Office of Water
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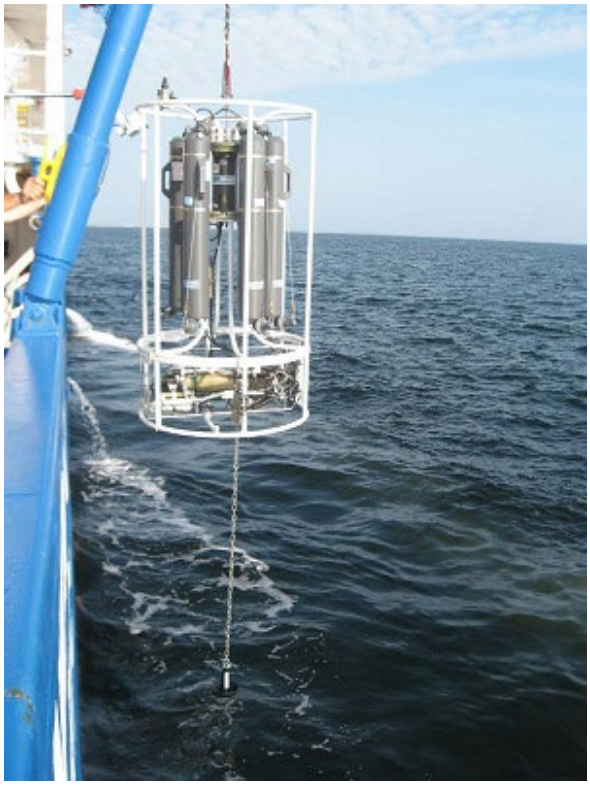
2020 National MPRSA Ocean Site Monitoring Assessment Report



EPA Marine Protection Permitting Program

January 2024

Executive Summary

The Marine Protection, Research, and Sanctuaries Act (MPRSA) regulates the transportation and disposition (dumping) of any material into ocean waters. Under the MPRSA, the U.S. Environmental Protection Agency is responsible for designating and managing MPRSA ocean sites used for permitted activities. The U.S. Army Corps of Engineers (USACE) is responsible for issuing MPRSA permits for dredged material using the EPA's environmental criteria; MPRSA permits for ocean dumping of dredged material are subject to the EPA's review and written concurrence. For all other materials, the EPA is responsible for issuing MPRSA permits. The EPA, together with USACE, develops site management and monitoring plans (SMMPs) for each MPRSA ocean site designated for the ocean dumping of dredged material. The EPA's management and monitoring of these ocean sites ensures that MPRSA permitted activities will not unreasonably degrade or endanger human health or welfare, the marine environment, or economic potentialities.

In 2020, the EPA managed 99 MPRSA-designated ocean sites located off the U.S. Atlantic, Gulf of Mexico, and Pacific coasts; and near the islands of Puerto Rico, Hawaii, Guam, and American Samoa. This National MPRSA Ocean Site Monitoring Assessment Report provides a comprehensive overview of the EPA's 2020 monitoring activities conducted at ten MPRSA-designated ocean sites and one whale carcass disposal area in five of the EPA's coastal Regions:

- Western Long Island Sound Disposal Site, CT (Region 1)
- Historic Area Remediation Site (HARS), NJ and Whale Disposal Area (Region 2)
- Morehead City, NC Ocean Dredged Material Disposal Site (ODMDS)(Region 4)
- Wilmington, NC ODMDS (Region 4)
- Corpus Christi Ship Channel Maintenance, TX ODMDS (Region 6)
- Corpus Christi Ship Channel New Work/Construction, TX ODMDS (Region 6)
- Brazos Island Harbor Maintenance, TX ODMDS (Region 6)
- Brazos Island Harbor New Work/Construction, TX ODMDS (Region 6)
- Matagorda Ship Channel, TX ODMDS (Region 6)
- LA-2, CA ODMDS (Region 9)

Based on the results of these 2020 oceanographic surveys, the EPA determined that environmentally acceptable conditions were met at each of the surveyed ocean sites and permitted disposal of dredged material under the MPRSA can continue at these sites.

Additionally, the EPA will use the data and information collected in 2020:

- to improve on the protocol followed to ensure whale carcasses disposed in ocean waters off the coast of New Jersey sink to the whale carcass disposal area;
- to inform site management, including modification of five ODMDSs along the Gulf coast of Texas, as well as future updates to each sites' MPRSA-required management and monitoring plan;
- to inform future surveys at these sites, including where increased dredged material disposal from deepening and navigation infrastructure projects is anticipated, to ensure dumping will not unreasonably degrade or endanger human health or the environment; and
- to refine methodologies for collecting data from towed video (e.g., remotely operated vehicle) to be able to collect comparable quantitative information via imagery and video in rocky and hard bottom areas.

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Acronyms and Abbreviations

aRPD	apparent redox potential discontinuity
BVA	Barry Vittor and Associates
CFR	Code of Federal Regulations
COC	contaminant of concern
CTD	conductivity, temperature and depth meter
DDT	dichloro-diphenyl-trichloroethane
ER-L	effects range-low
ER-M	effects range-median
ft	feet
F/V	fishing vessel
HARS	Historic Area Remediation Site
km	kilometers
km^2	square kilometers
m	meter
m^2	square meter
m^3	cubic meter
MPRSA	Marine Protection, Research and Sanctuaries Act
MRL	minimum reporting limit
nmi	nautical mile
nmi^2	square nautical mile
NOAA	National Oceanic and Atmospheric Administration
ODMDS	ocean dredged material disposal site
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
PRA	priority remediation area
PVI	plan view imaging/image
ROV	remotely operated vehicle
R/V	research vessel
SMMP	site management and monitoring plan
SPI	sediment profile imaging/image
SQG	sediment quality guideline
SVOC	semi-volatile organic compound
TOC	total organic carbon
USACE	U.S. Army Corps of Engineers
USC	United States Code
WLDS	Western Long Island Sound Disposal Site
y^3	cubic yard

1.0 Introduction

The Marine Protection, Research, and Sanctuaries Act (MPRSA) regulates the dumping and transportation for the purpose of dumping of any material into the ocean. The MPRSA defines "dumping" broadly as a "disposition of material" which includes release for both disposal and non-disposal purposes (33 U.S.C. Section 1402(f)).

The MPRSA prohibits or restricts (primarily in terms of material type, amount, and location) the disposition of materials into the ocean that would adversely affect human health, welfare, or amenities; the marine environment; ecological systems; or economic potentialities. Section 101 of the MPRSA (33 U.S.C. 1411) generally prohibits the transportation of any material for the purpose of dumping, except as authorized by a permit.

In the United States today, the primary material (in terms of volume) permitted under the MPRSA is uncontaminated dredged material, which is sediment that is excavated or otherwise removed from our nation's waterways. The removal of sediment supports a network of coastal ports and harbors that are used for commercial, transportation, national defense, and recreational purposes. In 2019, this marine transportation network, partially facilitated by the dredging of waterways, contributed more than $69 billion and 581,000 jobs to the U.S. economy (National Ocean Economics Program). Other materials that are permitted under the MPRSA include fish wastes, vessels, marine mammal carcasses, and human remains for burials at sea.

Under the MPRSA, the U.S. Environmental Protection Agency establishes marine protection criteria for the evaluation of all MPRSA permit applications. Under the MPRSA, the EPA is the permitting authority for all materials other than dredged material. In the case of dredged material, the U.S. Army Corps of Engineers (USACE) issues MPRSA permits (or, in the case of federal navigation projects, directly authorizes activities under the MPRSA) using the EPA's marine protection criteria (40 CFR 227 and 228). All MPRSA permits and federal projects involving the disposition of dredged material into the ocean are subject to the EPA's review and written concurrence.

Dredged material that is proposed for permitting under the MPRSA is evaluated and tested to ensure that the material will not adversely affect human health and the marine environment. The sediments dredged from our nation's waterways sometimes are contaminated by historical pollution. If biologically available, contaminants may be ingested or absorbed by marine organisms, resulting in toxicity or bioaccumulation (accumulation of pollutants in the organism's tissues), which, in turn, exposes other organisms in the food web, potentially including humans. The *Evaluation of Dredged Material Proposed for Ocean Disposal,* commonly known as the Green Book (EPA 503/8-91/001), contains technical guidance for determining the suitability of dredged material for ocean disposal through chemical, physical, and biological evaluations. Only dredged material found suitable for permitting under the MPRSA using the procedures in the Green Book can be released in an MPRSA ocean site.

The EPA establishes the criteria for the designation of MPRSA ocean sites and is responsible for designating these sites under the MPRSA. To minimize the adverse impacts of MPRSA-permitted activities on human health and the marine environment, the EPA designates sites based on environmental studies of the proposed site and the regions adjacent to the proposed site, and historical knowledge of the impact of dumping on areas with similar physical, chemical, and biological characteristics. The EPA analyzes these impacts through environmental assessments or environmental impact statements. In general, the EPA designates sites only in areas where MPRSA-

permitted activities will not have a significant impact on various amenities, such as fisheries, coral reefs, and endangered species.

The EPA is also responsible for managing all ocean sites designated under the MPRSA. Managing MPRSA ocean sites involves:

- regulating the times, quantity, and characteristics of the material released at the site;
- establishing release controls, conditions, and requirements to minimize potential impacts to the marine environment; and
- monitoring the site and surrounding environment to verify that unanticipated or significant adverse effects are not occurring from historical or continued use of the site and that terms of the MPRSA permit are met.

All designated MPRSA ocean sites are required to have a site management and monitoring plan (SMMP). The EPA, in conjunction with the USACE, develops an SMMP for each site. Each SMMP includes, but is not limited to:

- a baseline assessment of site conditions;
- a monitoring program for the site;
- special management conditions or practices to be implemented at the site that are necessary for protection of the environment;
- consideration of the quantity of material and the presence, nature, and bioavailability of the contaminants in the material;
- consideration of the anticipated long-term use of the site; and
- a schedule for review and revision of the SMMP.

1.1 Ocean Site Monitoring

In 2020, the EPA managed 99 MPRSA-designated ocean sites located off the U.S. Atlantic, Gulf of Mexico, and Pacific coast; and near Puerto Rico, Hawaii, Guam, and American Samoa.

The EPA monitors environmental conditions in and around ocean sites as part of its implementation of the MPRSA. Under the MPRSA and its implementing regulations, the EPA uses monitoring data to:

- Evaluate potential ocean sites and designate ocean sites (MPRSA 102(c)(1); 40 CFR 228.4(b), 40 CFR 228.6(a));
- Assess trends in environmental impact (40 CFR 228.9(a)(1));
- Evaluate impacts after site use (40 CFR 228.10(a) and (b));
- Modify site use (40 CFR 228.11(a) and (d));
- Prohibit activities where necessary (MPRSA 102(c)(2)); and
- Develop an SMMP for each site, which must be reviewed and revised at least every 10 years (MPRSA 102(c)(3)).

The EPA's Regional MPRSA Coordinators and Chief Scientists plan and conduct oceanographic surveys to assess the physical, biological and chemical conditions at ocean sites and the surrounding marine environment. The EPA typically evaluates environmental impact at a site by comparing current conditions to those at the time of designation (baseline conditions) along with any other historical survey data. For example, the EPA may use monitoring information to evaluate movement and deposition of the permitted material to determine whether or how to modify site use. Ocean areas near the MPRSA ocean site which are not affected by permitted activities are used for comparisons to assess the impact from site use. The quantity and distribution of samples

collected in each monitoring survey are determined based on survey- and site-specific factors. The information collected from these site assessments inform the EPA's ongoing planning and decision-making regarding the management and monitoring of ocean sites.

As part of oceanographic surveys of the sites, the EPA may collect a variety of data to ensure that permitted dredged material is being adequately tested and that there are no unexpected adverse impacts at and around the sites. Sediment samples, water samples, organisms from benthic trawls, sediment plan view images (PVI) (photographs of the surface of the seafloor), and/or sediment profile images (SPI) (photographs of a cross-section of the upper 15-20 cm of the sediment-water interface) may be collected to evaluate the physical and biological state of the benthic environment in and around the ocean site and at reference areas. Parameters used to evaluate benthic habitat or benthic habitat quality include, but are not limited to: sediment grain size, depth of oxygenated sediment, depth of the apparent redox potential discontinuity (aRPD) (which indicates habitat quality by measuring interactions between sediment chemistry and biological activity within sediment), and sediment penetrability (Rhoads and Germano, 1982). Benthic community health can be classified using defined successional stages and species diversity. Successional stages at a site can range from stage zero (recently disturbed) to stage three (mature). Species diversity is a metric which combines species richness (the number of different species) and evenness (the relative abundance of species) to provide an overall indication of community structure.

The EPA may also analyze sediment samples for contaminants of concern (COCs) including metals, polychlorinated biphenyls (PCBs), polycyclic aromatic hydrocarbons (PAHs), persistent pesticides, semi-volatile organic compounds (SVOCs), organotins, and/or dioxins. To evaluate the extent to which MPRSA-permitted dredged material may impact benthic communities at or near sites, the EPA commonly compares contaminant concentrations in sediments collected at and around ocean sites to sediment quality guidelines (SQGs), which are informal benchmarks used to relate chemical concentrations in sediments to the potential toxicity to benthic or aquatic organisms. Many EPA Regions rely on effects range low (ER-L) and effects range median (ER-M), national SQGs which are developed by the National Oceanic and Atmospheric Administration (NOAA) (NOAA, 1999). Chemical concentrations below the ER-L are not likely to cause adverse effects, while chemical concentrations above the ER-M are likely to cause adverse effects.

2.0 Report Objectives

In 2020, the EPA's Chief Scientists conducted oceanographic surveys at ten MPRSA ocean sites as well as one whale carcass disposal area (Table 1, Figure 1) to inform planning and ongoing decision-making with respect to the management and monitoring of these sites. This national report serves as a comprehensive summary of these monitoring efforts which were conducted in five of the seven EPA coastal Regions.

Table 1. Table of MPRSA-designated ocean sites surveyed in 2020. The five sites in Region 6 are located within three study areas: Corpus Christi, Brazos Island Harbor, and the Matagorda Ship Channel.

EPA Region	MPRSA Ocean Site	Area (nmi^2)	Depth (ft)
1	Western Long Island Sound, CT (WLDS)	2	75-115
2	Historic Area Remediation Site and whale carcass disposal, NJ	15.7	40-138
4	Morehead City, NC	8	50*
4	Wilmington, NC	9.4	35-52
6	Corpus Christi Ship Channel Maintenance, TX	0.61	35-50
6	Corpus Christi Ship Channel New Work/Construction, TX	1.4	46-53
6	Brazos Island Harbor Maintenance, TX	0.42	43-65
6	Brazos Island Harbor New Work/Construction, TX	0.42	60-67
6	Matagorda Ship Channel, TX	0.54	25-40
9	Los Angeles/Long Beach (LA-2), CA	0.77	360-1,050

**Depth reported as a site average*

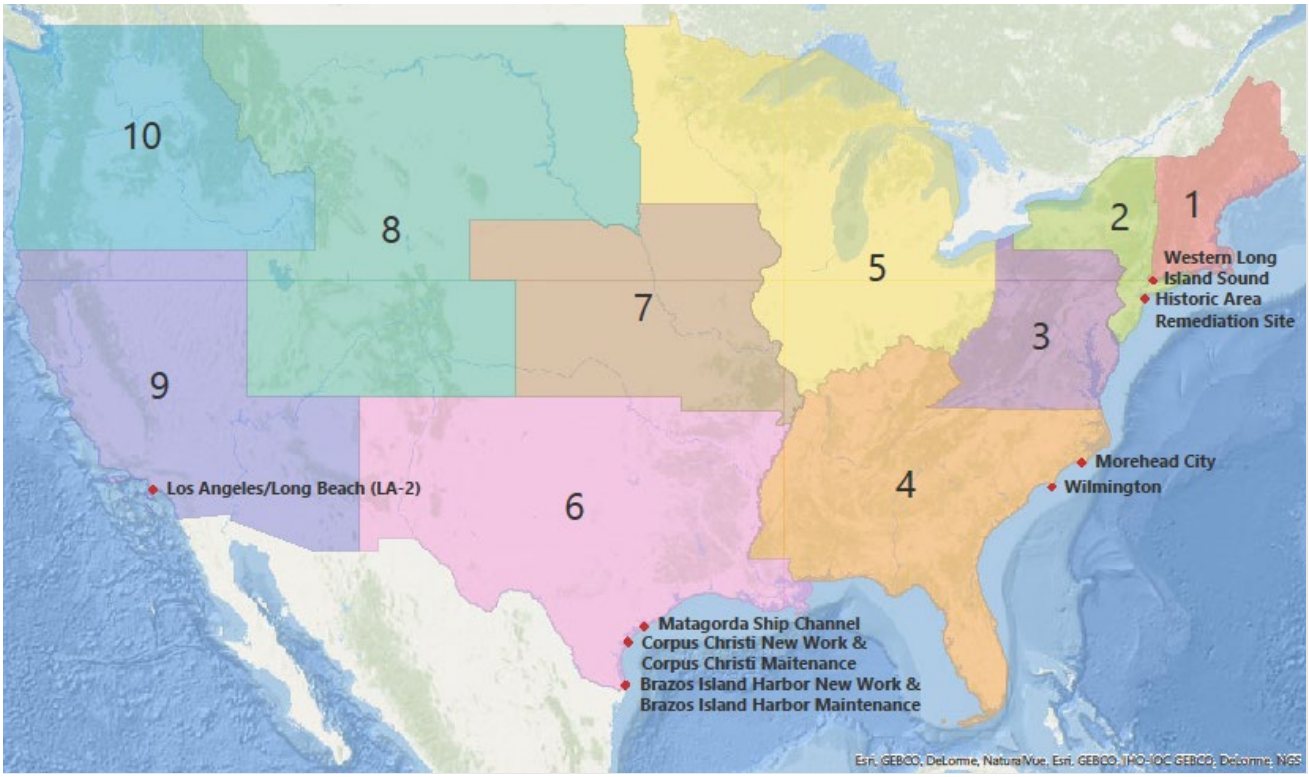

Figure 1. Approximate locations of the ten ocean sites surveyed in 2020. Numbers indicate EPA Regions.

3.0 Summary of Monitoring Surveys

A summary of 2020 survey objectives, activities, and results, as well as conclusions and recommended management actions resulting from these surveys, is presented below.

3.1 Region 1 – Western Long Island Sound Disposal Site

3.1.1 Background

The Western Long Island Sound Disposal Site (WLDS) lies approximately 3.1 miles (5.0 km) south of the Connecticut coastline in the western portion of the Long Island Sound and is surrounded by three historical disposal sites (Figure 2). The WLDS covers an area approximately 2 square nautical miles (nmi^2) (6.9 km^2) in size. Water depths at the WLDS vary across the site, sloping from 75 ft (23 m) at the shallowest point along the northwestern boundary to 115 ft (35 m) in the central portion of the site.

The EPA designated the WLDS under the MPRSA in 2016, however the general vicinity of the WLDS has likely been used for disposal operations for more than a century. Since the beginning of record keeping in 1982, approximately 1.5 million cubic yards (y^3; 1.15 million cubic meters, m^3) of dredged material has been disposed at the WLDS. Approximately 124,000 y^3 (94,805 m^3) of dredged material has been disposed at a single location at the southern-most of two mounds in the North-East corner of the site since the previous bathymetric survey in 2018.

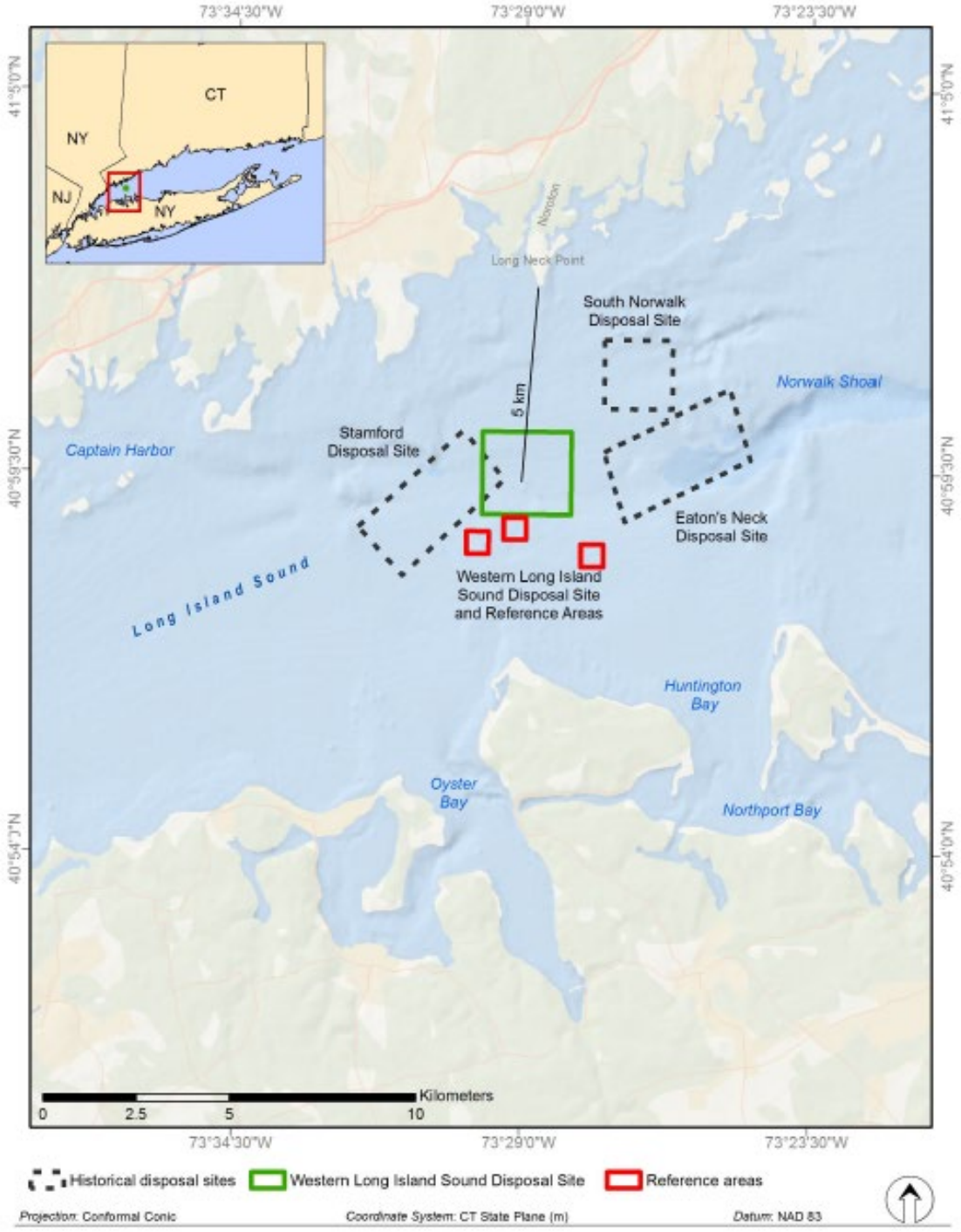

Figure 2. Location of the Western Long Island Sound Disposal Site (WLDS), depicted as the green square. The red squares are reference areas, which are sampling locations used for comparison when evaluating WLDS conditions.

3.1.2 Survey Objectives, Activities, and Findings

The objectives of the 2020 investigation were to characterize the seafloor topography and surface features of the site and surrounding area to confirm compliance with permits for dredged material disposal activities, confirm the stability of older dredged material deposits, and evaluate reference areas associated with the site. The acoustic survey, which consisted of bathymetric, backscatter, and side-scan sonar data, was conducted within the full WLDS footprint as well as an extended

area to the south to further evaluate conditions in and around the existing three reference areas established for WLDS (Battelle 2020). The survey was conducted aboard the 39 ft (12 m) F/V *Jeanette T* from October 14 to 16, 2020, prior to the start of any seasonal disposal activities at the WLDS.

The bathymetric data provided measurements of water depth that, when processed, were used to map the seafloor topography. Backscatter and side-scan sonar data provided images that supported characterization of surface sediment texture and roughness. Side-scan sonar data allow qualitative characterization of features that are not depicted by backscatter or bathymetric data. Each of these acoustic data types were used to assess dredged material disposal footprint and surface sediment features.

Acoustic data were collected using an R2Sonic 2022 broadband multibeam echo sounder (MBES). The total survey covered a rectangular area approximately 1.5 x 1.9 mile (2.4 x 3.1 km) in size (Figure 3).

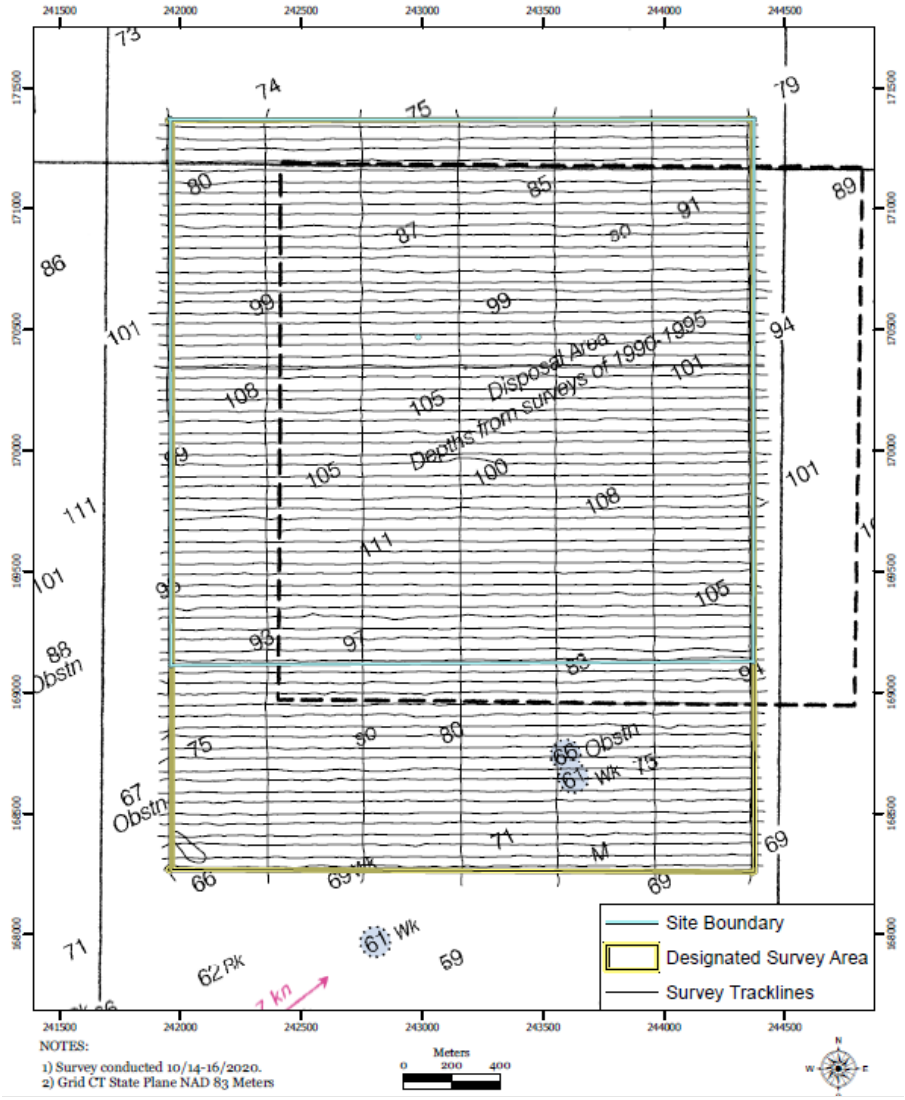

Figure 3. Acoustic survey transects at the WLDS disposal site. Survey lines are 148 ft (45 m) apart with crosslines spaced 1,312 ft (400 m) apart, with a total length of 123.4 miles (198.6 km).

Bathymetric data did not suggest the presence of new disposal features or noteworthy seabed features (Figure 4).

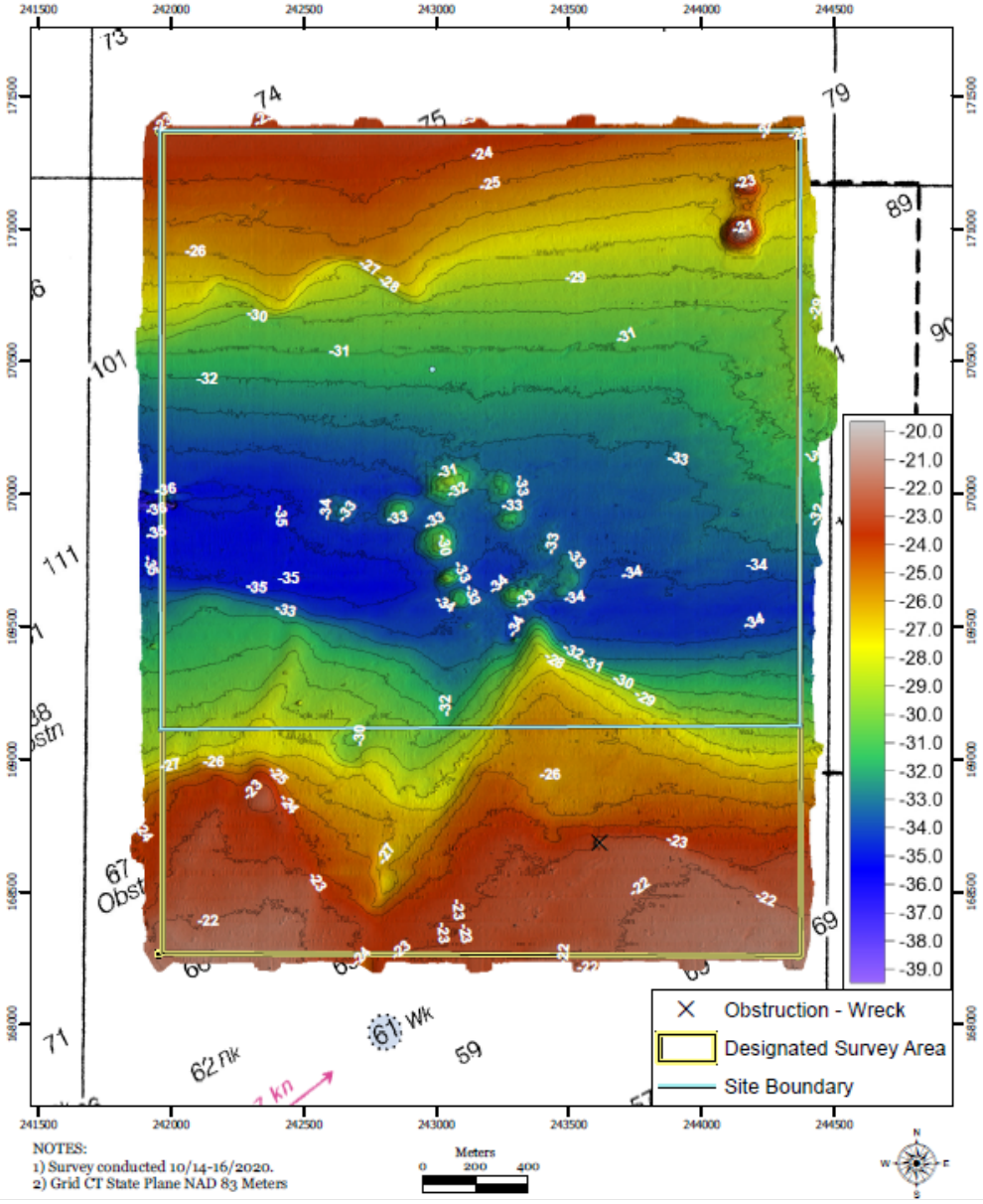

Figure 4. Bathymetry of the study area, including the WLDS, as measured during the 2020 survey.

The bathymetric elevation comparison between 2014 and 2020 (Figure 5) suggests accumulation of approximately 20 ft (6 m) of material in the larger (southern) of the two northeastern mounds, while the northern mound appears to have compacted by approximately 3.3 ft (1 m), as is generally observed once disposal operations over an area are terminated.

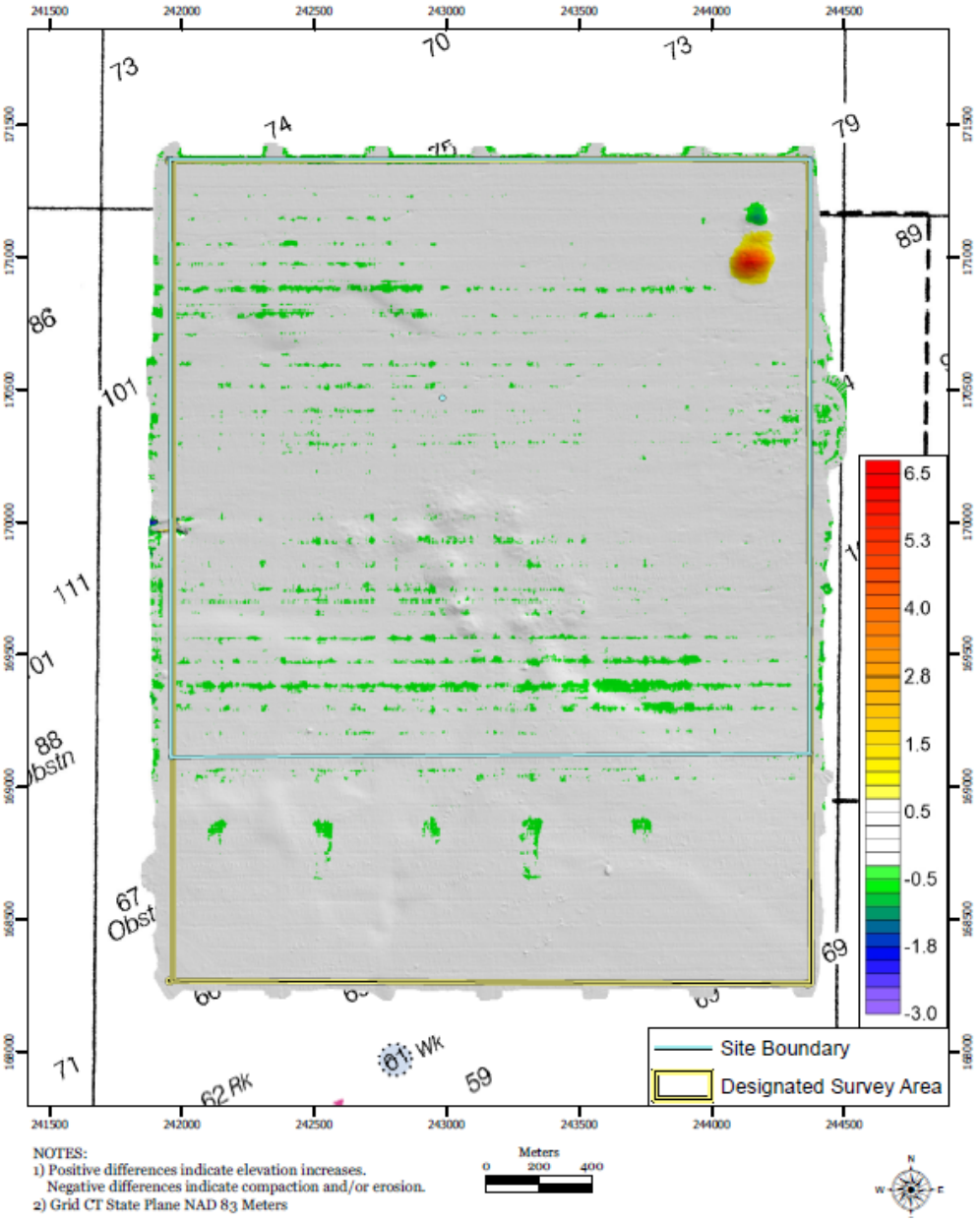

Figure 5. WLDS bathymetric elevation comparison (depth difference) 2020 vs 2014. Positive differences between surveys suggest deposition/accretion since 2014 (indicated in yellow, orange, and red); negative differences suggest compaction/erosion since 2014 (indicated in green).

The results from the acoustic backscatter identified a few fine-scale coarse disposal features in the northern portion of the site that were not observed in 2014 data. It is possible that some of the finer differences in backscatter between these surveys are associated with differences in acoustic discrimination capability between multibeam echosounder systems rather than changes in bottom texture.

3.1.3 Conclusions and Recommended Management Actions

The 2020 WLDS survey objectives were fully met. Region 1 concluded that the disposal of approximately 124,255 y^3 (95,000 m^3) of dredged material since the previous survey in 2018 has increased the size/height of the most recent mound formed in the northeastern portion of the site, but the deposits formed by the disposal have not dispersed outside of the site. Given the current

height and footprint of the active disposal mound in the northeast portion of the site, EPA Region 1 suggests that dredged material disposal at this northeast location should be terminated, and a new disposal target should be established.

The lack of change in bathymetry across the full site (other than the active area of disposal) when compared to the 2014 survey further supports the use of the WLDS with confidence in the stability of deposits formed by the disposal of dredged material. The high-resolution acoustic data collected to the south of the WLDS will provide additional insight in locating the collection of reference samples for comparison when evaluating the WLDS site conditions.

The EPA recommends that future monitoring of the WLDS should be conducted following the disposal a cumulative total of greater than 130,795 y^3 (100,000 m^3) of dredged material or sooner if disposal activities are not in compliance with MPRSA federal authorizations and dredged material permit conditions (e.g., off target disposal).

3.2 Region 2 – Historic Area Remediation Site, NJ and Whale Carcass Disposal Area

3.2.1 Background

Historic Area Remediation Site
The Historic Area Remediation Site (HARS) is located in the New York Bight Apex, approximately 3.5 nautical miles (nmi) east of Highlands, New Jersey, and 7.7 nmi south of Rockaway, New York. Since the 1800s, the New York Bight Apex has been used for disposal of dredged material and a variety of other wastes including municipal garbage, building materials, sewage sludge, and industrial waste. The HARS, which is 15.7 nmi^2 in area and an average of 89 ft (27 m) in depth, encompasses several of these historical disposal sites, including the former New York Bight dredged material disposal site known as the Mud Dump Site.

The Mud Dump Site was closed in 1996 after surveys revealed dioxin and PCB accumulation in benthic invertebrates within and around the site. The EPA designated the HARS in 1997 for placement of dredged material. The management priority for the HARS is to reduce the impacts from previous disposals to return environmental conditions to acceptable levels, as defined in the HARS-specific guidance, by covering the surface of the site with uncontaminated dredged sediments. As such, the EPA designated the HARS as an ocean remediation site, restricting dumping in the area solely to remediation material (a significant portion of the material placed at the HARS is rocky and glacial till material from various deepening and widening projects in New York and New Jersey harbors). The placement of such remediation material renders toxic sediments unavailable to marine organisms and prevents further exposure to contaminated sediments. The area targeted for remediation within the HARS is comprised of nine individual priority remediation areas (PRAs) measuring approximately 1 nmi^2 in size (Figure 7). The HARS is jointly managed by EPA and USACE, and multiple stakeholders and government agencies collaborate on this effort including state and federal agencies, port authorities, non-governmental organizations, and academics.

Whale Carcass Disposal Area
Under the MPRSA, the EPA authorizes the ocean disposal of marine mammal carcasses when there is not another viable option for carcass disposal other than disposal in ocean waters. A floating carcass near shore (e.g., in a harbor) may pose a risk to public safety before making

landfall to the extent it might attract predators (e.g., sharks) to a recreation area in nearby waters or pose a hazard to navigation.

When a marine mammal carcass is found floating in the NY/NJ Harbor area and there is no viable option for land-based disposal, the EPA and USACE, in coordination with the NOAA Stranding Network, tow the carcass to an ocean disposal area located approximately 28 nmi (51.9 km) off the coast of NJ. Typically, chains and cement blocks are used to sink and anchor the carcass in place on the seafloor, preventing it from floating back into the harbor area and becoming a hazard to navigation and/or floating onto a nearby beach. To date, five whale carcasses have been disposed of in the whale carcass disposal area.

3.2.2 Survey Objectives, Activities, and Findings

Prior to 2020, the most recent EPA survey at the HARS was conducted in 2018 and consisted of chemistry, physical, and toxicity analyses. The primary objective of the 2020 survey was to use a remotely operated vehicle (ROV) to survey a rocky hard-bottom area within the HARS and adjacent sediment types to gather information about how to manage the rock area for successful colonization by encrusting organisms. A secondary objective of this 2020 survey was to use the ROV to search for and examine the remains of five whale carcasses disposed in the whale carcass disposal area and confirm that there are no lasting ecological impacts of several large carcasses decaying in one location on the seafloor. The survey took place from November 10-17, 2020, aboard the R/V *Hugh R. Sharp*.

Historic Area Remediation Site

Most of the 2020 survey time was spent within the HARS in the western regions of PRAs 1, 2, and 3 (Figure 6). Rocky material placed at the western boundary of the HARS in PRAs 1 and 2 originated from federal deepening projects that occurred from 2001 to 2014. The material placed along the western margin was Pleistocene glacial till including boulders, rocks, and cobble. No disposal activity has occurred in PRAs 1-3 since 2014.

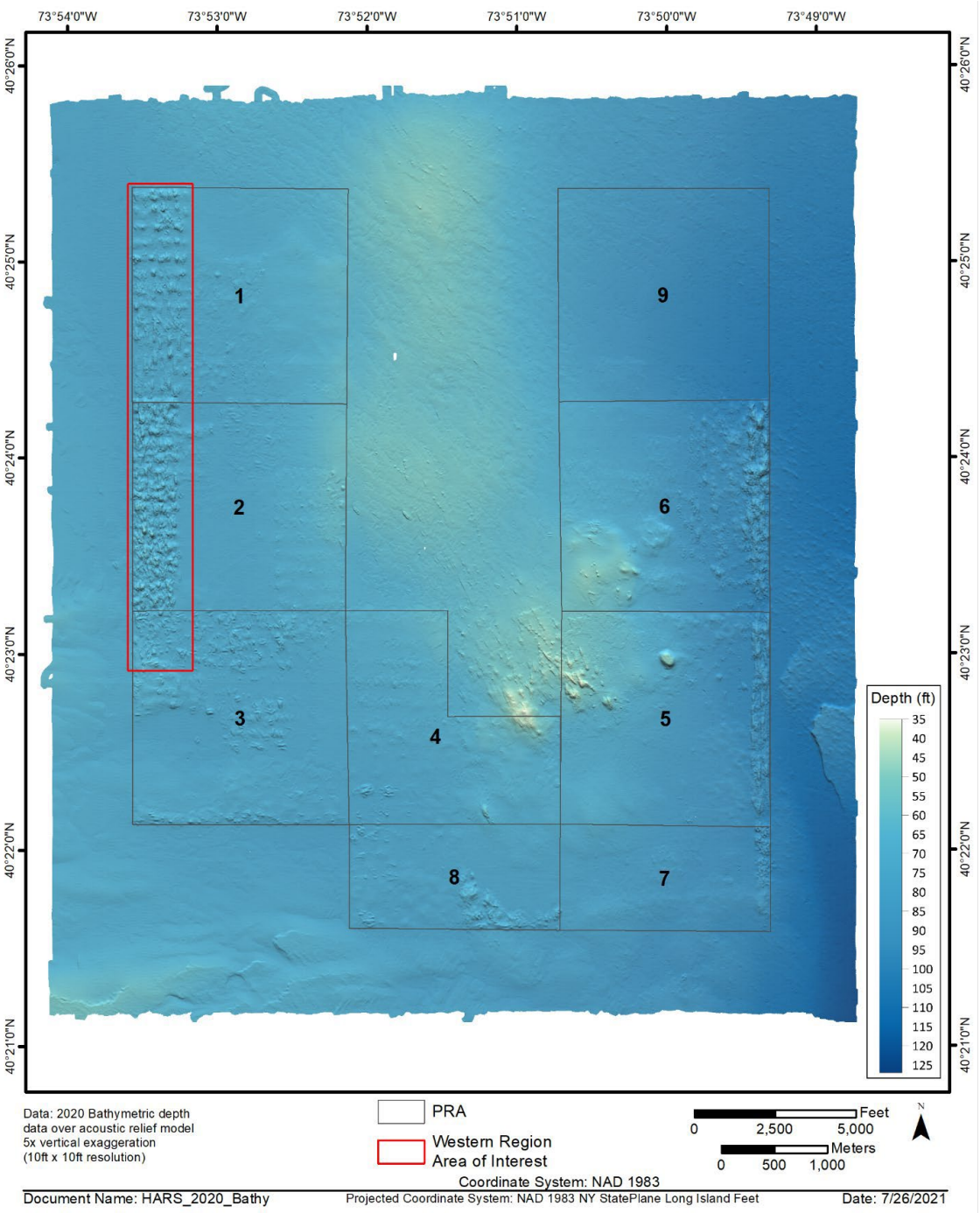

Figure 6. 2020 Historic Area Remediation Site (HARS) study area, composed of nine priority remediation areas (PRAs) represented by the numbers inside the shapes outlined in grey. The rectangle outlined in red on the western boundary of the site represents the rock and glacial till area of interest of the 2020 survey, where deepening material was placed between 2001 and 2014.

A ROV was used to collect video and still images across the rocky area within the HARS as well as two reference areas outside of the HARS (Figure 7).

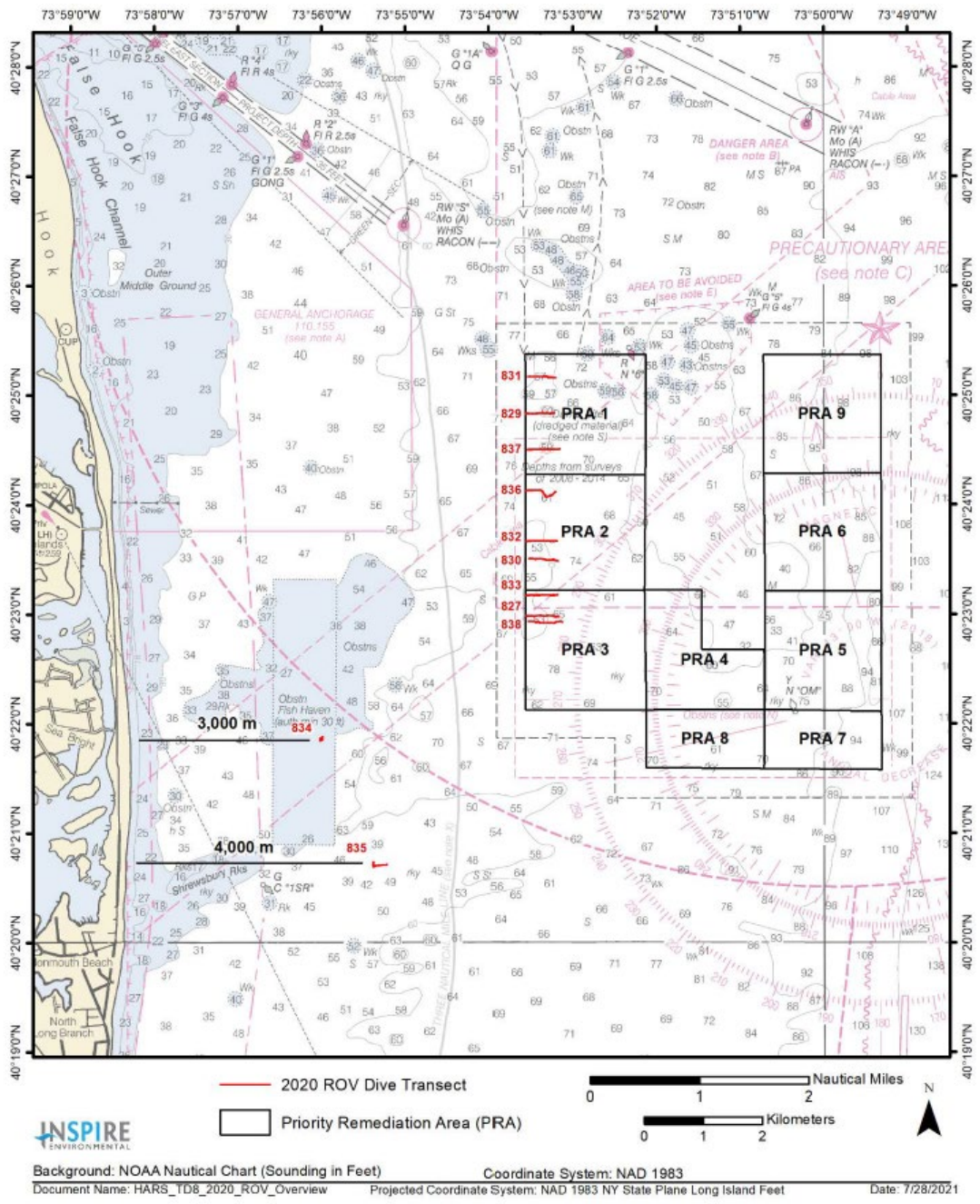

Figure 7. 2020 HARS survey transects (nine within PRAs 1-3 and two outside of the HARS) marked in red.

To identify and map out sediment type transitions along the rock boundary area (shown as the red rectangle in Figure 6), ROV transects were completed throughout PRAs 1-3 (Figure 7). Along these transects, forward-facing HD screen grabs and downward-facing plan view digital stills were collected every two minutes.

The video and images were analyzed for sediment type and percent cover of encrusting organisms. Image pairs of screen grabs and plan view digital still images (images taken less than 30 seconds apart) from the rock transects were analyzed for substrate type and percent coverage of fauna identified. Image pairs were also analyzed for presence/absence of red clay.

Initial observations found that levels of rock colonization varied but many rocks (including some in all transects) had abundant encrusting growth including corals, barnacles, and sponges. No clear pattern in rock colonization levels was apparent. Larger areas of clay than expected were observed, including several large clay mounds that were previously thought to be rock piles. These clay areas did not appear to support many benthic organisms, though some burrows were observed.

In some areas, sediment adjacent to rock was predominantly gravel (>80% gravel cover) or gravel mixes (30-80% gravel cover). Images from transects in PRA 3 generally had higher occurrences of sand (<5% gravel cover), gravelly (5-30% gravel cover), and gravel mixes compared to images from transects in PRAs 1 and 2 where gravel cover tended to be higher. For the artificial reef area outside of the HARS, image analysis found adjacent sediment type to be predominantly gravel. For the natural reef area outside of the HARS, image analysis found sediment type to be generally gravelly with some instances of gravel mixes. Overall, in the western boundary rock area within the HARS, larger gravel types (boulder and cobble) were observed more often in PRAs 1 and 2. Transects within PRA 3 contained a wider variety of substrate subgroups, and muddy sandy gravel was most frequently observed.

Colonization of rocks by encrusting organisms was found to be generally high throughout the western boundary rock area, where most image pairs from all three PRAs were categorized as having dense or moderate percent cover of attached epifauna, similar to artificial reef outside of the HARS (Figure 8). Image analysis of the natural reef area outside of the HARS found a wider range of epifauna cover, ranging from sparse to dense.

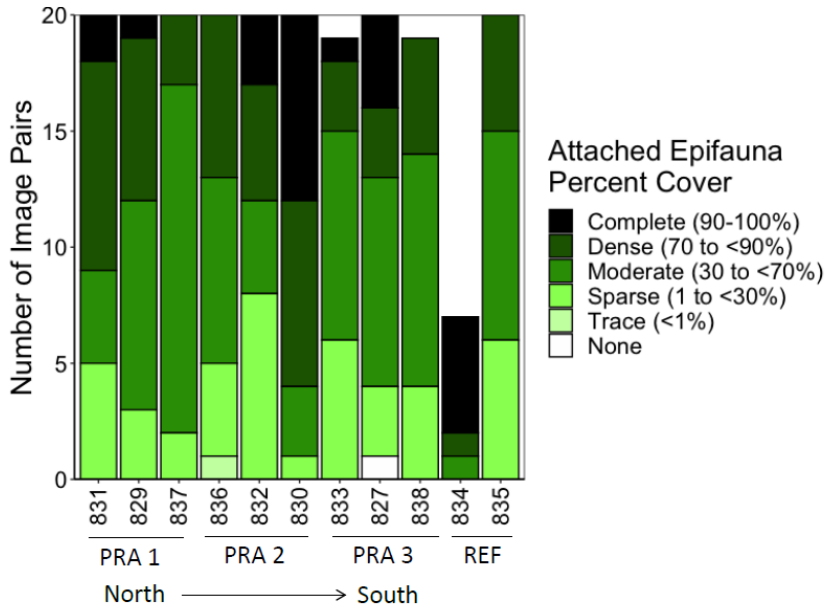

Figure 8. Number of image pairs for each percent attached epifauna bin by transect at the HARS (INSPIRE 2021). Image pairs are screen grabs from videos and plan view digital still images (images taken less than 30 seconds apart) from the rock transects.

The image analysis found that in PRAs 1-3 and in the two reference areas outside of the HARS, the largest size rocks (boulders) had the highest levels of faunal percent cover.
The northern star coral (*Astrangia poculata*) and sponges (e.g., *Clionia*) were documented in all transects in PRAs 1, 2, and 3. The northern star coral occurred in more image pairs and at higher percent cover values in PRAs 1 and 2 compared to those in PRA 3 (Figure 9). The opposite pattern

was observed for sponges, with sponges occurring at highest percent cover values in images from transects in PRA 3 (Figure 10).

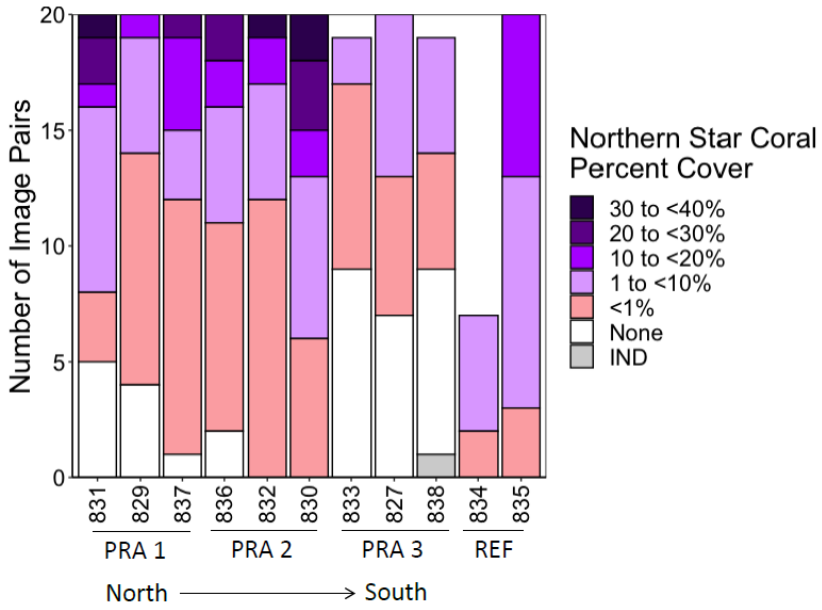

Figure 9. Number of image pairs for each coral percent cover bin by transect at the HARS (INSPIRE 2021). Image pairs are screen grabs from videos and plan view digital still images (images taken less than 30 seconds apart) from the rock transects.

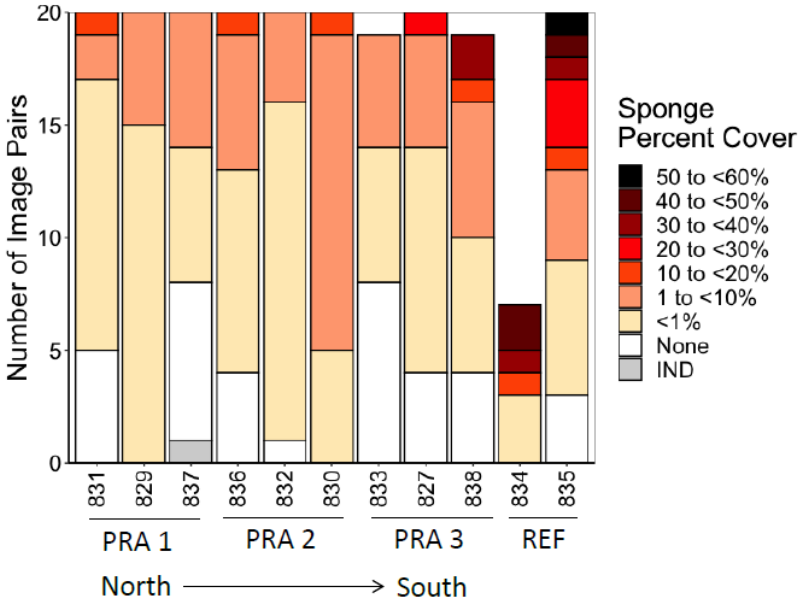

Figure 6. Number of image pairs for each sponge percent cover bin by transect at the HARS (INSPIRE 2021). Image pairs are screen grabs from videos and plan view digital still images (images taken less than 30 seconds apart) from the rock transects.

In PRAs 1 and 2, northern star coral percent cover was generally higher than sponge cover, and in PRA 3 and both reference transects, sponge percent cover was generally higher than northern star coral percent cover. Northern star coral and sponges were found at similar densities in image pairs from the two transects outside of the HARS.

Whale Carcass Disposal Area
During the ROV survey of the whale carcass disposal area, Region 2 located bones and sinking blocks from only one whale carcass. Neither the bones nor sinking blocks from the other four whales disposed in the area were found within the study area. The remains that were located were from a humpback whale that had been disposed of six months prior to this survey. Monitoring results revealed that the carcass was reduced to whale bones with minimal whale tissue remaining within six months, and Region 2 found no measurable impact on sediment quality parameters (including total organic carbon, grain size, and polychlorinated biphenyl concentration) from carcass decomposition.

Follow up discussions between EPA Region 2 and USACE suggested that the most likely reason the remains of the other four whales were not located in the whale disposal area is either that the tow vessel or carcass drifted off the disposal area while sinking was in process.

3.2.3 Conclusions and Recommended Management Actions

The survey objectives were accomplished, and environmentally acceptable conditions are being met at the HARS. The ROV footage of the western boundary rock area shows that deepening material made primarily of large rocks has been successful at creating artificial reef habitat with high levels of encrusting organism colonization in the HARS regardless of adjacent sediment type.

Based on observations of red clay mounds having little visible colonization by benthic organisms, an SPI survey was subsequently conducted to delineate the areas of red clay within the HARS and to assess the level of colonization by benthic organisms. The Region plans to have further discussions with the federal and local partners and stakeholders about management of existing clay areas within the HARS and future placement of clay material. Additionally, Region 2 will consider the results of the 2020 survey when updating the SMMP for the HARS.

Recommended management actions for future whale carcass disposals in the NY/NJ Harbor area include using an improved sinking protocol where the EPA and USACE will release trapped gasses within the carcass with a blade before sinking to reduce buoyancy and increase sinking speed. In addition to using chains and cement blocks to weigh down the carcass, releasing trapped gasses should help ensure the carcass ends up within the whale carcass disposal area coordinates.

3.3 Region 4 – Morehead City, NC & Wilmington, NC Ocean Dredged Material Disposal Sites

3.3.1 Background

Morehead City ODMDS
Designated by the EPA in 1987, the Morehead City ODMDS is located approximately 3 nmi (5.6 km) south of Atlantic Beach, near Cape Lookout, North Carolina (Figure 11). The site is 8 nmi^2 (27.4 km^2) in size and averages approximately 50 ft (15 m) in depth. Material at the site consists primarily of fine sand from the Morehead City Harbor and entrance channel. The last status and trends survey at the Morehead City ODMDS was completed in September 2011. In the last fifteen years, the site has received a yearly average of 485,207 y^3 (370,967 m^3) of material.

Wilmington ODMDS
The EPA designated the Wilmington ODMDS in 2002. The site is located approximately 5 nmi (9.7 km) offshore Bald Head Island, North Carolina. The Wilmington ODMDS has an area of about 9.4

nmi^2 (27.4 km^2) (Figure 16). Depths within the ODMDS range from approximately 35 to 52 ft (9 to 11 m). On average, approximately 1.5 million y^3 (1.15 million m^3) of dredged material is disposed annually. The ODMDS is used for the disposal of new work and maintenance material from the Wilmington Harbor Civil Works Navigation Project, and channels and berthing areas maintained for the Military Ocean Terminal, Sunny Point. An SMMP was developed for the site at designation and reviewed and revised in 2012. The EPA last conducted a trend assessment survey at the Wilmington ODMDS in May 2010.

Because of the proximity of these MPRSA-designated ocean sites to each other, oceanographic monitoring was conducted at both site during the same survey.

3.3.2 Survey Objectives, Activities, and Findings

The primary objective for this survey was to collect sediment, water, and benthic biota samples from each site to conduct a routine trend assessment ensuring the sites were meeting environmental goals. The purpose of a trend assessment survey is to determine the physical, chemical, and biological structure of a disposal site and assess how those parameters change over time. The information collected during trend assessment surveys are also used to evaluate the efficacy of the current SMMP. The survey was conducted aboard the University of Georgia's R/V *Savannah* from February 7-12, 2020.

During this survey, Region 4 collected benthic (sediment and biological) samples and assessed the water column at each site. Region 4 collected sediment and macroinvertebrate samples using a double 0.04m^2 Young Grab (two 0.04m^2 grabs in one frame). The sediment samples were processed on board and sent to a laboratory to be analyzed for grain size distribution and concentrations of PCBs, pesticides, semi-volatile organics (SVOAs), metals, total organic carbon (TOC), total solids and butyl-tins. Macrofauna samples were also processed on board and sent to a laboratory to be analyzed for benthic community parameters including density, diversity, evenness, and richness. Additionally, Region 4 collected physiochemical data from the water column at the center of each site. The vessel's conductivity, temperature, and depth (CTD) probe was used to measure dissolved oxygen, salinity and temperature throughout the water column at that station. Region 4 scientists compared the physical, chemical and biological results among stations within the ODMDSs and to stations outside of the ODMDSs. They also compared sediment chemistry results against historical concentrations at the ODMDSs.

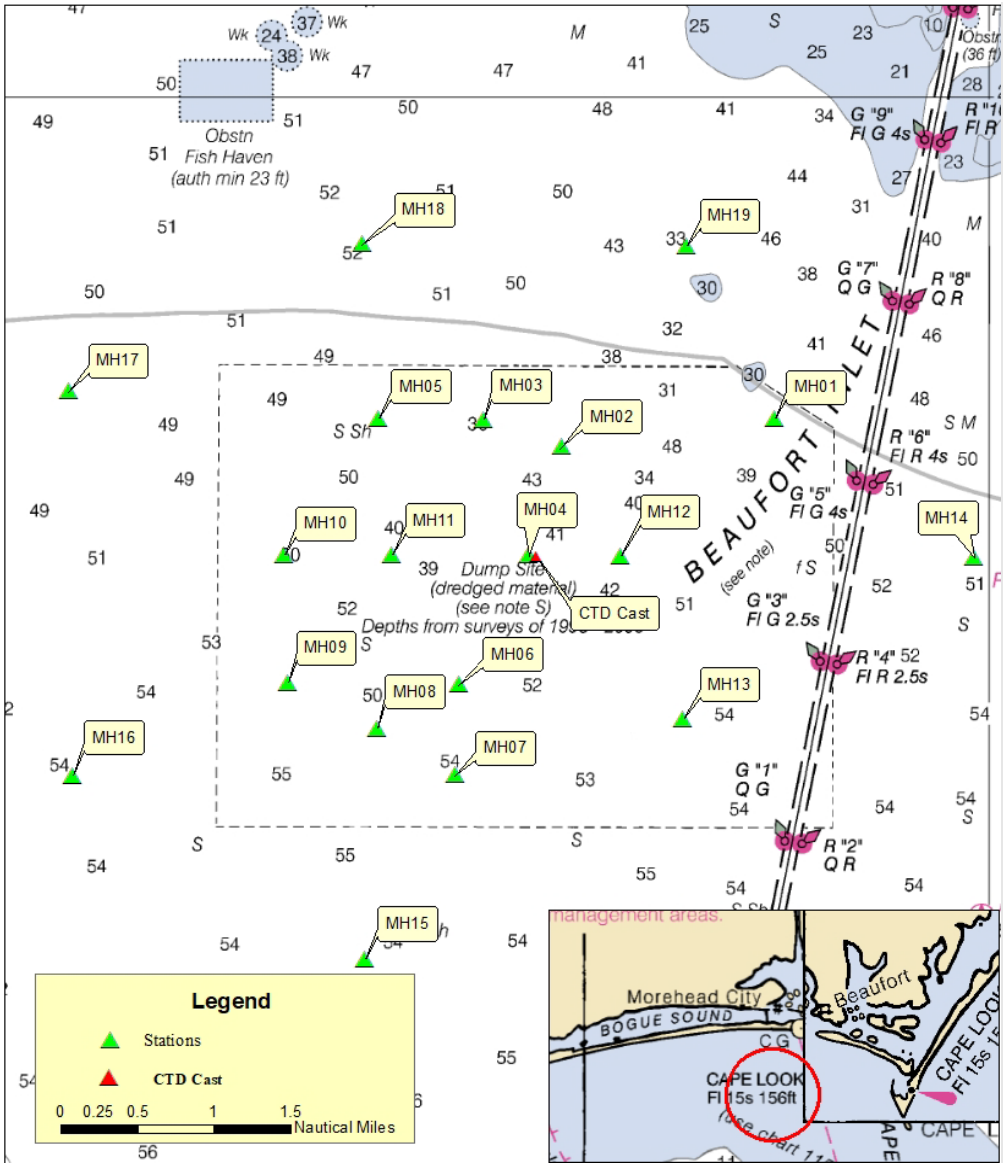

Figure 7. Morehead City ODMDS and sampling stations. Nineteen stations were sampled for sediment chemistry and macroinvertebrates, six of which were outside the ODMDS (MH14-MH19).

Morehead City ODMDS

Results from the sediment grain size analysis showed that sediment grain sizes were fairly uniform within and outside of the Morehead City ODMDS and consisted largely of fine sand (Figure 12). Fines (silts and clays) at stations inside and outside the ODMDS ranged from a minimum of 2.4% to a maximum of 9.7% of the sediment composition. The similarities in sediment texture measured inside and outside of the ODMDS suggest that conditions across the study area are relatively consistent and that disposal activities are not altering the grain size conditions within the site compared to conditions in the surrounding area where no dredged material has been disposed.

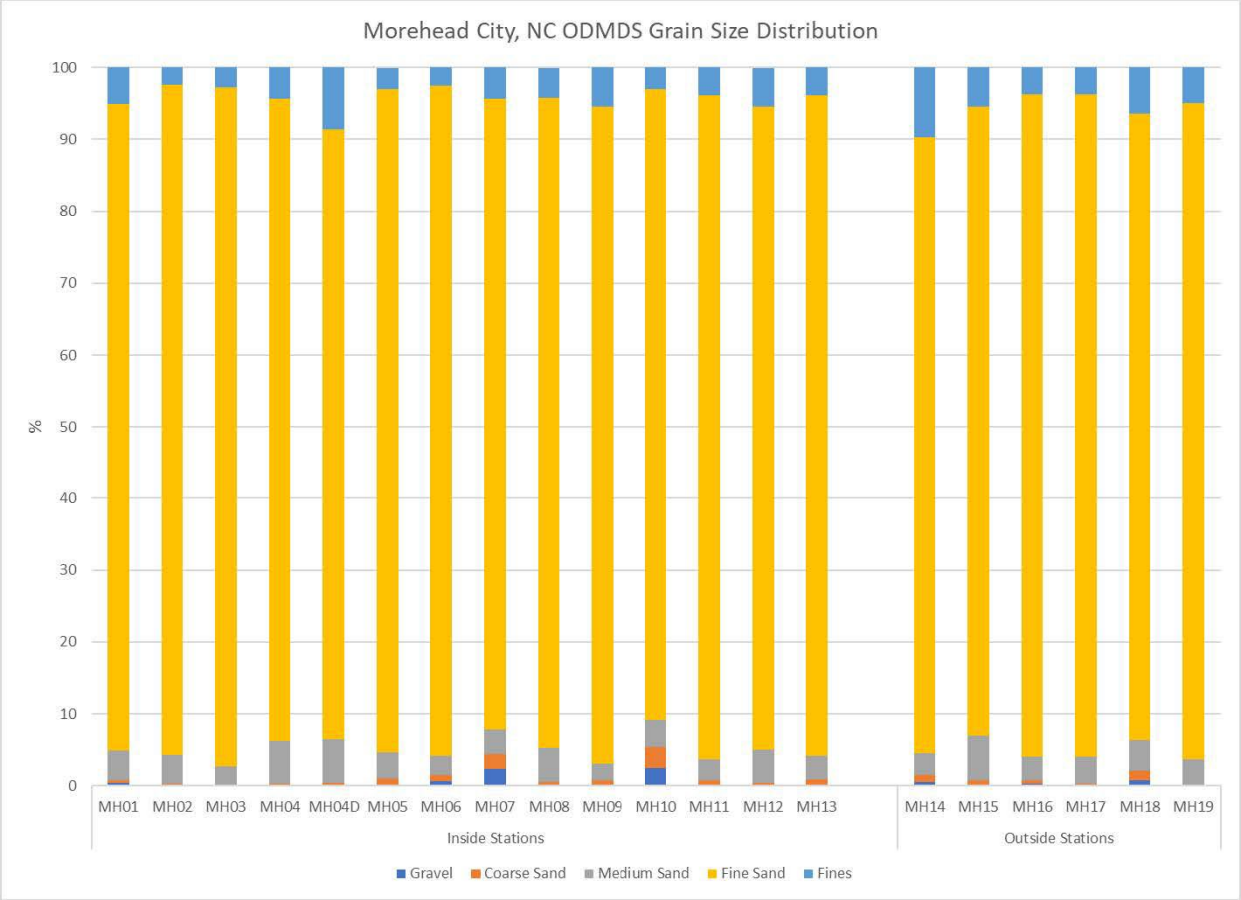

Figure 8. Grain size distribution at the Morehead City ODMDS. All stations were predominantly sand with variable amounts of fines.

Results from Region 4's sediment chemistry analyses showed that, with the exception of four metals (arsenic, chromium, iron, and lead), the concentration of all contaminants (PCBs, pesticides, SVOAs, metals, TOC, total solids, and butyl-tins) was at or below the minimum reporting limit (MRL). The concentrations of the aresenic, chromium, iron, and lead that were detected above the MRL were below levels of concern. There were no significant differences in metals concentrations inside versus outside the ODMDS.

Benthic infaunal (sediment-dwelling) communities can be used as indicators of the ecosystem health at the seafloor. Region 4 used macroinvertebrate data to compare community parameters between stations inside the site versus outside the site. Results from the 2020 survey showed that the only statistically significant difference in macrofauna was that the density of macrofauna collected from outside of the site was greater than the density of macrofauna collected from inside of the site (Barry Vittor and Associates (BVA) 2020A, Figure 13). Densities inside the ODMDS ranged from 1,200 organisms/m^2 at Station MH3 to 3,525 organisms/m^2 at Station MH11, with an average of 2,189 organisms/m^2. Densities outside the ODMDS ranged from 988 organisms/m^2 at Station MH19 to 4,825 organisms/m^2 at Station MH14, with an average of 3,435 organisms/m^2 (BVA 2020A).

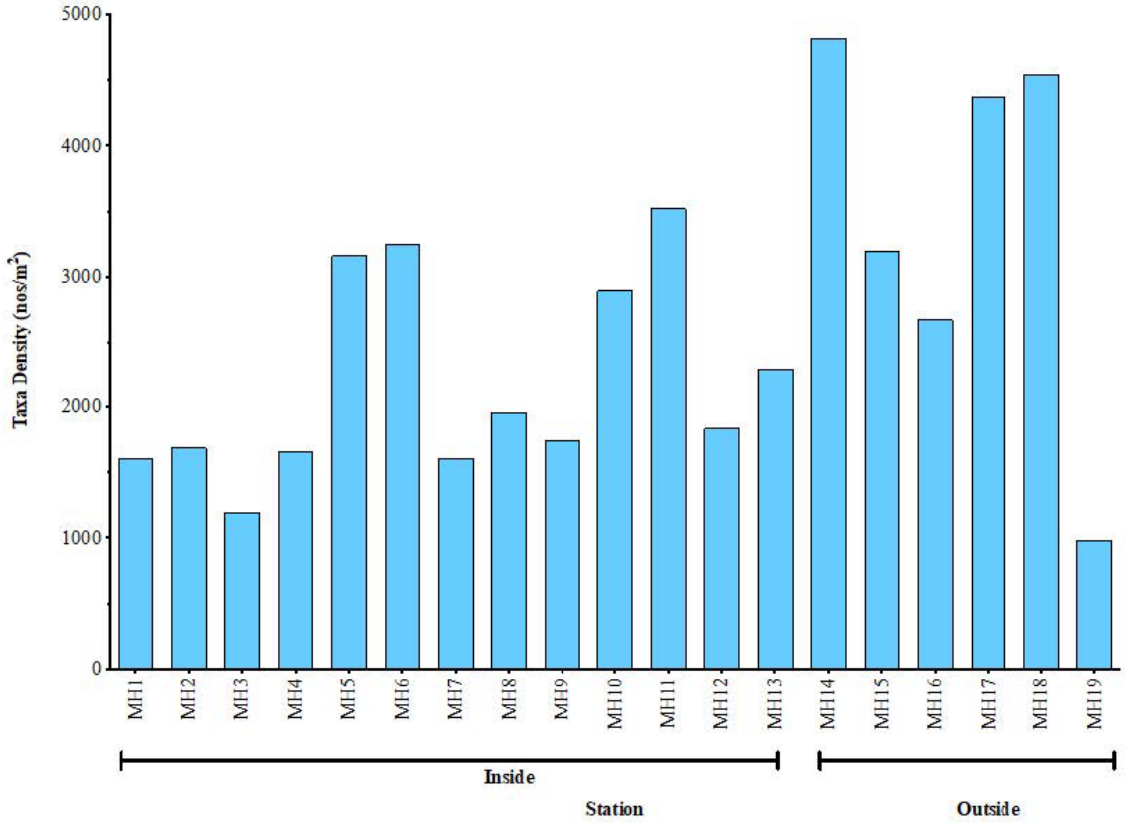

Figure 9. Taxa density (number of species (nos) per m^2) at the Morehead City ODMDS. Density was significantly higher at stations outside the ODMDS when compared to stations inside the ODMDS.

Stations inside the Morehead City ODMDS were either dominated by annelids (MH1, MH2, MH5, MH6, MH8-MH13), arthropods (MH4 and MH7), or by other taxa (MH3). Stations outside the ODMDS had similar patterns in that annelids dominated MH14, MH15, MH17, and MH18, arthropods dominated MH16, and other taxa dominated MH19 (BVA 2020A, Figure 14).

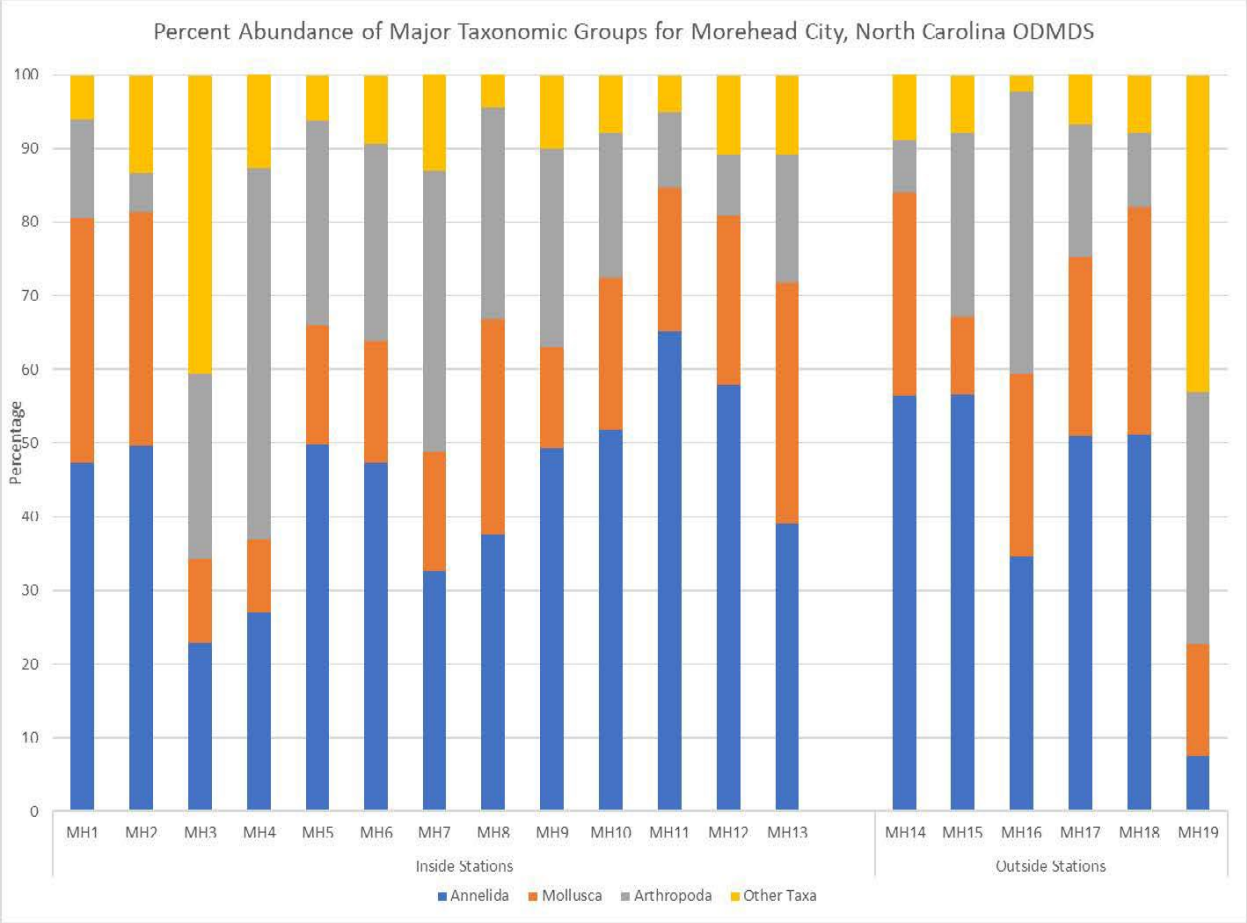

Figure 10. 2020 distribution of major taxonomic groups at the Morehead City ODMDS.

Taxa diversity inside the Morehead City ODMDS ranged from 2.59 at Station MH3 to 3.50 at Station MH9 (average = 3.18). Taxa diversity outside the ODMDS ranged from 1.93 at Station MH19 to 3.55 at Station MH14 (average = 3.11). The high taxa diversity both inside and outside the site reflects a species-rich assemblage at all stations associated with the Morehead City ODMDS (BVA 2020A).

Taxa evenness inside and outside the Morehead City ODMDS ranged from 0.76 to 0.91 and 0.71 to 0.87, respectively. Taxa richness inside the ODMDS ranged from 30 to 61 and outside the ODMDS ranged from15 to 66 (Figure 15). Taxa diversity, richness, and evenness all showed no significant differences between stations inside the site versus outside the site (BVA 2020A).

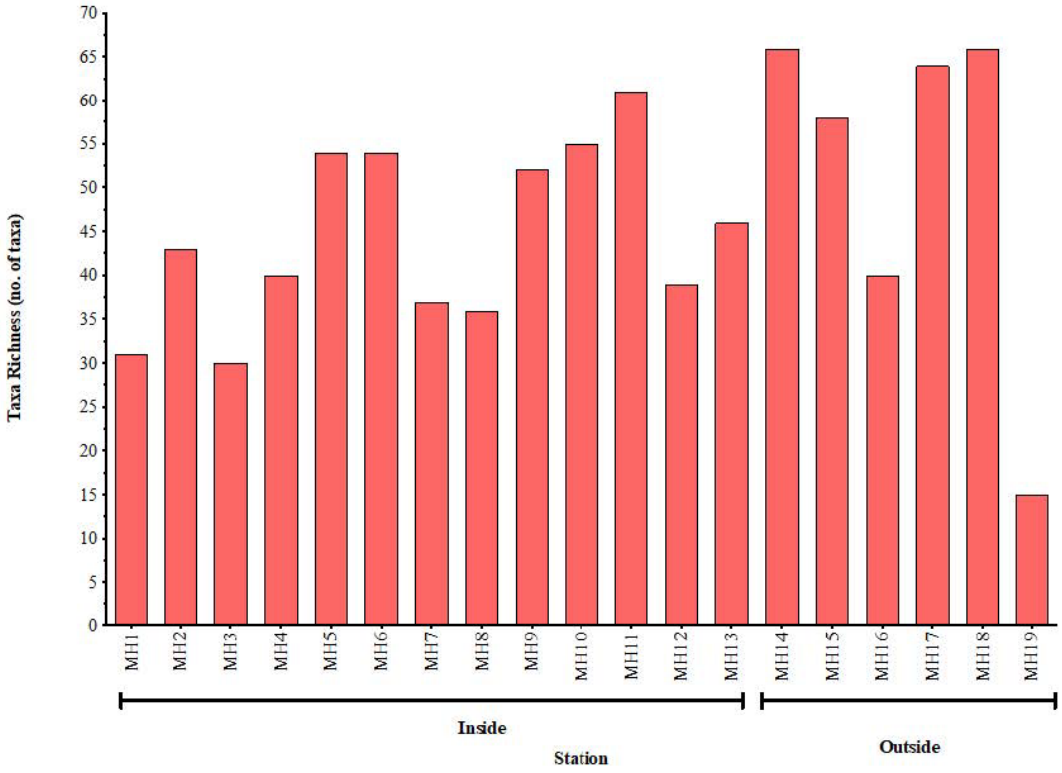

Figure 11. Taxa richness at the Morehead City ODMDS. Taxa richness averaged 44.5 for stations inside the ODMDS and 51.5 for stations outside the ODMDS.

Region 4 compared the data collected from the 2020 survey to data from the survey conducted in 2011. Overall, there were no significant differences in the benthic macroinvertebrate community from 2011 to 2020 (BVA 2020A). Taxa richness was 2.8x and 3.0x higher in 2020 inside and outside the ODMDS when compared to 2011. Densities were also 2.8x and 3.3x higher inside and outside the ODMDS when compared to 2011. However, there was no statistically significant difference found for richness or density between 2011 and 2020 (BVA 2020A).

Results from Region 4's CTD cast showed that dissolved oxygen, salinity, and temperature were similar throughout the water column. These in-situ water column profiles can be used to describe the physical characteristics of the water and serve as a foundation for understanding the local marine environment. By looking at the physiochemical properties of the water column profile, Region 4 can identify anomalies indicative of impacts from dredged material disposal activities. The parameters Region 4 measured at the Morehead City ODMDS were within expected values for this nearshore, shallow environment indicating no lasting impacts from dredged material disposal were present in the water column.

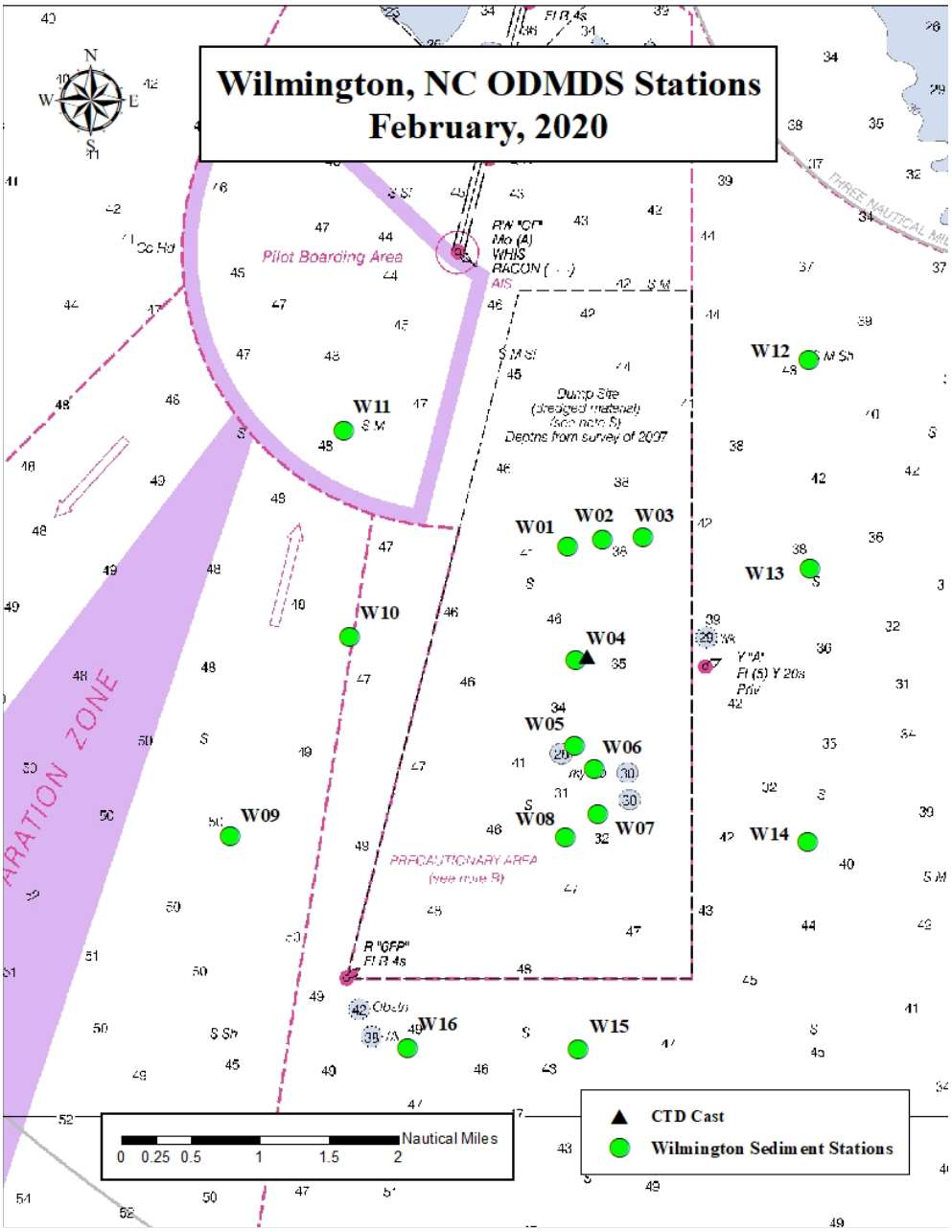

Figure 12. Wilmington ODMDS and sampling stations. Sixteen stations were sampled for sediment chemistry and macroinvertebrates, eight of which were outside the ODMDS (W09-W16).

Wilmington ODMDS

Results from the sediment grain size analysis showed that sediment grain sizes were fairly uniform within and outside of the Wilmington ODMDS. Inside the site boundaries, all but two stations consisted of >92% sand. Stations outside of the site all consisted of greater than 94% sand (BVA 2020B, Figure 17). The similarities in sediment texture measured inside and outside of the ODMDS suggest that conditions across the study area are relatively consistent and that disposal activities are not altering the grain size conditions within the site compared to conditions in the surrounding area where no dredged material has been disposed.

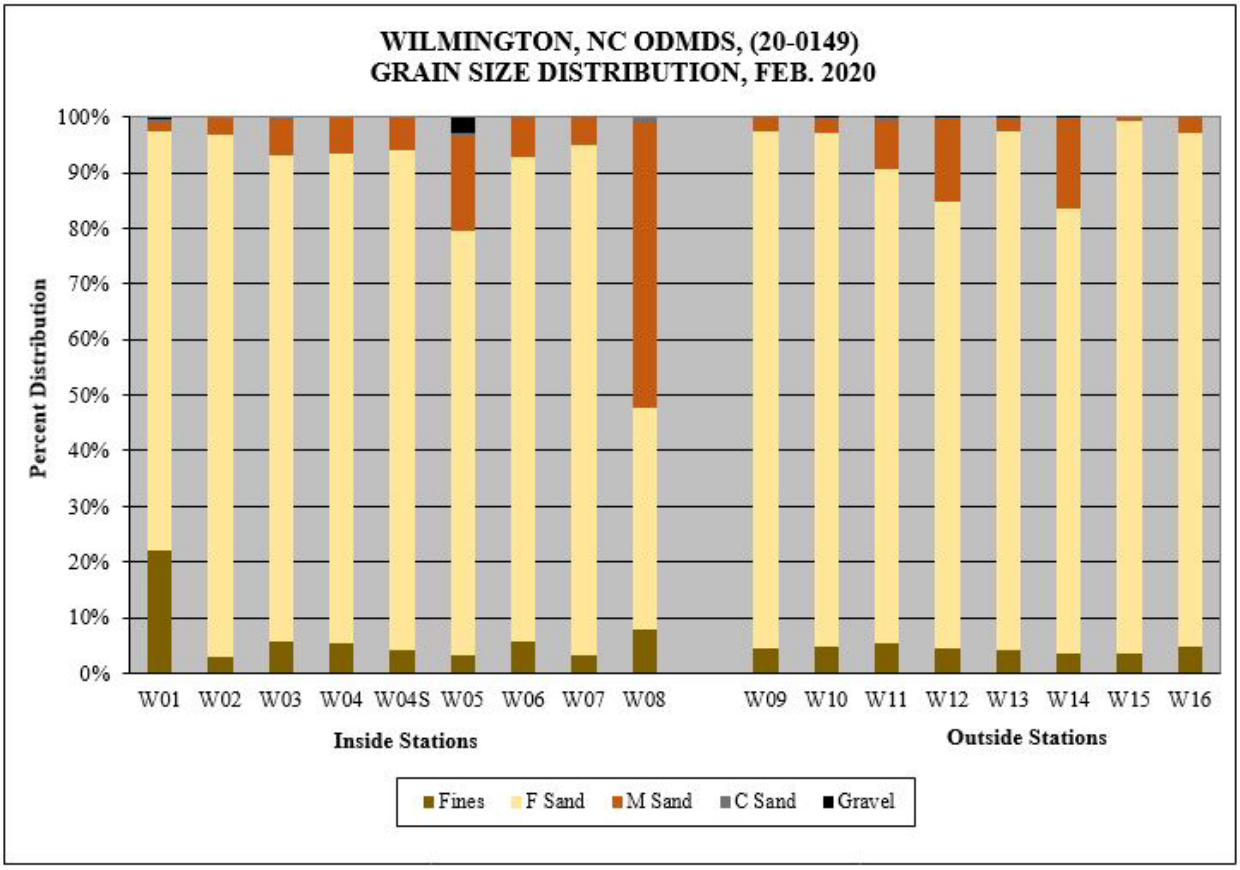

Figure 13. Grain size distribution at the Wilmington ODMDS. Sediment grain sizes were similar at stations both inside and outside the ODMDS.

Results from Region 4's sediment chemistry analyses showed that the concentration of five metals were at or below the MRL. Seven metals (aluminum, arsenic, chromium, lead, nickel, and zinc) were measured in concentrations above the MRL, however, their concentrations were below levels of concern. Results from sediments that were tested for PCBs, pesticides, SVOAs, metals, TOC, total solids, and butyl-tins were all at or below the minimum reporting limit MRL. There were no significant differences in metals concentrations inside versus outside the ODMDS.

Results from the macrofaunal analyses showed that macrofaunal densities inside the ODMDS ranged from 425 organisms/m^2 at Station W02 to 1,638 organisms/m^2 at Station W07 (BVA 2020B, Figure 18). Densities outside the ODMDS ranged from 938 organisms/m^2 at Station W09 to 4,113 organisms/m^2 at Station W14. There was no significant difference in density between stations inside and outside the ODMDS. Additionally, benthic organism densities at stations both inside and outside the ODMDS were not significantly different in 2020 when compared to results from the survey conducted in 2010.

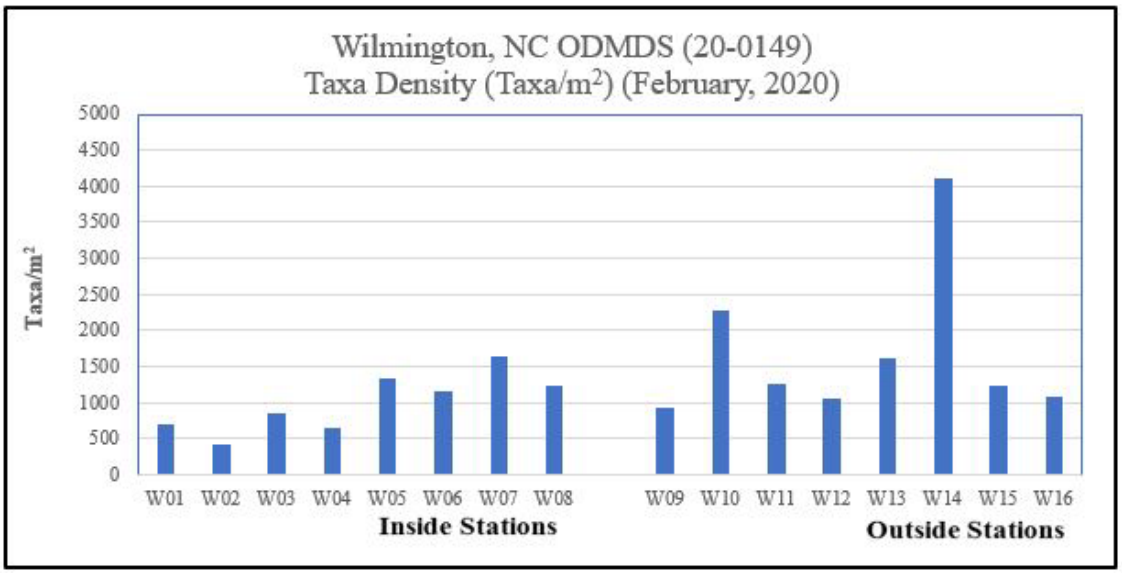

Figure 14. Taxa density at the Wilmington ODMDS. Densities averaged 1,000.0 organisms/m^2 inside the ODMDS and 1,698.4 organisms/m^2 outside the ODMDS.

In 2020, taxa diversity was high both inside (2.80) and outside (3.03) the Wilmington ODMDS, reflecting a species-rich assemblage at all stations associated with the Wilmington ODMDS site. There was no significant difference in diversity between stations inside and outside the ODMDS. Taxa diversity at stations both inside and outside the ODMDS was not significantly different in 2020 when compared to 2010 (BVA 2020B). The stations inside the ODMDS were dominated by a mixed assemblage of annelids, mollusks (bivalves), and arthropods (amphipods). The stations outside the ODMDS were dominated by annelids and mollusks (Figure 19).

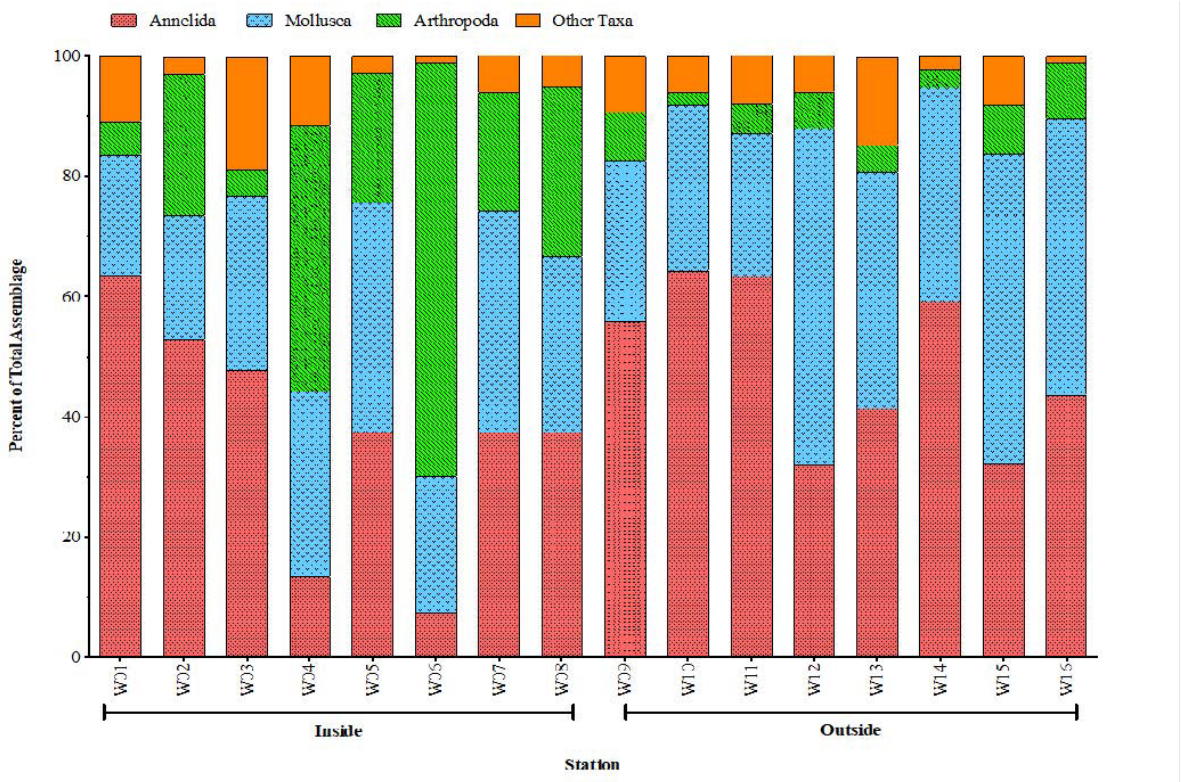

Figure 19. 2020 distribution of major taxonomic groups at the Wilmington ODMDS.

Taxa richness inside the ODMDS ranged from 18 taxa at Stations W02 and W04 to 44 taxa at Station W07. Taxa richness outside the ODMDS ranged from 28 taxa at Station W16 to 44 taxa at Stations W10 and W14 (Figure 20). In 2020, taxa richness was significantly higher at stations outside the ODMDS when compared to stations inside the ODMDS. There was no significant difference in taxa richness inside and outside the ODMDS between 2010 and 2020 (BVA 2020B).

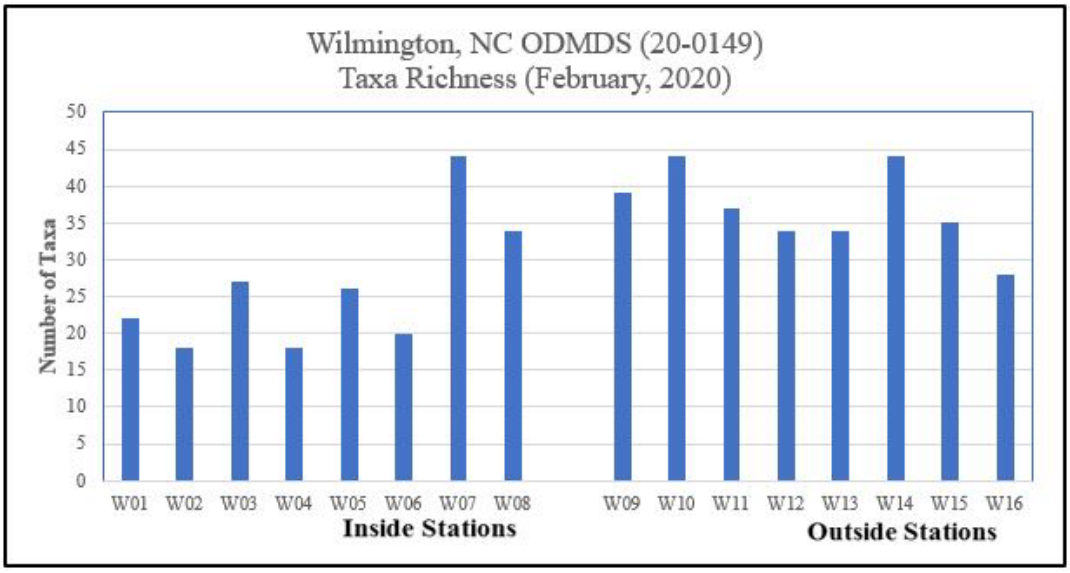

Figure 15. Taxa richness at the Wilmington ODMDS averaged 26.1 for stations inside the ODMDS and 36.9 for stations outside the ODMDS.

Taxa evenness inside the ODMDS ranged from 0.76 at Station W06 to 0.94 at Station W02. Taxa evenness outside the ODMDS ranged from 0.64 at Station W14 to 0.93 at Station W09 (BVA 2020B).

Results from Region 4's CTD cast showed that dissolved oxygen, salinity, and temperature were similar throughout the water column. These measurements were within expected values for this nearshore, shallow environment and indicated that no lasting impacts from dredged material disposal were present in the water column.

3.3.3 Conclusions and Recommended Management Actions

The data and information collected from this survey show that ongoing dredged material disposal activities have resulted in little change to the physical, chemical, and biological characteristics of both the Morehead City and Wilmington ODMDSs and surrounding areas. The results from the 2020 survey confirm that environmentally acceptable conditions, as outlined in the SMMP, are being met at the Morehead City ODMDS and at the Wilmington ODMDS and that pre-disposal testing and evaluation of dredged material has been effective at preventing any contaminated material from being disposed of at the ocean sites. While this information will be incorporated into the next SMMP update for each of these MPRSA ocean sites, no immediate site management modifications are necessary at this time.

Region 4 intends to continue to routinely monitor the chemical, physical, and biological parameters inside and surrounding both ODMDSs to document any changes to the area, ensure that short-term anticipated impacts stay within the boundaries of the ODMDSs, and that disposal activities are not causing lasting adverse impacts.

3.4 Region 6 – Corpus Christi, Brazos Island Harbor, and Matagorda Ocean Dredged Material Disposal Sites

3.4.1 Background

In February 2020, the EPA monitored five ODMDSs in the Gulf of Mexico: (1) Matagorda Ship Channel, (2) Corpus Christi New Work, (3) Corpus Christi Ship Channel Maintenance, (4) Brazos Island Harbor, (5) Brazos Island Harbor 42-Foot Project (New Work). The EPA anticipates increased use of the five ODMDSs, which has prompted the need to consider site expansions to meet anticipated site capacity needs. These five ODMDSs are located within three study areas (Figure 21).

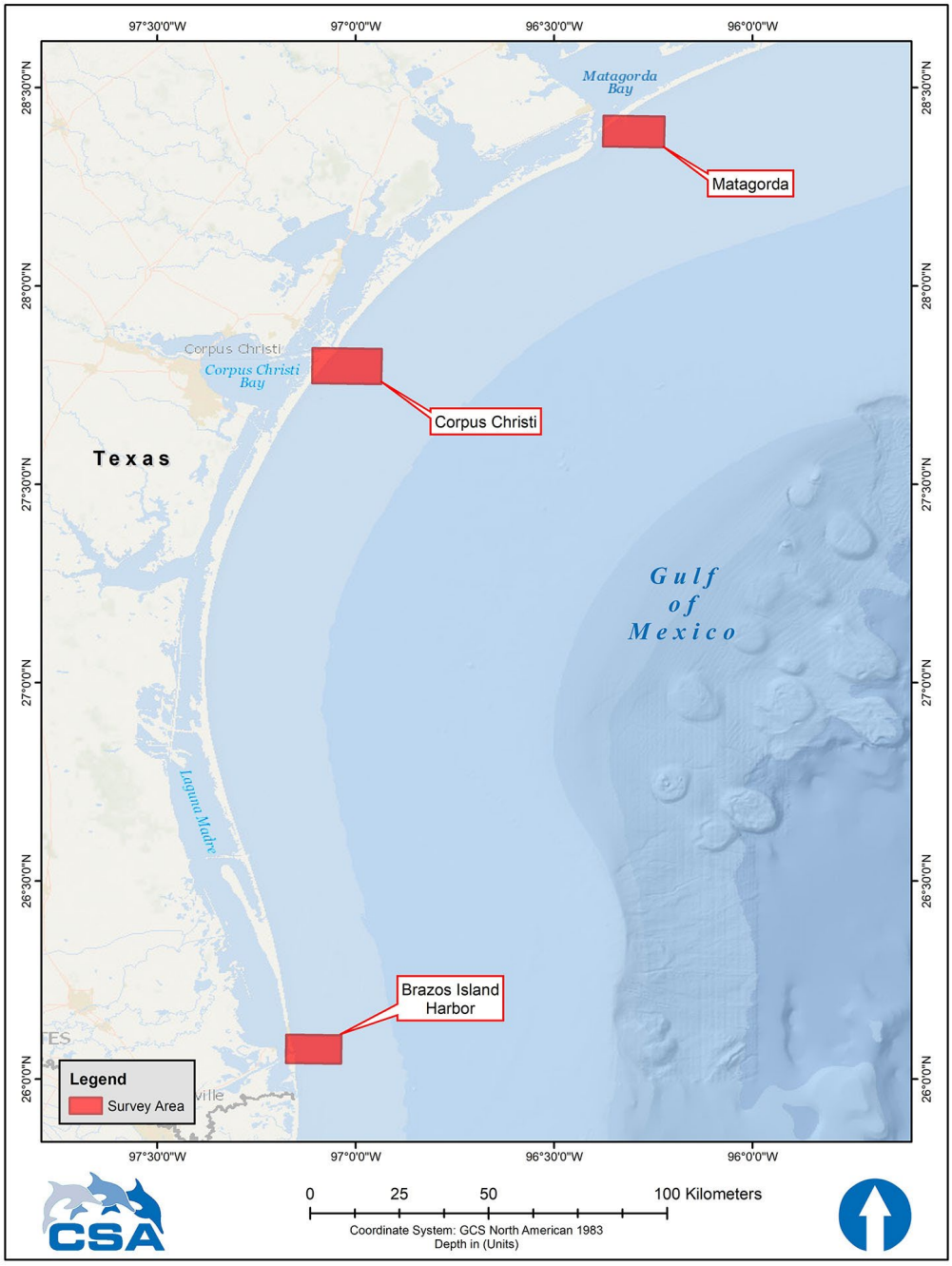

Figure 16. Locations of the three study areas in the Gulf of Mexico along the Texas coast.

Matagorda Ship Channel ODMDS
The EPA designated the Matagorda Ship Channel ODMDS on September 10, 1990. The Matagorda Ship Channel ODMDS is a rectangular site occupying an area of approximately 0.5 nmi^2 (1.9 km^2) with depths ranging from 25 to 40 ft (7.6 to 12.2 m). The USACE conducts regular operation and maintenance dredging activities of the Matagorda Ship Channel removing an average of 2 million y^3 (1.53 million m^3) of dredged material annually. The study area monitored during this survey extends 3 nmi^2 (10.3 km^2) and includes the designated ocean site, an area being considered for site expansion, and the surrounding marine environment.

Corpus Christi ODMDSs
EPA designated the Corpus Christi Ship Channel New Work ODMDS (formerly Homeport Project, Port Arkansas, Texas) on August 31, 1988. The Corpus Christi Ship Channel New Work ODMDS is rectangular in shape and covers 1.4 nmi^2 (4.8 km^2) of the sea floor in water depths naturally ranging from approximately 46 to 53 ft (14 to 16 m). The site is located approximately 3.3 nmi (6.1 km) offshore.

The Corpus Christi Ship Channel Maintenance ODMDS was designated by the EPA on July 11, 1989. The site is rectangular in shape and covers 0.6 nmi^2 (2.1 km^2) of the sea floor in water depths naturally ranging from approximately 35 to 50 ft (10.7 to 15.2 m). The Corpus Christi Ship Channel Maintenance ODMDS is located approximately 1.7 nmi (3.1 km) offshore. The highest shoaling sections of the Entrance Channel are dredged approximately every two years, and this maintenance dredged material is disposed at the Corpus Christi Ship Channel Maintenance ODMDS. Since the 1989 designation, approximately 9.5 million y^3 (7.26 million m^3) of dredged material, primarily from the Entrance and Jetty Channels, have been disposed at the Corpus Christi Ship Channel Maintenance ODMDS.

Brazos Island Harbor ODMDSs
The EPA designated the Brazos Island ODMDS on September 11, 1990. Since then, approximately 3.6 million y^3 (2.75 million m^3) of dredged material from the Entrance and Jetty Channels have been disposed there. The site is located approximately 1.6 nmi (3.0 km) offshore with water depths ranging from 43 to 65 ft (13.1 to 19.8 m).

A second site, the Brazos Island 42-Foot Project (New Work) ODMDS, was designated by the EPA on January 17, 1992, for the disposal of construction dredged material from channel improvement projects in Brazos Island Harbor. The site is located approximately 3.8 nmi (7.0 km) offshore with water depths ranging from 60 to 67 ft (18.2 to 20.4 m). Approximately 575,000 y^3 (439,620 m^3) of new work material from the widening and deepening of the Brazos Island Harbor Entrance and Jetty Channels was placed at the Brazos Island Harbor New Work ODMDS from February 20, 1992, to April 14, 1992. This has been the only disposal to occur at the site.

The Brazos Island Harbor study area monitored during this survey extends 5.4 nmi^2 (18.5 km^2) and includes both of the MPRSA-designated ocean sites each with an area of 0.42 nmi^2 (1.4 km^2), the area being considered for expanding the sites, and the surrounding marine environment.

3.4.2 Survey Objectives, Activities, and Findings
The purpose of conducting monitoring in these three study areas was to collect sediment and benthic macroinfaunal samples to 1) characterize the current physical, chemical, and biological benthic conditions, 2) conduct a routine trend assessment ensuring the sites were meeting environmental goals, and 3) collect data to from areas surrounding the site to inform site

expansions in each area. Depending on the type of substrate material encountered, one of two grab samplers were used, a Van Veen or a Smith-McIntyre from the 135-ft (41-meter) Louisiana Universities Marine Consortium (LUMCON) R/V *Point Sur*.

During this 2020 survey, Region 6 collected benthic (sediment and biological) samples from each of the three study areas. The sediment samples were processed on board and sent to a laboratory to be analyzed for the numerous contaminants of concern and conventional parameters including grain size distribution, total organic carbon, metals, phenols, hydrocarbons, PCBs, and pesticides. The full list of contaminants of concern and conventional parameters can be found in EPA Region 6's Regional Implementation Agreement (USACE and USEPA, 2003) for ocean dredged material disposal projects in Louisiana and Texas. Macrofauna samples were also processed on board and sent to a laboratory to be analyzed for benthic community parameters including density, diversity, evenness, and richness. Region 6 scientists compared the physical, chemical and biological results among stations within the ODMDSs and to stations in the surrounding marine environment.

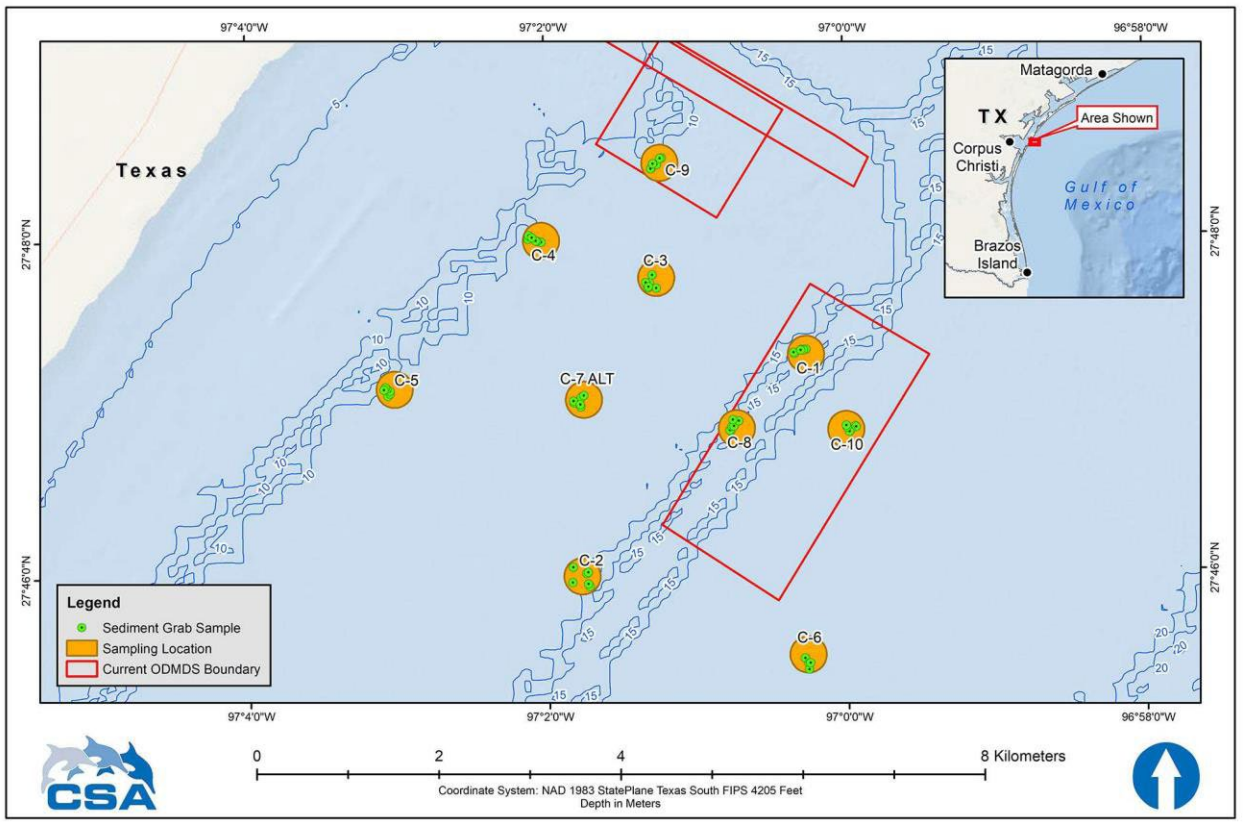

Figure 17. Station locations for the Corpus Christi study area. Twelve benthic monitoring stations were located within the disposal areas and 18 stations were located outside of the ODMDS and in the potential expansion area.

Corpus Christi ODMDSs

Results from the sediment grain size analysis showed that sediments throughout the Corpus Christi study area varied. Sediments ranged from >80% sand at 20 stations to approximately 90% silty-clay at three stations. A significant percentage of silty-clay fractions (>30%) was also found at six stations, and some percent gravel fraction (shell hash) was found at four stations (BVA 2020C, Figure 23).

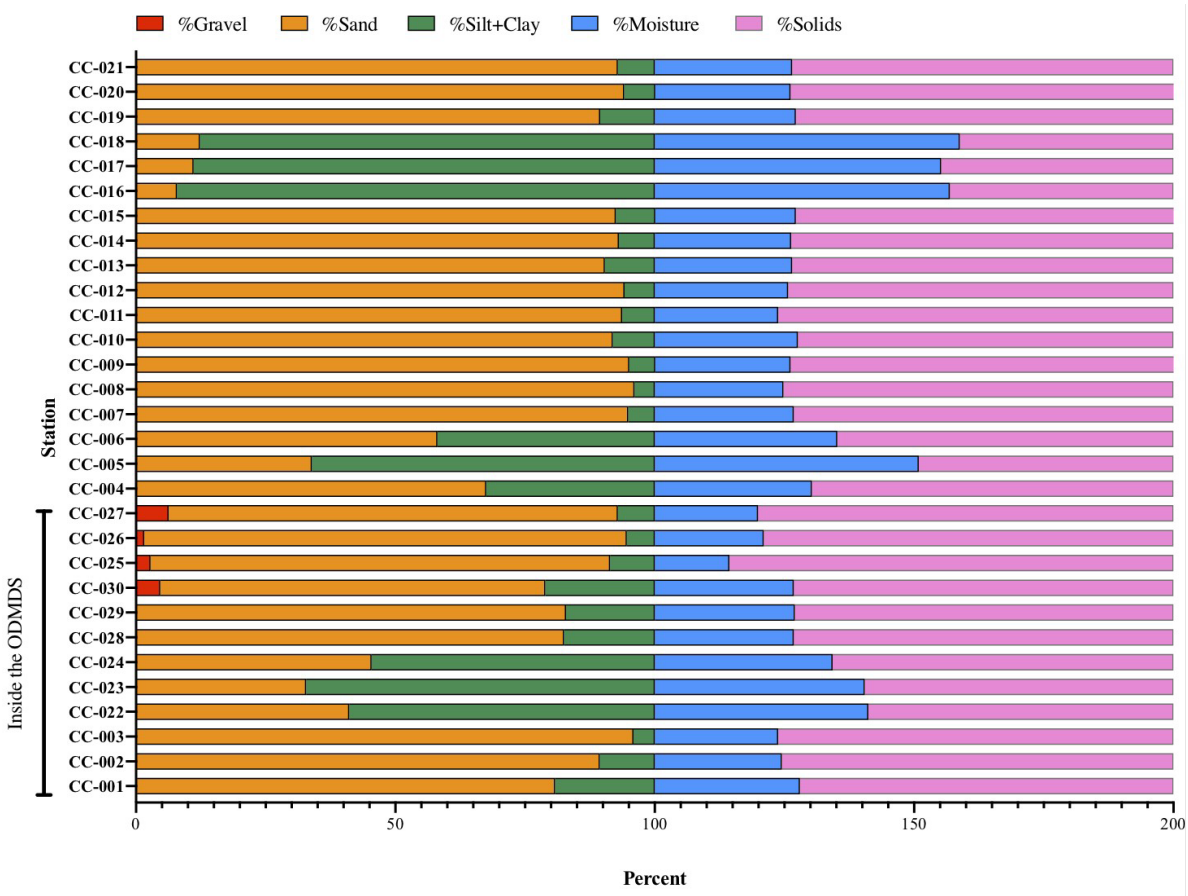

Figure 18. Sediment data for the Corpus Christi study area by station, 2020.

Results from Region 6's sediment chemistry analyses of samples collected from the Corpus Christi study area showed that no trends were apparent, and all contaminants were found in very low concentrations. Three metals, barium, manganese and nickel exceeded screening levels and concentrations were higher in areas with higher proportions of silt and clay. Even though the concentrations of these metals exceeded screening levels, they were found at very low levels lacking risk potential and indicating no issues of concern.

Overall, the macroinfaunal assemblages inside the existing Corpus Christi ODMDSs were similar to those outside of the ODMDSs, in terms of species abundance and composition of major taxonomic groups (Annelida, Mollusca, and Arthropoda). Inside the ODMDS sites, all but two stations located in the southeastern portion of the Corpus Christi study area were dominated (>50% assemblage composition) by annelids; Station CC-025 was dominated by polychaetes, mollusks, and arthropods, while Station CC-027 was co-dominated by polychaetes and arthropods. Outside the ODMDS sites, all but six stations were dominated by polychaetes (Figure 24). The average total biomass at the 12 stations inside the ODMDS sites was 1.67 g, and the average total biomass at the 18 stations outside the ODMDSs was 0.92 g (BVA 2020C).

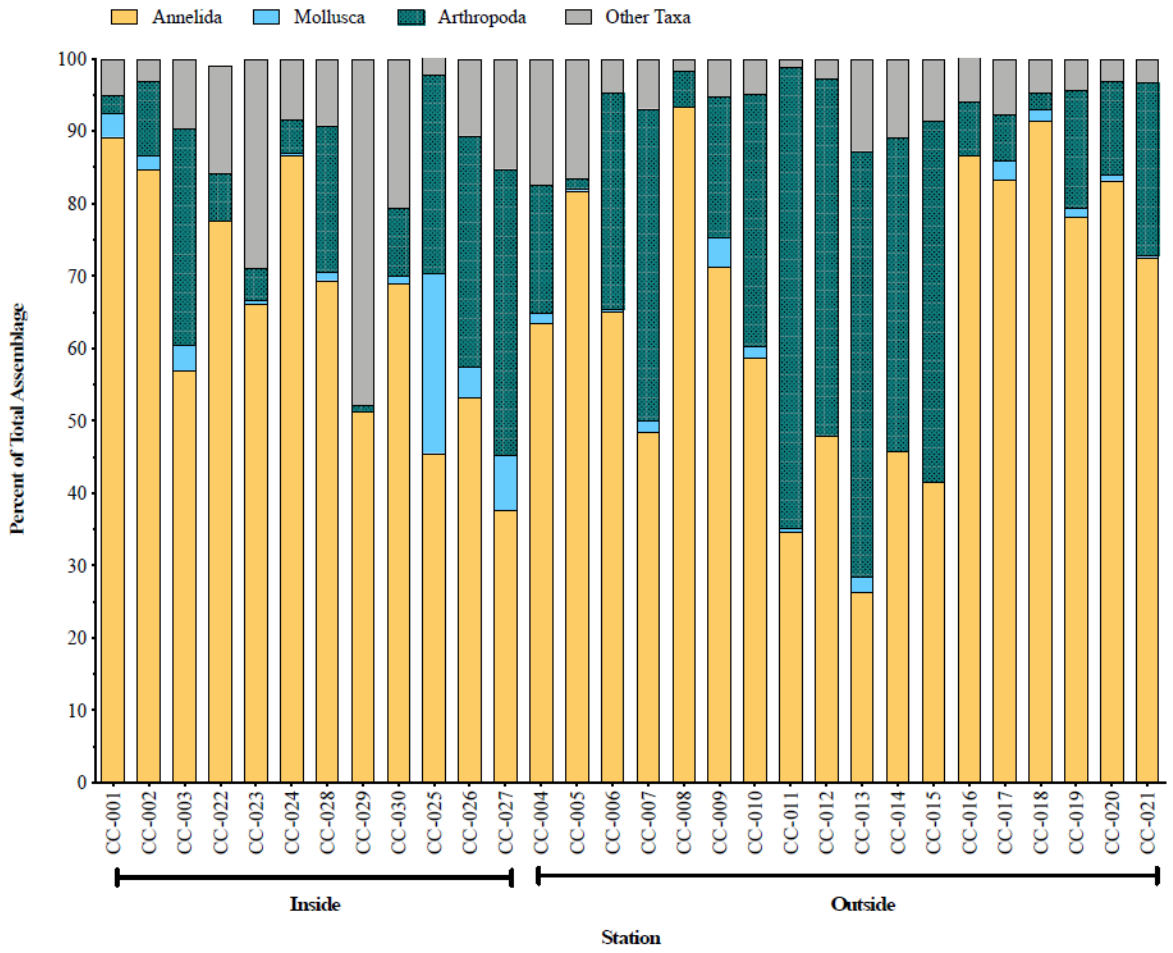

Figure 19. Distribution of major taxa for the Corpus Christi, Texas sampling stations, 2020.

Taxa richness at the 12 stations inside the ODMDSs averaged 30.9 and ranged from 14 taxa at Station CC-025 to 50 taxa at Station CC-023. Taxa richness at the 18 stations outside the ODMDSs averaged 31.5 and ranged from 22 taxa at Stations CC-010 and CC-017 to 51 taxa at Station CC-005 (Figure 25). Densities at the 12 stations inside the ODMDSs ranged from 550 organisms/m^2 at Station CC-025 to 6,137.5 organisms/m^2 at Station CC-023, with an average of 2,651.0 organisms/m^2. Densities at the 18 stations outside the ODMDSs averaged 2,276.4 organisms/m^2 and ranged from 787.5 organisms/m^2 at Station CC-010 to 6,612.5 organisms/m^2 at Station CC-021 (Figure 26, BVA 2020C).

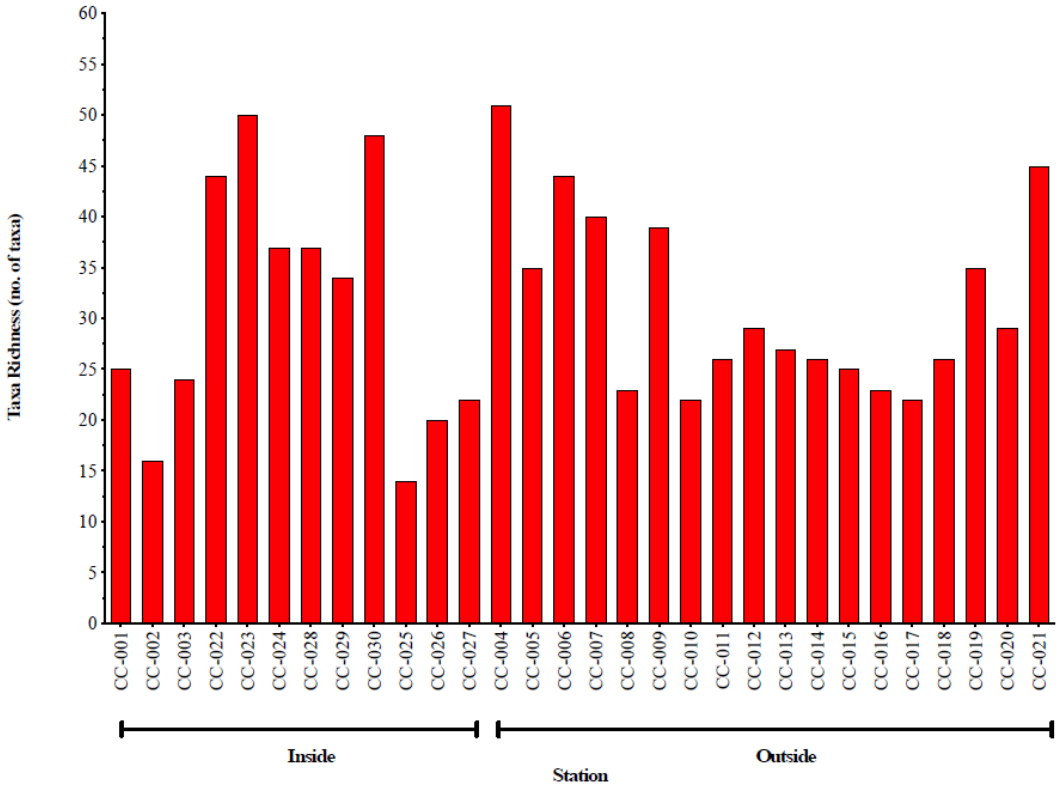

Figure 20. Taxa richness data for the Corpus Christi, Texas sampling stations, 2020.

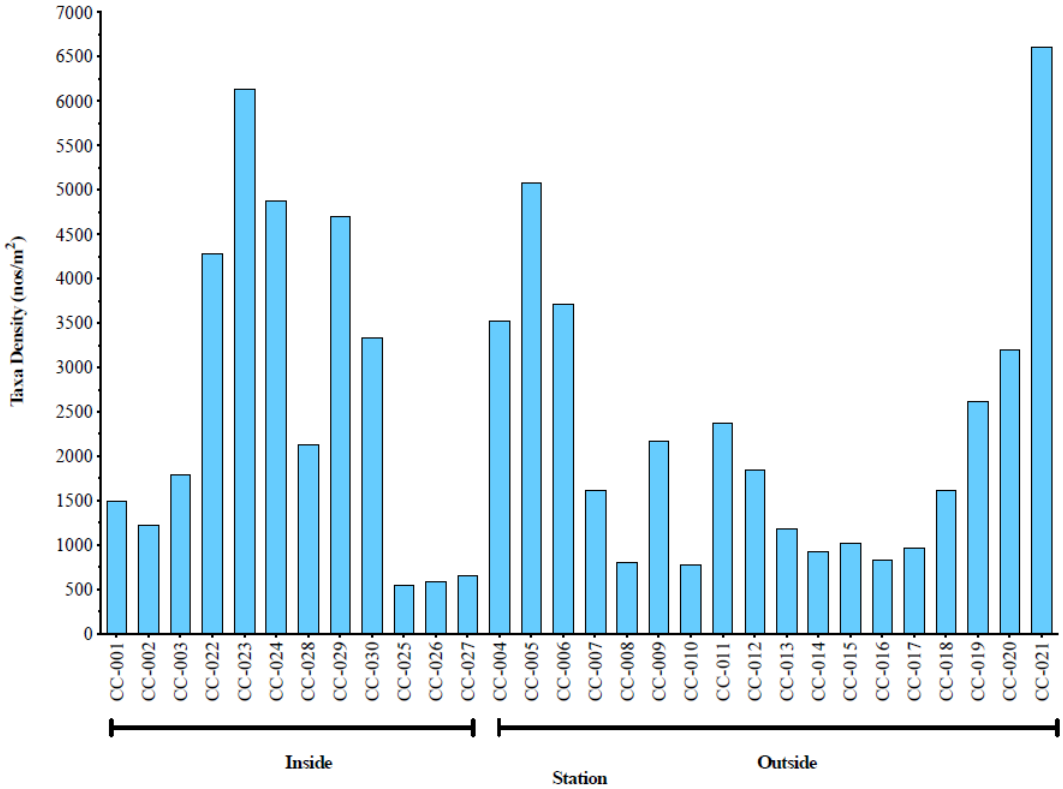

Figure 21. Density data for the Corpus Christi, Texas sampling stations, 2020.

Taxa diversity at the stations inside and outside the ODMDSs averaged 2.48 and 2.62, respectively. Taxa evenness inside and outside the ODMDS sites ranged from 0.62 to 0.91 and 0.60 to 0.90, respectively (BVA 2020C).

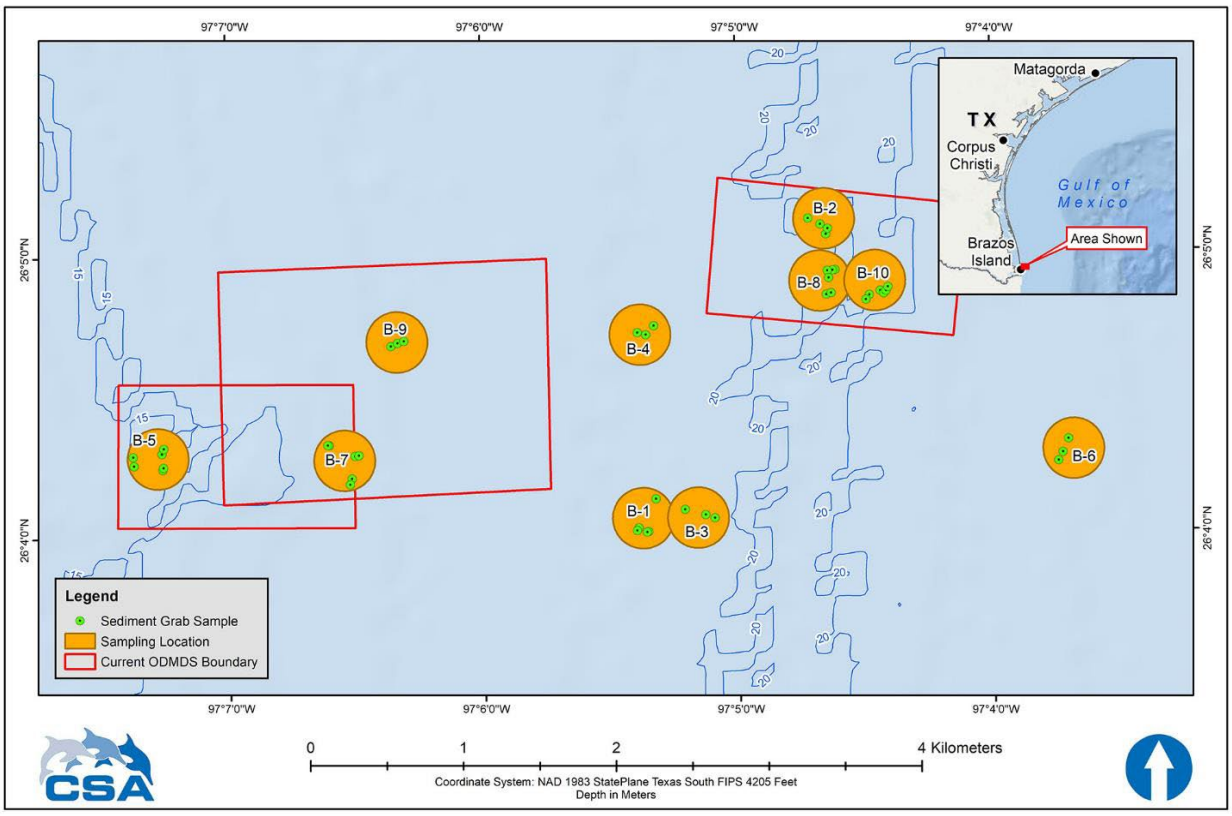

Figure 27. Sampling locations in and around the Brazos Island Harbor study area.

Brazos Island Harbor ODMDSs

Results from the sediment grain size analyses showed that sediments across the Brazos Island Harbor study area were predominately sand, ranging from 90 to 95% with an average of 92% (Figure 28, Tetra Tech, Inc. 2020A) at all stations sampled.

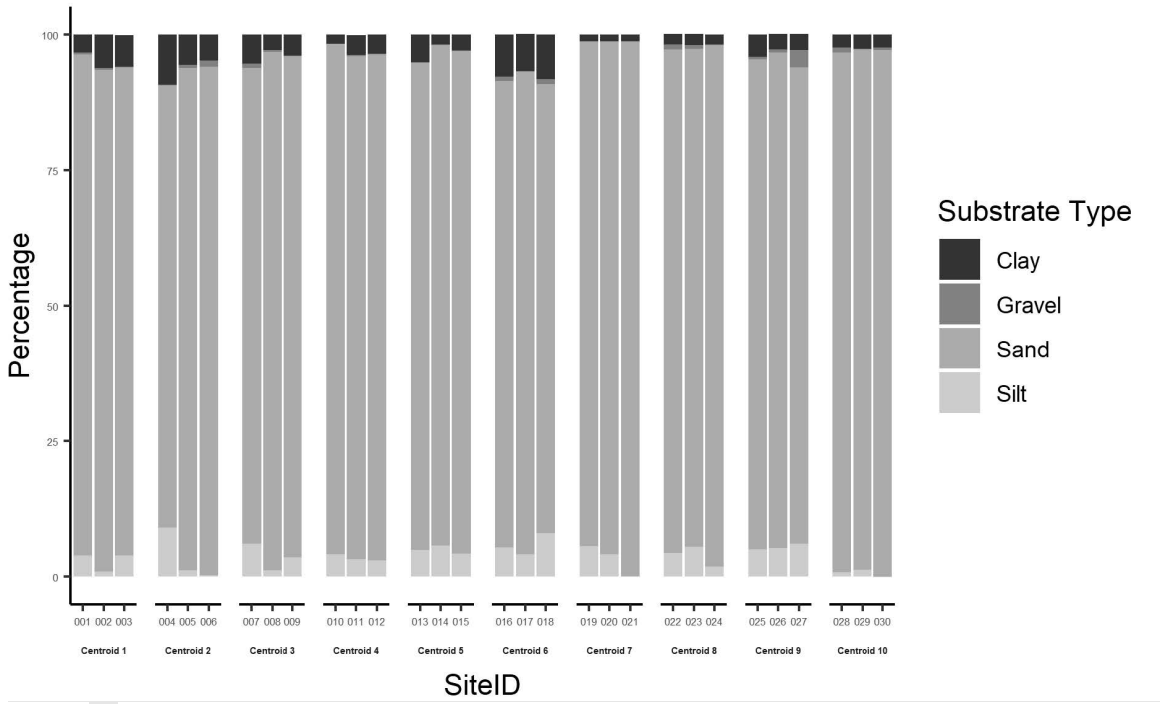

Figure 28. Percent composition of substrate particles grouped by type for each station within the Brazos Island Harbor study area.

Results from Region 6's sediment chemistry analyses of the Brazos Island Harbor study area showed that no trends were apparent, and all contaminants were in very low concentrations. Sample location 6 (outside the ODMDSs) indicates slightly higher levels for several metals; however, barium is the only measured constituent to exceed a screening threshold (Figure 29, Tetra Tech, Inc. 2020A). Application of the threshold screening values resulted in exceedances for one contaminant, barium. Though limited variation in substrate characteristics seems to be associated with low concentrations of contaminants, there are no aspects of the sediment chemistry indicating issues of concern.

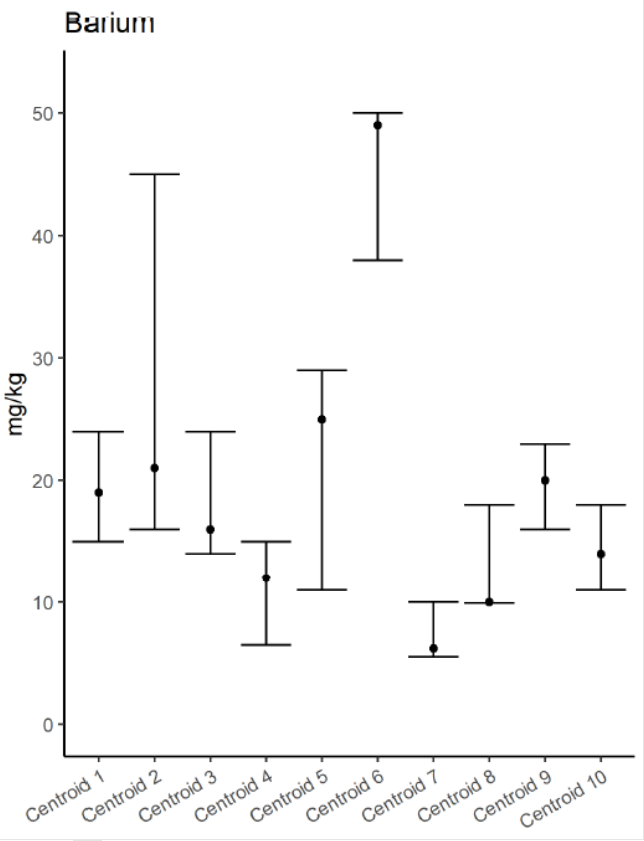

Figure 29. Range chart illustrating results for barium concentrations of the three samples in the Brazos Island Harbor study area.

Macrofaunal data across the Brazos Island Harbor study area showed that most stations inside of the site and all the stations outside the ODMDSs were dominated by polychaetes. Taxa richness averaged 32 taxa/station inside the ODMDSs and 24 taxa/station at stations outside the ODMDSs. Densities at stations inside the ODMDSs averaged 931.9 organisms/m^2 and densities at stations outside the ODMDSs averaged 526.0 organisms/m^2. The macroinfaunal assemblages found at stations both inside and outside the Brazos Island Harbor ODMDSs are adapted to a fluctuating environment and are typical of those found in nearshore, shallow water benthic habitats (Felder and Kemp, 2009).

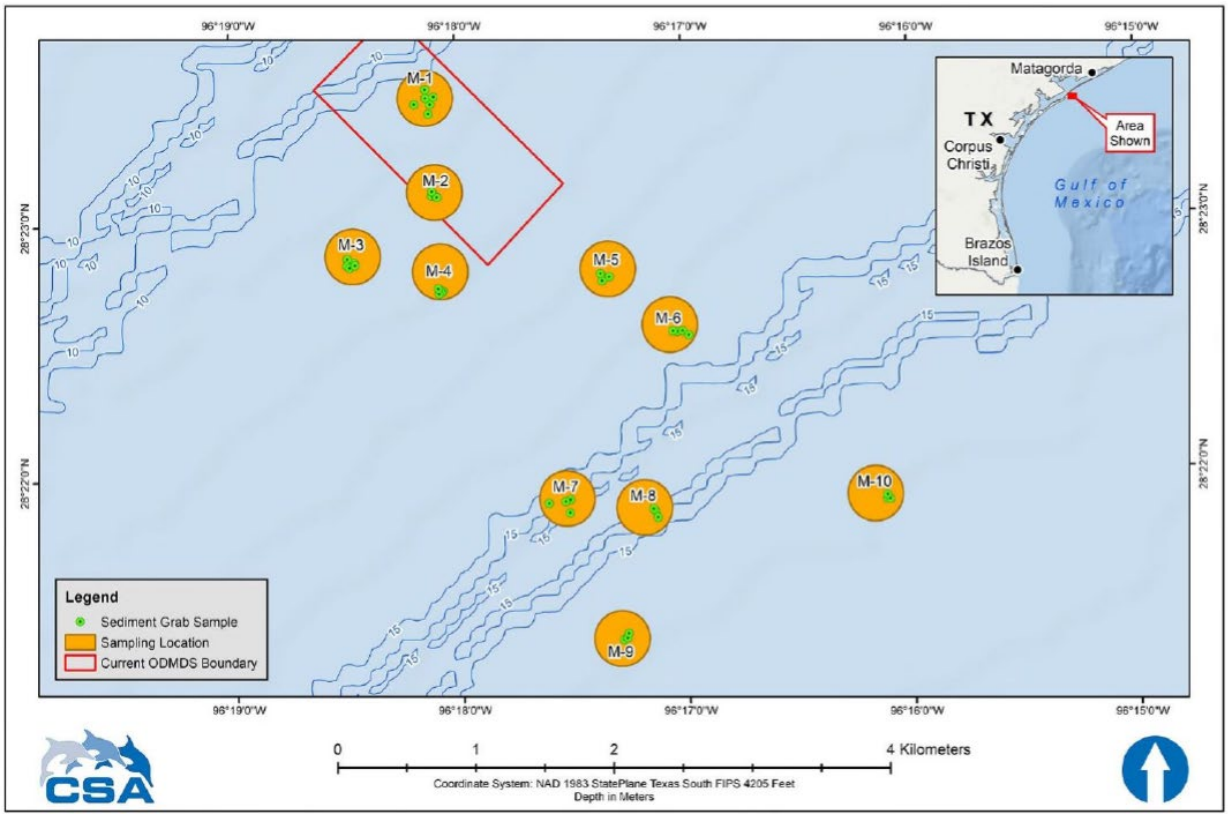

Figure 22. Sampling centroids in and around the Matagorda study area.

Matagorda Ship Channel ODMDS

Results from the sediment grain size analyses showed that sediments throughout the Matagorda study area followed a general trend where the percentage of sand in sediment samples decreased further from shore. Sediments from stations closer into shore (1 – 4) were predominantly sand (more than 95%). Sand percentages decreased to approximately 60% at locations 5 and 6, and samples collected from locations 9 and 10, farther from shore, had smaller percentages of sand (Figure 31, Tetra Tech, Inc. 2020B).

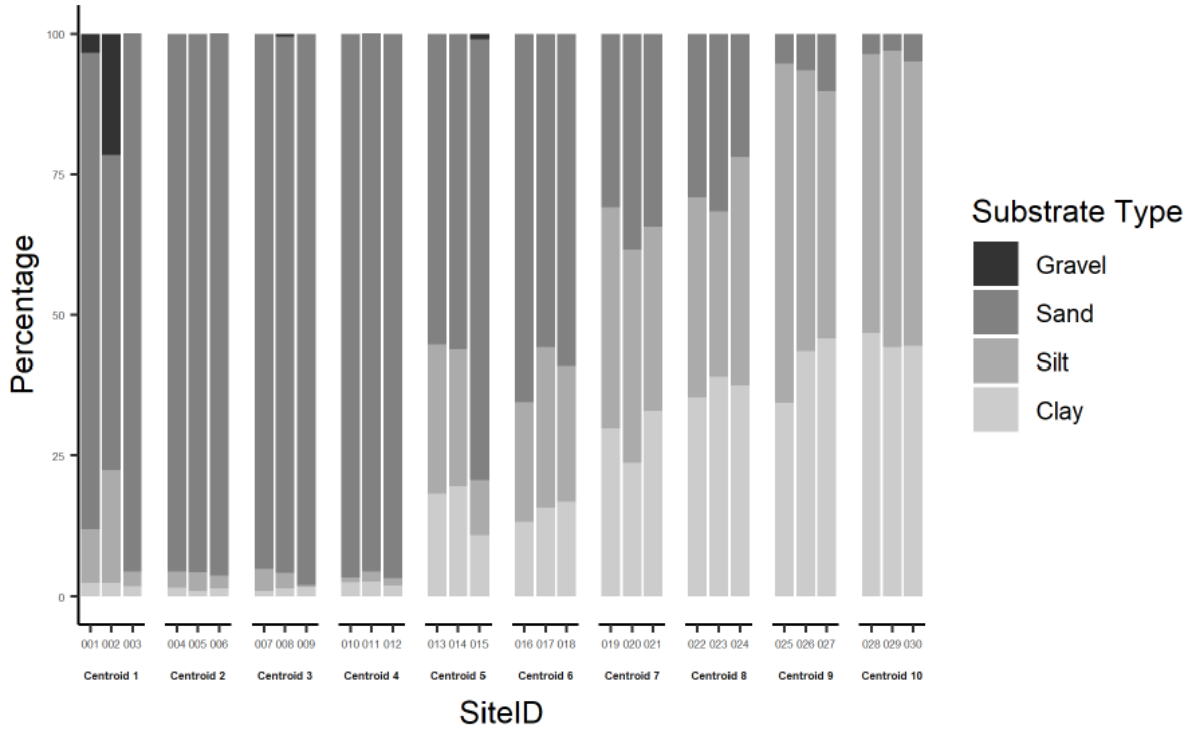

Figure 23. Percent composition of substrate particles grouped by type for each station within the Matagorda study area.

Results from Region 6's sediment chemistry analyses of the Matagorda study area showed a general trend of contaminants increasing with increased distances from shore. Six metals and one pesticide: aluminum, arsenic, barium, colbalt, and manganese and gamma-BHC exceeded screening levels. Although the concentration of these metals and pesticide exceeded the threshold value, the concentrations measured were below the level of concern. The general trend of increasing concentrations of contaminants with increased distance from shore is likely due to the shift in predominant sediment grain sizes in present the area. Finer particle sizes (e.g., silts and clays) tend to have higher concentrations of various contaminants than larger particle sizes (e.g., sand) and in the Matagorda study area, EPA Region 6 found that predominant grain size decreased with increasing distance from shore.

Macrofaunal data across the Matagorda study area showed that the macroinfaunal assemblages present were correlated with sediment grain size. The stations with predominantly sandy sediments had macroinfaunal assemblages typical of sandy sediment habitats (e.g., abundance of the chordate, *Branchiostoma*, haustorid amphipods, the polychaete, *Polygordius*), while opportunistic polychaetes (e.g., *Mediomastus*, *Magelona*) were most abundant in stations with higher percentages of silty-clay sediments. The macroinfaunal assemblages found at stations both inside and outside the Matagorda ODMDS are adapted to a fluctuating environment and are typical of those found in nearshore, shallow water benthic habitats (Felder and Kemp, 2009).

3.4.3 Conclusions and Recommended Management Actions

The data and information collected from this survey confirmed that environmentally acceptable conditions, as defined in the sites site management and monitoring plans, are being met at the Corpus Christi, Matagorda, and Brazos Island Harbor ODMDSs and that that pre-disposal testing and evaluation of dredged material has been effective at preventing any contaminated material from being disposed of at the sites. Region 6 intends to continue to routinely monitor the chemical,

physical, and biological parameters inside and surrounding the ODMDS to identify any changes, ensure that short-term anticipated impacts stay within the boundaries of the ODMDSs, and that disposal activities are not causing lasting adverse impacts.

Region 6 will also utilize the data collected during this survey to inform any modification of these ODMDSs that may be needed to increase the capacity for disposal at MPRSA ocean sites of dredged material generated from port, harbor, and channel maintenance and new work navigation projects along the Gulf coast of Texas.

3.9 Region 9 – LA-2 Ocean Dredged Material Disposal Site

3.9.1 Background

The LA-2 ODMDS was first used as an interim[1] MPRSA ocean site in the mid-1970s and was subsequently designated as a permanent MPRSA ocean disposal site in 1992. It is located on the outer continental shelf margin, at the upper southern wall of the San Pedro Sea Valley, approximately seven nmi (13 km) offshore of the entrance to the Los Angeles/ Long Beach Harbor (Figure 35). The site ranges in depth from 361 to 1,050 ft (110 to 320 m). It is a circular site, with a radius of 3,000 ft (915 m); however, disposal must occur in the surface disposal zone, which has a radius of 1,000 ft (305 m). The LA-2 ocean disposal site has received approximately 7.3 million y^3 (5.58 million m^3) of dredged material since its first use in 1976, including approximately 4.73 million y^3 (3.62 million m^3) since designation in 1991.

The overall study area also considered far-field impact sources such as the Los Angeles County water treatment system outfall and an Area of Potential Legacy Short Dumps (referred to herein as the Legacy Area). “Short dumps” refer to events where dredged materials were dumped before reaching the MPRSA-designated ocean site. The Legacy Area extends from the entrance channels of the Port of Los Angeles and Port of Long Beach and is the area within which most vessels would pass through when approaching the designated LA-2 ODMDS.

[1] Interim MPRSA ocean disposal sites are no longer available for use. Amendments enacted in 1992 under the MPRSA require that no MPRSA permits shall be issued for an EPA-established ocean site after January 1, 1997, unless the site has received a final designation. In 2008, the EPA repealed expired, and therefore obsolete, provisions regarding interim ocean disposal sites.

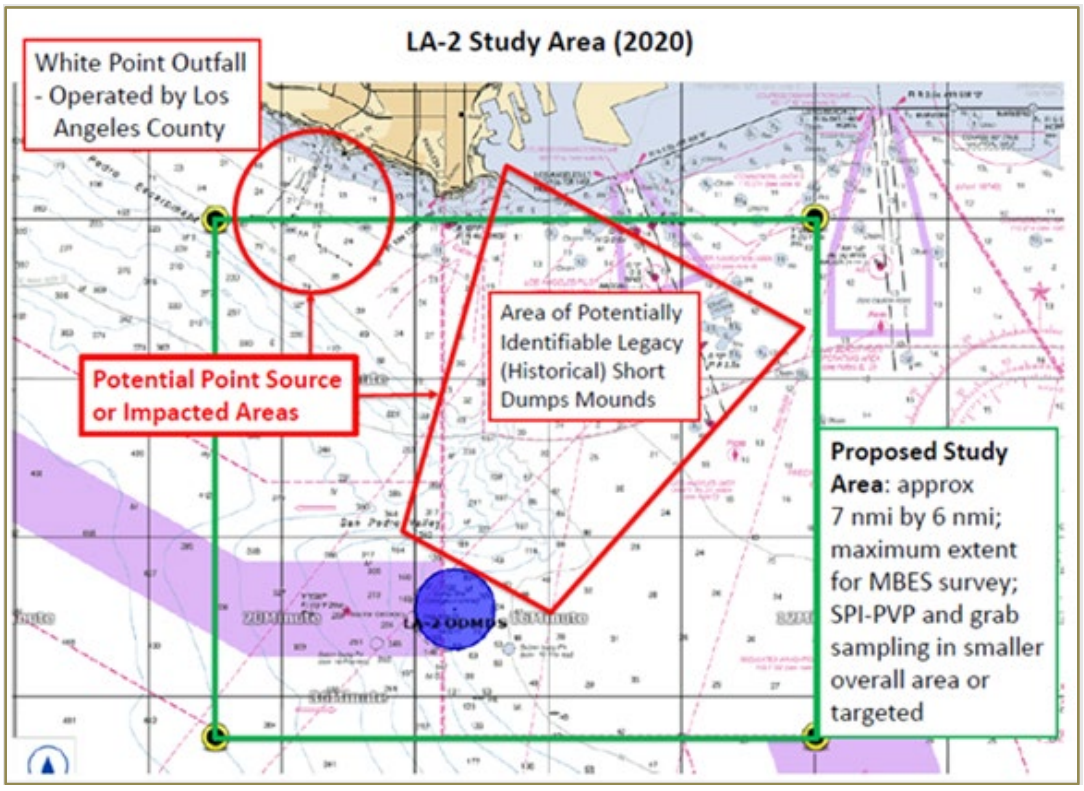

Figure 24. LA-2 ODMDS and study area offshore of Los Angeles-Long Beach, CA.

3.9.2 Survey Objectives, Activities, and Findings

The EPA conducted a two-part oceanographic monitoring survey of the LA-2 ODMDS in the fall of 2020 aboard the M/V *Bold Horizon*. During the first portion of the survey, the EPA conducted a multi-beam echosounder (MBES) survey to characterize the seafloor of the overall LA-2 ODMDS study area and identify any seafloor features that could affect the sediment sampling. The MBES survey covered an area of 7 nmi by 6 nmi, extending beyond the designated disposal site in all directions (Figure 33). The survey provided high-resolution bathymetry of the study areas, and the results were used to inform the selection of sediment grab stations for chemical and benthic community sampling.

During the second portion of the survey, the objectives were to: 1) collect sediment profile images (SPI) and plan view images (PVI) to evaluate the extent and characteristics of the dredged material footprint and any potential impacts of the dredged material disposal on the benthic environment; 2) collect sediment grain size and chemistry samples to determine whether analyte concentrations are within the range of the material approved for disposal, and how the concentrations compare to areas immediately outside of the site and further geographically removed; and 3) collect benthic community samples to evaluate the recovery of the benthic community following dredged material disposal and determine whether there are any impacts from dredged material disposal to the benthic community outside the ocean disposal site.

SPI-PVI imaging is a monitoring technique used to provide data on the physical characteristics of the seafloor and the status of the benthic biological community. SPI-PVI imaging has been shown to be a powerful reconnaissance tool that can efficiently map gradients in sediment type, biological communities, and disturbances from physical forces, anthropogenic input, or organic enrichment. SPI and PVI were collected in a radial sampling design, allowing for sampling to occur both within and outside of each disposal site, and encompassing most of the same area as the MBES survey.

Stations were located within the LA-2 ODMDS boundary and along eleven radial transects, spaced approximately 2,130 ft (650 m) apart and extending up to 4.5 miles (7.2 km) from the LA-2 ODMDS center. In total, the EPA collected and analyzed SPI and PVI from 99 stations and sediment and biological samples from 30 stations.

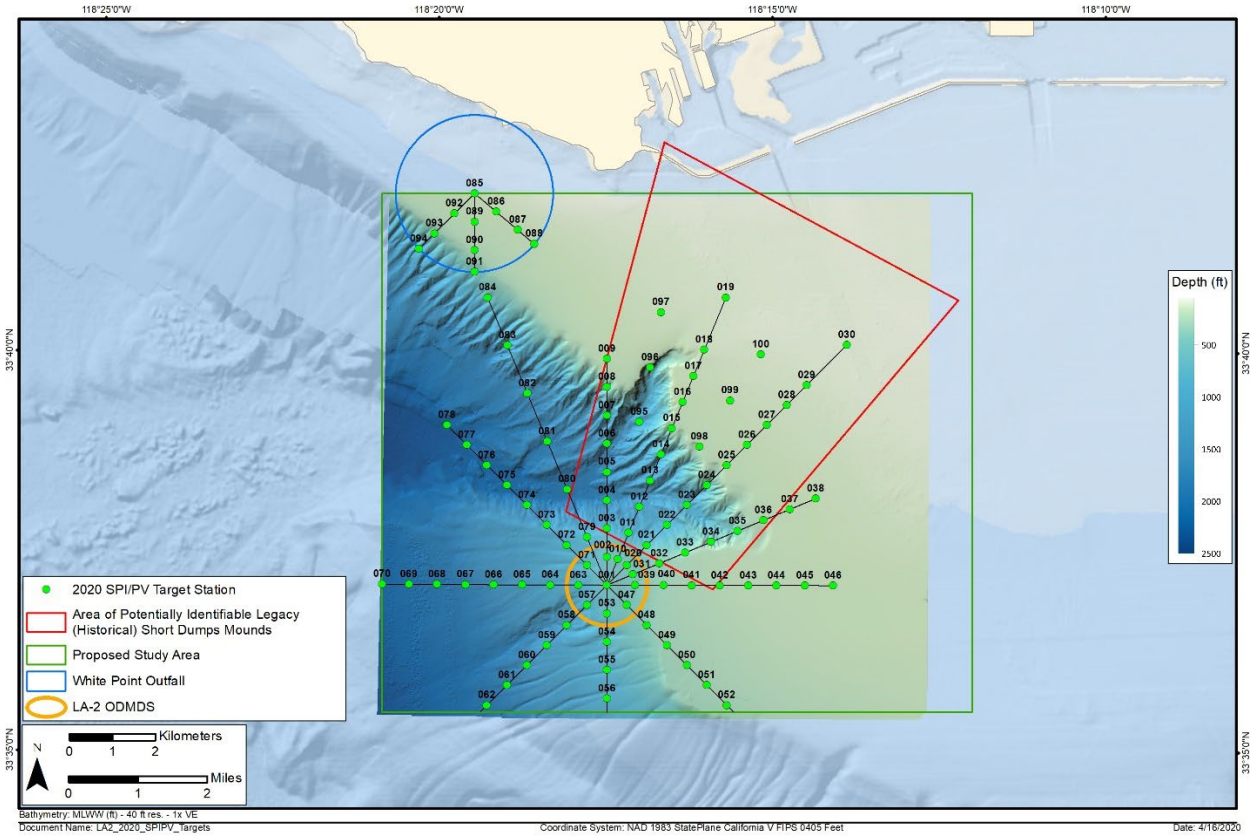

Figure 25. LA-2 ODMDS study area and SPI-PVI target station locations. The boundary of the ODMDS is depicted in orange.

Sediment and benthic community samples were collected using a 0.1 m^2 Van Veen Grab sampler. The sediment samples were analyzed for grain size, TOC, metals, dioxins and furans, pesticides (DDTs), organotins, PAHs, and PCBs. Chemistry of sediment samples within the dredged material footprint was analyzed to determine whether the analyte concentrations correspond to levels expected from pre-disposal dredged material testing. Sediment chemistry samples inside the dredged material footprint was compared to samples collected outside of the dredged material footprint.

Sediment grain size was generally related to water depth across the surveyed area. The shallower stations located on the continental shelf were predominantly composed of fine sand, while stations located within the deeper areas along the continental slope and within the San Pedro Sea Valley were composed of either very fine sand or silt/clay (Figure 34). Gravels, including cobble and boulder on soft sediment, were uncommon across the surveyed area; only 8 stations had documented gravels (Figure 35). Overall, the stations inside the dredged material footprint were predominantly sand (average of 62.6%), followed by silt (24.6%), and clay (12.4%). Similarly, the predominant grain size of stations outside the site, not including the outfall, was also sand (average of 57.8%), followed by silt (27.5%) and clay (14.42%).

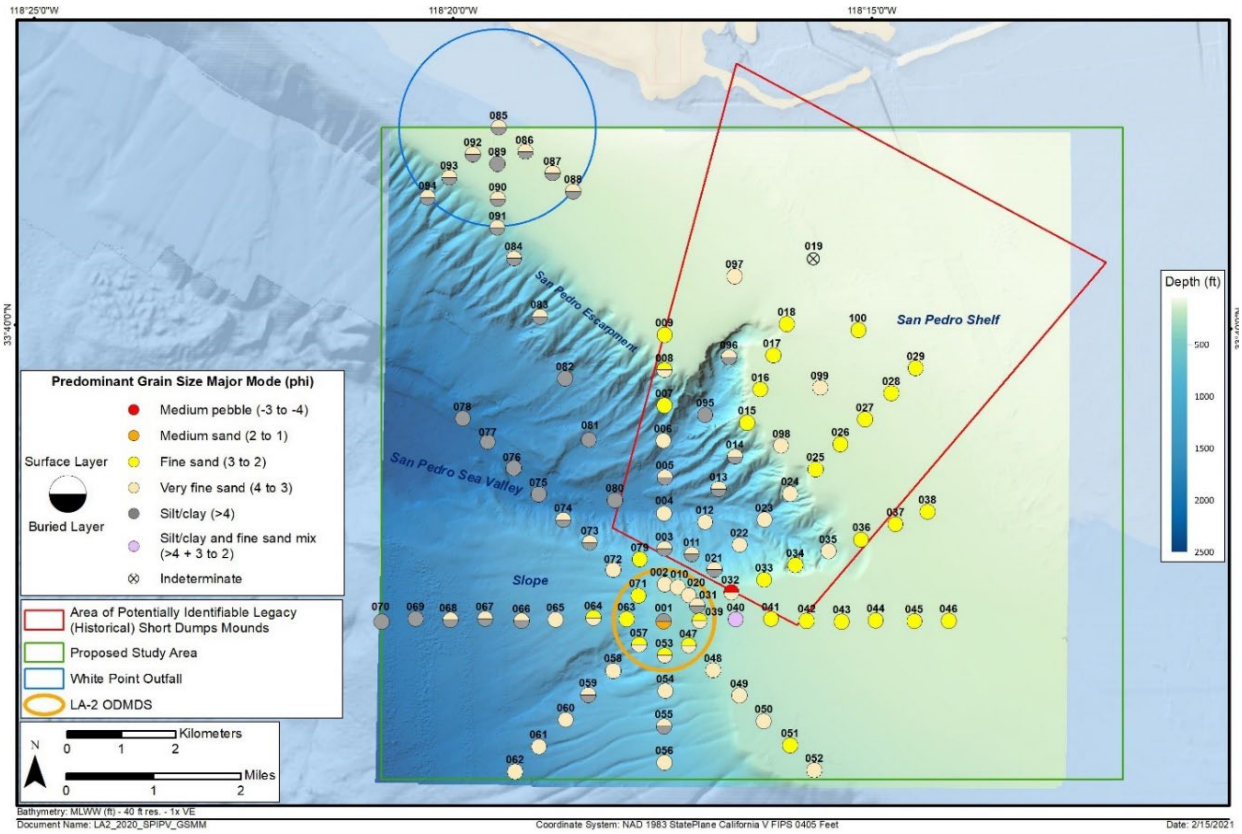

Figure 26. Predominant grain size by station in the LA-2 study area. Most stations are characterized by soft sediments.

Dredged material was observed at all stations within the LA-2 ODMDS boundary and at several stations outside the disposal site, generally at stations in the vicinity of the LA-2 ODMDS and within the Legacy Area. Dredged material was identified in SPI by the presence of features visually distinct from native sediments, including patches of light gray or dark brown clay, disordered mixtures of coarse and fine material, and distinct surficial layers of pale gray very fine sand and deep layers of dark black silt/clay. In addition to the dredged material within the LA-2 ODMDS, there were several stations near the LA-2 ODMDS boundary where trace dredged material was documented as indicated by small amounts of light gray clay or small inclusions of dark brownish black sediment. Often in these replicate images, there was evidence that the sediments had been reworked by infauna and were beginning to resemble background sediments.

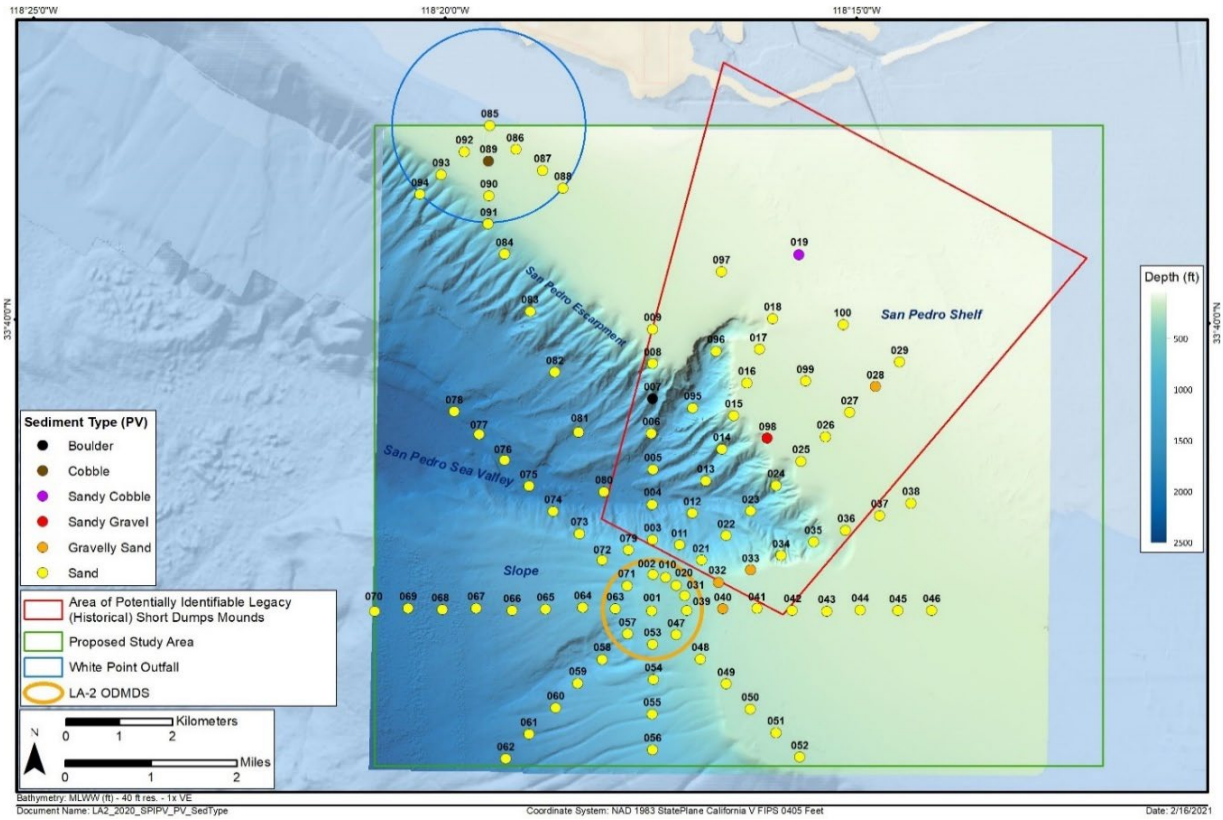

Figure 27. Sediment type derived from PVI analysis denoting presence of gravels at the LA-2 study area.

Region 9 compared their sediment chemistry results to effects range low (ER-L) and effects range median (ER-M) thresholds, which are measures of toxicity in marine sediments. Adverse effects are rarely seen in sediments with chemical concentrations below the ER-L. Adverse effects are generally observed in sediments with chemical concentrations above the ER-M. Most analytes measured at stations within the dredged material footprint were below the ER-L, with the exception of nickel, which slightly exceeded the ER-L at two stations, and arsenic, copper, mercury, and zinc, which each only slightly exceeded the ER-L at Station 001. DDTs exceeded the ER-L at Station 064. All analytes within the dredged material footprint were well below the ER-M.

Overall, the area within the dredged material footprint of the LA-2 ODMDS displayed less elevated chemical concentrations than all other surrounding areas. Apart from values for zinc and lead, the average concentrations of analytes inside the disposal site were all below those in the "outside area" (i.e., the areas outside the dredged material footprint, but not including the White Point Outfall nor the Legacy Area). However, average values for both zinc and lead inside the ODMDS were well below the ER-L.

When measurable, each of the overall areas (i.e., the LA-2 ODMDS, the White Point outfall, the Legacy Area, and other stations removed from the LA-2 ODMDS) had average apparent redox potential discontinuity (aRPD) values above 1.0 cm, indicating that the areas are not considered impaired. Additionally, there was no evidence of sedimentary methane nor of low dissolved oxygen conditions in the water column nor at the benthic boundary layer in any of the SPI analyzed.

There were 15,407 organisms captured in the collected benthic community samples. Throughout the study area, density ranged from a low of 980 animals per square meter (station 012; in the Legacy Area), to a high of 21,120 (station 047) inside the LA-2 ODMDS. Throughout the study area,

there were 422 unique invertebrate taxonomic identifications (taxa richness). Within the LA-2 ODMDS, the taxa richness ranged from a low of 17 (station 001) to a high of 79 (station 047). Taxa richness outside of the LA-2 ODMDS ranged from a low of 24 (station 078) to a high of 115 (station 085). The mean diversity and mean evenness inside the LA-2 ODMDS were both lower than those same indices for the Legacy Area and the remaining areas outside of the LA-2 ODMDS. Overall, the LA-2 ODMDS displayed higher mean abundance and density than the areas outside of the ODMDS and the Legacy Area. This suggests that disposal activities are not causing lasting impacts to the benthic community.

3.9.3 Conclusions and Recommended Management Actions

Results from the 2020 survey confirm that environmentally acceptable conditions, as defined in the site management and monitoring plan, are being met at the LA-2 ODMDS and that pre-disposal testing and evaluation of dredged material has been effective at preventing any contaminated material from being disposed of at the site. The bulk of the dredged material disposed in the last decade or more appears to have been deposited properly within the site boundaries. There are minor and localized physical impacts from dredged material disposal, as expected, but no significant adverse impacts are apparent to the benthic environment outside of site boundaries. EPA Region 9 recommends that the LA-2 ODMDS can continue to be used under an updated SMMP.

Region 9 intends to continue to routinely monitor the chemical, physical, and biological parameters inside and surrounding the LA-2 ODMDS to document any changes to the area, ensure that short-term anticipated impacts stay within the boundaries of the ODMDS, and that disposal activities are not causing lasting adverse impacts.

4.0 Next Steps

The EPA conducts oceanographic surveys to monitor the impacts of regulated dumping at ocean disposal sites and to inform management and monitoring decisions in accordance with the EPA roles and responsibilities under the MPRSA and ocean dumping regulations. The EPA monitors to ensure that dumping will not unreasonably degrade or endanger human health or the environment, to verify that unanticipated adverse effects are not occurring from past or continued use of the site, and to ensure that terms of MPRSA permits and MPRSA federal project authorizations are met.

Based on the results of these 2020 oceanographic surveys, the EPA determined that environmentally acceptable conditions were met at each of the surveyed ocean sites and permitted disposal of dredged material under the MPRSA can continue at these sites.

Additionally, the EPA will use the data and information collected in 2020:

- to improve on the protocol followed to ensure whale carcasses disposed in ocean waters off the coast of New Jersey sink to the whale carcass disposal area;
- to inform site management, including modification of five ODMDSs along the Gulf coast of Texas, as well as future updates to each sites' MPRSA-required management and monitoring plan;
- to inform future surveys at these sites, including where increased dredged material disposal volumes from deepening and navigation infrastructure projects are anticipated, to ensure dumping will not unreasonably degrade or endanger human health or the environment; and

- to refine methodologies for collecting data from towed video (e.g., remotely operated vehicle) to be able to collect comparable quantitative information via imagery and video in rocky and hard bottom areas.

5.0 Acknowledgements

This report is based on the monitoring surveys conducted, analyses performed, and conclusions drawn by the EPA's Regional offices 1, 2, 4, 6, and 9 during 2020. This report was developed with the support of Marine Protection Permitting Program staff from EPA Headquarters and all coastal Regional offices.

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