Office of Water
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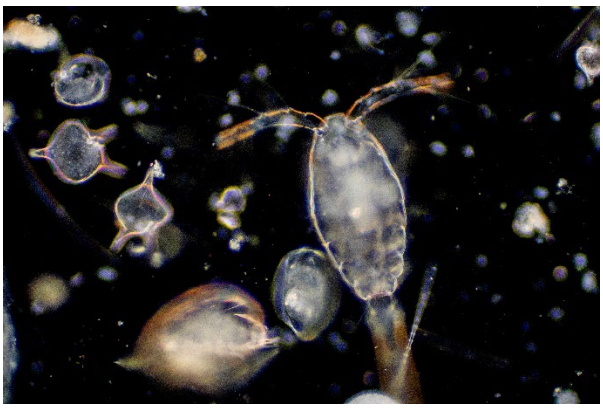
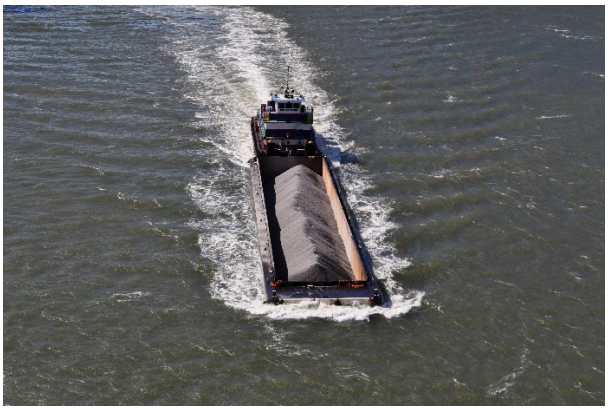
2019 National Site Monitoring Assessment Report





The EPA's 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 sites used for the permitted disposal of materials. 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 materials 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 for each MPRSA site designated for the ocean disposal of dredged material. The EPA's management and monitoring of these ocean sites ensures that disposal activities will not unreasonably degrade or endanger human health or welfare, the marine environment, or economic potentialities.

In 2019, the EPA managed 98 MPRSA designated ocean disposal sites located off the U.S. Atlantic, Gulf of Mexico, and Pacific Coasts, and near Puerto Rico, Hawaii, Guam and American Samoa. This National MPRSA Site Monitoring Assessment Report (SMARt) provides a comprehensive overview of the EPA's 2019 monitoring activities conducted at seven ocean dredged material disposal sites (ODMDSs) in four of the EPA coastal Regions:

- Massachusetts Bay, MA ODMDS (Region 1)
- Norfolk, VA ODMDS (Region 3)
- Savannah, GA ODMDS, (Region 4)
- Siuslaw River, OR North and South ODMDSs (Region 10)
- Umpqua River, OR North and South ODMDSs (Region 10)

Based on the results of the 2019 MPRSA monitoring surveys, the EPA determined that environmentally acceptable conditions were met at each of the surveyed ODMDSs and permitted disposal of dredged material under the MPRSA can continue at these sites. The EPA also confirmed that dredged materials from the Boston Harbor Deep Navigation Project disposed of in the expanded portion of the Massachusetts Bay Disposal Site are covering wastes on the seafloor that were historically disposed of in the area.

Additionally, the EPA will use the data and information collected in 2019:

- to inform site management 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 biological data from towed video to be able to collect comparable quantitative information via video as an alternative to conducting benthic trawls.

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Acronyms and Abbreviations

aRPD	apparent redox potential discontinuity
CFR	Code of Federal Regulations
cm	centimeter
COC	contaminant of concern
CTD	conductivity, temperature and depth meter
EPA	United States Environmental Protection Agency
ER-L	effects range-low
ER-M	effects range-median
ft	feet
FR	Federal Register
g	gram
in	inches
ISQG	interim sediment quality guidelines
km	kilometer
km^2	square kilometer
m	meter
m^2	square meter
mg	miligram
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
PEL	probable effects level
ROV	remotely operated vehicle
R/V	research vessel
SQG	sediment quality guideline
SVOC	semi-volatile organic compound
TEL	threshold effects level
TEQ	toxicity equivalent quotient
TOC	total organic carbon
USACE	U.S. Army Corps of Engineers
USC	United States Code
y^3	cubic yard

1.0 Introduction

The Marine Protection, Research and Sanctuaries Act (MPRSA) regulates the disposition (dumping) of any material into the ocean unless expressly excluded. 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) disposed of in the ocean 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 disposed in the ocean include fish wastes, vessels, marine mammal carcasses, ice piers in Antarctica, and human remains for burial at sea.

Under the MPRSA, the U.S. Environmental Protection Agency establishes environmental criteria for the evaluation of all permit applications. The EPA is the permitting authority for the disposition (dumping) of all materials into the ocean other than dredged material. In the case of dredged material, the U.S. Army Corps of Engineers (USACE) issues ocean dumping permits (or, in the case of federal projects, authorizes ocean dumping of dredged material) using the EPA's environmental criteria (40 CFR 228.5 and 228.6). All MPRSA permits and federal projects involving ocean dumping of dredged material are subject to the EPA's review and written concurrence.

Dredged material that is proposed for ocean disposal 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 historic chemical pollutants. If biologically available, such 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 and, ultimately, humans if contaminated seafood is eaten. The Evaluation of Dredged Material Proposed for Ocean Dumping Testing Manual, commonly known as the Green Book (EPA 503/8-91-001), is a technical guidance for determining the suitability of dredged material for ocean disposal through chemical, physical and biological evaluations. Only dredged material found suitable for disposal using the procedures in the Green Book can be permitted for disposal in an MPRSA ocean dredged material disposal site (ODMDS).

The EPA establishes the criteria for the designation of MPRSA sites and is responsible for designating these sites under the MPRSA (40 CFR 228.5 and 228.6). To minimize the adverse impacts of the disposition (dumping) of materials into the ocean on human health and the marine environment, the EPA designates MPRSA sites based on environmental studies of the proposed site and the regions adjacent to the proposed site, and historical knowledge of the impact of disposal 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 sites designated under the MPRSA. Management of these MPRSA sites involves:

- regulating the timing, quantity and characteristics of the material dumped at the site;
- establishing disposal 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 ocean disposal site and that terms of the MPRSA permit are met.

All designated ODMDSs are required to have a site management and monitoring plan. The EPA, in conjunction with USACE, develops a site management and monitoring plan for each ODMDS. Each site management and monitoring plan 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 disposed 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 site management and monitoring plan.

1.1 Ocean Dredged Material Disposal Site Monitoring

During 2019, the EPA's Regions managed 98 MPRSA-designated sites off the U.S. Atlantic, Gulf of Mexico, and Pacific coasts: and near Puerto Rico, Hawaii, Guam and American Samoa. Of the 98 MPRSA sites, all are designated for the disposal of dredged material except one which is located offshore of American Samoa and is designated for the disposal of fish processing wastes.

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

- Evaluate potential ocean disposal sites and designate ocean disposal 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 disposal impact (40 CFR 228.10(a) and (b));
- Modify disposal site use (40 CFR 228.11(a) and (d));
- Prohibit dumping where necessary (MPRSA 102(c)(2)); and
- Develop a site management and monitoring plan 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 ODMDS monitoring surveys to assess the physical, biological and chemical conditions at ODMDSs 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 disposed dredged material to determine whether or how to modify site use. Ocean areas near the ODMDS which are not affected by dredged material disposal are used for comparisons to assess the impact from dredged material disposal within the site. 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 ODMDSs.

As part of ODMDS surveys, the EPA may collect a variety of data to ensure that the dredged materials disposed of in the ocean are being adequately tested and that there are no unexpected adverse impacts at and around ODMDSs. Sediment samples, water samples, organisms from benthic trawls, sediment plan view images (photographs of the surface of the seafloor) and/or sediment profile images (photographs of a cross-section of the upper 6-8 in (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 ODMDS 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), persistent pesticides and semi-volatile organic compounds (SVOCs) including polycyclic aromatic hydrocarbons (PAHs), organotins and/or dioxins. To evaluate the extent to which dredged material being disposed in the ocean may impact benthic communities at or near ODMDSs, the EPA commonly compares contaminant concentrations in sediments collected at and around ODMDSs 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 of the 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 2019, the EPA's chief scientists conducted surveys at seven ODMDSs (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 four of seven of the EPA's coastal Regions.

***Table 1**: Area and depth of ocean dredged material disposal sites surveyed in 2019.*

EPA Region	Ocean Dredged Material Disposal Site	Area (nmi²)	Depth (ft)
1	Massachusetts Bay, MA	4.6	167-305
3	Norfolk, VA	43	43 - 85
4	Savannah, GA	4.3	37*
10	Siuslaw River, OR North Siuslaw River, OR South	0.26 0.16	30-115 79-125
10	Umpqua River, OR North Umpqua River, OR South	0.68 0.67	30-120 20-120

**Depth reported as a site average*

***Figure 1**: Approximate locations of the seven ocean dredged material disposal sites surveyed in 2019 and the EPA's Regional boundaries.*

3.0 Summary of Monitoring Surveys

A summary of 2019 survey objectives, activities and results, as well as conclusions and recommended management actions resulting from these surveys, is presented below.

3.1 Region 1 – Massachusetts Bay Disposal Site

3.1.1 Background

The Massachusetts Bay Disposal Site lies approximately 20 nmi (37 km) east of Boston Harbor, adjacent to the Stellwagen Bank National Marine Sanctuary. Region 1 designated the Massachusetts Bay Disposal Site as an ODMDS under the MPRSA in 1993, however historical notes and records show that the general vicinity had been used for historical disposal since the 1900s.

As designated in 1993, the boundaries of the Massachusetts Bay Disposal Site overlap with two historical disposal areas: 1) the Industrial Waste Site, which was used until 1977 to dispose of various wastes including dredged material, derelict vessels, construction debris, ordnance, chemical wastes, and barrels of low-level radioactive wastes and 2) an interim[1] Massachusetts Bay disposal site that was used between 1977 and 1992. When the EPA designated the Massachusetts Bay Disposal Site under the MPRSA in 1993, its boundary overlapped the southern portion of the historical Industrial Waste Site but excluded the area with the highest density of exposed debris and waste containers on the seafloor.

[1]Interim ocean disposal sites are no longer available for use. Amendments enacted in 1992 under the MPRSA require that no permits for ocean dumping shall be issued for an EPA-established ocean disposal 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.

Oceanographic monitoring conducted in the area by the EPA and other agencies in the 1970s, 1980s, and 1990s did not identify any unacceptable human health or environmental risks associated with the exposed debris and waste containers in the Industrial Waste Site, however general concerns remained regarding the long-term disposition of waste containers and munitions on the seafloor (EPA/USACE 2018).

During the design phase of the Boston Harbor Deep Draft Navigation Project, approximately 11 million y^3 (8.4 million m^3) of sediments were proposed to be dredged from the harbor. Discussions between Region 1 and USACE identified the potential to use the dredged material from the Boston Harbor Deep Draft Navigation Project determined to be suitable for ocean disposal to cover the area of the historic Industrial Waste Site with the highest density of waste containers and debris exposed on the seafloor. By disposing of dredged material from the deepening project over the former Industrial Waste Site, the dredged material could serve as a protective layer on the seafloor by isolating the historically disposed debris and waste barrels from the surrounding marine environment and thereby protecting important marine resources in the area. Additionally, in consultation with the EPA, USACE began developing and piloting a technique for disposing dredged material from standard split-hulled scows in a manner to minimize impacts on the ambient seafloor (Sturdivant and Carey 2017).

Based on the success of the pilot demonstration, the EPA, in collaboration with USACE, completed an environmental assessment to support expanding the Massachusetts Bay Disposal Site boundary to encompass the area of the historic Industrial Waste Site with the highest density of waste containers exposed on the seafloor. In 2018, Region 1 modified the boundaries of the Massachusetts Bay Disposal Site (FR Doc. 2018-11324) by expanding the site to accommodate the disposal of material dredged from the Boston Harbor Deep Draft Navigation Project.

Since its designation in 1993, more than 14.5 million y^3 (19 m^3) of dredged material from Boston Harbor and other navigational harbor dredging projects in the area have been disposed at the Massachusetts Bay Disposal Site. At the time of this 2019 survey, nearly two-thirds of the Boston Harbor Deep Draft Navigation Project had been completed, resulting in approximately 7.1 million y^3 (5.4 million m^3) of dredged material being disposed over the former Industrial Waste Site.

3.1.2 Survey Objectives, Activities, and Findings

In 2019, Region 1 conducted a survey of the Massachusetts Bay Disposal Site, including the expanded portion of the site, to delineate the thickness of dredged material recently deposited at the site and to assess coverage of the former Industrial Waste Site. Region 1 completed this survey on June 26 and 27, 2019, aboard the R/V *Jamie Hanna*. During the survey, scientists used a multibeam echosounder and side-scan sonar with backscatter to take measurements along 28 transect lines located within the Massachusetts Bay Disposal Site. Transect lines were spaced approximately 150 m apart and oriented in a north-south direction. Region 1 used the data collected during this survey to determine water depths and physical properties of the seafloor. Once processed, these data resulted in maps showing topography, texture and roughness of the seafloor allowing Region 1 to distinguish the ambient seafloor from the areas that have received dredged material (Figure 2).

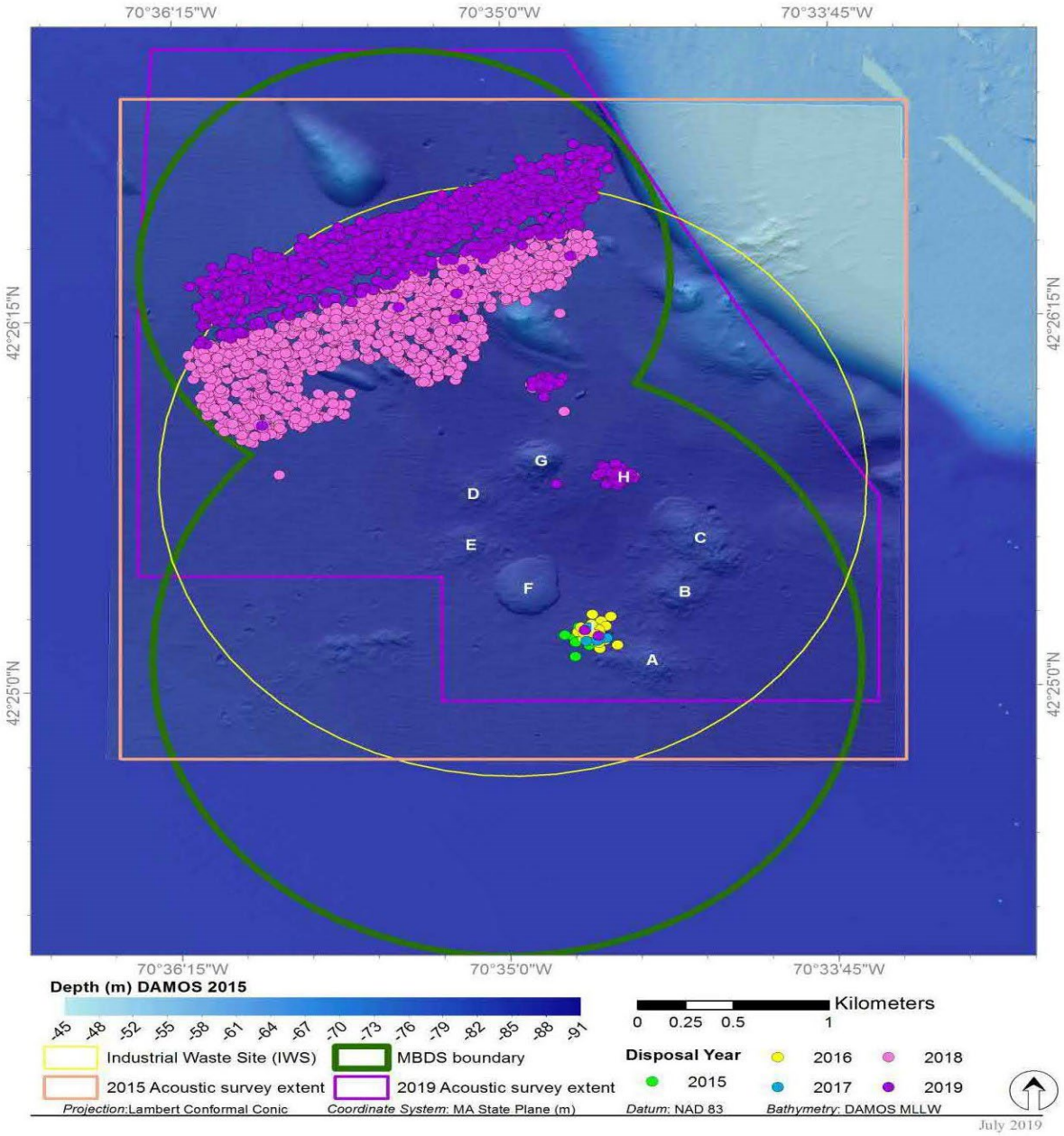

***Figure 2**: Bathymetric map of the 1993 Massachusetts Bay Disposal Site boundary (larger green circle) and 2018 expanded area (smaller overlapping dark green circle). Targeted disposal mounds in the main portion of the site are noted by letters A through I. Individual disposal locations are indicated by small circles, with varied colors indicating the year the disposal occurred (2015 - 2019). Disposal over the former Industrial Waste Site is indicated by pink and purple dots in the smaller, northern circle of the Massachusetts Bay Disposal Site.*

3.1.3 Conclusions and Recommended Management Actions

The data and information that Region 1 collected during this survey showed that dredged material from the Boston Harbor Deep Navigation Project disposed over the historical barrel field in the Industrial Waste Site portion of the Massachusetts Bay Disposal Site had created a layer of sediment over the area and fully covered the debris and waste containers that had been exposed on the seafloor. While the 2019 monitoring data will be used to inform updates to the site's management and monitoring plan, no immediate site management modifications were necessary at the time that this survey was conducted, and Region 1 determined that any remaining dredged material from the Boston Harbor Deep Navigation Project could continue to

be disposed of in the Massachusetts Bay Disposal Site. Region 1 recommends that additional monitoring be conducted at the Massachusetts Bay Disposal Site after the completion of the Boston Harbor Deep Navigation Project and should include chemical and biological sampling to confirm that contaminants from the historical barrel field continue to stay isolated from seafloor and that benthic recovery of the disposal area is occurring as expected.

3.2 Region 3 – Norfolk Ocean Dredged Material Disposal Site

3.2.1 Background

The Norfolk ODMDS is located approximately 20 nmi (37 km) off the coast of Virginia Beach, VA. The site is circular with a radius of four nmi (7 km) and a total area of 50 nmi^2 (172 km^2). Water depths within the site range from 43 to 85 ft (14 to 26 m) with a gradual slope from west to east. Since designation of the Norfolk ODMDS in 1993, primarily silt and clay from navigational channels within the Chesapeake Bay region have been permitted for disposal at the site. Region 3 anticipates that the Norfolk ODMDS will have significantly more dredged material disposed at the site in coming years as USACE receives increased funding for deepening and/or widening channels in the Chesapeake Bay and along coastal Virginia to full authorization depths. Most recently, Region 3 completed a survey of the Norfolk ODMDS in 2015. Results from that survey showed that metal concentrations and benthic community structure varied between the Norfolk ODMDS and reference area, and Region 3 recommended that future surveys should assess chemical contaminants and benthic biological recovery within the ODMDS.

3.2.2 Survey Objectives, Activities, and Findings

Region 3's two objectives for its 2019 survey were informed by its 2015 survey of the Norfolk ODMDS. Region 3's primary objective for the 2019 survey was to collect sediment samples from the Norfolk ODMDS and reference area and analyze these samples for contaminants of concern. These data will contribute to a dataset that will allow Region 3 to conduct a trend assessment study of the area to identify impacts of dredged material disposal to the marine environment. Region 3's secondary objective was to collect sediment and macroinvertebrate tissue samples from within the Mid-Atlantic Bight (Figure 3). These samples were analyzed for contaminant concentrations that will help Region 3 establish a better understanding of the background levels of contaminants present in tissues of the macroinvertebrates representative in the marine benthic environment of the Mid-Atlantic Bight.

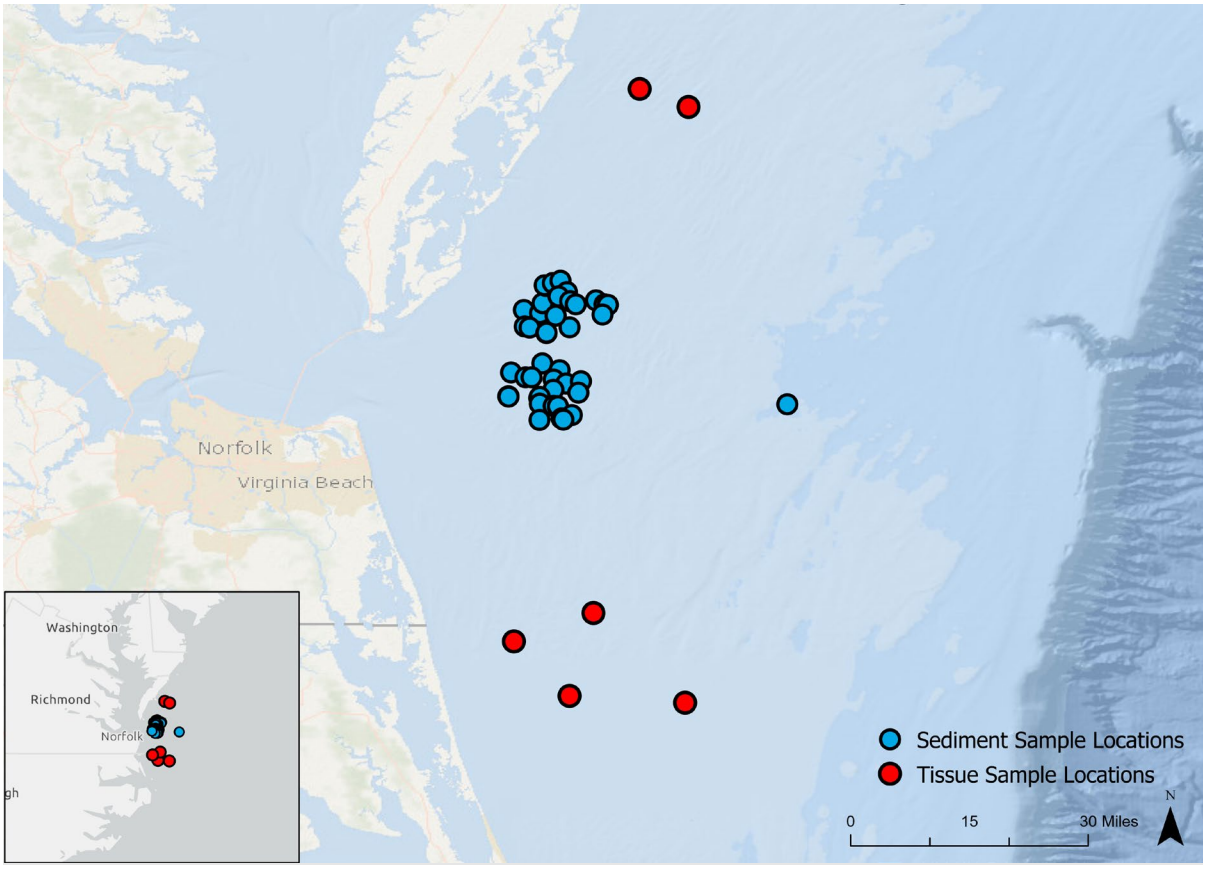

***Figure 3**: Map of locations where sediments were sampled from within the Norfolk ODMDS and reference area (represented by blue dots) and where tissue samples were collected from within the Mid-Atlantic Bight (represented by red dots) during the 2019 survey.*

Region 3 monitored the Norfolk ODMDS on July 10-14, 2019, aboard the R/V *Savannah*. To collect sediment samples from the Norfolk ODMDS and reference area as well as sediment and macroinvertebrate samples from the Mid-Atlantic Bight, Region 3 used a Young Modified van Veen grab. These samples were processed on board and sent to a laboratory to be analyzed for grain size distribution and concentrations of metals, pesticides, PCBs, and SVOCs including dioxins, furans, and PAHs.

Sediment grain size distribution at the Norfolk ODMDS was dominated by fine and medium sand followed by silt and clay. Grain size distributions were consistent between the Norfolk ODMDS and the reference area indicating that long-term dredged material disposal activities at the Norfolk ODMDS are not causing lasting impacts to the physical characteristics of the benthos.

Region 3 compared the concentration of metals, pesticides, PCBs and SVOCs measured in the sediment samples to Threshold Effects Levels (TEL), laboratory reporting limits, established guidance levels, toxicity equivalence quotients (TEQs), or published effects levels (Buchman, 2008). The concentration of all metals present in the sediment samples were below TEL values. Selenium does not have an established TEL value for marine sediment, however in sediment samples where selenium levels were detected, it was present in concentrations below laboratory reporting limits. Region 3 did not detect elevated levels of pesticides in any of the sediment samples, nor did Region 3 detect measurable concentrations of PCBs in any of sediment samples. Toxicity equivalence quotients (TEQ) were calculated for the dioxin and furan results for each sample. TEQs were then compared to Interim Sediment Quality

Guidelines (ISQG) and Probable Effects Levels (PEL) (Buchman, 2008). Dioxin and furan TEQs for all samples were below both the ISQG and PEL concentrations, indicating that the concentrations of dioxins and furans in the sampled sediment are unlikely to adversely impact the marine environment. Region 3 found 1.7 ug/kg and 3.6 ug/kg of total PAHs present in two sampling stations within the reference area, however neither concentration was above any sediment thresholds. In the absence of marine SQGs, Region 3 evaluated the toxicity of the contaminant detected in samples and determined that the presence of any contaminant was well below lethal effects levels in marine organisms (World, 2004). Through the results of the sediment analyses, Region 3 confirmed that all detected concentrations of contaminants were below levels where effects of toxicity are known to occur. Given the low concentrations at which compounds were detected in samples collected during this survey, Region 3 does not anticipate the presence of the detected contaminants to pose any significant potential for environmental impacts from dredged material disposal within or around the Norfolk ODMDS.

Due to sampling difficulties and mechanical challenges, Region 3's macroinvertebrate tissue and sediment sampling efforts in the Mid-Atlantic Bight resulted in less than adequate tissue from enough sites to complete this objective. The tissue and sediment samples that were successfully collected from the Mid-Atlantic Bight were analyzed for contaminants of concern and the contaminants that were detected were below levels at which effects are known to occur.

3.2.3 Conclusions and Recommended Management Actions

Data and information collected from this survey demonstrated that dredged material disposal activities to date have resulted in little change to the physical and chemical characteristics of the Norfolk ODMDS. The results from the 2019 survey confirm that environmentally acceptable conditions, as outlined in the site management and monitoring plan, are being met at the site. While no modifications to the site management and monitoring plan are necessary at this time, the information collected during Region 3's survey will inform the next update of the site management and monitoring plan for this site.

Increased volumes dredged material being disposed of within the Norfolk ODMDS could contribute to sediment composition changes, retention of pollutants, and/or shifts in benthic infauna in the future. Region 3 intends to continue to routinely monitor the chemical, physical and biological parameters inside and surrounding the ODMDS to document any changes to the area, ensure that short-term anticipated impacts are within acceptable limits and ensure that disposal activities are not causing lasting adverse impacts. Additionally, Region 3 recommends continuing to collect sediment and macroinvertebrate samples from the Mid-Atlantic Bight in future surveys to establish a better understanding of the background levels of contaminants in the area.

3.3 Region 4 – Savannah Ocean Dredged Material Disposal Site

3.3.1 Background

The Savannah ODMDS is located approximately 3.7 nmi (6.8 km) offshore of Tybee Island, Georgia. It encompasses an area of 4.3 nmi^2 (14.6 km^2) and water depths within and surrounding the Savannah ODMDS range from 28 to 42 ft (8.5 to 12.8 m). Until Region 4 formally designated the site in 1987, the Savannah ODMDS had been used as an interim site for the ocean disposal of dredged material since 1976. Between 1976 and 2012, approximately 30 million y^3 of dredged material had been disposed in the Savannah ODMDS at an average rate of approximately 500,000 y^3 (382,300 m^3) annually.

From 2012 to 2014, and in advance of the Savannah Harbor Expansion Project, a deepening project to enable the port and surrounding navigation channels to accommodate larger "post-Panamax" vessels, Region 4, in coordination with USACE Savannah District, conducted a series of surveys to update physical, chemical and biological baseline data for the Savannah ODMDS. Since 2015, more than 3.5 million y^3 (2.7 m^3) of dredged material from the Savannah Harbor Entrance Channel has been disposed of within the ODMDS.

3.3.2 Survey Objectives, Activities, and Findings

During this 2019 survey, Region 4's objective was to collect sediment samples from the Savannah ODMDS to be analyzed for physical, chemical and biological properties. These data will contribute to a continuous monitoring dataset that will allow Region 4 to conduct a trend assessment study of the area and to identify impacts of increased volumes of dredged material disposal on the marine environment.

Region 4's survey of the Savannah ODMDS was conducted on March 6-7, 2019, aboard the University of Georgia's Skidaway Institute of Oceanography's research vessel, the R/V *Savannah*. During the survey, Region 4 collected sediment and macrofauna samples from within the ODMDS boundaries and from outside of the site (Figure 4). To collect these samples, Region 4 used a double Young Modified van Veen grab. The sediment samples were processed on board and sent to a laboratory to be analyzed for grain size distribution and concentrations of metals, pesticides, PCBs, TOC, and PAHs. Macrofauna samples were also processed on board and sent to a laboratory to be analyzed for benthic community parameters including density, diversity, and richness. Additionally, Region 4 collected physiochemical data from the water column at station SAV09 within the ODMDS. 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 ODMDS and to stations outside of the ODMDS. They also compared sediment chemistry results against sediment quality guidelines (SQGs) and historical concentrations at the ODMDS.

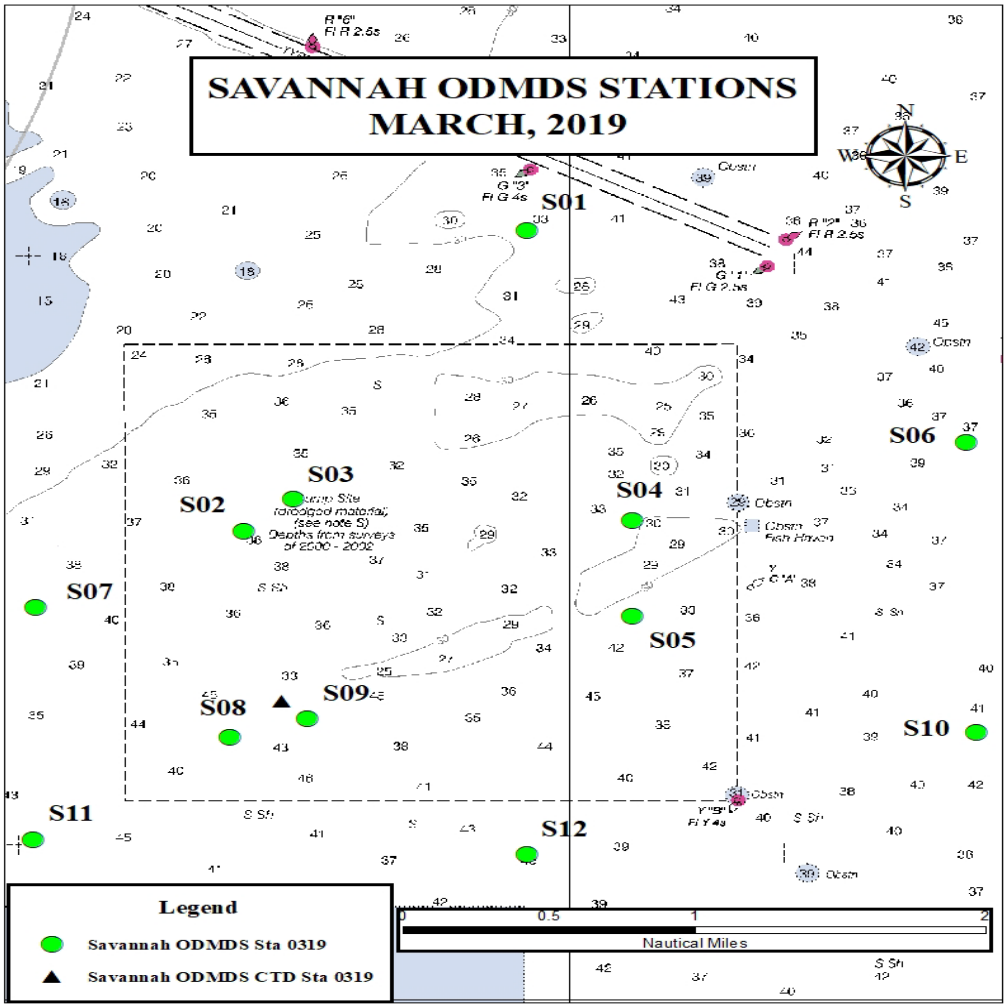

***Figure 4**: Sampling stations within and outside of the boundaries of the Savannah ODMDS.*

Results from the sediment grain size analysis showed that sediment grain sizes were relatively consistent within and outside of the ODMDS, with most samples consisting primarily of sand. With the exception of sediments collected from Station S07, which is outside of the ODMDS, where Region 4 measured 81% of the sediment being sand and 19% silt and clay, sand made up 98% and 94% of the sediment samples taken from within and outside of the site, respectively. When compared to data collected during a 2006 survey, Region 4 saw very similar results with sand fractions measuring 94% and 96% within and outside of the site, respectively. The similarities in sediment texture measured inside and outside of the ODMDS suggest that conditions across the survey area are relatively consistent and that disposal activities are not altering grain size conditions within the site compared to conditions in the surrounding area where no dredged material has been disposed.

Region 4's sediment chemistry results showed that all metals were measured in concentrations below the TEL and concentrations inside the ODMDS were similar to background concentrations outside the ODMDS. Analyses of the sediments from this survey also showed all organic and inorganic analyte concentrations were significantly below all environmental thresholds (TEL and ERL). Concentrations of PCBs, pesticides, and PAHs were too low to be detected.

In the results from the macrofauna sampling, Region 4 measured an average biomass of 0.74 g and identified an average of 29 taxa in samples taken from within the ODMDS. They measured an average biomass of 2.16 g and identified an average of 48 taxa in samples taken outside of the ODMDS. The most abundant taxa collected at stations inside the ODMDS were polychaetes (*Apoprionospio pygmaea* and *Spiophanes bombyx*), bivalves (*Solen viridis*), and amphipods (*Eudovenopus honduranus* and *Metharpinia floridana*), representing 32.1%, 14.7%, 11.5% of the assemblage, respectively. The most abundant taxa collected at stations outside the ODMDS were polychaetes (*Mediomastus*), chordates (*Branchiostoma*), and annelids from the Family Naididae representing 36.7%, 11.0% and 5.0% of the assemblage, respectively. Taxa diversity averaged 2.51 inside the ODMDS and 2.76 outside the ODMDS. Although biomass and diversity were higher outside of the ODMDS than inside the ODMDS, these data reflect an overall similarity in biological assemblages across the study area. When comparing data from the 2019 survey to macrofauna data collected during previous surveys, Region 4 did not see a significant difference in benthic density, diversity or richness. Higher taxa density is generally seen as an indicator of a healthy community. The benthic results from the 2019 survey show that while short-term impacts from disposal activities are present in the ODMDS, they are within acceptable limits and disposal activities are not causing adverse impacts to the invertebrate populations in the study area.

Results from Region 4's CTD cast showed that dissolved oxygen, salinity and temperature were similar throughout the water column, from the surface of the water to 1 m above the seafloor. 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 disposal activities. The parameters Region 4 measured during the survey were within expected values for this near shore, shallow environment indicating 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 Region 4 collected from this survey show that dredged material disposal activities have short-term impacts to the Savannah ODMDS, however, it is expected, based on the status of the benthos within the site, that recolonization and return to background conditions would occur if site use were to cease. Results from the 2019 survey confirm that environmentally acceptable conditions, as outlined in the site management and monitoring plan, are being met at the Savannah 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. While this information will be incorporated into the next site management and monitoring plan update, no immediate site modifications are necessary at this time.

Continued work on the Savannah Harbor Expansion Project could contribute to sediment composition changes, retention of pollutants, and/or shifts in benthic infauna in the future. Region 4 intends to continue to routinely monitor the chemical, physical and biological parameters inside and surrounding the ODMDS to document any changes to the area, ensure that short-term anticipated impacts are within acceptable limits, and ensure that disposal activities are not causing lasting adverse impacts.

3.4 Region 10 – Siuslaw North and South Ocean Dredged Material Disposal Sites

3.4.1 Background

The Siuslaw North ODMDS and Siuslaw South ODMDS are located approximately one nmi offshore of Florence, Oregon, near the mouth of the Siuslaw River. Since 1929, USACE has

been disposing of dredged material from navigation channels associated with the Siuslaw River at a series of interim sites in the area. Due to sediment transport and mounding concerns and the continued need for dredged material to be disposed of offshore, Region 10 designated the Siuslaw North ODMDS and Siuslaw South ODMDS pursuant to the MPRSA on April 29, 2010 (75 FR 5708). Designating these sites allows Region 10, in collaboration with USACE Portland District, to better manage and monitor the dredged material being disposed of offshore while minimizing the potential for mounding and navigation concerns and avoiding adverse effects to biological resources, as many commercially and recreationally important species such as salmonids, skate and Dungeness crab are found in the area. Since the sites were designated in 2010, dredged material disposal has only occurred at the Siuslaw North ODMDS (not the Siuslaw South ODMDS). On average, USACE disposes of 98,000 y^3 per year at the Siuslaw North ODMDS and disposal volumes for these sites are not expected to exceed 118,000 y^3 (90,217 m^3) annually (USEPA and USACE 2010a).

Baseline surveys to support the designation of the Siuslaw North and South ODMDSs were conducted by the EPA and USACE in 2008. Earlier studies of the area's geophysical properties were conducted in the mid-1980s where predominant physical sediment and bathymetric characteristics were identified. Prior to this 2019 survey, the EPA had not conducted monitoring at the Siuslaw North and South ODMDSs since their designation.

3.4.2 Survey Objectives, Activities, and Findings

Region 10 surveyed the Siuslaw North and Siuslaw South ODMDSs to assess the physical, chemical and biological characteristics inside and outside of the sites. These data will contribute to a continuous monitoring dataset that will allow Region 10 to conduct a trend assessment of the environmental effects of dredged material disposal at the site and inform updates to the sites' management and monitoring plan. Region 10 conducted the surveys of both sites from September 20 – September 23, 2019, aboard the R/V *Miss Linda*.

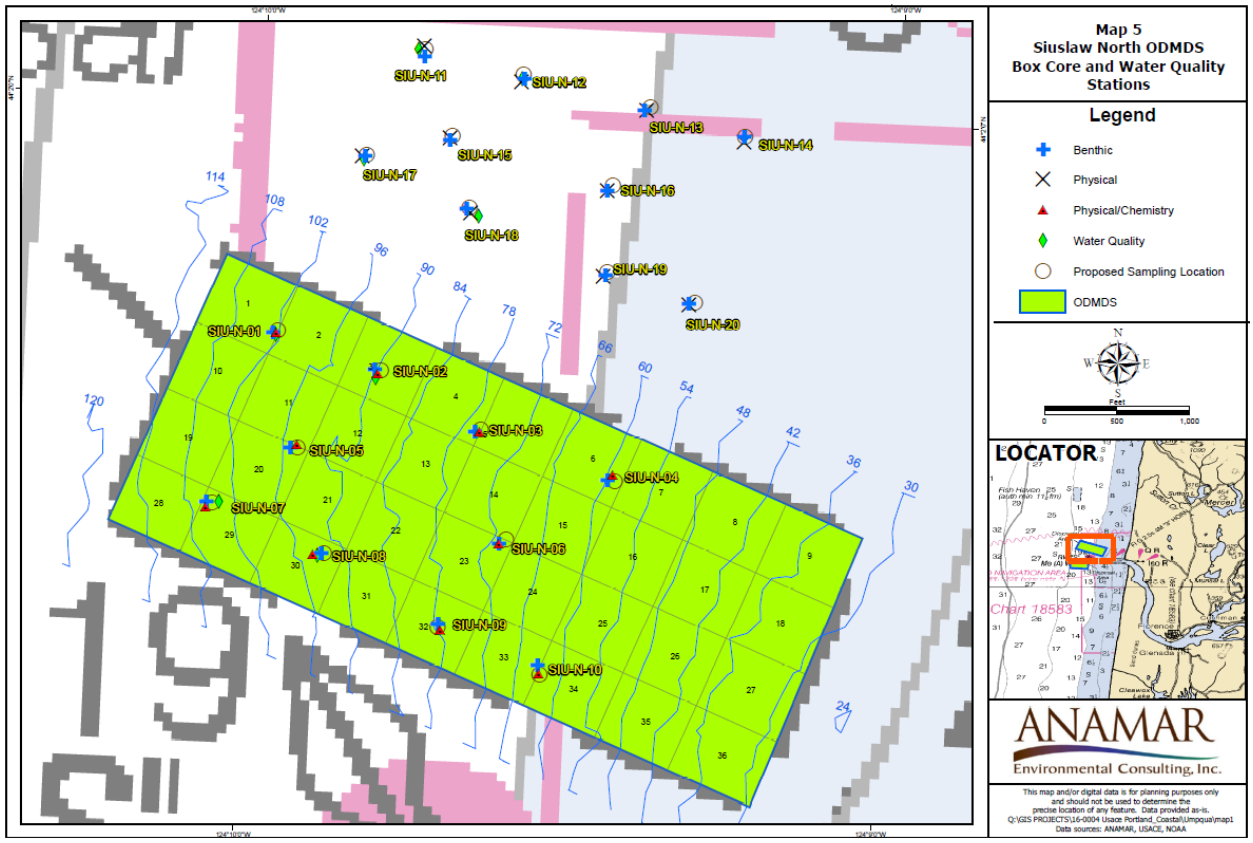

***Figure 5**: Siuslaw North ODMDS and reference area map showing sampling locations for benthic, physical, chemical, and water quality parameters.*

During the survey, Region 10 collected sediment and macrofauna samples from 20 stations in the Siuslaw North ODMDS study area, 10 from within the ODMDS boundaries and 10 located outside of the site, and from 10 stations in the Siuslaw South ODMDS study area, 5 from within the ODMDS boundaries and 5 located outside of the site (Figures 5 and 6). To collect these samples, Region 10 used a 0.1 m^2 Grey-O'Hare modified box core. The sediment samples collected from the Siuslaw North and South ODMDS study areas were processed onboard and sent to a laboratory to be analyzed for grain size distribution, total solids, and benthic community parameters (e.g., abundance, density, richness, diversity, and evenness). The sediment samples collected from the Siuslaw North ODMDS study area were also analyzed for concentrations of metals, tributyltins, chlorinated hydrocarbons, pesticides, PAHs, phthalates, phenols, PCBs, motor oils, and diesel range organics. In addition to comparing the sediment data inside and outside of the ODMDS, Region 10 also compared sediment chemistry results against the Sediment Evaluation Framework for the Pacific Northwest. The Sediment Evaluation Framework for the Pacific Northwest provides a regional framework for assessing and characterizing sediment (RSET, 2018).The physical and chemical sediment data collected during this survey were evaluated to ensure that dredged material disposal is not changing the sediment structure of the benthos or causing contamination of the benthic community. Sediment chemistry was not analyzed on the sediments collected from the Siuslaw South ODMDS because the site has not been used for disposal since its designation.

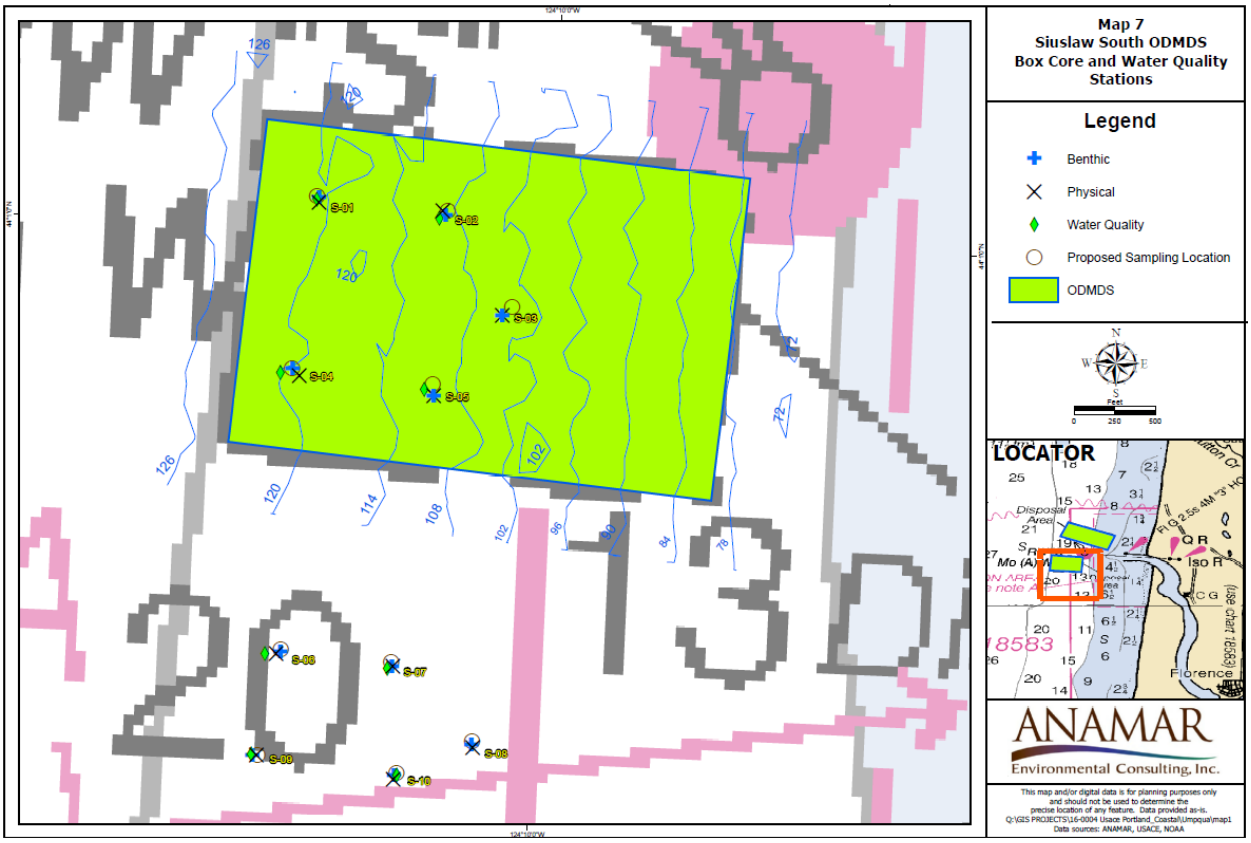

***Figure 6**: Siuslaw South ODMDS and reference area map showing sampling locations for benthic, physical, and water quality parameters.*

Region 10 also conducted epifaunal trawls and video transects inside and outside of the ODMDSs to assess epifaunal community characteristics. To conduct the trawls, a 12-foot-wide otter trawl was towed behind the vessel along transects of 1200 ft (366 m) to 1600 ft (488 m) in length. Video transects were conducted using JW Fisher TOV-2 underwater camera. The camera was towed behind the vessel along similar transects to where otter trawls were conducted. Epifaunal trawls and video transects conducted within and outside the ODMDSs assess epifaunal community characteristics; these data consider how the areas are utilized by fish and invertebrates relative to the disposal of dredged material. Findings identified in the underwater videos were also compared to the findings from the epifaunal trawls.

Additionally, Region 10 collected in-situ water quality data from four stations within and outside of the North and South ODMDSs. A YSI Pro-DDS multiparameter sampling meter was used to measure temperature, salinity, pH, and dissolved oxygen at various depths throughout the water column at each station. Water quality data help inform if conditions within the ODMDS are outside of normal oceanographic ranges.

3.4.2.1 Siuslaw North ODMDS Study Area

Results from the grain size analyses of sediments collected from within and outside of the Siuslaw North ODMDS indicated that all samples were comprised primarily of sand, with total sand ranging from 99.2% to 100% and total fines ranging from 0.0% to 0.7%. Sediments collected from outside of the site boundaries had a higher percentage of fine-grained sand compared to samples within the Siuslaw North ODMDS, which had a higher percentage of medium-grained sand. Total solids for all samples ranged from 71.9% to 82.2%. TOC for all samples ranged from <0.02% to 0.17%. The similarities in sediment texture measured inside and outside of the ODMDS suggest that conditions across the survey area are relatively

consistent and that disposal activities are not altering grain size conditions within the site compared to conditions in the surrounding area where no dredged material has been disposed.

Region 10's sediment chemistry results showed that all metals, tributyltin, chlorinated hydrocarbons, and pesticides were measured in concentrations below the marine benthic toxicity screening levels in the Sediment Evaluation Framework for the Pacific Northwest. The concentration of total PAHs from samples collected within the ODMDS ranged from <9.1 µg/kg to <9.6 µg/kg. Diethyl phthalate, di-n-butyl-phthalate, phenol, and 4-methylphenol were detected in concentrations greater than the method reporting limit (MRL) in all samples collected from the Siuslaw North ODMDS study area, and 2- methylphenol was detected in concentrations greater than the MRL in all samples except two collected from within the ODMDS (SIU-N-01 and SIU-N-02). Benzoic acid was detected in concentrations greater than the MRL in all samples. Total PCBs ranged from 4.8 µg/kg to 5.1 µg/kg. For all of these compounds, the MRL is lower than the marine benthic toxicity level. Therefore, while PAHs, phthalates, and PCBs were detected in sediment samples, the concentrations at which they are present are not expected to cause any adverse effect to the benthic environment. Motor oils and diesel range organics ranged from <100 mg/kg to <110 mg/kg and <42 mg/kg to <43 mg/kg, respectively. While there are no established marine benthic toxicity screening levels for these compounds, they were not detected in concentrations greater than the MRL in any sample and are not expected to cause any adverse effect to the benthic environment.

In the results from the macrofauna sampling, Region 10 identified a total of 19,581 individual organisms in samples collected from inside the ODMDS and 50,956 individual organisms in samples collected outside of the site boundaries. The average values for diversity, evenness, and richness of the benthic community in samples collected from within the site were 1.12, 0.23, and 32, respectively. The average values for diversity, evenness and richness of the benthic community in samples collected from outside of the site were 1.00, 0.19 and 39, respectively. Region 10 did not detect any significant statistical differences when comparing benthic community measurements inside of the ODMDS to those outside of the ODMDS.

In the results from the epibenthic trawls conducted in the Siuslaw North ODMDS study area, Region 10 identified 15 species of fish and 12 species of invertebrates. Pacific tomcod (*Microgadus proximus*) was the most common fish collected across the entire study area. Seven of the 15 fish species collected were in greater densities outside of the ODMDS when compared to those measured inside the ODMDS. Three fish species (sand sole, speckled sanddab and staghorn sculpin) were found in higher densities inside the ODMDS, and three fish species (bay pipefish, blacktail snailfish and Pacific sanddab) were only found inside the ODMDS. Overall, fish species densities were greater outside the ODMDS. Dungeness crab (*Metacarcinus magister*), Crangon shrimp (*Crangon sp.*) and mysid were by far the most common invertebrates collected across all sampled transects. The average density of invertebrates was greater inside the ODMDS compared to the measurements taken outside of the ODMDS; however, densities observed throughout the center of the ODMDS were lower than all other reported densities. Additionally, Region 10 observed that density was higher along the shallower stations and generally decreased with increasing depth. Lower densities and lower taxa richness observed in the mid depth ranges of the ODMDS may be a response to disposal of dredged material. Epifaunal community composition within the Siuslaw North ODMDS was different when compared to the epifaunal community composition present outside of the ODMDS, however, the differences were minor when considered in the larger-scale ecosystem context.

When comparing the trawl data to the video data collected in the Siuslaw North ODMDS study area, Region 10 found that both the trawl and video data indicated a greater occurrence of

Dungeness crab and flatfish inside the ODMDS and more non-flatfish outside the ODMDS. The benthic and epibenthic results from the 2019 survey show that while there are differences in community structure that could be attributed to disposal activities, they are within acceptable limits and disposal activities are not causing lasting adverse impacts to the fish and invertebrate populations in the study area.

In the results from in-situ water quality monitoring conducted in the Siuslaw North ODMDS study area, Region 10 noted the following observations. Site depth ranged from 85.3 ft (26 m) to 101.7 ft (31 m). Water temperature was best predicted by depth where temperatures decreased with increasing depth. The mean bottom depth temperature in the study area was 54.1 °F (12.3 °C) and there was no difference in mean temperature between inside and outside of the ODMDS. The average salinity measured in the Siuslaw North ODMDS study area was 32.5 ppt there were no differences in salinity measured inside and outside of the ODMDS. Average pH measured in the north study area was 8.0, slightly more acidic when compared to the global ocean average pH (8.1), however, it is within the normal range for the Oregon. Dissolved oxygen measured in the north study area ranged from 7.0 mg/L to 7.9 mg/L and was negatively correlated with depth. These in-situ water quality parameters are within expected values indicating no lasting impacts from dredged material disposal were present in the water column.

3.4.2.2 Siuslaw South ODMDS Study Area

Results from the grain size analyses of sediments collected from within and outside of the Siuslaw South ODMDS indicated that all samples were comprised primarily of sand, with total sand ranging from 99.6% to 100% and total fines ranging from 0.0 to 0.4%. Sediments collected from within the ODMDS were comprised of slightly higher percentages of fine sand compared to those collected outside and to the south of the ODMDS, which had a higher percentage of medium sand. Total solids for all samples ranged from 76.6% to 80.6%. TOC for all samples ranged from 0.03% to 0.08%. The similarities in sediment texture measured inside and outside of the ODMDS were expected, as disposal activities have not been conducted in the Siuslaw South ODMDS since its designation.

In the results from the macrofauna sampling, Region 10 identified 16,612 individual organisms making up a total of 83 invertebrate taxonomic identifications inside the ODMDS and 14,007 individual organisms making up a total of 66 invertebrate taxonomic identifications outside of the ODMDS. The average values for diversity, evenness and richness of the benthic community in samples collected from within the site were 1.70, 0.31 and 45, respectively. The average values for diversity, evenness and richness of the benthic community in samples collected from outside of the site were 1.90, 0.35 and 44, respectively. All sampling locations had similar taxa composition, which suggests the groups are not diverse and were dominated by few taxa. No statistical differences were found in the infaunal community inside and outside of the Siuslaw South ODMDS as expected since disposal activities had not occurred at the site.

In the results from the epibenthic trawls conducted in the Siuslaw South ODMDS study area, Region 10 identified 14 species of fish and nine species of invertebrates. Similar to the results from the Siuslaw North ODMDS, Pacific tomcod (*Microgadus proximus*) was the most common fish species collected and the average density of fish across stations was greatest outside the ODMDS. Dungeness crab (*Metacarcinus magister*), Crangon shrimp (*Crangon sp.*) and mysid (*Mysida*) were the most common invertebrates collected in all sampled transects. The average invertebrate density was slightly greater outside of the ODMDS when compared to densities measured inside the ODMDS however, there was no statistical difference when comparing diversity, evenness, and richness measurements inside versus outside of the ODMDS. The lack of statistical difference indicates that there was either no difference between inside the ODMDS

compared to outside the ODMDS or that the variation across samples was so high that much more sampling would be required to detect a statistical difference.

When comparing the trawl data to the video data collected in the Siuslaw South ODMDS study area, Region 10 found that both the trawl and video data indicated a greater occurrence of Dungeness crab and flatfish inside the ODMDS and more non-flatfish outside the ODMDS. While reviewing the video data, Region 10 also noted that the absolute differences between inside and outside ODMDSs described in this report are relatively minor and easily within the error associated with trying to observe organisms from the video footage and error associated with correcting for the area observed within the videos.

In the results from the in-situ water quality monitoring conducted in the Siuslaw South ODMDS study area, Region 10 noted the following observations. Site depth ranged from 111.5 ft (34 m) to 121.4 ft (37 m). Water temperature was best predicted by depth where temperatures decreased with increasing depth. The mean bottom depth temperature in the study area was 51.4 °F (10.8 °C) and there was no difference in mean temperature between inside and outside of the ODMDS. The average salinity measured in the Siuslaw South ODMDS study area was 32.6 ppt there were no differences in salinity measured inside and outside of the ODMDS. The average pH measured in the south study area was 7.9. In the south study area, where there was less of a depth gradient, dissolved oxygen ranged from 6.9 mg/L to 8 mg/L regardless of depth. These in-situ water quality parameters are within expected values indicating no lasting impacts from dredged material disposal were present in the water column.

3.4.3 Conclusions and Recommended Management Actions

Results from the 2019 survey confirm that environmentally acceptable conditions, as outlined in the site management and monitoring plan, are being met at the Siuslaw North and Siuslaw South ODMDSs 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. While this information will be incorporated into the next site management and monitoring plan update, no immediate site modifications are necessary at this time.

Region 10 anticipates that future surveys will continue to include physical and chemical, sediment characteristics, infaunal and epifaunal communities and water quality to ensure acceptable environmental parameters are being upheld at disposal sites. Additionally, if Region 10 can continue to refine the implementation of the towed video, it would be beneficial in reducing environmental harm from the collection of benthic organisms while still collecting appropriate data to meet the EPA's site management regulatory requirements.

3.5 Region 10 – Umpqua North and South Ocean Dredged Material Disposal Sites

3.5.1 Background

Region 10 designated the Umpqua North ODMDS and Umpqua South ODMDS offshore of Reedsport in Winchester Bay, Oregon on April 24, 2009. The Umpqua North and Umpqua South ODMDSs are located on the Southern Oregon Coast, 0.7 mni (1.2 km) northwest and southwest, respectively, from the entrance to the mouth of the Umpqua River (Figure 7).

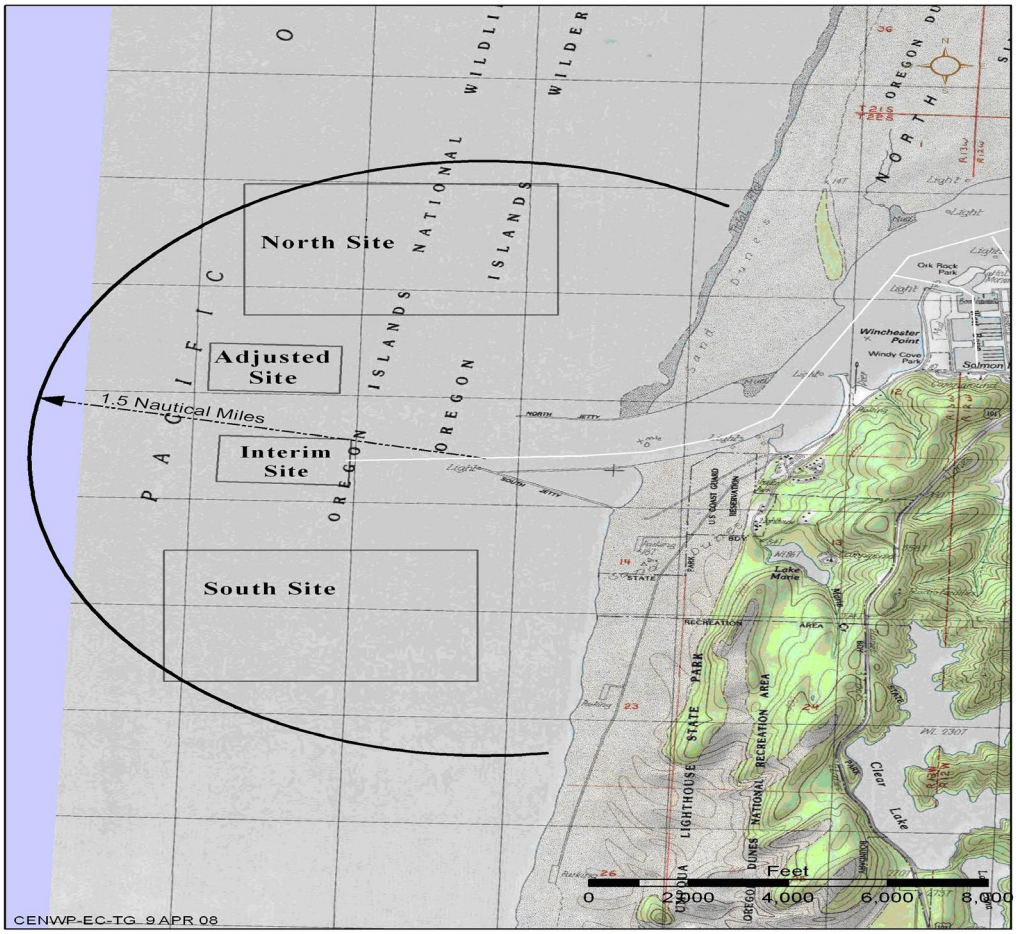

***Figure 7**: Map showing the location of the Umpqua North and South ODMDSs and Interim and Adjusted sites off the coast of Oregon (EPA and USACE 2009).*

Historically, USACE has disposed of dredged material in a series of short-term selected and interim sites off the mouth of the Umpqua River. Due to mounding in those sites and the continued need for dredged material to be disposed of offshore long-term, Region 10 designated the Umpqua North and Umpqua South ODMDSs to better manage and monitor dredged material disposal while minimizing the potential for mounding and navigation concerns in the area. Both sites contain a drop zone set back 500 ft (152 m) from the site boundaries where disposal must occur (USEPA and USACE 2009). The Umpqua North and Umpqua South ODMDSs were designated to receive suitable dredged material from USACE federal navigation projects, other local USACE projects, and appropriately permitted dredged material from non-USACE projects. Each site was designated with the capacity to receive approximately 188,000 y^3 (143,736 m^3) of dredged material per year for 20 years, a total of 3.8 million y^3 (29,053,085 m^3) each, without impacting the wave climate and navigation in the area (USEPA and USACE 2009).

Since the sites were designated in 2009, USACE has disposed of an average of 127,000 y^3 (97,098 m^3) per year. Disposal has been occuring annually at the Umpqua North ODMDS; with the most recent disposal activity, relative to the 2019 survey, occuring in 2018. Dredged material was disposed of at the Umpqua South ODMDS only once since its designation, in 2019, concurrent with the dates of this monitoring survey.

3.5.2 Survey Objectives, Activities, and Findings

In 2019, Region 10 surveyed the Umpqua North and Umpqua South ODMDSs to assess the physical, chemical and biological characteristics of the seafloor inside and outside of the sites. These data will contribute to a continuous monitoring dataset to allow Region 10 to conduct a trend assessment of the environmental effects of dredged material disposal at the site and inform updates to the sites' management and monitoring plan. Region 10 conducted monitoring at these sites in two separate sampling efforts from July through September. The first sampling effort was to collect hydroacoustic backscatter data that was ground-truthed by images of the seafloor collected via remotely operated vehicle (ROV). The second survey collected sediment for physical, chemical and biological analyses, benthic trawls for epifaunal analysis and near-bottom water quality data. The hydroacoustic survey and ROV ground truthing work was conducted aboard Marine Technical Services' 23-foot. The sediment sampling, benthic trawls and water-quality assessments were conducted aboard the R/V *Miss Linda*.

Region 10 conducted the hydroacoustic survey prior to any grab sampling, towed video or trawling to identify areas on the seafloor that may have roughness, biological or anthropogenic, which would either impact or could be destroyed by survey techniques. During the hydroacoustic survey, Region 10 towed a SonarTech P150S side-scan sonar in a series of transects over an area of 3,400 acres (13.8 km^2) to collect backscatter data to identify the extent of sand dollar beds and any debris in the study area (Figure 8). Region 10 used an ROV to ground truth the backscatter data so that the areas which needed to be avoided could accurately be mapped. Region 10 used these data to refine the sampling locations for the trend assessment part of the survey.

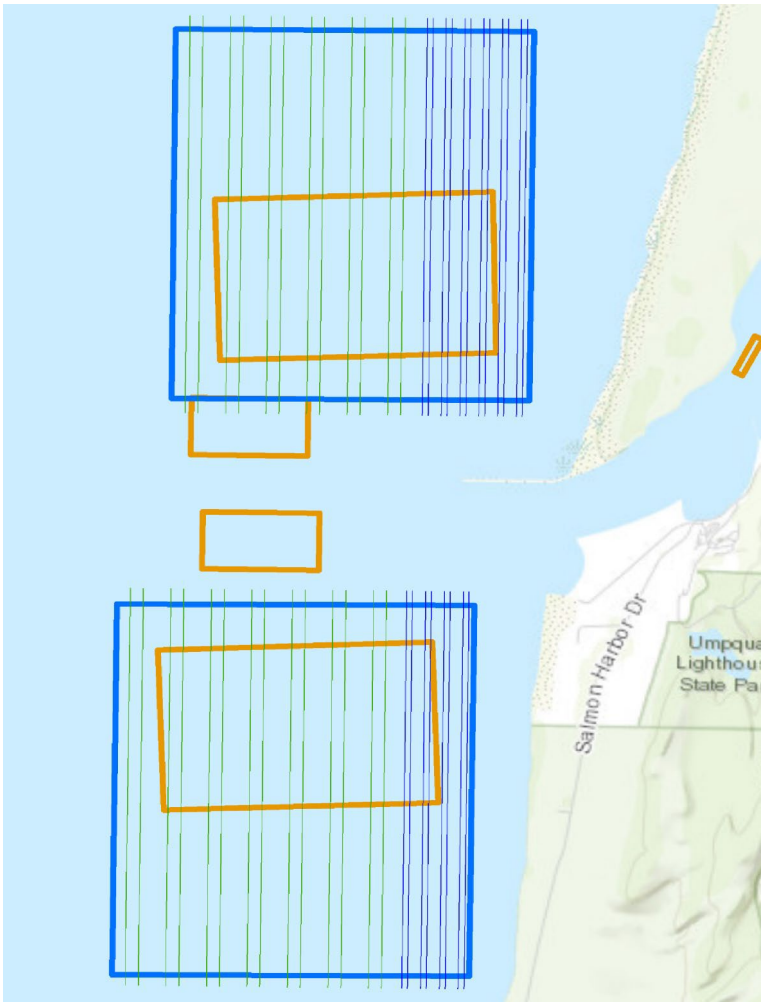

***Figure 8**: Study area (blue box) sampled during the Umpqua North ODMDS and South ODMDS survey. Historical interim site, selected site, and designated ODMDS boundaries are noted by the orange squares; transects followed during the hydroacoustic are indicated by the vertical blue and green lines.*

Region 10 used several types of sampling mechanisms during the second part of the survey. Region 10 collected sediment and macrofauna samples from 40 stations in the Umpqua North ODMDS study area, 20 from within the ODMDS boundaries and ten from reference locations north and south of the site boundaries (Figure 9). They also collected sediment and macrofauna samples from 16 stations in the Umpqua South ODMDS study area, 8 from within the ODMDS and 8 reference areas located outside of the site (Figure 10). To collect these samples, Region 10 used a 0.1 m^2 Grey-O'Hare modified box core. Region 10 processed all sediment and macrofauna samples onboard and sent them to a laboratory to be analyzed for grain size distribution, total solids, TOC and benthic community parameters (e.g., abundance, density, richness, diversity and evenness). Ten of the sediment samples collected from within the Siuslaw North ODMDS were also analyzed for chemicals of concern including concentrations of metals, motor oils and diesel range organics, tributyltins, pesticides, PAHs, chlorinated hydrocarbons, phthalates, phenols and PCBs. Region 10 compared the physical parameters of the sediment collected from inside of the ODMDSs to those collected from reference areas outside of the ODMDS and compared sediment chemistry results collected from inside the Umpqua North ODMDS to the marine benthic toxicity screening levels from the 2018 Sediment Evaluation Framework for the Pacific Northwest. The results from the physical, chemical and biological analyses allowed Region 10 to ensure that dredged material disposal is not changing the sediment structure of the benthos or causing contamination of the benthic community.

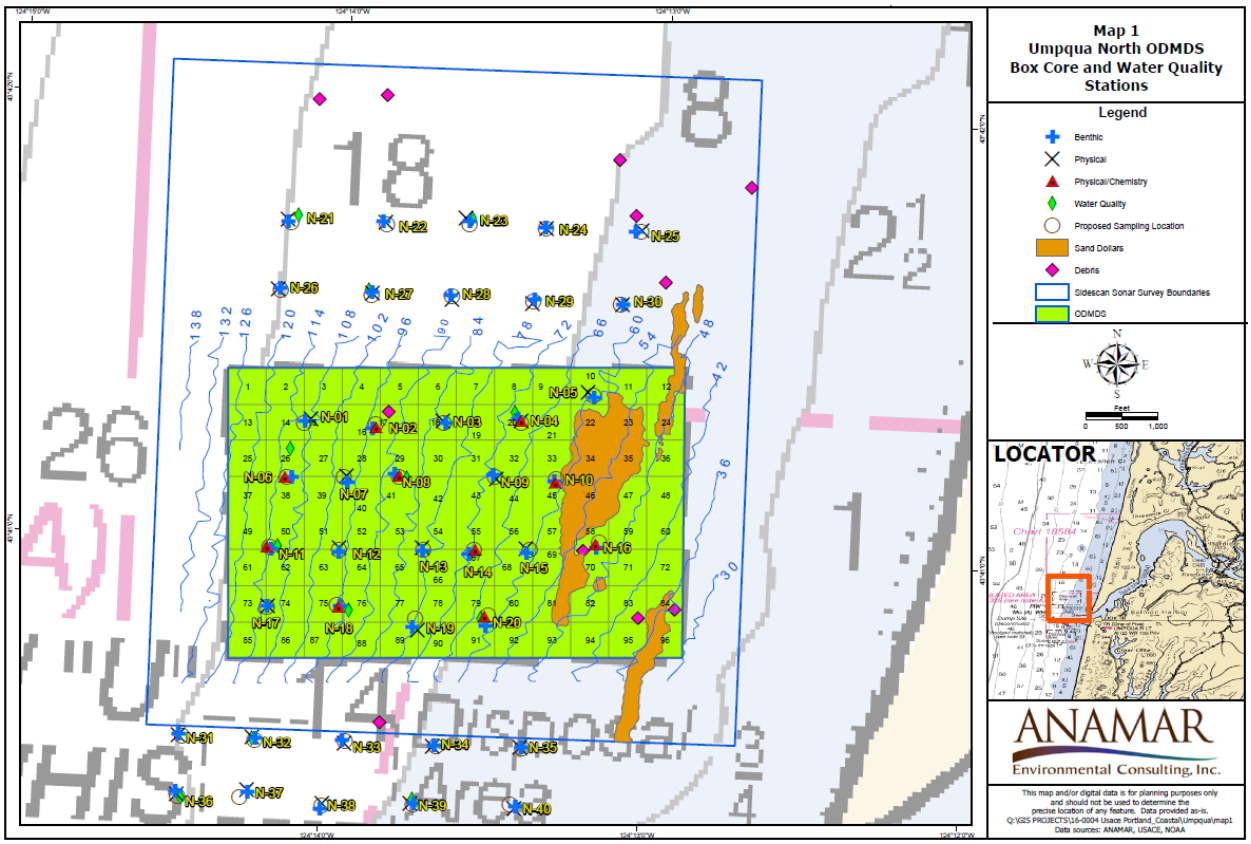

***Figure 9**: Umpqua North ODMDS and reference area map showing sampling locations for benthic, physical, chemical, and water quality parameters.*

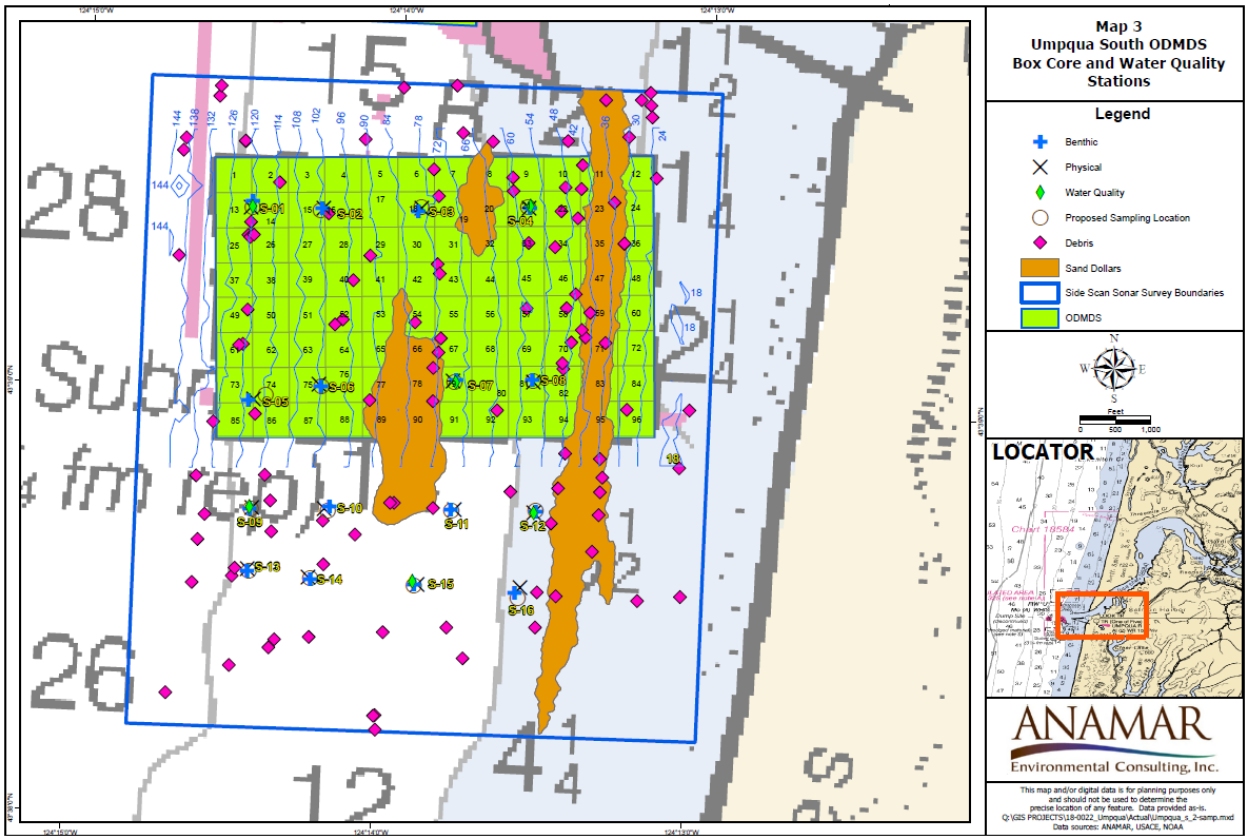

***Figure 10**: Umpqua South ODMDS and reference area map showing sampling locations for benthic, physical, chemical, and water quality parameters.*

In addition to collecting sediment samples during the second part of the survey, Region 10 also conducted benthic otter trawls and video tows along 12 transects in the Umpqua North and Umpqua South study areas. To conduct these trawls, a 12-foot-wide otter trawl was towed behind the vessel along transects of 1200 ft (366 m) to 1600 ft (488 m) in length. Video tows were conducted using JW Fisher TOV-2 underwater camera. The camera was towed behind the vessel along similar transects to where otter trawls were conducted. Epifaunal trawls and video tows conducted within and outside the ODMDSs assess epifaunal community characteristics; these data consider how the areas are utilized by fish and invertebrates relative to the disposal of dredged material. Findings identified in the underwater videos were compared to the findings from the epifaunal trawls.

Lastly, Region 10 collected in-situ water quality data from 10 stations within and outside of the Umpqua North ODMDS and 6 stations within and outside of the Umpqua South ODMDS. A YSI Pro-DDS multiparameter sampling meter was used to measure temperature, salinity, pH, and dissolved oxygen at various depths throughout the water column at each station. Water quality data help inform if conditions within the ODMDS are outside of normal oceanographic ranges.

In the results from the hydroacoustic and ROV surveys, Region 10 identified two primary habitat classifications, soft bottom and sand dollar beds. Areas identified as soft-bottom habitat varied from fine-sand with silt to medium sand. The deeper offshore benthos consisted of finer grained sediments relative to the nearshore, and sand waves became more pronounced moving toward the shoreline. Bioturbation was minimal but increased with distance from shore. Tube worms and mollusk burrows were observed, while larger sessile organisms such as anemones, sea whips and sea pens were absent. Occasionally, flat fish were observed in the study areas, and Dungeness Crab were abundant. Sand dollar beds were present in both the north and south

study areas. Region 10 observed a long narrow bed of sand dollars running north to south nearshore and two defined beds further offshore in the center of the survey area (Figures 9 and 10). In between the mapped sand dollar beds, Region 10 identified dispersed sand dollars in ROV footage, but they were present in such low abundance that they could not be mapped. While Region 10 did not observe large debris, they identified numerous derelict crab pots in both the north and south study areas. Region 10 also noted that there were minor instances of gaps in the side-scan and ROV survey records due to having to avoid other vessels and crab pots present in the area during the time of the survey. These hydroacoustic and ROV data were used to identify general characteristics of the benthos in the north and south study area and refine the sediment sampling and epibenthic trawl locations to avoid areas with high densities of sand dollars.

3.5.2.1 Umpqua North ODMDS Study Area

In the results from the hydroacoustic and ROV surveys specific to the Umpqua North ODMDS study area, Region 10 observed patches of sand dollars in the southeast corner of the ODMDS and extending to the south, outside of the ODMDS boundary (Figure 9).

Results from the grain size analyses of sediments collected from within and outside of the Umpqua North ODMDS indicated that all samples were comprised primarily of sand, with total sand ranging from 99.0% to 99.9% and total fines ranging from 1.0% to 0.1%. Sediments collected from outside of the site boundaries had a higher percentage of fine-grained sand compared to samples within the Umpqua North ODMDS, which had a higher percentage of medium-grained sand. Total solids for all samples ranged from 71.0% to 83.0%. TOC for all samples ranged from <0.02% to 0.11%. The similarities in sediment texture measured inside and outside of the ODMDS suggest that conditions across the survey area are relatively consistent and that disposal activities are not altering grain size conditions within the site compared to conditions in the surrounding area where no dredged material has been disposed.

Sediment chemistry results showed that while a few chemicals of concerns were detected, none were above the marine benthic toxicity screening levels outlined in the Sediment Evaluation Framework for the Pacific Northwest. For metals, some were detected above the MRL, but none above the marine benthic toxicity screening levels. Motor oils and diesel range organics, tributyltin, pesticides, PAHs, chlorinated hydrocarbons, phenols, and miscellaneous extractables were estimated to be present in concentrations below the MRL. All MRLs were below the marine benthic toxicity screening levels outlines in the Sediment Evaluation Framework for the Pacific Northwest. This was also the case for PCB Aroclors, which were not detected above the MRL. Total PCBs ranged from 4.8 µg/kg to 5.1 µg/kg. Phthalates and phenols had a few analytes detected above the MRL, but the concentrations were below the marine benthic screening levels. For all of these compounds, the MRL is lower than the marine benthic toxicity level indicating that the concentrations at which they are present are not expected to cause any adverse effect to the benthic environment.

In the results from the macrofauna sampling, Region 10 identified a total of 27,046 individual organisms in samples collected from inside the ODMDS and 34,726 individual organisms in samples collected outside of the site boundaries. The average values for diversity, evenness, and richness of the benthic community in samples collected from within the site were 2.71, 0.52 and 39, respectively. The average values for diversity, evenness and richness of the benthic community in samples collected from outside of the site were 2.41, 0.48 and 41, respectively. The most abundant taxa present both inside and outside of the site were *Owenia fusiformis* (a tubeworm) and *Dendraster excentricus* (sand dollar). There was noticeable variability in species presence across all stations regardless of location which suggests that the groups are diverse and are not dominated by few taxa. Region 10 did not detect any significant statistical

differences when comparing benthic community measurements inside of the ODMDS to those outside of the ODMDS, indicating high sample variation.

In the results from the epibenthic trawls Region 10 identified 14 species of fish, as well as two families of juvenile or small individuals (Bothidae and Pleuronichthys), and one genus of small individuals Citharichthys. Region 10 also identified 13 species of invertebrates, and one genus of shrimp. Pacific tomcod (*Microgadus proximus*) and English sole (*Parophrys vetulus*) were the most common fish species collected. Fish species collected in the north survey area generally occurred at greater densities outside of the site boundaries and increased with decreasing water depth. Pacific tomcod (*Microgadus proximus*) and starry flounder (*Platichthys stellatus*) were the only fish species collected both inside the ODMDS and outside of the ODMDS that were present in greater density inside the ODMDS. No trends were observed regarding the size of fish based on if they were collected from inside the ODMDS or the reference area.

Dungeness crab (*Metacarcinus magister*) were collected during each trawl conducted in in the Umpqua North study area. There were no obvious trends observed regarding Dungeness crab abundance, sex or size and water depth. Notable quantities of hermit crabs, mysids, and sand dollars were collected in trawls conducted inside the ODMDS. Region 10 found that invertebrate density was greater inside the ODMDS and increased with decreasing water depth. While population density was greater inside of the ODMDS, taxa richness, diversity and evenness were greater in samples collected from outside of the ODMDS. Richness, evenness and density were not statistically different between the two areas due to high variability in the samples. These results indicate that invertebrates contribute more to the observed differences between inside versus outside of the ODMDS than fish do. The variety of species required to explain the within group similarities for the north survey area illustrates that the samples were generally characterized by a moderate number of species.

Region 10 found it difficult to compare the trawl data with the towed video imagery because of the lack of clarity in the video imagery to identify organisms to species. Furthermore, abundance between the two areas could not be compared because the video imagery was not established to describe data in terms of density (organisms per unit of area) as the otter trawl data collection was designed to do. For future surveys, Region 10 recommends that towed video should be performed from a vessel that can achieve slower tow speeds to improve clarity of images so that organisms can be identified to species.

Overall, when benthic and epibenthic community metrics from within the Umpqua North ODMDS were compared with metrics measured outside of the ODMDS, Region 10 did not observe significant differences. These results indicate that disposal activities occuring inside the ODMDS are not causing lasting adverse effects to the benthic and epibenthic environment.

In the results from the in-situ water quality monitoring conducted in the Umpqua North ODMDS study area, Region 10 noted the following observations. Site depth ranged from 59 ft (18 m) to 121 ft (37 m). Water temperature was best predicted by depth where temperatures decreased with increasing depth. The mean bottom temperature in the study area was 55.8 °F (13.2 °C) and there was no difference in mean temperature between inside and outside of the ODMDS. The average salinity measured in the Umpqua South ODMDS study area was 32.9 ppt there were no differences in salinity measured inside and outside of the ODMDS. The average pH measured in the south study area was 8.1. Dissolved oxygen was negatively correlated with depth and ranged from 7.8 mg/L to 8.7 mg/L. All of these measurements are within the normal range for the Oregon coast and indicate no lasting impacts from dredged material disposal were present in the water column.

3.5.2.1 Umpqua South ODMDS Study Area

In the results from the hydroacoustic and ROV surveys specific to the Umpqua South ODMDS study area, Region 10 observed large continuous beds of sand dollars that extended from just north of the Umpqua South ODMDS, southward, along the eastern most portion of the ODMDS and until the southern boundary of the survey area. Two large sand dollar beds were found between the 60 and 90 ft (18 and 27 m) depth contour; beyond this depth the ODMDS and seafloor is sand (Figure 10).

Results from the grain size analyses of sediments collected from within and outside of the Umpqua South ODMDS, indicated that all samples were comprised primarily of sand, with total sand ranging from 96.1% to 99.9% and total fines ranging from 0.1% to 2.6%. Sediments collected from reference areas outside of the site boundaries had a slightly lower percentage of fine-grained sand compared to samples within the Umpqua South ODMDS, which is indicative of recent disposal activity. Total solids for all samples ranged from 73.5% to 79.0%. TOC for all samples ranged from <0.02% to 0.28%. The similarities in sediment texture measured inside and outside of the ODMDS suggest that conditions across the survey area are relatively consistent and that disposal activities are not altering grain size conditions within the site compared to conditions in the surrounding area where no dredged material has been disposed. Chemistry analysis was not conducted on samples collected from the south study area samples because regular disposal activities had not occurred at the Umpqua South ODMDS.

In the results from the macrofauna sampling, Region 10 identified a total of 12,578 individual organisms in samples collected from inside the ODMDS and 7,483 individual organisms in samples collected from outside of the site boundaries. The average values for diversity, evenness, and richness of the benthic community in samples collected from within the site were 2.76, 0.49 and 53, respectively. The average values for diversity, evenness, and richness of the benthic community in samples collected from outside of the site were 3.05, 0.57 and 48, respectively. Similar to the observations seen in the North study site, Region 10 found the most abundant taxa inside and outside of the Umpqua South ODMDS were *Owenia fusiformis* and *Dendraster excentricus*. Region 10 did not detect any significant statistical differences when comparing benthic community measurements inside of the ODMDS to those outside of the ODMDS, indicating high sample variation.

In the results from the epibenthic trawls conducted in the Umpqua South ODMDS study area, Region 10 identified 18 species of fish and 12 species of invertebrates. English sole was the most common fish species collected. Average density of fish was similar inside and outside of the boundaries of the ODMDS.

Dungeness crab (*Metacarcinus magister*) were collected during each trawl conducted in the Umpqua South ODMDS study area. Dungeness crab density was greater inside the ODMDS than was observed outside of the site boundaries. Average density of other invertebrates was equivalent when comparing measurements from inside of the ODMDS to those outside of the site boundaries and densities were generally lower in the transects conducted in deeper waters. While taxa density, and richness were greater outside of the boundaries of the ODMDS, diversity and evenness were greater inside the ODMDS. Statistical analyses did not detect a significant difference in density, diversity, evenness or richness due to high sample variation.

Due to challenges encountered during the video tows in the Umpqua South ODMDS study area, Region 10 conducted only one video tow inside and outside of the ODMDS. These minimal video tows resulted in few observations of Dungeness crab, flatfish and tubeworm casings. Of these observations, Dungeness crab comprised the majority of organisms recorded. Because of

the limited amount of video data collected, Region 10 does not recommend that these data be used as an assessment of the entire Umpqua South ODMDS study area.

Overall, when benthic and epibenthic community metrics from within the Umpqua South ODMDS were compared with metrics measured outside of the ODMDS, Region 10 did not observe significant differences. These results indicate that disposal activities occuring inside the ODMDS are not causing lasting adverse effects to the benthic and epibenthic environment.

In the results from the in-situ water quality monitoring conducted in the Umpqua South ODMDS study area, Region 10 noted the following observations. Site depth ranged from 55.8 ft (17 m) to 118.1 ft (36 m). Water temperature was best predicted by depth where temperatures decreased with increasing depth. The mean bottom depth temperature in the study area was 51.4 °F (10.8 °C) and there was no difference in mean temperature between inside and outside of the ODMDS. The average salinity measured in the Umpqua South ODMDS study area was 32.9 ppt there were no differences in salinity measured inside and outside of the ODMDS. The average pH measured in the south study area was 8.0. In the south study area, where there was less of a depth gradient, dissolved oxygen ranged from 7.4 mg/L to 8.6 mg/L regardless of depth. All these measurements are within the normal range for the Oregon coast indicating no lasting impacts from dredged material disposal were present in the water column.

3.5.3 Conclusions and Recommended Management Actions

Results from the 2019 survey confirm that environmentally acceptable conditions, as outlined in the site management and monitoring plan, are being met at the Umpqua North and Umpqua South ODMDSs and that pre-disposal testing and evaluation of dredged material has been effective at preventing any contaminated material from being disposed of at the sites. While this information will be incorporated into the next site management and monitoring plan update, no immediate site modifications are necessary at this time.

Region 10 anticipates that future surveys will continue to include physical, chemical and biological analyses including sediment characteristics, infaunal and epifaunal communities, and water quality parameters to ensure that ongoing disposal activities at both sites do not result in lasting adverse impacts.

4.0 Next Steps

The EPA conducts oceanographic surveys to monitor the impacts of regulated dumping at MPRSA-designated ocean dredged material disposal sites and to inform management decisions in accordance with the EPA's roles and responsibilities under the MPRSA and its implementing regulations. The EPA monitors ODMDSs to ensure that dredged material disposal 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 sites, and to ensure that the terms of MPRSA permits are met.

Based on the results of the 2019 MPRSA monitoring surveys, the EPA determined that environmentally acceptable conditions were met at each of the surveyed ODMDSs and permitted disposal of dredged material under the MPRSA can continue at these sites. The EPA also confirmed that dredged materials from the Boston Harbor Deep Navigation Project disposed of in the expanded portion of the Massachusetts Bay Disposal Site are covering wastes on the seafloor that were historically disposed of in the area.

Additionally, the EPA will use the data and information collected in 2019:

- to inform site management 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 biological data from towed video to be able to collect comparable quantitative information via video as an alternative to conducting benthic trawls.

5.0 Acknowledgements

This report is based on the monitoring surveys conducted, analyses performed, and conclusions drawn by the EPA's Regional offices 1,3,4,10 during 2019. This report was developed with the support of the Marine Protection Permitting Program staff from the EPA's Headquarters and all coastal Regional offices.

6.0 References

Buchman, M. F. 2008. NOAA Screening Quick Reference Tables, NOAA OR&R Report 08-1, Seattle WA, Office of Response and Restoration Division, National Oceanic and Atmospheric Administration, 34 pp.

National Ocean Economics Program. 2020. http://www.oceaneconomics.org.

NOAA. 1999. Sediment Quality Guidelines Developed for the National Status and Trends Program.

Northwest Regional Sediment Evaluation Team (RSET). 2018. Sediment Evaluation Framework for the Pacific Northwest. Prepared by the RSET Agencies, May 2018, 183 pp plus appendices.

Rhoads, D.C. and J.D. Germano. 1982. Characterization of Organism-Sediment Relations Using Sediment Profile Imaging: An Efficient Method of Remote Ecological Monitoring of the Seafloor (RemotsTM System). Marine Ecology Progress Series, 8:115-128.

Sturdivant, S.K.; Carey, D.A. 2017. Baseline Seafloor Assessment Survey for the Proposed Expansion of the Massachusetts Bay Disposal Site September/October 2015. DAMOS Contribution No. 201 U.S. Army Corps of Engineers, New England District, Concord, MA, 105 pp.

USEPA. 2018. Final Environmental Assessment on the Proposed Expansion of the Massachusetts Bay Ocean Dredged Material Disposal Site and Finding of No Significant Impact. U.S. Environmental Protection Agency, Region 1, Boston, MA.

USEPA and USACE. 2009. Site Management and Monitoring Plan for the Umpqua River Ocean Dredged Material Disposal Sites, OR. April 2009. https://www.epa.gov/ocean-dumping/site-management-and-monitoring-plan-smmp-umpqua-river-ocean-dredged-material-disposal.

USEPA and USACE. 2010a. Siuslaw River North and South ODMDS, Site Management and Monitoring Plan. April 2010. https://www.epa.gov/ocean-dumping/site-management-and-monitoring-plan-smmp-siuslaw-river-ocean-dredged-material-disposal.

World Health Organization. 1994. Environmental Health Criteria 161: Phenol. International Programme on Chemical Safety.