Appendix L

Benthic Habitat Assessment

Job No. 100018536

APPENDIX L
BENTHIC HABITAT ASSESSMENT FOR THE PROPOSED PORT OF GULFPORT EXPANSION PROJECT
HARRISON COUNTY
GULFPORT, MISSISSIPPI

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April 2017

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Acronyms and Abbreviations

°C	degrees Celsius
CMC	Criteria Maximum Concentration
DO	dissolved oxygen
EFH	Essential Fish Habitat
EIS	Environmental Impact Statement
EPA	U.S. Environmental Protection Agency
ERDC	U.S. Army Engineer Research and Development Center
ERL	Effects Range Low
ERM	Effects Range Medium
FNC	Gulfport Harbor Federal Navigation Channel
GPS	Global Positioning System
GSMFC	Gulf States Marine Fisheries Commission
Gulf	Gulf of Mexico
H'	Shannon-Wiener Diversity Index
LPIL	lowest practical identifiable level
MDEQ	Mississippi Department of Environmental Quality
mg/L	milligrams per liter
MsCIP	Mississippi Coastal Improvements Program
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
PA	Project area
PAH	polycyclic aromatic hydrocarbon
PE	East Pier expansion
PGEP	Port of Gulfport Expansion Project
pg/g	picograms/gram
PM	West Pier expansion
PN	North Harbor fill
Port	Port of Gulfport
Psu	practical salinity unit(s)
SA	study area
TB	Turning Basin
TEQ	toxic equivalent
USACE	U.S. Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service
WHO	World Health Organization
WQC	water quality criteria
WQS	water quality standards

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1.0 INTRODUCTION

An Environmental Impact Statement (EIS) has been prepared to analyze and disclose the potential impacts of the proposed Port of Gulfport Expansion Project (PGEP) located in Gulfport, Mississippi (Appendix A, Figure 1). The proposed action is the expansion of the Port of Gulfport (Port) in Harrison County, Mississippi. The proposed PGEP involves the dredging and filling of approximately 282 acres of estuarine mud and sand bottom habitat in Mississippi Sound for construction of wharfs, bulkheads, terminal facilities, container storage areas, intermodal container transfer facilities, expanded turning basin, and construction of a breakwater in addition to placement of new work and maintenance dredged material (Appendix A, Figure 1).

During pre-application coordination with State and Federal agencies, Stephania Bolden, Ph.D., of the National Marine Fisheries Service (NMFS) Southeast Regional Office, Protected Resources Division, provided a list of comments to the U.S. Army Corps of Engineers (USACE) Mobile District via e-mail in April 2010. The comments indicated concern for potential Project-related impacts to Gulf sturgeon (*Acipenser oxyrinchus desotoi*). Additionally, during the scoping and public meetings, various agency personnel from NMFS responded with comments regarding the presence of Gulf sturgeon in the vicinity of proposed Project expansion activities and the inability to adequately determine potential impacts to Gulf Sturgeon from the expansion with the current data set. They also responded with comments regarding the need to adequately disclose contaminants in the dredging footprint and the potential impacts from dredging on aquatic organisms.

As a result of these comments, the USACE and Atkins, the Applicant's third-party EIS consultant, engaged in a discussion with the agencies to determine what information would be necessary to adequately estimate impacts to Gulf sturgeon, habitat (including Critical Habitat), prey species, and other aquatic organisms, including fisheries species. A consensus was reached that a habitat assessment of the proposed Project footprint, Project area, and study area would be necessary to address these concerns (see Appendix B).

The objectives of this Habitat Assessment are to:

1. Characterize the benthic habitat and community including substrate, seagrasses, macrobenthic organisms, and ambient water conditions within the Project footprint, Project area, and study area.
2. Compare similarities and differences in the benthic community between the Project footprint, Project area, and study area.
3. Compare benthic habitat and community in the Project footprint, Project area, and study area to areas where Gulf sturgeon are known to occur in the Mississippi Sound per Ross et al. (2009).
4. Describe the chemical parameters detected in the sediment, water, and elutriate samples collected within the Project footprint.

The data collected in this assessment were used in the EIS to describe potential adverse impacts from proposed dredging operations and construction of proposed PGEP facilities on Gulf sturgeon, Essential Fish Habitat (EFH), EFH-designated species, and fisheries species.

1.1 GULF STURGEON

Gulf sturgeon is a federally listed species with designated critical habitat and is a State-listed critically imperiled species in all three coastal counties of Mississippi, including Harrison County. Gulf sturgeon is an anadromous species, which means it breeds in freshwater after migrating up rivers from marine and estuarine environments. Since 1997, several research studies have posed hypotheses to better understand the freshwater and marine habitat requirements of the Gulf sturgeon, the genetic relationship of Gulf sturgeon throughout their distribution in the Gulf of Mexico (Gulf), their reproduction, and population size (Ross et al., 2003, 2009; Heise et al., 2005, 2009; Heise et al., 2004; Dugo et al., 2004). This research is ongoing and has more urgency and new questions since hurricanes Ivan (2004) and Katrina (2005) made landfall, because it is unknown what impact, if any, the hurricanes had on the population as a whole.

Historically, Gulf sturgeon occurred in rivers from the Mississippi River to the Tampa Bay, and in bays and estuaries from Florida to Louisiana, including the Pearl River and Pascagoula River (U.S. Fish and Wildlife Service [USFWS] and Gulf States Marine Fisheries Commission [GSMFC], 1995). Gulf sturgeon have been documented to inhabit coastal rivers from Louisiana to Florida during the warmer months and overwinter in estuaries, bays, and the Gulf. In Florida, Gulf sturgeon have been documented to spend summer months near the mouth of springs and cool water rivers in the Suwannee River (USFWS and GSMFC, 1995). Fox et al. (2002) found that Gulf sturgeon occupied the shoreline areas of Choctawhatchee Bay, Florida, in 7 to 10 feet waters over sand substrate.

Immature and mature Gulf sturgeon participate in freshwater migration. Studies have shown that subadults and adults spend 8 to 9 months each year in rivers and 3 to 4 of the coolest months in the estuaries or Gulf waters (USFWS and GSMFC, 1995).

Gulf sturgeon are found in rivers, bays, and estuaries along the Mississippi Gulf coast. Ross et al. (2009) and Heise et al. (2004) conducted an extensive tagging and tracking study from 1997 to 2004, where they followed individual Gulf sturgeon throughout the Pascagoula and Pearl rivers, Mississippi Sound, and in Breton Sound. In Mississippi Sound, the majority of the tracking effort was near the barrier islands and concentrated in the central and eastern portion of Mississippi Sound. Gulf sturgeon from both the Pearl and Pascagoula rivers are known to use the Mississippi Gulf Coast, including the barrier islands, for migration and foraging. Rogillio et al. (2007) and Ross et al. (2009) located tagged adult Gulf sturgeon among Cat, Ship, Horn, and Petit Bois islands from October through March.

The U.S. Army Engineer Research and Development Center (ERDC) is conducting an ongoing Gulf sturgeon monitoring effort at Ship Island in association with the Mississippi Coastal Improvements Program (MsCIP). The study's objective is to define the seasonal occurrences and movements of Gulf sturgeon around Ship Island and within Camille Cut. This research has shown that between September 2011 and

June 2012, a total of 13,720 detections from approximately 14 Gulf sturgeons originating from five rivers (Pearl, Pascagoula, Escambia, Blackwater, and Yellow) were found in their study area (ERDC, 2012).

Comparatively, between September 2012 and June 2013, ERDC logged 94,244 detections from 21 Gulf sturgeon originating from the Pearl, Pascagoula, Escambia, Blackwater, Yellow, Choctawhatchee, and Brothers Rivers. The greatest number of Gulf sturgeon detected during the 2011–2012 sampling period occurred in November and December followed by decreasing monthly numbers from January through March. Whereas, the greatest number of fish documented during the 2012–2013 sampling period occurred in December with similar numbers through March. They noted a significant decrease in Gulf sturgeon activity in the array in April, while the greatest number of detections was recorded in December and January. The fewest number of detections per month were reported for October and April (ERDC, 2013). The summary for the 2014 deployment period had not yet been submitted to the USACE.

A Gulf sturgeon monitoring study was performed for the PGEP in which Gulf sturgeon monitoring was conducted from fall 2012 to 2014 in the Mississippi Sound, between West and East Ship Islands, and around the Project area (Peterson et al., 2015, Appendix O of the EIS; Peterson, 2015). The Gulf sturgeon monitoring study was conducted using a network of telemetry receivers in the vicinity of the proposed Project area (referred to as the Gulfport array in the study) and further east (east gate) and west (west gate) between the Port and the Pascagoula and Pearl Rivers, respectively, to determine the use of the near shore and Project area by Gulf sturgeon (Peterson et al., 2015, Appendix O of the EIS). Key results from this study are summarized below.

- Adult Gulf sturgeon are mainly from the Pascagoula and Pearl drainages but there were some eastern population fish [Escambia, Choctawhatchee and Blackwater (recaptured fish) drainages] that appeared in the Gulfport array.
- Overall, Gulf sturgeon occurrence appears to be more concentrated on the east gate and eastern portion of the Gulfport array compared to the west gate and western portion of the array.
- Total detections were markedly lower in the year 2 data set than year 1, with four individuals (two from each drainage) returning to the array over the 2 years of this project. These data suggest some level of consistent and repeatable regional-scale movement patterns in Gulf sturgeon from the western Gulf drainages.
- The number of detections per fish and time within the array varied greatly among all the detected Gulf sturgeon, with individuals taking both transitory paths through the Gulfport array, and localized movements within the entire array.
- Gulf sturgeon from each life stage category (adult, sub-adult, juvenile) were detected. The adults, unexpectedly, had the greatest number of occurrences and detections. Juveniles and sub-adults life history stages may experience restricted movements away from natal rivers as young fish, and only begin to expand their range later with age, based on the relative low occurrence of detections of those two life history stages. However, adults have been documented within the proposed Project area during pre- and post-migratory periods. The data suggest that the Gulf sturgeon habitat monitored serves as a corridor between other habitat types, drainages, feeding zones, or is used as a pre-/post-migratory acclimation zone.

Gulf sturgeon spend their time feeding and searching for food while they overwinter in the Mississippi Sound and fast while in a freshwater environment, which makes them totally dependent on the marine/estuarine food web for growth (Gu et al., 2001). Heard et al. (2002) examined the stomach contents of one Gulf sturgeon that was found dead in Mississippi, and the Florida lancelet (*Branchiostoma floridae*) was the sole organism that was identified. Later studies, as well as studies conducted in other parts of the Gulf, confirm that Florida lancelets are one of the key prey items of Gulf sturgeon (USFWS and National Oceanic and Atmospheric Administration [NOAA], 2009). However, Gulf sturgeon also eat various types of polychaetes (segmented worms), mollusks (including sand dollars [*Mellita quinquiesperforata*] and other bivalve shells), and other arthropods (USFWS and NOAA, 2009).

The habitat where most subadult and adult Gulf sturgeon were located in the Mississippi Sound is shown in Table 1. Gulf sturgeon winter habitat is characterized by relatively shallow (less than 23 feet), well oxygenated and clear water located over sand and shell fragment substrate (Ross et al., 2009). Habitats are also characterized by abundant food items, including lancelets, sand dollars, haustoriid amphipods (bottom dwelling crustaceans), bivalve shells, and various types of polychaetes.

Table 1
Gulf Sturgeon Habitat Characteristics

Characteristic	Average	Minimum	Maximum
Dissolved oxygen (mg/L)	7.5	4.7	9.2
Water Depth (feet)	12.8	3.9	22.9
Bottom temperature (°C)	15.6	11.5	21.5
Salinity (psu)	22.8	0	33.7
Dominant substrate	Mixture of fine to medium sized sand	Mud and clay	Medium to coarse sand
Sub-dominant substrate	Medium to coarse sand	Mud and clay	Shell fragments

Source: Ross et al. (2009)
mg/L = milligrams per liter
psu = practical salinity unit(s)
°C = degrees Celsius

According to the Gulf sturgeon 5-year review (USFWS and NOAA, 2009), the most aggressive threats to the Gulf sturgeon population include channel improvements and maintenance dredging activities, poor water quality associated with contamination by pesticides/heavy metals/industrial contaminants, red tide, climate change, and impeding river flow via dams or diversions.

2.0 METHODS

2.1 HABITAT SURVEY

2.1.1 Field Methods

On April 3 and 5, 2012, substrate was collected using a Petite Ponar dredge from 48 sample locations within the Project footprint, Project area, and study area of the proposed PGEP (Appendix A, Figures 2 and 3). Petite Ponar dredge grabs were collected at each sample location. A composite sample of approximately 1 liter of material was obtained at each sample location (three to ten Petit Ponar grabs per location). Each benthic sample was field-washed through a 541-micron mesh wash bucket (WildCo®). Each benthos sample was preserved in 10 percent formalin and stored in a 9-x-12-inch, 4-milliliter resealable plastic bag labeled with the date and sample location identification number.

Benthos samples were identified in a laboratory using a dissecting microscope to the lowest practical identifiable level (LPIL) and enumerated. The references (keys) used to identify taxa included *Seashells of the Texas Coast* (Andrews, 1972), *Guide to the Identification of Marine and Estuarine Invertebrates* (Gosner, 1971), *The Polychaete Worms, Definitions and Keys to the Orders, Families and Genera* (Fauchald, 1977), and *Macrobenthic Inventory of the Aquatic Shoreline Habitat Within the Gulf Islands National Seashore* (Rakocinski et al., 1995). Michael A. Poirrier, Ph.D., an emeritus professor at The University of New Orleans aided in identifying a portion of the macrobenthic organisms. Benthic macroinvertebrate data are presented in Appendix C.

A visual characterization score of the dominant substrata (substrate) was recorded as 1-clay, mud; 2-fine sand; 3-medium to coarse sand; and 4-shell fragments (Ross et al., 2009). Additionally, grain size was analyzed for each of the sampling locations to determine the percent composition of sediment type throughout the Project footprint, Project area, and study area.

Water quality conditions were measured using similar methods as Ross et al. (2009) and are detailed in Section 2.3 (Water Quality).

2.1.2 Data Analyses

Several metrics were identified for comparing the benthic community in the Project footprint, Project area, and study area. These included:

- Percent relative abundance
- Percent occurrence
- Relative species richness and species richness
- Average relative species abundance

- Shannon-Wiener Diversity Index
- Species evenness

Relative abundance refers to how numerous a taxon is relative to other taxon in a defined location or community (Brower et al., 1998). Relative abundance was calculated for all the samples, and separately for the Project footprint, Project area, and study area, by taking the number of individuals collected in a particular species divided by the total number of organisms collected in a particular group. This was calculated to determine which species were the most abundant species collected and if any similarities occurred between the survey and Ross et al. (2009).

Percent occurrence is the number of samples containing a taxon compared to the number of samples taken in a particular area (Brower et al., 1998). It was calculated for all samples, and individually for samples in the Project footprint, Project area, and study area. Percent occurrence was calculated by dividing the number of times a taxon was collected by the number of samples collected in a particular area (Project footprint, Project area, or study area). This was calculated to determine whether or not a taxon was widely distributed.

Species richness is the number of species collected in a particular area (Brower et al., 1998). Cumulative species richness was calculated for all samples and separately for samples in the Project footprint, Project area, and study area.

Average relative abundance refers to the mean number of individuals collected in a particular area. This was calculated by adding the individual species' relative abundance from each of the three sample areas and then dividing by three. The cumulative relative abundance was calculated by adding the number of each species in all three sampling areas and dividing it by the total number of species collected.

The Shannon-Wiener Diversity Index takes into account both species richness and relative abundance of each species to quantify how well species are represented within a community. The Shannon-Wiener index was calculated to measure the diversity of the Project footprint, Project area, and study area using the following equation: $H' = - p_i \ln p_i$; where H' = the Shannon-Wiener index, and p_i = the proportional abundance of each taxon (Brower et al., 1998). The index value ranges from 0 to about 4.5 with low numbers representing less diverse communities and high numbers representing more diverse communities. In general, it is thought that more disturbed and less stable environments should have a lower index value.

Species evenness is used to measure the evenness in the distribution of organisms across all species present in a community. Evenness was calculated using $E_{var.}$ E_{var} is based on the variance in abundance (Keeney and Poulin, 2007). The index ranges from 0 to 1, with increasing values indicating an increasingly even distribution. Low values are representative of communities dominated by one to a few taxa; whereas, high numbers are representative of communities with many taxa with similar abundance.

2.2 SEDIMENT, WATER, AND ELUTRIATE SURVEY

Sediment, water, and elutriate sampling were only performed in the proposed Project footprint and were conducted simultaneously with the benthic sampling. Field sampling procedures and laboratory analyses were conducted according to the same methodology used by the USACE for routine sediment, water, and elutriate analysis prior to maintenance dredging (Environmental Protection Agency [EPA]/USACE, 1998). Additionally, all sample collections and chemical analyses were conducted according to the Mississippi Department of Environmental Quality (MDEQ) State of Mississippi Water Quality Criteria for Intrastate, Interstate, and Coastal Waters (MDEQ, 2007). Prior to sample collection, all containers and sampling equipment were cleaned according to protocols described in Plumb (1981). Care was taken to avoid contamination to sampling devices from the boat deck or other surfaces. Powderless latex gloves were worn during sample collection.

Samples in Gulfport Harbor were taken from four areas within the proposed Project footprint, including the Turning Basin Expansion, the West Pier Expansion, the East Pier Expansion, and the North Harbor Expansion areas (Appendix A, Figure 4). All sample locations were located and documented using a hand-held Garmin 76 CS Global Positioning System (GPS) accurate to <16.4 feet. Coordinates for all locations are included in Table 2. Sediment samples (surface grab samples) were collected at each of the four Project footprint areas, approximately every 500–1,000 linear feet, depending on the area.

Samples were collected so that three subsamples (PE-11-A,B,C) were composited into one sample within the East Pier Expansion; two subsamples (PN-11-A,B) were composited into one sample within the North Harbor Expansion; nine subsamples (PM-11-A through PM-11-I) were composited into three samples within the West Pier Expansion; and six subsamples (TB-11-A through TB-11-F) were composited into two samples for the Turning Basin Expansion (Table 2).

Sediment samples were collected using a Petit Ponar to grab surface sediment. Prior to collecting each sample, all residual sediment was removed from the Petit Ponar dredge with a brush. It was rinsed with deionized water and then with ambient water. Each sample was deposited into a clean polyethylene pan. Composite samples were mixed thoroughly and then placed into a pre-cleaned glass jar. The jar was filled completely to avoid headspace and ensure the total sample volume. The lid was tightly secured and placed into a cooler with ice.

Table 2
Sampling Nomenclature, Matrix, and Location for Sediment, Water, and Elutriate Samples Collected Within the Proposed Project Area, Gulfport, Mississippi

Sample Number	GPS Location	Sample Matrix	Analyses
Pier Expansion			
PE-11-A	N30 21 19.3 W89 05 12.6	Sediment	W, S, E, GS
PE-11-B	N30 21 19.3 W89 05 07.8	Sediment, Water	Component of PE location above
PE-11-C	N30 21 14.4 W89 05 07.8	Sediment	Component of PE location above
PN-11-A	N30 21 34.0 W89 05 37.9	Sediment, Water	W, S, E, GS
PN-11-B	N30 21 38.8 W89 05 37.9	Sediment	Component of PN location above
PM-11-A	N30 20 59.5 W89 05 22.9	Sediment	W, S, E, GS
PM-11-B	N30 20 49.9 W89 05 32.7	Sediment, Water	Component of PM location above
PM-11-C	N30 20 49.7 W89 05 22.9	Sediment	Component of PM location above
PM-11-D	N30 20 39.9 W89 05 22.8	Sediment	W, S, E, GS
PM-11-E	N30 20 39.7 W89 05 13.1	Sediment, Water	Component of PM location above
PM-11-F	N30 20 39.6 W89 05 03.7	Sediment	Component of PM location above
PM-11-G	N30 20 30.2 W89 05 22.8	Sediment	W, S, E, GS
PM-11-H	N30 20 30.1 W89 05 12.9	Sediment, Water	Component of PM location above
PM-11-I	N30 20 30.3 W89 05 37.9	Sediment	Component of PM location above
Basin Expansion			
TB-11-A	N30 20 49.5 W89 05 03.1	Sediment	W, S, E, GS
TB-11-B	N30 20 49.7 W89 04 53.0	Sediment, Water	Component of BE location above
TB-11-C	N30 20 39.9 W89 04 53.4	Sediment	Component of BE location above
TB-11-D	N30 20 39.7 W89 04 43.2	Sediment	W, S, E, GS
TB-11-E	N30 20 29.8 W89 04 33.5	Sediment, Water	Component of BE location above
TB-11-F	N30 20 30.4 W89 04 44.6	Sediment	Component of BE location above

GPS Coordinate System WGS 84

PE = East Pier; PN = North Harbor; PM = West Pier; TB = Turning Basin

W = Water; E = Elutriate; S = Sediment; GS = Grain Size

Water samples were collected one time using a suitable nonmetallic bilge pump with a foodgrade hose and a peristaltic pump. The depth of each water sample collected was at mid-depth. Prior to filling sample containers, the pump was allowed to run and purge water from the hose from any previous samples to ensure water collected was representative of the sample location. Water samples were then collected in polyethylene and glass bottles provided by the laboratory. Water samples to be analyzed for metals were collected using a variable-speed peristaltic pump and Teflon® tubing. Water samples to be analyzed for metals other than mercury and selenium were filtered through a clean 0.45-µm filter prior to dispensing into containers. Pre-cleaned brown glass bottles were used for organic analyses. All bottles contained the appropriate preservatives and were filled completely to avoid headspace.

Elutriates for chemical analyses were prepared from sediment and water collected. Sediment and water were combined at a 1:4 ratio, respectively, and prepared as designated in EPA/USACE (1998) by laboratory personnel.

2.2.1 Dioxins and Furans Analyses

All sediment samples were analyzed for dioxins and furans. Laboratory results were reported as toxic equivalents (TEQ). The laboratory used World Health Organization (WHO) 2005 toxic equivalency factors to calculate TEQ (WHO, 2005). The target detection limits for each individual congener were 0.1 picograms/gram (pg/g) dry weight for sediment. Higher detection limits may be acceptable if these detection limits could not be met.

2.2.2 Sample Preservation and Storage

Collected samples were cooled and stored at 2 to 4 degrees Celsius (°C) until laboratory analysis. Analyses were performed within the recommended holding times, as described in EPA/USACE (1998).

2.2.3 Chain of Custody

A chain of custody was completed and accompanied the samples until laboratory analysis.

2.2.4 Chemical Analyses

Each composite sample was analyzed for water, sediment, and elutriate conditions. All chemical analyses were performed by Anacon, Inc., who is accredited for the analytes/analyte groups and matrices analyzed by the Texas Commission on Environmental Quality, an accrediting authority recognized by the National Environmental Laboratory Accreditation Program. The constituents for which analyses were conducted, the methods used, and the method detection limits are provided in Appendix D.

2.3 WATER QUALITY

In situ standard water quality parameters were recorded at each sample site (n = 48) at the surface and 1 foot off the bottom at the time sediment, water, and benthic samples were collected. A YSI 6920 v2 Series multi-

parameter instrument was used to measure water quality parameters, including: dissolved oxygen (DO) measured in milligrams per liter (mg/L), pH measured in standard units, salinity (psu), water temperature (°C), air temperature (°C), and water depth (feet). Turbidity was measured as water clarity using a Secchi disk in centimeters, but converted to inches to keep the units consistent. In addition to water quality parameters, ambient water and weather conditions were recorded. Multi-parameter water quality instrument calibrations were performed before and after sampling. Water quality data are presented in Appendix E.

3.0 RESULTS

3.1 HABITAT SURVEY

3.1.1 Macrobenthic Organisms

Benthic samples were taken from 48 sample locations within the proposed Project footprint, Project area, and study area. The location of each site is shown in Appendix A, Figures 2–4. Samples yielded a total 105 different macrobenthic taxa identified to the LPIL (Appendix C). A study area location (SA 18) yielded the highest total number of individuals collected and the highest total number of taxa. A location in the East Pier Expansion Area (PE-11-B) yielded the lowest number of total individuals collected and taxa.

Tables 3 and 4 contain taxa that comprise ≥1 percent cumulative relative abundance and taxa that overlap with Ross et al. (2009). *Leitoscoloplos fragilis* (polychaete worm) had the highest cumulative and area-specific percent relative abundance with an average of 23.3 (Table 3). *L. fragilis* also exhibited the second highest frequency of occurrence in the Project footprint (90.0 percent) and tied for the highest in the Project area (88.9 percent), refer to Table 4. Nemertea (LPIL), ribbon worm, was collected and had a cumulative occurrence of 92 percent, but only accounted for 9 percent of the cumulative relative abundance. In contrast, *Mediomastus ambiseta*, a polychaete, showed the second highest relative abundance (14 percent), but had a low cumulative percent occurrence (27 percent) when compared to *L. fragilis* (85 percent), Nemertea (92 percent), and *Glycinde solitaria* (polychaete worm, 88 percent).

Species richness was calculated for the Project footprint, Project area, and study area, and compared to the total number of taxa found over the entire area sampled. The Project area and the Project footprint had similar relative species richness, 44.2 percent and 38.1 percent, respectively. The study area had much higher relative species richness than the Project footprint and Project area with 86.6 percent of the total taxa encountered. The North Harbor and Turning Basin areas within the existing Gulfport Harbor Federal Navigation Channel (FNC) at the Port had a lower relative species richness than the West Pier and East Pier areas outside of the existing channel (Figure 1).

Table 3
Percent Relative Abundance of Macrobenthic Organisms Collected from the Proposed Port of Gulfport Expansion Project Footprint, Project Area, and Study Area, Gulfport, Mississippi

Taxa	Percent Relative Abundance				
	Cumulative	Footprint	Project Area	Study Area	Average
*Leitoscoloplos fragilis**	19	28.0	27.6	14.3	23.3
*Mediomastus ambiseta**	14	11.8	1.1	17.6	10.2
Nemertea (LPIL)	9	7.8	16.4	8.2	10.8
Glycinde solitaria	8	7.6	13.6	7.5	9.6
Sigambra tentaculata	5	2.2	0.3	7.0	3.2
Magelona sp. (LPIL)	4	—	0.6	6.1	2.2
Balanoglossus aurantiacus	4	6.2	1.7	3.1	3.7
Acteocina canaliculata	3	9.2	1.1	1.5	3.9
Cossura soyeri	3	5.1	2.5	2.6	3.4
Paraprionospio pinnata	3	3.9	1.7	2.5	2.7
Actinaria (LPIL)	2	0.7	7.2	1.6	3.2
Notomastus sp. (LPIL)	2	—	—	2.4	0.8
Macoma tenta	2	—	—	2.3	0.8
Capitella capitata	1	1.2	5.0	0.4	2.2
Decapoda	1	0.4		1.4	0.6
Oxyurostylis sp. (LPIL)	1	0.4	2.2	1.0	1.2
Mysidacae (LPIL)	1	0.3	1.1	1.2	0.9
Pectinaria gouldii	1	1.0	0.3	1.0	0.7
Apocorophium louisianum	1	—	—	1.3	0.4
*Spiophanes bombyx**	1	—	—	1.3	0.4
Streblospio benedicti	1	2.4	—	0.4	0.9
Amphipoda (LPIL)	1	—	1.7	0.9	0.9
Glycera americana	1	0.4		1.0	0.5
Hesionidae	1	1.1	0.3	0.6	0.7
Oligochaeta (LPIL)	1	1.1	—	0.7	0.6
Spiochaetopterus oculatus	1	1.0	0.8	0.6	0.8
Chaetognatha	1	0.3	3.6	0.3	1.4
Tharyx acutus	1	0.3		0.7	0.3
Amphicteis floridus	1	0.3	0.3	0.6	0.4
*Nassarius acutus**	1	0.6	—	0.6	0.4
Bivalvia (LPIL)*	<0.1	—	—	0.2	0.1
*Mulinia lateralis**	<0.1	0.4	—	—	0.1
*Prionospio cristata**	<0.1	—	—	<0.1	<0.1

— Taxa were not recorded

* Taxa identified in Ross et al. (2009)

LPIL = lowest practical identifiable level

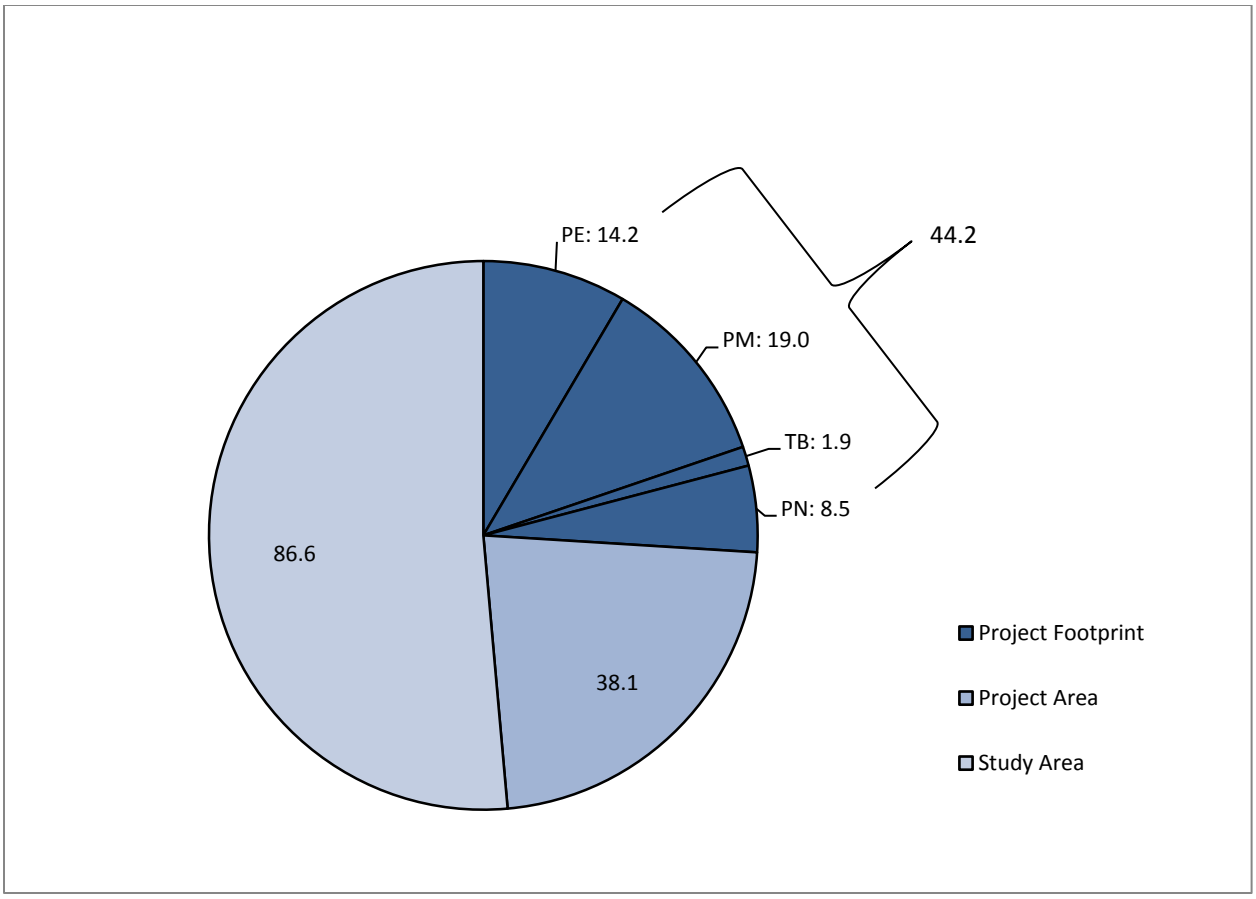
Table 4
Percent Occurrence of Macrobenthic Organisms Collected from the Proposed Port of Gulfport Expansion Project Footprint, Project Area, and Study Area, Gulfport, Mississippi

Taxa	Percent Occurrence				
	Cumulative	Footprint	Project Area	Study Area	Average
*Leitoscoloplos fragilis**	85	90.0	88.9	78.9	85.9
*Mediomastus ambiseta**	27	60.0	22.2	5.3	29.2
Nemertea (LPIL)	92	95.0	77.8	94.7	89.2
Glycinde solitaria	88	85.0	88.9	89.5	87.8
Sigambra tentaculata	46	30.0	11.1	78.9	40.0
Magelona (LPIL)	29	—	22.2	63.2	28.5
Balanoglossus aurantiacus	38	55.0	22.2	26.3	34.5
Acteocina canaliculata	50	55.0	44.4	47.4	48.9
Cossura soyeri	23	25.0	55.6	5.3	28.6
Paraprionospio pinnata	63	65.0	55.6	63.2	61.2
Actinaria (LPIL)	29	15.0	33.3	42.1	30.1
Notomastus (LPIL)	15	—	—	36.8	12.3
Macoma tenta	6	—	—	15.8	5.3
Capitella capitata	21	25.0	11.1	21.1	19.1
Decapoda	23	10.0	0.0	47.4	19.1
Oxyurostylis (LPIL)	29	10.0	33.3	47.4	30.2
Mysidacae (LPIL)	21	10.0	11.1	36.8	19.3
Pectinaria gouldii	21	25.0	11.1	21.1	19.1
Apocorophium louisianum	4	—	—	10.5	3.5
*Spiophanes bombyx**	6	—	—	15.8	5.3
Streblospio benedicti	10	15.0	—	10.5	8.5
Amphipoda (LPIL)	15	0.0	11.1	31.6	14.2
Glycera americana	15	15.0	<0.1	21.1	12.0
Hesionidae	21	20.0	11.1	26.3	19.1
Oligochaeta (LPIL)	8	10.0	0.0	10.5	6.8
Spiochaetopterus oculatus	35	25.0	33.3	47.4	35.2
Chaetognatha	13	5.0	11.1	21.1	12.4
Tharyx acutus	6	5.0	—	10.5	5.2
Amphicteis floridus	2	10.5	11.1	26.3	16.0
*Nassarius acutus**	13	15.0	—	15.8	10.3
Bivalvia (LPIL)*	8	—	—	21.1	7.0
*Mulinia lateralis**	6	15.0	—	—	5.0
*Prionospio cristata**	2	—	—	5.3	1.8

— Taxa were not recorded

* Taxa identified in Ross et al. (2009)

LPIL = lowest practical identifiable level



PE = East Pier; PN = North Harbor; PM = West Pier; TB = Turning Basin

Figure 1
Relative Species Richness Found in the Project Footprint, Project Area, and
Study Area of the Proposed Port of Gulfport Expansion Project in Gulfport, Mississippi

Average species abundance showed the same trends as relative species richness with the Project footprint and the Project area having an overall lower abundance than the study area. The average number of species collected at each sample location was not only higher in the study area, but the number of species collected at each sample location varied more widely in the study area than in the Project footprint and Project area (Figure 2).

The median number of taxa collected in each group of samples (Project footprint, Project area, and study area) is shown on Figure 2, where the light blue and dark blue boxes meet in the middle. The median number of taxa collected within the Project footprint and the Project area were similar, with 9 taxa being collected in the Project footprint and 8.5 taxa in the Project area. A median of 15 taxa were collected in the study area.

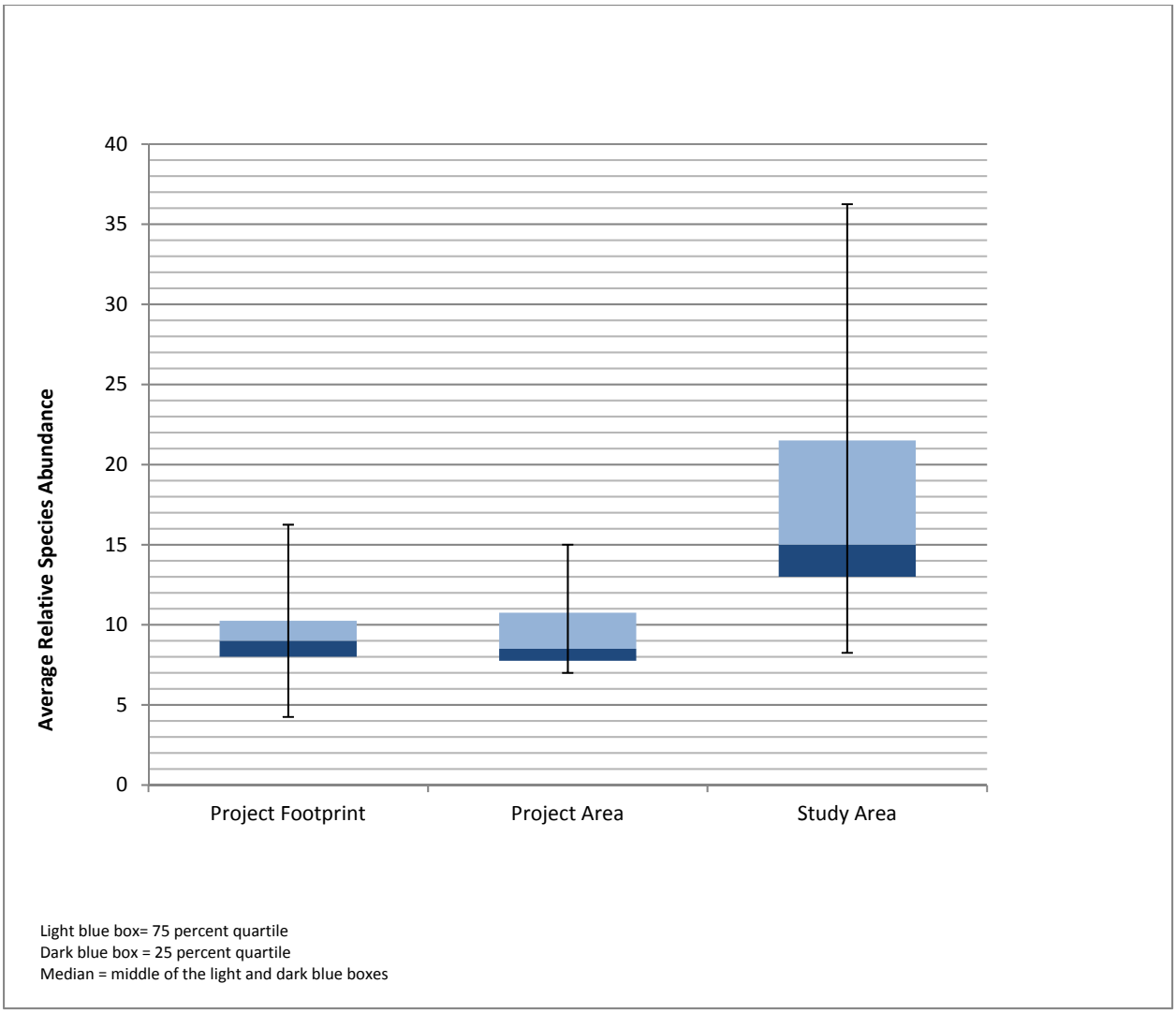


Figure 2
Average Relative Species Abundance within the Project Footprint, Project Area, and Study Area of the Proposed Port of Gulfport Expansion Project in Gulfport, Mississippi

The 25 and 75 percent quartile are shown as the lower and upper limits of the blue boxes in each group of samples. Both the Project footprint and the Project area had similar 25 and 75 percent quartile limits. The quartile limits for the Project footprint ranged from 8 to 10.25 taxa, while the Project area ranged from 7.75 to 10.75 taxa, and the study area ranged from 13 to 21.5 taxa.

The limits of the error bars are the minimum and the maximum number of taxa collected in each group of samples. The average relative abundance of taxa in the study area ranged from 8 to 36, as compared to the Project footprint which ranged from 4 to 16 taxa, and the Project area that had 7 to 15 taxa.

The Shannon-Wiener Diversity Index (H′), species evenness, and species richness were calculated for the Project footprint, Project area, and study area (Table 5). The cumulative values were computed and yielded

a 3.16 Shannon-Wiener index and 0.88 in species evenness. The study area had the highest diversity as compared to the Project footprint and Project area, which were relatively similar (see Table 5). The study area also had the most species (highest species richness value) and was dominated by single occurrences of species (low evenness value). The Project area had the lowest diversity of species (2.60), but had the most even distribution of species (0.37) as compared to the study area and the footprint. However, the distribution of species (species evenness) within the Project footprint, Project area, and study area were relatively similar. Twice as many species were collected in the study area when compared to the Project footprint and Project area.

Table 5
Species Diversity, Species Evenness, and Species Richness for the
Proposed Port of Gulfport Expansion Project, Gulfport, Mississippi

	Number of Samples	Shannon-Wiener Diversity Index	Species Evenness Index	Species Richness
Project Footprint	20	2.67	0.30	46
Project Area	9	2.60	0.37	40
Study Area	19	3.17	0.26	91
Cumulative	48	3.16	0.88	105

3.1.2 Seagrass

No seagrass was observed during the habitat survey.

3.1.3 Grain Size

Sediment was collected for grain size analyses from 48 sample locations, but only 47 samples were analyzed by Anacon, Inc., because one jar broke while transporting samples back to the lab. Sand was the most dominant sediment type and ranged from 31.4 to 68.7 percent, whereas clay ranged from 13.6 to 33.6 percent, and silt ranged from 16.4 to 33.1 percent (Table 6). Sample PA 5 from the Project area was the only location that had sediment that was fine, comprising 0.6 percent of the three sample areas. Sand dominated the North Harbor and West Pier sample areas within the Project footprint, whereas the East Pier and Turning Basin sample areas had sediment evenly divided between sand/clay/silt. Sand was also the dominant sediment type in both the Project area and study area (Appendix A, Figures 5–7).

The substratum ranged from 1 (clay/mud) to 2 (fine sand). No medium to coarse sand or shell fragments were observed during the field survey. The areas that contained sand via visual characterization were located in the North Harbor Expansion area within the Project footprint and the study area. This visual comparison varied from the grain size analysis with the visual characterization biased toward characterizing fine sand as mud.

Table 6
Grain Size Percent and Substratum of the Proposed
Port of Gulfport Expansion Project, Gulfport, Mississippi

			Mean % (95% Confidence Interval)				Substratum[b] Mean (95% Confidence Interval)
		N	Sand[a]	Clay[a]	Silt[a]	Fines[a]	
Project Footprint	PE	3	31.4 (0.3)	31.4 (0.2)	33.1 (0.2)	—	1.0
	PM	9	56.3 (0.7)	23.4 (0.4)	20.1 (0.3)	—	1.4 (<0.0)
	PN	2	68.7 (0.6)	13.6 (0.5)	16.4 (0.2)	—	2.0 (0.1)
	TB	6	36.4 (0.9)	33.6 (0.4)	26.7 (0.5)	—	1.0
Project Area		9	51.0 (0.6)	22.3 (0.3)	26.1 (0.3)	0.6 (0.0)	1.3 (<0.0)
Study Area		18	48.4 (0.5)	22.3 (0.3)	29.0 (0.3)	—	1.9 (<0.0)

a Anacon, Inc., Data

b Substratum coded as 1-clay, mud; 2-fine sand; 3-medium to coarse sand; 4-shell fragments

PE = East Pier; PN = North Harbor; PM = West Pier; TB = Turning Basin

3.2 SEDIMENT, WATER, AND ELUTRIATE SURVEY

Sediment, water, and elutriate analyses were conducted for those locations within the proposed Project footprint. The water quality parameters taken at the time of collection are presented in Appendix E, as are the coordinates at which samples were collected. Included in Appendix D, Tables D2-D5 list the parameters and the concentrations of detected parameters in the various media. Also included in the tables are appropriate standards, criteria, or screening values to which the detected parameters can be compared.

The results of the chemical analyses for compounds detected in the water and elutriate samples are presented in Tables D3 and D4 in Appendix D. Also included in Tables D3 and D4 are the Mississippi Surface Water Quality Standards (WQS), provided by the MDEQ for the protection of aquatic life and the EPA water quality criteria (WQC). Since the sediment and water samples used to prepare the elutriates are from grab samples from a marine environment and thus are a snapshot in time, not from a series of samples taken over time as they are in various studies, such as the four-day chronic WQC (Criteria Continuous Concentration), the acute marine WQS and acute WQC (Criteria Maximum Concentration [CMC]) were used to determine water criteria. The ammonia CMCs are specific to each individual pH, temperature, and salinity, and the values given in Tables D3 and D4 are approximate for the range of values of these parameters in Appendix E. An examination of Table D3 indicates that there are no exceedances of any acute WQS or CMC for any of the sample locations.

Elutriates were prepared from collected sediment and station water, filtered to remove suspended material for trace metal analysis (except mercury and selenium) or centrifuged, and submitted for chemical analysis. Therefore, the elutriates provide information on those constituents that are dissolved into the water column

during dredging, filling, or open-water placement. A comparison of the elutriate results with the water results indicates increases in concentration of arsenic at most locations and zinc at one location, upon elutriate preparation. Although increases are detected in arsenic and zinc, Table D4 indicates that there are no exceedances of any acute WQS or CMC for the sample locations.

Sediment concentrations of detected compounds are presented in Table D5A. A number of metals and polycyclic aromatic hydrocarbons (PAHs), and one phthalate ester (the ubiquitous Bis [2-ethylhexyl] phthalate) were detected, although few PAHs were found at the Turning Basin sampling locations.

There are no enforceable sediment quality criteria or standards with which to compare concentrations in the various sediment types. However, there are several different guidelines that are used to look for a cause for concern in sediment samples, one of which is the Effects Range Low (ERL). No ERLs were exceeded except for arsenic at a Turning Basin station (TB-11-[D, E, F]). Although the ERL was exceeded, the level did not exceed the Effects Range Medium (ERM) for arsenic, which is 70 mg/L.

3.2.1 Dioxins and Furans Analyses

Dioxin and furan analyses on sediment samples were conducted for the sample locations inside the Project footprint. The results, both raw data and data normalized to total organic content of the individual sediments, are included in Table D5A. The range of un-normalized values, 2.9 to 14 pg/g dry weight, total TEQ of 2,3,7,8 tetrachlorodibenzo p Dioxin, are similar to those found in the Panhandle Bay Systems of Florida (1-78 pg/g TEQ) (USFWS, 2002) or results (1.8–11 pg/g TEQ) from Sampling for the Naval Construction Battalion Center, Gulfport, Mississippi, in November 2005 (EPA, 2006).

3.3 WATER QUALITY

Standard water quality parameters were collected at 48 locations within the Project footprint, Project area, and study area of the proposed PGEP. Because the sampling was conducted over a two-day period, temperature and salinity showed little variation over the 211,000-acre area that was sampled. The lowest salinity level was recorded at Station SA 16, located at the mouth of Biloxi Bay and was 4.22 psu. This salinity reading was the only sampling location in a bay-type habitat; therefore, it was removed from further temperature analysis as shown in Table 7. The highest salinity reading was 33.39 psu, observed at Station SA 18 from the study area, located just north of the eastern tip of Ship Island. The average salinity in the Project footprint was 19.6 psu, but only 13.5 psu in the surrounding Project area. Higher salinity is typically observed in deeper areas, because salt water is denser than fresh water. This difference in salinity is likely due to the depths in the proposed Project footprint (Mean = 11.8 feet), compared to the surrounding Project area (Mean = 9.2 feet). The salinity within the entire study area averaged approximately 20 psu. This was higher than the Project footprint and the Project area, because the study area encompassed a much larger area that stretched from just south of the barrier islands to the beach (shoreline), and from the eastern tip of St. Louis Bay to the mouth of Biloxi Bay.

The average DO levels in the Project footprint, Project area, and the study area were 4.48, 6.51, and 4.76 mg/L, respectively. Difference in the DO can be attributed to the differences in water depth, as deeper water tends to exhibit lower DO values. The average water clarity ranged from 21.0 to 31.4 inches.

Table 7
Comparison of Water Quality Data Observed During this Habitat Survey[1]

			Mean % (95% Confidence Interval)				
		N	Depth (meters)	Bottom Temperature (°C)	Salinity (psu)	Bottom Dissolved Oxygen (mg/L)	Secchi Depth (inches)
Footprint	PE	3	17.4 (0.3)	20.0 (0.1)	20.56 (0.34)	3.56 (<0.0)	24.0 (—)
	PM	9	8.5 (<0.0)	21.1 (<0.0)	17.6 (0.12)	5.45 (0.1)	21.3 (0.1)
	PN	2	11.5 (0.3)	20.3 (0.1)	18.16 (0.36)	6.15 (0.1)	21.0 (0.2)
	TB	6	14.4 (0.3)	20.1 (0.1)	21.58 (0.11)	3.38 (<0.0)	24.0 (—)
Project Area		9	9.2 (<0.0)	21.3 (<0.0)	13.51 (0.05)	6.51 (<0.0)	20.0 (0.1)
Study Area		19	12.8 (<0.0)	21.2*(<0.0)	20.03 (0.12)	4.76 (<0.0)	31.4 (0.2)

[1] Complete water quality data are presented in Appendix E.

* Station SA16 was omitted from the mean and 95% Confidence Interval.

— The standard deviation is 0 and no Confidence Interval calculated.

°C = degrees Celsius; psu = practical salinity unit(s); mg/L = milligrams per liter

PE = East Pier; PN = North Harbor; PM = West Pier; TB = Turning Basin

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4.0 DISCUSSION

4.1 HABITAT SURVEY

4.1.1 Macrobenthic Organisms

Benthic samples were collected in 2012 from 48 locations within the Project footprint, Project area, and the study area. The data collected at these sites were used to calculate several metrics to compare the similarities and differences between the three areas sampled and the results from Ross et al. (2009). The goal of comparing these data to Ross et al. (2009) was to discern whether Gulf sturgeon habitat was present in the Project footprint of the proposed PGEP and to use the information in this report to quantify the potential impacts to Gulf sturgeon in the EIS to the extent the data will allow.

Several trends were shown in comparing the Project footprint, the Project area, and the study area. The study area had greater species diversity than the Project footprint and the Project area. It also had a slightly lower evenness value than the Project footprint and the Project area, which may indicate that more "rare" species were collected (high single species dominance) from the study area. The Project footprint and Project had similar relative abundance, species diversity, and species richness with a slightly more even distribution of species.

One reason the surrounding Project area may have a lower cumulative species richness and species diversity is that there were fewer samples collected in this area (n = 9) compared to the study area (n = 19) and Project footprint (n = 20). Another reason may be that the existing operations of the Port facilities, such as routine maintenance dredging and placement activities, may have an effect on the ambient condition surrounding the existing Port facility. This is difficult to discern, as this habitat assessment was conducted one time and not over a period of months or years to capture seasonal temporal variations. The higher species richness and species diversity observed in the study area compared to the Project footprint could be due to the fact that the study area encompasses a larger area that includes near-shore habitats, Mississippi Sound, Biloxi Bay estuarine habitats, and barrier islands.

Ross et al. (2009) recorded 17 macrobenthic taxa that comprised at least 1 percent in relative abundance over the study; the 2012 study recorded 30 macrobenthic taxa that comprised at least 1 percent in relative abundance from 48 sampling locations over three sample areas. Of the taxa that comprised >1 percent, seven taxa overlapped between the two studies (Table 8). The macrobenthic organisms collected in 2012 were dominated by polychaetes (four of the five most abundant organisms). However, the macrobenthic samples by Ross et al. (2009) were dominated (58.9 percent of all organisms) by Florida lancelets, sand dollars, amphipods, and bivalves. Polychaetes found by Ross et al. (2009) only totaled 7.9 percent of all organisms. The most abundant organisms recorded in 2012 were *L. fragilis* (19 percent) and *M. ambiseta* (14 percent). Ross et al. (2009) recorded the same two species, but they were much more abundant in the 2012 survey. The two data sets compared show the 2012 data have a much lower value for all of the cumulative relative abundance across all the overlapped species. Additionally, the 2012 study did not record

any Florida lancelets or sand dollars from the 48 sample locations. In the Ross et al. (2009) study, the percent relative abundance of Florida lancelets was 28.7 percent.

Table 8
Percent Relative Abundance of Species that Overlap with Ross et al. (2009)

	Ross et al. (2009)	2012				
Taxa	Cumulative	Cumulative	Project Footprint	Project Area	Study Area	Average
Leitoscoloplos fragilis	74.4	19.0	28.0	27.6	14.3	23.2
Mediomastus ambiseta	83.3	14.0	11.8	1.1	17.6	10.2
Mulinia lateralis	76.9	<0.1	0.4	—	—	0.1
Nassarius acutus	84.7	1.0	0.6	—	0.6	0.4
Prionospio cristata	91.6	<0.1	—	—	<0.1	<0.1
Spiophanes bombyx	66.8	1.0	—	—	1.3	0.4
Unidentified bivalve	71.1	<0.1	—	—	0.2	0.1

— Species was not present

The organisms with the highest relative occurrence recorded in 2012 were *L. fragilis* (85 percent) and *M. ambiseta* (27 percent), refer to Table 9. Ross et al. (2009) recorded the same two species, but they were collected much less frequently than in 2012. The two data sets compared show that the Ross et al. (2009) study had a much lower value of percent occurrence across all the overlapped species. Some of the species were only collected in the study area such as *Prionspio cristata, Spiophanes bombyx*, and the unidentified bivalve. These species are likely found only in bay habitat or near barrier islands.

4.1.2 Seagrass

No seagrass was observed during the survey.

4.1.3 Grain Size

Sediment was collected in 2012 from 48 sample locations for grain size analysis, but only 47 samples were analyzed by Anacon, Inc. Ross et al. (2009) did not run grain size analysis, but visually inspected the substratum and recorded its dominant and subdominant code. Ross et al. (2009) coded the substratum in four codes: 1–clay/mud; 2–fine sand; 3–medium to coarse sand; and 4–shell fragments. The same codes were used in 2012, and only the dominant substratum was recorded. Table 10 represents the grain size and dominant data collected in 2012 as compared to Ross et al. (2009). The substrate in the Project footprint, Project area and study area was dominated by sand; however, the sand was a fine grain as opposed to a coarse grain more typical of sturgeon habitat as recorded by Ross et al. (2009). Additionally, the locations where Gulf sturgeon were found were determined by visual inspection to be made up of at least 70 percent

sand size particle, while the highest mean percentage of sand found in 2012 was 51 percent. The visual substratum code recorded in 2012 ranged from 1.3 to 1.9 (a clay mud to a fine sand), whereas the mean dominant substratum code recorded by Ross et al. (2009) was 2.6, medium coarse sand. No coarse sand or shell fragment type substrate was found in 2012 during the visual characterization of the substrate in the Project footprint, Project area, or the study area.

Table 9
Percent Occurrence of Species that Overlap with Ross et al. (2009)

	Ross et al. (2009)	2012				
Taxa	Cumulative	Cumulative	Project Footprint	Project Area	Study Area	Average
Leitoscoloplos fragilis	14.8	85.0	90.0	88.9	78.9	85.9
Mediomastus ambiseta	14.8	27.0	60.0	22.2	5.3	29.2
Mulinia lateralis	11.1	6.0	15.0	—	—	5.0
Nassarius acutus	18.5	13.0	15.0	—	15.8	10.3
Prionspio cristata	22.2	2.0	—	—	5.3	1.8
Spiophanes bombyx	48.1	6.0	—	—	15.8	5.3
Unidentified bivalve	40.7	8.0	—	—	21.1	7.0

— Species was not present

Table 10
Grain Size and Substratum from Port of Gulfport Expansion Project
Compared to Ross et al. (2009)

		Mean % (95% Confidence Interval)				Substratum[b] Mean (95% Confidence Interval)	Ross et al. (2009)	
	N	Sand[a]	Clay[a]	Silt[a]	Fines[a]		Dominant Substratum	Subdominant Substratum
Footprint	20	48.7 (0.4)	26.7 (0.2)	23.7 (0.2)	—	1.4 (0.1)		
Project Area	9	51.0 (0.6)	22.3 (0.3)	26.1 (0.3)	0.6 (<0.0)	1.3 (<0.0)	2.6 (0.2)	3.2 (0.3)
Study Area	18	48.4 (0.5)	22.3 (0.3)	29.0 (0.3)	—	1.9 (<0.0)		

a Anacon, Inc., Data

b Substratum are coded as 1 – clay, mud; 2 – fine sand; 3 – medium to coarse sand; 4 – shell fragments

4.2 SEDIMENT, WATER, AND ELUTRIATE SURVEY

A number of metals (zinc and arsenic), PAHs, and one phthalate ester were detected in the proposed Project footprint. These compounds will be compared against the ambient levels that exist in nature and that have been documented during routine maintenance dredging near the Port, as further discussed in the EIS to determine whether potential negative impacts could occur from dredging and filling activities as part of the

proposed Project. Based on the results shown in this report, no exceedances occurred; however, these need to be evaluated with regard to each of the organisms discussed in the EIS, each of which have a varying tolerance level to chemicals.

4.2.1 Dioxins and Furans Analyses

Dioxin and furan analyses on sediment samples were conducted for the sample locations inside the Project footprint. Both raw data and data normalized to total organic content of the individual sediments appear to be similar to ambient conditions, but this will be discussed further in the EIS.

4.3 WATER QUALITY

No sampling locations exhibited all the water quality habitat characteristics found in Ross et al. (2009) (depth, DO, and water clarity).

Temperature was higher during the 2012 survey in comparison to the Ross et al. (2009) study (Table 11). This difference is likely an artifact of the 2012 survey being done over a 2-day period in April instead of over several years between the months of November and April for the Ross et al. (2009) study.

The DO was overall much lower than recorded in areas where adult Gulf sturgeon were found, according to data reported in Ross et al. (2009). The mean DO recorded in Ross et al. (2009) was 7.5 mg/L as compared to 4.48 to 6.51 mg/L for the 2012 survey. However, this may be an artifact of the 2012 survey being done over a two-day period in April instead of over several years between the months of November and April.

Water clarity was also much lower in the Project footprint, Project area, and study area as compared to the Ross et al. (2009) data. However, the Ross et al. (2009) data were collected primarily between the barrier islands where tagged adult Gulf sturgeon were located, as compared to the sample design for this study which was a grid of sample locations with a wide variety of habitats.

Table 11
Water Quality Parameters from the Proposed Port of Gulfport Expansion Project, Gulfport, Mississippi

			Mean % (95% Confidence Interval)			
	N	Depth (feet)	Bottom Temperature (°C)	Salinity (psu)	Bottom Dissolved Oxygen (mg/L)	Secchi depth (inches)
Project Footprint	20	11.8 (<0.0)	20.6 (<0.0)	19.61 (<0.00)	4.48 (0.1)	22.50 (0.04)
Project Area	9	9.2 (<0.0)	21.3 (<0.0)	13.51 (0.05)	6.51 (<0.0)	20.00 (0.08)
Study Area	19	12.8 (<0.0)	21.2 (<0.0)	20.03 (0.12)	4.76 (<0.0)	31.40 (0.12)
Ross et al. (2009)	40-69	12.8 (1.0)	16.0 (0.7)	22.8 (2.30)	7.5 (0.3)	77.68 (8.46)

mg/L = milligrams per liter
psu = practical salinity unit(s)
°C = degrees Celsius

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5.0 CONCLUSIONS

Ross and other researchers in Louisiana, Mississippi, and Florida have worked diligently trying to find out as much as possible about Gulf sturgeon, including what they eat and what habitat type they prefer during overwintering. In a 2009 publication by Ross et al., they found that adult Gulf sturgeon were found at locations exhibiting the below characteristics:

- Less than 23 feet deep (mean of 13 feet)
- Well oxygenated water (mean of 7.5 mg/L)
- Clear water (mean Secchi dish transparency of 77.7 inches)
- Dominant substrates of coarse to fine sand and shell fragments
- Benthic community dominated by Florida lancelets, sand dollars, amphipods, and bivalves

None of the sampling locations visited in 2012 exhibited all the habitat characteristics found in Ross et al. (2009) (depth, DO, water clarity, benthic organisms, and substrate type). However, several sampling locations did have similar substrate type, high DO conditions, shallow depth, and an overlap of one to four benthic species with those collected during the Ross et al. (2009) study. The sampling locations that exhibited the majority of the characteristics thought to be indicative of adult Gulf sturgeon wintering habitat included two locations in the West Pier Expansion area within the Project footprint (PM-11-D and PM-11-E), one location in the Project area (PA-5), and two locations in the study area (SA-16 and SA-17). Several additional locations in the study area (SA-2, SA-7, SA-9, SA-13, and SA-18), adjacent to the barrier islands, exhibited only two characteristics but are noted here, because they showed at least three benthic species similar to Ross et al. (2009) and were dominated by sand substrate. These similarities are shown spatially on maps provided in Appendix A (Figures 5–-7) and in Table 12 below.

Table 12
Habitat Characteristics of Gulf Sturgeon Observed at Each Sampling Location[1]

Sample Location	Depth (feet)	Dissolved Oxygen (mg/L)	Secchi Depth (feet)	Dominant Substratum Sand	Benthic Species Overlap >2[2]
Footprint					
PE-11-A					X (2)
PE-11-B					
PE-11-C					X (2)
PM-11-A					X (3)
PM-11-B					X (2)
PM-11-C					
PM-11-D	**X**	**X**		**X**	**X (2)**
PM-11-E	**X**	**X**		**X**	**X (3)**
PM-11-F					X (2)
PM-11-G				X	
PM-11-H					X (3)
PM-11-I				X	
PN-11-A				X	X (2)
PN-11-B				X	X (2)
TB-11-A					
TB-11-B				X	X (2)
TB-11-C				X	X (2)
TB-11-D					
TB-11-E					X (3)
TB-11-F				X	
Project Area					
PA-1				X	X (2)
PA-2				X	X (2)
PA-3	X	X			
PA-4				X	
PA-5	**X**	**X**		**X**	
PA-6				X	
PA-7					
PA-8					
PA-10				X	

Table 12, cont'd

Sample Location	Depth (feet)	Dissolved Oxygen (mg/L)	Secchi Depth (feet)	Dominant Substratum Sand	Benthic Species Overlap >2[2]
Study Area					
SA-1				X	
SA-2				**X**	**X (3)**
SA-3					
SA-4				X	
SA-5					
SA-6					X (2)
SA-7				**X**	**X (3)**
SA-8					
SA-9				**X**	**X (3)**
SA-10				X	
SA-11	X	X			
SA-12					X (3)
SA-13				**X**	**X (4)**
SA-14					
SA-15					
SA-16	**X**	**X**		**X**	**X (3)**
SA-17	**X**	**X**			**X (2)**
SA-18				**X**	**X (4)**
SA-19	X	X			

1 X - Sample location has Gulf Sturgeon characteristics (Ross et al. 2009)

2 (#) - Number of benthic species overlap with Ross et al. (2009)

Sample location exhibits 4 of 5 habitat characteristics

Sample location exhibits 3 of 5 habitat characteristics

mg/L = milligrams per liter

PE = East Pier; PN = North Harbor; PM = West Pier; TB = Turning Basin; PA = Project Area; SA = Study Area

Macrobenthic organisms collected in 2012 from all sample areas were dominated by polychaetes. Although Ross et al. (2009) does not indicate that polychaetes are a primary food source for Gulf sturgeon in the Mississippi Sound, Brooks and Sulak (2005) indicate they are a secondary food source for juvenile Gulf sturgeon in the Suwannee River. Since the movements and habitat use of juvenile and sub-adult life history stages are not well known, a habitat comparison of the area surveyed in 2012 with the habitat used by young Gulf Sturgeon cannot be made at this time.

The inshore region of the Mississippi Sound (north of the barrier island) showed similarities in habitat characteristics used by Gulf sturgeon; however, this portion of the Sound is not used extensively by adult

sturgeon according to Ross et al. (2009). It is thought that the Mississippi Sound, as well as coastal rivers and bays, such as Biloxi Bay, are likely nursery areas for younger fish (Ross et al. 2009). Four juvenile Gulf sturgeon were captured in February in Pascagoula River Estuary (Ross et al. 2003). More recently, Havrylkoff et al. (2012) found evidence of prolonged and extensive use of the Pascagoula River mouth and immediate adjacent coastal habitats by juvenile Gulf sturgeon in April and May.

Anecdotal evidence from Ross et al. (2009) and Havrylkoff et al. (2012) show that juveniles and sub-adults may prefer estuarine and river mouth habitat for feeding. The proposed Project area is located along the shoreline in sandy, shallow, beach habitat. However, because the Port is situated between two rivers that contain Gulf sturgeon, it is likely that all life history stages, including juveniles and sub-adults, may pass near or through the Project area. Based on data collected by Peterson et al. (2015) (Appendix O of the EIS), the number of detections per fish and time within the monitoring area surrounding the proposed Project area varied greatly among all the detected Gulf sturgeon, with individuals taking both transitory paths through the area, and localized movements within the entire monitoring area. Gulf sturgeon from each life stage category were detected (adult, sub-adult, juvenile), with adults, unexpectedly, having the greatest number of occurrences and detections. The relative low occurrence of juveniles and sub-adults suggests these life history stages may experience restricted movements away from natal rivers as young fish, and only begin to expand their range later with age. On the other hand, adults have been documented within the proposed Project area during pre- and post-migratory periods, illustrating the importance of the area for the Gulf sturgeon. This suggests that the Gulfport sturgeon habitat monitored area serves as a corridor between other habitat types, drainages, feeding zones, or pre-/post-migratory acclimation zone for the Gulf sturgeon (see Appendix O of the EIS).

Based on the information gathered for this report and published data, it is unlikely that adult Gulf sturgeon would use the proposed Project footprint for feeding. Although some of the habitat characteristics are similar to Gulf sturgeon habitat in other parts of Mississippi Sound, not all habitat characteristics were present at any one sample location, and the ongoing Port operations likely deter Gulf sturgeon from persisting in this area. Additionally, published literature show adult Gulf sturgeon congregate near the barrier islands and use nearshore habitat for moving between river mouths (Ross et al., 2009; Havrylkoff et al., 2012). Therefore, adult Gulf sturgeon are likely to pass through the Project area but are not likely to feed there.

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Appendix A

Maps

Project Area

Proposed Project Features

0 3,000 Feet

Figure 1

Port of Gulfport Expansion Project

Proposed Project Features and Project Area

Prepared By: 13188	Scale: 1" = 3000'
Job No.: 100018536	Date: Apr 06, 2017

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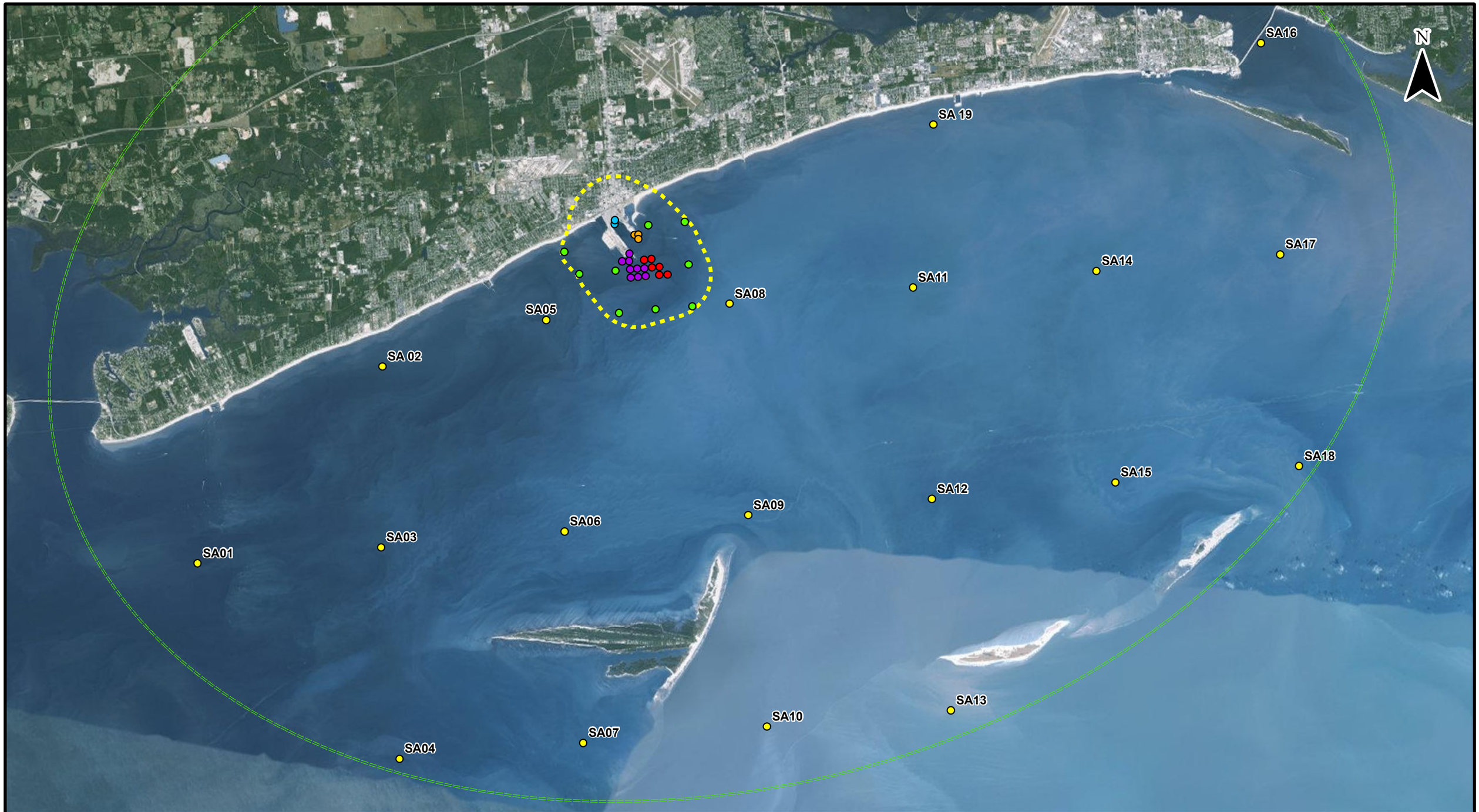

Source: ESRI World Imagery

Legend

- Study Area Sample Location (SA - 25,000 ft spacing)
- Project Area Sample Location (PA - 5,000 ft spacing)

Project Footprint

- Turning Basin Sample Location (TB - 1,000 ft spacing)
- West Pier Expansions Sample Location (PM - 1,000 ft spacing)
- North Harbor Fill Sample Location (PN - 500 ft spacing)
- East Pier Expansions Sample Location (PE - 500 ft spacing)

Study Area
Project Area

0 1 2 4 Miles

ATKINS

Figure 2
Study Area Map and Sample Locations
Port of Gulfport Expansion Project
Gulfport, Mississippi

Project No.: 100018536	Scale: 1" = 2 miles
Drawn By: ATKINS / 13037	Date: Jul 23, 2015

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Legend

- Study Area Sample Location (SA - 25,000 ft spacing)
- Project Area Sample Location (PA - 5,000 ft spacing)

Source: ESRI World Imagery

Project Footprint

- Turning Basin Sample Location (TB - 1,000 ft spacing)
- West Pier Expansions Sample Location (PM - 1,000 ft spacing)
- North Harbor Fill Sample Location (PN - 500 ft spacing)
- East Pier Expansions Sample Location (PE - 500 ft spacing)

- Project Area
- Proposed Pier Expansion
- Proposed Turning Basin Expansion

0 1,000 2,000 4,000 Feet

ATKINS

Figure 3
Project Area Map and Sample Locations
Port of Gulfport Expansion Project
Gulfport, Mississippi

Project No.: 100018536	Scale: 1" = 2000'
Drawn By: ATKINS / 13037	Date: Jul 23, 2015

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Legend

- Study Area Sample Location (SA - 25,000 ft spacing)
- Project Area Sample Location (PA - 5,000 ft spacing)

Source: ESRI World Imagery

Project Footprint

- Turning Basin Sample Location (TB - 1,000 ft spacing)
- West Pier Expansions Sample Location (PM - 1,000 ft spacing)
- North Harbor Fill Sample Location (PN - 500 ft spacing)
- East Pier Expansions Sample Location (PE - 500 ft spacing)

- Project Area
- Proposed Pier Expansion
- Proposed Turning Basin Expansion

0 500 1,000 2,000 Feet

ATKINS

Figure 4
Project Footprint Map and Sample Locations
Port of Gulfport Expansion Project
Gulfport, Mississippi

Project No.: 100018536	Scale: 1" = 1000'
Drawn By: ATKINS / 13037	Date: Jul 23, 2015

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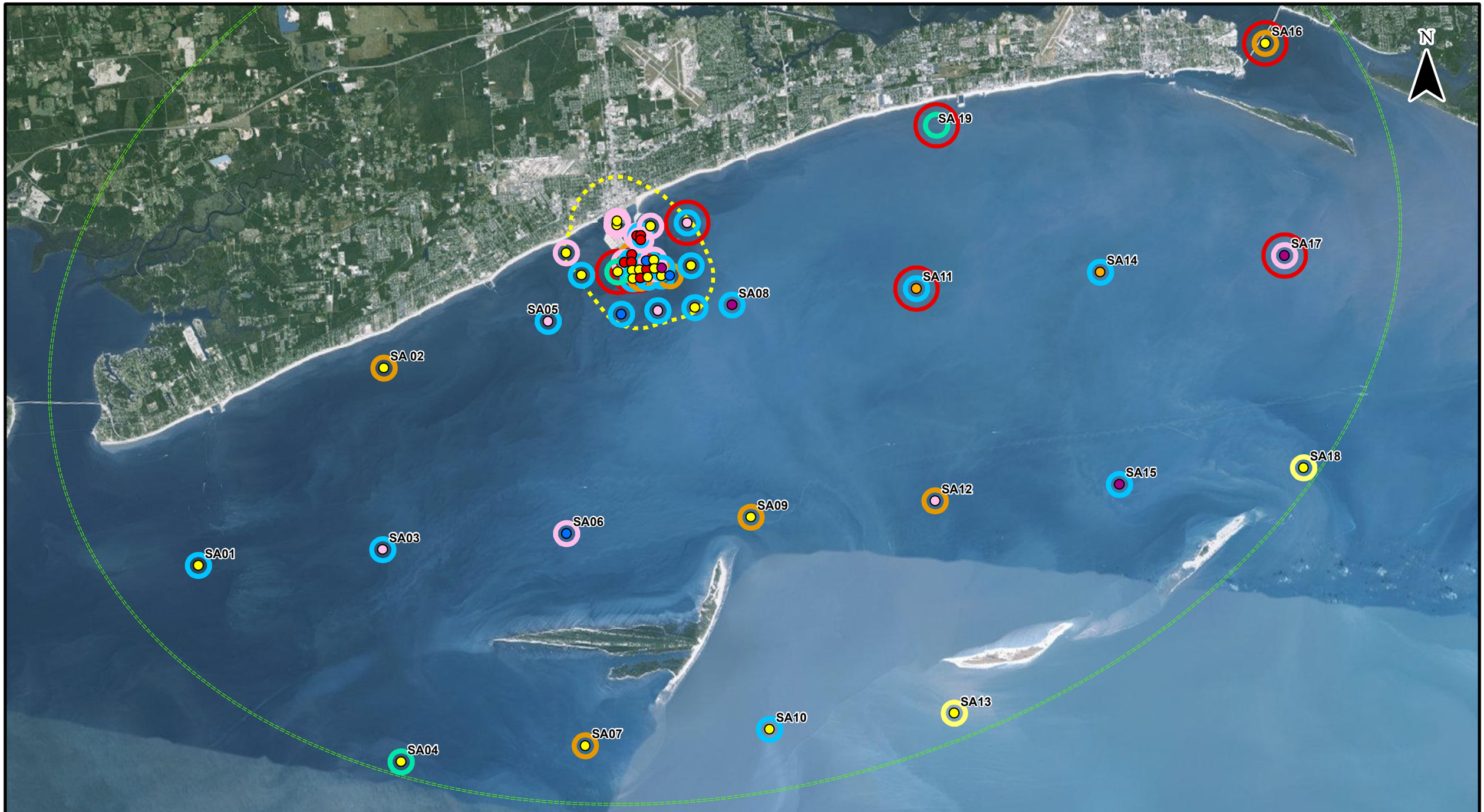

Legend

*** SA 19 was not analyzed for grain size by Anacon**

Source: ESRI World Imagery

Anacon Inc. Dominant Sediment Types

- Sand
- Sand/Silt
- Sand/Clay/Silt
- Silt
- Clay/Silt
- Clay

Number of Benthic species overlapping with Ross et al. (2009)

- 4
- 3
- 2
- 1
- 0

Sample Locations with shallow water (< 13.5 ft) and high dissolved oxygen (DO> 7.2 mg/L)

Study Area

Project Area

0 1 2 4 Miles

ATKINS

Figure 5
Study Area Map showing Sample Locations with Gulf sturgeon Habitat Characteristics
Port of Gulfport Expansion Project
Gulfport, Mississippi

Project No.: 100018536	Scale: 1" = 2 miles
Drawn By: ATKINS / 13037	Date: Jul 23, 2015

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Legend

Anacon Inc. Dominant Sediment Types

- Sand
- Sand/Silt
- Sand/Clay/Silt
- Silt
- Clay/Silt
- Clay

Number of Benthic species overlapping with Ross et al. (2009)

- 4
- 3
- 2
- 1
- 0

- Sample Locations with shallow water (< 13.5 ft) and high dissolved oxygen (DO> 7.2 mg/L)
- Project Area
- Proposed Expansion
- Proposed Turning Basin Expansion

0 1,000 2,000 4,000 Feet

Source: ESRI World Imagery

ATKINS

Figure 6
Project Area Map showing Sample Locations with Gulf sturgeon Habitat Characteristics
Port of Gulfport Expansion Project
Gulfport, Mississippi

Project No.: 100018536	Scale: 1" = 2000'
Drawn By: ATKINS / 13037	Date: Jul 24, 2015

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Legend

Anacon Inc. Dominant Sediment Types

- Sand
- Sand/Silt
- Sand/Clay/Silt
- Silt
- Clay/Silt
- Clay

Number of Benthic species overlapping with Ross et al. (2009)

- 4
- 3
- 2
- 1
- 0

- Sample Locations with shallow water (< 13.5 ft) and high dissolved oxygen (DO> 7.2 mg/L)
- Project Area
- Proposed Expansion
- Proposed Turning Basin Expansion

0 500 1,000 2,000 Feet

Source: ESRI World Imagery

ATKINS

Figure 7
Project Footprint Map showing Sample Locations with Gulf sturgeon Habitat Characteristics
Port of Gulfport Expansion Project
Gulfport, Mississippi

Project No.: 100018536	Scale: 1" = 1000'
Drawn By: ATKINS / 13037	Date: Jul 24, 2015

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Appendix B

Scope of Work

Proposed Port of Gulfport Expansion Project
Proposed Scope of Work
for
Benthic Habitat Assessment of Wintering Grounds of
Gulf Sturgeon *(Acipenser onxyrincusdesotio)* and EFH
in the Study Area for the Proposed Gulfport Harbor Expansion Project
Harrison County, Gulfport, Mississippi

Introduction

Atkins was contracted to write a third-party Environmental Impact Statement (EIS) for the Port of Gulfport Expansion Project. The proposed action involves dredging a new turning basin and adding new piers in three locations adjacent to the existing port (Figure 1, Attachment A).

During pre-application coordination with other agencies, Dr. Bolden from National Marine Fisheries Service (NMFS) Southeast Regional Office, Protected Resources Division, provided a list of comments to USACE Mobile District via e-mail in April 2010. The comments indicated concern for potential project-related impacts to Gulf sturgeon (*Acipenser onxyrincus desotio*) and species with designated essential fish habitat (EFH). Additionally, during the scoping and public meetings, various agency personnel from NMFS responded with comments regarding the presence of Gulf sturgeon in the proposed project vicinity and the ability to adequately disclose potential impacts to Gulf sturgeon from the expansion with the current data set. They also responded with comments regarding the need to adequately disclose contaminants in the dredging footprint and the potential impacts from dredging on aquatic organisms (specifically, species with designated EFH).

This scope of work is being proposed to conduct a benthic habitat and epifauna survey (Habitat Survey) within the project area and study area of the Port of Gulfport Expansion Project (Figures 2 and 3, Attachment B), and a sediment, water, and elutriate analysis in the project area (Figure 2), Attachment B) in response to the agency comments mentioned above.

The objective of the Habitat Survey is to delineate the benthic (substrate type) habitat including submerged aquatic vegetation (SAV), determine the benthos present, and characterize the ambient water conditions in the project area and study area. Atkins will use similar data collection methodology and techniques used in Ross, et al, 2009, for easy comparison between this habitat survey and past and ongoing research in the study area. The results of the Habitat survey will be used to determine anticipated direct, secondary and cumulative impacts from the proposed construction and operation of the Port of Gulfport Expansion project on Gulf sturgeon and habitats designated as EFH.

The objective of the sediment, water, and elutriate sampling and analysis is to evaluate potential adverse impacts from the dredging operations performed during the construction of proposed facilities. The data collected in this scope of work will not be used in consideration the Marine Protection, Research, and Sanctuaries Act Section 103 Permit, as the proposed ODMDS site is not being evaluated under this scope of work.

Methods

Habitat Survey

Substrate will be collected using a petite Ponar dredge from each sampling location within the dredging footprint, project area, and study area. Petite Ponar dredge grabs will be collected at each sample until a minimum of 1 liter of material is obtained. Ponar grabs will be composited for each station. A visual characterization score of the dominant and subdominant substrata will

be recorded as 1 - clay, mud; 2 - fine sand; 3 - medium to coarse sand; 4 - shell fragments, per Ross, et al, (2009). Afterward, each benthic sample will be field-washed through a number 30 mesh screen and preserved in the field. Each benthos sample will be preserved in 10 percent formalin and stored in a glass jar labeled with the sample location identification number. Benthos samples will be sent to a laboratory (most likely the Gulf Coast Research Laboratory, GCRL) where each sample will be identified to the lowest practical taxonomic level and enumerated.

Substrate data will be presented in a table and depicted on a map. Benthic data will be presented in tabular format with the most abundant taxa at the top of the list and the least abundant taxa at the bottom. The average percent relative abundance, cumulative relative abundance, and percent occurrence will be calculated for the project footprint, project area, and study area.

Ambient water quality conditions will be collected one time from each sample location at the surface and 1 foot off the bottom at the time benthic data are collected. Temperature (Celsius, °C), dissolved oxygen (DO) measured in milligrams per liter (mg/L), and salinity (parts per thousand, ppt) will be collected using a YSI 6920 v2 meter. Turbidity will be measured using secchi disk in centimeters (cm). Air temperature (°C), wind speed (mile per hour, mph), and direction will be recorded with a digital altimeter. Water conditions and weather will be recorded in the field and verified using the closest on-line weather station. One water quality meter may be deployed for the duration of sampling in the study area to record any diurnal differences in ambient water conditions.

Sediment, Water, and Elutriate Survey

Field sampling procedures and laboratory analyses will be conducted according to the same methodology used by the U.S. Army Corps of Engineers (USACE) for routine sediment, water, and elutriate analysis prior to maintenance dredging (Environmental Protection Agency [EPA]/ USACE, 1998). Additionally, all sample collections and chemical analyses will be conducted according to the Mississippi Department of Environmental Quality (MSDEQ) State of Mississippi Water Quality Criteria for Intrastate, Interstate, and Coastal Waters (MsDEQ, 2007). Prior to sample collection, all containers and sampling equipment will be cleaned according to protocols described in Plumb (1981) or other appropriate guidance manuals. Care will be taken to avoid contamination to sampling devices from the boat deck or other surfaces. Powderless latex gloves will be worn during sample collection.

Sample locations identified in Gulfport Harbor will be taken from four areas within the port, including the turning basin (TB), the main pier expansion (PM), east pier expansion (PE), and the north pier expansion (PN) (Figure 2, Attachment B). All sample locations will be located and documented using a hand-held Garmin 76 CS Global Positioning System accurate to <5 meters. Coordinates for all locations will be included in a table and submitted with the findings report. Sediment samples (surface grab samples) will be collected at each of the four dredging footprints and will occur approximately every 500–1,000 linear feet, depending on the area.

The sample number, matrix and analysis to be run are shown in Table 1 below. Samples will be collected so that three sub samples will composited into one sample in the PE area; two subsamples will be composited into one sample in the PN area; eight subsamples will be composited into three samples to the PM area; and five subsamples will be composited into two samples for the TB.

Prior to sample collection with a surface grab, all residual sediment will be removed from the dredge with a brush. The dredge will be rinsed with deionized water and then with ambient water. Each sample will be deposited into a clean polyethylene pan. Composite samples will be mixed thoroughly and then placed into a pre-cleaned glass jar. The jar will be filled completely to avoid headspace and ensure the total sample volume. The lid will be tightly secured and placed into a cooler with ice.

Water samples will be collected one time using a suitable non-metallic bilge pump with a food-grade hose and a peristaltic pump. The depth of each water sample will be at the surface, mid-depth, and to one-third of the way to the bottom. Prior to filling sample containers, the pump will be allowed to run and purge the existing hose from any previous samples to ensure water collected was representative of the sample location. Water samples will then be collected in polyethylene and glass bottles provided by laboratory. Water samples to be analyzed for metals will be collected using a variable-speed peristaltic pump and Teflon tubing. Water samples to be analyzed for metals other than mercury and selenium will be filtered through a clean 0.45-µm filter prior to dispensing into containers. Pre-cleaned brown glass bottles will be used for organic analyses. All bottles will contain the appropriate preservatives and will be filled completely to avoid headspace.

Table 1: Sampling Nomenclature, Matrix, and Location

Sample Number	GPS Location	Sample Matrix	Analyses
Pier Expansion			
PE-11-A	TBD	Sediment, Water	W,S, E, GS,
PE-11-B	TBD	Sediment, Water	Component of PE station above
PE-11-C	TBD	Sediment, Water	Component of PE stations above
PN-11-A	TBD	Sediment, Water	W,S, E, GS,
PN- 1-B	TBD	Sediment, Water	Component of PN station above
PM-11-3A	TBD	Sediment, Water	W, S, E, GS
PM-11-3B	TBD	Sediment, Water	Component of PM station above
PM-11-3C	TBD	Sediment, Water	Component of PM stations above
PM-11-3D	TBD	Sediment, Water	W, S, E, GS
PM-11-3E	TBD	Sediment, Water	Component of PM station above
PM-11-3F	TBD	Sediment, Water	Component of PM stations above
PM-11-3G	TBD	Sediment, Water	W, S, E, GS
PM-11-3H	TBD	Sediment, Water	Component of PM station above
Basin Expansion			
TB-11-A	TBD	Water, Sediment	W, S, E, GS
TB-11-B	TBD	Sediment	Component of BE station above
TB-11-C	TBD	Sediment, Water	Component of BE stations above
TB-11-E	TBD	Sediment	W, S, E, GS
TB-11-F	TBD	Sediment	Component of BE station above

Elutriates for chemical analyses will be prepared from sediment and water collected at sample sites 500 linear feet apart. Sediment and water will be a combined at a 1:4 ratio, respectively, and prepared as designated in EPA/USACE (1998) by laboratory personnel.

During sediment collections, water chemistry, elutriates, and in situ standard water quality parameters will also be recorded at each sample site. A YSI 600 Series multi-parameter instrument will be used to measure water quality parameters, which include: dissolved oxygen (mg/L), pH (SU), salinity (ppt), water temperature (°C), air temperature (°C), and water depth (feet). In addition to water quality parameters, ambient water and weather conditions will be recorded. Multi-parameter water quality instrument calibrations were performed before and after sampling according to MDEQ's SWQM Procedure Manual.

Analyses for Dioxins and Furans

All sediment samples will be analyzed for the dioxins and furans listed in the table below. Laboratory results will be reported as TEQ. The laboratory will use WHO 2005 TEF to calculate TEQ. The target detection limits for each individual congener will be 0.1 pg/g dry weight for sediment. Higher detection limits may be acceptable if these detection limits cannot be met.

Table 2: Dioxin and Furan Congeners to be Analyzed in the Gulfport Expansion Project Area

Analyte	CAS Numbers	EPA Method
Polychlorinated Dibenzo-p-dioxins		
2,3,7,8 - Tetrachloro Dibenzo-*p* -Dioxin	1746-01-6	1613, 8280b, or 8290a
1,2,3,7,8 - Pentachloro Dibenzo-*p* -Dioxin	40321-76-4	1613, 8280b, or 8290a
1,2,3,4,7,8 - Hexachloro Dibenzo-*p* -Dioxin	39227-28-6	1613, 8280b, or 8290a
1,2,3,6,7,8 - Hexachloro Dibenzo-*p* -Dioxin	57653-85-7	1613, 8280b, or 8290a
1,2,3,7,8,9 - Hexachloro Dibenzo-*p* -Dioxin	19408-74-3	1613, 8280b, or 8290a
1,2,3,4,6,7,8 - Heptachloro Dibenzo-*p* -Dioxin	35822-46-9	1613, 8280b, or 8290a
Octachloro Dibenzo-*p* -Dioxin	3268-87-9	1613, 8280b, or 8290a
Polychlorinated Dibenzofurans		
2,3,7,8 - Tetrachloro Dibenzo-*p* -Furan	51207-31-9	1613, 8280b, or 8290a
1,2,3,7,8 - Pentachloro Dibenzo-*p* -Furan	57117-41-6	1613, 8280b, or 8290a
2,3,4,7,8 - Pentachloro Dibenzo-*p* -Furan	57117-31-4	1613, 8280b, or 8290a
1,2,3,4,7,8 - Hexachloro Dibenzo-*p* -Furan	70648–26–9	1613, 8280b, or 8290a
1,2,3,6,7,8 - Hexachloro Dibenzo-*p* -Furan	57117-44-9	1613, 8280b, or 8290a
2,3,4,6,7,8 - Hexachloro Dibenzo-*p* -Furan	60851-34-5	1613, 8280b, or 8290a
1,2,3,7,8,9 - Hexachloro Dibenzo-*p* -Furan	72918–21–9	1613, 8280b, or 8290a
1,2,3,4,6,7,8 - Heptachloro Dibenzo-p-Furan	67562–39–4	1613, 8280b, or 8290a
1,2,3,4,7,8,9 - Heptachloro Dibenzo-p-Furan	55673–89–7	1613, 8280b, or 8290a
Octachloro Dibenzo-p-Furan	39001-02-0	1613, 8280b, or 8290a

Sample Preservation and Storage

Collected samples will be cooled and stored at 2 to 4°C until laboratory analysis. Analyses will be performed within the recommended holding times, as described in the referenced guidance documents.

Chain of Custody

A chain of custody will be completed according to appropriate guidance manuals and accompany the samples until laboratory analysis.

Chemical Analyses

Each composite sample will be analyzed for water, sediment, and elutriate conditions. All chemical analyses will be performed by Anacon, which is accredited for the analytes/analyte groups and matrices analyzed by the TCEQ, an accrediting authority recognized by the National Environmental Laboratory Accreditation Program (NELAP). The constituents for which analyses will be conducted, the methods used, and the Method Detection Limits are provided in Attachment C.

Results

Habitat Survey

Results from this survey will be summarized in a report. The habitat will be presented in a map and data will be presented with tables and graphs as necessary. A draft report will be sent out for review, and comments will be addressed before the final report is submitted.

Sediment, Water and Elutriate Analysis

Results from the sampling effort will be compiled into tables and summarized. Any analysis that results in levels that would potentially cause negative impacts to Gulf sturgeon or species with designated EFH in the project vicinity will be discussed and impacts will be disclosed in the EIS. Potential impacts will be described by each category of EFH affected and life stages of fish and invertebrate species potentially affected by the action. Secondary and cumulative effects on EFH and associated fishery species will also be described.

Cost

The cost for completing the scope of work outlined above would be done on a time a materials basis not to exceed $ 101,785.00.

Task	Cost
Labor	**$ 46,922.02**
Field Effort & Reporting Expenses	**$ 10,911.50**
Laboratory Analysis	**$ 42,203.40**
Total	**$ 100,036.92**

Literature Cited

Plumb, R. H., Jr. 1981. Procedure for Handling and Chemical Analysis of Sediment and Water Samples. EPA/CE-81-1. Prepared by State University College at Buffalo, Great Lakes Laboratory, Buffalo, New York. U.S. Environmental Protection Agency and U.S. Army Corps of Engineers, Waterways Experiment Station, Vicksburg, Mississippi.

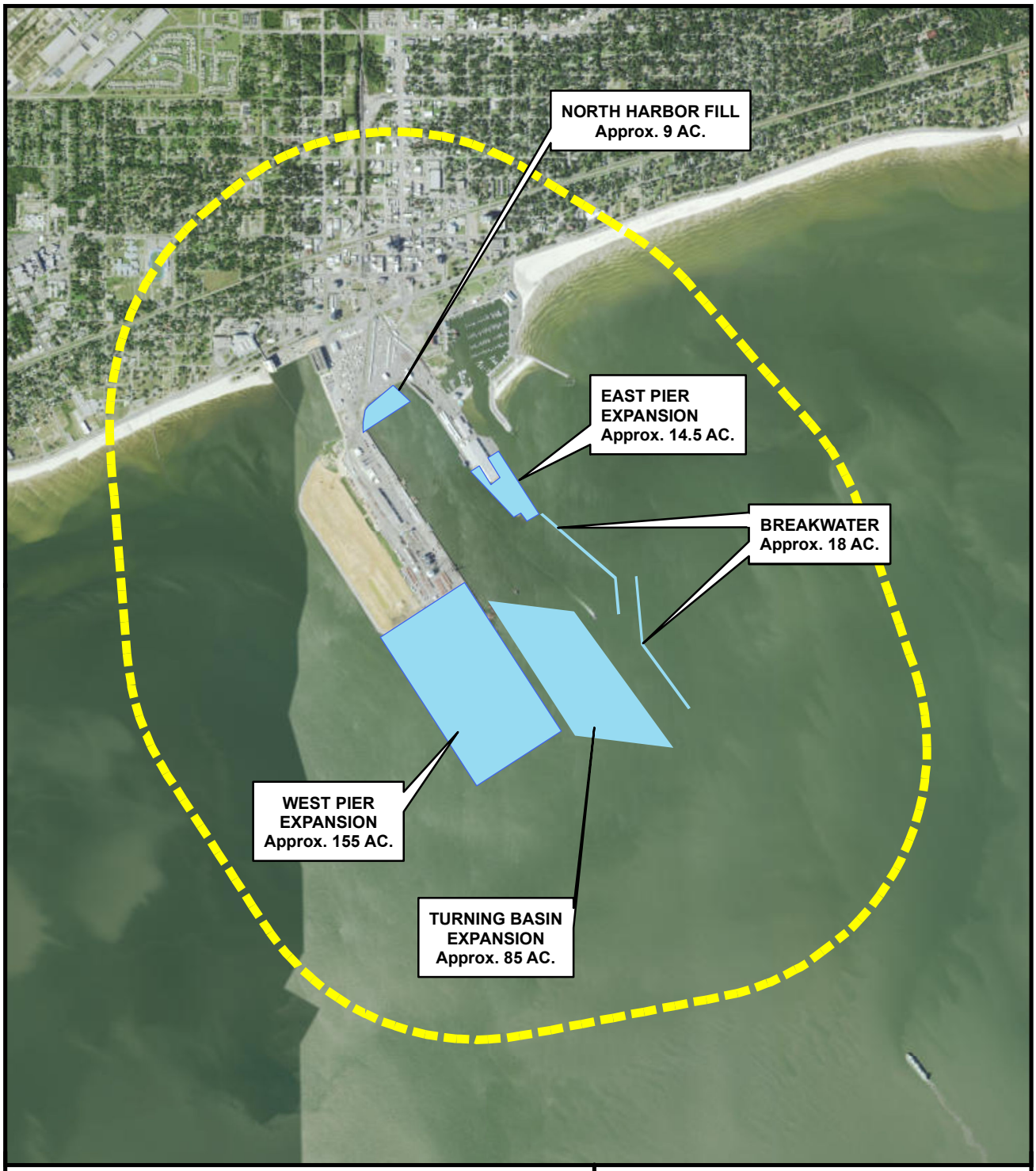
Ross, S. T., W. T. Slack, R. J. Heise, M. A. Dugo, H. Rogillio, B. R. Bowen, P. Mickle, and R. W. Heard. 2009. Estuarine and coastal habitat use of Gulf sturgeon (Acipenser oxyrinchus destoi) in the North-Central Gulf of Mexico. Estuaries and Coasts. 32: 360-374.

U.S. Army Corps of Engineers (Waterways Experiment Station). 1998. Use of Sediment Quality Guidelines (SQG's) in Dredged Material Management. Dredging Research Technical Note EEDP-04-29.

U.S. Environmental Protection Agency/U.S. Army Corps of Engineers (EPA/USACE). 1998. Evaluation of Dredged Material Proposed for Discharge in Waters of the U.S. – Testing Manual. Inland Testing Manual. EPA-823-B-98-004. 143pp + Appendices.

Attachment A

Figure 1



Project Area

Proposed Project Features

Federal Navigation Channel (FNC)

0 3,000 Feet

Figure 1

Port of Gulfport Expansion Project

Proposed Project Features and Project Area

Prepared By: 13188	Scale: 1" = 3000'
Job No.: 100018536	Date: Jul 24, 2015

File: A N:\Clients\M_N\Mississippi_State_Port_Authority\100018536\geospatial\Figs_BHA\PGEP_BHA_Figure_1_ProjFeatures_and_ProjArea.mxd

Attachment B

Figures 2 and 3

North and East Pier (500 ft Transects)

Project Area (5,000 ft Transects)

South Pier and Turning Basin (1,000 ft Transects)

Proposed Turning Basin Expansion

Proposed Pier Expansion

Project Area

0 2,500 Feet

Source: ESRI World Imagery

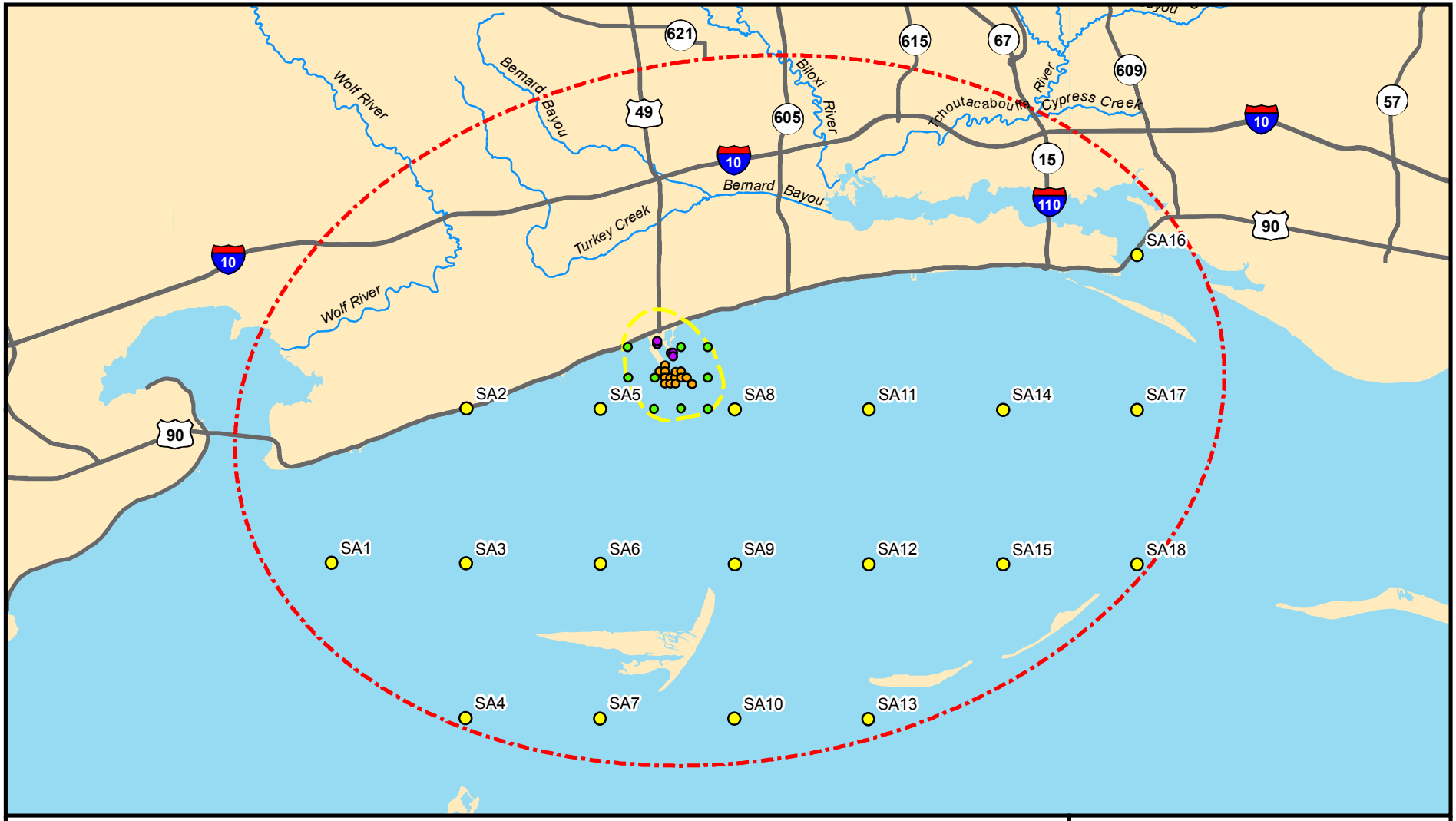
Figure 2

Port of Gulfport Expansion Project

Project Area Proposed Sampling

Prepared By: 24125	Scale: 1" = 2500'
Job No.: 100018536	Date: Jul 24, 2015

File: N:\Clients\M_N\Mississippi_State_Port_Authority\100018536\geospatial\Figs_EIS\Project_Area_Samples.mxd



0 4.5 Miles

- North and East Pier (500 ft Transects)
- Project Area (5,000 ft Transects)
- South Pier and Turning Basin (1,000 ft Transects)
- Study Area (25,000 ft Transects)
- Project Area
- Study Area

Figure 3

Port of Gulfport Expansion Project

Study Area Proposed Sampling

Prepared By: 24125	Scale: 1" = 4.5 miles
Job No.: 100018536	Date: Jul 24, 2015

File: N:/Clients/M_N/Mississippi_State_Port_Authority/100018536/geospatial/Figs_EIS/Study_Area_Samples.mxd

Attachment C

Detection Limits

Analytical Methodology and Minimum Detection Limits

Parameter	Contract Required Detection Limit	Units	EPA Method
		Water and Elutriate	
Metals			
Antimony	3.00	ug/L	200.8**
Arsenic	1.00	ug/L	200.8**
Beryllium	0.20	ug/L	200.8**
Cadmium	1.00	ug/L	200.8**
Chromium, Total	1.00	ug/L	200.8**
Chromium, Trivalent	1.00	ug/L	200.8**
Chromium, Hexavalent	1.00	ug/L	200.8**
Copper	1.00	ug/L	200.8**
Lead	1.00	ug/L	200.8**
Mercury	0.20	ug/L	200.8**
Nickel	1.00	ug/L	200.8**
Selenium	2.00	ug/L	200.8**
Silver	1.00	ug/L	200.8**
Thallium	1.00	ug/L	200.8**
Zinc	1.00	ug/L	200.8**
Pesticides and PCB's			
Aldrin	0.03	ug/L	608*
Alpha-BHC	0.03	ug/L	608*
Beta-BHC	0.03	ug/L	608*
Gamma-BHC (Lindane)	0.03	ug/L	608*
Delta-BHC	0.03	ug/L	608*
Chlordane	0.03	ug/L	608*
Alpha-Chlordane	0.03	ug/L	608*
Gamma- Chlordane	0.03	ug/L	608*
4,4'-DDD	0.10	ug/L	608*
4,4'-DDE	0.10	ug/L	608*
4,4'-DDT	0.10	ug/L	608*
Dieldrin	0.02	ug/L	608*
Endosulfan I	0.10	ug/L	608*
Endosulfan II	0.10	ug/L	608*
Endosulfan sulfate	0.10	ug/L	608*
Endrin	0.10	ug/L	608*
Endrin aldehyde	0.10	ug/L	608*
Heptachlor	0.10	ug/L	608*
Heptachlor epoxide	0.10	ug/L	608*
Toxaphene	0.50	ug/L	608*
Total PCB's	0.01	ug/L	608*

Analytical Methodology and Minimum Detection Limits

Parameter	Contract Required Detection Limit	Units	EPA Method
		Water and Elutriate	
Semivolatiles			
Acenaphthene	0.75	ug/L	625*
Acenaphthylene	1.00	ug/L	625*
Anthracene	0.60	ug/L	625*
Benzidine	1.00	ug/L	625*
Benzo(a)anthracene	0.40	ug/L	625*
Benzo(a)pyrene	0.30	ug/L	625*
Benzo(ghi)perylene	1.20	ug/L	625*
Benzo(b&k)fluoranthene	0.60	ug/L	625*
Bis(2-chloroethoxy)methane	1.00	ug/L	625*
Bis(2-chloroethyl)ether	0.90	ug/L	625*
Bis(2-chloroisoproply)ether	0.70	ug/L	625*
Bis(2-ethylhexyl)phthalate	2.00	ug/L	625*
4-Bromophenyl phenyl ether	0.40	ug/L	625*
Butyl benzyl phthalate	4.00	ug/L	625*
4-chloro-3-methylphenol	0.70	ug/L	625*
2-Chloronapthalene	0.80	ug/L	625*
2-Chlorophenol	0.90	ug/L	625*
4-Chlorophenyl phenyl ether	0.60	ug/L	625*
Chrysene	0.30	ug/L	625*
Dibenzo(ah)anthracene	1.30	ug/L	625*
Dibutyl phthalate	1.00	ug/L	625*
1,2-Dichlorobenzene	0.80	ug/L	625*
1,3-Dichlorobenzene	0.90	ug/L	625*
1,4-Dichlorobenzene	1.00	ug/L	625*
3,3-Dichlorobenzidene	3.00	ug/L	625*
2,4-Dichlorophenol	0.80	ug/L	625*
Diethyl phthalate	1.00	ug/L	625*
2,4-Dimethylphenol	10.0	ug/L	625*
Dimethyl phthalate	1.00	ug/L	625*
2,4-Dinitrophenol	5.00	ug/L	625*
Dimethyl phthalate	50.0	ug/kg	8270C
2,4-Dinitrophenol	500	ug/kg	8270C
2,4-Dinitrotoluene	200	ug/kg	8270C
2,6-Dinitrotoluene	200	ug/kg	8270C
Di-n-octyl phthalate	50.0	ug/kg	8270C

Analytical Methodology and Minimum Detection Limits

Parameter	Contract Required Detection Limit	Units	EPA Method[1]
		Sediment	
1,2-Diphenylhydrazine	10.0	ug/kg	8270C
Fluoranthene	20.0	ug/kg	8270C
Fluorene	20.0	ug/kg	8270C
Hexachlorobenzene	10.0	ug/kg	8270C
Hexachlorobutadiene	20.0	ug/kg	8270C
Hexachlorocyclopentadiene	300	ug/kg	8270C
Hexachloroethane	100	ug/kg	8270C
Indeno(123-CD)pyrene	20.0	ug/kg	8270C
Isophorone	10.0	ug/kg	8270C
2-Methyl-4,6-dinitrophenol	600	ug/kg	8270C
Naphthalene	20.0	ug/kg	8270C
Nitrobenzene	160	ug/kg	8270C
2-Nitrophenol	200	ug/kg	8270C
4-Nitrophenol	500	ug/kg	8270C
N-nitrosodimethylamine	20.0	ug/kg	8270C
N-nitrosodi-n-propylamine	150	ug/kg	8270C
N-nitrosodiphenylamine	20.0	ug/kg	8270C
Phenanthrene	20.0	ug/kg	8270C
Phenol	100	ug/kg	8270C
Pentachlorophenol	100	ug/kg	8270C
Pryene	20.0	ug/kg	8270C
1,2,4-Trichlorobenzene	10.0	ug/kg	8270C
2,4,6-Trichlorophenol	140	ug/kg	8270C
Conventional Parameters*			
Total Organic Carbon	0.1	%	9060
Total Petroleum Hydrocarbons	5.00	mg/kg	8021
Cyanide	2.00	mg/kg	SM-4500 CN-/335.2
Ammonia	0.10	mg/kg	350.3
Total Solids	-	%	160.3

[1] U.S. EPA, "Test Methods for the Evaluation of Solid Waste," SW-846, Latest Edition.
* Sediments only.

Appendix C

Benthic Data

ATKINS

Macrobenthic Organisms Collected from the Proposed Port of Gulfport Expansion Project, Gulfport Mississippi

Site ID	LPIL	Taxon	Number present
PE-11-A	S	*Amphicteis floridus*	1
	S	*Balanoglossus aurantiacus*	1
	S	*Chione inta purpurea*	1
	S	*Glycinde solitaria*	1
	F	Hesionidae	3
	S	*Leitoscoloplos fragilis**	45
	S	*Mediomastus ambiseta**	4
	S	*Paraprionospio pinnata*	3
	P	Nemertea (LPIL)	2
	S	*Sigambra tentaculata*	1
	S	*Tharyx acutus*	2
		Total	**64**
PE-11-B	S	*Glycinde solitaria*	3
	S	*Leitoscoloplos fragilis**	4
	S	*Paraprionospio pinnata*	1
	P	Nemertea (LPIL)	1
		Total	**9**
PE-11-C	F	Hesionidae	1
	S	*Leitoscoloplos fragilis**	1
	S	*Mediomastus ambiseta**	1
	S	*Paraprionospio pinnata*	1
	F	Phyllodocidae (LPIL)	1
	P	Nemertea (LPIL)	2
	S	*Sigambra tentaculata*	1
	S	*Spiochaetopterus oculatus*	1
	S	*Streblospio benedicti*	2
	G	*Stylochus* (LPIL)	1
		Total	**12**
PM-11-A	S	*Acteocina canaliculata*	1
	S	*Balanoglossus aurantiacus*	4
	S	*Glycinde solitaria*	2
	S	*Leitoscoloplos fragilis**	2
	S	*Mediomastus ambiseta**	3
	S	*Nassarius acutus**	2
	S	*Sigambra tentaculata*	1
		Total	**15**
PM-11-B	S	*Acteocina canaliculata*	1
	S	*Amphicteis floridus*	1
	O	Copepoda (LPIL)	1
	S	*Glycera americana*	1
	S	*Glycinde solitaria*	5
	F	Hesionidae	1

LPIL - Lowest Practical Identification Level

* Taxa overlap with species identified in Ross et al. 2009

P = Phylum; C = Class; O = Order; F = Family; G = Genus; S = Species

ATKINS

Macrobenthic Organisms Collected from the Proposed Port of Gulfport Expansion Project, Gulfport Mississippi

Site ID	LPIL	Taxon	Number present
PM-11-B	S	*Leitoscoloplos fragilis**	8
	S	*Mediomastus ambiseta**	1
	S	*Paraprionospio pinnata*	3
	P	Nemertea (LPIL)	3
	S	*Sigambra tentaculata*	2
	S	*Spiochaetopterus oculatus*	2
	G	*Stylochus* (LPIL)	1
		Total	**30**
PM11C	S	*Glycera americana*	1
	S	*Leitoscoloplos fragilis**	3
	O	Nudibranchia	1
	S	*Paraprionospio pinnata*	4
	S	*Pectinaria gouldii*	1
	P	Nemertea (LPIL)	1
	S	*Spiochaetopterus oculatus*	1
		Total	**12**
PM-11-D	S	*Glycinde solitaria*	2
	S	*Mediomastus ambiseta**	4
	S	*Mulinia lateralis**	1
	S	*Myriochele oculata*	2
	F	Mysidacae (LPIL)	1
	P	Nematoda	1
	G	*Oxyurostylis* (LPIL)	1
	S	*Pagurus pollicaris*	1
	G	*Pagurus* (LPIL)	1
	P	Nemertea (LPIL)	2
		Total	**16**
PM-11-E	S	*Acteocina canaliculata*	38
	S	*Glycinde solitaria*	2
	S	*Leitoscoloplos fragilis**	1
	S	*Mediomastus ambiseta**	15
	S	*Mulinia lateralis**	1
	F	Mysidacae (LPIL)	1
	S	*Paraprionospio pinnata*	1
	S	*Pectinaria gouldii*	3
	P	Nemertea (LPIL)	15
		Total	**77**
PM-11-F	S	*Acteocina canaliculata*	2
	S	*Glycinde solitaria*	1
	S	*Leitoscoloplos fragilis**	5
	S	*Nassarius acutus**	1
	S	*Paraprionospio pinnata*	2

LPIL - Lowest Practical Identification Level

* Taxa overlap with species identified in Ross et al. 2009

P = Phylum; C = Class; O = Order; F = Family; G = Genus; S = Species

ATKINS

Macrobenthic Organisms Collected from the Proposed Port of Gulfport Expansion Project, Gulfport Mississippi

Site ID	LPIL	Taxon	Number present
PM-11-F	S	*Pectinaria gouldii*	1
	P	Nemertea (LPIL)	1
	S	*Spiochaetopterus oculatus*	1
	G	*Stylochus* (LPIL)	1
		Total	**15**
PM-11-G	S	*Capitella capitata*	1
	S	*Cossura soyeri*	1
	S	*Glycinde solitaria*	2
	S	*Mediomastus ambiseta**	6
	S	*Pectinaria gouldii*	1
	P	Phoronida (LPIL)	3
	P	Nemertea (LPIL)	5
	S	*Teinostoma biscaynense*	1
		Total	**20**
PM-11-H	S	*Acteocina canaliculata*	1
	S	*Balanoglossus aurantiacus*	1
	S	*Cossura soyeri*	1
	S	*Glycera americana*	1
	S	*Glycinde solitaria*	2
	F	Hesionidae	3
	S	*Leitoscoloplos fragilis**	3
	S	*Paraprionospio pinnata*	2
	P	Nemertea (LPIL)	4
	S	*Spiochaetopterus oculatus*	2
		Total	**20**
PM-11-I	S	*Acteocina canaliculata*	9
	O	Actinaria (LPIL)	1
	S	*Amygdalium papyria*	1
	S	*Balanoglossus aurantiacus*	4
	S	*Capitella capitata*	4
	S	*Glycinde solitaria*	7
	S	*Leitoscoloplos fragilis**	1
	S	*Mediomastus ambiseta**	1
	S	*Nassarius acutus**	1
	C	Oligochaeta (LPIL)	2
	S	*Paraprionospio pinnata*	1
	P	Nemertea (LPIL)	3
		Total	**35**
PN-11-A	S	*Balanoglossus aurantiacus*	6
	S	*Cossura soyeri*	2
	S	*Glycinde solitaria*	3
	S	*Leitoscoloplos fragilis**	8

LPIL - Lowest Practical Identification Level

* Taxa overlap with species identified in Ross et al. 2009

P = Phylum; C = Class; O = Order; F = Family; G = Genus; S = Species

ATKINS

Macrobenthic Organisms Collected from the Proposed Port of Gulfport Expansion Project, Gulfport Mississippi

Site ID	LPIL	Taxon	Number present
PN-11-A	S	*Mediomastus ambiseta**	1
	S	*Paraprionospio pinnata*	3
	G	*Pinnixa* (LPIL)	1
	P	Nemertea (LPIL)	3
	S	*Sigambra tentaculata*	1
		Total	**28**
PN-11-B	S	*Acteocina canaliculata*	3
	O	Decapoda (LPIL)	2
	S	*Leitoscoloplos fragilis**	2
	S	*Mediomastus ambiseta**	39
	S	*Myriochele oculata*	1
	S	*Pectinaria gouldii*	1
	P	Nemertea (LPIL)	1
	S	*Streblospio benedicti*	13
	G	*Stylochus* (LPIL)	1
		Total	**63**
TB-11-A	S	*Balanoglossus aurantiacus*	7
	S	*Capitella capitata*	1
	S	*Cossura soyeri*	4
	S	*Glycinde solitaria*	2
	S	*Leitoscoloplos fragilis**	22
	C	Oligochaeta (LPIL)	2
	P	Nemertea (LPIL)	3
	S	*Streblospio benedicti*	2
		Total	**43**
TB-11-B	S	*Acteocina canaliculata*	5
	S	*Balanoglossus aurantiacus*	6
	F	Cirratulidae (LPIL)	1
	S	*Glycinde solitaria*	4
	S	*Leitoscoloplos fragilis**	9
	S	*Mediomastus ambiseta**	6
	F	Nereidae (LPIL)	1
	G	*Oxyurostylis* (LPIL)	1
	S	*Paramphinome* (LPIL)	3
	S	*Paraprionospio pinnata*	1
	G	*Phoronis* (LPIL)	3
	G	*Pinnixa* (LPIL)	1
	C	Polychaeta (LPIL)	1
	P	Nemertea (LPIL)	3
		Total	**45**
TB-11-C	S	*Acteocina canaliculata*	3
	O	Actinaria (LPIL)	1

LPIL - Lowest Practical Identification Level

* Taxa overlap with species identified in Ross et al. 2009

P = Phylum; C = Class; O = Order; F = Family; G = Genus; S = Species

ATKINS

Macrobenthic Organisms Collected from the Proposed Port of Gulfport Expansion Project, Gulfport Mississippi

Site ID	LPIL	Taxon	Number present
TB-11-C	S	*Balanoglossus aurantiacus*	2
	S	*Glycinde solitaria*	6
	S	*Leitoscoloplos fragilis**	1
	S	*Mulinia lateralis**	1
	F	Nereidae (LPIL)	1
	P	Nemertea (LPIL)	1
		Total	**16**
TB-11-D	S	*Acteocina canaliculata*	1
	S	*Amygdalium papyria*	1
	S	*Balanoglossus aurantiacus*	5
	S	*Capitella capitata*	2
	F	Cirratulidae (LPIL)	1
	O	Decapoda (LPIL)	1
	S	*Glycinde solitaria*	3
	S	*Leitoscoloplos fragilis**	28
	G	*Oxyurostylis* (LPIL)	1
	P	Nemertea (LPIL)	4
		Total	**47**
TB-11-E	O	Actinaria (LPIL)	3
	S	*Americamysis stucki*	1
	S	*Balanoglossus aurantiacus*	4
	P	Chaetognatha	2
	S	*Cossura soyeri*	29
	S	*Glycinde solitaria*	2
	S	*Leitoscoloplos fragilis**	54
	S	*Mediomastus ambiseta**	4
	G	*Naineris* (LPIL)	5
	F	Nereidae (LPIL)	2
	C	Oligochaeta (LPIL)	2
	S	*Paraprionospio pinnata*	4
	G	*Phoronis* (LPIL)	3
	C	Polychaeta (LPIL)	1
	P	Nemertea (LPIL)	1
	S	*Sigambra tentaculata*	10
		Total	**127**
TB-11-F	S	*Acteocina canaliculata*	2
	S	*Balanoglossus aurantiacus*	5
	S	*Capitella capitata*	1
	S	*Glycinde solitaria*	8
	C	Hydrozoa (LPIL)	1
	S	*Leitoscoloplos fragilis**	5
	C	Oligochaeta (LPIL)	2

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Site ID	LPIL	Taxon	Number present
TB-11-F	S	*Paraprionospio pinnata*	2
	P	Nemertea (LPIL)	1
		Total	**27**
PA01	S	*Acteocina canaliculata*	1
	S	*Glycinde solitaria*	3
	S	*Hypereteone heteropoda*	1
	S	*Leitoscoloplos fragilis**	7
	S	*Mediomastus ambiseta**	3
	G	*Monoculodes* (LPIL)	1
	F	Mysidacae (LPIL)	4
	G	*Oxyurostylis* (LPIL)	5
	S	*Pectinaria gouldii*	1
	S	*Polydora cornuta*	2
	P	Nemertea (LPIL)	7
		Total	**35**
PA 02	S	*Cossura soyeri*	1
	S	*Glycinde solitaria*	3
	P	Isopoda	1
	S	*Leitoscoloplos fragilis**	7
	S	*Mediomastus ambiseta**	1
	S	*Myriochele oculata*	5
	S	*Paraprionospio pinnata*	1
	P	Nemertea (LPIL)	2
	S	*Spiochaetopterus oculatus*	1
		Total	**22**
PA 03	O	Actinaria (LPIL)	1
	S	*Cossura soyeri*	2
	S	*Glycinde solitaria*	12
	S	*Leitoscoloplos fragilis**	9
	G	*Magelona* (LPIL)	2
	S	*Paraprionospio pinnata*	1
	P	Nemertea (LPIL)	8
		Total	**35**
PA 04	S	*Balanoglossus aurantiacus*	4
	S	*Glycinde solitaria*	6
	G	*Hermandura* (LPIL)	1
	S	*Hypereteone heteropoda*	1
	S	*Leitoscoloplos fragilis**	8
	G	*Pinnixa* (LPIL)	1
	F	Sabellariidae (LPIL)	1
	S	*Sigambra bassi*	2
		Total	**24**

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Site ID	LPIL	Taxon	Number present
PA 05	O	Amphipoda (LPIL)	6
	S	*Astrangia poculata*	2
	F	Balanidae (LPIL)	1
	S	*Balanoglossus aurantiacus*	2
	G	*Bowmaniella* (LPIL)	4
	S	*Capitella capitata*	18
	P	Chaetognatha	13
	C	Hydrozoa (LPIL)	4
	S	*Hypereteone heteropoda*	1
	P	Nematoda	1
	F	Nereidae (LPIL)	3
	G	*Oxyurostylis* (LPIL)	1
	C	Polychaeta (LPIL)	1
	P	Nemertea (LPIL)	33
	G	*Stylochus* (LPIL)	1
		Total	**91**
PA 06	S	*Acteocina canaliculata*	1
	O	Actinaria (LPIL)	18
	S	*Cossura soyeri*	1
	S	*Glycinde solitaria*	7
	S	*Leitoscoloplos fragilis**	16
	P	Nemertea (LPIL)	5
	S	*Spiochaetopterus oculatus*	1
		Total	**49**
PA 07	S	*Acteocina canaliculata*	1
	S	*Glycinde solitaria*	2
	F	Hesionidae	1
	S	*Leitoscoloplos fragilis**	15
	S	*Monoculodes sp. D*	1
	G	*Oxyurostylis* (LPIL)	2
	S	*Paraprionospio pinnata*	2
	S	*Polydora ligni*	1
	S	*Sigambra tentaculata*	1
	G	*Stylochus* (LPIL)	1
		Total	**27**
PA08	S	*Acteocina canaliculata*	1
	S	*Cossura soyeri*	2
	S	*Glycinde solitaria*	4
	S	*Leitoscoloplos fragilis**	18
	S	*Paraprionospio pinnata*	1
	S	*Phascolion strombi*	1
	S	*Phyllodoce mucosa*	1

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Macrobenthic Organisms Collected from the Proposed Port of Gulfport Expansion Project, Gulfport Mississippi

Site ID	LPIL	Taxon	Number present
PA08	P	Nemertea (LPIL)	1
		Total	**29**
PA 10	O	Actinaria (LPIL)	7
	S	*Amphicteis floridus*	1
	S	*Cossura soyeri*	3
	S	*Glycinde solitaria*	12
	S	*Leitoscoloplos fragilis**	19
	S	*Paraprionospio pinnata*	1
	P	Nemertea (LPIL)	3
	S	*Spiochaetopterus oculatus*	1
		Total	**47**
SA 01	S	*Acteocina canaliculata*	7
	S	*Ampelisca abdita*	1
	S	*Glycinde solitaria*	13
	G	Hermandura (LPIL)	1
	S	*Leitoscoloplos fragilis**	6
	G	*Leucon* (LPIL)	1
	F	Nereidae (LPIL)	2
	G	*Oxyurostylis* (LPIL)	2
	S	*Pectinaria gouldii*	1
	P	Nemertea (LPIL)	4
		Total	**38**
SA 02	O	Actinaria (LPIL)	1
	C	Bivalvia (LPIL)*	1
	O	Copepoda	1
	S	*Cossura soyeri*	3
	O	Decapoda (LPIL)	1
	S	*Edotea triloba*	1
	S	*Glycera americana*	9
	S	*Glycinde solitaria*	17
	S	*Leitoscoloplos fragilis**	17
	S	*Mediomastus ambiseta**	6
	G	*Monoculodes* (LPIL)	1
	F	Mysidacae (LPIL)	3
	G	*Oxyurostylis* (LPIL)	1
	S	*Parandalia tricuspis*	2
	S	*Paraprionospio pinnata*	2
	S	*Pectinaria gouldii*	16
	S	*Phascolion strombi*	1
	P	Phoronida (LPIL)	1
	S	*Phyllodoce mucosa*	1
	P	Nemertea (LPIL)	5

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Site ID	LPIL	Taxon	Number present
SA 02	S	*Sigambra tentaculata*	5
	S	*Spiochaetopterus oculatus*	1
	S	*Streblospio benedicti*	2
	G	*Stylochus* (LPIL)	1
		Total	**99**
SA 03	S	*Acteocina canaliculata*	1
	O	Actinaria (LPIL)	2
	S	*Cossura soyeri*	8
	S	*Glycinde solitaria*	4
	F	Hesionidae	2
	S	*Leitoscoloplos fragilis**	18
	G	*Magelona* (LPIL)	1
	S	*Paraprionospio pinnata*	1
	P	Nemertea (LPIL)	1
	S	*Sigambra tentaculata*	1
	S	*Spiochaetopterus oculatus*	1
		Total	**40**
SA 04	S	*Acteocina canaliculata*	1
	O	Actinaria (LPIL)	9
	S	*Amphicteis floridus*	1
	S	*Gammarus mucronatus*	1
	S	*Glycera americana*	2
	G	*Magelona* (LPIL)	5
	S	*Nereis falsa*	10
	S	*Ophiophragmus moorei*	2
	S	*Owenia fusiformis*	1
	S	*Phyllodoce mucosa*	1
	G	*Pinnixa* (LPIL)	1
	P	Nemertea (LPIL)	2
	S	*Sigambra tentaculata*	5
		Total	**41**
SA 05	O	Actinaria (LPIL)	14
	S	*Ampelisca abdita*	1
	S	*Cossura soyeri*	1
	S	*Glycinde solitaria*	11
	S	*Leitoscoloplos fragilis**	26
	S	*Pectinaria gouldii*	1
	P	Nemertea (LPIL)	2
	S	*Spiochaetopterus oculatus*	1
		Total	**57**
SA 06	S	*Acteocina canaliculata*	1
	S	*Balanoglossus aurantiacus*	2

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Macrobenthic Organisms Collected from the Proposed Port of Gulfport Expansion Project, Gulfport Mississippi

Site ID	LPIL	Taxon	Number present
SA 06	P	Chaetognatha	3
	S	*Cossura soyeri*	6
	S	*Glycinde solitaria*	5
	F	Hesionidae	5
	S	*Leitoscoloplos fragilis**	24
	S	*Mediomastus ambiseta**	1
	S	*Paraprionospio pinnata*	1
	S	*Phascolion strombi*	1
	P	Nemertea (LPIL)	4
	S	*Sigambra tentaculata*	2
	O	Decapoda (LPIL)	3
		Total	**58**
SA 07	O	Actinaria (LPIL)	1
	S	*Americamysis alleni*	2
	S	*Americamysis bahia*	1
	O	Amphipoda (LPIL)	2
	S	*Balanoglossus aurantiacus*	45
	G	*Callinectes* (LPIL)	1
	G	*Ceratoneis* (LPIL)	1
	O	Cumacea (LPIL)	3
	S	*Edotea triloba*	1
	S	*Glycinde solitaria*	15
	S	*Hypereteone heteropoda*	1
	S	*Leitoscoloplos fragilis**	2
	S	*Macoma tenta*	2
	G	*Magelona* (LPIL)	28
	S	*Mediomastus ambiseta**	83
	S	*Notomastus hemipodus*	1
	C	Oligochaeta (LPIL)	13
	C	Ophiuroidea (LPIL)	1
	G	*Oxyurostylis* (LPIL)	1
	S	*Paraprionospio pinnata*	7
	S	*Pectinaria gouldii*	2
	G	*Pinnixa* (LPIL)	6
	C	Polychaeta (LPIL)	1
	P	Nemertea (LPIL)	43
	F	Sabellariidae (LPIL)	6
	S	*Sigambra tentaculata*	17
	S	*Spiophanes bombyx**	2
		Total	**288**
SA 08	O	Actinaria (LPIL)	2
	P	Chaetognatha	1

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Macrobenthic Organisms Collected from the Proposed Port of Gulfport Expansion Project, Gulfport Mississippi

Site ID	LPIL	Taxon	Number present
SA 08	S	*Cossura soyeri*	10
	O	Decapoda (LPIL)	4
	S	*Glycinde solitaria*	11
	S	*Leitoscoloplos fragilis**	29
	S	*Leitoscoloplos robustus*	4
	G	*Magelona* (LPIL)	2
	F	Mysidacae (LPIL)	1
	G	*Oxyurostylis* (LPIL)	1
	S	*Paraprionospio pinnata*	2
	G	*Pinnixa* (LPIL)	1
	P	Nemertea (LPIL)	3
	S	*Sigambra tentaculata*	3
	S	*Spiochaetopterus oculatus*	1
		Total	**75**
SA 09	S	*Acteocina canaliculata*	16
	S	*Amphicteis floridus*	3
	O	Amphipoda (LPIL)	2
	S	*Balanoglossus aurantiacus*	3
	S	*Capitella capitata*	2
	O	Copepoda	1
	S	*Cossura soyeri*	2
	S	*Edotea triloba*	1
	S	*Glycinde solitaria*	3
	S	*Leitoscoloplos fragilis**	15
	S	*Macoma tenta*	1
	G	*Magelona* (LPIL)	13
	S	*Mediomastus ambiseta**	23
	S	*Myriochele oculata*	1
	F	Mysidacae (LPIL)	3
	G	*Notomastus* (LPIL)	1
	G	*Oxyurostylis* (LPIL)	1
	S	*Paraprionospio pinnata*	1
	S	*Phyllodoce mucosa*	1
	S	*Pinnixa chaetopterus*	4
	S	*Polydora cornuta*	1
	S	*Prionospio cristata**	1
	P	Nemertea (LPIL)	23
	S	*Sigambra tentaculata*	13
	S	*Spiochaetopterus oculatus*	2
	O	Decapoda (LPIL)	1
		Total	**138**
SA 10	S	*Acteocina canaliculata*	1

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Site ID	LPIL	Taxon	Number present
SA 10	O	Actinaria (LPIL)	2
	O	Amphipoda (LPIL)	1
	S	*Ancistrosyllis jonesi*	2
	S	*Balanoglossus aurantiacus*	8
	S	*Capitella capitata*	1
	P	Chaetognatha	1
	S	*Glycinde solitaria*	12
	S	*Leitoscoloplos fragilis**	6
	G	*Magelona* (LPIL)	5
	C	Oligochaeta (LPIL)	1
	G	*Paramphinome* (LPIL)	2
	S	*Paraprionospio pinnata*	10
	S	*Sigambra tentaculata*	12
	F	Tomopteridae (LPIL)	1
		Total	**65**
SA 11	S	*Acteocina canaliculata*	1
	S	*Balanoglossus aurantiacus*	4
	S	*Capitella capitata*	4
	S	*Cossura soyeri*	9
	S	*Glycinde solitaria*	6
	S	*Leitoscoloplos fragilis**	63
	G	*Magelona* (LPIL)	3
	G	*Ophicthus* (LPIL)	1
	G	Oxyurostylis (LPIL)	1
	S	*Paraprionospio pinnata*	1
	G	*Phoronis* (LPIL)	3
	F	Pilargidae (LPIL)	1
	G	*Pinnixa* (LPIL)	4
	P	Nemertea (LPIL)	8
	S	*Sigambra tentaculata*	10
	G	*Stylochus* (LPIL)	1
		Total	**120**
SA 12	P	Chaetognatha	1
	O	Copepoda	1
	S	*Cossura soyeri*	1
	O	Decapoda (LPIL)	1
	S	*Glycinde solitaria*	1
	S	*Leitoscoloplos fragilis**	16
	G	*Magelona* (LPIL)	7
	S	*Mediomastus ambiseta**	7
	S	*Nassarius acutus**	1
	G	*Notomastu* s (LPIL)	1

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Site ID	LPIL	Taxon	Number present
SA 12	S	*Paraprionospio pinnata*	3
	S	*Phascolion strombi*	1
	S	*Pinnixa chaetopterus*	1
	P	Nemertea (LPIL)	8
	S	*Sigambra tentaculata*	13
	S	*Spiochaetopterus oculatus*	1
		Total	**64**
SA 13	O	Amphipoda (LPIL)	3
	S	*Anadera transvera*	1
	S	*Armandia maculata*	1
	C	Bivalvia (LPIL)*	2
	S	*Chione inta purpurea*	1
	S	*Glycera americana*	3
	S	*Glycinde solitaria*	9
	S	*Heteromastus filiformis*	1
	S	*Mediomastus ambiseta**	89
	F	Mysidacae (LPIL)	3
	S	*Nassarius acutus**	1
	G	*Notomastus* (LPIL)	1
	F	Ophiuroidea (LPIL)	1
	S	*Owenia fusiformis*	1
	G	*Oxyurostylis* (LPIL)	11
	S	*Pandora trilineata*	3
	S	*Paraprionospio pinnata*	12
	S	*Phyllodoce mucosa*	1
	P	Nemertea (LPIL)	13
	F	Sigalionidae (LPIL)	1
	S	*Sigambra tentaculata*	23
	S	*Spiophanes bombyx**	1
	F	Tellinidae (LPIL)	8
	S	*Tharyx acutus*	7
	O	Decapoda (LPIL)	1
		Total	**198**
SA 14	S	*Armandia maculata*	1
	O	Copepoda	1
	S	*Cossura soyeri*	8
	S	*Glycinde solitaria*	11
	S	*Leitoscoloplos fragilis**	39
	G	*Magelona* (LPIL)	7
	S	*Myriochele oculata*	2
	G	*Notomastus* (LPIL)	1
	G	*Oxyurostylis* (LPIL)	1

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Macrobenthic Organisms Collected from the Proposed Port of Gulfport Expansion Project, Gulfport Mississippi

Site ID	LPIL	Taxon	Number present
SA 14	G	*Paramphinome* (LPIL)	8
	S	*Paraprionospio pinnata*	1
	P	Nemertea (LPIL)	5
	S	*Sigambra tentaculata*	4
	S	*Spiochaetopterus oculatus*	2
	O	Decapoda (LPIL)	3
		Total	**94**
SA 15	O	Actinaria (LPIL)	2
	C	Bivalvia (LPIL)*	1
	S	*Glycinde solitaria*	5
	F	Hesionidae	3
	G	*Magelona (LPIL)*	4
	G	*Notomastus (LPIL)*	20
	S	*Owenia fusiformis*	1
	C	Polychaeta (LPIL)	1
	P	Nemertea (LPIL)	11
	S	*Sigambra tentaculata*	9
	S	*Spiochaetopterus oculatus*	2
	F	Tellinidae (LPIL)	1
	O	Decapoda (LPIL)	1
		Total	**61**
SA 16	S	*Acteocina canaliculata*	1
	S	*Ampelisca abdita*	2
	S	*Amphicteis floridus*	5
	O	Amphipoda (LPIL)	2
	S	*Apocorophium louisianum*	26
	C	Bivalvia (LPIL)*	1
	S	*Glycinde solitaria*	1
	F	Hesionidae	2
	S	*Leitoscoloplos fragilis**	19
	S	*Mediomastus ambiseta**	5
	S	*Myriochele oculata*	1
	S	*Parandalia tricuspis*	2
	C	Polychaeta (LPIL)	1
	S	*Polydora cornuta*	3
	S	*Protomystides bidentata*	1
	P	Nemertea (LPIL)	3
	S	*Streblospio benedicti*	7
	S	*Teinostoma biscaynense*	2
		Total	**84**
SA 17	S	*Amphicteis floridus*	1
	S	*Cossura soyeri*	5

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Macrobenthic Organisms Collected from the Proposed Port of Gulfport Expansion Project, Gulfport Mississippi

Site ID	LPIL	Taxon	Number present
SA 17	S	*Glycera americana*	7
	S	*Leitoscoloplos fragilis**	9
	G	*Magelona* (LPIL)	1
	S	*Mediomastus ambiseta**	1
	S	*Myriochele oculata*	1
	F	Mysidacae (LPIL)	1
	G	*Notomastus* (LPIL)	14
	S	*Nuculana acuta*	1
	P	Nemertea (LPIL)	4
	S	*Sigambra tentaculata*	6
	S	*Spiochaetopterus oculatus*	1
	G	*Stylochus* (LPIL)	1
		Total	**53**
SA 18	S	*Ampelisca abdita*	3
	F	Ampharetidae	4
	S	*Amphicteis floridus*	3
	O	Amphipoda (LPIL)	8
	S	*Apocorophium louisianum*	1
	S	*Axiothella mucosa*	4
	S	*Capitella capitata*	2
	S	*Eteone fauchaldi*	1
	S	*Glycinde solitaria*	15
	F	Hesionidae	1
	S	*Leitoscoloplos fragilis**	1
	S	*Linga amiantus*	1
	S	*Macoma tenta*	44
	G	*Magelona* (LPIL)	47
	S	*Mediomastus ambiseta**	136
	G	*Megalomma* (LPIL)	3
	F	Mysidacae (LPIL)	7
	S	*Nassarius acutus**	10
	G	*Notomastus* (LPIL)	10
	F	Ophiuroidea (LPIL)	1
	S	*Owenia fusiformis*	1
	G	*Pagurus* (LPIL)	1
	S	*Pandora trilineata*	2
	S	*Paraprionospio pinnata*	9
	F	Phyllodocidae (LPIL)	3
	S	*Pinnixa chaetopterus*	2
	S	*Podarke obscura*	2
	P	Nemertea (LPIL)	23
	S	*Sigambra tentaculata*	19

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Site ID	LPIL	Taxon	Number present
SA 18	S	*Spiophanes bombyx**	23
	S	*Teinostoma biscaynense*	1
	S	*Tellidora cristata*	1
	F	Tellinidae (LPIL)	1
	F	Terebellidae (LPIL)	3
	S	*Tharyx acutus*	8
	O	Decapoda (LPIL)	14
		Total	**415**
SA 19	S	*Acteocina canaliculata*	1
	S	*Glycinde solitaria*	13
	S	*Mediomastus ambiseta**	6
	S	*Monoculodes sp. D*	2
	F	Mysidacae (LPIL)	6
	P	Nematoda	1
	G	*Oxyurostylis* (LPIL)	2
	G	*Pagurus* (LPIL)	1
	P	Nemertea (LPIL)	4
	G	*Stylochus* (LPIL)	1
	S	*Tagelus plebeius*	1
		Total	**38**

LPIL - Lowest Practical Identification Level
* Taxa overlap with species identified in Ross et al. 2009
P = Phylum; C = Class; O = Order; F = Family; G = Genus; S = Species

Appendix D

Water and Sediment Chemistry Data

TABLE D1

STANDARD PARAMETERS
GULPORT SHIP CHANNEL - 2012

Station*		Date	Time	Substrate	Secchi Depth (ft)	Water Depth (ft)	Dissolved (mg/L) Sfc	Dissolved (mg/L) Bot	pH Sfc	pH Bot	Salinity (PSU) Sfc	Salinity (PSU) Bot	Water Temp (°C) Sfc	Water Temp (°C) Bot	NTU Sfc	NTU Bot	Air Temp (°C)	Coordinates Latitude (N) Deg.	Latitude (N) Min.	Latitude (N) Sec.	Longitude (W) Deg.	Longitude (W) Min.	Longitude (W) Sec.
SA-	**01**	4/3/2012	0738	2	1.5	8.4	7.73	6.42	7.08	7.02	7.11	7.21	22.0	22.1	8.03	8.14	22.5	30	15	43.2	89	15	34.2
SA-	**02**	4/3/2012	1233	3	2	7.5	7.70	6.88	7.70	7.54	8.88	9.13	22.6	22.5	9.89	10.16	26.9	30	19	49.9	89	11	27.5
SA-	**03**	4/3/2012	0811	2	2.5	12.0	7.96	5.67	7.52	7.54	10.78	13.68	21.3	21.5	11.82	14.83	23.2	30	15	43.2	89	11	27.5
SA-	**04**	4/3/2012	0841	3	3.0	17.0	7.82	3.73	7.67	7.44	14.06	19.64	21.5	21.3	15.09	20.58	22.2	30	11	36.5	89	7	20.8
SA-	**05**	4/3/2012	1316	**1**	**1.5**	9.4	9.39	4.63	7.97	7.43	10.54	11.73	23.0	22.2	11.62	12.78	27.2	30	19	49.9	89	7	20.8
SA-	**06**	4/3/2012	1206	1	3.5	13.4	7.50	4.11	7.74	7.36	14.18	19.31	21.8	21.2	15.20	20.16	26.8	30	15	43.2	89	7	20.8
SA-	**07**	4/3/2012	0911	2	3.0	11.5	7.51	5.02	7.78	7.58	17.30	20.67	21.8	21.6	18.23	15.26	22.4	30	11	36.5	89	3	14.1
SA-	**08**	4/3/2012	1333	1	2.0	10.5	8.61	2.99	7.88	7.31	12.94	17.29	22.7	21.4	13.99	18.20	26.8	30	19	49.9	89	3	14.1
SA-	**09**	4/3/2012	1148	3	3.5	16.5	7.64	2.43	7.82	7.72	16.96	25.32	22.4	20.3	17.92	25.78	26.3	30	15	43.2	89	3	14.1
SA-	**10**	4/3/2012	0937	2	3.0	22.0	7.45	1.08	7.81	7.31	19.37	32.42	21.6	18.7	20.21	32.16	22.8	30	11	36.5	89	3	14.1
SA-	**11**	4/3/2012	1351	1	2.0	11.4	8.80	9.21	7.91	7.36	12.08	17.30	23.4	21.8	13.17	18.22	26.5	30	19	49.9	88	59	7.4
SA-	**12**	4/3/2012	1129	1	3.5	16.7	7.74	1.42	7.83	7.27	16.79	29.83	21.9	19.6	17.74	29.66	25.9	30	15	43.2	88	59	7.4
SA-	**13**	4/3/2012	1100	3	4.0	23.0	7.47	4.49	7.95	7.46	19.79	33.93	21.7	18.4	20.62	33.53	25.5	30	11	36.5	88	59	7.4
SA-	**14**	4/3/2012	1409	1	2.5	11.4	8.15	3.83	7.85	7.52	14.57	16.02	22.3	22.0	15.59	16.91	26.8	30	19	49.9	88	55	0.7
SA-	**15**	4/3/2012	1114	1	3.5	16.0	6.46	2.26	7.84	7.47	16.08	21.19	21.9	21.4	17.06	22.07	25.7	30	15	43.2	88	55	0.7
SA-	**16**	4/3/2012	1502	3	1.5	3.6	8.21	7.39	7.81	7.55	4.12	4.22	23.4	23.1	4.86	4.96	26.8	30	23	56.6	88	50	54.0
SA-	**17**	4/3/2012	1426	2	1.5	10.0	9.42	7.58	7.99	7.69	10.00	12.42	22.7	22.3	11.04	13.05	27.0	30	19	49.9	88	50	54.0
SA-	**18**	4/3/2012	1057	3	2.0	18.0	7.57	3.99	7.87	7.55	13.90	33.39	21.7	18.6	14.90	33.02	25.6	30	15	43.2	89	6	31.3
SA-	**19**	4/3/2012	1533	3	2.0	5.4	6.76	7.28	7.85	7.62	11.14	11.68	24.6	22.9	12.24	15.46	26.9	30	22	56.1	88	58	20.9
PA-	**01**	4/5/2012	1009	2	1.5	6.4	7.27	6.16	7.36	7.28	11.73	12.29	21.2	21.4	12.78	13.37	24.6	30	21	7.0	89	6	48.8
PA-	**02**	4/5/2012	1204	1	2.0	9.5	7.89	2.77	7.60	7.13	11.24	19.01	21.6	20.8	12.28	20.28	25.2	30	21	29.2	89	4	53.3
PA-	**03**	4/5/2012	1155	1	1.5	9.5	8.23	7.20	7.58	7.48	11.10	11.23	21.6	21.5	12.14	12.26	25.0	30	21	29.2	89	4	4.2
PA-	**04**	4/5/2012	1029	1	2.5	9.0	7.85	6.75	7.52	7.45	11.70	12.98	21.1	21.5	12.74	14.20	24.7	30	20	39.5	89	6	31.1
PA-	**05**	4/5/2012	1033	3	1.5	5.8	7.69	7.50	7.59	7.57	11.80	11.96	21.2	21.2	12.86	13.00	24.7	30	20	39.5	89	5	42.3
PA-	**06**	4/5/2012	1143	1	1.5	9.3	7.44	7.09	7.61	7.52	11.46	12.30	21.4	21.4	12.51	13.39	25.5	30	20	39.5	89	4	4.2
PA-	**07**	4/5/2012	1056	1	1.5	11.0	8.07	6.74	7.61	7.50	11.61	14.28	21.2	21.6	12.66	15.44	25.4	30	19	50.4	89	5	42.7
PA-	**08**	4/5/2012	1112	1	1.5	11.4	8.01	6.96	7.60	7.53	11.71	14.58	21.2	21.4	12.78	15.97	25.5	30	19	50.8	89	4	53.3
PA-	**10**	4/5/2012	1124	1	1.5	10.4	7.91	7.45	7.55	7.52	11.92	12.99	21.3	21.3	12.97	14.23	25.7	30	19	50.6	89	4	4.0
PE-11-	**A**	4/5/2012	1259	1	2.0	31.0	8.30	0.83	7.72	7.03	11.68	30.82	21.6	18.8	12.78	30.71	25.6	30	21	19.3	89	12	12.6
PE-11-	**B**	4/5/2012	1221	1	2.0	8.0	7.78	2.93	7.59	7.17	11.39	18.32	21.8	20.7	12.44	19.00	24.7	30	21	19.3	88	5	7.8
PE-11-	**C**	4/5/2012	1233	1	2.0	13.0	8.54	6.92	7.72	7.62	11.51	12.55	21.6	20.3	12.55	20.55	24.8	30	21	14.4	89	5	7.8
PM-11-	**A**	4/5/2012	1904	1	1.5	9.8	8.28	3.05	7.81	7.28	12.88	24.30	21.8	20.0	13.91	24.80	26.8	30	20	59.5	89	5	22.9
PM-11-	**B**	4/5/2012	1851	1	2.0	9.0	8.09	2.58	7.69	7.28	12.71	23.15	22.1	20.2	13.74	21.78	27.3	30	20	49.9	89	5	32.7
PM-11-	**C**	4/5/2012	1830	1	1.5	11.2	8.07	1.82	7.80	7.23	13.08	26.75	21.9	19.7	14.14	26.97	27.8	30	20	49.7	89	5	22.9
PM-11-	**D**	4/5/2012	1731	3	1.5	6.2	7.61	9.01	7.94	7.89	11.94	11.95	22.3	22.3	13.00	13.00	28.8	30	20	39.9	89	5	22.8
PM-11-	**E**	4/5/2012	1752	3	2.0	7.8	7.88	7.30	8.02	7.70	11.77	13.31	22.4	22.0	12.82	14.62	28.7	30	20	39.7	89	5	13.1
PM-11-	**F**	4/5/2012	1805	1	1.5	8.2	9.22	6.98	7.93	7.60	11.74	14.23	22.2	21.8	12.79	15.42	28.3	30	20	39.6	89	5	3.7
PM-11-	**G**	4/5/2012	1620	1	2.0	8.8	8.09	6.05	7.87	7.52	11.69	13.52	22.1	21.6	12.75	14.92	28.9	30	20	30.2	89	5	22.8
PM-11-	**H**	4/5/2012	1641	1	2.0	8.8	8.92	3.47	7.78	7.46	11.79	19.41	22.1	20.7	12.83	20.29	28.9	30	20	30.1	89	5	12.9
PM-11-	**I**	4/5/2012	1657	1	2.0	7.2	7.70	8.83	7.81	7.81	11.79	11.74	22.2	22.2	12.85	12.81	28.9	30	20	30.3	89	5	3.2
PN-11-	**A**	4/5/2012	1315	1	1.5	15.3	9.41	3.45	7.95	7.32	11.63	27.13	21.6	19.6	12.68	26.57	25.9	30	21	34.0	89	5	37.9
PN-11-	**B**	4/5/2012	1325	3	2.0	7.6	2.44	6.17	7.98	7.52	11.71	15.62	21.8	20.9	12.75	17.01	25.9	30	21	38.8	89	5	37.6
TB-11-	**A**	4/5/2012	1352	1	2.0	16.0	7.70	5.77	7.91	7.43	12.03	15.95	22.1	20.0	13.09	16.98	25.9	30	20	49.5	88	5	3.1
TB-11-	**B**	4/5/2012	1423	1	2.0	10.7	7.75	2.60	7.81	7.24	12.21	23.43	21.8	20.2	13.36	23.92	26.0	30	20	49.7	89	4	53.0
TB-11-	**C**	4/5/2012	1453	1	2.0	9.5	8.57	3.24	7.82	7.24	11.90	20.96	22.0	20.5	12.95	21.05	26.8	30	20	39.9	89	4	53.4
TB-11-	**D**	4/5/2012	1511	1	2.0	10.5	8.86	4.10	7.85	7.31	11.86	21.28	22.1	20.4	12.92	5.27	26.7	30	20	39.7	89	4	43.2
TB-11-	**E**	4/5/2012	1527	1	2.0	31.4	8.83	0.83	7.81	7.24	11.79	28.26	22.1	18.8	12.66	28.44	26.3	30	20	29.8	89	4	33.5
TB-11-	**F**	4/5/2012	1541	1	2.0	9.2	8.64	3.76	7.85	7.27	11.47	19.60	22.2	20.7	12.51	20.40	27.1	30	20	30.4	89	4	44.6

NTU = Nephelometric Turbidity Unit

TABLE D2

PARAMETERS DETERMINED BY CHEMICAL ANALYSIS

METALS

Antimony
Arsenic
Beryllium
Cadmium
Chromium, Total
Chromium, Trivalent
Chromium. Hexavalent
Copper
Lead
Mercury
Nickel
Selenium
Silver
Thallium
Zinc

PESTICIDES AND PCBs

Aldrin
Alpha-BHC
Beta-BHC
Gamma-BHC (Lindane)
Delta-BHC
Chlordane
Alpha-Chlordane
Gamma- Chlordane
4,4'-DDD
4,4'-DDE
4,4'-DDT
Dieldrin
Endosulfan I
Endosulfan II
Endosulfan sulfate
Endrin
Endrin aldehyde
Heptachlor
Heptachlor epoxide
Toxaphene
Total PCBs

SEMIVOLATILES

Acenaphthene
Acenaphthylene
Anthracene
Benzidine
Benzo(a)anthracene
Benzo(a)pyrene
Benzo(ghi)perylene
Benzo(b&k)fluoranthene
Bis(2-chloroethyloxy)methane
Bis(2-chloroethyl)ether
Bis(2-chloroisoproply)ether
Bis(2-ethylhexyl)phthalate
4-Bromophenyl phenyl ether
Butyl benzyl phthalate
4-chloro-3-methylphenol
2-Chloronapthalene
2-Chlorophenol
4-Chlorophenyl phenyl ether
Chrysene
Dibenzo(ah)anthracene
1,2-Dichlorobenzene
1,3-Dichlorobenzene
1,4-Dichlorobenzene
3,3'-Dichlorobenzidine
2,4-Dichlorophenol
2,4-Dinitrophenol
Diethyl phthalate
2,4-Dimethylphenol
Dimethyl phthalate
Di-n-butyl phthalate
2,4-Dinitrotoluene
2,6-Dinitrotoluene
Di-n-octyl phthalate
1,2-Diphenylhydrazine
Fluoranthene
Fluorene
Hexachlorobenzene
Hexachlorobutadiene
Hexachlorocyclopentadiene
Hexachloroethane
Indeno(123-CD)pyrene
Isophorone
2-Methyl-4,6-dinitrophenol (4,6-dinitro-o-cresol)
Naphthalene
Nitrobenzene
2-Nitrophenol
4-Nitrophenol
N-nitrosodimethylamine
N-nitrosodi-n-propylamine
N-nitrosodiphenylamine
Phenanthrene
Phenol
Pentachlorophenol
Pryene
1,2,4-Trichlorobenzene
2,4,6-Trichlorophenol

TABLE D2 (Concluded)

PARAMETERS DETERMINED BY CHEMICAL ANALYSIS

CONVENTIONAL PARAMETERS	
Ammonia	Total Petroleum Hydrocarbons
Cyanide	Lipids**
Total Organic Carbon	% Solids*

DIOXIN/FURAN CONGENERS	
2,3,7,8 - Tetrachloro Dibenzo-*p*-Dioxin	
1,2,3,7,8 - Pentachloro Dibenzo-p-Dioxin	1,2,3,7,8,9 - Hexachloro Dibenzo-p-Dioxin
1,2,3,4,7,8 - Hexachloro Dibenzo-p-Dioxin	1,2,3,4,6,7,8 - Heptachloro Dibenzo-p-Dioxin
1,2,3,6,7,8 - Hexachloro Dibenzo-p-Dioxin	Octachloro Dibenzo-p-Dioxin
2,3,7,8 - Tetrachloro Dibenzo-p-Furan	2,3,4,6,7,8 - Hexachloro Dibenzo-p-Furan
1,2,3,7,8 - Pentachloro Dibenzo-p-Furan	1,2,3,7,8,9 - Hexachloro Dibenzo-p-Furan
2,3,4,7,8 - Pentachloro Dibenzo-p-Furan	1,2,3,4,6,7,8 - Heptachloro Dibenzo-p-Furan
1,2,3,4,7,8 - Hexachloro Dibenzo-p-Furan	1,2,3,4,7,8,9 - Heptachloro Dibenzo-p-Furan
1,2,3,6,7,8 - Hexachloro Dibenzo-p-Furan	Octachloro Dibenzo-p-Furan

* sediment only
** tissue only

TABLE D3

CONCENTRATIONS OF DETECTED COMPOUNDS (ug/L)
WATER
GULPORT SHIP CHANNEL - 2012

Date Sampled: April 05, 2012

Parameter	WQC CMC	WQC CCC	WQS Acute	WQS Chronic	Detection Limit	PE-11-(A,B,C)	PM-11-(A,B,C)	PM-11-3-(D,E,F)	PM-11-3 (G,H,I)	PN-11-(A,B)	TB-11-(A,B,C)	TB-11-(D,E,F)	TB-11-(D,E,F) Dup	Field Blank
Arsenic	69	36	69	36	1.00	1.50	2.90	BDL	BDL	BDL	BDL	BDL	1.20	BDL
Copper	4.8	3.1	4.8	3.1	1.00	2.50	7.26	BDL	2.80	4.50	1.80	3.20	2.10	BDL
Nickel	74	8.2	75	8.3	1.00	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Selenium	290	71	290	71	2.00	BDL	2.56	2.30	1.29 J	2.40	1.90 J	0.46 J	0.60 J	BDL
Zinc	90	81	90.0	81.0	1.00	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Ammonia*	11.8	1.75	11.8	1.75	0.03	0.34	0.18	0.13	0.12	0.17	0.10	0.12	0.12	N/A
TOC*	N/A	N/A	N/A	N/A	0.10	5.15	5.04	5.49	5.39	5.61	5.15	5.31	4.93	N/A

Dup = Duplicate Sample
BDL = Below Detection Limits
* mg/L = micrograms per liter
J Compound detected value below Quantitation Limits

TABLE D4

CONCENTRATIONS OF DETECTED COMPOUNDS (ug/L)
ELUTRIATE
GULPORT SHIP CHANNEL - 2012

Date Sampled: April 05, 2012

Parameter	WQC CMC	WQC CCC	WQS Acute	WQS Chronic	Detection Limit	PE-11-(A,B,C)	PM-11-(A,B,C)	PM-11-3-(D,E,F)	PM-11-3 (G,H,I)	PN-11-(A,B)	TB-11-(A,B,C)	TB-11-(D,E,F)	TB-11-(D,E,F) Dup
Arsenic	69	36	69	36	1.00	2.30	2.60	1.90	3.00	2.30	2.20	2.60	2.60
Copper	4.8	3.1	4.8	3.1	1.00	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Nickel	74	8.2	75	8.3	1.00	1.40	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Selenium	290	71	290	71	2.00	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Zinc	90	81	90.0	81.0	1.00	BDL	BDL	BDL	24.9	BDL	BDL	BDL	BDL
Ammonia*	11.8	1.75	11.8	1.75	0.03	0.14	0.16	0.13	0.14	0.12	0.13	0.13	0.13
TOC*	N/A	N/A	N/A	N/A	0.10	4.40	4.50	4.11	4.53	4.59	4.59	5.21	5.45

Dup = Duplicate Sample
BDL = Below Detection Limits
* mg/L
J Compound detected value below Quantitation Limits

TABLE D5A

CONCENTRATIONS OF DETECTED COMPOUNDS (dry weight)
SEDIMENT
GULPORT SHIP CHANNEL - 2012

Date Sampled: April 05, 2012

Parameter	Units	Detection Limit	NOAA ERL	PE-11-(A,B,C)		PM-11-3-(A,B,C)		PM-11-3-(D,E,F)		PM-11-3 (G,H,I)		PN-11-(A,B)		TB-11-(A,B,C)		TB-11-(D,E,F)		TB-11-(D,E,F) Dup	
Arsenic	mg/kg	0.30	8.2	5.13		6.35		2.39		3.19		5.85		6.39		**9.68**		**11.0**	
Beryllium	mg/kg	1.00	N/A	0.76	J	1.17		0.37	J	0.40	J	1.12		1.11		1.81		1.49	
Chromium, Total	mg/kg	1.00	81.0	14.8		16.5		5.31		7.25		13.5		13.9		19.7		20.2	
Chromium III	mg/kg	1.00	N/A	14.8		16.5		5.31		7.25		13.5		13.9		19.7		20.2	
Copper	mg/kg	1.00	34.0	9.92		7.13		2.31		2.68		11.2		6.35		8.84		8.88	
Lead	mg/kg	0.30	46.7	15.0		13.2		5.01		6.14		17.4		13.6		18.1		17.8	
Mercury	mg/kg	0.20	0.15	0.07	J	BDL		BDL		BDL		0.06	J	BDL		0.05	J	0.09	J
Nickel	mg/kg	0.50	20.9	8.70		9.28		3.44		4.19		7.94		7.86		11.9		11.4	
Selenium	mg/kg	0.50	N/A	0.37	J	0.23	J	0.21	J	0.22	J	0.70		0.29	J	0.26	J	0.53	
Silver	mg/kg	0.20	1.0	0.07	J	0.06	J	BDL		BDL		0.06	J	0.07	J	0.08	J	0.09	J
Thallium	mg/kg	0.20	N/A	0.14	J	0.15	J	0.06	J	BDL		0.17	J	0.13	J	0.18	J	0.18	J
Zinc	mg/kg	2.00	150	47.2		40.3		13.6		16.7		52.3		37.5		53.7		53.1	
Naphthalene	ug/kg	20.0	160	41.8		BDL		BDL		BDL		BDL		BDL		BDL		BDL	
Phenanthrene	ug/kg	20.0	240	198		BDL		BDL		BDL		BDL		BDL		BDL		BDL	
Anthracene	ug/kg	20.0	85.3	56.1		BDL		BDL		BDL		BDL		BDL		BDL		BDL	
Fluoranthene	ug/kg	20.0	600	273		76.9		39.8		BDL		54.3		43.1		BDL		57.8	
Pyrene	ug/kg	20.0	665	256		83.3		41.4		BDL		63.1		BDL		BDL		66.0	
Chrysene	ug/kg	20.0	384	193		110		45.7		BDL		32.5		BDL		BDL		BDL	
Benzo(a)Anthracene	ug/kg	20.0	261	185		86.4		34.9		BDL		28.4		BDL		BDL		BDL	
Bis (2-ethylhexyl) phthalate	ug/kg	50.0	N/A	BDL		125		BDL		BDL		BDL		BDL		BDL		BDL	
Benzo(b)Fluoranthene	ug/kg	20.0	N/A	236		139		44.9		BDL		27.7		BDL		BDL		BDL	
Benzo(k)Fluoranthene	ug/kg	20.0	N/A	164		118		45.2		BDL		41.0		BDL		BDL		BDL	
Benzo(a)Pyrene	ug/kg	20.0	430	173		92.0		38.6		BDL		29.6		BDL		BDL		BDL	
Indeno(123-cd)Pyrene	ug/kg	20.0	N/A	60.4		34.9		BDL		BDL		BDL		BDL		BDL		BDL	
Benzo(ghi)Perylenene	ug/kg	20.0	N/A	70.3		47.3		22.9		BDL		22.6		BDL		BDL		BDL	
Ammonia	mg/kg	0.10	N/A	133		98.6		35.8		46.5		63.7		119		202		169	
TOC	%	0.10	N/A	1.94		1.31		0.41		0.65		1.21		1.82		2.20		2.72	
Percent Solids	%	N/A	N/A	43.6		47.8		70.6		64.5		52.5		45.0		38.0		34.2	

TABLE D5A

CONCENTRATIONS OF DETECTED COMPOUNDS (dry weight)
SEDIMENT
GULPORT SHIP CHANNEL - 2012

Parameter	Units	Detection Limit	NOAA ERL	PE-11-(A,B,C)	PM-11-(A,B,C)	PM-11-3-(D,E,F)	PM-11-3 (G,H,I)	PN-11-(A,B)	TB-11-(A,B,C)	TB-11-(D,E,F)
UN-NORMALIZED DATA as TEQs										
2,3,7,8-TCDD	pg/g		N/A	0.33 QJ	0.56 Q	0.54 J	0.38 J	0.15 QJ	0.14 QJ	0.14 QJ
1,2,3,7,8-PeCDD	pg/g		N/A	2.3 J	1.8 J	1.3 J	0.97 J	0.84 J	0.43 QJ	0.43 QJ
1,2,3,4,7,8-HxCDD	pg/g		N/A	0.55 B	0.45 B	0.24 BJ	0.16 BJ	0.16 BJ	0.13 BJ	0.13 BJ
1,2,3,6,7,8-HxCDD	pg/g		N/A	1.1 B	0.76 QBJ	0.37 B	0.25 BJ	0.26 BJ	0.21 BJ	0.21 BJ
1,2,3,7,8,9-HxCDD	pg/g		N/A	2.90 B	2.6 CB	0.93 CB	0.62 CB	0.63 CB	0.50 CB	0.50 CB
1,2,3,4,6,7,8-HpCDD	pg/g		N/A	4.1 B	2.9 B	1.2 B	0.88 B	0.85 B	0.72 B	0.72 B
OCDD	pg/g		N/A	1.8 BE	1 BE	0.60 B	0.45 B	0.45 B	0.39 B	0.39 B
2,3,7,8-TCDF	pg/g		N/A	0.053 J	0.016 QJ	0.13 Q	0.12 Q	0.13 Q	0.068 Q	0.068 Q
1,2,3,7,8-PeCDF	pg/g		N/A	0.010 QBJ	0.0039 QBJ	0.017 QBJ	0.013 BJ	0.011 QBJ	0.0084 BJ	0.0084 BJ
2,3,4,7,8-PeCDF	pg/g		N/A	0.16 QBJ	0.036 QBJ	0.15 QBJ	0.13 BJ	0.087 QBJ	0.081 BJ	0.081 BJ
1,2,3,4,7,8-HxCDF	pg/g		N/A	0.15 BJ	0.02 QBJ	0.11 CBJ	0.062 QBJ	0.064 QBJ	0.053 CBJ	0.053 CBJ
1,2,3,6,7,8-HxCDF	pg/g		N/A	0.13 QBJ	0.035 BJ	0.069 BJ	0.051 QBJ	0.045 BJ	0.035 QBJ	0.035 QBJ
2,3,4,6,7,8-HxCDF	pg/g		N/A	0.079 BJ	0.016 QBJ	0.038 BJ	0.027 BJ	0.023 BJ	0.022 BJ	0.022 BJ
1,2,3,7,8,9-HxCDF	pg/g		N/A	0.019 QBJ	0.0099 BJ	0.015 QBJ	0.016 BJ	0.014 BJ	0.026 QBJ	0.026 QBJ
1,2,3,4,6,7,8-HpCDF	pg/g		N/A	0.16 B	0.032 B	0.073 B	0.046 B	0.043 B	0.033 QB	0.033 QB
1,2,3,4,7,8,9-HpCDF	pg/g		N/A	0.011 BJ	0.0028 QBJ	0.0093 BJ	0.0077 QBJ	0.0069 BJ	0.0029 QBJ	0.0029 QBJ
OCDF	pg/g		N/A	0.0033 B	0.0006 QBJ	0.0014 BJ	0.00072 BJ	0.00048 BJ	0.00084 BJ	0.00084 BJ
Total TEQ	pg/g		N/A	14	10	5.8	4.2	3.8	2.9	2.9
NORMALIZED DATA as TEQs per 1% Organic Carbon										
2,3,7,8-TCDD	pg/g		N/A	17.0	42.7	132	58.5	12.4	7.69	6.36
1,2,3,7,8-PeCDD	pg/g		N/A	119	137	317	149	69.4	23.6	19.5
1,2,3,4,7,8-HxCDD	pg/g		N/A	28.4	34.4	58.5	24.6	13.2	7.14	5.91
1,2,3,6,7,8-HxCDD	pg/g		N/A	56.7	58.0	90.2	38.5	21.5	11.5	9.55
1,2,3,7,8,9-HxCDD	pg/g		N/A	149.5	198.5	226.8	95.4	52.1	27.5	22.7
1,2,3,4,6,7,8-HpCDD	pg/g		N/A	211.3	221.4	292.7	135.4	70.2	39.6	32.7
OCDD	pg/g		N/A	92.8	76.3	146.3	69.2	37.2	21.4	17.7
2,3,7,8-TCDF	pg/g		N/A	2.73	1.22	31.7	18.5	10.7	3.74	3.09
1,2,3,7,8-PeCDF	pg/g		N/A	0.52	0.30	4.15	2.00	0.91	0.46	0.38
2,3,4,7,8-PeCDF	pg/g		N/A	8.25	2.75	36.6	20.0	7.19	4.45	3.68
1,2,3,4,7,8-HxCDF	pg/g		N/A	7.73	1.83	26.8	9.54	5.29	2.91	2.41
1,2,3,6,7,8-HxCDF	pg/g		N/A	6.70	2.67	16.8	7.85	3.72	1.92	1.59
2,3,4,6,7,8-HxCDF	pg/g		N/A	4.07	1.22	9.27	4.15	1.90	1.21	1.00
1,2,3,7,8,9-HxCDF	pg/g		N/A	0.98	0.76	3.66	2.46	1.16	1.43	1.18
1,2,3,4,6,7,8-HpCDF	pg/g		N/A	8.25	2.44	17.8	7.08	3.55	1.81	1.50
1,2,3,4,7,8,9-HpCDF	pg/g		N/A	0.57	0.21	2.27	1.18	0.57	0.16	0.13
OCDF	pg/g		N/A	0.17	0.05	0.34	0.11	0.04	0.05	0.04
Total TEQ	pg/g		N/A	722	763	1415	646	314	159	132

Dup = Duplicate Sample
BDL = Below Detection Limit
N/A = Not Applicable
J Estimated result. Analyte detected below Quantitation Limits

TABLE D5A

CONCENTRATIONS OF DETECTED COMPOUNDS (dry weight)
SEDIMENT
GULPORT SHIP CHANNEL - 2012

Q Extimated maximum possible concentration.
C Co-eluting isomer
B Method blank contamination. The associated method blank contains the target analyte at a reportable level.
E Estimated result. Result concentration exceeds the calibration range.
S Ion supression.
mg/kg = milligrams per kilograms
µg/kg = micrograms per kilograms

TABLE D5B

GRAIN SIZE DATA
GULPORT SHIP CHANNEL - 2012

Date Sampled: April 03 & 05, 2012

Parameter	Units	Detection Limit	PE-11- A	PE-11- B	PE-11- C	PM-11- 3A	PM-11- 3B	PM-11- 3C	PM-11- 3D	PM-11- 3E	PM-11- 3F	PM-11- 3G	PM-11- 3H	PM-11- 3I
Gravel	%	N/A	1.6	0.0	11.0	0.3	0.0	0.0	1.4	0.0	0.0	0.0	0.0	0.0
Sand	%	N/A	33.3	39.8	21.0	37.3	19.0	31.6	93.0	97.7	32.0	98.5	33.6	64.1
Silt	%	N/A	28.8	33.1	37.4	28.3	34.1	31.1	5.0	0.5	31.7	0.3	33.0	17.2
Clay	%	N/A	36.3	27.1	30.6	34.1	46.9	37.3	0.6	1.8	36.3	1.2	33.4	18.7
D50	mm	N/A	0.0140	0.0466	0.0417	0.0422	0.0074	0.0199	0.419	0.297	0.036	0.269	0.0458	0.236

Parameter	Units	Detection Limit	PN-11- A	PN-11- B	TB-11- A	TB-11- B	TB-11- C	TB-11- D	TB-11- E	TB-11- F	SA- 01	SA- 02	SA- 03	SA- 04
Gravel	%	N/A	0.0	2.7	0.0	0.0	1.8	0.0	0.0	0.9	0.0	0.0	0.0	3.9
Sand	%	N/A	59.3	78.1	2.5	80.9	56.2	15.8	5.4	74.7	98.0	78.2	7.0	46.0
Silt	%	N/A	19.8	12.9	55.7	12.3	7.9	32.2	46.6	5.4	1.4	20.0	53.9	26.6
Clay	%	N/A	20.9	6.3	41.8	6.8	34.1	52.0	48.0	19.0	0.6	1.8	39.1	23.5
D50	mm	N/A	0.153	0.221	0.0105	0.251	0.199	0.0041	0.0060	0.225	0.489	0.192	0.0151	0.0748

Parameter	Units	Detection Limit	SA- 05	SA- 06	SA- 07	SA- 08	SA- 09	SA- 10	SA- 11	SA- 12	SA- 13	SA- 14	SA- 15	SA- 16
Gravel	%	N/A	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sand	%	N/A	13.7	9.2	67.5	20.4	80.9	47.7	33.7	39.7	66.9	42.5	19.2	96.1
Silt	%	N/A	51.7	42.9	21.4	35.4	9.4	40.3	38.6	47.6	18.2	43.9	33.2	2.0
Clay	%	N/A	34.6	47.9	11.1	44.2	9.4	12.0	27.7	12.7	14.9	13.6	47.6	1.9
D50	mm	N/A	0.0307	0.0075	0.149	0.0209	0.224	0.0723	0.0522	0.0640	0.225	0.0620	0.0068	0.182

Parameter	Units	Detection Limit	SA- 17	SA- 18	PA- 01	PA- 02	PA- 03	PA- 04	PA- 05	PA- 06	PA- 07	PA- 08	PA- 10
Gravel	%	N/A	0.9	1.2	0.0	1.5	0.0	0.0	0.3	0.0	0.0	0.0	0.0
Sand	%	N/A	15.8	87.9	93.6	61.6	26.8	43.7	96.0	48.2	10.8	26.4	51.8
Silt	%	N/A	33.5	2.3	5.8	19.4	41.2	34.3	3.7	26.9	43.9	40.2	23.1
Clay	%	N/A	49.8	8.6	0.6	17.5	32.0	22.0	0.0	24.9	45.3	33.4	25.1
D50	mm	N/A	0.0067	0.222	0.312	0.171	0.0382	0.0602	0.337	0.0675	0.0084	0.0386	0.0838

mm = millimeter

Appendix E

Water Quality Data

WATER QUALITY DATA

Project: **Gulfport Mississippi Expansion - Benthic Habitat Assessment** Project Number 100018536

Date(s) Collected: April 3 & 5, 2012 Tide, MLT April 3 - 5:05 @ -0.28'
April 5 - 4:53 @ -0.79 / 18:00 @ -0.27

Wind Direction: April 3 - East Southeast Wind Speed: April 3 - 10 to 15 mph
April 5 - West Southwest April 5 - 15 to 20 mph

Weather and Water Conditions: April 3 - Clear skys and smooth seas
April 5 - Over cast and 1 foot seas

Sample Number	SA* 01	SA* 02	SA* 03	SA* 04	SA* 05	SA* 06	SA* 07	SA* 08	SA* 09
Water Depth (Ft.)	8.4	7.5	12.0	17.0	9.4	13.4	11.5	10.5	16.5
DO (mg/L)	7.73	7.70	7.96	7.82	9.39	7.50	7.51	8.61	7.64
	6.42	6.88	5.67	3.73	4.63	4.11	5.02	2.99	2.43
pH	7.08	7.70	7.52	7.67	7.97	7.74	7.78	7.88	7.82
	7.02	7.54	7.54	7.44	7.43	7.36	7.58	7.31	7.72
Salinity (psu)	7.11	8.88	10.78	14.06	10.54	14.18	17.30	12.94	16.96
	7.21	9.13	13.68	19.64	11.73	19.31	20.67	17.29	25.32
Water Temp. (°C)	22.04	22.57	21.34	21.51	23.03	21.81	21.81	22.71	22.36
	22.14	22.46	21.5	21.25	22.19	21.19	21.62	21.40	20.28
NTU	8.03	9.89	11.82	15.09	11.62	15.20	18.23	13.99	17.92
	8.14	10.16	14.83	20.58	12.78	20.16	15.26	18.20	25.78
Air Temp. (°C)	22.5	26.9	23.2	22.2	27.2	26.8	22.4	26.8	26.3
Lat.	N30 15 43.2	N30 19 49.9	N30 15 43.2	N30 11 36.5	N30 19 49.9	N30 15 43.2	N30 11 36.5	N30 19 49.9	N30 15 43.2
Long.	W89 15 34.2	W89 11 27.5	W89 11 27.5	W89 07 20.8	W89 07 20.8	W89 07 20.8	W89 03 14.1	W89 03 14.1	W89 03 14.1
Substrata	2	3	2	3	1	1	2	1	3
Secchi Depth (ft)	1.5	2.0	2.5	3.0	1.5	3.5	3.0	2.0	3.5
Time	7:38	12:33	8:11	8:41	13:16	12:06	9:11	13:33	11:48
Comment	4/3/2012	4/3/2012	4/3/2012	4/3/2012	4/3/2012	4/3/2012	4/3/2012	4/3/2012	4/3/2012

REMARKS * Olny Grain Size and Sediment was collected

WATER QUALITY DATA

Project: **Gulfport Mississippi Expansion - Benthic Habitat Assessment** Project Number 100018536

Date(s) Collected: April 3 & 5, 2012 Tide, MLT April 3 - 5:05 @ -0.28'
April 5 - 4:53 @ -0.79 / 18:00 @ -0.27

Wind Direction: April 3 - East Southeast Wind Speed: April 3 - 10 to 15 mph
April 5 - West Southwest April 5 - 15 to 20 mph

Weather and Water Conditions: April 3 - Clear skys and smooth seas
April 5 - Over cast and 1 foot seas

Sample Number	SA* 10	SA* 11	SA* 12	SA* 13	SA* 14	SA* 15	SA* 16	SA* 17	SA* 18
Water Depth (Ft.)	22.0	11.4	16.7	23.0	11.4	16.0	3.6	10.0	18.0
DO (mg/L)	7.45	8.80	7.74	7.47	8.15	6.46	8.21	9.42	7.57
	1.08	9.21	1.42	4.49	3.83	2.26	7.39	7.58	3.99
pH	7.81	7.91	7.83	7.95	7.85	7.84	7.81	7.99	7.87
	7.31	7.36	7.27	7.46	7.52	7.47	7.55	7.69	7.55
Salinity (psu)	19.37	12.08	16.79	19.79	14.57	16.08	4.12	10.0	13.90
	32.42	17.30	29.83	33.93	16.02	21.19	4.22	12.42	33.39
Water Temp. (°C)	21.57	23.38	21.87	21.66	22.31	21.93	23.38	22.73	21.73
	18.65	21.77	19.61	18.35	22.04	21.41	23.12	22.32	18.59
NTU	20.21	13.17	17.74	20.62	15.59	17.06	4.86	11.04	14.90
	32.16	18.22	29.66	33.53	16.91	22.07	4.96	13.05	33.02
Air Temp. (°C)	22.8	26.5	25.9	25.5	26.8	25.7	26.8	27.0	25.6
Lat.	N30 11 36.5	N30 19 49.9	N30 15 43.2	N30 11 36.5	N30 19 49.9	N30 15 43.2	N30 23 56.6	N30 19 49.9	N30 15 43.2
Long.	W89 03 14.1	W88 59 07.4	W88 59 07.4	W88 59 07.4	W88 55 00.7	W88 55 00.7	W88 50 54.0	W88 50 54.0	W89 06 31.3
Substrata	2	1	1	3	1	1	3	2	3
Secchi Depth (ft)	5.0	2.0	3.5	4.0	2.5	3.5	1.5	1.5	2.0
Time	9:37	13:51	11:29	11:00	14:09	11:14	15:02	14:26	10:57
Comment	4/3/2012	4/3/2012	4/3/2012	4/3/2012	4/3/2012	4/3/2012	4/3/2012	4/3/2012	4/3/2012

REMARKS * Olny Grain Size and Sediment was collected

WATER QUALITY DATA

Project: **Gulfport Mississippi Expansion - Benthic Habitat Assessment** Project Number 100018536

Date(s) Collected: April 3 & 5, 2012 Tide, MLT April 3 - 5:05 @ -0.28'
April 5 - 4:53 @ -0.79 / 18:00 @ -0.27

Wind Direction: April 3 - East Southeast Wind Speed: April 3 - 10 to 15 mph
April 5 - West Southwest April 5 - 15 to 20 mph

Weather and Water Conditions: April 3 - Clear skys and smooth seas
April 5 - Over cast and 1 foot seas

Sample Number	PA* 1	PA* 2	PA* 3	PA* 4	PA* 5	PA* 6	PA* 7	PA* 8	PA* 10
Water Depth (Ft.)	6.4	9.5	9.5	9.0	5.8	9.3	11.0	11.4	10.4
DO (mg/L)	7.27	7.89	8.23	7.85	7.69	7.44	8.07	8.01	7.91
	6.16	2.77	7.2	6.75	7.50	7.09	6.74	6.96	7.45
pH	7.36	7.60	7.58	7.52	7.59	7.61	7.61	7.60	7.55
	7.28	7.13	7.48	7.45	7.57	7.52	7.50	7.53	7.52
Salinity (psu)	11.73	11.24	11.10	11.70	11.80	11.46	11.61	11.71	11.92
	12.29	19.01	11.23	12.98	11.96	12.30	14.28	14.58	12.99
Water Temp. (°C)	21.15	21.58	21.55	21.08	21.22	21.43	21.18	21.23	21.26
	21.41	20.78	21.45	21.48	21.20	21.43	21.55	21.41	21.26
NTU	12.78	12.28	12.14	12.74	12.86	12.51	12.66	12.78	12.97
	13.37	20.28	12.26	14.20	13.00	13.39	15.44	15.97	14.23
Air Temp. (°C)	24.6	25.2	25.0	24.7	24.7	25.5	25.4	25.5	25.7
Lat.	N30 21 07.00	N30 21 29.2	N30 21 29.2	N30 20 39.5	N30 20 39.5	N30 20 39.5	N30 19 50.4	N30 19 50.8	N30 19 50.6
Long.	W89 06 48.80	W89 04 53.3	W89 04 04.2	W89 06 31.1	W89 05 42.3	W89 04 04.2	W89 05 42.7	W89 04 53.3	W89 04 04.0
Substrata	2	1	1	1	3	1	1	1	1
Secchi Depth (ft)	1.5	2.0	1.5	2.5	1.5	1.5	1.5	1.5	1.5
Time	10:09	12:04	11:55	10:29	10:33	11:43	10:56	11:12	11:24
Comment	4/5/2012	4/5/2012	4/5/2012	4/5/2012	4/5/2012	4/5/2012	4/5/2012	4/5/2012	4/5/2012

REMARKS * Olny Grain Size and Sediment was collected

WATER QUALITY DATA

Project: **Gulfport Mississippi Expansion - Benthic Habitat Assessment** Project Number 100018536

Date(s) Collected: April 3 & 5, 2012 Tide, MLT April 3 - 5:05 @ -0.28'
April 5 - 4:53 @ -0.79 / 18:00 @ -0.27

Wind Direction: April 3 - East Southeast Wind Speed: April 3 - 10 to 15 mph
April 5 - West Southwest April 5 - 15 to 20 mph

Weather and Water Conditions: April 3 - Clear skys and smooth seas
April 5 - Over cast and 1 foot seas

Sample Number	PE-11 A	PE-11 B	PE-11 C	PM-11 A	PM-11 B	PM-11 C	PM-11 D	PM-11 E	PM-11 F
Water Depth (Ft.)	31	8	13	9.8	9.0	11.2	6.2	7.8	8.2
DO (mg/L)	8.30	7.78	8.54	8.28	8.09	8.07	7.61	7.88	9.22
	0.83	2.93	6.92	3.05	2.55	1.82	9.01	7.30	6.98
pH	7.72	7.59	7.72	7.81	7.69	7.80	7.94	8.02	7.93
	7.03	7.17	7.62	7.28	7.28	7.23	7.89	7.70	7.60
Salinity (psu)	11.68	11.39	11.51	12.88	12.71	13.08	11.94	11.77	11.74
	30.82	18.32	12.55	24.30	23.15	26.75	11.95	13.31	14.23
Water Temp. (°C)	21.61	21.75	21.62	21.79	22.14	21.88	22.34	22.35	22.24
	18.81	20.72	20.32	20.00	20.16	19.66	22.33	21.95	21.77
NTU	12.78	12.44	12.55	13.91	13.74	14.14	13.00	12.82	12.79
	30.71	19.00	20.55	24.80	23.78	26.97	13.00	14.62	15.42
Air Temp. (°C)	25.6	24.7	24.8	26.8	27.3	27.8	28.8	28.7	28.3
Lat.	N30 21 19.3	N30 21 19.3	N30 21 14.4	N30 20 59.5	N30 20 49.9	N30 20 49.7	N30 20 39.9	N30 20 39.7	N30 20 39.6
Long.	W89 05 12.6	W89 05 07.8	W89 05 07.8	W89 05 22.9	W89 05 32.7	W89 05 22.9	W89 05 22.8	W89 05 13.1	W89 05 03.7
Substrata	1	1	1	1	1	1	3	3	1
Secchi Depth (ft)	2.0	2.0	2.0	1.5	2.0	1.5	1.5	2.0	1.5
Time	12:59	12:21	12:33	19:04	18:51	18:30	17:31	17:52	18:05
Comment	4/5/52012	4/5/2012	4/5/2012	4/5/2012	4/5/2012	4/5/2012	4/5/2012	4/5/2012	4/5/2012

REMARKS:

WATER QUALITY DATA

Project: **Gulfport Mississippi Expansion - Benthic Habitat Assessment** Project Number 100018536

Date(s) Collected: April 3 & 5, 2012 Tide, MLT April 3 - 5:05 @ -0.28'
April 5 - 4:53 @ -0.79 / 18:00 @ -0.27

Wind Direction: April 3 - East Southeast Wind Speed: April 3 - 10 to 15 mph
April 5 - West Southwest April 5 - 15 to 20 mph

Weather and Water Conditions: April 3 - Clear skys and smooth seas
April 5 - Over cast and 1 foot seas

Sample Number	PM-11 G	PM-11 H	PM-11 I	PN-11 A	PN-11 B	TB-11 A	TB-11 B	TB-11 C	TB-11 D
Water Depth (Ft.)	8.8	8.8	7.2	15.3	7.6	16.0	10.7	9.5	10.5
DO (mg/L)	8.09	8.92	7.70	9.41	2.44	7.70	7.75	8.57	8.86
	6.05	3.47	8.83	3.45	6.17	5.77	2.60	3.24	4.10
pH	7.87	7.78	7.81	7.95	7.98	7.91	7.81	7.82	7.85
	7.52	7.46	7.81	7.32	7.52	7.43	7.24	7.24	7.31
Salinity (psu)	11.69	11.79	11.79	11.63	11.71	12.03	12.21	11.90	11.86
	13.52	19.41	11.74	27.13	15.62	15.95	23.43	20.96	21.28
Water Temp. (°C)	22.14	22.09	22.16	21.61	21.76	22.12	21.75	21.96	22.10
	21.6	20.69	22.16	19.62	20.91	20.01	20.15	20.48	20.37
NTU	12.75	12.83	12.85	12.68	12.75	13.09	13.36	12.95	12.92
	14.92	20.29	12.81	26.57	17.01	16.98	23.92	21.05	5.27
Air Temp. (°C)	28.9	28.9	28.9	25.9	25.9	25.9	26.0	26.8	26.7
Lat.	N30 20 30.2	N30 20 30.1	N30 20 30.3	N30 21 34.0	N30 21 38.8	N30 20 49.5	N30 20 49.7	N30 20 39.9	N30 20 39.7
Long.	W89 05 22.8	W89 05 12.9	W89 05 03.2	W89 05 37.9	W89 05 37.6	W89 05 03.1	W89 04 53.0	W89 04 53.4	W89 04 43.2
Substrata	1	1	1	1	3	1	1	1	1
Secchi Depth (ft)	2.0	2.0	2.0	1.5	2.0	2.0	2.0	2.0	2.0
Time	16:20	16:41	16:57	13:15	13:25	13:52	14:23	14:53	15:11
Comment	4/5/2012	4/5/2012	4/5/2012	4/5/2012	4/5/2012	4/5/2012	4/5/2012	4/5/2012	4/5/2012

REMARKS TB-11-D , TB-11-E, & TB-11-F makeup DUP 1

WATER QUALITY DATA

Project: **Gulfport Mississippi Expansion - Benthic Habitat Assessment** Project Number 100018536

Date(s) Collected: April 3 & 5, 2012 Tide, MLT April 3 - 5:05 @ -0.28'
April 5 - 4:53 @ -0.79 / 18:00 @ -0.27

Wind Direction: April 3 - East Southeast Wind Speed: April 3 - 10 to 15 mph
April 5 - West Southwest April 5 - 15 to 20 mph

Weather and Water Conditions: April 3 - Clear skys and smooth seas
April 5 - Over cast and 1 foot seas

Sample Number	TB-11 E	TB-11-F	SA* 19						
Water Depth (Ft.)	31.4	9.2	5.4						
DO (mg/L)	8.83	8.64	6.76						
	0.83	3.76	7.28						
pH	7.81	7.85	7.85						
	7.24	7.27	7.62						
Salinity (psu)	11.79	11.47	11.14						
	28.26	19.6	11.68						
Water Temp. (°C)	22.08	22.16	24.61						
	18.79	20.66	22.92						
NTU	12.66	12.51	12.24						
	28.44	20.4	15.46						
Air Temp. (°C)	26.3	27.1	26.9						
Lat.	N30 20 29.8	N30 20 30.42	N30 22 56.11						
Long.	W89 04 33.5	W89 04 44.56	W88 58 20.91						
Substrata	1	1	3						
Secchi Depth (ft)	2	2	2						
Time	15:27	15:41	15:33						
Comment	4/5/2012	4/5/2012	4/3/2012						

REMARKS TB-11-D , TB-11-E, & TB-11-F makeup DUP 1 * Olny Grain Size and Sediment was collected