the site sediments were found to have tissue concentrations for five metals (manganese, mercury, selenium, silver, and zinc) that were statistically different from the reference sediment tissues. Blunt-nose clams exposed to site sediments were found to have tissue concentrations significantly different than the reference sediment for five metals (aluminum, cadmium, iron, lead, and manganese). Neither organism was found to have dioxin/furan or PCB tissue concentrations significantly different from the reference sediments. The uptake ratios calculated by EA (2006) for each of the metals listed were all slightly greater than one; however, aluminum, iron, manganese, and zinc were cited as metals that do not have a tendency to biomagnify, and selenium was classified as non-bioavailable.

Both the 2016 Turning Basin and West Pier Terminal Expansion samples underwent 28-day bioaccumulation testing with clams (*Macoma nasuta*) and worms (*Nereis virens*) and tissue testing to evaluate the potential for bioaccumulation of chemical constituents. The results are described below.

5.6.1 2016 Anchor QEA Turning Basin Sampling

For all Turning Basin DUs, none of the tested analytes in tissue samples from bent-nose clams (*Macoma nasuta*) and sand worms (*Nereis virens*) exceeded the U.S. Food and Drug Administration (USFDA) Action/Guidance/Tolerance Levels or statistically exceeded the reference site tissue concentrations (Table 5-7). In DU 1, the bent-nose clam (*Macoma nasuta*) mean concentrations of 1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD) and 1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD) statistically exceeded the pre-test (day 0) tissue concentrations; however, mean concentrations of both OCDD and 1,2,3,4,6,7,8-HpCDD did not statistically exceed the mean reference site tissue concentrations. The sand worm (*Nereis virens*) Total Dioxin toxicity equivalency quotient (TEQ) results, calculated using both the fish and mammal toxic equivalency factors (TEFs), statistically exceeded the

pre-test (day 0) tissue concentrations; however, the Total Dioxin TEQ results for both fish and mammal did not statistically exceed the reference site Total Dioxin TEQ (Anchor QEA 2017).

Based on the assessment of chemical analyses performed on tissues exposed to sediment from the DUs and pre-test tissue concentrations, it is anticipated that ocean placement of the dredged material from the Turning Basin at the Pascagoula ODMDS is not expected to result in ecologically significant bioaccumulation of contaminants. Therefore, the dredged material from Turning Basin meets the LPC for benthic bioaccumulation.

5.6.2 2016 Anchor QEA West Pier Terminal Expansion and Berthing Areas Sampling

None of the tested analytes in tissue samples from bent-nose clams (*Macoma nasuta*) and sand worms (*Nereis virens*) exceeded the USFDA Action/Guidance/Tolerance Levels in the West Pier Terminal Expansion and berthing area DUs (Table 5-8). The bent-nose clam (*Macoma nasuta*) mean concentration of cadmium for DUs 2, 3, 4, and 6 and arsenic for DU 9 statistically exceeded the pre-test (day 0) tissue concentrations; however, these tissue concentrations did not statistically exceed the mean reference site tissue concentrations. Only the DU 3 tested analytes in the sand worm (*Nereis virens*) samples statistically exceeded the pre-test (day 0) tissue concentrations. For DU 3, the sand worm mean concentration of 1,2,3,4,6,7,8-HpCDD statistically exceeded the pre-test (day 0) tissue concentrations; however, the mean concentration from DU 3 did not statistically exceed the mean reference site tissue concentrations (Anchor QEA 2017).

Based on the assessment of chemical analyses performed on tissues exposed to sediment from the West Pier Terminal Expansion and berthing areas and reference site sediment, it is anticipated that ocean placement of the dredged material at the Pascagoula ODMDS is not expected to result in ecologically significant bioaccumulation of contaminants. Therefore, the dredged material from the West Pier Terminal Expansion and berthing areas meets the LPC for benthic bioaccumulation.

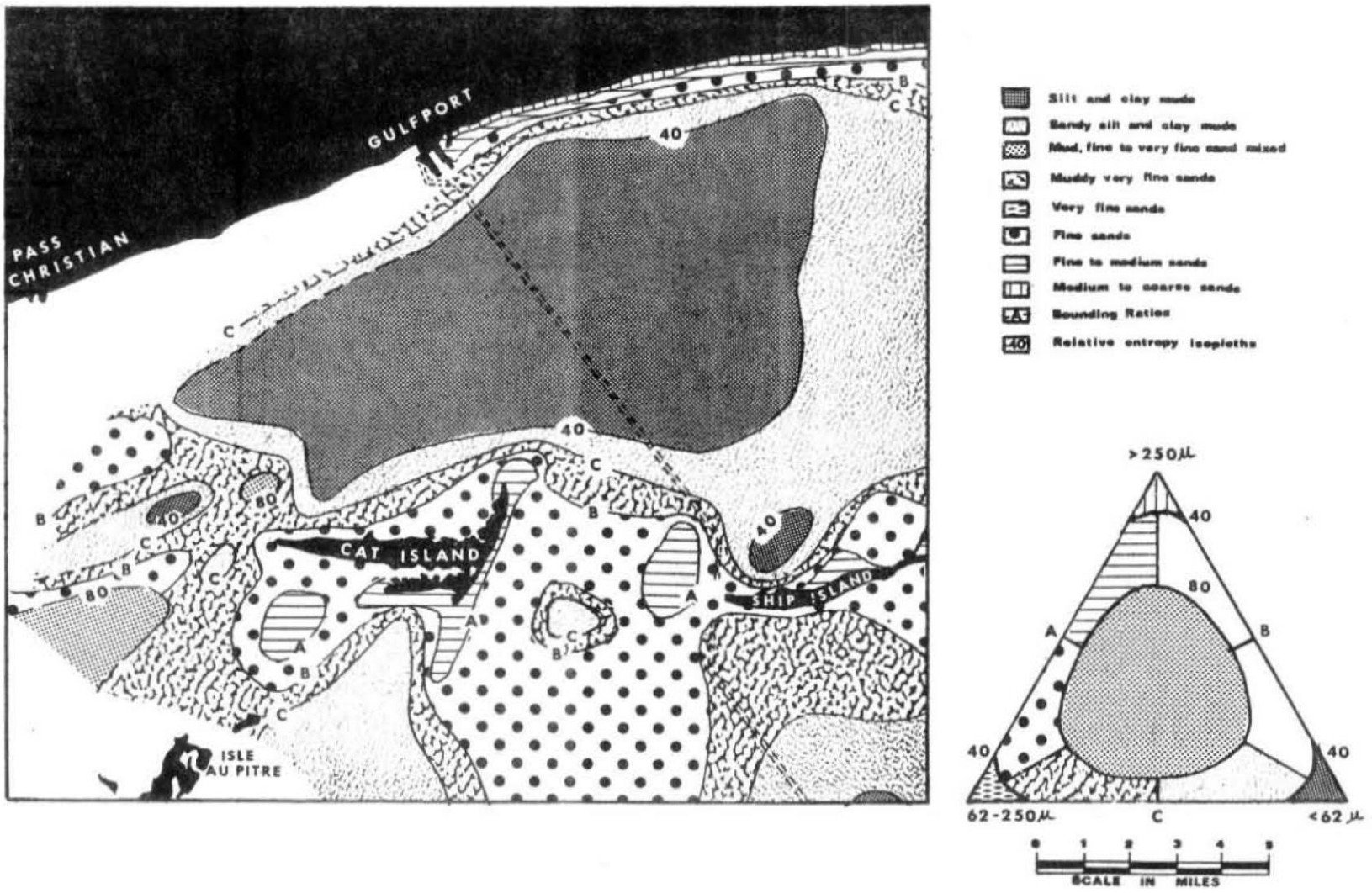
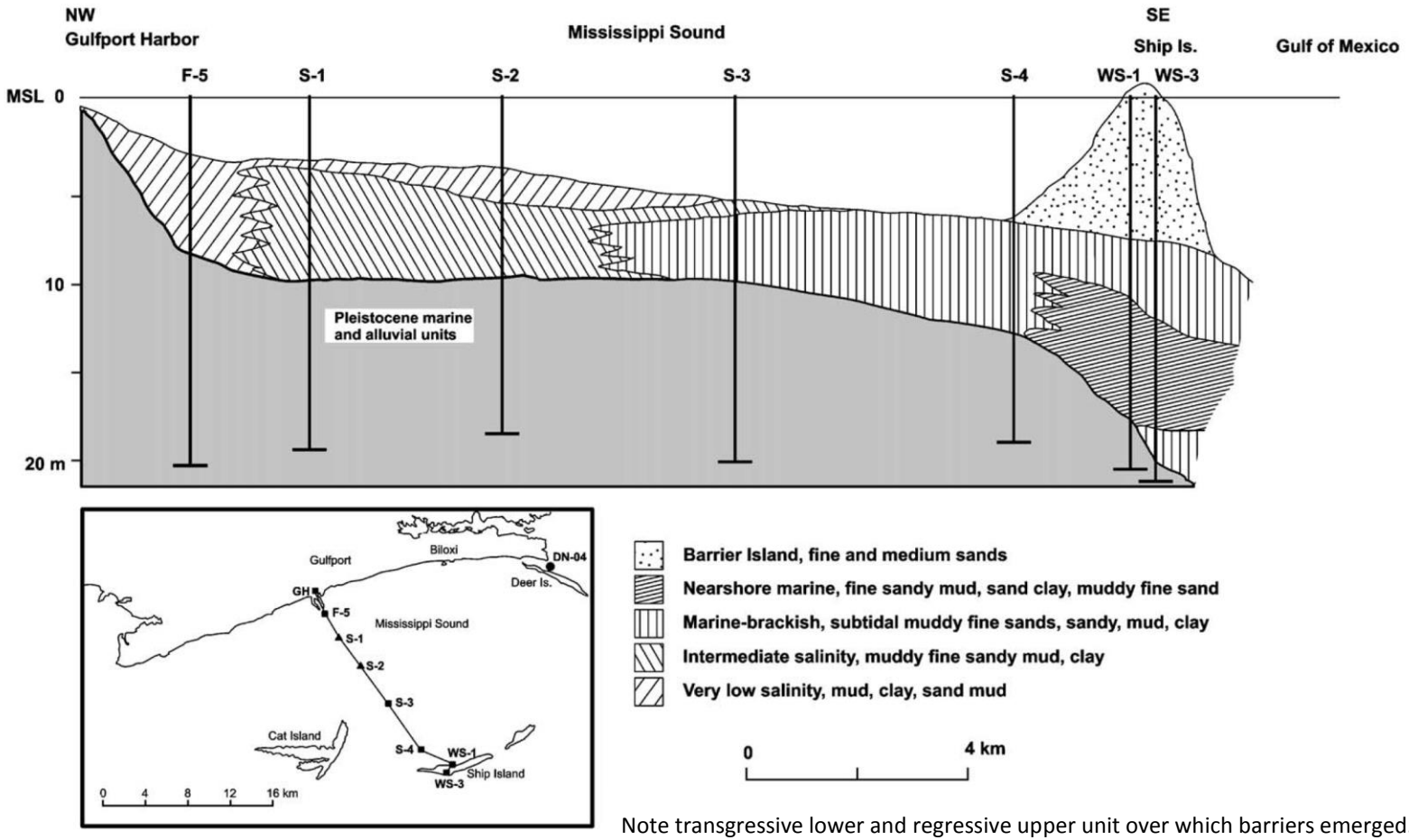


Figure 5-1

Distribution of Sediments in the Gulfport Ship Channel Area, Mississippi



Note transgressive lower and regressive upper unit over which barriers emerged.

Figure 5-2

Gulfport Geologic Cross-Section

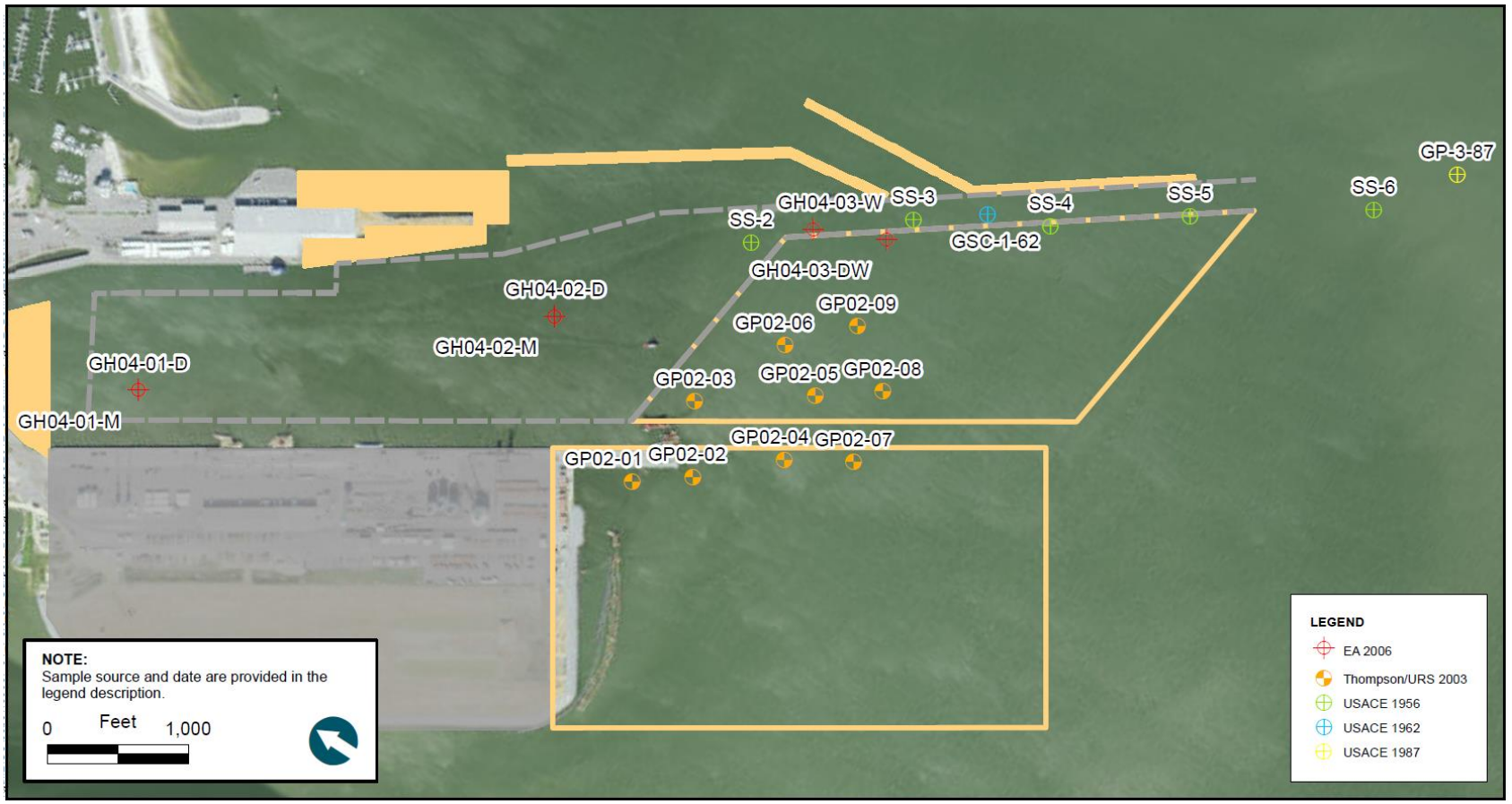


Figure 5-3

Sediment Boring Locations

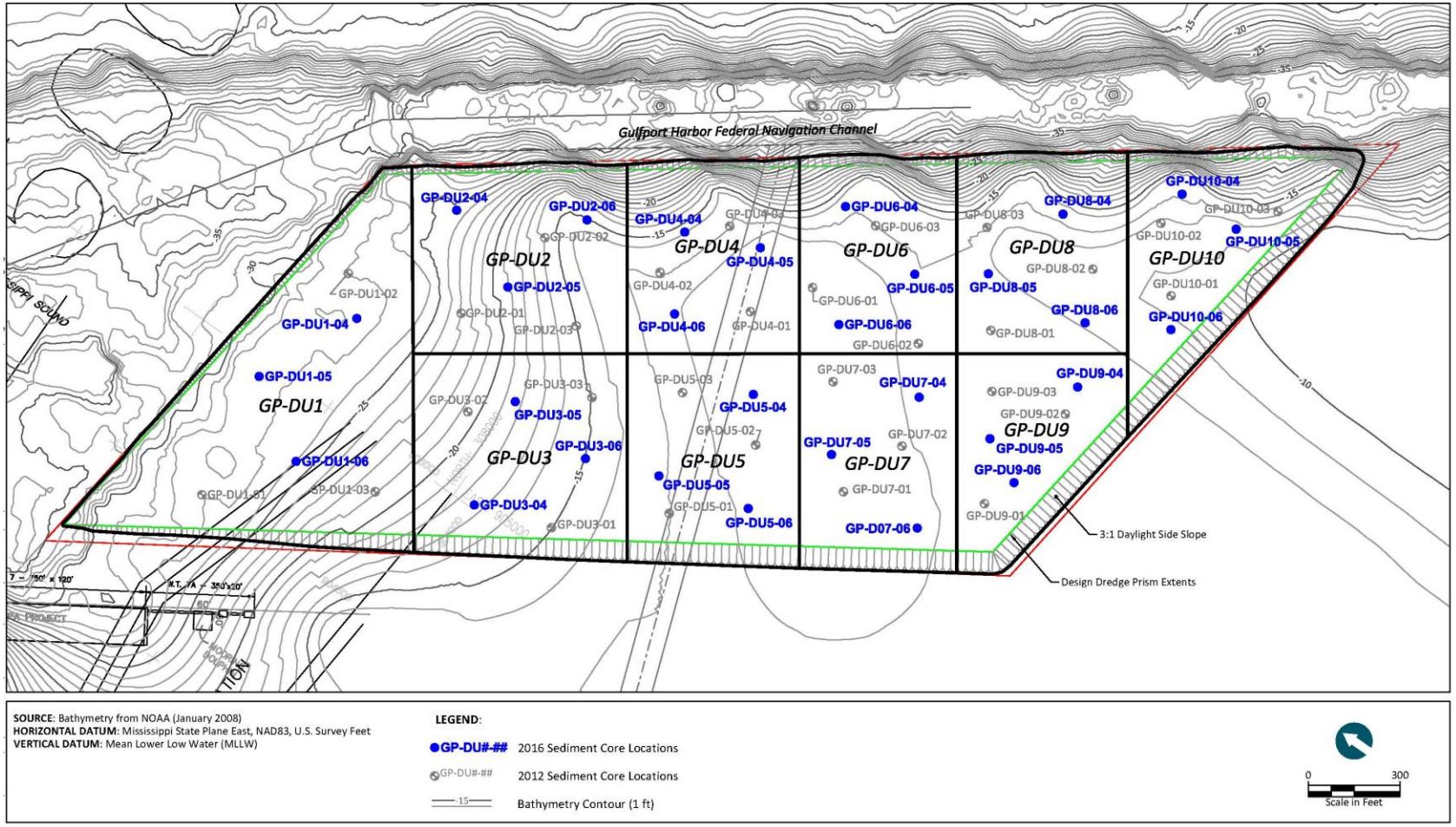


Figure 5-4

2012 and 2016 Turning Basin Dredge Units and Sampling Locations

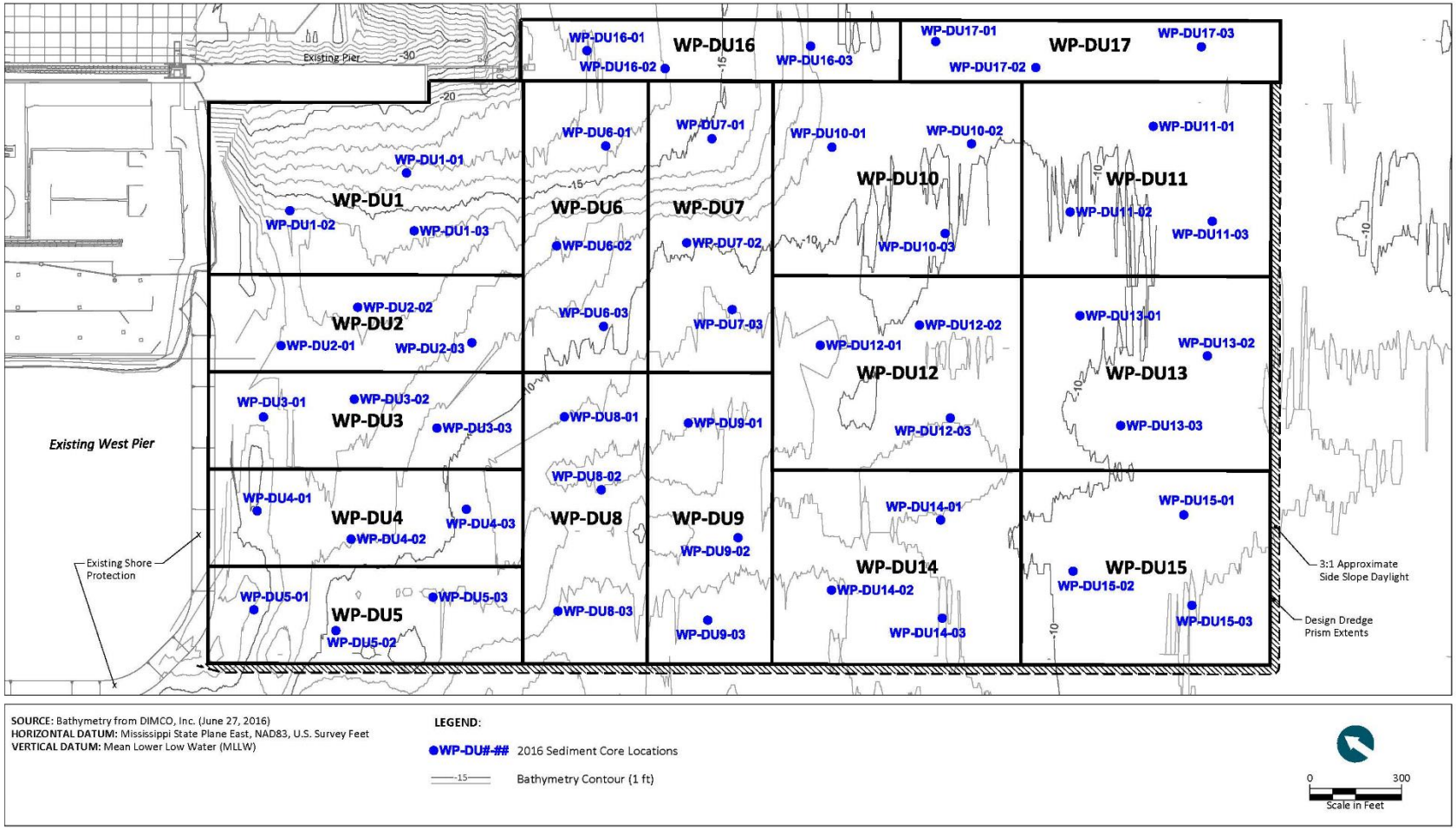


Figure 5-5

2016 West Pier Dredge Units and Sampling Locations

6 PROPOSED DREDGING ACTIVITIES

This section discusses the proposed dredging activities and volumes for the Project. The dredging activities include the West and East Pier Terminal Expansion, the Turning Basin construction, and the maintenance of the Turning Basin and additional berths. Best Management Practices (BMPs) will be used during dredging to the extent practical and in accordance with permit requirements. The BMPs may include the use of turbidity curtains and mixing zones along with turbidity monitoring. Standard BMPs for dredging operations are defined by USACE and the Mississippi Department of Environmental Quality (MDEQ). The dredging contractor will be required to follow these procedures. No net impact to water quality is expected outside of the State mixing zone. A standard clause/requirement would be included in the Port's dredging contracts indicating that the contractor must remove misplaced materials at their own cost.

6.1 West and East Pier Terminal Expansion

The Project proposes to expand the existing West Pier Terminal southward by 155 acres and 14.5 acres for the East Pier Terminal. For the DMMP, the dredging analysis will use the collective geotechnical data described in Section 5.

For the West Pier, boring logs from the samples described in Section 5.0 indicate that the majority of the materials above -30 feet MLLW are soft to very soft clays with very little sands. Soft clays are not suitable foundation soils for construction and would need to be dredged prior to constructing the West Pier terminal. The removal of the soft clays would also prevent mud waves into the adjacent estuary. Because there are no geotechnical borings in the area of the East Pier Terminal Expansion, the DMMP assumed the sediments in the area are similar to the borings near the West Pier expansion and dredging may be necessary to remove soft foundation materials.

To estimate dredging quantities for the West and East Pier Terminal Expansion, the calculations assumed a -20 feet MLLW dredging depth, which is consistent with the 24-acre expansion dredge design for the existing West Pier Terminal facility (Anchor QEA 2011). For the West Pier, the average sediment elevation (-11.2 feet MLLW) from four core borings (GP02-01, GP02-02, GP02-04, and GP02-07; Figure 5-3; Table 5-3) was used as the baseline

bathymetry. Assuming the West Pier Terminal Expansion project will require removal of all the material from -11.2 feet to -20 feet MLLW, the total dredging volume for the 155-acre expansion area is approximately 2.4 MCY. To estimate dredging quantities for the East Pier Terminal Expansion, the National Oceanic and Atmospheric Administration (NOAA) Digital Elevation Model [DEM] (2008) of the Mississippi Gulf Coast was used as the baseline bathymetry. The estimated dredging quantity for the East Pier Terminal Expansion footprint is 560,000 CY, which includes 2 feet of overdepth tolerance.

6.2 Turning Basin

As discussed in Section 1, the Turning Basin construction design includes dredging an 85-acre area adjacent to the Anchorage Basin and upper Sound Channel (Figure 1-2). The Project existing design depth is -36 feet MLLW, with 2 feet of advanced maintenance and 2 feet of allowable overdepth. The DMMP also addresses the dredging associated with the 30-year maintenance of the proposed turning basin.

6.2.1 Turning Basin Construction

A review of the 2011 USACE surveys shows that the average sediment elevation in the area is -12 feet MLLW. To construct the Turning Basin, approximately 3.8 MCY of sediment will be removed to reach the final -40 feet MLLW depth (-36 feet MLLW design depth plus 2 feet advance maintenance and 2 feet of overdepth). Dredging will also occur at the berthing facilities adjacent to the proposed West and East Pier Terminal Expansions and North Harbor Fill area. The dredging depth for the berths is -36 feet MLLW, which includes -32 feet MLLW design depth plus 2 feet advanced maintenance and 2 feet overdepth. The amount of material removed from the berthing areas is approximately 913,000 CY. Therefore, the total estimated dredging volume for constructing the Turning Basin is 4.71 MCY.

6.2.2 Turning Basin and Berth Maintenance Dredging

The volume and frequency of maintenance dredging for the proposed Turning Basin construction and the berthing areas (West Pier Terminal Expansion, North Harbor Fill, and the Existing and proposed East Pier Terminals) were calculated using the Anchorage Basin and upper Sound Channel shoaling rates from Section 4.0. For the calculations, it was

assumed that deposition occurs uniformly across the area over time—a reasonable assumption given the fluid mud material indicated by the USACE (2009a).

For the DMMP, the maintenance calculations assumed that dredging would occur once the sediment elevations reach 2 feet above design depths in the Turning Basin and berth areas. Therefore, to reach the expansion design elevations, approximately 825,000 CY of material would have to be removed from the Turning Basin, 155,000 CY from the West Pier berths, 65,000 CY from the North Harbor berth, and 210,000 CY from the East Pier berths for each maintenance event.

For the dredging frequency calculation, it was assumed that the proposed Turning Basin construction will experience shoaling similar to the upper Sound Channel as described in Table 4-4 (6 CY/Month/LF average and 13 CY/Month/LF maximum). The berthing areas will experience shoaling similar to the existing Anchorage Basin (4 CY/Month/LF average and 11 CY/Month/LF maximum). The maximum shoaling is included to account for seasonal, subtropical, and tropical storm events.

The resulting estimate indicates that maintenance dredging would be required approximately every 18 to 47 months for the Turning Basin construction and every 7 to 14 months for the berthing areas. These results can be compared to the historical data provided by the USACE, which indicate that the average duration between maintenance dredging events has been 18 to 29 months for the upper Sound Channel and the southern Anchorage Basin, but at a lower volume. Maintenance dredging is also dependent on funding, which could not be analyzed as part of this study or included in the decision matrix. Table 6-1 details the dredging volumes for the expansion projects and the volumes and shoaling rates for the maintenance dredging of the Turning Basin and berths.

Table 6-1

Dredging Volumes and Shoaling Rates

Area	Expansion	Maintenance (CY)	Maintenance Frequency (Months)	Shoaling Rates (CY/YR)	Total 30-year Maintenance Volume (MCY)
West Pier	2.4 MCY	NA	NA	NA	NA
East Pier	560,000 CY	NA	NA	NA	NA
Turning Basin	3.8 MCY	825,000	18 – 47	211,000 – 586,000	6.3 – 17.6
Berths (West & East Pier & North Harbor)	845,000 CY	See individual berths	See individual berths	See individual berths	See individual berths
West Pier Berths	See Berths	150,000	7-14	173,000 – 475,000	5.2 – 14.3
North Harbor Berths	See Berths	65,000	7-14	39,000 – 106,000	1.2 – 3.2
East Pier Berth	See Berths	210,000	7-14	63,000 – 172,000	1.9 – 5.2

Note:
NA = not applicable

7 DREDGED MATERIAL PLACEMENT SCREENING REQUIREMENTS

Placement options for the dredged material described in Section 6 include BU areas and ODMDS. In order for dredged material to be placed in BU and ODMDS locations, it must meet certain screening requirements. To determine if BU or ODMDS were viable placement options, a review of the screening requirements was performed for the DMMP. The screening requirements were then used along with the sediment data in Section 5 to determine if the dredged material from the dredging described in Section 6 could be placed in the selected BU and ODMDS locations.

7.1 Beneficial Use Sediment Screening Criteria

The *Final Master Plan for the Beneficial Use of Dredged Material for Coastal Mississippi* (Plan) (CH2M HILL 2011a) provides details for the interim guidance regarding the testing protocols for potential BU material. The purpose of these protocols is to encourage the use of dredged material at BU sites rather than at upland placement locations. As stated in the Plan (CH2M HILL 2011a), the Mississippi Department of Marine Resources (MDMR) aims to do the following:

- *Provide regulators and permit applicants with consistent guidance for evaluating, sampling, and testing sediments to be dredged from waters of the state for potential use in Mississippi's Beneficial Use of Dredge Material Program.*
- *Minimize the burden on applicants and contractors as they seek compliance with Mississippi's Beneficial Use of Dredge Material Law (section 49-27-61, Mississippi Code of 1972) effective July 1, 2010.*
- *Establish non-analytical evaluation as the baseline for non-commercial/industrial (low risk) dredging projects.*
- *Delineate when bioassay screening is allowed and when chemical analysis will be required.*

- *Develop standardized chemical testing/screening methods for projects with higher risk due to association with certain commercial or industrial environments (At this time, the NOAA Screening Quick Reference Tables will be required unless more specific potential contaminant information is available and/or more focused or alternate testing methodologies are proposed by the applicant and accepted by the appropriate regulatory agencies.)*

These goals are supplemented with specific interim protocols, described in Table 7-1, for the evaluation, sampling, and analysis of materials from a proposed dredging project site.

Table 7-1

Interim Protocols for Dredge Material Analyses for Beneficial Use[1]

Evaluation[2]	Any information provided by the applicant or their authorized agent regarding the potential for (or the absence of) chemical contamination at the project site or in the immediate vicinity or watershed could be considered to help reduce the need for additional analytical assessment. This could include: • Historical information regarding the use of the project site and/or adjacent or upstream sites. • Commercially available environmental record searches.
Sampling	Unless an alternative strategy is approved, the minimum sample collection interval will be: • For dredging projects totaling between 2,500 yd^3 and 25,000 yd^3, a minimum of two grab samples (one pair) will be taken. • For typical channel dredging or similar "linear" projects, two samples will be from the centerline of the channel, one at the upstream limit and the other at the downstream limit. For projects exceeding the base volume of 25,000 yd^3, an additional pair of grab samples will be taken on the centerline for each additional 25,000 yd^3 or part thereof. Each pair of samples will be composited so that each 25,000 yd^3 segment will be individually analyzed. Sample locations for nonlinear projects will be determined on a case-by-case basis. This sampling methodology may also be adjusted as appropriate on projects greater than 100,000 yd^3. All sample locations will be preapproved by MDMR. The specific type of analysis to be run will dictate the sample size, retrieval, and handling methods. Please contact the lab that will be used for specific instructions.

Analysis[3]	Sediment Toxicity Tests: 1. Method for assessing the Toxicity of Sediment-associated Contaminants with Estuarine and Marine Amphipods, Test Method 100.4. EPA/600/R-04/025, June 1994 2. 10-day *Leptocheirus plumulosus* sediment toxicity test Includes initial weight data for representative test organisms and final weight data for each replicate of each treatment. Analytical Analyses: • Percent organic matter, total organic carbon, and total volatile solids • Particle size distribution Sample and shipping containers (ice chests): 1-gallon bucket with lid (HCl and DI Rinsed)

Notes:
1. Reproduced from the final Master Plan for the Beneficial Use of Dredged Material for Coastal Mississippi (CH2M HILL 2011a).
2. Applicants or authorized agents may want to approach an initial evaluation of this type as they would a typical Phase 1 Environmental Assessment albeit with a focus on submerged/ aquatic aspects. Where no specific information regarding the potential for contamination (or lack thereof) is provided by the applicant or authorized representative, or if public commentary or other information suggests a possibility of contamination for a noncommercial/nonindustrial project, a nominal bio-assay screening process will be used. If, however, specific potential contaminants are identified, chemical analysis will be required.
3. For sites where some specific contaminate data are available or a commercial/ industrial site is involved, NOAA Screening Quick Reference Tables have been accepted by MDMR and Mississippi Department of Environmental Quality on a provisional basis. Additional or alternate chemical analysis may be required based upon site specifics (http://response.restoration.noaa.gov/book_shelf/122_NEW-SQuiRTs.pdf).

7.2 Evaluation of Turning Basin Sediments

Three of EA's sample sites (Section 5.0) close to the proposed Turning Basin construction (GH04-01/02-M, GH04-03-W, and GH04-03-DW) were checked for BU compatibility. According to the results of the 10-day whole sediment toxicity testing (bioassay) for *Leptocheirus plumulosus*, none of these samples exhibited a 10-day mean percent survival rate that was statistically different from the reference sediment sample (EA 2006). Testing methodology for EA's whole-sediment bioassays followed USEPA guidance which is slightly different than the specified testing method recommended by the MDMR in the interim protocols (Test Method 100.4 EPA/600/R-04/025). Should these 10-day bioassay results be utilized in conjunction with the characterization data for the new work dredging material, concurrence from the MDMR regarding the similarity and acceptance of the methods and results may be necessary.

Of the three parameters listed as Analytical Analyses by the interim protocols (percent organic matter, total TOC, and total volatile solids), only TOC was analyzed by EA (2006). For all samples collected for each of the alternatives developed by EA (2006), the overall range in TOC was 0.29 percent to 2.08 percent. The TOC measured in the reference sediments was 0.91 percent. These data should be supplemented with testing that analyzes the other two parameters; however, based upon the results of the 10-day bioassay and TOC analyses, it is not expected that the sediments from the proposed Turning Basin construction footprint will exhibit characteristics that are prohibitive for BU.

7.3 Evaluation of Sediments Adjacent to the Existing West Pier

In 2010, Anchor QEA conducted an analysis for the Port to determine if the soft sediment dredged material from the 24-acre area adjacent to the existing West Pier could be placed into the Deer Island BU site located in Harrison County, Mississippi (Anchor QEA 2010b). The results of the testing (Tables 7-2 and 7-3) indicated that the sediments from this location at the Port were suitable for placement at Deer Island.

The analyses included:

- 10-day bioassay testing (*L. plumulosus*, 2 to 4 millimeters [mm])
- Percent moisture
- Total volatile solids
- Organic matter content
- TOC

Table 7-2
Bioassay 10-Day Test Results (Anchor QEA 2010b)

Sample	*L. plumulosus* Survival		*L. plumulosus* Initial Weight (mg)	*L. plumulosus* Final Weight (mg)	
	Reference	Site		Reference	Site
PG-B1	98%	98%	0.397	0.326	0.344
PG-B2	98%	94%	0.397	0.326	0.329

Table 7-3
Sediment Analytical Results (Anchor QEA 2010b)

Test	PG-B1	PG-B2
Percent Moisture (%)	69.7	60.3
Total Volatile Solids (%)	6.28	4.84
Organic Matter (%)	9.30	6.60
Total Organic Carbon (%)	2.35	1.57

7.4 ODMDS Requirements

As defined by Section 103 of the Marine Protection Research Sanctuary Act (MPRSA) of 1972, ocean disposal shall be limited to dredged materials that meet the ocean dumping criteria published by the USEPA in Title 40 of the Code of Federal Regulations (CFR), Parts 220-228 (GPO 2012). The evaluation of dredged material for ocean disposal is conducted by the USACE—the permitting agency for the transportation of dredged material to the ocean for the purpose of disposal—and subject to USEPA review and concurrence.
USEPA and USACE have developed a tiered testing approach to evaluate the suitability of dredged material for ocean disposal. Guidance for the evaluation of dredged material under the MPRSA Section 103 program is provided in the *Evaluation of Dredged Material Proposed for Ocean Disposal - Testing Manual* (Testing Manual; USEPA/USACE 1991). As stated in USEPA/USACE (1991), the four tiers for testing dredged material for ocean disposal are as follows:

- Tier 1 Evaluation of Existing Information
- Tier 2 Conservative Screening Tools
- Tier 3 Laboratory Bioassays
- Tier 4 Advanced Biological Evaluations

The Testing Manual (USEPA/USACE 1991) and ocean dumping regulations stress the use of effects-based-testing bioassays as evaluative tools necessary to determine suitability of material for ocean dumping. The evaluation of dredged material focuses on biological effects rather than the concentration of contaminants. Bioassay testing focuses primarily on the impact of the solid phase on the benthic environment. Material deposited on the seafloor has

greater potential to cause impact to a smaller area for a longer period than the fraction of dredged material released to the water column.

To determine the suitability for ocean dumping, the dredged material for a proposed project is evaluated in a tiered process (Tiers 1, 2, and 3). Quantitative comparisons of the acceptable conditions (reference sediments) and potential effects of a dredged material indicate whether the dredged material in question causes a direct and specific biological effect under test conditions; such effects can indicate the potential to adversely affect the biological receptors at an ODMDS (USEPA/USACE 1991). If the results of the appropriate tests and evaluations show the proposed dredged material meets the criteria under 40 CFR 227, disposal of the material at an USEPA-designated or USACE-selected ODMDS is supported. The following sections describe the evaluation process and present an initial evaluation based on current data.

7.4.1 Tier 1 Evaluation Description

A Tier 1 evaluation uses readily available information and includes an assessment of when the regulatory exclusions from testing are applicable. Information on the proposed dredging site, sediment grain size, and potential for contamination is used to determine whether the exclusion criteria are met; the exclusion criteria as stated in 40 CFR 227.13 (b) are as follows:

> *(1) Dredged material is composed predominantly of sand, gravel, rock, or any other naturally occurring bottom material with particle sizes larger than silt, and the material is found in areas of high current or wave energy such as streams with large bed loads or coastal areas with shifting bars and channels; or*
>
> *(2) Dredged material is for beach nourishment or restoration and is composed predominantly of sand, gravel or shell with particle sizes compatible with material on the receiving beaches; or*
>
> *(3) when:*
>
> > *(i) The material proposed for dumping is substantially the same as the substrate at the proposed disposal site; and*
> >
> > *(ii) The site from which the material proposed for dumping is to be taken is far removed from known existing and historical sources of pollution so as*

> *to provide reasonable assurance that such material has not been contaminated by such pollution.* (GPO 2012)

Evaluation at successive tiers is based on more extensive and specific information that allows more comprehensive evaluations of the potential for environmental effects. Note that compliance with the ocean dumping regulations requires compliance with water quality criteria (WQC; Tier 2); bioassays to assess toxicity in the water column (both liquid phase and suspended phase); and sediment and bioaccumulation in the sediment (Tier 3).

7.4.2 Expansion Project Tier 1 Data Evaluation

The Southeast Regional Implementation Manual (SERIM) provides guidance regarding the evaluation of dredged materials for ocean disposal (USEPA/USACE 2008). As outlined in the SERIM, the first step of a Tier 1 evaluation is the assessment of the exclusion criteria.

According to the first exclusion requirement, the dredged material should have particle sizes predominantly larger than silts, have no more than 12 percent fines, and must be found in areas with excessive current or high wave energy (USEPA/USACE 2008). Based on the characteristics of the sediment type and hydrodynamics at the Port, this exclusion criterion is not fulfilled. As discussed in Section 5, the majority of the material within the Project dredging footprint is silty and clayey. Moreover, the wave climate around the Port is generally mild and the tidal fluctuations do not create excessive current velocity.

The second exclusion requirement is regarding beach nourishment or restoration. This activity does not require the issuance of a Section 103 permit under MPRSA; therefore, the second criterion is "seldom, if ever, applicable" (USEPA/USACE 2008).

The third exclusion criterion has two requirements that must be fulfilled: 1) the dredged material is substantially similar to the sediments at the ODMDS; and 2) the dredged material is located at a sufficient distance away from any potential sources of pollution. The two requirements will be discussed in Section 7.4.3. As described in Section 5, Anchor QEA collected reference samples from the Turning Basin, the Gulfport Western ODMDS, and the Pascagoula ODMDS (Anchor QEA 2013). The reference samples were then analyzed and

compared to determine the capability between Turning Basin and ODMDS sediments. The analysis included physical, chemical, and biological for sediment, site water, and tissue.

7.4.3 ODMDS Sediment Physical and Chemical Characteristics

Based on the guidance provided in the SERIM, in order for sediments at the dredging site and the proposed placement areas to be "substantially" similar, both must have the same USCS group classification (USEPA/USACE 2008). As discussed in Section 5, previous investigations of the materials present at the Port show the sediments are predominantly silts and clays with moderate sand fractions.

For the existing Gulfport Western ODMDS, the Site Management and Monitoring Plan (SMMP) identifies a range for the silt and clay content of the sediments at these sites. Specifically, the composition ranges from 22 to 91 percent silts and clays, which the SMMP identifies as "comparable" to the dredging site, which in this case is the Gulfport Harbor (USEPA/USACE 2008). Additionally, the four SERIM recommended reference locations for the ODMDS range in sediment composition from 64.5 to 96.1 percent fines, and the material types are classified as either sandy silt or silt (USEPA/USACE 2008).

The available documentation for the sediment characteristics at the Pascagoula ODMDS includes the designation EIS prepared by the USEPA (1990) and the SMMP (USEPA/USACE 2008). The EIS noted that that the silt and clay content of the ODMDS sediments range from 21 to 77 percent and while there is little apparent seasonal variation, the average sand fraction was slightly higher in the spring (USEPA 1990). The material types are similar to the four reference locations cited by the SERIM (USEPA/USACE 2008). Percent fines at these locations range from 11.2 to 92.4 percent and the overall material types are classified as silt, sandy silt, or silty sand.

The Anchor QEA sampling and analysis showed that the Gulfport Western and Pascagoula ODMDSs contained a high percentage of fines (Anchor QEA 2013). Table 7-4 summarizes the physical data for the Gulfport Western and Pascagoula ODMDS samples from the 2013 Anchor QEA report. All metals except cadmium were detected in the samples. The samples did not contain any organometallic compounds, SVOCs, PAHs, or pesticides. Because the

sediment samples were similar in physical and chemical characteristics and generally lacking in containments of concern, both ODMDSs were determined to be suitable disposal options for the Turning Basin dredged material.

Table 7-4
ODMDS Physical Sediment Characteristics

ODMDS	Percent		
	Sand	Silt	Clay
Gulfport Western	5.7	44.6	49.7
Pascagoula	2.7	28.6	68.7

7.4.4 Sediment Contamination Assessment

As suggested by the SERIM, the USEPA's Envirofacts website (USEPA 2017a) and the U.S. Coast Guard's National Response Center (NRC) website (Coast Guard 2017) were consulted to assess previous spills or events that may have contributed to the contamination of sediments at the Port. Envirofacts provides up-to-date information regarding environmental compliance information for registered facilities. Reports were generated for registered facilities near the Port (Appendix B). Also, the USEPA Region 4 Superfund website (USEPA 2017b) was consulted for listed contaminated sites in the vicinity of the Port. The available information indicates there are no sites on the waterway or in close proximity in the surrounding upland areas that would adversely affect the sediments at the Port.

The NRC website provides access to a comprehensive database of reported incidents involving potential hazardous releases into the environment. Data reports from 2001 to April 2017) were reviewed for incidents occurring in Gulfport, Mississippi, at the Port. The majority of incidents reported were due to sheen, discharge from a docked vessel (presumably bilge), or mechanical failure of a vessel. A single incident of radiation detected emanating from a container was reported; however, it was later discovered that the contents (silicon sand) gave a false reading of radiation (Coast Guard 2017). Table 7-5 summarizes incidents that were near the Port of Gulfport Anchorage Basin. This table was developed by filtering all of the yearly reports provided on the NRC website for incidents that were cataloged as occurring in Gulfport, Mississippi, and relating the Harbor, West Pier, or East

Pier. The Navigation Data Center (USACE 2017) website was also reviewed to determine the vessel cargo shipped in and out of Port. In the early 1900s, the Port's initial use was for the export of raw and finished wood products. Transitioning into the 1960s, the Port's import and export activities expanded to include refrigerated containers of tropical fruits. Titanium dioxide is another major commodity handled by the Port facility. Table 7-6 provides a summary of domestic and foreign cargo receipts and shipments to the Port as of 2014 (USACE 2017). Based on data from the NRC, no spills of any cargo of any type occurred during the period of review.

As described in Section 5.3, the 2016 Turning Basin and West Pier Terminal and berthing area sampling results showed all the DUs were below the ERM values for the chemical analysis of the sediment.

Table 7-5
NRC Incident Summary

Date	Identification Number	Description	Type of Incident	Remedial Action Description	Federal Agency Notified
4/26/2001 6:45	564118	The caller stated that there is a spill under the pier.	Fixed	None	
6/19/2001 17:00	570126	The caller is reporting a release of material from his vessel due to packing gland on starboard side coming loose allowing water into the engine room.	Vessel	The crew pumped out vessel's engine area, and repacked the shaft. Crew deployed sorbent pads.	USCG Gulfport
7/12/2001 15:45	572764	A hydraulic hose on a tug boat ruptured causing hydraulic oil to spill onto the deck and into the Gulfport harbor.	Vessel	Booms applied, absorbents applied, material contained.	USCG
1/24/2002 14:45	592094	A lumber vessel was discovered dumping raw sewage into the Gulfport harbor.	Vessel	None	
3/21/2002 17:15	597281	The caller reported a release of 10 gallons of diesel from vessel due to tank overflow.	Vessel	Material contained, cleanup completed.	CG
3/21/2002 18:15	597283	Caller reporting a release of material due to a tank burping during fueling.	Vessel	Investigation underway, contractor has been hired, investigation underway.	Coast Guard in Gulfport
5/11/2002 8:00	603422	The material spilled out of the vessel Anthony Taylor due to unknown causes.	Vessel	None	Coast Guard
6/10/2002 19:15	609924	The fuel tank on a carrier vessel was overfilled causing diesel fuel to spill into the Gulfport harbor.	Vessel	Absorbents applied.	MSO Mobile
7/30/2002 6:25	618258	The caller is reporting an unknown sheen around the vessel "Nova Zelandia".	Unknown Sheen	None	USCG
6/29/2003 9:45	649391	The transfer hose on a vacuum truck failed causing waste oil to spill into the Gulfport harbor.	Mobile	Applied booms and absorbents.	USCG
8/12/2003 9:15	653660	Materials released from a vessel, due to an equipment failure.	Vessel	Clean up underway.	
11/10/2003 12:00	704901	Material released from a fuel tank vent on a cargo vessel (Dutch flag) due to unknown causes.	Vessel	Material contained, cleanup crew on-site.	
7/22/2004 11:30	729161	An unknown sheen was discovered in the Gulf Port harbor.	Unknown Sheen	None	USCG
9/28/2004 12:40	736625	The caller is reporting an unknown sheen.	Unknown Sheen	None	
1/10/2005 13:00	746709	Caller is reporting an unknown sheen in the water.	Unknown Sheen	None	CG
3/25/2005 10:16	753743	Caller stated release of oil from sound tube, cleaning their bilge and sounding tubes overflowed.	Vessel	Clean up underway, ship crew doing cleanup on site with booms.	
8/6/2005 19:45	768194	The caller is reporting the discovery of a diesel fuel sheen in the west Mississippi Sound coming from a grounded fishing vessel.	Vessel	None as of yet.	USCG
5/15/2009 10:00	905715	Caller stated that she was fishing with her husband and they noticed a large sheen in the Gulf of Mexico. Caller believed the sheen was coming from a crane that was doing work in the area.	Unknown Sheen	None	USCG
1/13/2010 8:45	928471	Caller stated this morning 13-Jan-2010 at the Port of Gulfport a radiation hit on a container was discovered. The Customs Boarder Protection personnel checked out the container and the port was shut down at 0755 hours until 0845 hours. The container in question contained silicon sand, which gave a false reading of radiation. Caller stated there was no real hazard to the cargo. Caller stated there was no evacuation just a shutdown for fifty minutes until the container was checked out by Customs Boarder Protection at that point the gates were reopened. The reporting party was under the impression that Custom Boarder Protection called this incident into the National Response Center earlier today but there is not a report of this incident generated until now.	Storage Tank	The container was checked out by the Customs Border Protection.	Customs Border Protection
7/27/2011 9:11	983993	Caller reported an unknown substance floating in the water near the Port.	Unknown	None	USCG

Date	Identification Number	Description	Type of Incident	Remedial Action Description	Federal Agency Notified
4/3/2013 17:12	1042859	Caller reporting a collision that happened at dock. Caller stated that there was another vessel that made contact with a barge.	Vessel	None	USCG
1/23/2015 9:30	1106430	Caller is reporting an unknown sheen between the vessel and the shore from an unknown source.	Unknown Sheen	Vessel determined not to be source.	

Note:
1. None of the entries in this table have been altered from their original content in meaning or description.

Table 7-6
Port of Gulfport Domestic and Foreign Cargo

Commodity	All Traffic Types (Domestic and Foreign)		
	All Traffic Directions (Short Tons)	Receipts (Short Tons)	Shipments (Short Tons)
Coal, Lignite, and Coal Coke	0	0	0
Petroleum and Petroleum Products	14,000	2,000	12,000
Chemicals and Related Products	93,000	16,000	77,000
Crude Materials, Inedible Except Fuels	721,000	663,000	58,000
Primary Manufactured Goods	293,000	12,000	281,000
Food and Farm Products	789,000	693,000	96,000
All Manufactured Equipment, Machinery	289,000	122,000	167,000
Total unknown or not elsewhere classified	28,000	7,000	21,000
Total	2,227,000	1,515,000	712,000

7.4.5 Additional Sediment Testing

In addition to the physical and chemical analyses for Tier 1 evaluation, Anchor QEA performed biological analysis of the Project sediments and the Pascagoula ODMDS. As described in Section 5.0, the biological testing included solid phase, suspended particulate phase, and bioaccumulation tests.

7.4.5.1 2016 Turning Basin Sediment Testing

As described in Section 5.0, bioassay and bioaccumulation tests were conducted on composite samples from the DUs and reference samples from the Pascagoula ODMDS. Based on the results of the testing and analysis, each of the ten Turning Basin Expansion DUs meet the LPC for ocean placement at the Pascagoula ODMDS. Because each of the ten Turning Basin Expansion DUs meet the LPC for ocean placement, consideration as beneficial use material for shoreline nourishment is also a viable option for placement (Anchor QEA 2017).

7.4.5.2 2016 West Pier Terminal Expansion and Berthing Areas Sediment Testing

As described in Section 5.0, bioassay and bioaccumulation potential tests were conducted on composite samples from the DUs and reference samples from the Pascagoula ODMDS. Based on the results of the testing and analysis, each of the 17 West Pier Terminal Expansion and Berthing Area DUs meet the LPC for ocean placement at the Pascagoula ODMDS. Because all 17 DUs meet the LPC for ocean placement, consideration as beneficial use material for shoreline nourishment is also a viable option for placement (Anchor QEA 2017).

7.4.6 Expansion Project Data Evaluation Conclusions

Available data were reviewed as part of a Tier 1 assessment to determine the suitability of the sediments from the Turning Basin construction area for ocean placement. The primary resource for the Tier 1 evaluation was the SERIM developed by the USEPA and USACE (2008). Of note, the SERIM does indicate that physical data used to compare and characterize the sediments at a particular site should not be more than 10 years old. Therefore, it is recommended that the final decision for material suitability be based on the data generated by the 2016 sediment characterization effort conducted to support the Expansion EIS, described earlier in this document.

The data generated from this sediment characterization provides further proof of the similarity of the materials at the Project and ODMDS location. The report for the sediment sampling at the Turning Basin and West Pier provides a thorough comparison of sediments found at the Project site and those found at each reference location. Additional testing to support Tier 2 and 3 evaluations was also conducted as part of the sediment characterization. These results provide sufficient information to determine final disposition of the sediments dredged from the Turning Basin construction and the West Pier Terminal and Berthing areas.

Based on the available data, there is no apparent evidence of contamination at the Port, and the sediments present at the Project site and at the ODMDSs appear to be similar in physical and chemical characteristics. The Tier evaluation portion of this DMMP is considered complete until additional data prove otherwise.

8 DREDGED MATERIAL PLACEMENT ALTERNATIVES

Potential expansion project dredged material placement sites reviewed for the DMMP include BU sites, ODMDS, and upland locations. As explained below, the State of Mississippi prefers dredged material to be placed in BU sites when feasible. When placement in a BU site is not feasible, ODMDS may be considered as an alternative dredged material placement option. An upland site may be required if the sediment is not considered suitable for placement in a BU or ODMDS. The following sections describe the proposed placement alternatives for BU sites, ODMDS, and upland locations. BMPs will be used during dredged material placement to the extent practical and in accordance with permit requirements. The BMPs may include the use of turbidity curtains and mixing zones along with turbidity monitoring. Standard BMPs for dredging operations are defined by USACE and MDEQ. The dredging contractor will be required to follow these procedures. No net impact to water quality is expected outside of the State mixing zone. A standard clause/requirement would be included in the Port's dredging contracts indicating that the contractor must remove misplaced materials at their own cost.

8.1 Beneficial Use Sites

BU sites provide an alternative to traditional dredged material placement sites such as confined upland facilities or open-water sites (i.e., thin-layer placement sites or ODMDS). In addition to providing a placement area for dredged material, BU may also provide environmental, economic, and social benefits. The use of dredged material for BU is legally mandated in several states, including Mississippi.

Dredged material can be beneficially used in various engineering applications, environmental enhancements, and agricultural product uses (USEPA/USACE 2007a). The composition and grain size distribution of the material is an important consideration when evaluating the proposed site(s), delivery method(s), and overall project scope. Additionally, BU alternatives should evaluate other material and management aspects, which include, but are not limited to, the following: contaminants, implementation, efficacy of proposed methods, environmental effects resulting from the dredging and placement, overall project costs, and future maintenance.

The following sections discuss the legal requirement for BU in the State of Mississippi and present four potential BU sites listed in recent assessments of the Mississippi Gulf Coast region (CH2M HILL 2011a, 2011b).

8.1.1 Mississippi Law

The goal of BU for coastal Mississippi is to retain sediments "in the system," ensuring that dredged material removed from the Mississippi Sound is reused within the system (CH2M HILL 2011a). To facilitate keeping the sediments in the system, Mississippi passed Section 49-27-61 in July 2010 which requires dredged material from dredging activities generating more than 2,500 CY to be placed in appropriate BU programs, provided such material is suitable and a BU site is available.

8.1.2 Beneficial Use Permitting and Additional Considerations

The MDMR establishes new BU sites and permits by county to ensure dredged material is used beneficially. Permitting new BU sites must be closely coordinated with the National Marine Fisheries Service and other regulatory agencies; new sites must be delineated to mitigate the impacts on critical habitat areas for the Gulf sturgeon. The projected sea level rise along the Mississippi Gulf Coast is another factor that should be considered when creating BU sites, as the design and construction of ancillary structures (containment dikes, breakwaters, etc.) should be able to provide the necessary protection of a BU site well into the future.

Proposed BU projects are to be submitted to the MDMR permitting office for review. The BU Program Administrator will determine the following: 1) is it feasible for the proposed site to receive dredged materials; and 2) does the site has sufficient capacity to accept the proposed dredged materials. If the site has sufficient capacity, the BU Program Administrator will send approval to the permitting office. If the BU projects does not identify a specific BU site, the BU Program Administrator will review existing priority areas for consideration.

The MDMR Office of Coastal Management outlines the following four options for permit applicants who are involved in coastal projects that include dredging (CH2M HILL 2011a):

1. Design and implement a new BU project for the proposed dredged material.
2. Provide the dredged material in an approved coastal restoration project.
3. Apply the dredged material at alternative locations of equal BU.
4. Make a voluntary contribution to the Coastal Resources Trust Fund, based on the amount of material dredged. Such contributions from several smaller projects to the Coastal Resources Trust Fund can be combined to fund larger projects.

8.2 Available BU Sites and Capacities

Ideally, the BU sites chosen for a particular project is in close proximity to the material source, thus creating an even balance between the efforts required for dredging, transport, and placement activities. By identifying BU sites, commercial dredging companies and agencies (e.g., USACE) are provided with several choices for material placement locations that include coastal restoration and enhancement project areas.

The BU sites in the DMMP are limited to the Table 8-1 projects, which have been suggested by federal, state, and local authorities as possible designated BU sites in the Mississippi Gulf Coast region; site locations are displayed on Figure 8-1. If future BU sites are identified by the agencies, those BU sites may be evaluated and used for dredged material from the Project. For each of the suggested BU sites, Table 8-1 lists the estimated dredged material capacity, which is subject to change as the sites are permitted and additional data are collected. Many of the proposed BU sites identified in the table require containment structures to prevent erosion of the placed dredged material and breakwater structures for protection of the site during and after construction. For those BU sites, Table 8-1 lists the structure type and proposed length and estimated structure construction cost range. For the proposed sites that may not require additional structures, the cost ranges are "studies" costs, which include, but are not limited to, site topographic and/or bathymetric surveys, adjacent marsh and habitat evaluation, and dredged material suitability testing.

As noted in Table 8-1, information regarding BU at the Chandeleur Islands has been adapted from another report (T. Baker Smith [TBS] 2006), which documents the proposed

construction and restoration of marshlands lost because of Hurricane Katrina; this report does not cite a quantity of material (or an estimated capacity) necessary to restore the islands. The available information provides a total land loss footprint (2,206 acres), which can be used to estimate the total placement coverage. The estimated dredging quantity (7.68 MCY) could provide a 2-foot-thick cover layer over the total land-loss footprint cited by TBS (2006). This value is a generalization that assumes an even layer of dredged material placed across the entire area. It is likely that a thickness greater than this nominal value will be required to restore portions of the marshland at the Chandeleur Islands; therefore, this site may be able to receive additional dredged material.

Table 8-1

Identified Beneficial Use Project Sites

Project[1]	County	Capacity (CY)	Distance to Port of Gulfport (MI)[2]	Containment and Protection Structure Description and Length (LF)	Costs	
					Low	High
Biloxi Marsh Complex (BMC) (Louisiana)	NA	Unlimited[3]	29	Earthen (Unspecified Length)	$100,000 (studies)	$200,000 (studies)
Chandeleur Islands (Louisiana)[4]	NA	Unknown	29 to 46[5]	Design of Breakwater, Terminal Groins, Shoreline Armor Structures (unspecified length)	$750,000	$1,250,000
Bayou Caddy Marsh	Hancock	30,000	25	Temporary or None Needed	$50,000 (studies)	$150,000 (studies)
Bayou Caddy Safe Haven	Hancock	200,000	25	None Needed	$50,000 (studies)	$150,000 (studies)
Wolf River Marsh	Harrison	420,000	33	11,450 Riprap 5,700 Riprap/Deltalok 3,100 Temporary	$3,000,000	$4,000,000
Deer Island	Harrison	1,100,000	20	7,500 Earthen	$1,500,000	$3,000,000
Back Bay Marsh Island	Harrison	300,000	38	8,800 Riprap	$4,600,000	$6,100,000
Lake Mars Pier and Boat Launch	Jackson	39,000	23	None Needed	$30,000 (studies)	$100,000 (studies)
Lower Escatawpa	Jackson	1,150,000	39	24,000 Temporary: 12,000 Riprap, 12,000 Coir (if needed) or None Needed	$50,000 (studies) $3,924,000 temporary	$150,000 (studies) $5,472,000 temporary
Round Island	Jackson	3,300,000	38	5,000 Riprap	$1,700,000	$2,500,000

Notes:

1. Unless noted otherwise, all information presented in this table is from the *Final Project Management Plan for Selected Beneficial Use Projects Along Coastal Mississippi* (CH2M HILL 2011b).
2. The distance to the Port of Gulfport was measured along the existing channels; these distances should be considered approximate, as routes are subject to change based on vessel draft and traffic restrictions.
3. It is likely that further evaluation (bathymetric surveys) of the BMC will provide data that can be used to establish a capacity for this site.
4. Information for the Chandeleur Islands marsh restoration project is adapted from the T. Baker Smith report: *The Biloxi Marsh Stabilization and Restoration Plan* (2006).
5. The distance from the Port to the Chandeleur Islands is estimated based on the length of the island footprint assumed to receive dredged material.

MI = miles

8.3 Site Selection

From the information provided in Table 8-1, two criteria—estimated capacity and distance to the Port—were evaluated to select candidate BU sites for the Project's new work. The only two sites listed that may be able to accommodate the estimated new work dredging volume are the Chandeleur Islands and the BMC, specifically the Northeastern Outlying Islands. These two sites will be carried forward for further evaluation of new work dredging and placement costs.

For the Turning Basin and West Pier, North Harbor, and East Pier berthing areas maintenance dredging placement alternatives, candidate BU sites were also evaluated by estimated capacity, distance to the Port, and proposed containment and/or shoreline protection. Because maintenance materials typically have a higher moisture content than new work materials, sites with structural containment(s) may be necessary to consolidate the material and to prevent material erosion. Those BU sites with a containment and/or shoreline protection design and shoreline nourishment are believed to be the best candidates for the maintenance dredging material. The proposed BU site nearest the Port with sufficient capacity to accommodate at least one maintenance cycle is Deer Island. Deer Island will be carried forward for further evaluation of maintenance dredging and placement costs.

The three BU sites identified as candidates for the new work (Chandeleur Islands and BMC - Northeastern Outlying Islands) and maintenance materials (Deer Island) are discussed further of the following sections. Descriptions of each site, along with their habitat value, stability, and sediment transport, are also provided.

8.3.1 Chandeleur Islands

The Chandeleur Islands are a chain of barrier islands forming the easternmost point of the State of Louisiana. The federally owned island chain is part of the Breton National Wildlife Refuge (NWR), the second oldest refuge in the NWR system. The NWR was established in 1904 to provide sanctuary for nesting wading birds and sea birds as well as winter shorebirds and waterfowl (U.S. Fish and Wildlife Service [USFWS] 2006). The islands are the result of the westward shift of the Mississippi River (approximately 2,000 years ago), which

discontinued the sediment supply to the St. Bernard delta region; in subsequent years, the sediments remaining in this area contributed to the formation of these islands (USFWS 2006).

8.3.1.1 Habitat Value

The majority of the Chandeleur Islands consist of sandy beach areas, which provide sufficient habitat for vegetation such as black mangrove, groundsel bush, and wax myrtle; additionally, the shallow, submerged shore areas support beds of manatee, shoal, turtle, and widgeon grass (USFWS 2006). According to the USFWS (2006), the habitat of the island area supports 23 species of shore and sea birds. Common nesting species include royal, Caspian, and sandwich terns; laughing gull; brown pelican; black skimmer; and large numbers of waterfowl, such as redheads, canvasback, and scaup, that frequent the islands during winter months (USFWS 2006).

8.3.1.2 Site Stability

The Chandeleur Islands make up the largest barrier islands in the Gulf of Mexico and protects the nearshore areas of Southeast Louisiana (TBS 2006) and southern Hancock County, Mississippi from storm surge and wave action resulting from tropical events. Because the day-to-day erosive forces (i.e., wind and wave action) and tropical events put the islands in a constant state of vulnerability, it may be necessary to construct coastal protection structures to provide additional site stability. Further analysis would be required to determine the alignment, material, and cross section of these structures. Additionally, vegetative planting as part of the island restoration effort would contribute to the establishment and retention of critical habitat.

8.3.1.3 Sediment Transport

The islands are prone to erosion and have an average rate of shoreline loss of 44.3 feet per year. The post-Hurricane Katrina area of the islands is approximately 5,214 acres, which represents a 30 percent decrease from the islands' 2001 area (7,420 acres; TBS 2006). Previous analyses cited by TBS (2006) have shown that the islands experience cycles of land loss and gain, with most of the affected area on the Gulf side of the islands. However, as previously mentioned, the area experiences a net loss on a yearly basis.

8.3.2 Biloxi March Complex – Northeastern Outlying Islands

Another BU site proposed within the Breton NWR and 210,000-acre BMC estuary is the Northeastern Outlying Islands, which comprises approximately 30,290 acres and includes islands, bays, and open-water lakes, specifically False Mouth Bay, Bay Boudreau, Drum Bay, and Shell Island Lake (CH2M HILL 2011b; TBS 2006). These areas are also portions of the St. Bernard delta region, established by sediment deposited by the Mississippi River prior to changing course approximately 2,000 years ago.

8.3.2.1 Habitat Value

The ecological functions of this area provide support for aquatic life in the region. This area of the BMC controls salinities for portions of the Mississippi Sound. Improvement of this area through BU would serve to enhance the fisheries of the surrounding areas, thus providing support to commercial and recreational fishermen (CH2M HILL 2011b).

8.3.2.2 Site Stability

The stability at this site depends on the condition of the Chandeleur Islands. The Chandeleur Islands protect the Northeastern Outlying Islands, which lie on the leeward side of the islands, from offshore waves. Restoration of the area would provide additional storm protection of the coastal region of Louisiana and Hancock County, Mississippi (CH2M HILL 2011b).

The conceptual restoration plan proposed by TBS (2006) in their evaluation suggested revegetating the site to provide stability and habitat establishment. As noted in Table 8-1, this area may require containment or breakwater structures. However, further evaluations of site conditions are required to determine the following: 1) the type(s) of vegetation necessary to recreate establish the habitat; and 2) the need for coastal protection structures for this site.

8.3.2.3 Sediment Transport

According to TBS (2006), the exposed lakes and bays of this area are prone to wave fetch on a daily basis, which increases the potential for erosion; between 2001 and 2005, approximately 1,297 acres of land were lost.

8.3.3 Deer Island

Deer Island, one of the first areas in coastal Mississippi to become a BU site, is located in southeast Harrison County (CH2M HILL 2011b). The island is composed of approximately 400 acres of land that is owned, managed, and monitored primarily by the MDMR (CH2M HILL 2011b).

8.3.3.1 Habitat Value

The habitat within the island is varied and includes sandy beach along the shorelines and barrier island pond/lagoon complex, poly and mesohaline marsh, slash pine maritime forest, and relic dune scrub (CH2M HILL 2011b). The ecological function of this habitat variety serves to support migratory birds with feeding, nesting, and wintering areas. The site is also home to a great blue heron rookery along with other bird species, including brown pelican, sharp-shinned hawk, American kestrel, merlin, snowy plover, American oystercatcher, and Least Tern (CH2M HILL 2011b).

8.3.3.2 Site Stability

Previous and ongoing projects at the site indicate the need for coastal structures to protect the material placement areas (LAW/GBA 2002; CH2M HILL 2011b). The island is positioned on the Mississippi Sound, with wave action impacting its southern face. However, because it is located in the nearshore area, Deer Island does receive some protection from the barrier islands.

8.3.3.3 Sediment Transport

A Deer Island geological study found that the shoreline retreat is approximately 2 acres per year, and since 1850, the island has lost more than 300 acres (Schmid and Otvos 2003). The loss rate is calculated from a comparison of the shoreline profiles and the resultant island

footprint acreage. Additionally, Schmid and Otvos (2003) found that the erosion at the site is greatest at the southeastern corner of the island where muddy sands are the predominant material type. Originally, the southeastern corner of the island extended farther east and was called Little Deer; however, it has completely eroded away (CH2M HILL 2011b).

8.4 Ocean Sites Available for Material Placement

The USACE and other public and private entities use approved ocean disposal sites (i.e., ODMDS) when other open-water, BU, or upland placement options for dredged material are not feasible. Currently, there are three designated ODMDS locations—Gulfport Eastern, Gulfport Western, and Pascagoula—in the vicinity of the proposed Project. As previously discussed, the Gulfport Eastern ODMDS is no longer used by the USACE because the dredged material placed in the ODMDS migrates from the placement area into the FNC, which increases the necessity for maintenance dredging (CH2M HILL 2010a). Due to the likelihood of dredged material shoaling into the FNC, this ODMDS will not be included as part of the programmatic analysis of dredged material placement alternatives evaluated in Section 9.

After the submittal of the draft DMMP, the USACE informed the project team that the Gulfport Western ODMDS (Figure 8-1) permit had expired and would likely not be renewed. Therefore, the Gulfport Western ODMDS will no longer be considered a viable option for placement of the dredged material. The Pascagoula ODMDS will be the only ODMDS evaluated as a potential placement location for the dredged material from the Project. Available data regarding area, water depths, and placement activity (i.e., dates and quantities) were obtained from the USACE Ocean Disposal Database (USACE 2015) and the Pascagoula ODMDS SMMP (USEPA/USACE 2006).

8.4.1 Pascagoula ODMDS

The Pascagoula ODMDS is located south of Horn Island on the western side of the Pascagoula Bar Channel (Figure 8-1) and was designated as an ODMDS in 1991. From 1976 to 1990, a portion of the area was used as an undesignated placement location. During this period, approximately 5.8 MCY were placed at the undesignated placement location. The existing Pascagoula ODMDS is approximately 32 square miles in area, with water depths

varying from 38 feet in the north near Horn Island to greater than 52 feet along the southern boundary (USEPA/USACE 2006).

According to the USACE Ocean Disposal Database (USACE 2015), the Pascagoula ODMDS has been used for material placement as recently as 2013. Table 8-2 provides the placement date and quantities available from the database as of June 2015. The data show that this ODMDS is active and has received an average of 1.7 MCY every 16 months during the 1992 to 2013 time period. According to the database, the total material quantity placed at the site is approximately 28.6 MCY (USACE 2015).

The SMMP (USEPA/USACE 2006) provides information on the dredged materials placed at the Pascagoula ODMDS from 1992 to 2005 and indicates the following:

- The ODMDS is a highly dispersive site for fine materials.
- The fine-grained materials are typically found in the central and southern portions of the site; the remaining area consists of materials that are generally sandier material.
- Of the 11 placement events, 3 (1995, 2000, and 2001) consisted of new work materials; the remaining events were conducted for Operations and Maintenance (O&M) purposes.
- The material composition for the placement events varies. The new work dredging material consisted of a mixture of silts, clays, and sands. Four O&M dredging projects were identified as having placed sand at the site; the remaining four O&M events placed silts and clays or a mixture of material types at the site.
- The SMMP for the Pascagoula ODMDS does not specify a maximum placement quantity per year. Therefore, it is assumed that the amount of material disposed of at one time is not an issue for the Pascagoula ODMDS.

Table 8-2

Ocean Disposal Data – Pascagoula ODMDS

Year	Total Quantity
1992	168,200
1993	607,400 (1,161,000)
1995	2,625,600 (2,650,000)
1996	3,291,200
1998	2,654,000 (1,600,000)
1999	414,200
2000	7,651,200 (7,700,000)
2001	3,494,700 (3,495,000)
2002	630,300 (630,000)
2003	1,097,500 (1,300,000)
2004	2,053,100 (1,009,000)
2005	120,000 (121,000)
2006	672,500
2008	1,489,100
2009	152,700
2011	248,726
2013	1,216,428

Notes:
Quantities reported in this table are from the USACE Ocean Disposal Database (USACE 2015) and are supplemented with values from the SMMP (USACE/USEPA 2006) which are in parentheses.

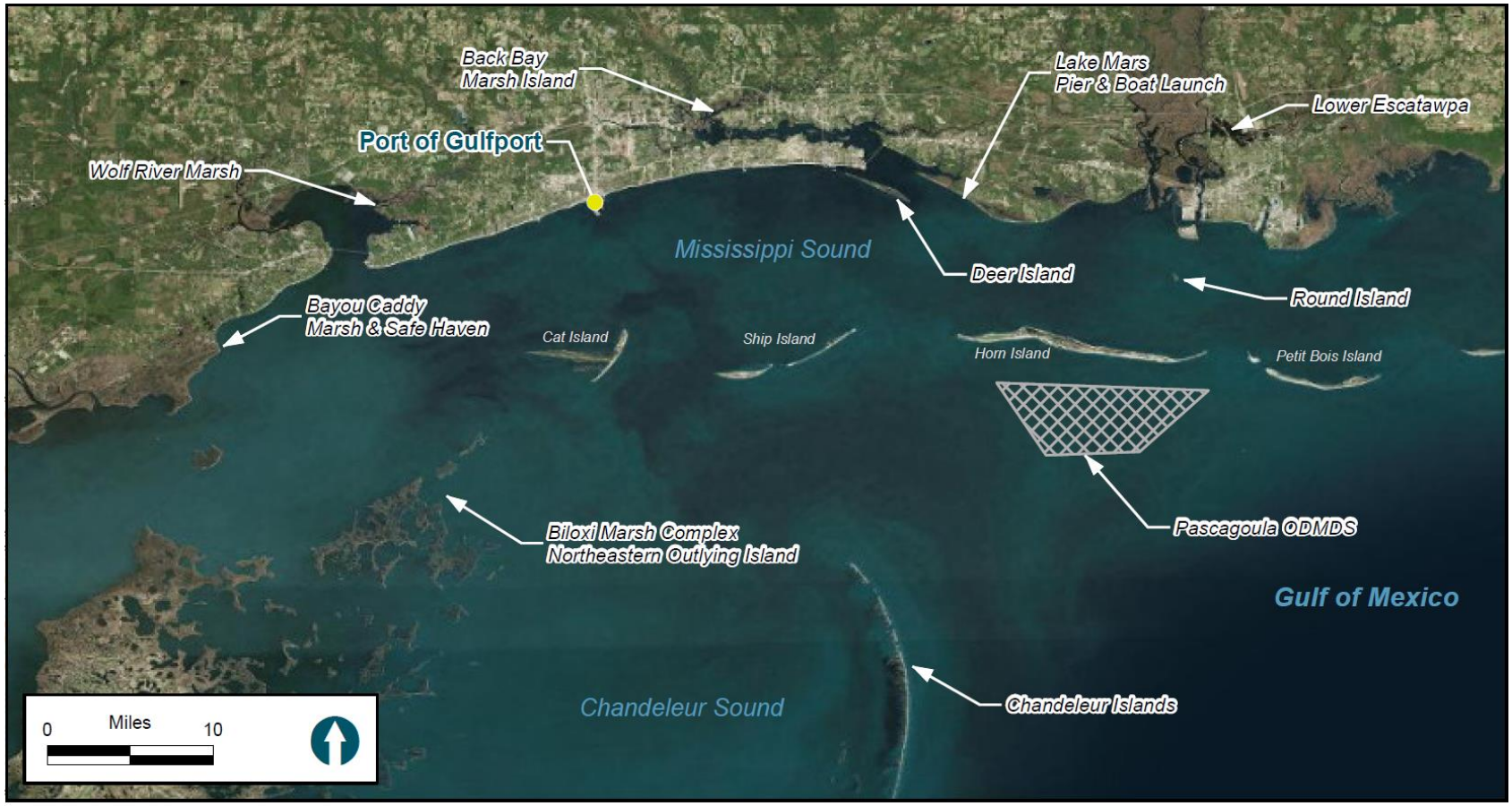


Figure 8-1

ODMDS and BU Locations

8.5 Upland Disposal

If the dredged material is found to be unsuitable for BU or ODMDS disposal, the material will be placed in available upland dredged material disposal sites or landfills. Currently, the Harrison County Development Commission dredged material disposal site on the Industrial Seaway has capacity for up to 750,000 CY. The USACE also uses the site for placement of the material from the Industrial Seaway maintenance dredging. The material would be transported by barge and hydraulically or mechanically offloaded to the disposal site. Because dewatering of the material occurs in the disposal site, dewatering of the dredged material before transporting or offloading is unnecessary. This site would be suitable for the East Pier Expansion dredged material.

Because of the limited capacity at the Harrison County site, another upland placement site would be needed for dredged material from the West Pier Expansion and Turning Basin construction. An upland disposal site 30 miles north of the Port in Stone County has been identified as a potential placement site for the dredged material. The name and specific location of the site is being withheld at the request of the owner. For this option, the material would be mechanically dredged, dewatered, placed into trucks, and hauled to the disposal site for offloading.

9 PROGRAMMATIC ANALYSIS OF PLACEMENT ALTERNATIVES: NEW WORK DREDGING

Section 9 presents an evaluation of the five placement alternatives for the dredging associated with the construction of the West and East Pier Terminal Expansion projects and creation of a new Turning Basin.

9.1 Placement Alternatives

9.1.1 West Pier Terminal Expansion Fill

Alternative 1 evaluates using the Turning Basin dredged material as fill for the proposed West Pier Terminal Expansion. This alternative assumes that the sediment in both the West Pier Terminal Expansion and Turning Basin footprints is suitable as foundation soils and that the West Pier footprint will not be dredged prior to the placement of the material excavated from the Turning Basin creation.

An estimate of the fill necessary to construct the West Pier Terminal Expansion was calculated using the existing DEM of the Mississippi Sound region (NOAA 2008). Using the estimated dredging quantity for the Turning Basin creation and berthing facilities (4.71 MCY) and the estimated fill rate for the footprint (0.25 MCY/LF), an unconsolidated finished elevation of +4 to +7 feet MLLW was estimated. The consolidated foundation and dredged material finished elevation is likely below MLLW.

To keep the dredged material in the project area, dikes and temporary shore protection would be constructed prior to placing the Turning Basin dredged material into the West Pier Terminal Expansion footprint. Based on the current footprint dimensions and assuming a 3H:1V side slope, 20-foot crest width, finished elevation of +12 feet MLLW, and a displaced toe to -20 feet MLLW, approximately 1.3 MCY of fill material would be needed to construct containment berms along the perimeter. Construction of the berms can be completed via barge-mounted excavator. A phased approach to the berm construction and fill placement is suggested to control mud waves and other associated impacts.

9.1.2 ODMDS Placement

For Alternative 2, the dredged material would be placed in the Pascagoula ODMDS (Figure 9-1), as described in Section 8.4. The Pascagoula ODMDS is located 26 miles from the Port and west of the Pascagoula Bar FNC. The ODMDS has a surface area of 32 square miles and water depths ranging from 38 to 52 feet. The alternative assumes that the dredged materials would be mechanically dredged, loaded into bottom dump, split-hull hopper barges, and transported by tugboat to the Pascagoula ODMDS. The materials would then be dumped from the barges into the ODMDS in 2- to 3-foot lifts.

As described in Section 5, only a limited volume of material can be placed in the ODMDS at any one time from DUs 7-12 West Pier Terminal Expansion. While the material is technically appropriate for ocean disposal, the limit on the amount of material that can be placed at any one time may not justify the cost of transport to the ODMDS. For DUs 7-10, the amount of material is about half of a scow and would not be an economic issue. However for DUs 11 and 12, because the amount of material would be limited to 750 cy and 150 cy respectively, the cost may not justify transporting such a light load. A more economically feasible option would be to place the dredged material from DUs 11 and 12 in available Mississippi BU or upland sites. The final decision on placement for these two DUs will be made during design and engineering when options for dredging and current transportation costs can be analyzed.

9.1.3 Beneficial Use Placement: Chandeleur Islands

BU placement in the Chandeleur Islands (Figure 9-1) is Alternative 3A. Because the islands are prone to erosion, restoration of these islands is needed to provide storm protection for coastal Louisiana. The islands also provide essential bird habitats and nesting grounds. For this alternative, it is assumed that the dredged material meets Louisiana and Mississippi regulations for BU and will be acceptable for restoration activities at the Chandeleur Islands.

The restoration of the islands can be accomplished by pumping dredged materials ashore to fill low-lying or submerged areas. The long-term goal of the dredged material placement is to encourage and enhance marsh development by increasing elevations in the marsh or restoring eroded marsh areas. Finished elevations of the placed dredged material will dictate

the marsh species and habitat. Further marsh development activities (e.g., planting indigenous marsh grasses to mitigate erosion) are beyond the scope of this DMMP.

Based on the information presented in Section 8.3, the total estimated new work dredging quantity for the West and East Pier Terminals Expansion and Turning Basin construction could provide a 1.7-feet-thick cover layer over the total land loss footprint cited by TBS (2006). Assuming that portions of the restoration area (2,206 acres) are below the water surface elevation, it is recommended that the low-lying areas of the upland portions of the site receive sediment before the fringes. Moreover, TBS (2006) recommends that further engineering actions (i.e., coastal structures) be erected on the islands as protective measures against extreme events; TBS cited a cost range of $750,000 to $1.25 million for the design effort. Based on previous experience, engineering design is typically 10 percent of the estimated construction cost. Therefore, the associated construction cost for shoreline protection may range from $7.5 to $12.5 million.

One-third of the site was used in the 2009 channel widening contract, and recent aerial photography indicates that the area is highly dispersive and a significant capacity exists along the eastern shores of the island chain. Additional data, such as bathymetric and topographic surveys, will need to be collected to determine actual site capacity, proposed placement areas, and the need for coastal protection structures.

9.1.4 Beneficial Use Placement: BMC – Northeastern Outlying Islands

The Northeastern Outlying Islands in the BMC (Figure 9-1), Alternative 3B, is the second BU alternative. The re-establishment of this portion of the BMC would serve two purposes: 1) increase coastal protection for Hancock County, Mississippi; and 2) enhance existing fisheries (CH2M HILL 2011b).

As of June 2016, the potential placement area in the Northeastern Outlying Islands has been narrowed down to the Johnson Bay and Northwest Jack Williams Bay areas. Restoration in these areas can be accomplished by distributing dredged materials into the open-water areas. As with the Chandeleur Islands, the long-range goal of the BU site is to create mounds to encourage marsh habitat development, intertidal circulation, and habitat diversity. The need

for containment structures due to oyster leases in the area will be required; however, final designs have not been determined. Further marsh development activities may be necessary to complete the restoration activities (e.g., planting indigenous marsh grasses to mitigate erosion) and are not covered by this DMMP.

Additional data are necessary for the permitting and design phases of this alternative. Survey data are necessary to establish the actual capacity of the site and proposed placement (i.e., discharge) locations. For practical purposes, the site currently is considered to have an unlimited capacity, which will need to be verified prior to alternative selection. For costing the alternatives, it is assumed the capacity analysis will cost $100,000 to $200,000.

9.1.5 Upland Disposal

Alternative 4 involves placing the dredged material in the Stone County disposal site as discussed in Section 8.5. This alternative would only be used if the material was unsuitable for ODMDS or BU. For costing purposes, this alternative assumes that all material from the West and East Pier Terminal Expansion, Turning Basin creation, and berths would be placed in the Stone County disposal area. As shown in Table 9-1, this placement option is not cost effective. Another option to this alternative would be to place the East Pier Terminal Expansion material into the Harrison County disposal site if the site has available capacity. Because the amount of material to be dredged from the East Pier project is relatively small (560,000 CY) compared to the overall project (7.68 MCY), the cost of this option has minimal impact on the overall cost of placement at the Stone County disposal site and is not assessed as part of the DMMP.

9.2 Cost Assessment

A cost assessment for each of the alternatives involving new work dredging for the Port expansion is presented in Table 9-1. The total costs include a 30 percent contingency for construction costs. The gross unit cost represents the quotient of the total construction cost and the estimated dredging quantity. Additionally, mobilization and demobilization costs are estimated to be 19 percent of the total construction cost and are factored into this analysis.

Table 9-1

West and East Pier and Turning Basin Construction Dredging Cost Summary

Alternative	Total Cost ($ MIL)	Quantity (MCY)	Gross Unit Cost ($/CY)	Description
1[1]	$86.91	5.27	$12.50	Mechanically dredge the Turning Basin construction footprint, East Pier Expansion footprint, West Pier Terminal Expansion berth area, and North Harbor Fill berth area, construct a containment berm for the dredged material along the perimeter of the West Pier Expansion footprint, and use the dredged materials as fill for the West Pier Terminal Expansion.
2	$49.79	7.68	$4.80	Mechanically dredge the Turning Basin construction footprint, East Pier Expansion footprint, West Pier Expansion footprint and berth area, and North Harbor Fill berth area; transport and place the dredged material at the Pascagoula ODMDS.
3A	$58.56	7.68	$5.90	Mechanically dredge the Turning Basin construction footprint, East Pier Expansion footprint, West Pier Expansion footprint and berth area, and North Harbor Fill berth area; transport and place the dredged material at the Chandeleur Islands BU site.
3B	$57.37	7.68	$5.80	Mechanically dredge the Turning Basin construction footprint, East Pier Expansion footprint, West Pier Expansion footprint and berth area, and North Harbor Fill berth area; transport and place the dredged material at the Biloxi Marsh Complex – Johnson Bay and Northwest Jack Williams Bay BU site.
4	$206.11	7.68	$20.50	Mechanically dredge the Turning Basin construction footprint, East Pier Expansion footprint, West Pier Expansion footprint and berth area, and North Harbor Fill berth area; process, dewater, transport, and place the dredged material in an upland site approximately 30 miles north of the Port in Stone County.

Note:
1. Previous estimates for fill transport and placement range from $17.00 to $20.50 per CY (Anchor QEA 2010a). Therefore, Alternative 1 provides a potential cost savings ranging from $4.20 to $7.70 per CY.

9.3 Summary

As presented in Table 9-1, the costs for placing the material in an upland site and using the dredged material as fill for the West Pier Expansion footprint are substantially greater than the other three alternatives. The cost assessment for Alternative 1 includes the cost of material and labor necessary to construct a containment berm. However, Alternative 1 may provide considerable savings for the overall Project if the sediments dredged from the Turning Basin construction footprint and the existing substrate within the West Pier Expansion footprint are suitable foundation material or can be consolidated. Additional geotechnical studies and engineering would need to be conducted to determine the costs for this alternative. The amount of time needed to consolidate the material would also be a factor in this decision. The use of the dredged material would reduce the amount of off-site fill needed to construct the project and in turn reduce the costs of the overall project. To determine the actual cost benefit of this alternative, the cost analysis information must be evaluated alongside other cost assessments for filling the West Pier Terminal Expansion footprint with off-site materials. This level of detail and evaluation are not part of this DMMP.

The remaining three alternatives are similarly priced. Placement at the Pascagoula ODMDS (Alternative 2) is the lowest, as no additional equipment is required for placement or habitat development and restoration. Placement at the BU sites (Alternatives 3A and 3B) cost $1.00 to $1.10 more per CY than ODMDS placement, but it provides ecological and shoreline protection benefits that ODMDS placement is unable to provide.

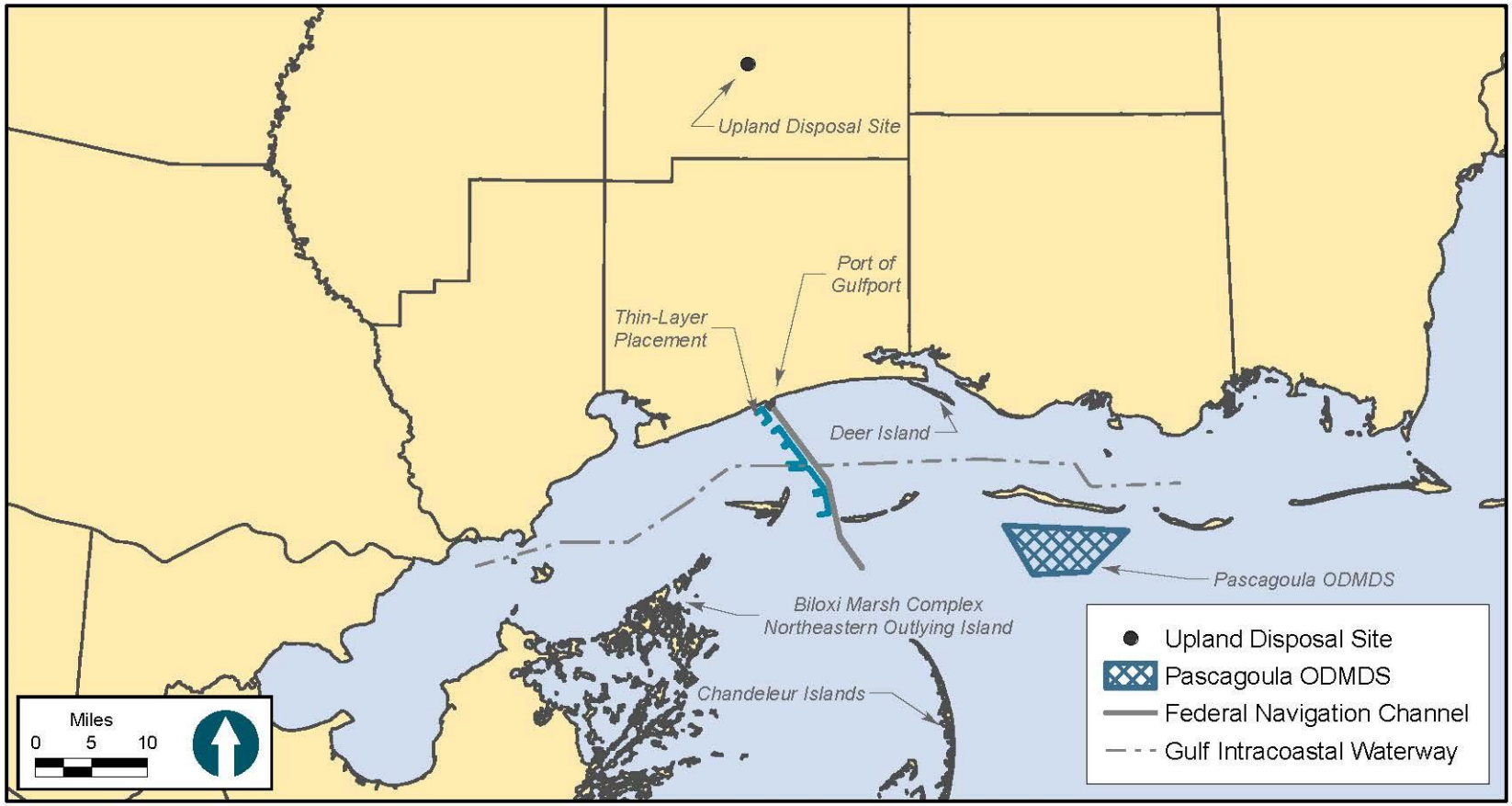


Figure 9-1

Proposed Placement Locations

10 PROGRAMMATIC ANALYSIS OF PLACEMENT ALTERNATIVES: FUTURE MAINTENANCE DREDGING

Section 10 presents an evaluation of the three placement alternatives for the maintenance dredging associated with the Turning Basin and West Pier, North Harbor, and East Pier berthing areas. Two of these alternatives include sites identified in Section 8: Deer Island in Section 8.3.3 and Pascagoula ODMDS in Section 8.4.1.

10.1 Placement Alternatives

10.1.1 Thin-Layer Placement

Thin-layer placement, Alternative 1, is when dredged material is dispersed over a designated open-water bottom. Dredged material is transported to the placement area via discharge pipeline and dispersed by a "spill barge" in a single 6- to 12-inch lift over the surface area. In order to meet the water quality regulations, the spill barge is usually fitted with a diffuser at the end of the dredge discharge pipe. The diffuser is oriented such that the material is discharged at or below the water surface. This method is described in Subpart H Sec. 230.73 of the Section 404 (b)(1) *Guidelines for Specification of Disposal Sites for Dredged or Fill Material* (USEPA 1980) and has been implemented at numerous projects. Additionally, the requirement for dredging and placement for the coastal areas of Mississippi is that turbidity must not exceed 50 Nephelometric Turbidity Units above background outside of the permitted 750-foot mixing zone around the placement areas/discharge location.

The Port typically uses the available open-water D/As adjacent to the upper Sound Channel (Figure 10-1) as placement areas for the dredged maintenance material. These areas are available for thin-layer placement of maintenance materials only. The 60-year FNC project history (USACE 2011) indicates that the open-water D/As on the western side of the channel (1, 3, 5, 7, and 9) have sufficient capacity, which is restored via the predominant east-to-west Mississippi Sound currents. The restored capacity should accommodate the future maintenance needs of the Port. Although the USACE does not use the northern portion of D/A 1 because of pumping distances from the FNC and impacts to the Commercial Small Craft Harbor during dredging events, it has adequate vertical capacity for future maintenance events at the Port, with water depths varying from 6 to 20 feet. Dredged material placed in this northern area of the historic D/A footprint would migrate off the site and supply the

nearshore areas to the west. Placement in the nearshore area would begin to offset the net erosion observed by USACE in their studies (Rosati et al. 2009) and would comply with the intent of the Mississippi BU law (MS Code 49-27-61) to keep the materials within the system. The southern part of D/A 1 was removed from the regular FNC maintenance dredging material placement cycle, as it has reached its maximum capacity (elevation -4 feet MLLW).

The analysis of this alternative assumes maintenance dredging of the proposed Turning Basin construction and West Pier, North Harbor, and East Pier berthing areas using a hydraulic cutterhead dredge. BD surveys of the Turning Basin construction and West Pier, North Harbor, and East Pier berthing areas and before placement (BP) surveys of the open-water D/A(s) selected to receive the maintenance material will be necessary prior to each maintenance dredging event. Depending on the capacities of these sites, more than one D/A may be necessary to accommodate the estimated quantity; this determination cannot be made until BP surveys for the areas are completed. The methods and requirements of placing the material in the open water D/As are described in the Appendix A permit requirements. Because the Port frequently uses the open-water placement areas for maintenance-dredged materials, it is expected that continuing to maintain the existing permits for these sites will not be an issue for future dredging events, especially because no historical contaminant or bioaccumulation impacts are documented.

10.1.2 Beneficial Use Placement

The maintenance materials could be placed in the proposed BU sites described in the *Final Project Management Plan for Selected Beneficial Use Projects along Coastal Mississippi* (CH2M HILL 2011b). This application is different from typical maintenance dredging events at the Port, as it may require the construction of containment dikes and breakwaters. Complete funding for the construction and establishment of a given BU site may not be available for a single maintenance dredging event; therefore, a phased approach for these sites should be considered. Currently, Deer Island, Alternative 2, appears to be the only site in proximity to the Port listed in the *Final Project Management Plan for Selected Beneficial Use Projects Along Coastal Mississippi* (CH2M HILL 2011b) that has the capacity for a single maintenance event. Because using BU sites further from the Port is more expensive and not a feasible option, they were not evaluated as part of the programmatic analysis.

Deer Island is located off the coast of Biloxi, Mississippi, and has previously received sediments for BU along the southeastern corner of the island. The MDMR has recently issued a permit allowing the placement of additional sediments in the original containment area constructed under a USACE contract (DACW21-98-D-002S/CK1104; LAW/GBA 2002) in 2002 and for the construction of a new containment dike adjacent to the existing placement area.

CH2M HILL (2011b) proposed the following BU activities at Deer Island:

- Restoring the island to the historic 1850 footprint by filling the southern shoreline along the length of the island with an estimated 1.1 MCY of sediment
- Constructing a 7,500 LF earthen containment dike at the southwestern corner of the site

Restoration would provide additional marsh habitat and protection for the island, and the increased island footprint would provide the mainland coastline further protection from tropical events.

The cost for construction of the containment dike is estimated to range from $1.5 to $3.0 million (CH2M HILL 2011b); additional studies of the sediment drift along the island's southern shore may be necessary—these studies are not included in the above construction costs. Bathymetric and topographic condition surveys of the restoration area will be necessary prior to Project implementation to determine the appropriate dike alignment and verify the site's capacity.

10.1.3 ODMDS Placement

For Alternative 3, the Pascagoula ODMDS, discussed in Section 8.4.1, would be the placement location for the dredged maintenance material from the Turning Basin and the West Pier, North Harbor, and East Pier berthing areas. Because the Pascagoula ODMDS is a dispersive site, it is assumed that the ODMDS is capable of handling the 30-year maintenance dredging volumes for the Turning Basin and the berthing areas.

The analysis of this alternative assumes the Turning Basin construction and berth maintenance dredging will be accomplished by mechanical dredging, and the dredged sediments will be transported to the site via tugboat and split-hull hopper barges.

10.2 Turning Basin and Berth Cost Assessment

A cost assessment for each of the three alternatives involving maintenance dredging of the Turning Basin and West Pier, North Harbor, and East Pier berths is presented in Table 10-1. A contingency of 30 percent is added to the construction cost to provide the total cost, which is listed in the second column of the table. The gross unit cost represents the quotient of the total construction cost and the dredging quantity. Additionally, mobilization and demobilization costs are assumed 19 percent of the total construction cost and are factored into this analysis.

Table 10-1
Turning Basin and Berths Maintenance Dredging Cost Summary

Alternative	Total Cost ($ MIL)	Quantity (MCY)	Gross Unit Cost ($/CY)	Description
1	$ 3.40	1.26	$ 2.10	Hydraulically dredge the Turning Basin construction and berth areas, and place dredged material via thin-layer dispersal method in open-water placement sites.
2	$ 19.44	1.26	$ 12.10	Mechanically dredge the Turning Basin construction and berth areas, construct containment dikes at Deer Island, and transport and place dredged material at Deer Island BU site.
3	$ 8.71	1.26	$ 5.20	Mechanically dredge the Turning Basin construction and berth areas, and transport and place dredged material at the Pascagoula ODMDS.

10.3 Summary

Thin-layer placement in the available open-water D/As presents the least expensive option for maintenance dredging of the Turning Basin and West Pier, North Harbor, and East Pier berthing areas because less construction equipment and distance are required for placement.

As documented in the MsCIP studies (Rosati et al. 2009), the northern 70 percent of D/A 1 is not used for USACE FNC maintenance and would provide a placement area that would feed the areas west of the Port. The cost for placement at the Pascagoula ODMDS is not significantly higher, but does not support Mississippi's BU requirement or provide any environmental benefit. Placement at the ODMDS assumes that the tugboats and barges will be operating on a 24-hour schedule with minimal downtime; equipment failure and adverse weather would have a significant effect on the Project's timing.

The Deer Island BU alternative is the most expensive as a result of the following:

1. Construction of a containment dike prior to the first dredging event
2. Equipment access
3. Implementation of offloading methods to aid in marsh development

All subsequent maintenance costs would only include dredging, transport, and offloading, which result in a gross unit cost of approximately $9.10 per CY; inflation is not factored into this analysis.

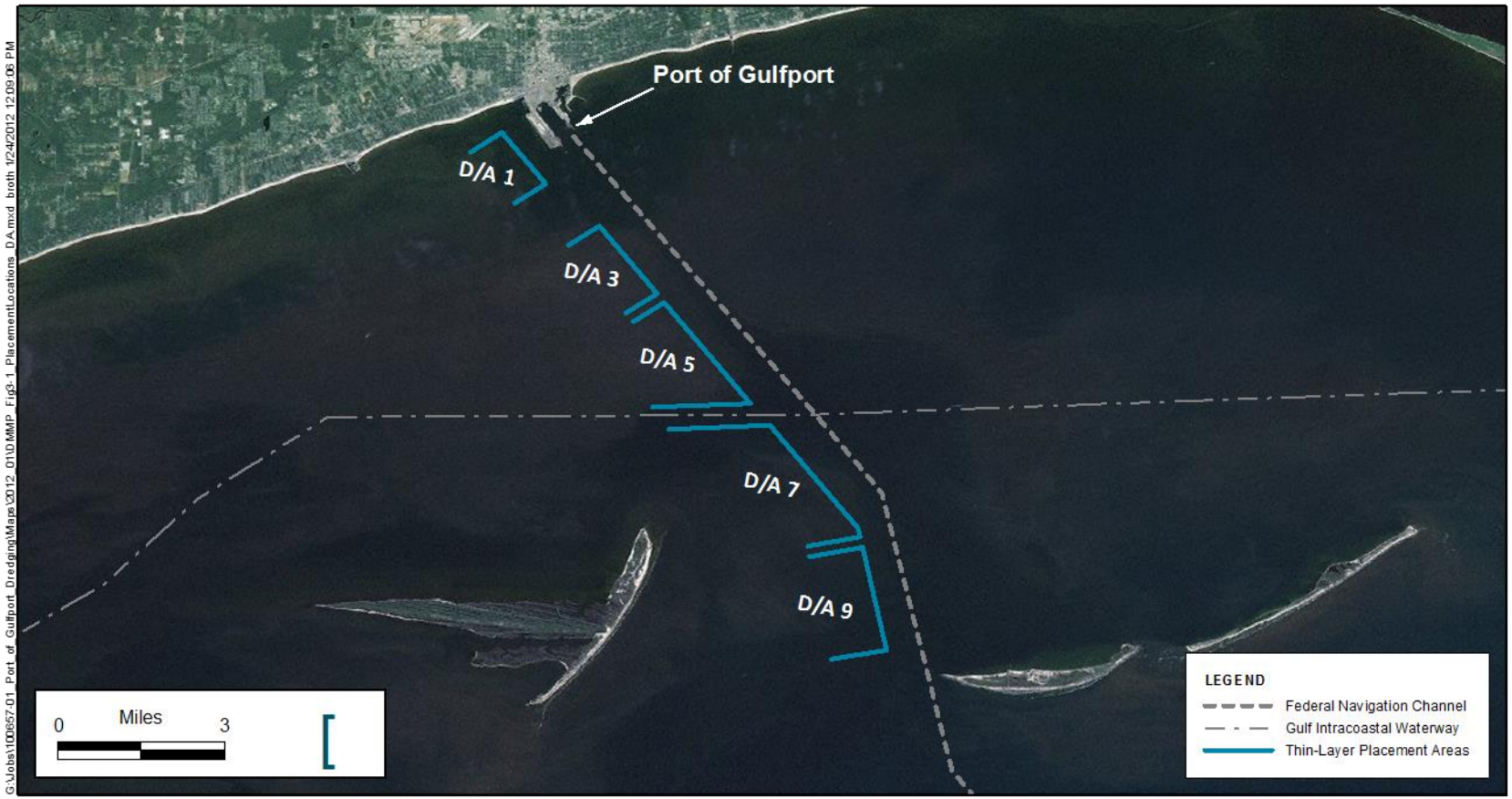


Figure 10-1

Thin-layer Placement Areas

11 SUMMARY AND RECOMMENDATIONS

The goal of this DMMP is to collect and present historical dredging and sediment characterization data; outline the existing permits; analyze dredged material placement alternatives; and present sediment characteristic information for the BU and ODMDS placement areas for the Port Expansion Project.

Alternatives presented for placement of West and East Pier and Turning Basin dredged material include the following:

- West Pier Terminal Expansion structural fill
- Pascagoula ODMDS
- Chandeleur Islands BU
- BMC - Northeastern Outlying Islands BU
- Upland disposal

Alternatives presented for placement of the Turning Basin and West Pier, North Harbor, and East Pier berthing areas maintenance materials include the following:

- Open-water D/As
- Deer Island BU
- Pascagoula ODMDS

Tables 11-1 and 11-2 provide a summary and screening matrix of each alternative. The conclusions presented in these tables are based on the current alternatives analysis and the data available to support each alternative. Each evaluation criterion was scored based on the benefit to the project, with the lowest total scores being the most favorable. Each alternative was then assigned a ranking based on their total score, with 1 being the best scenario.

11.1 New Work Dredging Summary

Using the dredged material from the Turning Basin for the West Pier Terminal Expansion construction (Alternative 1) has the potential to reduce the overall costs of the Port Expansion if the dredged material is found to be suitable as fill material. However, a comprehensive geotechnical analysis and the associated West Pier construction costs are

necessary to make a complete evaluation of this alternative. Using the Turning Basin dredged material as fill also introduces a considerable amount of uncertainty, as it is not currently known whether the West Pier substrate will need to be excavated prior to placement of the Turning Basin dredged material. In addition, the time it would take to execute this alternative (dewatering, settlement, and consolidation) as compared to the others would have to be calculated.

Alternative 2 (ODMDS placement) provides the lowest cost and the least amount of uncertainty for the new work dredging. The BU alternatives (3A and 3B) present the most significant potential for habitat development and shoreline nourishment, which should be considered when determining the ultimate goal for new work material placement. However, to evaluate the BU sites as dredged material placement locations, additional survey and habitat investigations may need to be performed at the sites to determine site capacities and placement locations.

Alternative 4 (upland disposal) is the most expensive, has the longest construction time, and does not provide any potential for habitat restoration. Also, the material will have to be trucked along major roadways, which may create issues with local traffic and present hazards to transportation.

11.2 Turning Basin and Berth Maintenance Dredging Summary

For the maintenance dredging, Alternative 1, thin-layer placement, is the least expensive of the three alternatives. The Port currently has permits for and uses the thin-layer placement areas for maintenance dredged material. In addition, using the open-water sites for dredged material placement allows the sediment to remain in the Mississippi Sound because it is bypassed in the direction of the net littoral drift.

The Deer Island BU (Alternative 2) has the potential to provide considerable habitat and protection benefits to coastal Mississippi. However, Deer Island does not provide a long-term placement option for the 30-year maintenance of the Turning Basin construction and would be filled to capacity (1.1 MCY) after one maintenance event. Existing conditions

and capacity data collection, permitting, design, and containment construction would also need to occur prior to using Deer Island as a placement site.

As documented in the USACE MsCIP sediment transport studies (Rosati et al. 2009), the best option for a longer-term BU placement scenario would be to develop and sequence the maintenance events in order to feed materials into the longshore system. Even if additional BU alternatives are developed in the future, thin-layer and ODMDS placement should be retained as placement alternatives to account for tropical and subtropical events that have historically deposited large volumes of material in Anchorage Basin and the Port berthing areas.

Alternative 3 (Pascagoula ODMDS) is less expensive than Alternative 2 and is currently available for placement of dredged material. However, placement of dredged material at the Pascagoula ODMDS does not meet the Mississippi BU law and does not provide a substantial habitat or protection benefit to coastal Mississippi.

Table 11-1

West and East Pier Terminal Expansion and Turning Basin Construction Alternatives Screening Matrix

Evaluation Criteria	Alternative 1 West Pier Expansion Fill	Alternative 1 Scoring 1 = Positive 2 = Neutral 3 = Negative	Alternative 2 Pascagoula ODMDS Placement	Alternative 2 Scoring 1 = Positive 2 = Neutral 3 = Negative	Alternative 3A Chandeleur Islands	Alternative 3A Scoring 1 = Positive 2 = Neutral 3 = Negative	Alternative 3B Biloxi Marsh Complex - Northeastern Outlying Islands (Johnson Bay and Northwest Jack Williams Bay)	Alternative 3B Scoring 1 = Positive 2 = Neutral 3 = Negative	Alternative 4 Upland Disposal	Alternative 4 Scoring 1 = Positive 2 = Neutral 3 = Negative
Estimated Capacity	Sufficient Capacity	1	Unlimited Capacity[1]	1	Sufficient Capacity	1	No Capacity Limit[2]	1	No Capacity Limit	1
Additional Construction	Yes – Containment berms will be required to contain the material.	3	None	1	Yes – Rock containment berms will be necessary to contain the material.	3	Yes -Containment berms will be required to contain the material.	3	Site may need truck access areas and containment berms to assist in dewatering	3
Distance from Port	0 miles	1	20 to 30 miles[3]	2	29 to 46 miles[3,4]	2	29-30 miles[3]	2	30 miles	2
Transportation Route	Anchorage Basin	1	Mississippi Sound and Gulf of Mexico	1	Mississippi Sound and Gulf of Mexico	1	Mississippi Sound and Gulf of Mexico	1	Highway 49 – will have to consider traffic and other potential impacts associated with transporting material along major roadways	3
Estimated Dredging and Offloading Duration[5]	2.5 years	2	2 years	1	2 years	1	2 years	1	14 years	3
Estimated Cost ($ Million)	$86.91	2	$49.79	1	$58.56	1	$57.37	1	$206.11	3
Habitat Benefit	None	3	None	3	Habitat benefits include shoreline nourishment to support commercially and recreationally important species	1	Habitat benefits include shoreline nourishment to support commercially and recreationally important species; will also provide storm surge protection for coastal MS and LA	1	None	3
Total Score		13		10		10		10		18
Ranking		2		1		1		1		3

Notes:
1. Because the ODMDS is a dispersive site, it is assumed that capacity is maintained by tidal currents transporting materials off site.
2. Capacity limit for the Northeastern Outlying Islands is based on the Project Management Plan for Selected Beneficial Use Projects Along Coastal Mississippi (CH2M HILL 2011b).
3. Distances from the Port to the placement areas were estimated using the current channel alignments. It is possible that the distances shown could be altered based on the route chosen to access a certain placement site.
4. The distance from the Port to the Chandeleur Islands is estimated based on the length of the island footprint assumed to receive dredged material.
5. The estimated dredging and offloading duration is based on previous Gulfport construction projects: Alternatives 1 through 3B - 5,200 cy per day and Alternative 4 - 1500 cy per day.

BU - Beneficial Use; ODMDS - Ocean Dredged Material Disposal Site;
EIS - Environmental Impact Statement; SMMP - Site Management and Monitoring Plan.

Table 11-2
Maintenance Alternatives Screening Matrix

Evaluation Criteria	Alternative 1 Thin-Layer Placement	Alternative 1 Scoring 1 = Positive 2 = Neutral 3 = Negative	Alternative 2 Deer Island	Alternative 2 Scoring 1 = Positive 2 = Neutral 3 = Negative	Alternative 3 Pascagoula ODMDS Placement	Alternative 3 Scoring 1 = Positive 2 = Neutral 3 = Negative
Estimated Capacity	Not Applicable (dispersive site)	1	1.1 million cubic yards[1]	2	Not Applicable (dispersive site)	1
Additional Construction	None	1	Yes - 7,500 LF of containment dike is necessary to complete the restoration at the southeastern end of the site along the Little Deer shoreline	3	None	1
Distance from Port[2]	0 to 10 miles	1	20 miles	2	30 miles	3
Estimated Dredging and Offloading Duration	20 days	1	4 months	2	4 months	2
Estimated Cost ($ Million)	$3.24	1	$18.74	3	$8.30	2
Habitat Benefit	Sediment and nutrients are kept in the system	2	Considerable habitat benefit; this area is home to various species; restoration will also provide additional protection for the MS coast.	1	None	3
Total Score		7		13		12
Ranking		1		3		2

Notes:
1. Capacity limits for the Deer Island BU site is are based on the *Final Project Management Plan for Selected Beneficial Use Projects Along Coastal Mississippi* (CH2M HILL 2011b).
2. Distances from the Port to the placement areas were estimated using the current channel alignments. It is possible that the distances shown could be altered based on the route chosen to access a certain placement site.

BU – Beneficial Use
D/A – Disposal Area
EIS - Environmental Impact Statement
LF- Linear Feet
ODMDS – Ocean Dredged Material Disposal Site;
SMMP - Site Management and Monitoring Plan.

11.3 Recommendations

The recommended dredged material placement alternatives associated with the new work (West and East Pier Terminal Expansion and Turning Basin creation) and the Turning Basin and West Pier, North Harbor, and East Pier berth maintenance dredging are presented in Section 11.3.

For permitting, the DMMP must identify placement areas for the dredged material. Because of this requirement, the recommendations below only consider current viable placement areas. If additional BU sites are permitted prior to the final Expansion Project design, the Port will evaluate the additional BU sites and their capacities as part of the final design and may use the newer BUs for placement areas instead of the alternatives listed below.

11.3.1 Placement of New Work Dredging Material

As shown in Table 11-1, Alternatives 2, 3A, and 3B offer the best scenarios and tie for the number 1 ranking position. Out of the three alternatives, the recommended placement alternative for the dredged material from the West and East Pier Expansion and Turning Basin creation is a permitted BU site such as the BMC - Northeastern Outlying Islands and Chandeleur Islands sites. Alternative 3B was chosen because it meets BU requirements, provides habitat benefits, and provides storm surge protection for coastal Mississippi and Louisiana.

During the DMMP evaluation, the Port began discussions with the MDMR/USACE Beneficial Use Group (BUG) on using the BMC - Northeastern Outlying Islands as a placement area for dredged material from the Port expansion. The BUG was in favor of a BU site instead of the ODMDS because the BU site would meet the preferred Mississippi placement method, provide additional shoreline protection, and create essential wildlife habitat. Based on favorable consideration by the BUG, the MDMR is proceeding with permitting the BMC - Northeastern Outlying Islands as a BU site, which is the recommended placement alternative for the new work material. This alternative has unlimited capacity and provides environmental and storm surge benefits to Louisiana and Mississippi.

After the submittal of the 2013 DMMP, a pre-application meeting was held on August 6, 2014, with the Mississippi State Port Authority (MSPA), Mississippi Development Authority, MDMR, USACE (Mobile and New Orleans Districts), USEPA, NOAA Fisheries, Louisiana Department of Environmental Quality, Louisiana Department of Natural Resources, Louisiana Office of State Lands, Louisiana Coastal Protection and Restoration Authority, Louisiana Department of Wildlife and Fisheries, and St. Bernard Parish. The agencies were in favor of using the Port Expansion Project dredged material to restore the BMC. The location of the proposed BU has been narrowed to the Johnson Bay and Northwest Jack Williams Bay areas of the BMC - Northeastern Outlying Islands based on initial field studies and review of landowner and oyster lease information.

Although the Pascagoula ODMDS is not the preferred placement area for the West and East Pier Terminal Expansion and the Turning Basin creation, it is a viable placement alternative. If BU sites are not available or suitable for dredged material placement, the dredged material could be placed in the Pascagoula ODMDS. As discussed in 11.1, Alternative 4, upland disposal, is not a viable placement option for the majority of the new work material due to costs, construction times, and lack of environmental benefits. Upland disposal is economically feasible as a placement option for material from the West Pier DUs 11 and 12, as discussed in Section 9.1.2.

11.3.2 Placement of Turning Basin and Berth Maintenance Dredging Material

The recommended placement option for the Turning Basin and West Pier, North Harbor, and East Pier berth maintenance dredged material is thin-layer placement in the available open-water D/As. The D/As, currently used by the USACE and the Port, present the lowest total Project cost of all the proposed alternatives and provide an environmental benefit. Placement at the Pascagoula ODMDS is also a viable option for future maintenance material; however, this option is more costly, as the material must be transported off site for placement. Additionally, this placement method removes materials from the sediment processes within the estuary. As discussed in 11.2, Alternative 3, Deer Island, is currently not a viable placement option due to capacity restraints.

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APPENDIX A
PORT OF GULFPORT
USACE MAINTENANCE DREDGING PERMIT

DEPARTMENT OF THE ARMY
MOBILE DISTRICT, CORPS OF ENGINEERS
P.O. BOX 2288
MOBILE, AL 36628-0001

REPLY TO
ATTENTION OF

August 7, 2009

Coastal Branch
Regulatory Division

SUBJECT: Department of the Army Draft Permit Number SAM-2009-00433-JBM, Mississippi State Port at Gulfport

Mississippi State Port
at Gulfport
Attention: Mr. John Webb
Post Office Box 40
Gulfport, Mississippi 39501

Dear Mr. Webb:

Enclosed are two copies of a Department of the Army draft permit for work specified in accordance with the enclosed plans, drawings, and specifications. If the permit is acceptable as drafted, you are requested to sign both copies in the space indicated and return both signed copies to me for final action. The original will be signed by me and returned to you with a placard to be posted at all times that construction is performed at the site.

This permit is not valid until it is properly signed by both the applicant and me; therefore, work must not commence on the project until a fully-executed copy has been returned to you.

Your attention is directed to all conditions under which this permit will be issued. Failure to comply with any condition of the approved permit may result in its suspension, cancellation, or revocation. If you object to certain terms and conditions contained within the permit, you may request that the permit be modified. Enclosed you will find a Notification of Administrative Appeal Options and Process fact sheet and Request for Appeal (RFA) form. If you choose to object to certain terms and conditions of the permit, you must follow the directions provided in Section 1, Part A and submit the completed RFA form to the letterhead address.

In order for an RFA to be accepted by the U.S. Army Corps of Engineers (Corps), the Corps must determine that it is compleie, that it meets the criteria under 33 CFR Part 331.5, and that it has been received by the District office within 60 days of the date of the RFA. Should you decide to submit an RFA form, it must be received at the letterhead address by within 60 days of the date of this letter.

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, MOBILE DISTRICT
CORPS OF ENGINEERS
P.O. BOX 2288
MOBILE, ALABAMA 36628-0001

REPLY TO
ATTENTION OF:

September 11, 2009

Coastal Branch
Regulatory Division

SUBJECT: Department of the Army Draft Permit Number SAM-2009-00433-JBM, Mississippi State Port at Gulfport

Mississippi State Port
at Gulfport
Attention: Mr. John Webb
Post Office Box 40
Gulfport, Mississippi 39501

Dear Mr. Webb:

PLEASE READ THIS LETTER CAREFULLY AND COMPLY WITH ITS PROVISIONS

There is enclosed a Department of the Army permit authorizing you to perform the work specified therein in accordance with the plans shown on the drawings attached thereto. This permit is issued under provision of the Federal laws for the protection and preservation of the navigable waters of the United States. These laws provide that after the proposed work has been approved by issuance of a Department of the Army permit,

IT SHALL NOT BE LAWFUL TO DEVIATE FROM SUCH PLANS EITHER BEFORE OR AFTER COMPLETION OF THE WORK,

unless modification of said plans has previously been submitted to and received the approval of the Department of the Army.

You should study and carefully adhere to all the terms and conditions of the permit. The District must be notified of the commencement and completion of the permitted work. The enclosed cards may be used for that purpose. Also enclosed is a "NOTICE OF AUTHORIZATION" which must be conspicuously displayed at the site during construction of the permitted work.

If for any reason it becomes necessary to make a material change in location or plans for this work, revised plans should be submitted promptly to the District Engineer in order that the revised plans may receive the approval required by law before work is begun.

Compliance with this and other conditions of the permit is essential. Failure to submit the notices requested may result in its revocation.

Please contact me at (251) 690-2658, if you have any questions. For additional information about our Regulatory Program, visit our web site at: www.sam.usace.army.mil/rd/reg. Please take a moment to complete our customer satisfaction survey while you're there. Your responses are appreciated and will allow us to improve our services.

Sincerely,

Linda T. Brown

Linda T. Brown
Team Leader, Coastal Mississippi
Regulatory Division

Enclosures

DEPARTMENT OF THE ARMY PERMIT

Permittee: **MISSISSIPPI STATE PORT AT GULFPORT**

Permit No.: **SAM-2009-00433-JBM**

Issuing Office: **MOBILE DISTRICT**

NOTE: The term "you" and its derivatives, as used in this permit, means the permittee or any future transferee. The term "this office" refers to the appropriate district or division office of the Corps of Engineers having jurisdiction over the permitted activity or the appropriate official of that office acting under the authority of the commanding officer.

You are authorized to perform work in accordance with the terms and conditions specified below.

Project Description: **Maintenance dredge 200,000 cubic yards of material over a 10-year period from the Gulfport Harbor and the Gulfport Commercial Small Craft Harbor including the entrance channel. The areas to be dredged and the project depths are shown on the enclosed drawings. Material will be dredged by hydraulic and mechanical methods. Hydraulically dredged material will be placed in the Federal Project Mississippi Sound open water disposal sites utilizing thin layer disposal techniques. Mechanically excavated material will be placed in the Harrison County Development Commission upland disposal areas C-1 and C-2. No wetlands or submerged aquatic vegetation will be impacted. The purpose of the project is to provide sufficient water depths for vessel access to the port's docks which are adjacent to the Federal authorized project. This is a request to reauthorize work permitted by Department of the Army permit MS96-02521-U, which expired in December 2006.**

ATTACHED:
1. **Vicinity map**
2. **10-Year Maintenance Dredging Plan**
3. **Cross Sections A & B**
4. **Cross Sections C & D**
5. **Cross Section E**
6. **Cross Section F**
7. **Open Water Disposal Area Plan.**
8. **Upland Disposal Area Vicinity Map**
9. **Upland Disposal Area Site Plan**
10. **Mississippi Department of Marine Resources Coastal Program Certification dated 17 June 17 2009**
11. **Mississippi Department of Environmental Quality Water Quality Certification dated 3 August 2009**
12. **Permit Condition Requirements for Disposal in Open Waters**
13. **National Marine Fisheries Service's Biological Opinion F/SER.2007/02307, dated 9 July 2007**

Project Location: **The project is located on Mississippi Sound, Gulfport, Harrison County, Mississippi (Lat. 30.356° N, Long. 89.091° W).**

Permit Conditions:

General Conditions:

1. The time limit for completing the work authorized ends on **7 AUGUST 2019**. If you find that you need more time to complete the authorized activity, submit your request for a time extension to this office for consideration at least 1 month before the above date is reached.

2. You must maintain the activity authorized by this permit in good condition and in conformance with the terms and conditions of this permit. You are not relieved of this requirement if you abandon the permitted activity, although you may make a good faith transfer to a third party in compliance with General Condition 4 below. Should you wish to cease to maintain the authorized activity or should you desire to abandon it without a good faith transfer, you must obtain a modification of this permit from this office, which may require restoration of the area.

3. If you discover any previously unknown historic or archeological remains while accomplishing the activity authorized by this permit, you must immediately notify this office of what you have found. We will initiate the Federal and State coordination required to determine if the remains warrant a recovery effort or if the site is eligible for listing in the National Register of Historic Places.

4. If you sell the property associated with this permit, you must obtain the signature of the new owner in the space provided and forward a copy of the permit to this office to validate the transfer of this authorization.

5. If a conditioned water quality certification has been issued for your project, you must comply with the conditions specified in the certification as special conditions to this permit. For your convenience, a copy of the certification is attached if it contains such conditions.

6. You must allow representatives from this office to inspect the authorized activity at any time deemed necessary to ensure that it is being or has been accomplished in accordance with the terms and conditions of your permit.

Special Conditions: **a. All activities authorized by this permit shall be conducted in accordance with other local, State and Federal laws and regulations to protect the environment (e.g. Mississippi Department of Environmental Quality stormwater construction regulations and Section 401 Water Quality Certification requirements).**

b. Best management practices shall be implemented to minimize erosion, siltation and damage to adjacent wetlands and waters of the United States. Appropriate erosion and siltation control measures must be used and maintained in effective operating condition during construction. All temporary erosion control features shall remain in place until permanent stabilization measures have been completed and have become fully effective.

c. All fill activities shall be performed in a manner that minimizes disturbance and turbidity increases in "waters of the United States" and wetlands; and shall be retained in a manner to preclude its erosion into any adjacent wetlands or waterway.

d. The permittee shall perform before and after-dredging surveys of the work area. The surveys shall extend 200 feet into the Federal Navigation Channel from the limits of dredging. Sounding shall be on intervals of 25 feet in 2 principle directions. Both surveys shall be controlled from a common baseline (horizontally) and a common vertical datum (mean sea level, mean low water, National Geodetic Vertical Datum, etc.). Surveys shall be in plan view or cross-section and show the limits of the Federal Channel. Surveys shall be taken within a 2-week interval of starting and completing dredging. The before-dredging surveys shall be submitted to the Mobile District for review and approval prior to dredging. The after-dredging survey shall be provided to the Mobile District within 30 days of completion. The surveys will be used to compare before and after-dredging water depths in the Federal Channel. If the permittee's work results in shoaling, they will be responsible for restoring the Federal Channel to the pre-dredging depths.

e. The permittee shall comply with the attached document titled *Mississippi State Port Authority Permit Condition Requirements for Disposal in Open Waters* (copy attached). Thin layer disposal is limited to open water sites 1, 3, 5, 7 and 9 or as directed by the Mobile District.

f. The permittee understands and agrees that, if future operations by the United States require the removal, relocation, or other alteration, of the structure or work herein authorized, or if, in the opinion of the Secretary of the Army or his authorized representative, said structure or work shall cause unreasonable obstruction to the free navigation of the navigable waters, the Permittee will be required, upon due notice from the U.S. Army Corps of Engineers, to remove, relocate, or alter the structural work or obstructions caused thereby, without expense to the United States. No claim shall be made against the United States on account of any such removal or alteration.

g. The permittee shall comply with the National Marine Fisheries Service's Biological Opinion F/SER.2007/02307, dated July 9 2007 (copy attached).

Further Information:

1. Congressional Authorities: You have been authorized to undertake the activity described above pursuant to:

(X) Section 10 of the Rivers and Harbors Act 1899 (33 U.S.C. 403).
(X) Section 404 of the Clean Water Act (33 U.S.C. 1344).

2. Limits of this authorization.

a. This permit does not obviate the need to obtain other Federal, State, or local authorizations required by law.

b. This permit does not grant any property rights or exclusive privileges.

c. This permit does not authorize any injury to the property or rights of others.

d. This permit does not authorize interference with any existing or proposed Federal project.

3. Limits of Federal Liability. In issuing this permit, the Federal Government does not assume any liability for the following:

a. Damages to the permitted project or uses thereof as a result of other permitted or unpermitted activities or from natural causes.

b. Damages to the permitted project or uses thereof as a result of current or future activities undertaken by or on behalf of the United States in the public interest.

c. Damages to persons, property, or to other permitted or unpermitted activities or structures caused by the activity authorized by this permit.

d. Design or construction deficiencies associated with the permitted work.

e. Damage claims associated with any future modification, suspension, or revocation of this permit.

4. Reliance on Applicant's Data: The determination of this office that issuance of this permit is not contrary to the public interest was made in reliance on the information you provided.

5. Reevaluation of Permit Decision. This office may reevaluate its decision on this permit at any time the circumstances warrant. Circumstances that could require a reevaluation include, but are not limited to, the following:

a. You fail to comply with the terms and conditions of this permit.

b. The information provided by you in support of your permit application proves to have been false, incomplete, or inaccurate (See **4** above).

c. Significant new information surfaces which this office did not consider in reaching the original public interest decision.

Such a reevaluation may result in a determination that it is appropriate to use the suspension, modification, and revocation procedures contained in 33 CFR 325.7 or enforcement procedures such as those contained in 33 CFR 326.4 and 326.5. The referenced enforcement procedures provide for the issuance of an administrative order requiring you to comply with the terms and conditions of your permit and for the initiation of legal action where appropriate. You will be required to pay for any corrective measures ordered by this office, and if you fail to comply with such directive, this office may in certain situations (such as those specified in 33 CFR 209.170) accomplish the corrective measures by contract or otherwise and bill you for the cost.

6. Extensions. General condition 1 establishes a time limit for the completion of the activity authorized by this permit. Unless there are circumstances requiring either a prompt completion of the authorized activity or a reevaluation of the public interest decision, the Corps will normally give favorable consideration to a request for an extension of this time limit.

Your signature below, as permittee, indicates that you accept and agree to comply with the terms and conditions of this permit.

John H. Wulf 8/18/09

(PERMITTEE) **MISSISSIPPI STATE PORT AT GULFPORT** (DATE)
POST OFFICE BOX 40
GULFPORT, MISSISSIPPI 39501

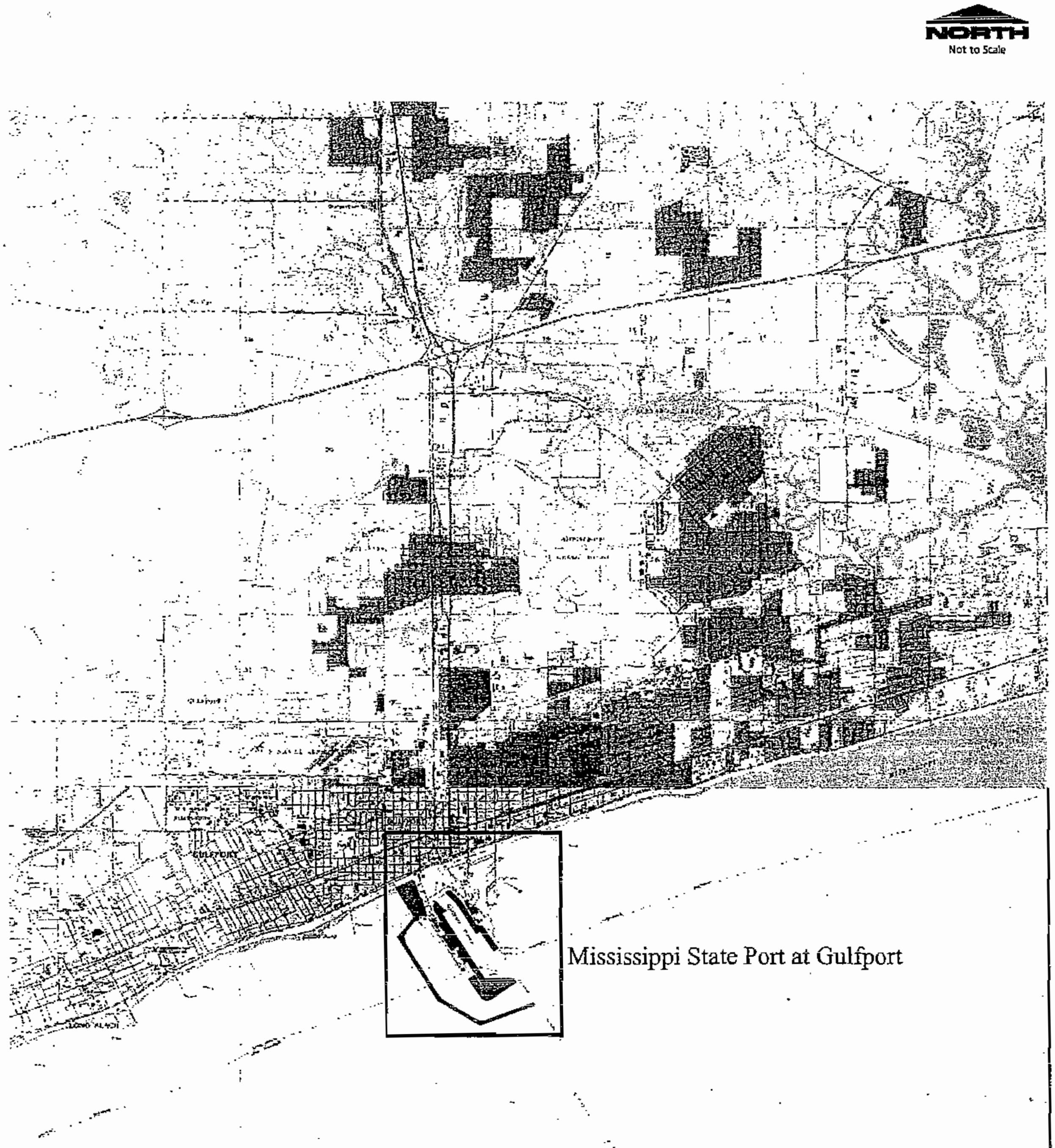
This permit becomes effective when the Federal official, designated to act for the Secretary of the Army, has signed below.

BYRON G. JORNS
COLONEL, DISTRICT COMMANDER BY: Linda T. Brown 14 Sep 2009

LINDA T. BROWN (DATE)
Team Leader, Coastal Mississippi
Regulatory Division

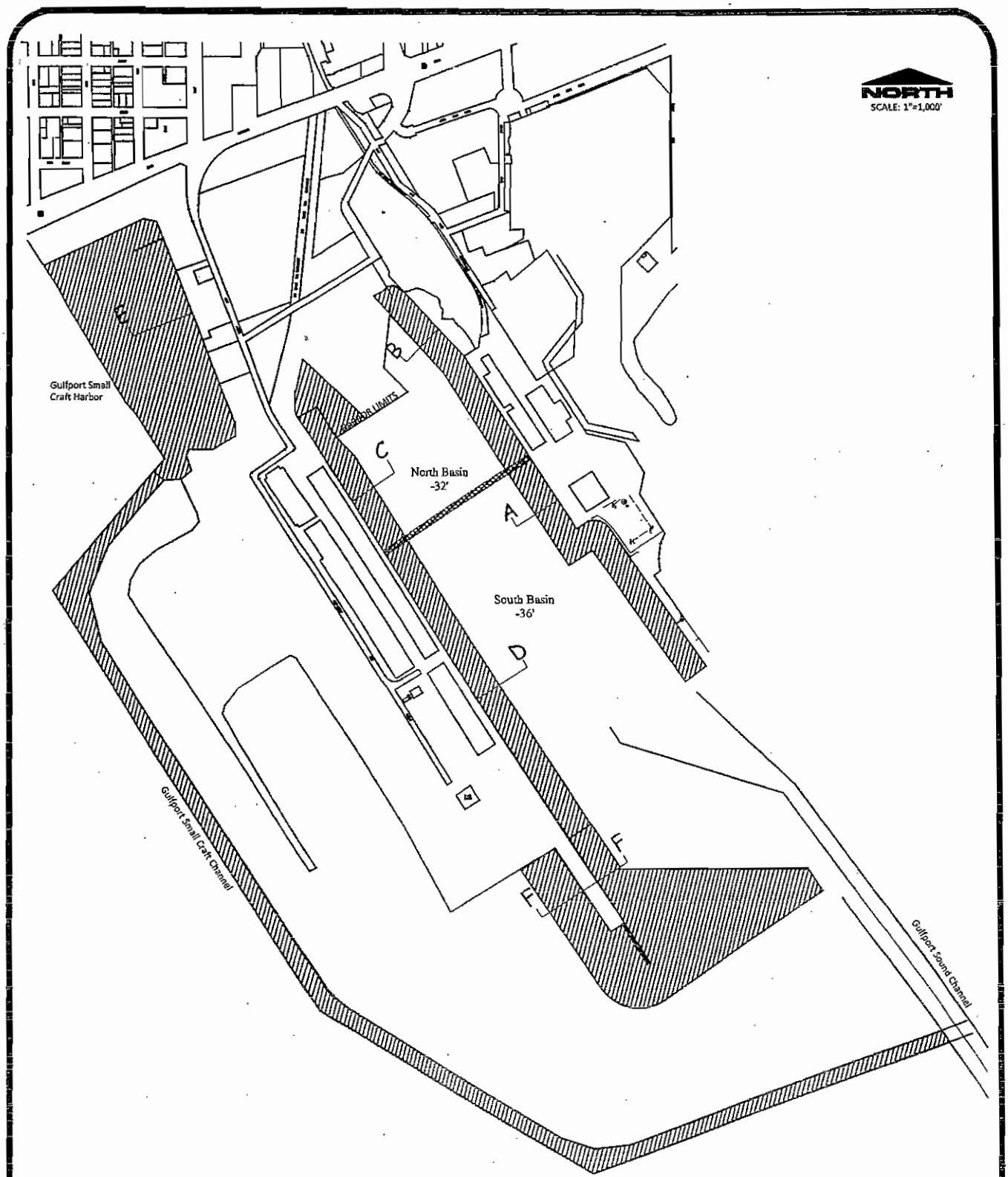
When the structures or work authorized by this permit are still in existence at the time the property is transferred, the terms and conditions of this permit will continue to be binding on the new owner(s) of the property. To validate the transfer of this permit and the associated liabilities associated with compliance with its terms and conditions, have the transferee sign and date below.

(TRANSFEREE) (DATE)



Vicinity Map-Port Site
10 Year Maintenance Dredging Plan
Mississippi State Port at Gulfport
Gulfport, Harrison County, Mississippi

APPROVED



10 Year Maintenance Dredging Plan

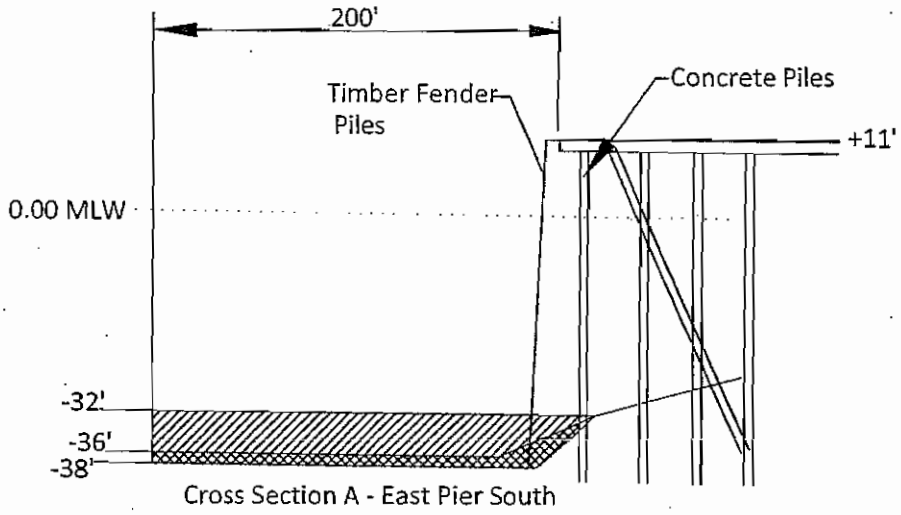
Mississippi State Port at Gulfport

Gulfport, Harrison County, Mississippi

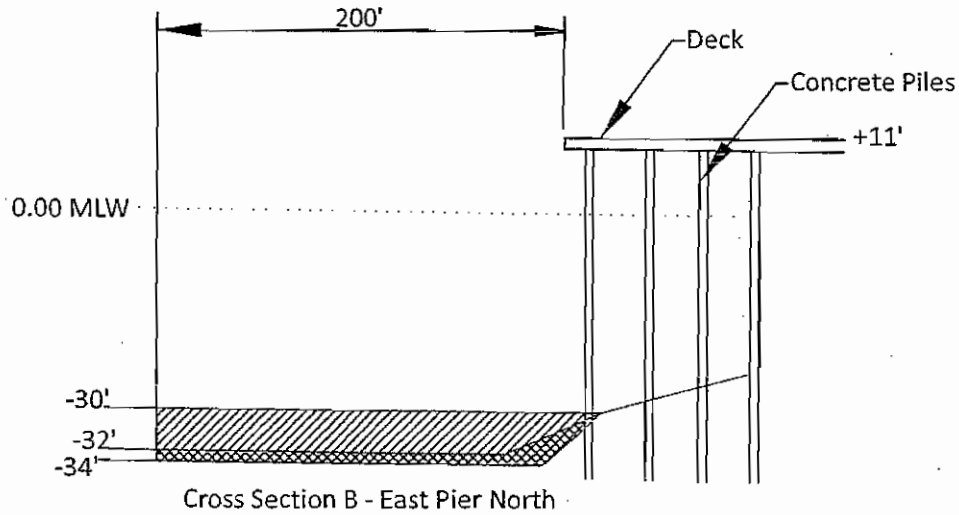
BMI Environmental Services, LLC

Environmental Consultants

APPROVED



Cross Section A - East Pier South



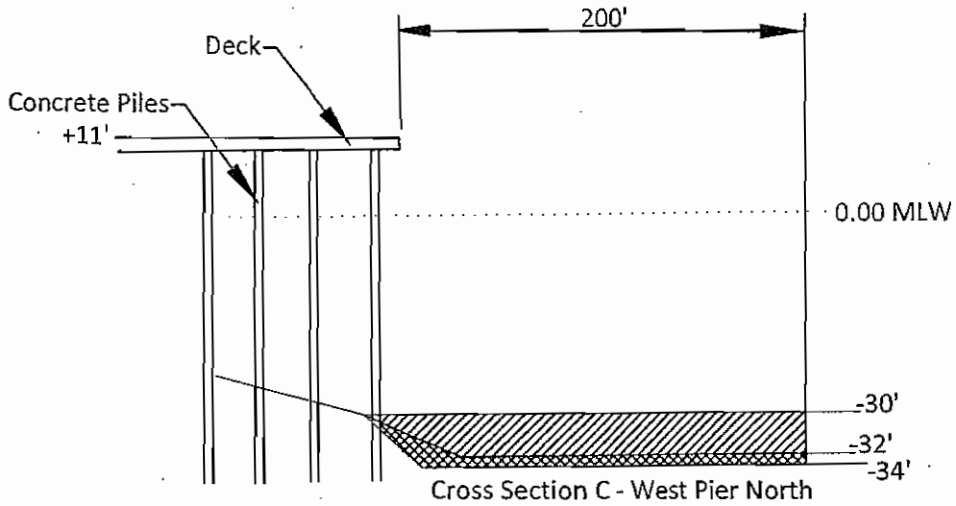
Cross Section B - East Pier North

Material to be dredged

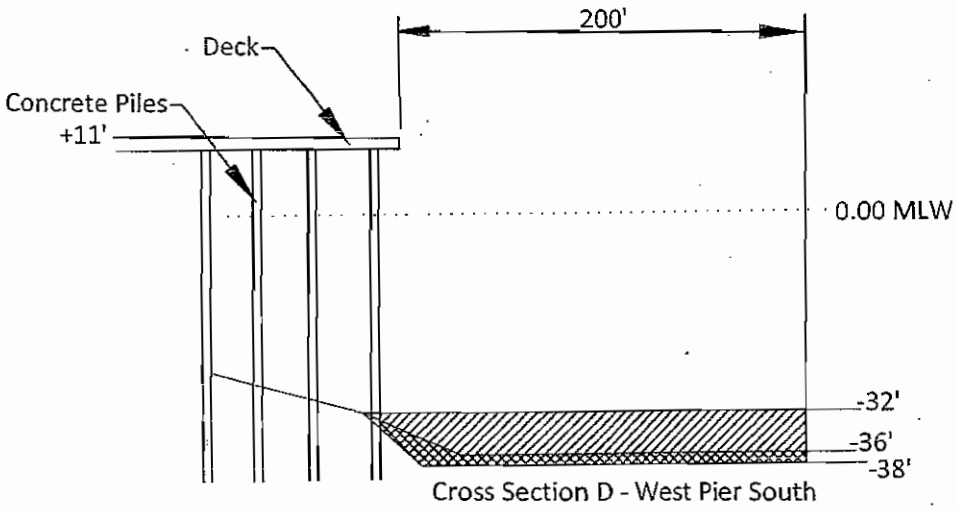
Allowable Overdepth

Cross Sections A & B - East Pier
10 Year Maintenance Dredging Plan
Mississippi State Port at Gulfport
Gulfport, Harrison County, Mississippi

APPROVED



Cross Section C - West Pier North



Cross Section D - West Pier South

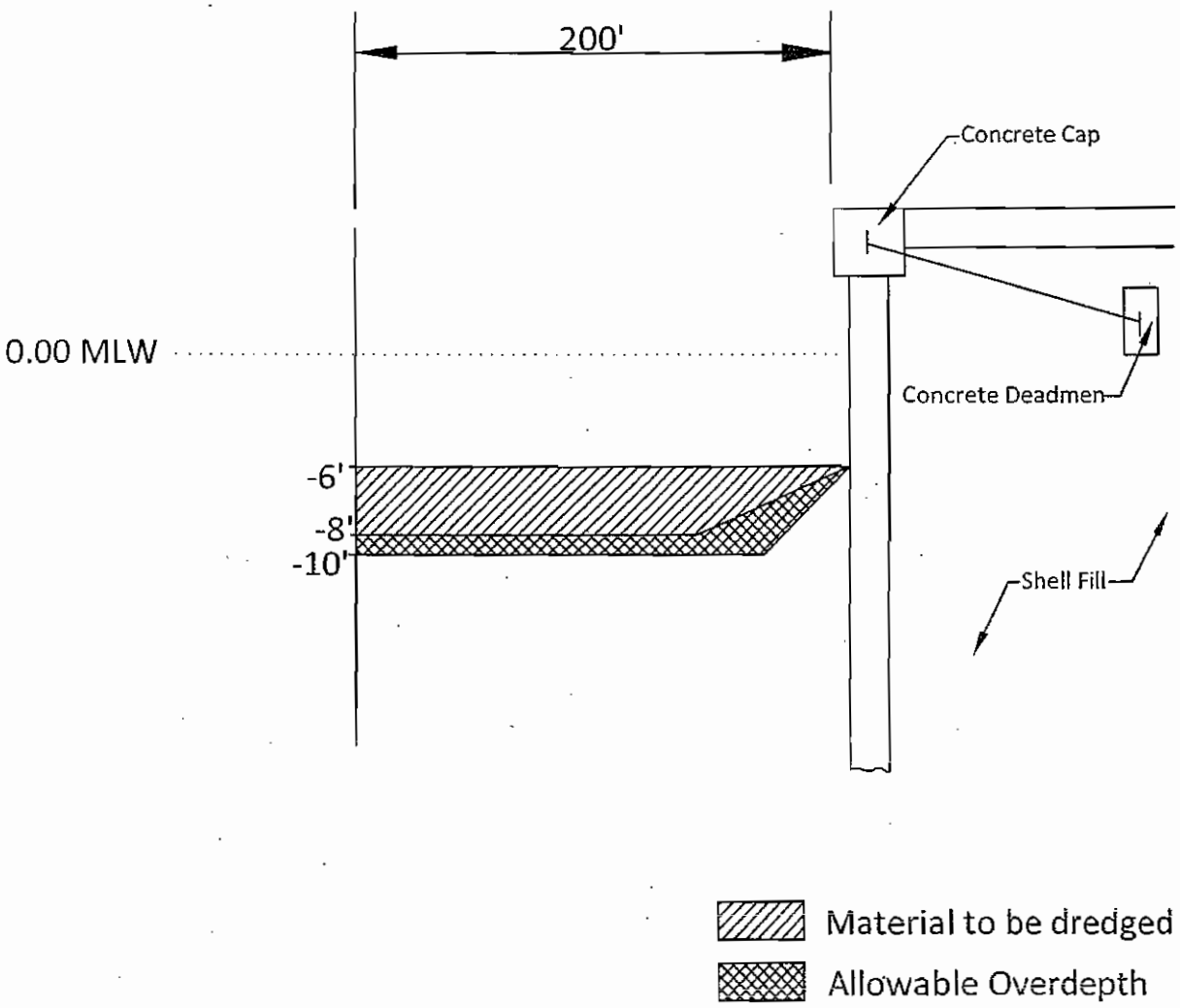
Material to be dredged

Allowable Overdepth

Cross Sections C & D - West Pier
10 Year Maintenance Dredging Plan
Mississippi State Port at Gulfport
Gulfport, Harrison County, Mississippi

BMI Environmental Services, LLC
Environmental Consultants

APPROVED



Cross Section E - Commercial Small Craft Harbor
10 Year Maintenance Dredging Plan
Mississippi State Port at Gulfport
Gulfport, Harrison County, Mississippi

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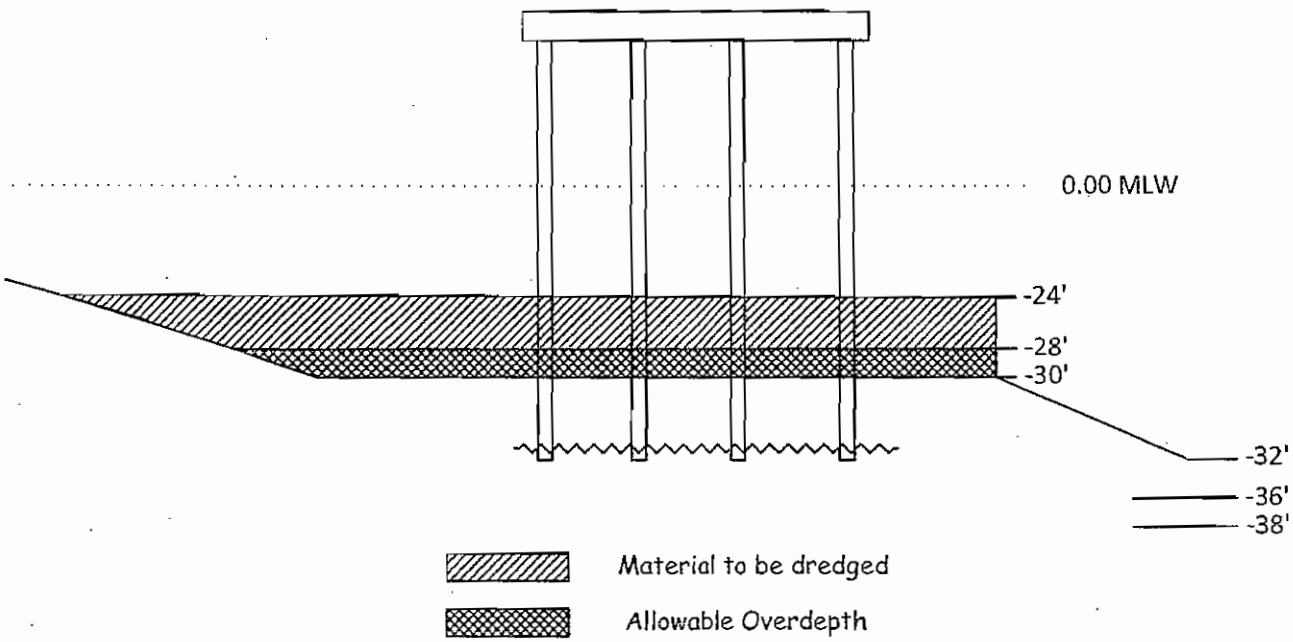
March 2009

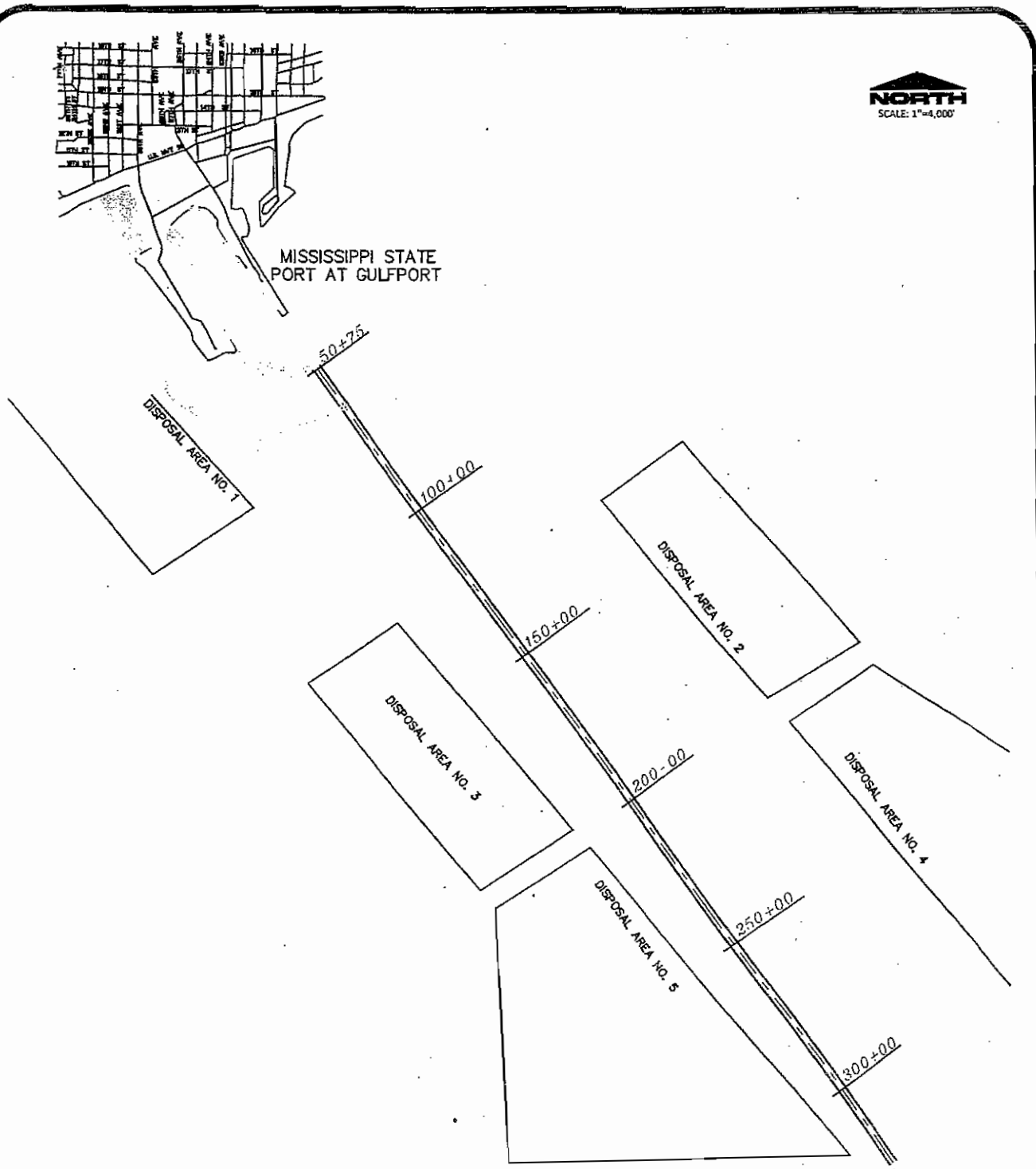
BMI Environmental Services, LLC
Environmental Consultants

APPROVED



Cross Section F - West Pier 7
10 Year Maintenance Dredging Plan
Mississippi State Port at Gulfport
Gulfport, Harrison County, Mississippi

APPROVED



Open Water Disposal Areas - Mississippi Sound
10 Year Maintenance Dredging Plan
Mississippi State Port at Gulfport
Gulfport, Harrison County, Mississippi

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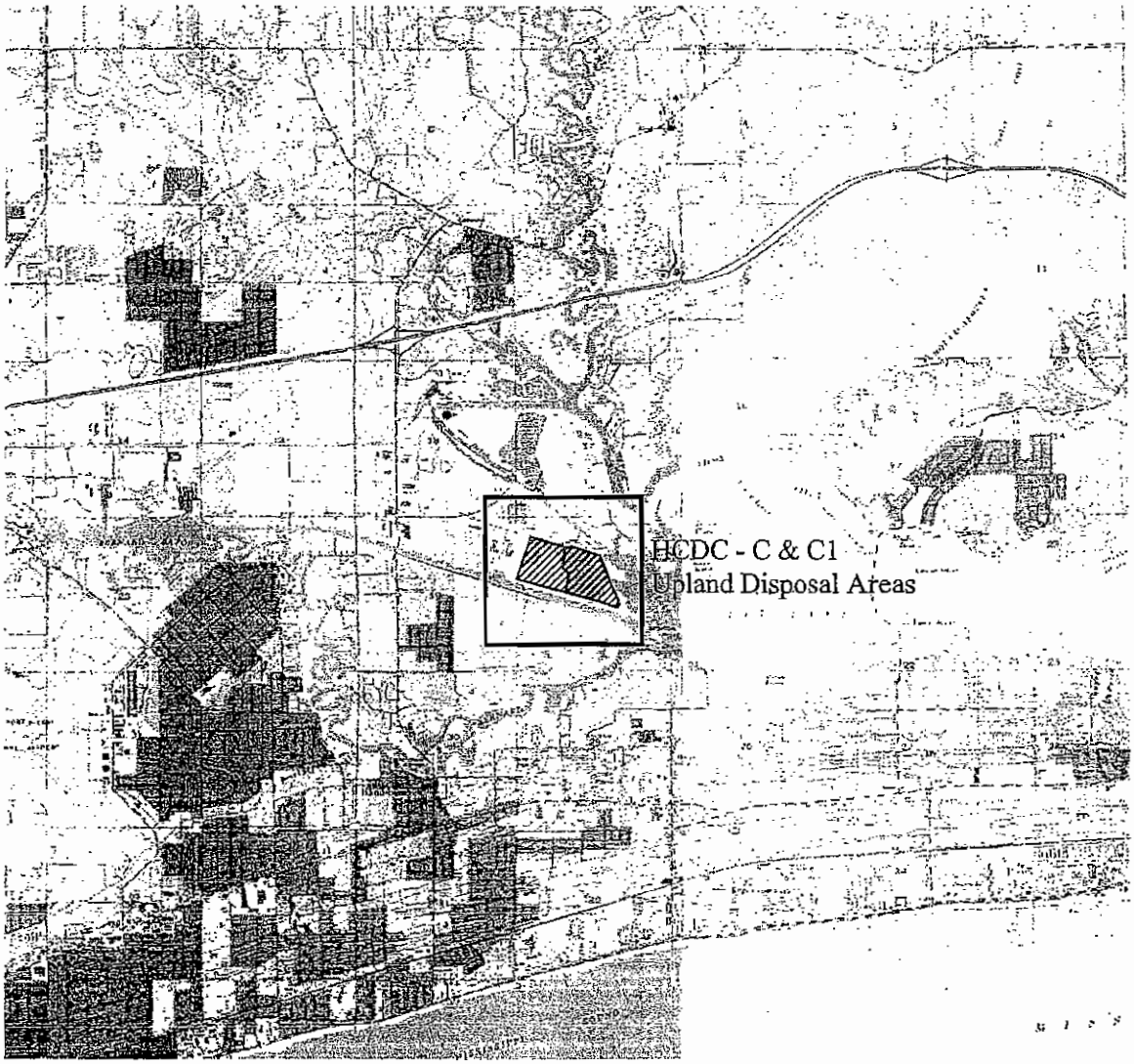
BMI Environmental Services, LLC
Environmental Consultants

March 2009

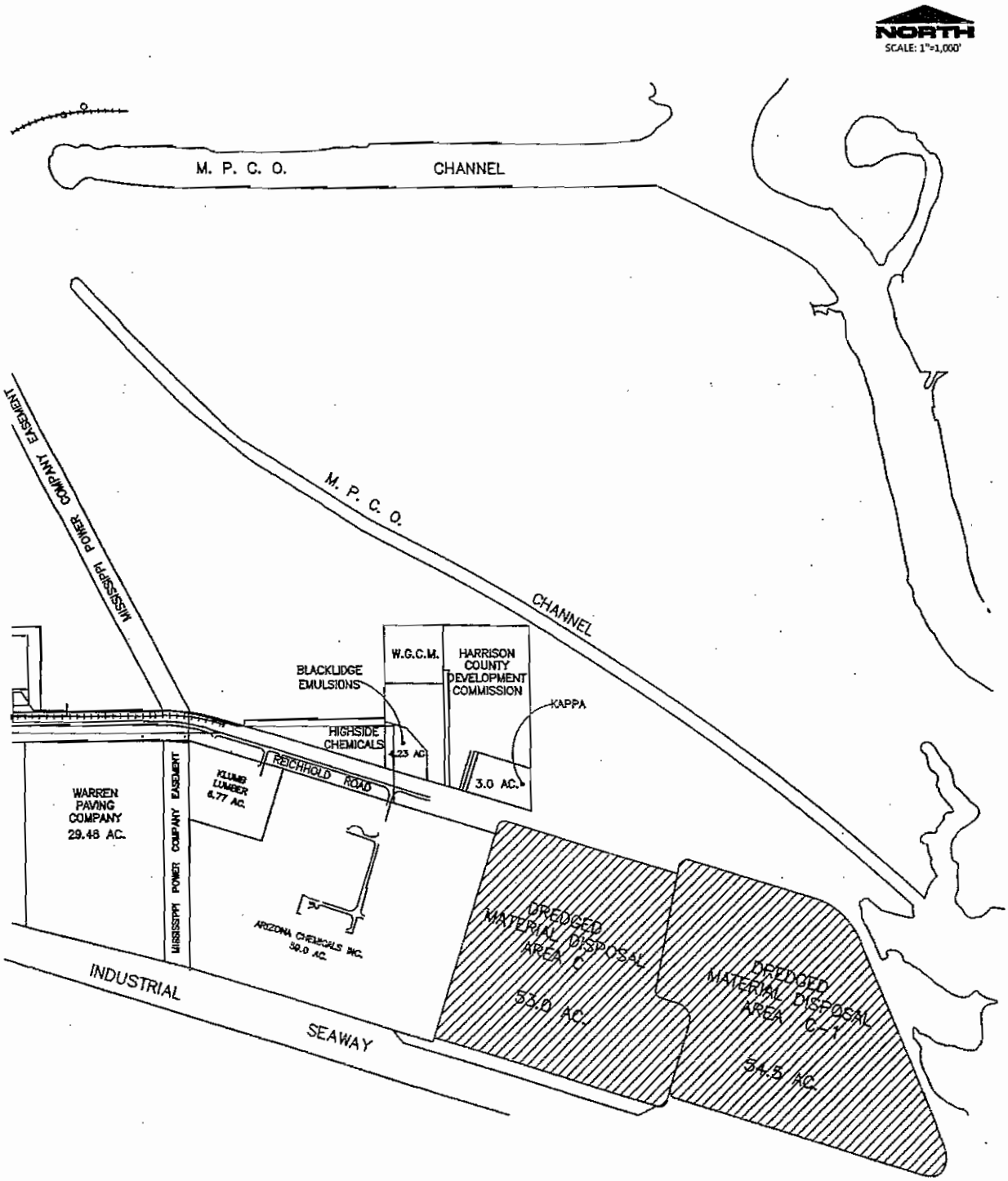
APPROVED

NORTH
Not to Scale



Vicinity Map-Uplands Disposal Areas
10 Year Maintenance Dredging Plan
Mississippi State Port at Gulfport
Gulfport, Harrison County, Mississippi

APPROVED



Upland Disposal Areas - HCDC Disposal Sites
10 Year Maintenance Dredging Plan
Mississippi State Port at Gulfport
Gulfport, Harrison County, Mississippi

BMI Environmental Services, LLC
Environmental Consultants

APPROVED

STATE OF MISSISSIPPI
Haley Barbour
Governor

MISSISSIPPI DEPARTMENT OF MARINE RESOURCES
William W. Walker, Ph.D., Executive Director

June 17, 2009

Mississippi State Port
P.O. Box 40
Gulfport, MS 39501

RE: DMR-080020; State Port and Commercial Small Craft Harbor Dredging

Dear John Webb:

Please find enclosed a copy of the Certificate of Exclusion issued to you June 17, 2009.

Please execute this Certificate by signing both documents and returning the copy to the Department of Marine Resources.

If you have any questions regarding this correspondence, please contact James Davis with the Bureau of Wetlands Permitting at 228-523-4115 or james.davis@dmr.ms.gov .

Sincerely,

William W. Walker, Ph.D.
Executive Director

WWW/jdd

Enclosures

cc: Mr. John B. McFadyen, USACE
Mr. Robert Seyfarth, OPC
Mr. Larry Lewis, BMI Environmental

APPROVED

Certification Number: DMR-080020
Type: Exclusion
Date: June 17, 2009

WHEREAS, application by: Mississippi State Port for compliance under the provisions of Chapter 27, Mississippi Code of 1972, as amended, to perform certain works affecting the coastal wetlands of the State of Mississippi on the MS Sound in Gulfport, Harrison County, Mississippi.

NOW THEREFORE, this certification authorizes the above named applicant hereinafter called permittee, to perform such works on the MS sound in Gulfport, MS in adherence to the following conditions contained herein:

1. An area 5,000 feet in length and 200 feet in width shall be dredged to a depth of 36 feet below mean low water as indicated on the attached diagram;

2. An area 5,000 feet in length and 200 feet in width shall be dredged to a depth of 38 feet below mean low water as indicated on the attached diagram;

3. An area 5,000 feet in length and 200 feet in width shall be dredged to a depth of 30 feet below mean low water as indicated on the attached diagram;

4. An area 3,680 feet in length and 1,000 feet in width shall be dredged to a depth of 10 feet below mean low water as indicated on the attached diagram;

5. An area 10,330 feet in length and 100 feet in width shall be dredged to a depth of 10 feet below mean low water as indicated on the attached diagram;

6. Approximately 200,000 cubic yards of dredge material lshall be removed;

7. No sinks or sumps shall be created in the dredging process. Dredging depth is limited to that of the controlling navigational depth of the adjacent waters. A minimum 3:1 (horizontal: vertical) side slope shall be maintained in the dredge area;

8. A minimum distance of 10 feet shall be maintained between the dredge area and any wetlands;

9. Turbidity shall be minimized at the dredge site by methods such as using staked filter cloth, staged construction, and/or the use of turbidity screens around the immediate project site; and,

APPROVED

10. No dredging of wetlands, submerged aquatic vegetation or shellfish beds is authorized.

This authorization is contingent on Water Quality Certification from the Mississippi Department of Environmental Quality.

This certification conveys no title to land and water, and does not constitute authority for reclamation of coastal wetlands.

This certification authorizes no invasion of private property or rights in property.

This certification is issued on the further condition that the permittee notify the Department of Marine Resources in advance of any changes in the dimensions or procedures.

Granting of this certification does not relieve the permittee from requirements of a Permit from the U.S. Army Corps of Engineers nor from the necessity of compliance with all applicable state or local laws, ordinances and zoning or other regulations.

Work authorized by this certification must be completed on or before June 17, 2019

This certification shall become effective upon acceptance by the permittee and receipt of the executed copy.

Please execute this certification by signing both documents and returning the copy to the Department of Marine Resources.

The Department of Marine Resources has also coordinated a review of your project through the Coastal Program review procedures and determined that the project referenced above is consistent with the Mississippi Coastal Program, provided that you comply with the noted conditions and reviewing coastal program agencies do not disagree with said plans.

THE PERMITTEE BY ACCEPTANCE OF THIS CERTIFICATION AGREES TO ABIDE BY THE STIPULATIONS AND CONDITIONS CONTAINED HEREIN AND AS DESCRIBED BY THE PLANS AND SPECIFICATIONS SUBMITTED AS PART OF THE COMPLETED APPLICATION.

APPROVED

STATE OF MISSISSIPPI
DEPARTMENT OF MARINE RESOURCES

BY: _____
William W. Walker, Ph.D.
Executive Director

Accepted this the 18th day of August, 2009.

BY: John H. Wurt

WWW/jdd

Enclosures

cc: Mr. John B. McFadyen, USACE
Mr. Robert Seyfarth, OPC
Mr. Larry Lewis, BMI Environmental Services

APPROVED

MISSISSIPPI

Department of Marine Resources

NOTICE OF COMPLIANCE
DMR- 080020EXCLUSION DATE: June 16, 2009
THIS NOTICE ACKNOWLEDGES THAT:

Mississippi State Port
P.O. Box 40
Gulfport, MS 39501

HAS, THROUGH APPLICATION TO THIS DEPARTMENT, DULY COMPLIED WITH THE MISSISSIPPI COASTAL WETLANDS PROTECTION LAW TO:

1. An area 5,000 feet in length and 200 feet in width shall be dredged to a depth of 36 feet below mean low water as indicated on the attached diagram;
2. An area 5,000 feet in length and 200 feet in width shall be dredged to a depth of 38 feet below mean low water as indicated on the attached diagram;
3. An area 5,000 feet in length and 200 feet in width shall be dredged to a depth of 30 feet below mean low water as indicated on the attached diagram;
4. An area 3,680 feet in length and 1,000 feet in width shall be dredged to a depth of 10 feet below mean low water as indicated on the attached diagram;
5. An area 10,330 feet in length and 100 feet in width shall be dredged to a depth of 10 feet below mean low water as indicated on the attached diagram;
6. Approximately 200,000 cubic yards of dredge material shall be removed;
7. No sinks or sumps shall be created in the dredging process. Dredging depth is limited to that of the controlling navigational depth of the adjacent waters. A minimum 3:1 (horizontal: vertical) side slope shall be maintained in the dredge area;
8. A minimum distance of 10 feet shall be maintained between the dredge area and any wetlands;
9. Turbidity shall be minimized at the dredge site by methods such as using staked filter cloth, staged construction, and/or the use of turbidity screens around the immediate project site; and,
10. No dredging of wetlands, submerged aquatic vegetation or shellfish beds is authorized.

At the Mississippi State Port on the MS Sound in Gulfport, Harrison County, Mississippi.

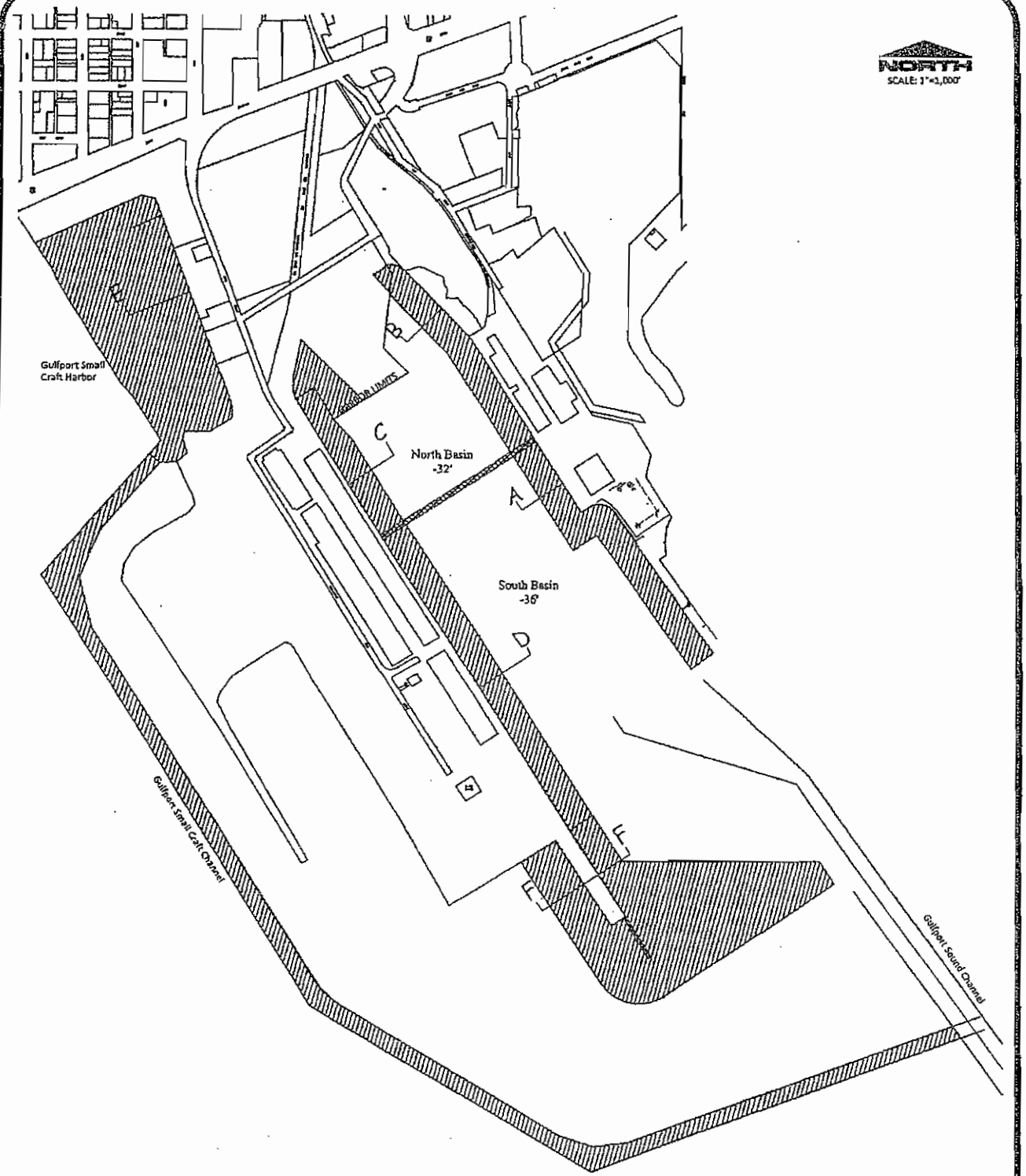
No construction debris or unauthorized fill material shall be allowed to enter coastal wetlands or waters.

FURTHERMORE, THIS PROJECT AS PROPOSED HAS BEEN FOUND TO BE CONSISTENT WITH ALL GUIDELINES FOR CONDUCT OF REGULATED ACTIVITIES IN COASTAL WETLANDS AS SET FORTH IN THE MISSISSIPPI COASTAL PROGRAM.

Executive Director

POST THIS NOTICE CONSPICUOUSLY AT SITE OF WORK

APPROVED



10 Year Maintenance Dredging Plan

Mississippi State Port at Gulfport

Gulfport, Harrison County, Mississippi

BMI Environmental Services, LLC

Environmental Consultants

APPROVED

STATE OF MISSISSIPPI

HALEY BARBOUR

GOVERNOR

MISSISSIPPI DEPARTMENT OF ENVIRONMENTAL QUALITY

TRUDY D. FISHER, EXECUTIVE DIRECTOR

August 3, 2009

Certified Mail No.7005 3110 0003 6328 7811

Mr. John Webb
Mississippi State Port Authority
Post Office Box 40
Gulfport, Mississippi 39501

Dear Mr. Webb:

Re: Mississippi State Port Authority of Gulfport
Harrison County
COE No. SAM20090433JBM
WQC No. WQC2009019

Pursuant to Section 401 of the Federal Water Pollution Control Act (33 U. S. C. 1251, 1341), the Office of Pollution Control (OPC) issues this Certification, after public notice and opportunity for public hearing, Mississippi State Port Authority of Gulfport, an applicant for a Federal License or permit to conduct the following activity:

> Mississippi State Port Authority of Gulfport: Proposed maintenance dredging of 200,000 cubic yards over a 10-year period from the Gulfport Harbor and the Gulfport Commercial Small Craft Harbor including the entrance channel. Material will be dredged by hydraulic and mechanical techniques. Hydraulically dredged material will be placed in the Federal Project Mississippi Sound open water disposal site, utilizing thin layer disposal techniques. Mechanically excavated material will be placed in the Harrison County Development Commission upland disposal areas C-1 and C-2. No wetlands or submerged aquatic vegetation will be impacted. This is a request to reauthorize work permitted by Department of the Army permit MS96-02521-U which expired in December 2006. [SAM20090433JBM, WQC2009019].

POST OFFICE BOX 2261 • JACKSON, MISSISSIPPI 39225-2261 • TEL: (601) 961-5171 • FAX: (601) 354-6612 • www.deq.state.ms.us

APPROVED

The Office of Pollution Control certifies that the above-described activity will be in compliance with the applicable provisions of Sections 301, 302, 303, 306, and 307 of the Federal Water Pollution Control Act and Section 49-17-29 of the Mississippi Code of 1972, if the applicant complies with the following conditions:

1. Basin and channel depths shall gradually increase toward open water and shall not exceed the controlling navigational depth. No "sumps" shall be created by proposed dredging.

2. Best management practices shall be used at all times during construction to minimize turbidity at both the dredge and spoil disposal sites. The disposal sites shall be constructed and maintained in a manner that minimizes the discharge of turbid waters into waters of the State.

3. Mechanically dredged material shall be transported in lined and covered trucks to an approved diked upland site for final disposal.

4. The mechanically excavated material shall be disposed in the contained upland disposal site and stabilized to prevent movement of sediment into adjacent drainage areas.

5. Turbidity outside the limits of a 750-foot mixing zone shall not exceed the ambient turbidity by more than 50 Nephelometric Turbidity Units.

6. No sewage, oil, refuse, or other pollutants shall be discharged into the watercourse.

The Office of Pollution Control also certifies that there are no limitations under Section 302 nor standards under Sections 306 and 307 of the Federal Water Pollution Control Act which are applicable to the applicant's above-described activity.

This certification is valid for the project as proposed. Any deviations without proper modifications and/or approvals may result in a violation of the 401 Water Quality Certification. If we can be of further assistance, please contact us.

Sincerely,

Jerry W. Cain, P.E., DEE
Director, Office of Pollution Control

JWC:fw

4595 WQC20090001

ADDRAVED

cc: Mr. Larry Lewis, BMI Environmental, Inc.
Mr. John B. McFadyen , U.S. Army Corps of Engineers, Mobile District
Ms. Willa Brantley, Department of Marine Resources
Mr. Duncan Powell, Environmental Protection Agency
Ms. Janet Riddell, Office of Budget & Fund Management

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MISSISSIPPI STATE PORT AUTHORITY
PERMIT CONDITION REQUIREMENTS FOR DISPOSAL IN OPEN WATER SITES

"Thin Layer Dispersal" Process: The disposal (dispersal) process shall be operated in such a manner that the dredged material will settle out in the designated open water disposal areas (D/A) in thin layers. It is desired that the deposited material thickness not exceed a six (6) inch thick lift even if the deposited material settles immediately to the bottom after falling out of the dredge pipeline. However, due to the inaccuracies in the disposal process, material thickness up to a maximum of twelve (12) inches will be allowed. This specifically means that the existing bottom surfaces of disposal areas cannot be raised in elevation more than twelve (12) inches throughout the dredging operations. Any material deposited in excess of twelve (12) inches shall be removed by the Contractor at his own expense with no increase in contract price or time. The Contractor shall provide a positive means to disperse the dredged material deposit over enough D/A bottom surface area to accomplish this restriction. No dredge discharge will take place in a particular disposal area prior to the Contractor's submittal of the "before construction" survey (discussed elsewhere within this Specification), plotted in plan view. The "after construction" survey shall be made by the Contractor within one (1) week after dredge discharge into a particular disposal area ceases and that data plotted and submitted in plan view and in X-sections along with the "before construction" survey by the Contractor before final acceptance of the contract work in that area of channel is given. The Contractor shall prepare, operate and maintain the disposal areas in a manner to accomplish the contract required results. The Contractor shall also be aware that the amount of EXCESS DREDGING he performs will directly impact the outcome of the "Thin Layer Dispersal" process and the limitation discussed above. (EXCESS means greater than the required dredging plus allowable tolerances).

Disposal Area Surveys: The Contractor shall perform "before", "monthly" (or more frequent, if necessary), and "after" condition surveys along repeatable ranges covering the disposal site and adjacent bottoms within the limits specified herein all referenced to MLLW. The "before" and "after" condition surveys shall be taken within the five (5) day time period prior to commencement of disposal operations and within the five (5) days following completion of disposal operations at this disposal area. These surveys shall be oriented with ranges (cross sections) perpendicular to the channel centerline and ranges shall be spaced one-hundred (100) feet apart, and extended two hundred (200) feet beyond the disposal site limits. Soundings along each range shall be at least every 25 feet. The hydrographic surveys shall have a vertical accuracy of at least plus or minus 0.5 feet. The Contractor shall submit this data in "raw" form (fathometer charts, books, etc.) plotted form, and on a CD within five (5) working days after the surveys are completed. The data furnished to the Contracting Officer on CD's shall be in an "IBM compatible format, ASCII". The Contractor shall constantly monitor dredge disposal operations in order to comply with paragraph entitled DISPOSAL OF EXCAVATED MATERIALS.

Dredge (Excavation) Plant Instrumentation: All dredge (excavation) plant utilized shall be instrumented to monitor where excavation takes place and describe the excavation sequence as specified herein. The data produced by this instrumentation will be collected by automated (computer-digitized) means and stored on a CD in an "IBM P.C. compatible format, DOS Operating System". Each CD can be used to its maximum storage space up to one weeks data, if capable. The original disks will be submitted to the Government at the end of the project. Also each week's data collection will be presented in a graphic form, i.e., plotted, identified and indexed to show the work area (excavation and disposal as appropriate) of each day distinctly. This can be done with more than one day's data on one graph with different colors for the different days or on individual graphs for each individual day. All horizontal positions referred to below shall be referenced to the Mississippi State Plane Coordinate System.

If the dredge is a hydraulic pipeline dredge, the following elements shall be monitored, as a minimum:

(a) Dredge I.D. designation.
(b) Dredge cutterhead location in the X, Y and Z directions at least every minute interval, all tied to real time of day and date.
(c) If dredge material discharge is in a location other than that designated, X and Y directions of discharge point at least every minute interval, all tied to real time of day and date

If the dredge is a mechanical-type (bucket) dredge the following elements shall be monitored, as a minimum:

(a) Dredge I.D. designation.
(b) Dredge bucket location in the X, Y and Z directions, at both the bucket grab closing point and the bucket release or opening point over the transport vessel, all tied to real time of day and date.
(c) Trip Identification.
(d) Tow Vessel I.D. designation and its position every five minute interval sailing to/from the disposal area; position at least every minute interval during the travel immediately approaching the Disposal Area boundary, through the Disposal Area, and during the travel immediately after exiting the Disposal Area boundary, all tied to real time of day and date.
(e) Transport Vessel I.D. designation.
(f) Name of captain of vessel.
(g) Number of transport vessels used, and distance from tow vessel.
(h) Transport vessel draft, on same intervals as (d) above, all tied to real time of day and date.

If any other type dredge is used, these same basic elements will be required to be monitored to specifically document where the excavation takes place, how the excavated material moves to the Disposal Area and proof that the excavated material was properly deposited into the proper Disposal Area.

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If a dragging operation is used in conjunction with a dredge the following elements will be monitored, as a minimum:

a. I.D. designation.
b. Drag device's horizontal location (X and Y), while performing dragging operations.

The Dredge Plant Instrumentation is a part of the dredge plant and must be functional at all times. If failure of any part thereof occurs the Contractor will be expected to repair the failed part within the next 24 hours restoring full operations. If failure to repair does not occur in that period, the particular plant affected will be considered non-responsive to the contract requirement and will either be replaced or a redundancy part added to render the plant fully operational to include the monitored data, all at no additional increased price or time to the contract.

APPROVED

Endangered Species Act - Section 7 Consultation
Biological Opinion

Action Agency: U.S. Army Corps of Engineers, Mobile District (MDCOE)

Activity: Maintenance dredging of Gulfport Harbor Navigation Project (Consultation Number F/SER/2007/02307)

Consulting Agency: National Oceanic and Atmospheric Administration, National Marine Fisheries Service (NMFS), Southeast Regional Office, Protected Resources Division, St. Petersburg, Florida

Approved By:

Roy E. Crabtree, Ph.D., Regional Administrator
NMFS, Southeast Regional Office
St. Petersburg, Florida

Date Issued: 7/9/07

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Background

Section 7(a)(2) of the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. § 1531 *et seq.*), requires that each federal agency shall ensure that any action authorized, funded, or carried out by such agency is not likely to jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of critical habitat of such species; section 7(a)(2) requires federal agencies to consult with the appropriate Secretary on any such action. NMFS and the U.S. Fish and Wildlife Service (USFWS) share responsibilities for administering the ESA.

Consultation is required when a federal action agency determines that a proposed action "may affect" listed species or designated critical habitat. Consultation is concluded after NMFS determines that the action is not likely to adversely affect listed species or critical habitat or issues a biological opinion (opinion) that identifies whether a proposed action is likely to jeopardize the continued existence of a listed species, or destroy or adversely modify critical habitat. The opinion states the amount or extent of incidental take of the listed species that may occur, develops measures (i.e., reasonable and prudent measures - RPMs) to reduce the effect of take, and recommends conservation measures to further conserve the species. Notably, no incidental destruction or adverse modification of critical habitat can be authorized, and thus there are no reasonable and prudent measures, only reasonable and prudent alternatives that must avoid destruction or adverse modification.

This document represents NMFS' opinion based on our review of impacts associated with the dredging and disposal of materials associated with maintaining the Gulfport Harbor Navigation Project in Mississippi Sound, Harrison County, Mississippi, over a period of 10 years.

The MDCOE will perform the proposed action. This opinion analyzes project effects on Gulf sturgeon critical habitat in accordance with section 7 of the ESA, and is based on project information provided by MDCOE and other sources of information including the published literature cited herein.

BIOLOGICAL OPINION

1 CONSULTATION HISTORY

The routine operations and maintenance dredging of the Gulfport Harbor Navigation Project was previously coordinated with NMFS, resulting in a June 24, 2004, biological opinion. However, this opinion was limited to the effects of work conducted between June and September 2004. As a result of Hurricane Katrina, emergency coordination was conducted with NMFS via e-mail on October 6, 2005.

To maintain sufficient channel depths, the project must be dredged every 12-18 months due to shoaling. Therefore, the MDCOE provided NMFS a biological assessment for work to be conducted over a 10-year period on January 18, 2007. This submission determined that the proposed action was "not likely to result in the destruction or adverse modification of critical habitat," and requested a formal ESA section 7 consultation.

The MDCOE amended the consultation submission on March 27, 2007, via e-mail, and requested the opinion evaluate the effects of the action over a 10-year period.

2 DESCRIPTION OF THE PROPOSED ACTION AND ACTION AREA

2.1 Proposed action

The proposed Gulfport Harbor Navigation Project action includes the following work over a 10-year period:

1. Maintenance dredging of: a Gulf entrance channel (Ship Island Pass) 38 feet deep, 300 feet wide, and approximately 8 miles long across Ship Island Bar; a channel 36 feet deep, 220 feet wide, and approximately 12 miles long through Mississippi Sound; and a stepped anchorage basin at Gulfport Harbor 32-36 feet deep, 1,120 feet wide, and 2,450 feet long.
2. Maintenance dredging of: a commercial small boat harbor, about 26 acres in area, and an entrance channel 100 feet wide at a depth of 8 feet.

Dredging will be performed by hydraulic and/or hopper dredge and with a tolerance of up to two feet advanced maintenance and up to two feet of overdepth dredging. Maintenance dredging is currently required every 12-18 months for the Gulf entrance and Ship Island Pass channel segments, every 18 months for the Mississippi Sound channel segment, and every 18-24 months for the anchorage area. For each maintenance dredging cycle during the ten-year period, dredged material will be disposed as follows:

1. Approximately 3.9 million cubic yards of dredged material from the Mississippi Sound channel segment and anchorage area will be placed in thin-layer disposal sites west of the channel, no more than 12 inches in thickness;
2. Approximately 750,000 cubic yards of dredged material from the Ship Island Pass channel segment will be placed in the littoral zone disposal site southeast of Cat Island in

Mississippi Sound or at the two Ocean Dredged Material Disposal Sites (ODMDS) in the Gulf of Mexico; and

3. Approximately 400,000 cubic yards of dredged material from the Gulf entrance channel segment will be placed in the littoral zone disposal site southeast of Cat Island in Mississippi Sound or at the two ODMDS in the Gulf of Mexico.

2.2 Action area

50 CFR 404.02 defines action area as "all areas to be affected directly or indirectly by the federal action and not merely the immediate area involved in the action." The action area is the Gulfport Channel and anchorage basin, Mississippi Sound, Mississippi, and entrance channel in the Gulf of Mexico.

3 STATUS OF LISTED SPECIES AND CRITICAL HABITAT

The following endangered (E) and threatened (T) species under the jurisdiction of NMFS may occur in or near the action area:

Common Name	Scientific Name	Status
Sea Turtles		
Loggerhead sea turtle	*Caretta caretta*	T
Hawksbill sea turtle	*Eretmochelys imbricata*	E
Leatherback sea turtle	*Dermochelys coriacea*	E
Kemp's ridley sea turtle	*Lepidochelys kempii*	E
Green sea turtle	*Chelonia mydas*[1]	E/T
Fish		
Gulf sturgeon	*Acipenser oxyrinchus desotoi*	T
Smalltooth sawfish	*Pristis pectinata*	E

Critical Habitat
Within the Gulf of Mexico, NMFS has only designated critical habitat for Gulf sturgeon.

3.1 Species not likely to be affected

Gulfport Harbor channels are identified in NMFS' revised regional biological opinion (GMRBO; NMFS 2007) to the COE's Gulf of Mexico districts on hopper dredging of navigation channels and borrow areas. The GMRBO analyzes and accounts for the effects of maintenance dredging, as well as channel widening and deepening "to previously authorized dimensions," on listed species. Therefore, listed sea turtle and fish species are not considered further in this opinion;

[1] Green turtles in U.S. waters are listed as threatened except for the Florida breeding population, which is listed as endangered. Due to the inability to distinguish between these populations away from the nesting beach, green turtles are considered endangered wherever they occur in U.S. waters.

rather, the GMRBO addresses effects to listed species; any takes of sea turtles or Gulf sturgeon will be counted against the incidental take statement (ITS) of that opinion, and the RPMs and terms and conditions of that ITS are applicable to this action.

3.2 Critical habitat likely to be affected

Gulf sturgeon critical habitat was jointly designated by NMFS and USFWS on April 18, 2003 (50 CFR 226.214). Critical habitat is defined in section 3(5)(A) of the ESA as (i) the specific areas within the geographic area occupied by a species, at the time it is listed in accordance with the Act, on which are found those physical or biological features (I) essential to the conservation of the species and (II) that may require special management considerations or protection; and (ii) specific areas outside the geographic area occupied by a species at the time it is listed, upon a determination that such areas are essential for the conservation of the species. "Conservation" is defined in section 3(3) of the ESA as the use of all methods and procedures that are necessary to bring any endangered or threatened species to the point at which listing under the ESA is no longer necessary.

Gulf sturgeon critical habitat includes areas within the major river systems that support the seven currently reproducing sub-populations (USFWS et al. 1995) and associated estuarine and marine habitats. Gulf sturgeon use the rivers for spawning, larval and juvenile feeding, adult resting and staging, and to move between the areas that support these components. Gulf sturgeon use the lower riverine, estuarine, and marine environments during winter months primarily for feeding and, more rarely, for inter-river migrations. Estuaries and bays adjacent to the riverine units provide unobstructed passage of sturgeon from feeding areas to spawning grounds.

Fourteen areas (units) are designated as Gulf sturgeon critical habitat. Critical habitat units encompass approximately 2,783 river kilometers (km) and 6,042 km^2 of estuarine and marine habitats and include portions of the following Gulf of Mexico rivers, tributaries, estuarine and marine areas:

Unit 1.	Pearl and Bogue Chitto Rivers in Louisiana and Mississippi;
Unit 2.	Pascagoula, Leaf, Bowie, Big Black Creek, and Chickasawhay Rivers in Mississippi;
Unit 3.	Escambia, Conecuh, and Sepulga Rivers in Alabama and Florida;
Unit 4.	Yellow, Blackwater, and Shoal Rivers in Alabama and Florida;
Unit 5.	Choctawhatchee and Pea Rivers in Florida and Alabama;
Unit 6.	Apalachicola and Brothers Rivers in Florida;
Unit 7.	Suwannee and Withlacoochee River in Florida;
Unit 8.	Lake Pontchartrain (east of causeway), Lake Catherine, Little Lake, the Rigolets, Lake Borgne, Pascagoula Bay, and Mississippi Sound systems in Louisiana and Mississippi, and sections of the state waters within the Gulf of Mexico;
Unit 9.	Pensacola Bay system in Florida;
Unit 10.	Santa Rosa Sound in Florida;
Unit 11.	Nearshore Gulf of Mexico in Florida;
Unit 12.	Choctawhatchee Bay system in Florida;
Unit 13.	Apalachicola Bay system in Florida; and

Unit 14. Suwannee Sound in Florida.

Critical habitat determinations focus on those physical and biological features (primary constituent elements; PCEs) that are essential to the conservation of the species (50 CFR 424.12). Federal agencies must ensure that their activities are not likely to result in the destruction or adverse modification of the PCEs within defined critical habitats. Therefore, proposed actions that may impact designated critical habitat require an analysis of potential impacts to each PCE.

PCEs identified as essential for the conservation of the Gulf sturgeon consist of:

1. Abundant food items, such as detritus, aquatic insects, worms, and/or molluscs, within riverine habitats for larval and juvenile life stages; and abundant prey items, such as amphipods, lancelets, polychaetes, gastropods, ghost shrimp, isopods, molluscs and/or crustaceans, within estuarine and marine habitats and substrates for sub-adult and adult life stages;
2. Riverine spawning sites with substrates suitable for egg deposition and development, such as limestone outcrops and cut limestone banks, bedrock, large gravel or cobble beds, marl, soapstone, or hard clay;
3. Riverine aggregation areas, also referred to as resting, holding, and staging areas, used by adult, sub-adult, and/or juveniles, generally, but not always, located in holes below normal riverbed depths, believed necessary for minimizing energy expenditures during fresh water residency and possibly for osmoregulatory functions;
4. A flow regime (i.e., the magnitude, frequency, duration, seasonality, and rate-of-change of fresh water discharge over time) necessary for normal behavior, growth, and survival of all life stages in the riverine environment, including migration, breeding site selection, courtship, egg fertilization, resting, and staging, and for maintaining spawning sites in suitable condition for egg attachment, egg sheltering, resting, and larval staging;
5. Water quality, including temperature, salinity, pH, hardness, turbidity, oxygen content, and other chemical characteristics, necessary for normal behavior, growth, and viability of all life stages;
6. Sediment quality, including texture and other chemical characteristics, necessary for normal behavior, growth, and viability of all life stages; and
7. Safe and unobstructed migratory pathways necessary for passage within and between riverine, estuarine, and marine habitats (e.g., an unohstructed river or a dammed river that still allows for passage).

As stated in the final rule designating Gulf sturgeon critical habitat, the following activities, among others, when authorized, funded or carried out by a federal agency, may destroy or adversely modify critical habitat:

1. Actions that would appreciably reduce the abundance of riverine prey for larval and juvenile sturgeon, or of estuarine and marine prey for juvenile and adult Gulf sturgeon, within a designated critical habitat unit, such as dredging; dredged

material disposal; channelization; in-stream mining; and land uses that cause excessive turbidity or sedimentation;

2. Actions that would appreciably reduce the suitability of Gulf sturgeon spawning sites for egg deposition and development within a designated critical habitat unit, such as impoundment; hard-bottom removal for navigation channel deepening; dredged material disposal; in-stream mining; and land uses that cause excessive sedimentation;
3. Actions that would appreciably reduce the suitability of Gulf sturgeon riverine aggregation areas, also referred to as resting, holding, and staging areas, used by adult, sub-adult, and/or juveniles, believed necessary for minimizing energy expenditures and possibly for osmoregulatory functions, such as dredged material disposal upstream or directly within such areas; and other land uses that cause excessive sedimentation;
4. Actions that would alter the flow regime (the magnitude, frequency, duration, seasonality, and rate-of-change of fresh water discharge over time) of a riverine critical habitat unit such that it is appreciably impaired for the purposes of Gulf sturgeon migration, resting, staging, breeding site selection, courtship, egg fertilization, egg deposition, and egg development, such as impoundment; water diversion; and dam operations;
5. Actions that would alter water quality within a designated critical habitat unit, including temperature, salinity, pH, hardness, turbidity, oxygen content, and other chemical characteristics, such that it is appreciably impaired for normal Gulf sturgeon behavior, reproduction, growth, or viability, such as dredging; dredged material disposal; channelization; impoundment; in-stream mining; water diversion; dam operations; land uses that cause excessive turbidity; and release of chemicals, biological pollutants, or heated effluents into surface water or connected groundwater via point sources or dispersed non-point sources;
6. Actions that would alter sediment quality within a designated critical habitat unit such that it is appreciably impaired for normal Gulf sturgeon behavior, reproduction, growth, or viability, such as dredged material disposal; channelization; impoundment; in-stream mining; land uses that cause excessive sedimentation; and release of chemical or biological pollutants that accumulate in sediments; and
7. Actions that would obstruct migratory pathways within and between adjacent riverine, estuarine, and marine critical habitat units, such as dams, dredging, point-source-pollutant discharges, and other physical or chemical alterations of channels and passes that restrict Gulf sturgeon movement (68 FR 13399).

The GMRBO requires separate consultation on dredging or disposal of dredged materials in Gulf sturgeon critical habitat. As dredging and disposal of dredged material will modify habitat, NMFS believes that designated critical habitat for Gulf sturgeon may be affected by the project. However, since channels encompassed by the proposed Gulfport Harbor Navigation Project are considered major shipping channels and are identified on standard navigation charts, they are excluded from, and not considered as part of, Gulf sturgeon critical habitat, as specified by 50 CFR §226.214(h)(2). Therefore, this opinion will only focus on the effects of the disposal of

dredged material within Mississippi Sound, which is Gulf sturgeon critical habitat (i.e., critical habitat Unit 8).

Within Unit 8, PCEs potentially affected by the proposed project include water quality, migratory pathways, sediment quality, and prey abundance. However, with the exception of prey abundance, NMFS expects the effects of the proposed action will not affect or will only have insignificant effects on these PCEs. Water quality impacts from sediment disturbance as a result of disposal are expected to be temporary and minimal, with suspended particles settling out within a short time frame without measurable effects on water quality. No changes in temperature, salinity, pH, hardness, oxygen content, and other chemical characteristics are expected. NMFS only expects insignificant effects to Gulf sturgeon critical habitat as a result of water quality impacts related to this project.

Within critical habitat Unit 8, sub-adult and adult Gulf sturgeon move from the rivers through estuarine and marine areas to feeding areas. Unit 8 is known to support migratory pathways for Gulf sturgeon from two sub-populations (Pascagoula and Pearl Rivers), as groups of individuals from these sub-populations have been located by telemetry on numerous occasions throughout the unit (Reynolds 1993; Rogillio et al. 2001; Ross et al. 2001a). However, NMFS is not aware of any data describing Gulf sturgeon presence or absence within the Gulfport Channel, or use of the channel itself as a migration route. However, Gulf sturgeon likely swim through the project area during their intermittent inter-riverine movements. Therefore, NMFS concludes from the absence of localized relocation data coupled with the nature of the action (i.e., thin-layer disposal with a minimum depth of -4 ft mean low water), that the proposed action over a 10-year period would have no effect on the ability of critical habitat Unit 8 to provide a migratory pathway for Gulf sturgeon.

Substrate modification can impact prey availability and abundance; potential project impacts relative to Gulf sturgeon prey are presented in the next section. The proposed action will directly impact the benthos by the placement of dredged material into the disposal areas. The composition of the dredged materials removed from the channel is expected to be the same as that remaining; sediment quality and texture of the spoil have been described by MDCOE as identical to the existing conditions at all disposal sites. Furthermore, the results of the National Demonstration Project that occurred in the project area (MDCOE 1999) report that: 1) The repetitive long-term use of thin-layer disposal generally has no long-lasting effect on sediment texture in the area, 2) benthic biotic community composition of sites utilized in the study for disposal were similar to those that did not experience thin-layer placement, and 3) site variations were within the natural variation of the system and not a result of the thin-layer placement, with the exception of the first three months immediately following the disposal. NMFS also considered the potential of contamination in the project area; a contaminant sink would impact Gulf sturgeon health. The sediment being removed from the anchorage and the channel is not known to contain any contaminants (J. Jacobson, MDCOE, pers. comm., June 16, 2004). Therefore, NMFS concludes the proposed action over a 10-year period will have only insignificant effects on sediment quality of critical habitat Unit 8.

4 ENVIRONMENTAL BASELINE

This section contains a description of the effects of past and ongoing human activities leading to the current status of the species, their habitat, and the ecosystem, within the action area. The environmental baseline is a snapshot of the factors affecting the species and includes federal, state, tribal, local, and private actions already affecting the species, or that will occur contemporaneously with the consultation in progress. Unrelated, future federal actions affecting the same species that have completed formal or informal consultation are also part of the environmental baseline, as are implemented and ongoing federal and other actions within the action area that may benefit listed species.

4.1 Status of critical habitat within the action area

Of the fourteen units designated as Gulf sturgeon critical habitat, only Unit 8 will be impacted by the maintenance of Gulfport Channel (i.e., dredging and disposal) project. Unit 8 encompasses Lake Pontchartrain east of the Lake Pontchartrain Causeway, Little Lake, The Rigolets, Lake St. Catherine, and Lake Borgne, including Heron Bay, and the Mississippi Sound. Critical habitat follows the shorelines around the perimeters of each included lake. The Mississippi Sound includes adjacent open bays including Pascagoula Bay, Point aux Chenes Bay, Grand Bay, Sandy Bay, and barrier island passes, including Ship Island Pass, Dog Keys Pass, Horn Island Pass, and Petit Bois Pass. Unit 8 critical habitat within Mississippi Sound is defined by the following boundaries:

> The northern boundary of the Mississippi Sound is the shoreline of the mainland between Heron Bay Point, Mississippi, and Point aux Pins, Alabama. Critical habitat excludes St. Louis Bay, north of the railroad bridge across its mouth; Biloxi Bay, north of the U.S. Highway 90 bridge; and Back Bay of Biloxi. The southern boundary follows along the broken shoreline of Lake Borgne created by low swamp islands from Malheureux Point to Isle au Pitre. From the northeast point of Isle au Pitre, the boundary continues in a straight north-northeast line to the point one nautical mile (nm) seaward of the westernmost extremity of Cat Island (30°13'N, 89°10'W). The southern boundary continues one nm offshore of the barrier islands and offshore of the 72 COLREGS lines at barrier island passes [defined at 33 CFR 80.815 (c), (d) and (e)] to the eastern boundary. Between Cat Island and Ship Island there is no 72 COLREGS line. NMFS has therefore defined that section of the unit southern boundary as one nm offshore of a straight line drawn from the southern tip of Cat Island to the western tip of Ship Island. The eastern boundary is the line of longitude 88°18.8'W from its intersection with the shore (Point aux Pins) to its intersection with the southern boundary. The lateral extent of Unit 8 is the MHW line on each shoreline of the included water bodies or the entrance to rivers, bayous, and creeks. Pascagoula Channel, a major shipping channel, as identified on standard navigation charts and marked by buoys, is excluded.

Unit 8 provides juvenile, sub-adult, and adult feeding, resting, and passage habitat for Gulf sturgeon from the Pascagoula and the Pearl River sub-populations (68 FR 13395); fish are consistently located both inshore and around/between the barrier islands (i.e., Cat, Ship, Horn, and Petit Bois) within this unit (Reynolds 1993; Rogillio et al. 2001; Ross et al. 2001a). Gulf

sturgeon have also been documented within one nm of the barrier islands of Mississippi Sound. Substrate in this unit ranges from sand to silt, which contain known Gulf sturgeon prey items, including lancelets (Menzel 1971; Abele and Kim 1986; AFS 1989; Heise et al. 1999; Rogillio et al. 2001; Ross et al. 2001a). Four PCEs are present in critical habitat Unit 8: abundant prey items for sub-adults and adults, water quality, sediment quality, and safe and unobstructed migratory pathways. Unit 8 of Gulf sturgeon critical habitat encompasses a total of 3,567 km^2 (881,421 acres). The amount of benthos impacted by the disposal of material (43.03 km^2 or 10,633.43 acres) constitutes 1.21 percent of the total area within the unit.

Mississippi Sound is an arm of the Gulf of Mexico that extends from Lake Borgne, Louisiana, on the west to Mobile Bay, Alabama, on the east. The sound is about 100 mi (161 km) long and 7 to 15 mi (11-24 km) wide and is mostly unstratified brackish water. The sound is part of the Intracoastal Waterway and is separated from the Gulf by a series of narrow islands and sandbars. Two major rivers (Pearl and Pascagoula) flow into Mississippi Sound. In addition, Mississippi Sound receives water from both the Gulf of Mexico to the south and from the drainage basins of Biloxi Bay and St. Louis Bay. About 80 percent of Mississippi Sound has been designated as Gulf sturgeon critical habitat.

Mississippi Sound contains a number of different submerged aquatic communities, including seagrass beds, marine algae, mollusk reef, unconsolidated bottom communities, oyster beds, and salt marsh. The beaches that border Mississippi Sound on the north are manmade and are maintained on an annual and periodic basis; the beaches on the barrier islands are natural. A number of barrier islands exist off the coast including Cat, Ship, Horn, and Petit Bois. The barrier islands significantly reduce the penetration of long swells from the Gulf of Mexico, resulting in relatively low energy waves (< 1 ft) in the sound. However, hurricanes and strong winter cold fronts can produce surges and much larger wave conditions at the coast, which in turn increases sediment transport. Circulation within the sound is influenced by the freshwater outflow from rivers and bays, seasonal easterly and westerly winds, tidal-driven flow that enters the sound through the barrier island passes, and the Loop Current (ocean current within the Gulf of Mexico) that has a counterclockwise spire just south of the barrier islands.

A substantial portion of coastal Mississippi Sound has been developed into urban, industrial, and residential uses. Much of this urban development is highly concentrated between Pascagoula and Bay St. Louis, Mississippi; some urban growth is centered around industrial development and a commercial fishing industry. Population growth during the past three decades has been characterized by alternating periods of robust growth and stagnation. Over the past decade or so, the development of a casino industry centered around Biloxi, Mississippi, and the construction of a naval base, has spurred both population and economic growth in nearby Harrison, Hancock, and Jackson Counties.

The biological and natural resources in the Mississippi Sound are many. The aquatic resources include aquatic plants, invertebrates, reptiles, birds, fish, and marine mammals. There are numerous gas fields in Mississippi Sound and the potential of additional oil and gas reserves. Each individual state regulates drilling, production, and storage at inshore and nearshore sites; the Minerals Management Service (MMS), a bureau in the U.S. Department of the Interior, is the

federal agency that manages the nation's natural gas, oil, and other mineral resources on the outer continental shelf.

Sediment layers in the Mississippi Sound are from the Pliocene, Miocene, Oligocene, and Eocene epoch. These sediments and sedimentary rocks consist of clay, silt, sand, gravel, and limestone. Most sediments in the north are a result of a river system (ancestral to the current Mississippi River) that drained the rising continental interior and deposited sediments from throughout the large continental drainage area into the Gulf of Mexico; sediments in the south may be of marine origin. Mississippi Sound sediments are relatively uncontaminated. Mississippi Sound is reported to have limited areas (about 6 percent) with high sediment contamination levels; nearby Mobile Bay (61 percent), Perdido Bay (92 percent), and Pensacola Bay (62 percent) estimates are much higher (EPA EMAP-E database).

Dredging commonly occurs in Mississippi Sound; the majority is conducted by the MDCOE. Most dredging in Mississippi Sound is conducted to allow for safe navigation; the majority of projects are to maintain waterways, some are for improvement (deepening or widening). Annually, MDCOE dredges and moves about 250 million cubic yards (five-year average), most (75-80 percent) of which occurs in the sound.

4.2 Factors affecting critical habitat within the action area

Gulf sturgeon critical habitat Unit 8 is a spatially defined area that includes winter-feeding and migratory habitat for two sub-populations. Changing the sediment character could appreciably impair normal Gulf sturgeon behavior; additionally, it could restructure the benthic community, thus reducing the availability of prey items. Channel dredging activities, upland activities, and poor dredge-and-fill practices could impact water quality in the unit.

4.2.1 Federal actions

Federal agencies that consult on potential impacts to Gulf sturgeon critical habitat include the COE, the Department of Defense (DOD), the Environmental Protection Agency (EPA), the Federal Energy Regulatory Commission (FERC), and the Nuclear Regulatory Commission (NRC). Dredging and dredged material disposal and military activities, including training exercises and ordnance detonation, have the potential to impact designated critical habitat. While numerous formal consultations have been conducted on potential impacts to the species, NMFS has conducted less than twenty formal consultations on potential impacts to Gulf sturgeon critical habitat since the effective date (April 18, 2003). USFWS has also conducted less than 20 formal consultations to ascertain potential project impacts on designated Gulf sturgeon critical habitat (J. Ziewitz, USFWS, pers. comm., February 2007). The previous formal consultations conducted by NMFS concluded that proposed actions would not result in the destruction or adverse modification of critical habitat. Numerous informal consultations with the DOD, COE, EPA, FERC, and NRC analyzing potential impacts to designated critical habitat have been conducted.

Numerous nationwide COE permits exist for wetland mitigation throughout Mississippi Sound. NMFS recently updated the GMRBO (NMFS 2007), which includes maintenance dredging in

Gulf sturgeon critical habitat Units 8-14. It concluded when channels within designated critical habitat are dredged to only their current depth, without improvements (i.e., deepening or widening), the project will not destroy or adversely modify Gulf sturgeon critical habitat. However, major shipping channels such as those included in the Gulfport Harbor Navigation Project are excluded from, and not considered as part of, Gulf sturgeon critical habitat, as specified by 50 CFR §226.214(h)(2).

Federally regulated storm water and industrial discharges and chemically treated discharges from sewage treatment systems may impact Gulf sturgeon critical habitat. NMFS continues to consult with EPA to minimize the effects of these activities on both listed species and designated critical habitat. In addition, other federally permitted construction activities, such as beach restoration, have the potential to impact Gulf sturgeon critical habitat.

4.2.2 State or private actions

A number of activities that may indirectly affect Gulf sturgeon critical habitat Unit 11 include discharges from wastewater systems, dredging, ocean dumping and disposal, and aquaculture. The impacts from these activities are difficult to measure. Where possible, however, conservation actions through the ESA section 7 process, ESA section 10 permitting, and state permitting programs are being implemented to monitor or study impacts from these sources.

Increasing coastal development and ongoing beach erosion will result in increased demands by coastal communities, especially beach resort towns, for periodic privately funded or federally sponsored beach renourishment projects. These activities may affect Gulf sturgeon critical habitat by burying nearshore habitats that serve as foraging areas.

4.2.3 Conservation and recovery actions shaping the environmental baseline

Actions impacting wetlands abutting Gulf sturgeon critical habitat throughout Apalachicola Bay are regulated, managed, and mitigated via numerous COE nationwide permits.

Federal EFH consultation requirements pursuant to the Magnuson-Stevens Fishery Management and Conservation Act minimize and mitigate for losses of wetlands, and preserve valuable foraging and developmental habitat for Gulf sturgeon.

5 EFFECTS OF THE ACTION ON GULF STURGEON CRITICAL HABITAT

As discussed above, critical habitat Unit 8 contains four PCEs that may be affected by the proposed project: water quality, migratory pathways, sediment quality, and abundant prey items. However, with the exception of prey abundance, NMFS expects the effects of the proposed action will not affect or will only have insignificant effects on these PCEs. Therefore, only potential impacts on prey abundance are analyzed below. This biological opinion does not rely on the regulatory definition of "destruction or adverse modification" of critical habitat at 50 CFR 402.02. Instead, we have relied upon the statutory provisions of the ESA to complete the following analysis with respect to critical habitat.

In other opinions, NMFS has considered and analyzed the following factors to determine direct and indirect effects of projects impacting Gulf sturgeon prey abundance essential to the conservation of the Gulf sturgeon: Gulf sturgeon sub-populations using affected critical habitat, mean generation time, foraging method, prey items, benthic community structure, potential Gulf sturgeon prey in action area, and recovery of benthic biota. Whether individual factors are relevant to a particular action and are analyzed within an opinion is highly site and fact specific. NMFS determines and assesses relevant factors in order to predict the persistence and resilience of the prey resource with regard to density of both current and recovering Gulf sturgeon populations. That is, numerous variables depicting Gulf sturgeon prey are utilized to determine the likelihood of appropriate and abundant prey in the unit following the project to ensure that the action is not likely to result in the destruction or adverse modification of the PCE. Of the aforementioned factors, NMFS has determined that only the following are relevant to the proposed action and hence analyzed in this opinion to assess direct and indirect effects of the proposed action on the abundance of prey in Unit 8:

1. Gulf sturgeon sub-populations using affected critical habitat;
2. Prey items;
3. Benthic community structure;
4. Recovery of benthic biota; and
5. Potential Gulf sturgeon prey in action area.

Gulf sturgeon sub-populations using affected critical habitat

Overall, Gulf sturgeon critical habitat Unit 8 provides juvenile, sub-adult, and adult feeding, resting, and passage habitat for Gulf sturgeon from the Pascagoula and the Pearl Rivers. The project area is located about midway between the Pearl and Pascagoula Rivers. Ross et al. (2001a; 2001b) have investigated the movement of fish exiting the nearby Pascagoula River (n=19) and concluded that the fish locate in or near the barrier island (Cat, Ship, Horn, and Petit Bois Islands) passes (Ross et al. 2001a) in the clean sand substrates. Rogillio et al. (2001) tracked fish from the Pearl River (n=25) and all fish relocated (n=7) were also found near the barrier islands. After three months of systematic survey, no fish were located nearshore, or in Lakes Pontchartrain or Borgne. Incidental capture of a sturgeon tagged in the Pearl River near Breton Island, Louisiana, supports the concept that Gulf sturgeon utilize barrier island sites in the winter (Rogillio et al. 2001). Preference for sandy habitat is supported by studies in other areas that have correlated Gulf sturgeon presence to sandy substrate (Fox et al. 2002).

The actual number of Gulf sturgeon utilizing the project area for foraging is, at this time, likely few. Few data describing the population size and structure of Gulf sturgeon are available. Of the nine major rivers that are known to support Gulf sturgeon (Pearl, Pascagoula, Escambia, Yellow, Conecuh, Choctawhatchee, Apalachicola, Suwannee, and Withlacoochee), population estimates have been calculated only for three (Apalachicola, Choctawhatchee, and Suwannee Rivers). NMFS believes that Gulf sturgeon population size within the other six major rivers is small. Therefore, the number of Gulf sturgeon from the two rivers (i.e., Pearl and Pascagoula Rivers) that likely utilize the project area and that would be affected by an impacted prey base is presumably few, but likely to increase as species recovery occurs.

Prey items

Ontogenetic changes in Gulf sturgeon diet and foraging area have been documented. Young-of-the-year forage in freshwater on aquatic invertebrates and detritus (Mason and Clugston 1993; Sulak and Clugston 1999); juveniles forage throughout the river on aquatic insects (e.g., mayflies and caddis flies), worms (oligochaete), and bivalves (Huff 1975; Mason and Clugston 1993); adults forage sparingly in freshwater and depend almost entirely on estuarine and marine prey for their growth (Gu et al. 2001). Both adult and sub-adult Gulf sturgeon are known to lose up to 30 percent of their total body weight while in freshwater, and subsequently compensate the loss during winter feeding in marine areas (Carr 1983; Wooley and Crateau 1985; Clugston et al. 1995; Morrow et al. 1998; Heise et al. 1999; Sulak and Clugston 1999; Ross et al. 2000). Therefore, once Gulf sturgeon leave the river after having spent at least six months in the river fasting, it is presumed that they immediately begin feeding. Upon exiting the rivers, Gulf sturgeon concentrate around the mouths of their natal rivers in lakes and bays. These areas are very important for the Gulf sturgeon as they offer the first foraging opportunity for the Gulf sturgeon exiting the rivers.

Few data have been collected on the food habits of Gulf sturgeon; their threatened status limits sampling efforts and gastric lavaging has only recently become successful. Gulf sturgeon have been described as opportunistic and indiscriminate benthivores; their guts generally contain benthic marine invertebrates including amphipods, lancelets, polychaetes, gastropods, shrimp, isopods, molluscs, and crustaceans (Huff 1975; Mason and Clugston 1993; Carr et al. 1996; Fox et al. 2000; Fox et al. 2002). During the early fall and winter, immediately following downstream migration, Gulf sturgeon are most often located in nearshore (depth less than 20 ft) sandy areas that support burrowing macroinvertebrates, where the fish are presumably foraging (Craft et al. 2001; Ross et al. 2001; Fox et al. 2002). Generally, Gulf sturgeon prey are burrowing species (e.g., annelids: polychaetes and oligochaetes, amphipods, isopods, and lancelets) that feed on detritus and/or suspended particles, and inhabit sandy substrate.

Benthic community structure

In most areas, community structure of the benthos is unknown. Without a comprehensive benthic survey, availability of Gulf sturgeon prey remains uncertain. Most of what is known about the community structure of sandy benthic communities of the northern Gulf of Mexico is the result of work by Saloman et al. (1982), Culter and Mahadevan (1982), and Rakocinski et al. (1991; 1993). While none of these reports describe the benthic community in or near the project area, the community structure described by Rakocinski et al. (1991; 1993) is likely similar to the project areas as both sites are comprised predominantly of sand.

Two areas will be impacted by this action: nearshore borrow areas and the swash zone. Community structure at the nearshore borrow areas, based on Rakocinski et al. (1991; 1993; 1996), is likely to be predominantly cumacean (*Cyclaspsis* cf. *varians)* and polychaete *(Streptosyllis pettiboneae* and *Nepthys bucera).* The mole crab *(Emerita talpoida*), spinoid polychaete (*Scolelelpis squamata*), and wedge clam (*Donax variabilis*) likely dominate the swash zone, with some occurrence of polychaetes *(Dispio uncinata, Leitoscoloplos fragilis*, and *Paraonis gracilis)*, haustoriid amphipods (*Haustorius jaynae)*, isopods (*Ancinus depressus* and *Exosphaeroma diminutum*), and the mysid shrimp *(Metamysidospis swiftii).*

Recovery of benthic biota

Rate and success of benthic recovery resulting from placement of dredged material is a function of sediment texture, depth of overburden, time of year, and habitat type. Placement of materials similar to ambient sediments (e.g., sand on sand or mud on mud) has been shown to produce less severe impacts in contrast to placement of dissimilar sediments, which generally results in more severe, long-term impact (Maurer et al. 1978). Deposition of dredged material in extremely thin layers (<10 cm; 4 in) can minimize impacts by allowing many populations of small, shallow-burrowing infauna with characteristically high reproductive rates and wide dispersal capabilities to recover quickly. Deposits greater than 20-30 cm (8-12 in) generally eliminate all but the largest and most vigorous burrowers (Maurer et al. 1978).

Observed rates of benthic community recovery after dredged material placement range from a few months to several years. The relatively species-poor benthic assemblages associated with low salinity estuarine sediments can recover in periods of time ranging from a few months to approximately one year (Leathem et al. 1973; McCauley et al. 1976; 1977; Van Dolah et al. 1979; 1984; Clarke and Miller-Way 1992), while the more diverse communities of high salinity estuarine sediments may require a year or longer (e.g., Jones 1986). Succession within the project area, as discussed in the report from the National Demonstration Project, could begin within a few days as larvae settle during seasonal recruitment (MDCOE 1999).

Potential Gulf sturgeon prey in the action area
Research in Choctawhatchee Bay (Fox and Hightower 1998; Fox et al. 2002) indicates that Gulf sturgeon show a preference for sandy shoreline habitats with the majority of fish being located in areas lacking seagrass. Craft et al. (2001) found that Gulf sturgeon in Pensacola Bay prefer shallow shoals with unvegetated, fine- to medium-grain sand habitats such as sandbars and subtidal energy zones resulting in sediment sorting and a preponderance of sand supporting a variety of prey items. Habitats used nearby the Mississippi Sound barrier islands tend to have a clean sand substrate and all benthic samples from the area contained lancelets (Ross et al. 2001a). Other nearshore Gulf of Mexico locations where Gulf sturgeon are often located (via telemetry and tag returns) consist of unconsolidated, fine-medium grain sand habitats, including natural inlets and passes that are known to support Gulf sturgeon prey items (Menzel 1971; Abele and Kim 1986; AFS 1989). It has been concluded that Gulf sturgeon are foraging in these sandy areas where they are repeatedly located, as this habitat supports their prey (see preceding "Prey items" section for specifics).

Summary of effects on Gulf sturgeon prey abundance
Gulf sturgeon prey abundance, the only PCE likely to be adversely affected by the proposed action, has the ability to recover and recolonize, and therefore its resilience to the action should be considered. Recovery of the macrobenthic assemblages is expected to be rapid as sediment composition pre- and post-construction will be similar, and nearshore benthic assemblages are known to recover relatively quickly from physical disturbance.

While habitat known to support prey will be impacted, there are no telemetry data to indicate that Gulf sturgeon selectively utilize the project area. It is likely when Gulf sturgeon enter the project area following their fall migration, they will find appropriate and abundant prey in the areas adjacent to the project location. Given that the sturgeon forage opportunistically while benthic cruising, they can easily locate prey and fulfill nutritional requirements in areas adjacent to those

impacted. Thus, the temporary reduction of benthic prey availability (<1 year) in an area that constitutes 1.21 percent of critical habitat Unit 8 may adversely affect but will not destroy or adversely modify this PCE's capacity within critical habitat Unit 8 to support the Gulf sturgeon's conservation in the short- or long-term.

5.5 Summary of effects on Gulf sturgeon critical habitat

Based on the description of the proposed action, and the preceding discussions and analysis presented in Sections 5.1. through 5.4, NMFS concludes that project impacts may adversely affect but will not destroy or adversely modify the critical habitat's ability to support the Gulf sturgeon's conservation in the short- or long-term.

6 CUMULATIVE EFFECTS

ESA section 7 regulations require NMFS to consider cumulative effects in formulating their biological opinions (50 CFR 402.14). Cumulative effects include the effects of future state, tribal, local, or private actions that are reasonably certain to occur in the action area considered in this opinion. Because many activities that affect marine habitat involve some degree of federal authorization (e.g., through MMS or COE), NMFS expects that ESA section 7 will apply to most future major actions that could affect designated Gulf sturgeon critical habitat Unit 8.

7 CONCLUSION

After reviewing the current status of Gulf sturgeon critical habitat Unit 8, the environmental baseline, the effects of the proposed action, and the cumulative effects, it is NMFS' biological opinion that the effects of the proposed placement of dredged materials into disposal areas within Gulf sturgeon critical habitat will not reduce the critical habitat's ability to support the Gulf sturgeon's conservation. NMFS concludes that the action, as proposed, is not likely to destroy or adversely modify designated Gulf sturgeon critical habitat.

8 INCIDENTAL TAKE STATEMENT

NMFS does not anticipate that the proposed action will incidentally take any species and no take is authorized. However, any takes of sea turtles or Gulf sturgeon will be counted against the ITS of the GMRBO, and the RPMs and terms and conditions of that ITS are applicable to this action.

9 CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the ESA directs federal agencies to utilize their authority to further the purposes of the ESA by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species, to help implement recovery plans, or to develop information. NMFS believes that MDCOE should implement the following conservation recommendations:

1. Gather data describing community structure of the benthos in and near the project area that would help to determine local Gulf sturgeon prey availability and thereby assist in future assessments of impacts to designated critical habitat; and

2. Gather data describing recovery rates of benthic assemblages impacted by the deposition of dredged material into designated disposal areas that would assist in future assessments of impacts to Gulf sturgeon prey items.

In order for NMFS to be kept informed of actions minimizing or avoiding adverse effects or benefiting listed species or their habitats, NMFS requests notification of the implementation of any conservation recommendations.

10 REINITIATION OF CONSULTATION

This concludes formal consultation on the disposal of materials associated with maintaining Gulfport Harbor Navigation Project in Mississippi Sound, Harrison County, Mississippi. As provided in 50 CFR 402.16, reinitiation of formal consultation is required where discretionary federal agency involvement or control over the action has been retained (or is authorized by law) and if (1) the amount or extent of taking specified in the incidental take statement is exceeded, (2) new information reveals effects of the action that may affect listed species or critical habitat in a manner or to an extent not previously considered, (3) the identified action is subsequently modified in a manner that causes an effect to listed species or critical habitat that was not considered in the biological opinion, or (4) a new species is listed or critical habitat designated that may be affected by the identified action.

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APPENDIX B
USEPA ENVIROFACTS REPORTS

Related Topics: Envirofacts

FRS

FRS Facility Detail Report

STEVE DORING SERVICES OF AMERICA

EPA Registry Id: 110007650700
WEST PIER PORT OF GULFPORT
GULFPORT, MS 395011960

Facilty Registry Service Links:

- Facility Registry Service (FRS) Overview
- FRS Facility Query
- FRS Organization Query
- EZ Query
- FRS Physical Data Model
- FRS Geospatial Model

Legend

- ★ **Selected Facility**
- ■ **EPA Facility of Interest**
- □ **State/Tribe Facility of Interest**

The facility locations displayed come from the FRS Spatial Coordinates tables. They are the best representative locations for the displayed facilities based on the accuracy of the collection method and quality assurance checks performed against each location. The North American Datum of 1983 is used to display all coordinates.

Environmental Interests

Information System	System Facility Name	Information System Id/Report Link	Environmental Interest Type	Data Source	Last Updated Date	Supplemental Environmental Interests:
RESOURCE CONSERVATION AND RECOVERY ACT INFORMATION SYSTEM	STEVE DORING SERVICES OF AMERICA	MSR000001339	CESQG (Y)	RCRAINFO	09/02/2000	

Additional EPA Reports: MyEnvironment Enforcement and Compliance Site Demographics Facility Coordinates Viewer Environmental Justice Map Viewer Watershed Report

Standard Industrial Classification Codes (SIC)

No SIC Codes returned.

Facility Codes and Flags

EPA Region:	04
Duns Number:	
Congressional District Number:	04
Legislative District Number:	
HUC Code/Watershed:	03170009 / MISSISSIPPI COASTAL
US Mexico Border Indicator:	
Federal Facility:	NO
Tribal Land:	NO

Alternative Names

No Alternative Names returned.

Organizations

Affiliation Type	Name	DUNS Number	Information System	Mailing Address
OWNER	STEVE DORING SERVICES		RCRAINFO	

National Industry Classification System Codes (NAICS)

No NAICS Codes returned.

Facility Mailing Addresses

Affiliation Type	Delivery Point	City Name	State	Postal Code	Information System
FACILITY MAILING ADDRESS	P. O. BOX 1960	GULFPORT	MS	395021960	RCRAINFO

Contacts

Affiliation Type	Full Name	Office Phone	Information System	Mailing Address
REGULATORY CONTACT	MARKY MCANDREWS	2288633922	RCRAINFO	

Query executed on: APR-07-2017

Last updated on September 24, 2015