DRAFT
ENVIRONMENTAL IMPACT STATEMENT
FOR
DESIGNATION OF AN OCEAN DREDGED MATERIAL DISPOSAL SITE OFFSHORE OF JACKSONVILLE, FLORIDA

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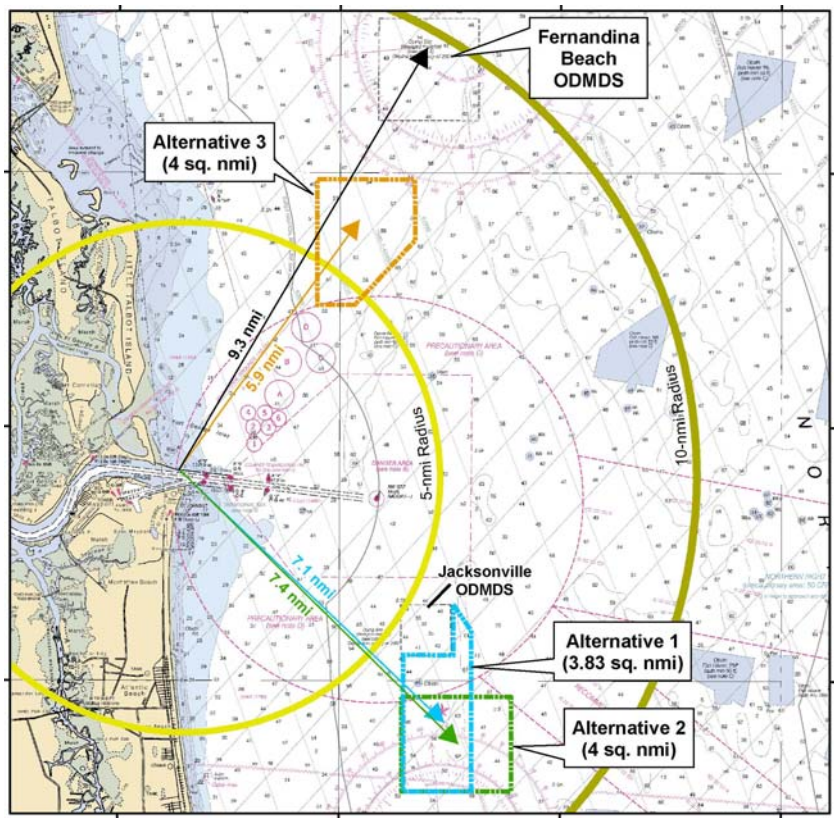

U.S. EPA Region 4
61 Forsyth Street, SW
Atlanta, GA 30303

United States Environmental Protection Agency

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U.S. Environmental Protection Agency
Region 4
Atlanta, Georgia

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ABSTRACT

This Environmental Impact Statement (EIS) evaluates the proposed action to designate a new 4-nmi^2 Ocean Dredged Material Disposal Site (ODMDS) offshore of Jacksonville, Florida as a permanent site for the ocean disposal of dredged material. This ocean disposal site will be available as an alternative for placement of suitable dredged material when no economically practicable upland placement or beneficial reuse options are available.

Use of the new ODMDS is not anticipated to cause significant long-term adverse environmental impacts beyond the site boundaries. Sediment disposal at the site is expected to cause impacts to benthos within the site, but the environmental effects are not anticipated to extend beyond the site boundaries. Water quality impacts will be localized, short-term, and negligible. No significant impacts to threatened and endangered species, fish and essential fish habitat, or commercial shrimp trawling and fishing in the vicinity of the ODMDS are expected. As part of the site designation process, the U.S. Environmental Protection Agency (EPA) has developed a Site Monitoring and Management Plan (SMMP) that will ensure that environmental impacts remain insignificant and that dredged material is properly managed within the site. The SMMP is provided in Appendix F.

The alternatives evaluated in detail in this EIS are: No Action Alternative, Alternative 1: Expansion of the Jacksonville ODMDS, Alternative 2: South of the Jacksonville ODMDS, and Alternative 3: North of the Jacksonville ODMDS. The Preferred Alternatives identified in this EIS are Alternative 1 and Alternative 2 because they

- Are located within the 5- to-10-nautical-mile (nmi) Zone of Siting Feasibility radius.
- Best meet EPA's general and specific site selection criteria.
- Minimize impacts to important commercial shrimp trawling areas and are preferred by commercial shrimpers over Alternative 3.
- Avoid areas north of the St. Johns River that historically have higher use by North Atlantic right whales.
- Have potentially less impacts to biological resources compared to Alternative 3 based on results from the site designation studies.
- Provide continued availability of an ocean disposal site for long-term management of dredged material from the Jacksonville area.

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Table of Contents

ABSTRACT i

EXECUTIVE SUMMARY ES-1

PURPOSE AND NEED FOR PROPOSED ACTION ES-1
SITE DESIGNATION PROCESS ES-1
ODMDS ALTERNATIVES ES-2
AFFECTED ENVIRONMENT ES-3
ENVIRONMENTAL EFFECTS ES-5
COMPARISON OF THE ALTERNATIVE OCEAN DISPOSAL SITES WITH THE FIVE GENERAL AND ELEVEN SPECIFIC SITE SELECTION CRITERIA ES-7
CONCLUSION ES-11

1. INTRODUCTION 1

1.1. OCEAN DISPOSAL OF DREDGED MATERIAL 1
1.2. PROPOSED ACTION 4
1.3. HISTORICAL AND FUTURE DREDGED MATERIAL DISPOSAL NEEDS 4
1.3.1. HISTORICAL DISPOSAL VOLUMES 4
1.3.2. FUTURE DISPOSAL VOLUMES 9
1.3.2.1. Maintenance Material 9
1.3.2.2. New Work Material 10
1.4. NEED FOR ACTION 12
1.4.1. CAPACITY OF THE JACKSONVILLE ODMDS 12
1.4.2. CAPACITY OF THE UPLAND CONFINED DISPOSAL FACILITIES 13
1.5. REGULATORY FRAMEWORK 17
1.5.1. LONDON CONVENTION 17
1.5.2. FEDERAL LAWS AND REGULATIONS 17
1.5.2.1. Marine Protection, Research, and Sanctuaries Act of 1972, as Amended (33 U.S.C. 1401 et seq.) 17
1.5.2.2. National Environmental Policy Act of 1969 (42 U.S.C. 4341 et seq.) 18
1.5.2.3. Clean Water Act of 1972 (33 U.S.C. 1251 et seq.) 20
1.5.2.4. Clean Air Act, as Amended (42 U.S.C. 1451 et seq.) 20
1.5.2.5. Fish and Wildlife Coordination Act of 1958 (16 U.S.C. 661 et seq.) 20
1.5.2.6. Marine Mammal Protection Act of 1972 (16 U.S.C. Chapter 31) 20
1.5.2.7. Magnuson-Stevens Fishery Conservation and Management Act (16 U.S.C. 1801 et seq.) 20
1.5.2.8. Anadromous Fish Conservation Act (16 U.S.C. 757a- 757g; 79 Stat. 1125) 21
1.5.2.9. Coastal Zone Management Act of 1972 (16 U.S.C. 1456 et seq.) 21
1.5.2.10. Endangered Species Act of 1973 (16 U.S.C. 1531 et seq.) 21
1.5.2.11. National Historic Preservation Act of 1966 (16 U.S.C. 470 et seq.) 21
1.5.3. EXECUTIVE ORDERS 22
1.5.3.1. Executive Order 11514, Protection and Enhancement of Environmental Quality (35 FR 4247; May 5, 1970) 22
1.5.3.2. Executive Order 11593, Protection and Enhancement of the Cultural Environment (36 FR 8921; May 15, 1971) 22
1.5.3.3. Executive Order 11990, Protection of Wetlands (42 FR 26961; May 24, 1977) 22
1.5.3.4. Executive Order 12088, Federal Compliance with Pollution Control Standards (January 23, 1987) 22
1.5.3.5. Executive Order 12372, Intergovernmental Review of Major Federal Programs (47 FR 3059; July 16, 1982) 22

1.5.3.6. Executive Order 12898, Federal Actions to Address Environmental Justice in Minority and Low-Income Populations (February 11, 1994) 22
1.5.3.7. Executive Order 13045, Protection of Children from Environmental Health Risks and Safety Risks (62 FR 19885, April 21, 1997) 23
1.5.3.8. Executive Order 13089, Coral Reef Protection 23
1.5.3.9. Executive Order 13112, Invasive Species 23
1.5.3.10. Executive Order 13158, Marine Protected Areas 23
1.5.3.11. Executive Order 13186, Responsibilities of Federal Agencies to the Migratory Bird Treaty Act (66 FR 3853; January 11, 2001) 23
1.5.3.12. Executive Order 13274, Environmental Stewardship and Transportation Infrastructure Project Reviews (67 FR 59449; September 18, 2002) 24
1.5.3.13. Executive Order 13423, Strengthening Federal Environmental, Energy, and Transportation Management (72 FR 3919; January 24, 2007) 24
1.5.4. STATE OF FLORIDA 24
1.5.4.1. Florida Coastal Management Program 24
1.6. NEPA PROCESS 28
1.6.1. NOTICE OF INTENT AND SCOPING PERIOD 28
1.6.2. INTERAGENCY COORDINATION 29
1.6.3. PROJECT COORDINATION 29
1.6.4. DRAFT EIS / PUBLIC MEETING 29
1.6.5. FINAL EIS / PROPOSED RULE 29
1.6.6. FINAL RULE / SITE DESIGNATION 30
2. ALTERNATIVES 31
2.1. ODMDS SITE SELECTION PROCESS 31
2.1.1. ZONE OF SITING FEASIBILITY 31
2.1.1.1. Economic Feasibility Analysis 32
2.1.1.2. Environmental Screening 32
2.1.2. SITE DESIGNATION STUDIES 33
2.1.2.1. Reconnaissance Surveys 37
2.1.2.2. Site Designation Studies 37
2.2. DESCRIPTION OF ALTERNATIVES 40
2.2.1. NO ACTION ALTERNATIVE (STATUS QUO) 40
2.2.2. OCEAN DISPOSAL ALTERNATIVES 42
2.2.2.1. Alternative 1: Expansion of the Jacksonville ODMDS 42
2.2.2.2. Alternative 2: South of the Jacksonville ODMDS 43
2.2.2.3. Alternative 3: North of the Jacksonville ODMDS 44
2.2.2.4. Disposal off the Continental Shelf 49
2.2.3. NON-OCEAN DISPOSAL ALTERNATIVES 49
2.2.3.1. Upland Disposal 49
2.2.3.2. Beach Nourishment, Nearshore Placement, and Other Beneficial Uses 50
2.3. COMPLIANCE WITH USEPA CRITERIA 51
2.3.1. GENERAL SITE SELECTION CRITERIA (40 CFR § 228.5) 51
2.3.1.1. General Site Selection Criteria 40 CFR § 228.5(a) 51
2.3.1.2. General Site Selection Criteria 40 CFR § 228.5(b) 52
2.3.1.3. General Site Selection Criteria 40 CFR § 228.5(c) 52
2.3.1.4. General Site Selection Criteria 40 CFR § 228.5(d) 53
2.3.1.5. General Site Selection Criteria 40 CFR § 228.5(e) 53
2.3.2. SPECIFIC SITE SELECTION CRITERIA (40 CFR 228.6) 53
2.4. ALTERNATIVES ELIMINATED FROM FURTHER EVALUATION 54
2.4.1. DISPOSAL OFF THE CONTINENTAL SHELF 54
2.4.2. UPLAND DISPOSAL 54

2.4.3. BEACH NOURISHMENT, NEARSHORE PLACEMENT, AND OTHER BENEFICIAL USES 54
2.5. COMPARISON OF ALTERNATIVES CONSIDERED 54
2.6. SELECTION OF THE PREFERRED ALTERNATIVE 63
3. EXISTING ENVIRONMENT 65
3.1. OCEAN DISPOSAL SITE CHARACTERISTICS 66
3.1.1. HISTORICAL USE OF STUDY REGION [40 CFR 228.5(E)] 66
3.1.2. TYPES AND QUANTITIES OF WASTES PROPOSED FOR DISPOSAL [40 CFR 228.6(A)(4)] 67
3.1.2.1. Maintenance Material 67
3.1.2.2. New Work Material 68
3.1.3. EXISTENCE AND EFFECTS OF CURRENT AND PREVIOUS DISCHARGE AND DUMPING IN THE AREA [40 CFR 228.6(A)(7)] 68
3.1.3.1. Jacksonville ODMDS 69
3.1.3.2. Fernandina Beach ODMDS 77
3.1.4. FEASIBILITY OF SURVEILLANCE AND MONITORING [40 CFR 228.5(D) AND 228.6(A)(5)] 85
3.2. PHYSICAL ENVIRONMENT 85
3.2.1. CLIMATE 85
3.2.2. AIR QUALITY 88
3.2.3. PHYSICAL OCEANOGRAPHY 90
3.2.3.1. Geology 90
3.2.3.2. Bathymetry 93
3.2.3.3. Waves and Currents 93
3.2.3.4. Sediment Transport 106
3.2.4. WATER QUALITY 107
3.2.4.1. Regional Characteristics 107
3.2.4.2. Alternative Sites Characteristics 111
3.2.5. SEDIMENT CHARACTERISTICS 117
3.2.5.1. Regional Characteristics 117
3.2.5.2. Alternative Sites Characteristics 117
3.3. BIOLOGICAL ENVIRONMENT 122
3.3.1. THREATENED, ENDANGERED, AND SPECIAL STATUS SPECIES 122
3.3.1.1. Sea Turtles 125
3.3.1.2. Fish 127
3.3.1.3. Marine Mammals 132
3.3.2. NON-THREATENED MARINE MAMMALS 137
3.3.2.1. Whales 137
3.3.2.2. Dolphins 139
3.3.3. SEABIRDS 141
3.3.3.1. Pelagic Seabirds 142
3.3.3.2. Neritic Seabirds 142
3.3.4. PLANKTON 143
3.3.4.1. Macroalgae Sargassum 143
3.3.4.2. Phytoplankton 143
3.3.4.3. Zooplankton 144
3.3.5. BENTHIC COMMUNITIES 144
3.3.5.1. Regional Characteristics 144
3.3.5.2. Alternative Sites Characteristics 145
3.3.6. EPIFAUNAL AND FISH COMMUNITIES 151
3.3.6.1. Regional Characteristics 151
3.3.6.2. Alternative Sites Characteristics 152

3.3.7. FISH AND ESSENTIAL FISH HABITAT 157
3.3.7.1. Marine Water Column 158
3.3.7.2. Pelagic Sargassum 158
3.3.7.3. Live/Hardbottom 159
3.3.7.4. Artificial Reefs 160
3.3.7.5. Species Managed by SAFMC 160
3.3.7.6. Atlantic Highly Migratory Species Managed by NMFS 164
3.3.7.7. Species Managed by MAFMC 168
3.3.7.8. State Managed Species in Federal Waters 170
3.4. SOCIOECONOMIC ENVIRONMENT 172
3.4.1. COMMERCIAL FISHING 173
3.4.2. COMMERCIAL SHIPPING 177
3.4.3. MILITARY USE 178
3.4.4. MINERAL RESOURCES 180
3.4.4.1. Oil and Gas Resources 180
3.4.4.2. Sand Borrow Areas 180
3.4.5. RECREATIONAL USE 186
3.4.5.1. Recreational Fishing 186
3.4.5.2. Recreational Boating 188
3.4.5.3. Diving/Snorkeling 188
3.4.6. ARCHAEOLOGICAL, HISTORICAL, AND CULTURAL RESOURCES 188
3.4.6.1. Historic Properties 188
3.4.7. SUBSEA CABLES 190
3.4.8. PUBLIC HEALTH AND WELFARE 190
4. ENVIRONMENTAL EFFECTS 193
4.1. EFFECTS ON THE PHYSICAL AND CHEMICAL ENVIRONMENT 194
4.1.1. AIR QUALITY 194
4.1.1.1. Alternatives 1 through 3 195
4.1.1.2. No Action Alternative (Status Quo) 196
4.1.2. PHYSICAL OCEANOGRAPHY 197
4.1.2.1. Bathymetry and Sediment Transport 197
4.1.2.1.1. Alternatives 1 through 3 197
4.1.2.1.2. No Action Alternative (Status Quo) 198
4.1.2.2. Waves and Currents 198
4.1.2.2.1 Alternatives 1 through 3 198
4.1.2.2.2 No Action Alternative (Status Quo) 199
4.1.3. WATER QUALITY 199
4.1.3.1. Alternatives 1 through 3 199
4.1.3.2. No Action Alternative (Status Quo) 202
4.1.4. SEDIMENT CHARACTERISTICS 202
4.1.4.1. Alternatives 1 through 3 202
4.1.4.2. No Action Alternative (Status Quo) 203
4.2. EFFECTS ON THE BIOLOGICAL ENVIRONMENT 204
4.2.1. THREATENED, ENDANGERED, AND SPECIAL STATUS SPECIES 204
4.2.1.1. Sea Turtles 205
4.2.1.1.1 Alternatives 1 through 3 205
4.2.1.1.2 No Action Alternative (Status Quo) 207
4.2.1.2. Fishes 207
4.2.1.2.1 Alternatives 1 through 3 207
4.2.1.2.2 No Action Alternative (Status Quo) 208
4.2.1.3. Marine Mammals 208
4.2.1.3.1 Alternatives 1 through 3 208

4.2.1.3.2 No Action Alternative (Status Quo) 211
4.2.2. NON-THREATENED MARINE MAMMALS 211
4.2.2.1. Alternatives 1 through 3 211
4.2.2.2. No Action Alternative (Status Quo) 212
4.2.3. SEABIRDS 212
4.2.3.1. Alternatives 1 through 3 212
4.2.3.2. No Action Alternative (Status Quo) 213
4.2.4. PLANKTON 213
4.2.4.1. Alternatives 1 through 3 213
4.2.4.2. No Action Alternative (Status Quo) 214
4.2.5. BENTHIC FAUNA 214
4.2.5.1. Alternatives 1 through 3 214
4.2.5.2. No Action Alternative (Status Quo) 218
4.2.6. FISHES 218
4.2.6.1. Alternatives 1 through 3 218
4.2.6.2. No Action Alternative (Status Quo) 221
4.2.7. ESSENTIAL FISH HABITAT 221
4.2.7.1. Pelagic Sargassum 221
4.2.7.2. Coral, Coral Reefs, and Live/Hardbottom Habitat 221
4.2.7.3. Species Managed by SAFMC 221
4.2.7.4. Atlantic Highly Migratory Species Managed by NMFS 223
4.2.7.5. Species Managed by MAFMC 224
4.2.7.6. SAFMC Policy Concerning Dredged Material Disposal Activities 224
4.2.7.7. Overall Effects to Essential Fish Habitat 225
4.3. EFFECTS ON SOCIOECONOMIC ENVIRONMENT 226
4.3.1. COMMERCIAL FISHING 226
4.3.1.1. Alternatives 1 through 3 226
4.3.1.2. No Action Alternative (Status Quo) 227
4.3.2. COMMERCIAL SHIPPING 227
4.3.2.1. Alternatives 1 through 3 227
4.3.2.2. No Action Alternative (Status Quo) 227
4.3.3. MILITARY USE 227
4.3.3.1. Alternatives 1 through 3 227
4.3.3.2. No Action Alternative (Status Quo) 228
4.3.4. MINERAL RESOURCES 228
4.3.4.1. Alternatives 1 through 3 228
4.3.4.2. No Action Alternative (Status Quo) 228
4.3.5. NAVIGATION 228
4.3.5.1. Alternatives 1 through 3 228
4.3.5.2. No Action Alternative (Status Quo) 229
4.3.6. RECREATIONAL ACTIVITIES 229
4.3.6.1. Alternatives 1 through 3 229
4.3.6.2. No Action Alternative (Status Quo) 229
4.3.7. ARCHAEOLOGICAL, HISTORICAL, AND CULTURAL RESOURCES 229
4.3.7.1. Alternatives 1 through 3 230
4.3.7.2. No Action Alternative (Status Quo) 231
4.3.8. SUBSEA CABLES 231
4.3.8.1. Alternatives 1 through 3 231
4.3.8.2. No Action Alternative (Status Quo) 232
4.3.9. PUBLIC HEALTH 232
4.3.9.1. Alternatives 1 through 3 232
4.3.9.2. No Action Alternative (Status Quo) 232

4.4. UNAVOIDABLE ADVERSE ENVIRONMENTAL IMPACTS 233
4.5. LONG-TERM IMPACTS 233
4.6. CUMULATIVE IMPACTS 234
4.6.1. RELEVANT PAST, PRESENT, AND FUTURE ACTIONS 239
4.6.1.1. Ocean Dredged Material Disposal 239
4.6.1.2. Jacksonville Harbor Deepening 240
4.6.1.3. Sand Borrow Areas 241
4.6.1.4. Other Activities 241
4.6.2. CUMULATIVE IMPACT ANALYSIS 242
4.6.2.1. Air Quality 242
4.6.2.2. Water Quality 242
4.6.2.3. Sediment Quality 244
4.6.2.4. Sea Turtles 244
4.6.2.5. Marine Mammals 244
4.6.2.6. Seabirds 245
4.6.2.7. Benthic Fauna 245
4.6.2.8. Fish and Essential Fish Habitat 245
4.6.2.9. Bioaccumulation 246
4.6.3. CONCLUSION 246
4.7. RELATIONSHIP BETWEEN SHORT-TERM AND LONG-TERM RESOURCE USES 247
4.8. IRREVERSIBLE OR IRRETRIEVABLE COMMITMENT OF RESOURCES 247
5. MANAGEMENT OF THE DISPOSAL SITE 249
5.1. OCEAN DISPOSAL PERMITS 249
5.2. SITE MANAGEMENT AND MONITORING 251
6. LIST OF PREPARERS 253
7. REFERENCES 255

LIST OF APPENDICES

Appendix A Public Participation and Agency Consultation
Appendix B Florida Coastal Zone Consistency Determination
Appendix C Biological Assessment
Appendix D Essential Fish Habitat Assessment
Appendix E Air Quality Evaluation
Appendix F Site Management and Monitoring Plan
Appendix G Zone of Siting Feasibility Study

LIST OF FIGURES

Figure 1.3-1 Region of Interest Showing Existing Jacksonville and Fernandina Ocean Dredged Material Disposal Sites 6
Figure 1.3-2 Mayport Naval Station and Jacksonville Harbor Federal Navigation Project and Existing ODMDS 7
Figure 1.3-3 Jacksonville Harbor Navigation Project 8
Figure 1.3-4 Jacksonville Harbor Nearshore Placement Areas 11
Figure 1.4-1 Bathymetry of Jacksonville ODMDS (2011) 15
Figure 1.4-2 Bartram and Buck Island Upland Confined Disposal Facilities 16
Figure 1.5-1 Overview of Tiered Approach to Evaluating Potential Impact of Ocean Disposal of Dredged Material 19
Figure 2.1-1 Three Disposal Scenarios and Three Distance Increments 34
Figure 2.1-2 General Representation of the Screening (Sieve) Technique for Siting 35
Figure 2.1-3 Resources in Region of Interest 36
Figure 2.1-4 North and South Survey Areas 38
Figure 2.1-5 Candidate Site Boundaries, Alternatives 1-3 39
Figure 2.2-1 Alternative 1 with nearby Resources and Features of Interest 45
Figure 2.2-2 Alternative 2 with nearby Resources and Features of Interest 46
Figure 2.2-3 Alternative 3 with Nearby Resources and Features of Interest 47
Figure 2.2-4 Shrimp Trawling Lines with Alternative 1-3 Boundaries 48
Figure 3.1-1 Jacksonville ODMDS Sampling Stations, June 1995 71
Figure 3.1-2 Jacksonville ODMDS Sampling Stations, June 1998 72
Figure 3.1-3 Jacksonville ODMDS Sampling Stations, June 2009 73
Figure 3.1-4 Jacksonville ODMDS Sediment Chemistry Trends 74
Figure 3.1-5 Jacksonville ODMDS Particle Size Distribution (2009) 75
Figure 3.1-6 2005 Sampling Stations Fernandina Beach ODMDS 78
Figure 3.2-1 Wind Roses for Jacksonville International Airport (1948-1995) and a Temporary Monitoring Site Just North of the St. Johns River Power Park (December 10, 1979-December 10, 1980) 87
Figure 3.2-2 Physiographic Provinces of the Southeastern United States 91
Figure 3.2-3 Physiographic Subdivisions of the North Florida Atlantic Continental Shelf 92
Figure 3.2-4a North Area Bathymetry with Alternative 3 Boundary 95
Figure 3.2-4b South Area Bathymetry with Alternatives 1 and 2 Boundaries 96
Figure 3.2-5 Instrument Location Map 97
Figure 3.2-6 Jacksonville ODMDS Wave Rose for Significant Wave Height 98
Figure 3.2-7 Jacksonville ODMDS Wave Rose for Peak Wave Period 99
Figure 3.2-8 Fernandina Beach ODMDS Wave Rose for Significant Wave Height 100
Figure 3.2-9 Fernandina Beach ODMDS Wave Rose for Peak Wave Period 101
Figure 3.2-10 Jacksonville ODMDS Depth Averaged Current Rose Diagram 102

Figure 3.2-11 Jacksonville ODMDS Progressive Vector Diagram 103
Figure 3.2-12 Fernandina Beach ODMDS Depth Averaged Current Rose Diagram 104
Figure 3.2-13 Fernandina Beach ODMDS Progressive Vector Diagram 105
Figure 3.2-14 Jacksonville ODMDS Bathymetric Changes 2002 to 2007 108
Figure 3.2-15 Contour Plot of Bottom Changes Between the September 2004 and June 2007 Hydrographic Surveys of Jacksonville ODMDS 109
Figure 3.2-16 Contour Plot of Bottom Changes Between the June 2007 and February 2008 Hydrographic Surveys of Jacksonville ODMDS 110
Figure 3.2-17a Alternatives 1 and 2 with Spring 2010 Sampling Locations 112
Figure 3.2-17b Alternative 3 with Spring 2010 Sampling Locations 113
Figure 3.2-17c Alternatives 1 and 2 with Fall 2010 Sampling Locations 114
Figure 3.2-17d Alternative 3 with Fall 2010 Sampling Locations 115
Figure 3.3-1 North Atlantic Right Whale Critical Habitat - Southeastern United States 124
Figure 3.3-2 Range of the Atlantic Sturgeon 129
Figure 3.3-3 Smalltooth Sawfish Critical Habitat 131
Figure 3.3-4 Calving Grounds of the North Atlantic Right Whale 133
Figure 3.3-5 North Atlantic Right Whale Occurrences within the Region of Interest 134
Figure 3.3-6 SPUE Data for NARW 1985-2007 135
Figure 3.3-7 Whale Strandings within the Project Area (1991-2006) 138
Figure 3.3-8 Mean Benthic Infaunal Biomass during the Spring 2010 Survey 146
Figure 3.3-9 Mean Benthic Infaunal Biomass during the Fall 2010 Survey 146
Figure 3.3-10 474 Identified Infaunal Taxa by Major Taxonomic Group 148
Figure 3.3-11 Bivalve and Gastropod Biomass during the Fall 2010 Survey 150
Figure 3.3-12 Bivalve and Gastropod Biomass during the Spring 2010 Survey 150
Figure 3.3-13 Invertebrate and Fish Biomass during the Spring 2010 Survey 153
Figure 3.3-14 Invertebrate and Fish Biomass during the Fall 2010 Survey 153
Figure 3.3-15 197 Identified Epifaunal Taxa by Major Taxonomic Group 154
Figure 3.3-16 72 Identified Fish Species by Order 155
Figure 3.4-1 Jacksonville Range Complex 179
Figure 3.4-2 Outer Continental Shelf Planning Area Boundaries 182
Figure 3.4-3a Duval Borrow Area 183
Figure 3.4-3b Duval County Area Showing Nearshore Potential Sand Borrow Areas and Physiographic Zones 184
Figure 3.4-3c Potential Sand Borrow Areas 185
Figure 3.4-4 Artificial Reefs and Fishing Hot Spots 187
Figure 3.4-5 Submerged Cable Routes, Alternatives 1-3 191

LIST OF TABLES

Table ES-1 Compliance with General Criteria (40 CFR 228.5) ... ES-7
Table ES-2 ODMDS Alternatives and EPA Specific Site Selection Criteria ... ES-8
Table ES-3 ODMDS Alternatives, Summary of Impact ... ES-13
Table 1.1-1 USEPA's Five General and Eleven Specific Site Selection Criteria ... 3
Table 1.3-1 Historical Volumes of Dredged Material Placed in the Jacksonville ODMDS and Vicinity ... 5
Table 1.3-2 Annual Shoaling Estimates ... 9
Table 1.4-1 Projected Status of the Jacksonville ODMDS ... 13
Table 1.5-1 Summary of Compliance of the Proposed Project with Environmental Statutes and Regulations ... 25
Table 2.1-1 Site Name Nomenclature ... 37
Table 2.2-1 Fernandina Beach ODMDS Coordinates ... 40
Table 2.2-2 Alternative 1 Coordinates (NAD83) ... 42
Table 2.2-3 Alternative 2 Coordinates (NAD83) ... 43
Table 2.2-4 Alternative 3 Coordinates (NAD83) ... 44
Table 2.3-1 Comparison of ODMDS Alternatives and EPA Specific Site Selection Criteria ... 55
Table 2.5-1 Summary of Impacts of the Proposed and No Action Alternatives ... 57
Table 2.5-2 Comparison of Alternative Sites Based on Results from the 2010 Site Designation Surveys ... 63
Table 3.1-1 Surveys Conducted at the Jacksonville ODMDS ... 80
Table 3.1-2 Surveys Conducted at the Fernandina Beach ODMDS ... 83
Table 3.2-1 Summary of Meteorological Conditions for Jacksonville ... 86
Table 3.2-2 National Ambient Air Quality Standards ... 89
Table 3.2-3a Spring and Fall 2010 CTD Profile Data ... 111
Table 3.2-3b Spring and Fall 2010 CTD-Profile Depth at Light Extinction ... 111
Table 3.2-4 Range of Concentrations of Detected Analytes at Alternative Sites ... 116
Table 3.2-5 Summary of Sediment Grain Size Analysis for Alternative Sites ... 118
Table 3.2-6 Range of Concentrations for Metals Detected at Alternative Sites ... 119
Table 3.2-7 Range of Concentrations for PAHs Detected at Alternative Sites ... 119
Table 3.2-8 Range of Concentrations for Organochlorine Pesticides Detected at Alternative Sites ... 120
Table 3.2-9 Range of Concentrations for PCBs Detected at Alternative Sites ... 121
Table 3.2-10 Range of Concentrations for Organotins Detected at Alternative Sites ... 122
Table 3.3-1 Status of Listed Species and Critical Habitat Potentially Occurring in the Region of Interest ... 123
Table 3.3-2 Seabirds Potentially Occurring within the Study Area ... 142
Table 3.3-3 Phytoplankton Species Typically Found in the Waters of the Georgia Bight ... 144
Table 3.3-4 Total Wet Weight Biomass of Benthic Infauna, Listed by Rank ... 147
Table 3.3-5 Total Mean Infaunal Densities, Listed by Rank ... 147
Table 3.3-6 Mean Infaunal Diversity Index Values, Listed by Rank ... 149
Table 3.3-7 Mollusk Wet Weight Biomass and Density, Listed by Rank ... 149

Table 3.3-8 Epifaunal Wet Weight Biomass, Listed by Rank 152
Table 3.3-9 Mean Epifaunal Diversity, Listed by Rank 155
Table 3.3-10 Total Epifaunal Density, Listed by Rank 156
Table 3.3-11 Densities of Taxa Managed under the Coral FMP Captured by Trawl during Spring and Fall 2010 160
Table 3.3-12 Densities of Taxa Managed under the Snapper-Grouper FMP Captured by Trawl during Spring and Fall 2010 163
Table 3.3-13 Invertebrate Taxa Managed by the State of Florida Extending into Federal Waters and Captured by Trawl during the Spring and Fall 2010 Surveys 171
Table 3.3-14 Fish Species Managed by the State of Florida Extending into Federal Waters and Captured by Trawl during the Spring and Fall 2010 Surveys 172
Table 3.4-1 2009 Mean Commercial Annual Landings for Duval, Nassau, and St. Johns Counties in Florida 174
Table 3.4-2 Top Species in Commercial Landings Ranked by Average Pounds Landed in 2009 in Duval, Nassau, and St. Johns Counties Combined 175
Table 3.4-3 Monetary Value of Commercial Landings in Mayport, Florida, from 1993 to 2009 175
Table 3.4-4 Summary of Habitats Used by Different Life Stages of Economically and Ecologically Important Fish and Epibenthic Invertebrate Species of the Study Area 176
Table 3.4-5 Spawning Seasons of Economically and Ecologically Important Fish and Invertebrate Species within the Study Area 176
Table 3.4-6 JAXPORT's Cargo Statistics from 2006-2010 177
Table 3.4-7 JAXPORT's 2010 Inbound and Outbound Tonnage Statistics 178
Table 3.4-8 Shoal Dimensions 181
Table 3.4-9 Sport Fishing Expenditures in Florida for State Residents and Non-Residents 16 Years and Older 186
Table 4.1-1 Comparison of Emissions Produced Annually for Maintenance Material Only Using a Clamshell or a Hopper Dredge 195
Table 4.1-2 Comparison of Emissions Produced Annually for New Work Material Using a Clamshell or a Hopper Dredge 196
Table 4.1-3 Wave Height Analysis 199
Table 4.2-1 Possible Effects of Dredged Material Disposal on Offshore Benthos 215
Table 4.6-1 Summary of Cumulative Impacts 236
Table 4.6-2 Past, Present, and Reasonably Foreseeable Projects/Activities 239
Table 5.2-1 Major Monitoring Requirements for the Proposed ODMDS 252

ACRONYMS AND ABBREVIATIONS

ADCP	acoustic Doppler current profiler
BA	Biological Assessment
BO	Biological Opinion
BOEMRE	Bureau of Ocean Energy Management, Regulation, and Enforcement
CAA	Clean Air Act
CCC	criterion continuous concentration
CMC	criteria maximum concentration
CDF	confined disposal facility
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CO	carbon monoxide
CWA	Clean Water Act
CZMA	Coastal Zone Management Act
DBA	Duval Borrow Area
DEIS	Draft Environmental Impact Statement
DO	dissolved oxygen
DPS	distinct population segment
EIS	Environmental Impact Statement
EFH	Essential Fish Habitat
ESA	Endangered Species Act
EPA/USEPA	Environmental Protection Agency
EWS	early warning system
FDEP	Florida Department of Environmental Protection
FEIS	Final Environmental Impact Statement
FMC	Fishery Management Council
FMP	fishery management plan
FTU	formazin turbidity units
FWC	Florida Fish and Wildlife Conservation Commission
FWRI	Fish and Wildlife Research Institute
FY	fiscal year
HAPC	habitat area of particular concern
JAXPORT	Jacksonville Port Authority
LTFATE	long term fate
MAFMC	Mid Atlantic Fisheries Management Council
MBTA	Migratory Bird Treaty Act
MDFATE	Multiple Dump FATE
MDL	method detection limit
MLLW	mean lower low water
MMPA	Marine Mammal Protection Act
MMS	Minerals Management Service
MPA	marine protected area
MPRSA	Marine Protection, Research and Sanctuaries Act
MQL	minimum quantitation limit
MRL	method reporting limit
MSA	Magnuson-Stevens Fishery Conservation and Management Act
NAAQS	National Ambient Air Quality Standards

NARW	North Atlantic right whale
NAVFAC	Naval Facilities Engineering Command
NEPA	National Environmental Policy Act
NH_3	ammonia
NHPA	National Historic Preservation Act
NMFS	National Marine Fisheries Service
NOAA	National Oceanographic and Atmospheric Administration
NOI	Notice of Intent
NO_x	nitrogen oxide
NPS	National Park Service
NARW	North Atlantic right whale
O&M	operation and maintenance
ODMDS	Ocean Dredged Material Disposal Site
PAH	petroleum aromatic hydrocarbons
PAR	photosynthetically active radiation
PCI	Panamerican Consultants, Inc.
PM	particulate matter
ROI	region of influence
ROSS	Reconnaissance Offshore Sand Search
SAFMC	South Atlantic Fisheries Management Council
SARBO	South Atlantic Regional Biological Opinion
SHPO	(Florida) State Historic Preservation Office(r)
SMMP	Site Management and Monitoring Plan
SO_2	sulfur dioxide
STFATE	short term fate
TEL	threshold effects level
TEU	twenty equivalent units
TKN	total Kjeldahl nitrogen
TP	total phosphorus
USACE	U.S. Army Corps of Engineers
U.S.C.	U.S. Code
USCG	U.S. Coast Guard
USEPA/EPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
VOC	volatile organic carbon (hydrocarbons)
YBP	years before present
ZSF	Zone of Siting Feasibility

UNITS OF MEASURE:

cm/s	centimeters/second
cy	cubic yards
m	meter(s)
mg/l	milligrams/liter
mm	millimeters
nmi, nmi^2	nautical mile(s), square nautical mile(s)
ppm	parts per million
PSU	practical salinity unit(s)
$\mu g/m^3$	micrograms per cubic meter

EXECUTIVE SUMMARY

PURPOSE AND NEED FOR PROPOSED ACTION

The U.S. Environmental Protection Agency (EPA) Region 4 proposes to designate an ocean dredged material disposal site (ODMDS) offshore of Jacksonville, Duval County, Florida. The purpose of the proposed action is to provide an economically and logistically feasible ocean disposal site for the long-term (50 years) management of suitable dredged material from the Duval County region in a manner that will not cause unreasonable degradation of the ocean with respect to the marine environment and human health. Dredge material is defined as "suitable" when it meets the criteria (40 Code of Federal Regulations [CFR] Parts 225 and 227), as determined by physical, chemical, and bioassay/bioaccumulation testing (USEPA and USACE 1991).

There is an existing Jacksonville ODMDS approximately 5 nautical miles (nmi) southeast of the mouth of the St. Johns River. However, due to capacity issues at this site, U.S. Army Corps of Engineers (USACE) Jacksonville District and EPA Region 4 have identified a need to designate a new ODMDS in the vicinity. The need for expanding current ocean disposal capacity is based on observed mounding, future capacity modeling, historical dredging volumes, and estimates of dredging volumes from future proposed projects. It is expected that the volume of dredge material generated over the next 50 years from the Jacksonville Harbor Navigation Project, Naval Station Mayport, and the proposed Jacksonville Harbor Deepening Project would exceed the combined capacity of the existing Jacksonville ODMDS, confined disposal facilities (CDFs), or beneficial use options, possibly as early as 2013.

SITE DESIGNATION PROCESS

By law, starting in 1997, ocean disposal may only occur at sites that have gone through a formal designation process to ensure that significant adverse impacts to the marine environment and human uses of the ocean will not occur. It is EPA's policy to publish and process a National Environmental Policy Act (NEPA) Environmental Impact Statement (EIS) for all ODMDS designations (Federal Register, Volume 63, Page 58045 [63 FR 58045], October 1998), even if the action would not result in any potentially significant adverse impacts. This EIS discloses potential environmental impacts associated with disposal of dredged material at the proposed alternative ODMDS locations and is part of the formal process to identify and designate an environmentally acceptable ODMDS for the Duval County area.

Formal designation of an ODMDS does not constitute approval for ocean disposal of dredge material. Designation of an ODMDS provides an additional dredged material management option for consideration in the review of each proposed dredging project. Ocean disposal is allowed only when EPA and USACE determine, on a case-by-case basis, that (1) the dredge material is environmentally suitable according to testing criteria (40 CFR Parts 225 and 227), as determined from physical, chemical, and bioassay/bioaccumulation testing (USEPA and USACE 1991); (2) the dredge material does not have a beneficial reuse; and (3) there are no practical non-ocean disposal options available. After an ODMDS is designated, other management options for suitable material, including beneficial use, will continue to be preferred over ocean disposal when such options are economically practicable and would not have unacceptable adverse effects.

In summary, the steps required to designate an ODMDS are:

1. Demonstrate a need for an ODMDS.
2. Conduct a constraints analysis (Zone of Siting Feasibility [ZSF] study) based on existing information to identify areas with the least conflicting uses and the least potential for environmental impacts.
3. Evaluate these areas in detail to determine the most suitable location within each study area for a candidate ODMDS.
4. Evaluate the specific candidate site(s)/alternatives using EPA's general and specific criteria (40 CFR Part 228) (see Table 1.1-1) and document the findings in the EIS.
5. Identify the preferred alternative (e.g., the site that best meets the criteria) and proceed with rulemaking published in the Federal Register to formally designate the ODMDS.

This document was prepared in accordance with the 1969 NEPA (42 U.S. Code [U.S.C.] §4321 et seq.), as implemented by the Council on Environmental Quality (CEQ) regulations (40 CFR Parts 1500-1508), USEPA Procedures for Implementing the Requirements of the Council on Environmental Quality on the NEPA (40 CFR Part 6), as amended October 19, 2007 (Federal Register Vol. 72, No. 181, pp 53652-53672), and EPA's site designation criteria (40 CFR 228). This EIS is issued in accordance with Title I of the Marine Protection, Research, and Sanctuaries Act (MPRSA), and as required by EPA's voluntary NEPA policy on the designation of ocean disposal sites (63 FR 58045), October 1998).

ODMDS ALTERNATIVES

The ZSF study prepared by USACE Jacksonville District in May 2010 was used to define a zone of economic and operational feasibility within which study areas for potential ODMDS siting were further evaluated. Based on the ZSF study and reconnaissance survey results, three alternative sites were selected for further site designation studies which assessed the physical, chemical, and biological characteristics of the alternative sites.

Chapter 2 of this Environmental Impact Statement (EIS) evaluates several alternatives and identifies the preferred alternatives that best meet the goals and objectives of the proposed action while minimizing the potential for adverse environmental effects. Alternatives were eliminated from detailed impact analysis in this EIS if they did not meet general and specific EPA siting criteria. The alternatives initially considered include:

- No Action Alternative
- Alternative 1: Expansion of the Jacksonville ODMDS (Preferred)
- Alternative 2: South of the Jacksonville ODMDS (Preferred)
- Alternative 3: North of the Jacksonville ODMDS
- Upland disposal at confined disposal facilities (CDF)
- Beach placement/beneficial use
- Ocean disposal at a deepwater site

Upland disposal and beach placement/beneficial use are considered on a case-by-case basis prior to the issuance of permits for ocean disposal. However, based on existing capacity of available CDFs for upland disposal, it has been determined that this option will not be sufficient for handling the quantities of dredge material that are anticipated to be generated in the region over the next 50 years. Further, beach and nearshore placement as a stand-alone alternative is not feasible because it requires beach-quality sand, while most dredging projects in the area do not typically yield beach-quality sand. Ocean disposal at a deepwater site is not economically

or operationally feasible because the continental shelf is approximately 60 to 70 nmi wide in this area. Consequently, these alternatives were eliminated from detailed evaluation in the EIS. Alternatives 1, 2, and 3 and the No Action Alternative are evaluated in detail in Chapters 3 and 4.

AFFECTED ENVIRONMENT

The following sections summarize the physical, biological, and socioeconomic environments of the project area.

Physical Environment

Jacksonville, Florida has a humid subtropical climate with mild weather during winters and hot weather during summers. The average daily temperature range is between 64°F to 91°F (18°C to 33°C) throughout the year. Average rainfall is approximately 52 inches per year, with the wettest months being June through September. Hurricanes and lesser tropical storms can lead to appreciable precipitation for short periods. Hurricanes in the region have generally traveled parallel to the coastline, either remaining far out to sea or losing much of their force over land. Along the Florida east coast, easterly winds are predominant throughout the year. Wind velocities are generally moderately light, averaging 7 to 10 knots over the year. Jacksonville has "attained" EPA's air quality standards.

The northeast coast of Florida is bounded by a shelf that is moderately broad and gently sloping and is about 60 to 70 nmi wide off Jacksonville. The most prominent geological and geomorphological features along the northeast coast of Florida include sand flats and ebb-tidal deltas on the inner shelf; sand waves, shoals, and banks on the middle shelf; and large sand ridges on the outer shelf (URS and CPE 2007). Natural reefs are widely scattered on the continental shelf and are composed of exposed limestone, shell, sand, gravel, and sponge and coral growths (NOAA 1980). In addition to naturally occurring reefs, numerous artificial reefs have been established to provide additional habitats for recreational fishing and diving purposes.

The Florida Current dominates circulation along the east Florida continental shelf. Currents flow predominately in the north-northwest and south-southeast directions and rarely exceed 30 cm/sec (1.0 feet/sec) in magnitude (USEPA 2009a). Along the shelf in the vicinity of northeast Florida, transport is dominated by waves and currents due to extratropical storm events and frontal passages which occur, on average, once or twice a month during the fall, winter, and spring months, and to a lesser extent tropical events that occur during the summer and fall months about once every 2 years (USACE 2008).

Water quality is influenced by the St. Johns River and coastal processes. The St. Johns River transports suspended particulates and nutrients to the nearshore region. Wave, storm surges, and wind can re-suspend bottom sediments and increase suspended particulates in the water, especially along the bottom. The in situ parameters and chemical characteristics of water samples collected from stations located within and adjacent to Alternative Sites 1, 2, and 3 were similar. All analytical results for metals, organochlorine pesticides, and PAHs were well below EPA water quality criteria.

Offshore of Fernandina Beach and Jacksonville, quartz sand is thick (up to 8.2 feet) and uniform in lateral extent, probably due to the presence of the St. Johns and St. Mary's rivers (URS and CPE 2007). In general, the physical and chemical characteristics of sediment samples collected from stations located within and adjacent to Alternative Sites 1, 2, and 3 were similar. Results

of grain size analysis for these alternative sites indicate a predominance of sand (70.1% to 98.6%).

Biological Environment

Ten species listed as threatened or endangered under the Endangered Species Act of 1973 (ESA) potentially occur within the vicinity of Alternatives 1, 2, and 3 (Table 3.3-1, Chapter 3). The sea turtle species potentially occurring within the vicinity of the three alternative sites include loggerhead, leatherback, Kemp's ridley, and green sea turtles. Of the threatened and endangered fish species, only the Atlantic sturgeon may be present in the offshore areas in the vicinity of the three alternative sites and in the transit areas between the dredging project area and the ODMDS.

The Marine Mammal Protection Act of 1972 prohibits taking, killing, injuring, or harassing of any marine mammal within the borders of the United States regardless of status. Therefore, all marine mammals encountered in the offshore region of Jacksonville must be given due consideration. Federally protected marine mammal species commonly found on Florida's northeast coast are the North Atlantic right whale (*Eubalaena glacialis*) and the Florida manatee (*Trichechus manatus latirostris*). Critical habitat for the North Atlantic right whale has been designated in the area within and adjacent to the three alternative sites (Figure 3.3-1, Chapter 3). The humpback whale (*Megaptera novaeangliae*) is also a state and federally listed endangered species, although occurrence in the project area is expected to be limited. Several other non-threatened marine mammals such as dolphins and other whale species may also occur in the project area.

Several species of pelagic, migrant, and coastal birds inhabit the eastern inner shelf of Florida. Species most likely to occur in the study area are pelagic birds, pelicans, gulls, and terns. With the exception of non-native species, all birds identified as potentially occurring in the northeast Florida area are protected under the Migratory Bird Treaty Act (MBTA) (Williams 2004).

The predominant infaunal invertebrates inhabiting the sand-bottom habitats of the nearshore east Florida shelf include annelid worms, crustaceans, echinoderms, and mollusks (Zarillo et al 2009). Based on spring and fall 2010 sampling results, the infaunal community is complex and diverse at all alternative sites and adjacent areas. Annelid worms, arthropods, and ostrocods were important components of infaunal samples (ANAMAR 2011).

Sea anemones, mollusks, sea stars, and mojarras were common in spring and/or fall 2010 trawl samples. Clearnose skates were common in spring samples. Lined sea stars were the most abundant invertebrate taxa, and the Atlantic croaker was the most abundant fish species collected during the site designation surveys. Hakes, searobins, drums, striped anchovy, and sand flounders are also common components of the epifaunal community.

The continental shelf of the southeastern United States, including the study area, harbors diverse marine fauna and supports large commercial and recreational fisheries. Essential fish habitat (EFH) identified by the South Atlantic Fisheries Management Council (SAFMC) applicable to this project area consists of live/hardbottom, coral and coral reefs, artificial reefs, sargassum, and water column habitats (NMFS 2008c). Rich assemblages of demersal fish congregate around the numerous reefs located off the coast of Jacksonville because of the shelter and associated abundance of benthic organisms that serve as food (NMFS 1978, Moe 1963). Specific fisheries complexes are snapper-grouper, which include groupers, temperate basses, snappers, and tilefishes; coastal migratory pelagic species such as king and Spanish mackerel;

and highly migratory species such as dolphinfishes, swordfish, billfishes, and many species of sharks (SAFMC 2007).

Socioeconomic Environment

Shrimp is the main commercial fishery in the project area and is based upon three penaeid shrimp species: northern white shrimp, northern brown shrimp, and northern pink shrimp. On average, from 1993 to 2009, the commercial fisheries industry for Mayport landed 5 million pounds, or approximately $9.3 million value, annually (NMFS 2009d).

Shipping is a major component of commerce in Jacksonville Harbor. JAXPORT is an international trade seaport in northeast Florida. Cargo and cruise business at Jacksonville's seaport supports 65,000 jobs across the region and generates a total of $19 billion in annual economic impact (www.jaxport.com, accessed April 19, 2011).

The U.S. Naval Station at Mayport is one of the most active naval facilities on the east coast of the United States and is situated on the south bank of the St. Johns River, seaward of downtown Jacksonville. Naval Station Mayport occupies 3,500 acres of land and serves as home port for five major components of the Atlantic Fleet, a helicopter fleet airwing, and several training and administrative units. The existing facilities provide berthing for both deep-draft (e.g., aircraft carriers) and medium-draft U.S. Navy ships.

The marine environment of northeastern Florida provides outstanding recreational opportunities for residents and tourists and generates considerable revenue for local businesses and the State of Florida. Millions of dollars are spent annually on activities associated with marine recreational fishing (e.g., tackle, baits, boats, fuel, and services). Other important recreational activities in the project area include swimming, scuba diving, and boating.

ENVIRONMENTAL EFFECTS

This section summarizes the potential environmental effects on physical, biological, and socioeconomic resources as a result of the proposed action.

Physical Environment

Regardless of which alternative site is selected, the potential impacts of disposal operations on air quality as a result of the proposed action are expected to be transient during transport and localized in the disposal site area during the disposal action. Under the No Action Alternative, the ODMDS would not be designated and material would be hauled to the Fernandina Beach ODMDS or placed in an upland CDF. Hauling material to Fernandina Beach would increase the hauling distance and result in increased transportation costs and air emissions. Managing material in an upland setting would result in air quality impacts associated with the use of heavy equipment for re-handling and placement of the dredged material.

The disposal of dredged material at an ODMDS would change the bathymetry within the boundaries of the site. However, the ODMDS is not expected to have any measurable effect on physical oceanographic or geologic conditions outside the site boundaries. Under the No Action Alternative there would be no effect on physical oceanographic or geologic conditions at the alternative sites.

Overall, potential impacts on water quality from suitable dredge material permitted for ocean disposal at the alternative sites is expected to be transient and localized (e.g., contained within the overall boundary of the disposal site) within hours of the initial disposal activity, and no

significant water quality impacts are expected outside the site boundaries. Therefore, there would be no overall unacceptable adverse impacts to water quality with ocean disposal. Under the No Action Alternative there would be no adverse impacts on the water column at the alternative sites.

As only sediments determined to be suitable (non-toxic) for ocean disposal in accordance with EPA and USACE testing criteria will be permitted for ocean disposal, there would be no unacceptable adverse impacts to the seabed inside or outside the ODMDS disposal site boundary. However, physical sediment characteristics would be altered within the site boundaries from a predominantly sand bottom to a mixture of sand, silt, clay, and rock. Under the No Action Alternative there would be no adverse impacts on sediment characteristics at the alternative sites.

Biological Environment

Impacts to infauna, epifauna, invertebrates, and demersal fishes are anticipated to be temporary and limited to the areas within the boundaries of the alternative disposal sites. Impacts to the benthic community are anticipated to be greatest as a result of burial and smothering of some organisms and alteration of sediment characteristics from a predominantly sandy bottom to a mixture of sand, silt, clay, and rock. Over time, this could potentially result in decreased abundance and a shift in community structure. However, these impacts are expected to be limited to areas receiving the greatest amounts of annual deposition thickness within the disposal site boundaries. Recolonization of the site is dependent on frequency of disposal events and depth of burial.

Impacts on water column organisms such as plankton, pelagic fishes, and marine mammals are expected to be minimal, temporary, and limited to the area within the site boundaries during disposal activities. Suspended sediment plumes are expected to be confined to the disposal area and short in duration. Loss of food resources as a result of burial is expected to be confined to the disposal area. Since the proposed disposal area is an extremely small percentage of the total regional area within which the pelagic fish are normally found, no significant effects are anticipated. No significant impacts to seabirds are anticipated for any of the alternatives. The exposure of marine organisms and other fauna to dredged material is not expected to result in significant adverse effects given that the dredge material proposed for ocean disposal must be tested and determined suitable (non-toxic) for ocean disposal according to EPA and USACE testing criteria.

Socioeconomic Environment

Potential hazards to commercial, military, and recreational navigation resulting from the transport and disposal of dredged material at the sites are expected to be insignificant. Vessel traffic in the region is highly regulated and conflicts with disposal barges are anticipated to be minimal. EPA will maintain a 25-foot minimum depth within the ODMDS to ensure navigational safety. Areas of commercial shrimp trawling and amenities such as hardbottom resources, artificial reefs, and known fishing hotspots have been avoided as much as possible to minimize impacts to the commercial fisheries and recreational activities as a result of the proposed action. The disposal of materials that are considered hazardous is prohibited at an ODMDS. Dredge material proposed for ocean disposal will be subject to strict testing requirements established by EPA and USACE. Material determined unsuitable for ocean disposal will be prohibited from disposal at the site. Therefore, the potential for human health and safety hazards is minimal and not significant for all of the alternatives.

The cultural resources survey indicates there are three subbottom features (two submerged and one positive relief) and one magnetic cluster within Alternative Site 1, and there are three subbottom features (two submerged and one positive relief) and two magnetic clusters within Alternative Site 2 (PCI 2012). Targets that may be impacted by dredged material disposal activities will be investigated further by archaeological divers to determine historical significance and whether they should be avoided or buffered to prevent adverse impacts. There are no existing or planned oil developments within the alternative site boundaries. The Duval sand borrow area is immediately to the east of Alternative Site 1 and north of Alternative Site 2 (Figures 2.2-1 and 2.2-2). Dredged material will be managed within the site to ensure that the sand borrow area is not affected by disposal operations (see Appendix F).

Comparison of the Alternative Ocean Disposal Sites with the Five General and Eleven Specific Site Selection Criteria

Table ES-1 presents an assessment of the extent to which the three alternative sites meet the five general site selection criteria in 40 CFR 228.5(a) to (e). Alternatives 1 and 2 meet the general criteria. Alternative 3 does not meet 40 CFR 228.5(a) criteria due to impacts to commercial shrimp trawling areas located within that site.

Table ES-1. Compliance with General Criteria (40 CFR 228.5) (Page 1 of 2)

Criteria	Compliance
40 CFR 228.5(a) The dumping of materials into the ocean will be permitted only at sites or in areas selected to minimize the interference of disposal activities with other activities in the marine environment, particularly avoiding areas of existing fisheries or shellfisheries, and regions of heavy commercial or recreational navigation.	The ZSF screened the marine environment to identify areas of existing fisheries or shellfisheries and regions of heavy commercial or recreational navigation. Alternatives 1 and 2 avoid existing fisheries and shellfisheries and regions of heavy commercial and recreational navigation. Alternative 3 would impact commercial shrimp trawling areas.
40 CFR 228.5(b) Locations and boundaries of disposal sites will be so chosen that temporary perturbances in water quality or other environmental conditions during initial mixing caused by disposal operations anywhere within the site can be expected to be reduced to normal ambient seawater levels or to undetectable contaminant concentrations or effects before reaching any beach, shoreline, marine sanctuary, or known geographically limited fishery or shellfishery.	All of the alternative sites are removed far enough from shore (minimum 3.6 nmi) and fishery resources to allow water quality perturbations caused by dispersion of disposal material to be reduced to ambient conditions before reaching any environmentally sensitive areas.
40 CFR 228.5(c) If at any time during or after disposal site evaluation studies, it is determined that existing disposal sites presently approved on an interim basis for ocean dumping do not meet the criteria for site selection set forth in Sections 228.5 through 228.6, the use of such sites will be terminated as soon as suitable alternate disposal sites can be designated.	There are no existing sites presently approved on an interim basis in the region.
40 CFR 228.5(d) The sizes of the ocean disposal sites will be limited in order to localize for identification and control any immediate adverse impacts and permit the implementation of effective monitoring and surveillance programs to prevent adverse long-range impacts. The size, configuration, and location of any disposal site will be determined as a part of the disposal site evaluation or designation study.	The location, size, and configuration of the alternative sites allow long-term capacity, site management, and site monitoring while limiting environmental impacts to within the site boundaries to the extent possible. Based on projected new work and maintenance dredge material disposal needs of approximately 60 million cubic yards (cy) over the next 50 years, it is estimated that the new ODMDS should be 4 nmi^2 in size.

Table ES-1. Compliance with General Criteria (40 CFR 228.5) (Page 2 of 2)

Criteria	Compliance
40 CFR 228.5(e) EPA will, wherever feasible, designate ocean dumping sites beyond the edge of the continental shelf and other such sites that have been historically used.	The continental shelf in the study area is approximately 60 to 70 nmi offshore of the coast. Neither of the historically used ocean dumping sites, Jacksonville ODMDS and Fernandina Beach ODMDS, is located beyond the continental shelf. The northern part of Alternative 1 overlays an area of historic dumping as evident by the presence of 6.9 acres of rubble in this area (Figure 2.2-1). Based on the ZSF economic analysis results, the ODMDS will not be located beyond the continental shelf because it is not economically or operationally feasible.

Table ES-2. ODMDS Alternatives and EPA Specific Site Selection Criteria (Page 1 of 4)

40 CFR 228.6(a) Criteria	Alternative 1: Expansion of Existing ODMDS	Alternative 2: South of the Existing ODMDS	Alternative 3: North of the Existing ODMDS
1. Geographical position, depth of water, bottom topography, and distance from the coast.	The center of the site is 7.1 nmi southeast of the mouth of the St. Johns River (81° 17.739' W; 30° 19.289' N). Water depths range from 43 to 66 feet MLLW, with an average depth of 57 feet. Sediment is predominantly silty sand and poorly graded sand (70–98% sand) (ANAMAR 2011). Distance from coast is 4.4 nmi (Figure 2.1-5).	The center of the site is 7.4 nmi southeast of the mouth of the St. Johns River (81° 17.300' W; 30° 18.762' N). Water depths range from 44 to 64 feet MLLW, with an average depth of 55 feet. Sediment is predominantly silty sand and poorly graded sand (79–99% sand) (ANAMAR 2011). Distance from coast is 4.4 nmi (Figure 2.1-5).	The center of the site is 5.9 nmi northeast of the mouth of the St. Johns River (81° 19.532' W; 30° 28.787' N). Water depths range from 46 to 62 feet MLLW, with an average depth of 55 feet. Sediment is predominantly silty sand and poorly graded sand (81–98% sand) (ANAMAR 2011). Distance from coast is 3.6 nmi (Figure 2.1-5).
2. Location in relation to breeding, spawning, nursery, feeding, or passage areas of living resources in adult or juvenile phases.	Site is located within North Atlantic right whale critical habitat (Figure 3.3-1). Wintering and calving grounds are located in the vicinity of the site (Figure 3.3-4).	Same as Alternative 1	Same as Alternative 1
3. Location in relation to beaches and other amenities such as natural and artificial reefs and fishing spots.	The site is approximately 4.4 nmi from coastal beaches and protected inshore waters and approximately 4 to 5 nmi west of the nearest artificial reef or fishing hotspots (Figures 2.1-3 and 3.4-4), and it is unlikely to interfere with coastal amenities.	Same as Alternative 1	The site is approximately 3.6 nmi from coastal beaches and protected inshore waters and approximately 3 to 4 nmi west of the nearest artificial reef or fishing hotspots (Figures 2.1-3 and 3.4-4), and it is unlikely to interfere with coastal amenities.

Table ES-2. ODMDS Alternatives and EPA Specific Site Selection Criteria (Page 2 of 4)

40 CFR 228.6(a) Criteria	Alternative 1: Expansion of Existing ODMDS	Alternative 2: South of the Existing ODMDS	Alternative 3: North of the Existing ODMDS
4. Types and quantities of wastes proposed to be disposed of and proposed methods of release, including methods of packaging the waste, if any.	Average annual maintenance material is approximately 0.5 to 1.12 million cy and new work material proposed for disposal could be up to 31.5 million cy of sediment and rock. Sediments dredged from the federal navigation channel are predominantly (69%) sand (USACE 2008). Sediments dredged from Naval Station Mayport range from sand to silty clay (USACE 2008). Sediments dredged from the proposed Jacksonville Harbor deepening will vary between silty sand, shell, shelly sand, and rock. Hopper dredge, barge, and scow combinations are the usual vehicles of transport for the dredged material. None of the material is packaged in any manner.	Same as Alternative 1	Same as Alternative 1
5. Feasibility of surveillance and monitoring.	Monitoring of the site is feasible and is described in the SMMP (Appendix F).	Same as Alternative 1	Same as Alternative 1
6. Dispersal, horizontal transport, and vertical mixing characteristics of the area, including prevailing current direction and velocity, if any.	Waves are predominately out of the east and a few exceed 2 meters (6.6 feet) in height or 15 seconds (s) in period (USEPA 2009a). Currents flow predominately in a north-northwest and south-southeast direction and rarely exceed 30 cm/s in magnitude (USEPA 2009a). Dilution rates are expected to range from 140:1 to 2800:1 after four hours (USACE 2010c).	Same as Alternative 1	Same as Alternative 1.

Table ES-2. ODMDS Alternatives and EPA Specific Site Selection Criteria (Page 3 of 4)

40 CFR 228.6(a) Criteria	Alternative 1: Expansion of Existing ODMDS	Alternative 2: South of the Existing ODMDS	Alternative 3: North of the Existing ODMDS
7. Existence and effects of current and previous discharges and dumping in the area (including cumulative effects).	Disposal has occurred at the Jacksonville ODMDS which is in close proximity to Alternative 1. Based on previous studies, no notable differences were detected between the inside and outside of the Jacksonville ODMDS that appear to have affected the chemical, physical, and biological integrity of this designated area, except for changes in depth (USEPA 2010a).	Same as Alternative 1.	Disposal has occurred at the Fernandina Beach ODMDS which is in close proximity to Alternative 3. Based on previous studies, no notable differences were detected between the inside and outside of the Fernandina Beach ODMDS that appear to have affected the chemical, physical, and biological integrity of this designated area, except for changes in depth (USEPA 2006).
8. Interference with shipping, fishing, recreation, mineral extraction, desalination, fish and shellfish culture, areas of special scientific importance, and other legitimate uses of the ocean.	Alternative 1 should not interfere with shipping or recreational fishing activities. The site is located within 1 nmi of a sand borrow area (Figure 3.4-2), but is not expected to interfere with sand mining activities. There are no active oil or gas leases in the area. Commercial shrimp trawling activities occur primarily in an area approximately 1 nmi west of the site (Figures 2.2-1 and 2.2-4). The site and surrounding area are not considered to be of special scientific importance.	Alternative 2 should not interfere with shipping or recreational fishing activities. The site is located immediately south of a sand borrow area (Figure 3.4-2), but is not expected to interfere with sand mining activities. There are no active oil or gas leases in the area. Commercial shrimp trawling activities occur primarily in an area approximately 1 nmi west of the site (Figures 2.2-2 and 2.2-4). The site and surrounding area are not considered to be of special scientific importance.	Alternative 3 should not interfere with shipping or recreational fishing activities. There are no sand borrow areas or active oil or gas leases near this site. Commercial shrimp trawling activities occur within the boundaries of Alternative 3 (Figures 2.2-3 and 2.2-4). The site and surrounding area are not considered to be of special scientific importance.

Table ES-2. ODMDS Alternatives and EPA Specific Site Selection Criteria (Page 4 of 4)

40 CFR 228.6(a) Criteria	Alternative 1: Expansion of Existing ODMDS	Alternative 2: South of the Existing ODMDS	Alternative 3: North of the Existing ODMDS
9. Existing water quality and ecology of the site as determined by available data or by trend assessment or baseline surveys.	Water quality is good with no evidence of degradation. North Atlantic right whales are endangered and critical habitat occurs within and adjacent to this site. Sea turtles may be present in the vicinity of the site. Annelid worms, arthropods, echinoderms, gastropods, and bivalves are common benthic taxonomic groups. The Atlantic croaker, spotted hake, searobins, drums, and sand flounders are common fish species.	Similar to Alternative 1	Similar to Alternative 1
10. Potentiality for the development or recruitment of nuisance species in the disposal site.	There are no components in the dredged material or consequences of its disposal that attract or result in recruitment of nuisance species to the ODMDS.	Same Alternative 1	Same Alternative 1
11. Existence at or in close proximity to the site of any significant natural or cultural features of historical importance.	The survey identified three subbottom features and one magnetic cluster. The features that have potential to be impacted by dredged material disposal will be investigated further by archaeological divers to determine historical significance.	The survey identified three subbottom features and two magnetic clusters. The features that have potential to be impacted by dredged material disposal will be investigated further by archaeological divers to determine historical significance.	No survey was conducted in this area since it is not a preferred alternative.

CONCLUSION

The No Action Alternative does not meet the goals and objectives for the designation of a new ocean disposal site for dredged material anticipated to be generated by the Jacksonville Harbor Navigation Project, Naval Station Mayport, and the proposed Jacksonville Harbor Deepening Project. The three ODMDS alternatives are not readily distinguishable from each other based on water quality and sediment quality. However there were some differences with regard to biological resources based on results from site designation surveys. Alternative 3 and the adjacent area had the greatest infaunal biomass diversity, mollusk diversity, mean epifaunal density, and federally managed taxa density compared to Alternatives 1 and 2.

Table ES-3 summarizes and compares the potential impacts to resource areas for the three offshore disposal alternatives. Impacts associated with Alternative 1 include burial of 6.9 acres of rubble areas created from previous disposal events in the northern corner of the site. Impacts associated with Alternative 2 include minimal impacts to mineral resources related to

possible transport of fine material from the disposal site into the sand borrow area immediately north of the site. Impacts associated with Alternative 3 include potentially significant effects on commercial shrimp trawling areas and an increased risk of vessel strikes with North Atlantic right whales due to their higher abundance north of the St. Johns River. Although Alternatives 1 and 2 would require a longer transit distance compared to Alternative 3, resulting in increased air emissions, fossil fuel consumption, operational duration, and operating costs, the impacts to biological and socioeconomic resources are less. No mitigation is proposed beyond the standard conditions and operating procedures presented in the Site Monitoring and Management Plan (SMMP) (Appendix F).

Based on the available information regarding physical, biological, and socioeconomic resources within and adjacent to the three alternative sites, the Preferred Alternatives identified in this EIS are Alternative 1 and Alternative 2 because they:

- Are located within the 5-10 nmi ZSF radius,
- Best meet EPA's general and specific site selection criteria,
- Minimize impacts to important commercial shrimp trawling areas and are preferred by commercial shrimpers over Alternative 3.
- Avoid areas north of the St. Johns River that historically have higher use by North Atlantic right whales,
- Have potentially less impacts to biological resources compared to Alternative 3 based on results from the site designation studies.
- Provide continued availability of an ocean disposal site for long-term management of dredged material from the Jacksonville area.

Table ES-3 ODMDS Alternatives, Summary of Impacts (Page 1 of 2)

Resource Area	Alternative 1 – Expansion of Jacksonville ODMDS	Alternative 2 – South of the Jacksonville ODMDS	Alternative 3 – North of the Jacksonville ODMDS
Air Quality	Short-term, localized increases during transport to ODMDS. No significant impacts.	Effects similar to Alternative 1, but slightly higher emissions due to longer transit distance.	Effects similar to Alternative 1, but slightly lower emissions due to shorter transit distance.
Water Quality	Short-term, localized increases in turbidity during dredged material disposal. No significant impacts.	Similar to Alternative 1	Similar to Alternative 1
Sediment Quality	Accumulation of dredged material on seafloor, changes in sediment characteristics. No significant effects on concentration of contaminants in sediments.	Similar to Alternative 1	Similar to Alternative 1
Biological Resources	Less infaunal biomass diversity, mollusk diversity, mean epifaunal density, and federally managed taxa density compared to Alternative 3.	Similar to Alternative 1	Greater infaunal biomass diversity, mollusk diversity, mean epifaunal density, and federally managed taxa density compared to Alternatives 1 and 2.
Protected Species (Sea Turtles and Marine Mammals)	Possible collisions with vessels, temporary decreases in foraging due to turbidity and burial of food. No significant impacts.	Similar to Alternative 1	Effects similar to Alternative 1. Higher risk of possible collision because of higher occurrence of right whales in this area compared to Alternatives 1 and 2.
Protected Species (Manatees)	Not likely to occur in project area. No significant impacts.	Similar to Alternative 1	Similar to Alternative 1
Protected Species (Fish)	Protected fish species not likely to occur in project area. No significant impacts.	Similar to Alternative 1	Similar to Alternative 1
Seabirds	Ship-following behavior, temporary reductions in prey, temporary visual impairment due to turbidity plume. No significant impacts.	Similar to Alternative 1	Similar to Alternative 1
Benthic Communities	Direct burial and change in sediments may reduce abundance, diversity, and ability to recolonize. Turbidity effects on filter-feeders. No significant impacts outside of site.	Similar to Alternative 1	Similar to Alternative 1
Fishes	Turbidity and burial of food may result in temporary decreases in foraging, short-term reduction in dissolved oxygen. No significant impacts.	Similar to Alternative 1	Similar to Alternative 1

Table ES-3 ODMDS Alternatives, Summary of Impacts (Page 2 of 2)

Resource Area	Alternative 1 – Expansion of Jacksonville ODMDS	Alternative 2 – South of the Jacksonville ODMDS	Alternative 3 – North of the Jacksonville ODMDS
EFH	No significant effects to EFH or federally managed species. There is 6.9 acres of rubble/hardbottom.	Similar to Alternative 1. There is 0.8 acres of rubble/hardbottom.	Similar to Alternative 1
Commercial Fishing	Site is located east of heavily used commercial shrimp trawling areas. No significant impacts.	Similar to Alternative 1	Located within heavily used commercial shrimp trawling areas. Negative impacts to shrimpers.
Commercial Shipping	No significant impacts.	Similar to Alternative 1	Similar to Alternative 1
Military Use	No significant impacts.	Similar to Alternative 1	Similar to Alternative 1
Mineral Resources	No significant impacts.	Adjacent to potential future sand borrow area.	No impacts.
Navigation	No significant impacts.	Similar to Alternative 1	Similar to Alternative 1
Recreation	No significant impacts.	Similar to Alternative 1	Similar to Alternative 1
Historic Properties	Potential to adversely affect historic properties. Greater potential than Alternative 2, pending further investigation.	Potential to adversely affect historic properties. Less potential than Alternative 1, pending further investigation.	Potential unknown. No survey was conducted in this area since it is not a preferred alternative.*
Undersea Cables	No significant impacts.	Similar to Alternative 1	Similar to Alternative 1
Public Health	No significant impacts.	Similar to Alternative 1	Similar to Alternative 1

* Because Alternative 3 is not a preferred site due to negative impacts to commercial shrimpers and higher occurrence of right whales, this site was not included in the archaeological study.

1. INTRODUCTION

This Environmental Impact Statement (EIS) evaluates the proposed designation of a new ocean dredged material disposal site (ODMDS) offshore Jacksonville, Duval County, Florida. The purpose of this action is to provide an environmentally acceptable site for disposal of both maintenance dredged material, primarily from the Jacksonville Harbor Federal Navigation Channel and the Naval Station Mayport facility, and potentially new material from proposed deepening projects. Several alternatives have been evaluated and two preferred alternatives have been selected.

Chapter 1: Introduction

1.1 Ocean Disposal of Dredged Material
1.2 Proposed Action
1.3 Historical and Future Dredged Material Disposal Needs
1.4 Need for Action
1.5 Regulatory Framework
1.6 NEPA Process

Chapter 1 discusses the purpose and need for action and the regulatory framework. Chapter 2 presents the alternatives and the rationale for selection of the preferred alternative. Chapter 3 discusses the affected environment and describes the physical, biological, and socioeconomic characteristics of the alternative sites and the adjacent areas. Chapter 4 discusses the environmental effects of the alternative sites and the no action alternative.

1.1. Ocean Disposal of Dredged Material

The U.S. Environmental Protection Agency (EPA) and the U.S. Army Corps of Engineers (USACE) share responsibility for the control and management of ocean disposal of dredged material under the Marine Protection, Research, and Sanctuaries Act of 1972 (MPRSA) (33 U.S.C. 1401 *et. seq.*). There are three distinct but interrelated activities for which EPA and/or USACE have responsibilities with respect to ocean disposal of dredged material (USEPA and USACE 2007):

1) Designation or selection of sites for ocean disposal of dredged material,
2) Evaluation of the suitability of dredged material for ocean disposal, and
3) Management and monitoring of ODMDSs to ensure compliance with the MPRSA.

The MPRSA assigns basic responsibility to EPA and USACE for ensuring that ocean dredged material disposal activities will not unreasonably degrade or endanger human health, welfare, or amenities or the marine environment (MRPSA Sections 102 and 103). Section 102 of the MPRSA authorizes EPA to designate sites or times at which dumping may occur and to establish criteria for reviewing and evaluating permit applications, including those for dredged material. It also authorizes EPA, in conjunction with USACE, to develop site management and monitoring plans (SMMPs) for dredged material disposal sites. Section 103 of the MPRSA authorizes USACE to issue permits subject to compliance with the EPA environmental criteria (Ocean Dumping Criteria at 40 CFR Part 227) and EPA concurrence with USACE's finding of compliance. Section 103(b) authorizes USACE, with EPA concurrence, to select alternative disposal sites of limited duration for disposal of dredged material in ocean waters when the use of a site designated by EPA is not feasible.

The site designation process requires selection of a site that minimizes adverse environmental effects and minimizes the interference of dumping activities with other activities in the marine environment (USEPA 1986a). Also, site designation is meant to ensure that temporary perturbations in water quality are reduced to normal ambient seawater levels before reaching

any beach, shoreline, marine sanctuary, or geographically limited fishery or shellfishery (40 CFR § 228.5 [a, b]).

Under the MPRSA, EPA is not legally required to subject its disposal site designations to environmental review per the National Environmental Policy Act (NEPA), 42 U.S.C. §§ 4321 et seq., but it is EPA's policy to voluntarily prepare NEPA documents for all ODMDS designations (Federal Register, Volume 63, Page 58,045 [63 FR 58045], October 1998). An EIS for ODMDS designation is a formal evaluation of alternative sites in which the potential environmental impacts associated with disposal of dredged material at various locations are examined. The EIS must first demonstrate the need for the proposed ODMDS designation action [40 CFR § 6.203(a) and 40 CFR § 1502.13] by describing available or potential aquatic and non-aquatic (i.e., land-based) alternatives and the consequences of not designating a site—the No Action Alternative. Once the need for an ocean disposal site is established, potential sites are screened for feasibility through the Zone of Siting Feasibility (ZSF) process. Remaining alternative sites are evaluated using EPA's ocean disposal criteria at 40 CFR Part 228 and compared in the EIS. To address EPA's authority to designate ocean dumping sites, the regulations outline five general criteria and 11 specific factors upon which to base site selection (40 CRF § 228.5-228.6) (Table 1.1-1). The general criteria require that sites be selected to minimize impacts to the marine environment and be of limited size. Sites located beyond the outer edge of the continental shelf should be used, if feasible, as should historically used sites. The specific factors include consideration of geographical information, oceanographic characteristics, and waste-related issues. Of the sites that satisfy these criteria, the site which best complies with these measures is selected as the preferred alternative for formal designation through rulemaking published in the Federal Register.

USACE is participating in the development of this EIS as a cooperating agency for a number of important reasons. USACE is responsible for issuing permits for the aquatic disposal of dredged material under both Section 404 of the CWA, 33 U.S.C. § 1344, and Section 103 of the MPRSA, 33 U.S.C. § 1413. In addition, USACE is responsible for implementing the federal dredging program for ensuring safe and reliable navigation in those project features (channels, anchorage areas, etc.) for which it has been delegated responsibility under its Civil Works Program. As a result of these responsibilities, USACE has knowledge concerning the needs of the dredging program as well as technical expertise in the area of assessing the environmental effects of dredging and disposal. USACE is providing technical support, including the funding of contractors, to assist in the preparation of this EIS. All final decisions regarding any site designations will be made by EPA. To take advantage of expertise held by other agencies and to ensure compliance with all applicable legal requirements, EPA is also closely coordinating with other Federal agencies, state agencies, and local governments. In addition, EPA and the USACE have held many meetings with members of the interested public to explain the process, gather information, and learn about concerns held by the public.

Formal designation of an ODMDS in the Federal Register does not constitute approval of dredged material for ocean disposal. Designation of an ODMDS provides one additional dredged material management option for consideration in the review of each proposed dredging project. Ocean disposal is allowed only when EPA and USACE determine, on a case-by-case basis, that (1) the dredged material is environmentally suitable according to testing criteria (40 CFR Parts 225 and 227) as determined from physical, chemical, and bioassay/bioaccumulation testing (USEPA and USACE 1991); (2) the dredged material does not have a beneficial use; and (3) there are no practical land placement options available.

Table 1.1-1. USEPA's Five General and Eleven Specific Site Selection Criteria

General Site Selection Criteria – 40 CFR § 228.5	
(a)	The dumping of materials into the ocean will be permitted only at sites or in areas selected to minimize the interference of disposal activities with other activities in the marine environment, particularly avoiding areas of existing fisheries or shellfisheries and regions of heavy commercial or recreational navigation.
(b)	Locations and boundaries of disposal sites will be so chosen that temporary perturbances in water quality or other environmental conditions during initial mixing caused by disposal operations anywhere within the site can be expected to be reduced to normal ambient seawater levels or to undetectable contaminant concentrations or effects before reaching any beach, shoreline, marine sanctuary, or known geographically limited fishery or shellfishery.
(c)	If at any time during or after disposal site evaluation studies it is determined that existing disposal sites presently approved on an interim basis for ocean dumping do not meet the criteria for site selection set forth in Sections 228.5 through 228.6, the use of such sites will be terminated as soon as suitable alternate disposal sites can be designated.
(d)	The sizes of the ocean disposal sites will be limited in order to localize for identification and control any immediate adverse impacts and permit the implementation of effective monitoring and surveillance programs to prevent adverse long-range impacts. The size, configuration, and location of any disposal site will be determined as a part of the disposal site evaluation or designation study.
(e)	EPA will, wherever feasible, designate ocean dumping sites beyond the edge of the continental shelf and other such sites that have been historically used.
Specific Site Selection Criteria – 40 CFR § 228.6(a)	
(1)	Geographical position, depth of water, bottom topography, and distance from the coast.
(2)	Location in relation to breeding, spawning, nursery, feeding, or passage areas of living resources in adult or juvenile phases.
(3)	Location in relation to beaches and other amenity areas.
(4)	Types and quantities of wastes proposed to be disposed of, and proposed methods of release, including methods of packaging the waste, if any.
(5)	Feasibility of surveillance and monitoring.
(6)	Dispersal, horizontal transport, and vertical mixing characteristics of the area, including prevailing current direction and velocity, if any.
(7)	Existence and effects of current and previous discharges and dumping in the area (including cumulative effects).
(8)	Interference with shipping, fishing, recreation, mineral extraction, desalination, fish and shellfish culture, areas of special scientific importance, and other legitimate uses of the ocean.
(9)	Existing water quality and ecology of the site as determined by available data or by trend assessment or baseline surveys.
(10)	Potentiality for the development or recruitment of nuisance species in the disposal site.
(11)	Existence at, or in close proximity to, the site of any significant natural or cultural features of historical importance.

Source: USEPA 1986a

1.2. Proposed Action

USACE has requested that EPA designate a new ODMDS, 4 square nautical miles (nmi^2) in size, offshore of the mouth of the St. Johns River for the disposal of dredged material primarily from the Jacksonville Harbor Federal Navigation Project and Naval Station Mayport. The purpose of the proposed action is to ensure that adequate environmentally acceptable and economically and logistically feasible ocean disposal site capacity is available for the next 50 years for suitable dredged material generated from new projects and maintenance dredging in the vicinity. The availability of suitable ocean disposal sites to support ongoing maintenance and capital improvement projects is essential for the continued use and economic growth of vital commercial and recreational areas in the region.

As part of the site designation process, comparisons of alternative sites based on environmental, operational, and economic criteria were conducted to identify potential dredged material disposal sites for further evaluation. This EIS has been prepared by EPA Region 4 in cooperation with USACE Jacksonville District to evaluate the feasibility for designation of a new ODMDS offshore of Jacksonville, Florida, to meet current and future dredged material disposal needs. This EIS is prepared in compliance with EPA's site designation criteria (40 CFR 228) (Table 1.1-1) and evaluates a number of alternatives for the disposal of dredged material generated in the region. This document provides the public and decision-makers with relevant information to assess the impacts associated with the final designation of an ODMDS offshore Jacksonville.

1.3. Historical and Future Dredged Material Disposal Needs

This section discusses existing maintenance dredging projects and proposed new work dredging projects and estimated volumes of dredged material produced from these projects. This information helps demonstrate the importance of dredging in this area and the need for continued long-term capacity for the disposal of dredged material.

1.3.1. Historical Disposal Volumes

The existing Jacksonville ODMDS is located approximately 5 nmi southeast of the mouth of the St. Johns River on the continental shelf off the east coast of Florida (Figure 1.3-1). It is currently 1 nmi by 1 nmi (1 nmi^2) in size. Since 1952, the area now designated as the Jacksonville ODMDS and vicinity has been used for disposal of dredged material (e.g., sand, silt, clay, rock) primarily from the Jacksonville Harbor Navigation Project, Naval Station Mayport entrance channel, and Naval Station Mayport turning basin (Figures 1.3-2 and 1.3-3). The Jacksonville ODMDS received interim site designation status in 1977 and final designation in 1983. Prior to and including the early 1970s, material was disposed in an area 0.5 nmi east of the Jacksonville ODMDS. In the late 1970s, material was disposed south of the site (USEPA AND USACE 2007).

Naval Station Mayport has used the Jacksonville ODMDS regularly since 1954 (prior to formal designation) and has been taking all of its maintenance dredged material to the Jacksonville ODMDS since two upland dredged material placement sites on Naval Station Mayport reached capacity in 1993. Since 1995, Naval Station Mayport has used the Jacksonville ODMDS on a biannual basis for disposal of most of its 900,000 cubic yards (cy) of maintenance material (annual average 450,000 cy) (NAVFAC 2008). Between 1996 and 2006, approximately 4.8 million cy of dredged material was placed at the Jacksonville ODMDS, of which 82% was generated from Naval Station Mayport maintenance dredging (Table 1.3-1) (USEPA and USACE 2007). Also, homeporting of additional surface ships at Naval Station Mayport required deepening of the turning basin and entrance channel and deepening of the Jacksonville Harbor

Federal Navigation Project, Bar Cut 3 (Figure 1.3-2). Total estimated dredged material volume for deepening is approximately 5.2 million cy (NAVFAC 2008), of which approximately 1.0 million cy has been disposed in the Jacksonville ODMDS as of February 2011 (Table 1.3-1).

In addition, the Jacksonville Harbor Federal Navigation Project has used the Jacksonville ODMDS for disposal of coarse material not suitable for beach placement from the entrance channel. In 2007, approximately 510,000 cy of material was placed at the Jacksonville ODMDS for the federal navigation project (Table 1.3-1). Historically, USACE removed approximately 300,000 cy from the outer portion of the federal navigation channel during maintenance dredging every 3 years (annual average 100,000 cy) which has been disposed of in the Jacksonville ODMDS since 2003 (NAVFAC 2008).

Table 1.3-1. Historical Volumes of Dredged Material Placed in the Jacksonville ODMDS and Vicinity

Year	Dredged Material Quantity (cy) (paid *in situ* volume)			
	Jacksonville Federal Navigation Channel	Naval Station Mayport (permit)	Jacksonville Shipyards (permit)	Total
1952–1970[1]	4,461,594	3,992,997	0	8,454,591
1971–1980[1]	2,652,407	3,048,844	0	5,701,251
1985[2]	15,800	0	0	15,800
1986[2]	0	0	109,700	109,700
1987[3]	82,200	0	26,500	108,700
1988[2]	210,500	0	0	210,500
1996[3]	0	659,623	0	659,623
1997[3]	0	439,748	0	439,748
2000[3]	0	887,284	0	887,284
2001[4]	0	174,832	0	174,832
2002[3]	0	225,200	0	225,200
2003[3]	560,446	905,328	0	1,465,774
2005[3]	0	59,667	0	59,667
2006[3]	0	888,134	0	888,134
2007[4]	510,000	0	0	510,000
2008[4]	0	635,000	0	635,000
2009	0	0	0	0
2010[4]	0	174,941	0	174,941
2011[4]	0	~1,000,000[5]	0	~1,000,000
Total 1996–2011	**8,492,947**	**11,091,598**	**136,200**	**19,720,745**

[1] Data from Jacksonville ODMDS EIS (USEPA 1983), in USEPA and USACE 2007
[2] Data from the USACE Ocean Disposal Database in USEPA and USACE 2007
[3] Data from the Jacksonville District Dredge Information System (paid *in situ* volumes), in USEPA and USACE 2007
[4] Data from the Jacksonville District Post Disposal Monitoring Reports
[5] Project ongoing, dredged volumes are approximate as of February 2011

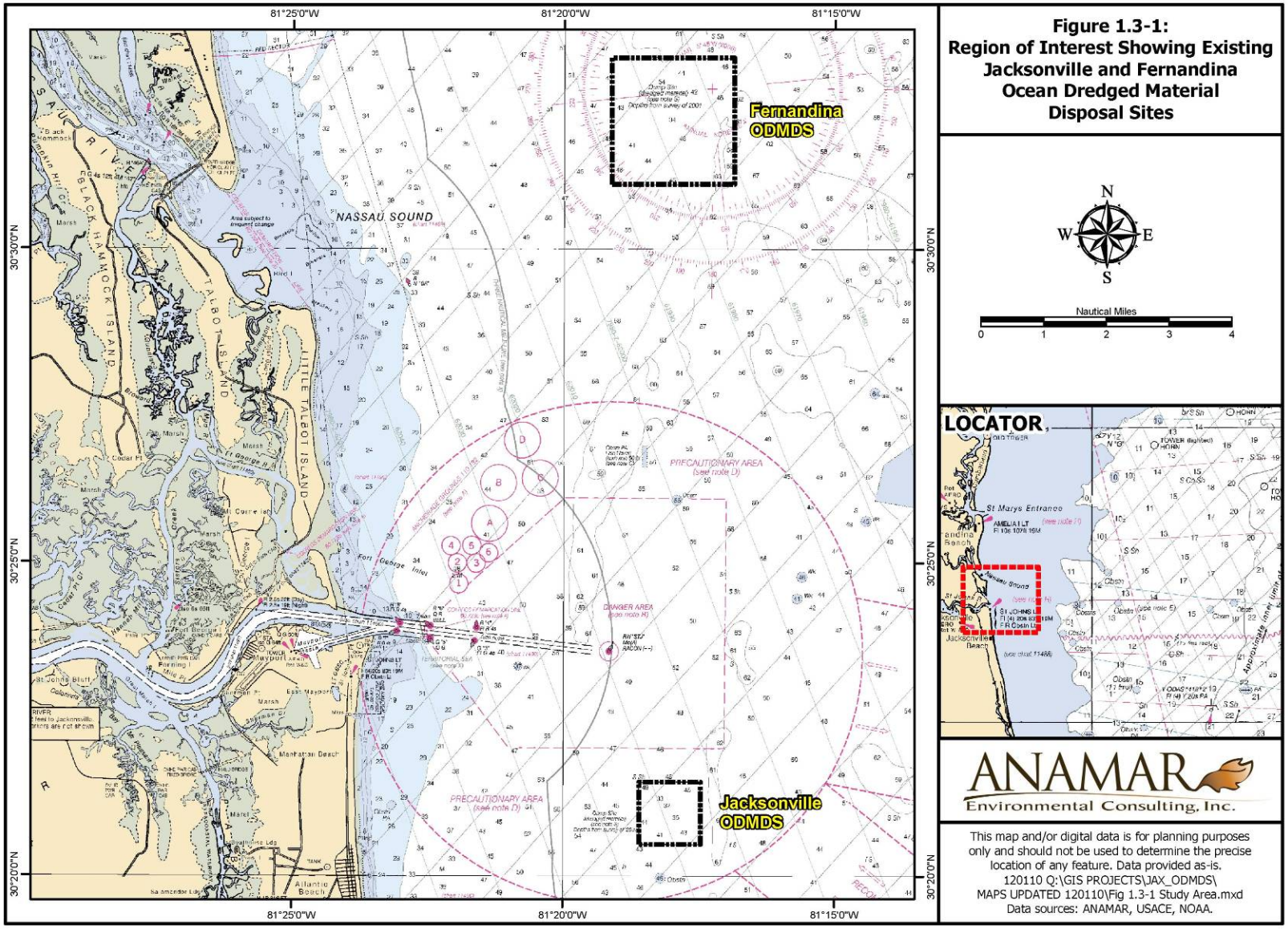


Figure 1.3-1: Region of Interest Showing Existing Jacksonville and Fernandina Ocean Dredged Material Disposal Sites

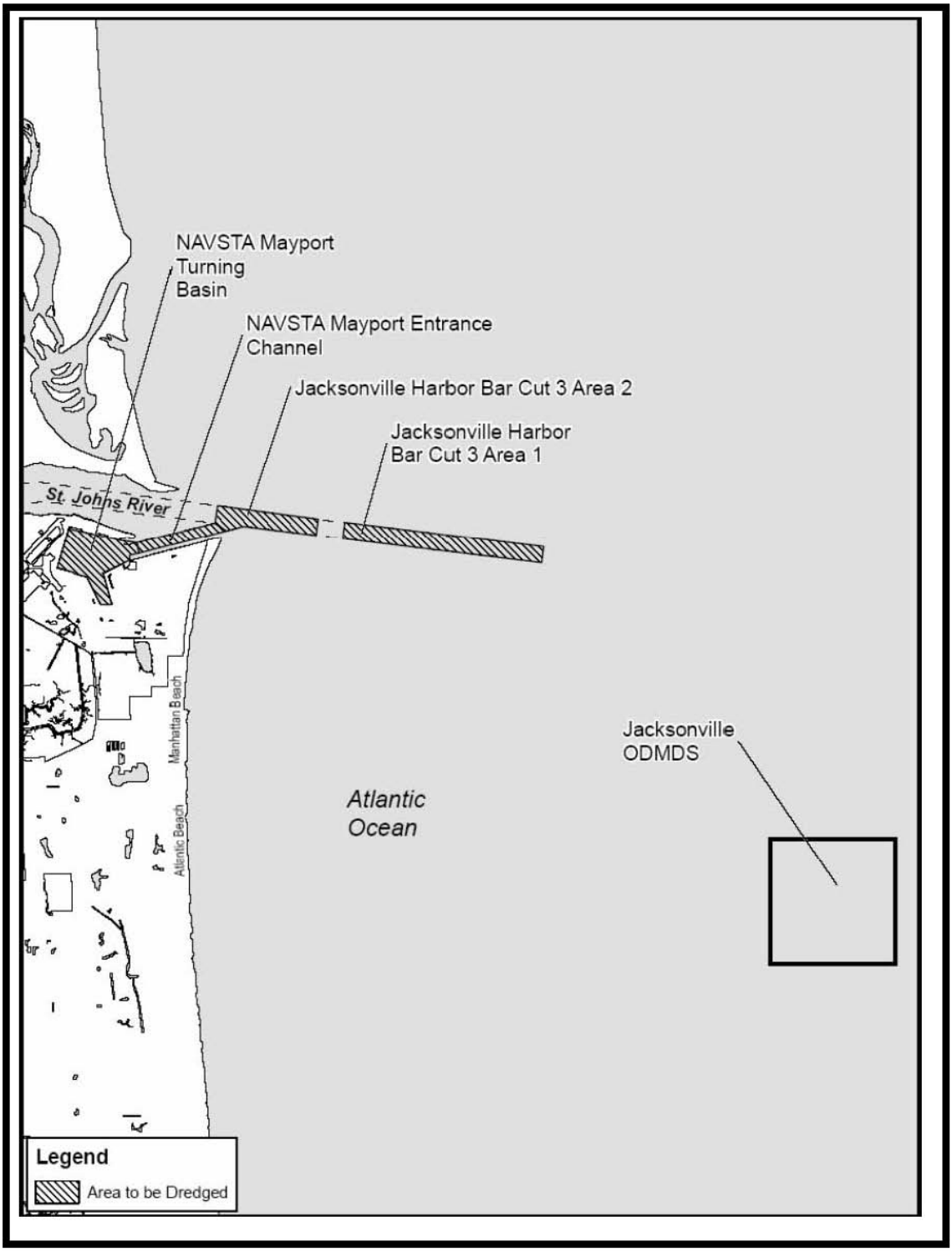
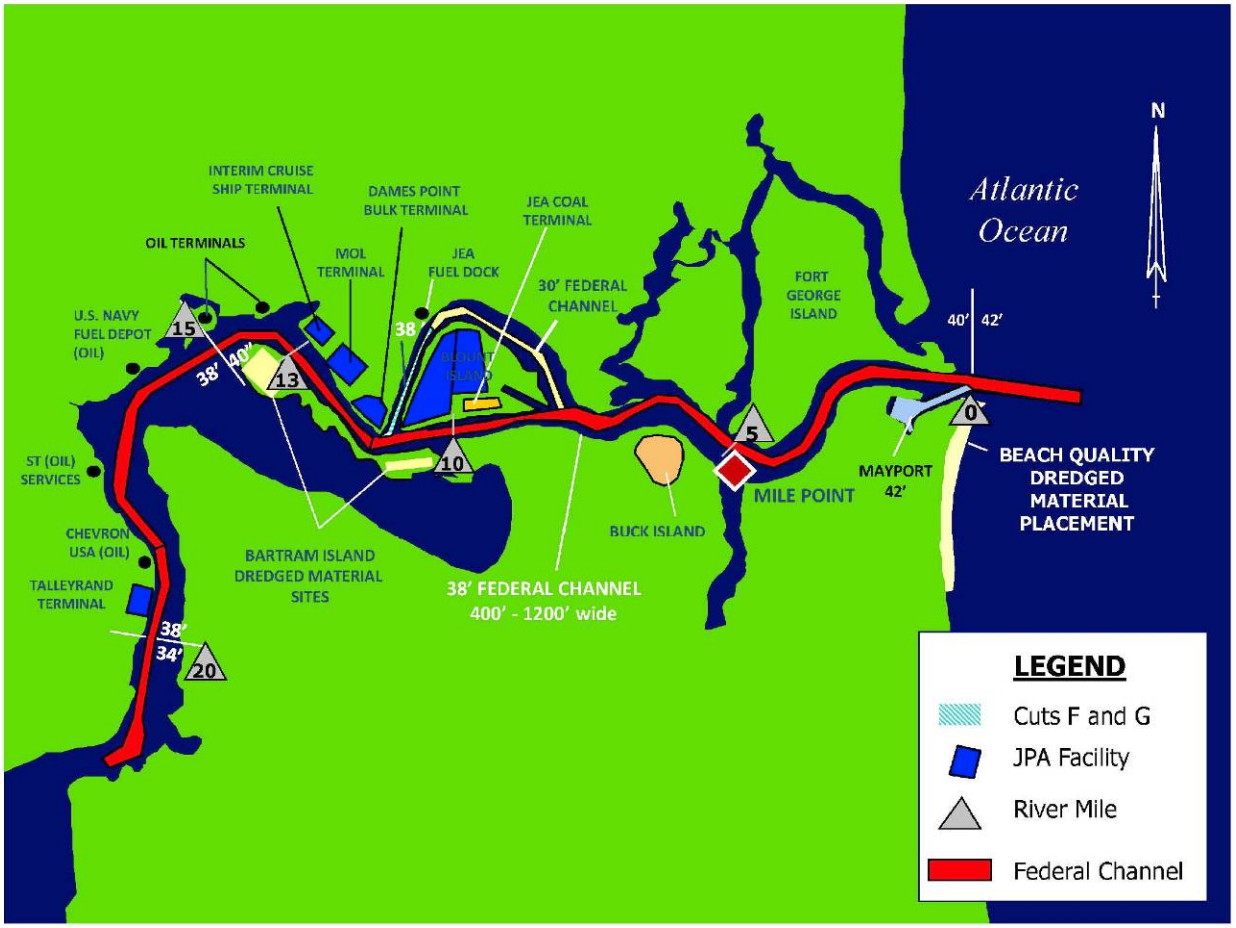


Figure 1.3-2. Mayport Naval Station and Jacksonville Harbor Federal Navigation Project and Existing ODMDS

This map and/or digital data is for planning purposes only and should not be used to determine the precise location of any feature.
Data provided a s-is. Data source: NAVFAC 2008 Q:\GIS PROJECTS\JAX_ODMDS\MAPS UPDATED 120110\Figure 1.3-2 Dredging Area and ODMDS.mxd 120110



Source: USACE

Figure 1.3-3. Jacksonville Harbor Navigation Project

1.3.2. Future Disposal Volumes

1.3.2.1. Maintenance Material

The accumulation of sediment, commonly referred to as shoaling, has restricted the width and reduced the depth of the channels within the Jacksonville Harbor Navigation Project and Naval Station Mayport. Jacksonville Harbor was dredged in 2010, and the most recent bathymetric survey documented a total in situ shoaling volume of approximately 900,000 cy within the authorized channels (USACE 2011). Volumes of maintenance material within the Jacksonville Harbor and berthing areas have increased as a result of increased shoaling rates and construction of new berthing areas. Current estimates of shoaling material from berthing areas have increased to about 520,000 cy which includes the addition of a new MOL/TraPac container ship terminal west of the Dames Point Bridge and a future Hanjin container ship terminal planned to replace the existing interim cruise ship terminal along the Brills Cut Range of Jacksonville Harbor (USACE 2010b; John Bearce, pers. comm.). Keystone Coal also plans to build a bulk terminal near the south end of the Chaseville Turn reach of the federal channel which will also increase berthing area dredging quantities. Material from the Jacksonville Harbor berthing areas has historically been disposed of at upland confined disposal facilities (CDFs); however, there is potential for some portion of it to go to an ODMDS in the future if capacity becomes limited at the CDFs.

Table 1.3-2 shows the estimated annual shoaling rates for Jacksonville Harbor and Naval Station Mayport based on the last 10 years of dredging history. The annual shoaling rate for Cuts 3-13 is estimated at 185,000 cy, and the annual shoaling rate for Cuts 14–42 is estimated at 435,000 cy. A sediment transport modeling study was conducted to predict future maintenance dredge requirements as a result of deepening the Naval Station Mayport turning basin and entrance channel. Results of the study indicate an increase of about 2%, 7%, and 2% in sedimentation within the Naval Station Mayport turning basin, Naval Station Mayport entrance channel, and federal navigation entrance channel, respectively (NAVFAC 2008). This equates to an approximate 5% increase of overall maintenance volume. Based on historic disposal volumes and anticipated increases in sedimentation as a result of the deepening, the future annual shoaling rate for Naval Station Mayport is estimated at 500,000 cy.

Table 1.3-2. Annual Shoaling Estimates

Channel Reach	Annual Shoaling Rate (cy)
Jacksonville Harbor Cuts 3 – 13 O&M	185,000
Jacksonville Harbor Cut 14 – 42 O&M	435,000
Naval Station Mayport O&M	500,000
Totals	**1,120,000**

O&M = Operation and Maintenance
Source: John Bearce, pers comm. (2012)

Historically, all of the material from the Jacksonville Harbor Navigation Project, with the exception of Bar Cut 3, has gone to an upland CDF. However, as discussed in more detail in Section 1.4.2, the capacity at the existing CDFs is becoming limited. Therefore, USACE needs to find alternative places to dispose of maintenance dredged material. Beach nourishment or nearshore placement using suitable dredged material is one disposal alternative for dredging projects. However, only beach-compatible material may be used in beach renourishment and nearshore placement projects. USACE has proposed to dispose of suitable, beach-compatible dredged material from the maintenance of the authorized project channels in the Pipe and

Barge nearshore placement areas (Figure 1.3-4) (USACE 2011). According to the Florida Administrative Code Chapter 62B-41.007, Subsections 5(j)-5(k) (the "Florida State Sand Rule"), sandy sediment derived from the maintenance of coastal navigation channels shall be deemed suitable for beach placement if it contains up to 10 percent fine material passing the #230 sieve. If this material contains between 10 and 20 percent fine material passing the #230 sieve by weight, and it meets all other sediment and water quality standards, it shall be considered suitable for placement in the nearshore portion of the beach. The material from Cuts 3 – 13 is considered by USACE to be generally compatible with beach or nearshore placement. However, depending on how strictly the "Sand Rule" is interpreted by the Florida Department of Environmental Protection (FDEP), some or all of the material may be determined to by non-compatible for beach or nearshore placement.

There are other beneficial use options that are also considered preferred disposal alternatives for dredging projects. For example, material from Cuts 14 - 42 has traditionally been placed in the Buck Island CDF for future offloading for beneficial use as construction material. However, offloading of material from Buck Island is contingent on a continuing market for the material and the cooperation of the residents in the neighborhood through which the material is transported for offloading. If either one of these contingencies halted offloading, then Buck Island would reach maximum capacity within a few years.

Therefore, for future planning purposes, as a worst case scenario, the USACE must assume that all of the operation and maintenance (O&M) material from Jacksonville Harbor Cuts 3 – 13 and Cuts 14 - 42 may need to be disposed in an ODMDS.

1.3.2.2. New Work Material

Future new work projects include potential improvements to Jacksonville Harbor Navigation Project, which are currently under investigation. The Jacksonville Harbor Deepening Project will result in additional dredged material disposal volumes that could range from approximately 7.6 to 31.5 million cy based on dredging to the 41-foot and up to the 50-foot project depth, respectively (Steve Conger, pers comm.). Of that material, approximately 0.6 to 2.9 million cy could be rock (Steve Conger, pers. comm.). Some of the rock or sand material may be suitable for beneficial uses; however, the remaining material would need to be placed at an ODMDS due to lack of capacity at upland CDFs. In addition, there are also non-federal users such as the Jacksonville Port Authority (JAXPORT) that have future dredge material disposal needs.

USACE evaluates the selection of appropriate disposal methods on a case-by-case basis for each project. To help minimize the volume of material going to the ODMDS, USACE encourages the use of suitable dredged material for nearshore placement or beach replenishment in areas degraded by erosion. However, the grain size distribution of dredged material must be compatible with the receiving beach, and biological and water quality impacts must be considered prior to permitting of beach disposal. If suitable, some of the sand material could be used for nearshore placement or beach replenishment. Other potential beneficial uses of dredged material include artificial reef construction, construction fill, use as cap material in aquatic remediation projects, wetland creation, wetland restoration, landfill daily cover, and recycling into commercial products such as construction aggregate, ceramic tiles, or other building materials. The rock material from the Jacksonville Harbor Deepening project could potentially be used for artificial reefs. Each of these disposal management options is evaluated on a per-project basis.

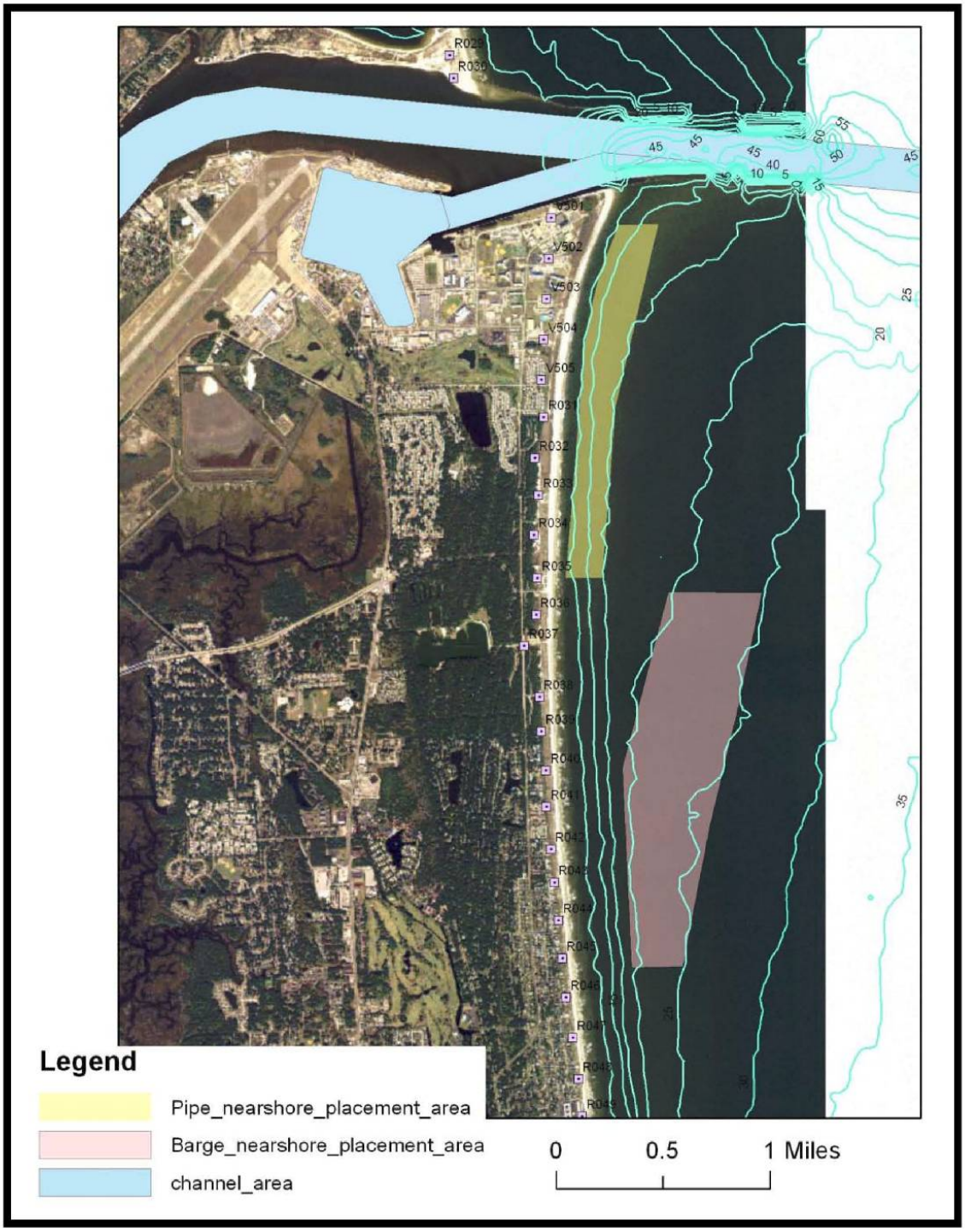


Figure 1.3-4 Jacksonville Harbor Nearshore Placement Areas

This map and/or digital data is for planning purposes only and should not be used to determine the precise location of any feature.
Data provided as-is. EIS Q:\GIS PROJECTS\JAX_ODMDS\PHASE 2\EIS\MAPS UPDATED 031511\Figure 1.3-4 Jacksonville Harbor Nearshore Placement Areas.mxd SOURCE: USACE 2011

1.4. Need for Action

USACE Jacksonville District and EPA Region 4 have identified a need to designate a new ODMDS. The need for expanding current ocean disposal capacity is based on observed mounding at the Jacksonville ODMDS, future capacity modeling, historical dredging volumes, estimates of dredging volumes for future proposed projects, and limited capacity of upland CDFs in the area. This section discusses in detail the current and future capacity issues at the existing Jacksonville ODMDS and CDFs.

Key documents that were used to demonstrate the need for expansion or new site designation include but are not limited to:

USACE. 2008. *Jacksonville Ocean Dredged Material Disposal Site Capacity Report.* USACE Jacksonville District, Jacksonville, Florida. May 2008.

USACE. 2010a. *Jacksonville Ocean Dredged Material Disposal Site Long Term Fate Analysis.* April 2010. USACE Jacksonville District, Jacksonville, Florida.

USACE. 2010b. *Zone of Siting Feasibility Study for the Environmental Protection Agency (EPA): Expansion/Designation of the Jacksonville Harbor Ocean Dredged Material Disposal Site (ODMDS).* USACE Jacksonville District, Jacksonville, FL.

USEPA and USACE. 2007. *Jacksonville Ocean Dredged Material Disposal Site, Site Management and Monitoring Plan.* USEPA and USACE Jacksonville District. November 2007.

USEPA. 2010c. *Revisions to the Jacksonville Ocean Dredged Material Disposal Site (ODMDS) Site Management and Monitoring Plan.* June 2010.

Naval Facilities Engineering Command, Southeast (NAVFAC). 2008. *Final Environmental Impact Statement for the Proposed Homeporting of Additional Surface Ships at Naval Station Mayport, Florida + Technical Appendices.* November 2008.

USACE. 2002. *Navigation Study for Jacksonville Harbor Final General Reevaluation Report and Environmental Assessment.* October 2002.

St. Johns Bar Pilot Association Letter. Subject: Jacksonville Harbor Two-foot Vessel Draft Restriction due to Terminal Channel Shoaling. February 11, 2010.

1.4.1. Capacity of the Jacksonville ODMDS

A bathymetric survey conducted at the Jacksonville ODMDS in February 2011 shows a mound centered within the site boundary that rises approximately 15 feet above the surrounding seabed, and elevations along the site boundary range from -46 feet to -57 feet mean lower low water (MLLW) (Figure 1.4-1). The center elevation of the site is currently at or near the -30-foot minimum operational depth. The Site Management and Monitoring Plan for the Jacksonville ODMDS requires measures to be taken when depths mound to 30 feet, warning that disposal cutoff depth in that area is imminent (USEPA and USACE 2007). Dredged material disposal contractors are now directed away from the center portion of the ODMDS to avoid breaching the minimum allowable depth criteria of -25 feet MLLW (per the SMMP) and minimum operational depth criteria of -30 feet MLLW.

In January 2008, an effort was initiated to evaluate the long-term capacity of the Jacksonville ODMDS (USACE 2008). At the time of the evaluation, the estimated remaining capacity at the Jacksonville ODMDS was conservatively estimated to be between 6.4 and 8.0 million cy. The viability of the Jacksonville ODMDS was calculated based on the estimated remaining capacity

of 7.5 million cy (as of June 2010), annual average maintenance material of 0.5 million cy from Naval Station Mayport and 0.62 million cy from Jacksonville Harbor (1.12 million cy total) , and the range of 1 to 4 million cy of dredged material that may be generated from the Naval Station Mayport Deepening Project and disposed of in the Jacksonville ODMDS according to the most current permit conditions (Table 1.4-1). Based on this scenario, the Jacksonville ODMDS would reach capacity in approximately 3 to 13 years. It is important to note that this estimate only includes maintenance material from Naval Station Mayport and Jacksonville Harbor and does not consider new work material from the proposed Jacksonville Harbor Deepening Project or non-federal projects. Addition of dredged material from these projects would cause the Jacksonville ODMDS to reach capacity even sooner. Based on these conditions, it is recognized that the Jacksonville ODMDS needs to be expanded or a new site designated by EPA to enable continued disposal of maintenance dredge material from Naval Station Mayport, Jacksonville Harbor Federal Navigation Project, and other sources that use the Jacksonville ODMDS.

Table 1.4-1. Projected Status of the Jacksonville ODMDS

Current Capacity (as of June 2011)	7.5 mcy* – 1.0 mcy (from Mayport Deepening, Spring 2011) = 6.5 mcy
Capacity Based on Permit Condition[1]	7.5 mcy – 4 mcy = 3.5 mcy
Annual Maintenance	0.5 – 1.12 mcy
Years Until Jacksonville ODMDS Reaches Capacity	6.5 mcy / 0.5 mcy = 13 years 3.5 mcy / 1.12 mcy = 3 years

[1] Naval Station Mayport's permit allows disposal of up to 4 mcy

* mcy = million cubic yards

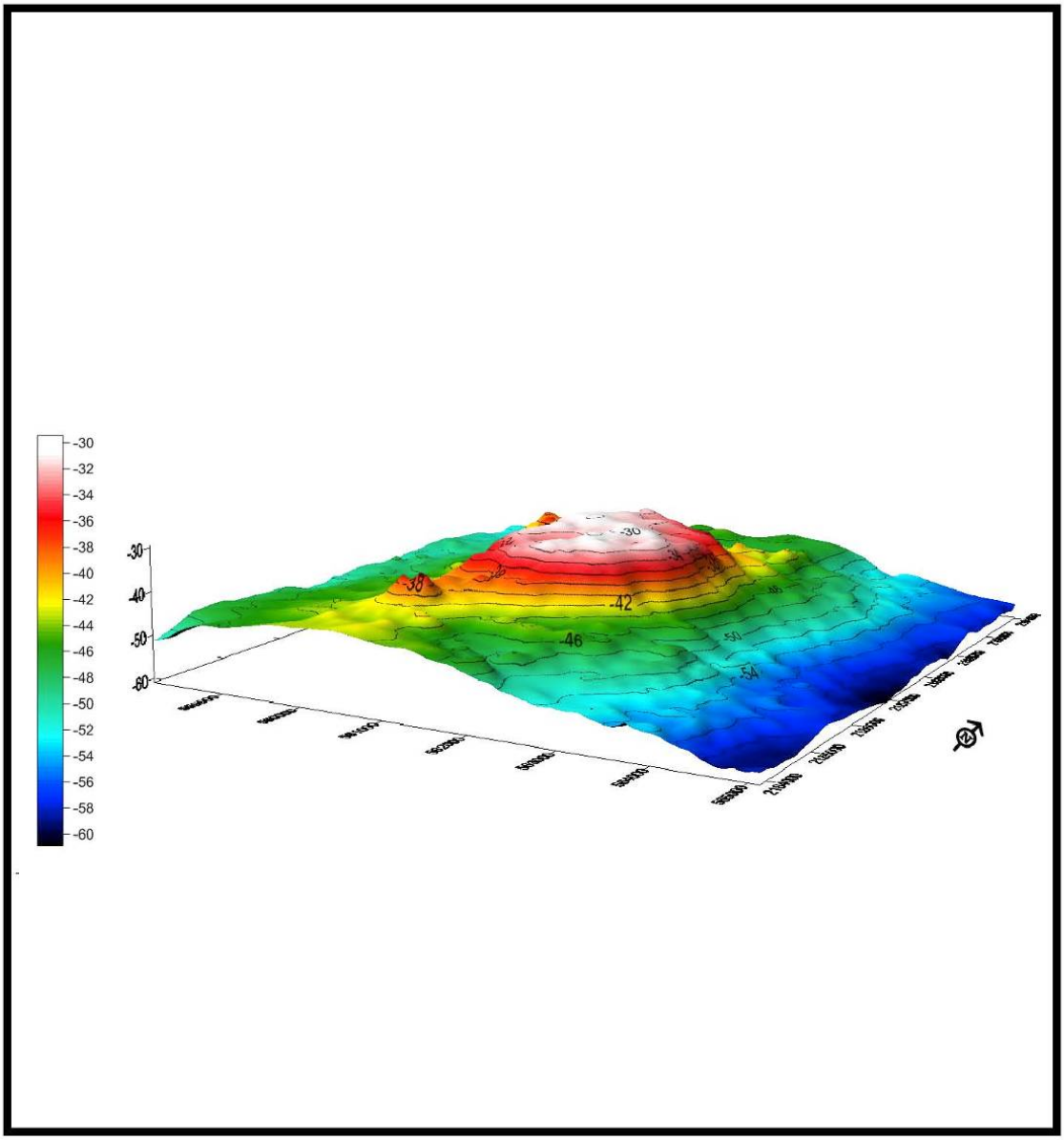
1.4.2. Capacity of the Upland Confined Disposal Facilities

The need for ODMDS expansion or new site designation is critical for maintenance of Jacksonville Harbor primarily due to capacity issues at the Bartram Island and Buck Island upland CDFs (Figure 1.4-2). Discussion with Jacksonville Port Authority (JAXPORT) representatives on July 10, 2009 indicates that changes in O&M of the existing upland CDFs will severely reduce the future capacity of those sites due to limits on future dike raising and expansion. Those changes will result in exceeding CDF capacity requirements sooner than originally estimated (potentially by 2012). The current situation at Bartram and Buck islands is as follows:

- Bartram Cell A is currently at capacity.
- Bartram Cell B is currently at capacity.
- Bartram Cell C is currently at capacity.
- Bartram Cell F is being offloaded into Cell G and will provide some ongoing capacity (approximately 1 million cy).
- Bartram Cell G is currently at capacity.
- Buck Island is scheduled to resume offloading in 2012; however, the local homeowners are not supportive of this plan.

Currently, no other CDFs exist for Jacksonville Harbor. Based on the new O&M developments, including increased shoaling rates, temporary suspension of recycling construction-grade material from the CDF at Buck Island, constraints on expansion of existing CDFs, and a lack of potential new upland areas for development of CDF, USACE Jacksonville District will require access to an expanded ODMDS as early as 2013 (USACE 2010b).

USACE plans to examine potential upland sites, beneficial uses of dredged material, and expansion of Bartram Island. However, environmental concerns, future development, and real estate costs may remove those alternatives from further consideration. Further discussion on non-ocean disposal alternatives is included in Section 2.2.3. This would leave ocean disposal as the primary future disposal option for dredged material generated from Jacksonville Harbor maintenance and deepening projects.



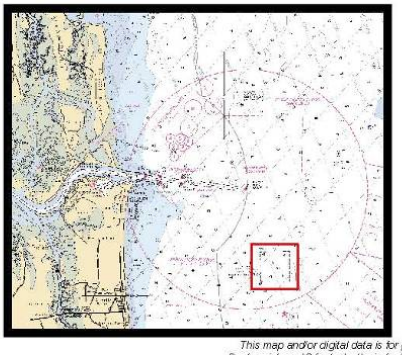
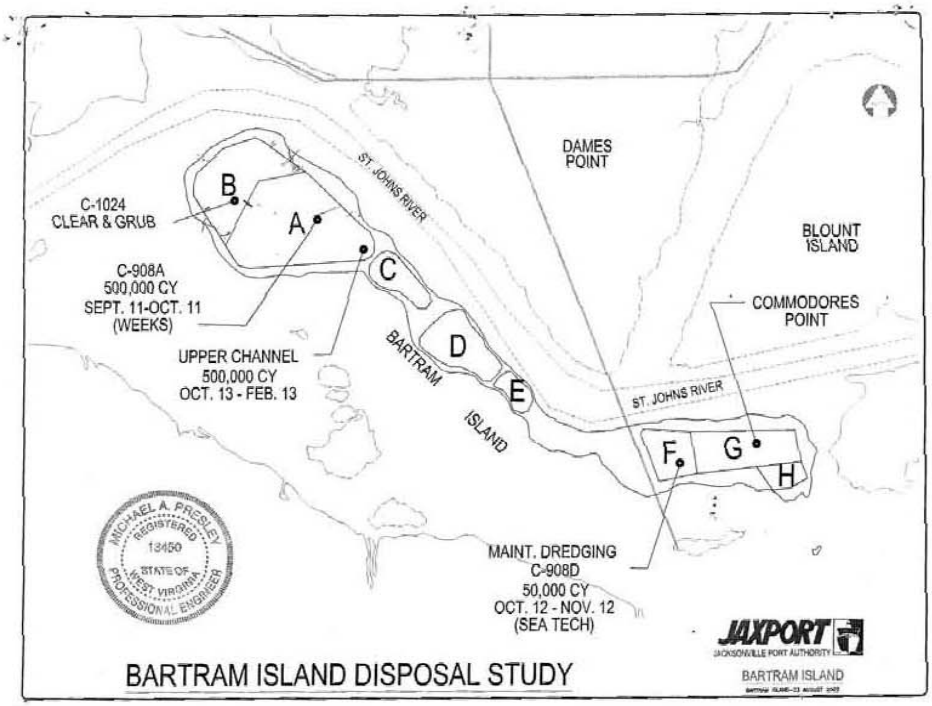


Figure 1.4-1. Bathymetry of Jacksonville ODMDS (2011)

This map and/or digital data is for planning purposes only and should not be used to determine the precise location of any feature.
Contour interval 2 feet, depths in feet below MLLW. Vertical scale exaggerated for display purposes. State Plane FL East (feet) NAD83.
Data provided as-is. Source: USACE February 2011 Q:\GIS PROJECTS\JAX_ODMDS\MAPS UPDATED 12011\Figure 1.4-1_Bathymetry of Jacksonville ODMDS (2011).mxd



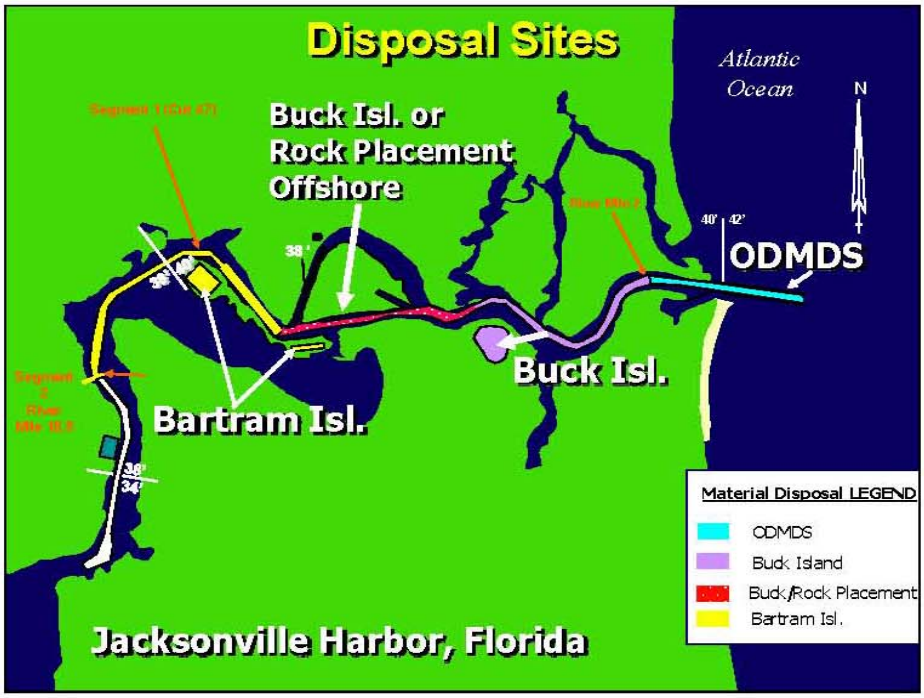


Figure 1.4-2. Bartram and Buck Island Upland Confined Disposal Facilities

Source: USACE 2010b

1.5. Regulatory Framework

An international treaty and several laws, regulations, and executive orders apply to ocean disposal of dredged material and to the designation of an ODMDS. The relevance of these statutes to the proposed action and to related compliance requirements is described in this section. Table 1.5-1 at the end of this section summarizes the level of compliance of the proposed site designation with relevant federal, state, and local environmental statutes.

1.5.1. London Convention

The principal international agreement governing ocean disposal is the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter (26 UST 2403: TIAS 8165), also known as the London Convention. This agreement became effective on August 30, 1975, after ratification by the participating countries, including the United States. Ocean disposal criteria incorporated into the MPRSA have been adapted from the provisions of the London Convention. Thus, material considered acceptable for ocean disposal under the MPRSA also is acceptable for ocean disposal under the London Convention.

1.5.2. Federal Laws and Regulations

1.5.2.1. Marine Protection, Research, and Sanctuaries Act of 1972, as Amended (33 U.S.C. 1401 et seq.)

The MPRSA regulates the transportation and ultimate disposal of material in the ocean, prohibits ocean disposal of certain wastes without a permit, and prohibits the disposal of certain materials entirely. Prohibited materials include those that contain radiological, chemical, or biological warfare agents; high-level radiological wastes; and industrial waste. The MPRSA has jurisdiction over all U.S. ocean waters in and beyond the territorial sea (12 nmi from the baseline), vessels flying the U.S. flag, and all vessels leaving U.S. ports.

Section 102 of the MPRSA authorizes EPA to promulgate environmental criteria for evaluation of all disposal permit actions, to retain review authority over USACE MPRSA Section 103 permits, and to designate ocean disposal sites for dredged material disposal. Additionally, as provided in Section 102(c) of the MPRSA:

> *After January 1, 1995, no site [ODMDS] shall receive a final designation unless a management plan has been developed pursuant to this section. Beginning on January 1, 1997, no permit for dumping pursuant to this Act or authorization for dumping under section 103(e) of this Act shall be issued for a site unless such site has received a final designation pursuant to this subsection or an alternative site has been selected pursuant to section 103(b).*

EPA's regulations for ocean disposal are published in 40 CFR Parts 220 through 229. As described in 40 CFR 228(e)(1), designation of an ocean disposal site is to be based on environmental studies of the proposed site, regions adjacent to the proposed site, and historical knowledge of the impact of dredged material disposal on areas similar to the proposed site. Impacts to be considered include those on the physical, chemical, biological, socioeconomic, and cultural characteristics of the site. All studies and evaluations prepared for the proposed site must be conducted in accordance with the general and specific site selection criteria specified in 40 CFR § 228.5 and 40 CFR § 228.6, respectively (Table 1.1-1). Considerations addressed by these site selection criteria include physical location, prior use, currents, feasibility of surveillance and monitoring, and proximity to sensitive resources.

Under the authority of Section 103 of the MPRSA, USACE may issue ocean disposal permits for dredged material if EPA concurs with the decision. If EPA does not agree with a USACE permit decision, a waiver process under Section 103 allows further action to be taken. The permitting regulations promulgated by USACE, under the MPRSA, appear in 33 CFR Parts 320 through 330 and 335 through 338. EPA and USACE must prohibit or restrict disposal of material that does not meet the regulatory criteria specified in 40 CFR Part 227. An equivalent process is used for USACE civil works projects that include disposal at an ODMDS.

Dredged material proposed for ocean disposal undergoes an extensive four-tiered evaluation to demonstrate compliance with the requirements of 40 CFR 227. Figure 1.5-1 illustrates an overview of the tiered evaluation process. Tiers I and II use existing information and relatively simple, rapid procedures for determining the potential environmental impacts of dredge material proposed for ocean disposal. If it is readily apparent that the material has the potential to cause substantial environmental impacts (or lack thereof), the information collected in Tier I and II evaluations may be sufficient for making a decision as to the suitability of the material for ocean disposal.

However, where the potential environmental impacts are not clear or where sufficient information is lacking, more extensive evaluation through Tiers III and IV may be needed. Each successive tier incorporates more intensive procedures that provide increasingly detailed information for assessing the potential environmental impacts of the dredge material. The intent of this tiered approach is to ensure the suitability of dredge material proposed for ocean disposal while using resources efficiently. This is achieved by testing the proposed material only as intensely as is necessary to provide sufficient information for making the disposal suitability decision (USEPA and USACE 1991). The application of this tiered process will ensure that only clean dredged material will be disposed of at an ODMDS.

EPA and USACE also may determine that ocean disposal is inappropriate because of ODMDS management restrictions or because options for beneficial use exist. Site management guidance is provided in 40 CFR § 228.7-228.11.

1.5.2.2. National Environmental Policy Act of 1969 (42 U.S.C. 4341 et seq.)

NEPA was established to ensure that the environmental consequences of federal actions were incorporated into agency decision-making processes. It establishes a process whereby the parties most affected by the impact of a proposed action are identified and their opinions are solicited. The proposed action and several alternatives are evaluated in relation to their environmental impacts, and a tentative selection of the most appropriate alternative is made. A draft EIS (DEIS) is developed that presents sufficient information to evaluate the suitability of the proposed and alternative actions. A Notice of Availability, announcing that the DEIS can be obtained for comment, is published in the Federal Register. After the DEIS comment period, the comments are addressed, revisions are made to the DEIS, and the document is published as a final EIS (FEIS), after which a proposed rule is published. For ODMDS designations, publication of a Final Rule in the Federal Register is equivalent to a NEPA Record of Decision.

The Council on Environmental Quality (CEQ) has published regulations in 40 CFR Parts 1500 through 1508 for implementing NEPA. EPA NEPA regulations are published at 40 CFR Part 6. USACE regulations for implementing NEPA are published in 33 CFR Part 220.

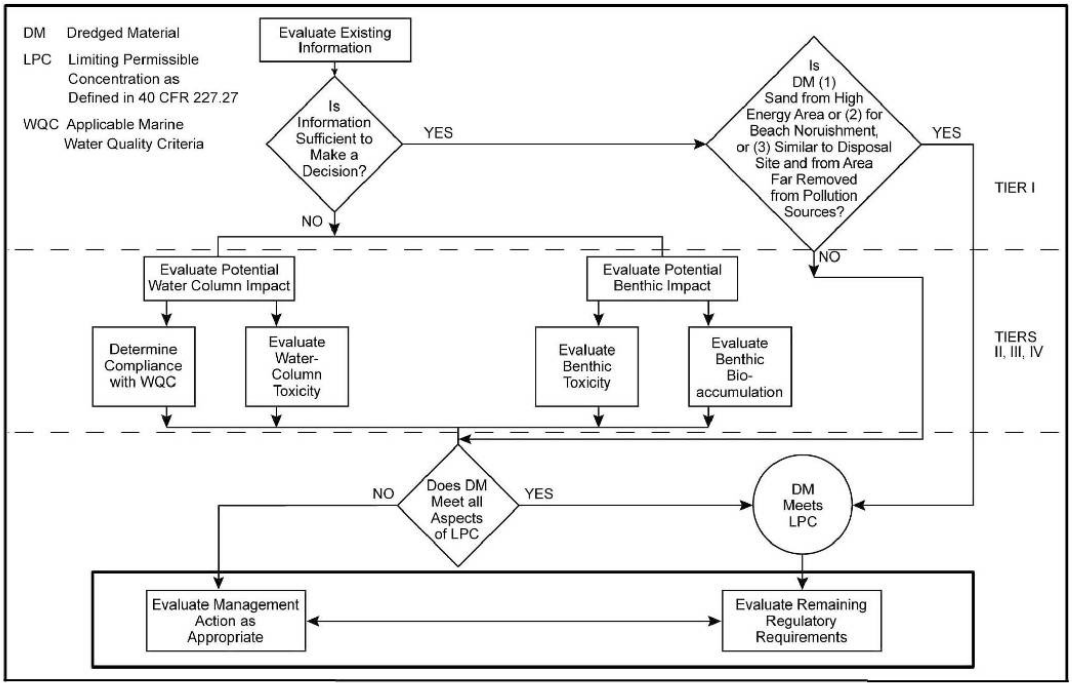


Figure 1.5-1. Overview of Tiered Approach to Evaluating Potential Impact of Ocean Disposal of Dredged Material

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1.5.2.3. Clean Water Act of 1972 (33 U.S.C. 1251 et seq.)

The Clean Water Act (CWA) was passed to restore and maintain the chemical, physical, and biological integrity of the nation's waters. Specific sections of the CWA control the discharge of pollutants and wastes into aquatic and marine environments.

Section 404 of the CWA establishes a program to regulate the discharge of dredge and fill material into navigable waters of the United States. The CWA and MPRSA overlap for discharges to the territorial sea (3 nmi from the baseline as defined by the CWA). The CWA supersedes the MPRSA if dredged material is placed in the ocean for beach restoration or other beneficial use. The MPRSA supersedes the CWA if dredged material is transported and disposed of in the territorial sea. As such, disposal actions at the ODMDS lie outside the jurisdiction of the CWA and are governed by the MPRSA.

1.5.2.4. Clean Air Act, as Amended (42 U.S.C. 1451 et seq.)

The Clean Air Act (CAA) is intended to protect the nation's air quality by regulating emissions of air pollutants. The CAA is applicable to permits and planning procedures related to dredged material disposal onshore and within the territorial sea. The territorial sea is defined as waters 3 miles seaward of the nearest shoreline. The proposed action (designation of an ODMDS) does not permit the actual disposal of dredged material. Although the ODMDS will not be located within the territorial sea, the CAA is still applicable to the proposed action because vessels used to transport material to the ODMDS will transit through the area designated as territorial sea. Therefore, a basic air quality evaluation of the potential impacts to air quality resulting from future use of the disposal sites has been conducted. Subsequent projects that would generate material to be disposed of at an ODMDS would be subject to further individual environmental review.

1.5.2.5. Fish and Wildlife Coordination Act of 1958 (16 U.S.C. 661 et seq.)

The Fish and Wildlife Coordination Act requires that water resource development programs consider wildlife conservation. Whenever any body of water is proposed or authorized to be impounded, diverted, or otherwise controlled or modified, the U.S. Fish and Wildlife Service (USFWS) and the state agency responsible for fish and wildlife must be consulted. Section 662(b) of the act requires federal agencies to consider recommendations based on USFWS investigations. The recommendations may address wildlife conservation and development, damage to wildlife attributable to the project, and measures proposed for mitigating or compensating for these damages.

1.5.2.6. Marine Mammal Protection Act of 1972 (16 U.S.C. Chapter 31)

The Marine Mammal Protection Act (MMPA) was enacted on October 21, 1972. All marine mammals are protected under this act, which prohibits, with certain exceptions, the "take" of marine mammals in U.S. waters and by U.S. citizens on the high seas, and the importation of marine mammals and marine mammal products into the U.S.

1.5.2.7. Magnuson-Stevens Fishery Conservation and Management Act (16 U.S.C. 1801 et seq.)

The Magnuson-Stevens Fishery Conservation and Management Act (MSA) was authorized in 1996 and charges the National Marine Fisheries Service (NMFS) with identifying, conserving, and enhancing essential fish habitat (EFH) for those species regulated under a federal fisheries management plan. The MSA requires

- Federal agencies to consult with NMFS on all actions or proposed actions authorized, funded, or undertaken by the agency that have the potential to adversely affect EFH;
- NMFS to provide conservation recommendations for any federal or state action that would adversely affect EFH; and
- Federal agencies to provide a detailed response in writing to NMFS within 30 days of receiving the EFH conservation recommendations.

The ODMDS is located within the jurisdiction of the MSA.

1.5.2.8. Anadromous Fish Conservation Act (16 U.S.C. 757a- 757g; 79 Stat. 1125)

The Anadromous Fish Conservation Act of 1965 authorizes the Secretary of the Interior and the Secretary of Commerce to enter into cooperative agreements with states and other non-federal interests for conservation, development, and enhancement of anadromous fishes, including those in the Great Lakes, and to contribute up to 50% of the federal share of the cost of carrying out such agreements.

1.5.2.9. Coastal Zone Management Act of 1972 (16 U.S.C. 1456 et seq.)

Under the Coastal Zone Management Act (CZMA), any federal agency conducting or supporting activities directly affecting the coastal zone must proceed in a manner consistent with approved state coastal zone management programs to the maximum extent practicable. If a proposed activity affects water use in the coastal zone (i.e., the territorial sea and inland), the applicant may need to demonstrate compliance with a state's approved CZMA program.

The Coastal Zone Reauthorization Amendments of 1990 (Section 6208) state that any federal activity, regardless of its location, is subject to the CZMA requirement for consistency if it will affect any natural resources, land uses, or water uses in the coastal zone. No federal agency activities are categorically exempt from this requirement. As part of the site designation process, EPA and USACE have prepared a coastal zone consistency determination addressing potential effects of dredged material disposal at the ODMDS on marine organisms, including threatened and endangered species (Appendix B). It also describes provisions for sediment testing to ensure that contaminated material is not discharged at the ODMDS.

1.5.2.10. Endangered Species Act of 1973 (16 U.S.C. 1531 et seq.)

The Endangered Species Act (ESA) protects threatened and endangered species by prohibiting federal actions that would jeopardize the continued existence of such species or that would result in the destruction or adverse modification of any critical habitat of such species. Section 7 (Interagency Cooperation) of the ESA requires that consultation regarding conservation of such species be conducted with USFWS and/or NMFS prior to project implementation. During the site designation process, USFWS and NMFS evaluate potential impacts of ocean disposal at the alternative sites on threatened and endangered species and associated critical habitat. These agencies are asked to certify or concur with the sponsoring agency's findings that the proposed activity will not adversely affect endangered or threatened species. Documentation of the consultation process on the proposed ODMDS designation is summarized in Section 1.6 of the EIS and all pertinent correspondence and formal responses are included in Appendix A.

1.5.2.11. National Historic Preservation Act of 1966 (16 U.S.C. 470 et seq.)

The purpose of the National Historic Preservation Act (NHPA) is to preserve and protect historic and prehistoric resources that may be damaged, destroyed, or made less available by a project or action. Under this act, federal agencies are required to identify cultural or historical resources

that may be affected by a proposed action and to coordinate project activities with the State Historic Preservation Officer (SHPO). EPA and USACE will coordinate proposed ODMDS designation with the SHPO.

1.5.3. Executive Orders

1.5.3.1. Executive Order 11514, Protection and Enhancement of Environmental Quality (35 FR 4247; May 5, 1970)

The federal government shall provide leadership in protecting and enhancing the quality of the nation's environment to sustain and enrich human life. Federal agencies shall initiate measures needed to direct their policies, plans, and programs so as to meet national environmental goals. CEQ, through the Chairman, shall advise and assist the President of the United States in leading this national effort.

1.5.3.2. Executive Order 11593, Protection and Enhancement of the Cultural Environment (36 FR 8921; May 15, 1971)

This executive order requires federal agencies to direct their policies, plans, and programs so that federally owned sites, structures, and objects of historical, architectural, or archaeological significance are preserved, restored, and maintained for the inspiration and benefit of the public. Compliance with this order will be coordinated with the SHPO.

1.5.3.3. Executive Order 11990, Protection of Wetlands (42 FR 26961; May 24, 1977)

This executive order directs federal agencies to avoid wetlands to the greatest extent possible and, if no other practicable alternative exists, impacts to wetlands should be mitigated or offset.

1.5.3.4. Executive Order 12088, Federal Compliance with Pollution Control Standards (January 23, 1987)

The head of each executive agency is responsible for ensuring that all necessary actions are taken for the prevention, control, and abatement of environmental pollution with respect to federal facilities and activities under the control of the agency.

1.5.3.5. Executive Order 12372, Intergovernmental Review of Major Federal Programs (47 FR 3059; July 16, 1982)

This executive order requires federal agencies to direct their policies, plans, and programs so that federally owned sites, structures, and objects of historical, architectural, or archaeological significance are preserved, restored, and maintained for the inspiration and benefit of the public. Compliance with this order is coordinated with the SHPO.

1.5.3.6. Executive Order 12898, Federal Actions to Address Environmental Justice in Minority and Low-Income Populations (February 11, 1994)

To the greatest extent practicable and permitted by law, and consistent with the principles set forth in the report on the National Performance Review, each federal agency shall make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations in the United States and its territories and possessions, the District of Columbia, the Commonwealth of Puerto Rico, and the Commonwealth of the Mariana Islands.

1.5.3.7. Executive Order 13045, Protection of Children from Environmental Health Risks and Safety Risks (62 FR 19885, April 21, 1997)

This executive order directs each federal agency to ensure that its policies, programs, activities, and standards address disproportionate risks to children that result from environmental health risks or safety risks. Children may suffer disproportionately from environmental health risks and safety risks.

1.5.3.8. Executive Order 13089, Coral Reef Protection

This executive order requires that all federal agencies whose actions may affect U.S. coral reef ecosystems shall: (a) identify their actions that may affect U.S. coral reef ecosystems; (b) utilize their programs and authorities to protect and enhance the conditions of such ecosystems; and (c) to the extent permitted by law, ensure that any actions they authorize, fund, or carry out will not degrade the conditions of such ecosystems.

1.5.3.9. Executive Order 13112, Invasive Species

The purpose of this executive order is to prevent the introduction of invasive species and provide for their control and to minimize the economic, ecological, and human health impacts that invasive species cause.

1.5.3.10. Executive Order 13158, Marine Protected Areas

The purpose of this executive order is to, consistent with domestic and international law: (a) strengthen the management, protection, and conservation of existing marine protected areas (MPAs) and establish new or expanded MPAs; (b) develop a scientifically based, comprehensive national system of MPAs representing diverse U.S. marine ecosystems and the nation's natural and cultural resources; and (c) avoid causing harm to MPAs through federally conducted, approved, or funded activities.

1.5.3.11. Executive Order 13186, Responsibilities of Federal Agencies to the Migratory Bird Treaty Act (66 FR 3853; January 11, 2001)

Migratory birds are of great ecological and economic value to this country and to other countries. They contribute to biological diversity and bring tremendous enjoyment to millions of Americans who study, watch, feed, or hunt these birds throughout the United States and other countries. The United States has recognized the critical importance of this shared resource by ratifying international, bilateral conventions for the conservation of migratory birds. Such conventions include the Convention for the Protection of Migratory Birds in 1916 between the United States and Great Britain (on behalf of Canada); the Convention for the Protection of Migratory Birds and Game Mammals in 1936 between the United States and Mexico; the Convention for the Protection of Migratory Birds and Birds in Danger of Extinction, and Their Environment in 1972 between United States and Japan; and the Convention for the Conservation of Migratory Birds and Their Environment in 1976 between United States and Russia.

These migratory bird conventions impose substantive obligations on the United States for the conservation of migratory birds and their habitats, and through the Migratory Bird Treaty Act (MBTA), the United States has implemented these migratory bird conventions with respect to the United States. This executive order directs executive departments and agencies to take certain actions to further implement the act.

1.5.3.12. Executive Order 13274, Environmental Stewardship and Transportation Infrastructure Project Reviews (67 FR 59449; September 18, 2002)

This executive order sets the policy that the development and implementation of transportation infrastructure projects in an efficient and environmentally sound manner is essential to the well-being of the U.S. people and a strong U.S. economy. Executive departments and agencies shall take appropriate actions, to the extent consistent with applicable law and available resources, to promote environmental stewardship in the nation's transportation system and expedite environmental reviews of high-priority transportation infrastructure projects.

1.5.3.13. Executive Order 13423, Strengthening Federal Environmental, Energy, and Transportation Management (72 FR 3919; January 24, 2007)

This executive order sets goals in the areas of energy efficiency, acquisition, renewable energy, toxics reductions, recycling, renewable energy, sustainable buildings, electronics stewardship, fleets, and water conservation. In addition, the order requires more widespread use of environmental management systems as the framework in which to manage and continually improve these sustainable practices.

1.5.4. State of Florida

1.5.4.1. Florida Coastal Management Program

The Florida Coastal Management Program is based on a network of agencies implementing 23 statutes that protect and enhance the state's natural, cultural, and economic coastal resources. The goal of the program is to coordinate local, state, and federal agency activities using existing laws to ensure that Florida's coast is as valuable to future generations as it is today. FDEP is responsible for directing the implementation of the state-wide coastal management program. Appendix B includes the Coastal Zone Consistency Determination.

Table 1.5-1. Summary of Compliance of the Proposed Project with Environmental Statutes and Regulations (Page 1 of 3)

Statute	Level of Compliance	Status of Compliance
London Convention	Full	Implemented through the MPRSA of 1972.
Marine Protection, Research and Sanctuaries Act of 1972 (MPRSA), as amended (33 U.S.C. 1401 et seq.)	Full	In compliance with Section 103 of the MPRSA, a SMMP has been developed in support of the proposed ODMDS final designation. The SMMP is included as Appendix F to this EIS. USACE will issue ocean disposal permits for future dredged material through regulations promulgated under Section 103 of the MPRSA. EPA is responsible for MRPSA compliance of all ocean disposal activities.
National Environmental Policy Act of 1969 (NEPA) (42 U.S.C. 4341 et seq.)	Full	The EIS was prepared for public review pursuant to NEPA with EPA as the lead agency and USACE as the cooperating agency.
Clean Water Act of 1972 (CWA) (33 U.S.C. 1251 et seq.)	N/A	All barges of dredged material will pass through CWA jurisdiction; however, the alternative sites are outside the jurisdiction of CWA (3 nmi).
Section 10, Rivers and Harbors Act	Full	Dredging activity that generates material for the ODMDS requires compliance with this act; however, the designation of an ODMDS would not require a Section 10 approval.
Clean Air Act (CAA), as amended (42 U.S.C. 1451 et seq.)	Full	Air emissions at the site would be from the vessels delivering dredged material to the ODMDS and would be short-term.
Fish and Wildlife Coordination Act of 1958 (16 U.S.C. 661 et seq.)	Full	This EIS concludes that the proposed action would not significantly adversely impact fish or wildlife.
Marine Mammal Protection Act of 1972 (MMPA) (16 U.S.C. Chapter 31)	Full	This EIS concludes that the proposed action would not adversely impact marine mammals. Appendix C includes the Biological Assessment (BA).
Magnuson-Stevens Fishery Conservation and Management Act (MSA) (16 U.S.C. 1801 et seq.)	Full	This act requires preparation of an EFH assessment, which is included in Appendix D. This EIS concludes that the proposed action is expected to have little overall effect on any species on the Fishery Management Plan (FMP) or their habitat.
Anadromous Fish Conservation Act	Full	This EIS concludes that the proposed action would not adversely impact anadromous fishes.
Coastal Zone Management Act of 1972 (CZMA) (16 U.S.C. 1456 et seq.)	Full	Although the ODMDS would be outside the coastal zone, transport to the site will be through the coastal zone, therefore a coastal zone consistency determination has been drafted for review and concurrence by FDEP (Appendix B).
Endangered Species Act of 1973 (ESA) (16 U.S.C. 1531 et seq.)	Full	Formal consultation with USFWS and NMFS was initiated via the scoping letter dated July 30, 2010. Additionally, a BA for species under both agencies' jurisdictions were prepared and submitted to each agency to initiate consultation under the ESA (Appendix C). This project was fully coordinated under the ESA and is in full compliance with it.

Table 1.5-1. Summary of Compliance of the Proposed Project with Environmental Statutes and Regulations (Page 2 of 3)

Statute	Level of Compliance	Status of Compliance
National Historic Preservation Act of 1966 (NHPA) (16 U.S.C. 470 et seq.)	Full	Coordination with the SHPO was initiated on November 24, 2010, and is ongoing.
Executive Order 11514, Protection and Enhancement of Environmental Quality (35 FR 4247; May 5, 1970)	Full	The proposed action has been fully evaluated during the NEPA process to identify and protect environmental resources and avoid/minimize impacts to the extent possible. The proposed action is in compliance with the goals of this executive order.
Executive Order 11593, Protection and Enhancement of the Cultural Environment (36 FR 8921, May 15, 1971)	Full	Coordination with the SHPO was initiated on November 24, 2010, and is ongoing. All of these activities are being completed in accordance with Executive Order 11593.
Executive Order 11990, Protection of Wetlands (42 FR 26961; May 24, 1977)	Full	No wetlands would be affected by project activities. The proposed action is in compliance with the goals of this executive order.
Executive Order 12088, Federal Compliance with Pollution Control Standards (January 23, 1987)	Full	The head of each executive agency is responsible for ensuring that all necessary actions are taken for the prevention, control, and abatement of environmental pollution with respect to federal facilities and activities under the control of the agency. Dredge material will be fully evaluated according to regulations in Section 103 of the MPRSA prior to disposal at the ODMDS. The proposed action is in compliance with the goals of this executive order.
Executive Order 12372, Intergovernmental Review of Major Federal Programs (47 FR 3059; July 16, 1982)	Full	Archaeological surveys and consultation with the SHPO have been conducted. All of these activities have been completed in accordance with the NHPA and the project is in full compliance with NHPA. The proposed action is in compliance with the goals of this executive order.
Executive Order 12898, Federal Actions to Address Environmental Justice in Minority and Low-Income Populations (February 11, 1994)	Full	The proposed action would not result in adverse health or environmental effects. Any impacts of this action would not be disproportionate toward any minority. The activity does not (a) exclude persons from participation in, (b) deny persons the benefits of, or (c) subject persons to discrimination because of their race, color, or national origin. The activity would not impact subsistence consumption of fish and wildlife. The proposed action is in compliance with the goals of this executive order.
Executive Order 13045, Protection of Children from Environmental Health Risks and Safety Risks (62 FR 19885, April 21, 1997)	Full	The proposed action would not result in adverse environmental health risks or safety risks to children. The proposed action is in compliance with the goals of this executive order.

Table 1.5-1. Summary of Compliance of the Proposed Project with Environmental Statutes and Regulations (Page 3 of 3)

Statute	Level of Compliance	Status of Compliance
Executive Order 13089, Coral Reef Protection	Full	Sidescan sonar surveys were conducted to identify hardbottom resources within and adjacent to the proposed alternative sites. These resources have been avoided to the extent possible to minimize degradation of such ecosystems. The proposed action is in compliance with the goals of this executive order.
Executive Order 13112, Invasive Species	Full	There are no components in the dredged material or consequences of its disposal that would be expected to attract or result in recruitment of nuisance species to the ODMDS. The proposed action is in compliance with the goals of this executive order.
Executive Order 13158, Marine Protected Areas (MPAs)	Full	The project area is not located in or adjacent to a MPA. The proposed action is in compliance with the goals of this executive order.
Executive Order 13186, Responsibilities of Federal Agencies to the Migratory Bird Treaty Act (MBTA) (66 FR 3853; January 11, 2001)	Full	No migratory birds would be adversely affected by project activities. The proposed action is in compliance with the goals of this executive order.
Executive Order 13274, Environmental Stewardship and Transportation Infrastructure Project Reviews (67 FR 59449; September 18, 2002)	Full	The proposed action does not involved development and implementation of transportation infrastructure projects. The proposed action is in compliance with the goals of this executive order.
Executive Order 13423, Strengthening Federal Environmental, Energy, and Transportation Management (72 FR 3919; January 24, 2007)	Full	Energy consumption and air quality have been considered when evaluating proposed alternatives. The proposed action is in compliance with the goals of this executive order.
Florida Coastal Management Program	Full	Although the ODMDS would be outside the coastal zone, transport to the site will be through the coastal zone, therefore a coastal zone consistency determination has been drafted for review and concurrence by FDEP (Appendix B). The proposed action is in compliance with the goals of the Florida Coastal Management Program.

1.6. NEPA Process

1.6.1. Notice of Intent and Scoping Period

NEPA, CEQ, and CZMA regulations guide the public involvement process for designation of an ODMDS.

The first opportunity for public comment occurred during the scoping period. The Notice of Intent (NOI) to prepare an EIS for the proposed action was published July 9, 2010, in the Federal Register (Appendix A). The closing date for the scoping period was set for September 7, 2010 (60 days). In addition to the NOI, a scoping letter was sent July 30, 2010, via e-mail inviting government agencies, interest groups, and the pubic to provide input on an array of alternative sites being evaluated for ODMDS designation and to identify significant resource concerns associated with those sites. An information package included with the scoping letter briefly described the site alternatives. Public comment was invited in the scoping letter as well as at the scoping meeting. Comments were provided by mail, e-mail, and in writing using comment cards that were provided at the scoping meeting.

USACE and EPA held two scoping meetings on Wednesday, August 18, 2010, from 2:00 p.m. to 4:00 p.m. and from 6:00 p.m. to 8:00 p.m. at JAXPORT, which were attended by a total of 14 people. Both meetings were formatted as follows:

- Attendees were asked to sign an attendance sheet.
- USACE Project Manager started the meeting with a brief introduction describing the purpose of the meeting.
- The EPA Ocean Dumping Coordinator made a short presentation describing the proposed action and need for action, the NEPA process, ODMDS site selection objectives, environmental considerations, the alternatives, and the project timeline.
- Attendees were then invited to visit various posters that were set up around the room. The posters described the NEPA process, the proposed action and alternatives, economic considerations, surveys and modeling, environmental considerations, and the public's role in shaping the alternatives. Staff from EPA and USACE was stationed at each of the posters to answer questions. Comment cards were provided to attendees to formally submit comments. Comments cards and responses to the scoping letter are provided in Appendix A**.**
- Posters and presentations from the meeting were also placed on the USACE website at: http://www.saj.usace.army.mil/Divisions/Planning/Branches/Environmental/DocsNotices_OnLine_DuvalCo.htm

The following issues and general areas of concern were raised during the scoping period:

- Shellfisheries: Representatives from the Shrimp Producers Association raised concerns about Alternative Site 3, which is in an area they fish 9 to 10 months of the year. They would prefer Alternative Sites 1 or 2 which encompass an area they fish less than 2 months of the year. These comments were considered during the development of the Draft EIS.
- EFH: The NMFS Habitat Conservation Division submitted preliminary comments. Resource concerns include proposed project areas that provide habitat for species of ecological, commercial, or recreational importance. General comments advised that the EIS should provide an EFH assessment that includes a description of the proposed action; an analysis of the effects (including cumulative effects) of the proposed action on

EFH and managed species; the federal agencies' views regarding the effects of the action on EFH, impacts to the benthic communities; and proposed mitigation, if applicable. The EFH assessment is included as Appendix D.

These issues and concerns have been addressed by selecting preferred alternative(s) that minimize overlap with the shrimp trawling areas based on the shrimpers' input during the scoping meeting. Impacts to areas with hardbottom have been minimized to the extent possible by conducting surveys to identify and delineate areas of hardbottom prior to selecting alternative locations.

1.6.2. Interagency Coordination

Consultation History

In an effort to invite participation from state and federal agencies early in the NEPA process when identifying potential alternative sites and get input regarding resource concerns, an interagency coordination meeting was held on February 11, 2010, at FDEP headquarters in Tallahassee. Staff from USACE, EPA, ANAMAR Environmental Consulting, Inc, National Oceanic and Atmospheric Administration (NOAA) Protected Resources Division, Florida Fish and Wildlife Conservation Commission (FWC), and FDEP attended. In addition, staff from these agencies also participated in teleconferences on March 3 and 24, 2010. A variety of topics were discussed, including results from sidescan sonar surveys, selection of candidate sites, and methodologies and timing of future site designation studies.

On August 9, 2011, another interagency meeting was held at FDEP headquarters in Tallahassee with state and federal agencies to discuss the progress of the Draft EIS, results of site designation studies, rationale for selection of the preferred alternatives, and the SMMP. Staff from USACE, EPA, ANAMAR Environmental Consulting, Inc, NOAA Protected Resources Division, FWC, and FDEP attended.

1.6.3. Project Coordination

Although a separate EIS document is being prepared for the Jacksonville Harbor Deepening Project, it is closely linked to this proposed action of designating a new ODMDS because of the need to ensure there is adequate capacity for disposal of dredged material generated during the deepening. Therefore, internal coordination between these projects has been conducted with the personnel from the USACE Jacksonville District and EPA Region 4. The projects have been planned and coordinated to the extent possible with regard to timeframes in which additional capacity may be required. Also, information has been shared between the two projects such as economic and feasibility data with regard to the location the three alternative sites (ZSF study) and environmental considerations with regard to sediment characteristics and volume of new work material.

1.6.4. Draft EIS / Public Meeting

The Draft EIS and SMMP will be circulated for 45 days of public review and comment. Comments may be provided in writing (by mail, facsimile, or electronic mail). Comments received on the Draft EIS during the public comment period and the public meeting will be included in Appendix A and will be addressed and incorporated into the Final EIS.

1.6.5. Final EIS / Proposed Rule

The Final EIS and Site Management and Monitoring Plan will be circulated for 30 days of public review and comment. Comments may be provided in writing (by mail, facsimile, or electronic

mail). Any comments received during the 30-day review period will be responded to and included with the Rulemaking.

1.6.6. Final Rule / Site Designation

EPA will also prepare a Final Rulemaking. The Final Rulemaking will state what the agency decision is, identify all alternatives considered, and state whether all practical means to avoid or minimize environmental harm from the proposed action have been adopted (see 40 CFR § 1505.2). Site designation will become effective 30 days after publication of the Final Rulemaking in the Federal Register.

2. ALTERNATIVES

The action proposed in this document is the final designation of an environmentally acceptable and economically feasible ODMDS offshore of Jacksonville, Florida. Section 2.1 describes the ocean disposal site designation process and how potential alternative ocean disposal site locations were identified and screened. Section 2.2 discusses the full suite of alternatives that were considered for disposal of dredged material. Section 2.3 compares each of the ocean disposal alternative sites and the degree to which each site complies with the EPA site selection criteria. Section 2.4 discusses the rationale for eliminating some alternatives from further consideration and identifies which alternatives were carried forward for detailed evaluation. Section 2.5 compares the environmental impacts of the alternatives considered. Section 2.6 discusses the rationale for the selection of the preferred alternative(s).

Chapter 2. Alternatives

2.1 ODMDS Site Selection Process
2.2 Description of Alternatives
2.3 Compliance with EPA Criteria
2.4 Alternatives not Considered for Further Analysis
2.5 Comparison of Alternatives Considered
2.6 Selection of the Preferred Alternative

For federally funded water resources projects, USACE must comply with the National Economic Development Plan, which requires USACE to select the project alternative that maximizes net economic benefit. Therefore, if more than one preferred alternative site is identified, USACE must select the site that is the most economical to use provided it meets EPA's environmental criteria.

2.1. ODMDS Site Selection Process

Ocean disposal is regulated under Title I of the MPRSA (33 U.S.C. 1401 *et seq.*). EPA has the responsibility for designating an acceptable location for the ODMDS (MPRSA Section 102). In summary, the steps required to designate an ODMDS are to

1. Demonstrate a need for an ODMDS (Section 1.4).
2. Conduct a constraints analysis (ZSF study) based on existing environmental and economic information to identify areas with the least conflicting uses and the least potential for environmental impacts (Section 2.1.1).
3. Conduct reconnaissance surveys and more detailed site designation surveys to identify and characterize the most suitable locations for potential disposal sites (Section 2.1.2).
4. Evaluate the specific candidate (alternative) sites using the EPA general and specific criteria (40 CFR Part 228) (Table 1.1-1) and document the findings in the EIS (Section 2.3 and Chapter 3).
5. Identify the preferred alternative(s) (e.g., the site(s) that best meet the criteria) and proceed with rulemaking published in the Federal Register to formally designate the ODMDS (Section 2.6).

2.1.1. Zone of Siting Feasibility

For the designation of a new ODMDS, a ZSF study is conducted to identify areas that are economically and operationally feasible and do not pose unacceptable adverse impact to the marine environment and valued resources. Section 2.1.1.1 describes the economic constraints analysis. Section 2.1.1.2 describes the environmental feasibility analysis. The ZSF study involving the economic feasibility analysis for the proposed action was prepared in May 2010 by

USACE Jacksonville District (Appendix G). Conclusions from these analyses were used to help identify environmentally compatible areas within the economically feasible radius (distance offshore) in which an ODMDS could potentially be sited.

2.1.1.1. Economic Feasibility Analysis

One of the primary purposes of the ZSF study is to define the radii (transport distance from shore) within which the disposal of dredged material generated in the Jacksonville Harbor region is considered economically and operationally feasible for both construction and maintenance dredging projects. The ZSF threshold is the radial distance offshore from the mouth of the St. Johns River where the benefit-to-cost ratio remains greater than or equal to one (i.e., costs above this amount would result in an unjustified project and therefore a closer site would be required). Three disposal scenarios and three distances (5, 10, and 15 nmi offshore) were analyzed to capture the substantial variability that can exist within a project of this scale (Figure 2.1-1). It is important to understand the distinction of assumptions of these three scenarios which are summarized below and discussed in detail in the ZSF study (Appendix G).

1. The first scenario of the 5-nmi increments (5, 10, 15 nmi) assumes a one-time construction cost at year 1 with no additional maintenance or new construction over the 50-year planning horizon.
2. The second scenario of the 5-nmi increments assumes routine O&M of the channel every 3 to 4 years in addition to new construction costs occurring every 10 years over the 50-year planning horizon.
3. The third scenario of the 5-nmi increments assumes O&M dredging only

Using preliminary new construction costs and benefits for the first scenario, a distance of about 5 to 10 nmi offshore appears justified (Figure 2.1-1). For the second scenario with the addition of new construction quantities, costs, and benefits to the O&M material costs over a 50-year planning horizon, distances of 5-, 10-, and 15-nmi offshore have a benefit-to-cost ratio less than one (Figure 2.1-1). For the third scenario, based on available preliminary cost-benefit information and assumptions for O&M quantities, the ZSF analysis indicates that a distance of 5 nmi offshore provides a benefit-to-cost ratio greater than one, but distances of 10 to 15 nmi offshore result in a benefit-to-cost ratio of less than one (Figure 2.1-1) (USACE 2010b). The results of the ZSF were used to help develop the ocean disposal alternatives considered in this EIS.

2.1.1.2. Environmental Screening

The designation process for developing alternatives and selecting the preferred location for the ODMDS uses a screening technique that initially defines a zone of economic and operational feasibility within which study areas for disposal sites may be evaluated for environmental and archaeological resources. A schematic representation of the ZSF process is shown in Figure 2.1-2. This screening process incorporates the best available information (e.g., scientific literature, input from resource agencies, input from the public and stakeholders) to identify sensitive and incompatible use areas. As part of the information gathering process and to help with alternatives development, meetings were organized by USACE and EPA with state and federal agencies and the public. These meetings had several objectives:

- To invite participation early in the NEPA process and discuss the proposed project among agencies and potential stakeholders.

- To solicit feedback on concerns and recommendations regarding the proposed action.
- To obtain additional information about potential resources that may be impacted in the region of interest.
- To discuss how these impacts can be avoided and/or mitigated.
- To propose and develop ideas on potential ODMDS locations and configurations.
- To obtain information on future disposal needs.

After identifying sensitive and incompatible areas, a geographic information system (GIS) was used to graphically represent the constraints (Figure 2.1-3) which include, but are not limited to, the following:

- Shipping lanes and navigation restrictions
- EFH including habitat areas of particular concern (HAPC)
- Breeding, spawning, nursery, feeding, or passage areas of living resources
- Geographically limited fisheries and shellfisheries
- Shrimp trawling areas
- Areas of hard and live bottom
- Artificial reefs and fish havens
- North Atlantic right whale (*Eubalaena glacialis*) corridors
- Mineral extraction sites (sand borrow areas)
- Significant natural or cultural resources of historical importance
- Underwater cables
- Political boundaries
- Distance to the edge of the continental shelf

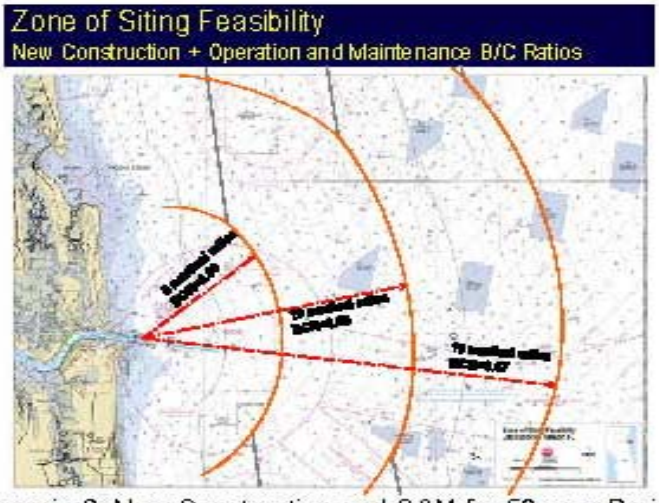
ODMDS designation should avoid these constrained areas to the greatest extent possible. The description of these resources is provided in detail in Chapter 3. The determination of the economic feasibility distance is described in Section 2.1.1.2.

2.1.2. Site Designation Studies

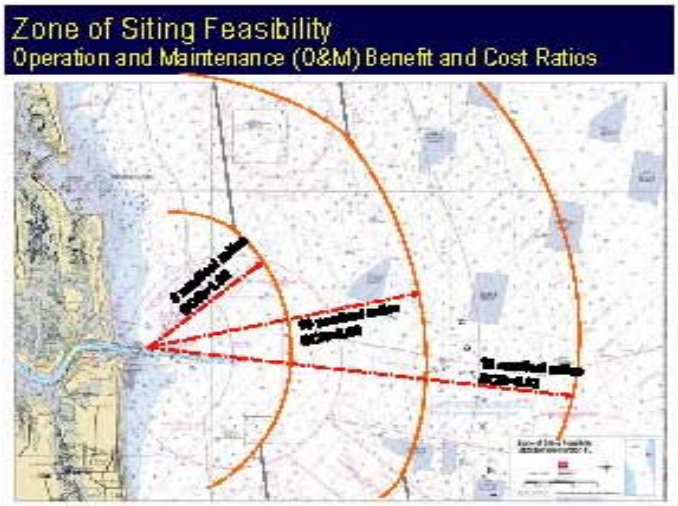
Criteria established by EPA identifies the need to perform site designation studies and present the results as part of the NEPA documents (40 CFR § 228.6(b)). The goal is to use the results from these studies to help select the least environmentally and socioeconomically damaging and the most economically feasible and logistically practical site possible. Three parts of the NEPA regulations apply directly to the site designation studies:

- Emphasis upon alternatives, including the proposed action. It is expected that environmental documentation will evaluate the environmental impacts of the proposed action and all reasonable alternatives, which would minimize adverse impacts on the environment. Therefore, the survey must determine what resources are present and could potentially be impacted.
- A succinct description of the affected environment, including the area outside the disposal site that may be modified by direct or indirect effects of the disposal process.
- An analysis of significant impacts of the disposal and, where appropriate, supplying practicable means of mitigating adverse environmental impacts.

Scenario 1: One-time Preliminary New Construction Costs



Scenario 2: New Construction and O&M for 50-year Project



Scenario 3 O&M for 50 year Project Scenario

Figure 2.1-1. Three Disposal Scenarios and Three Distance Increments (source: USACE 2010b)

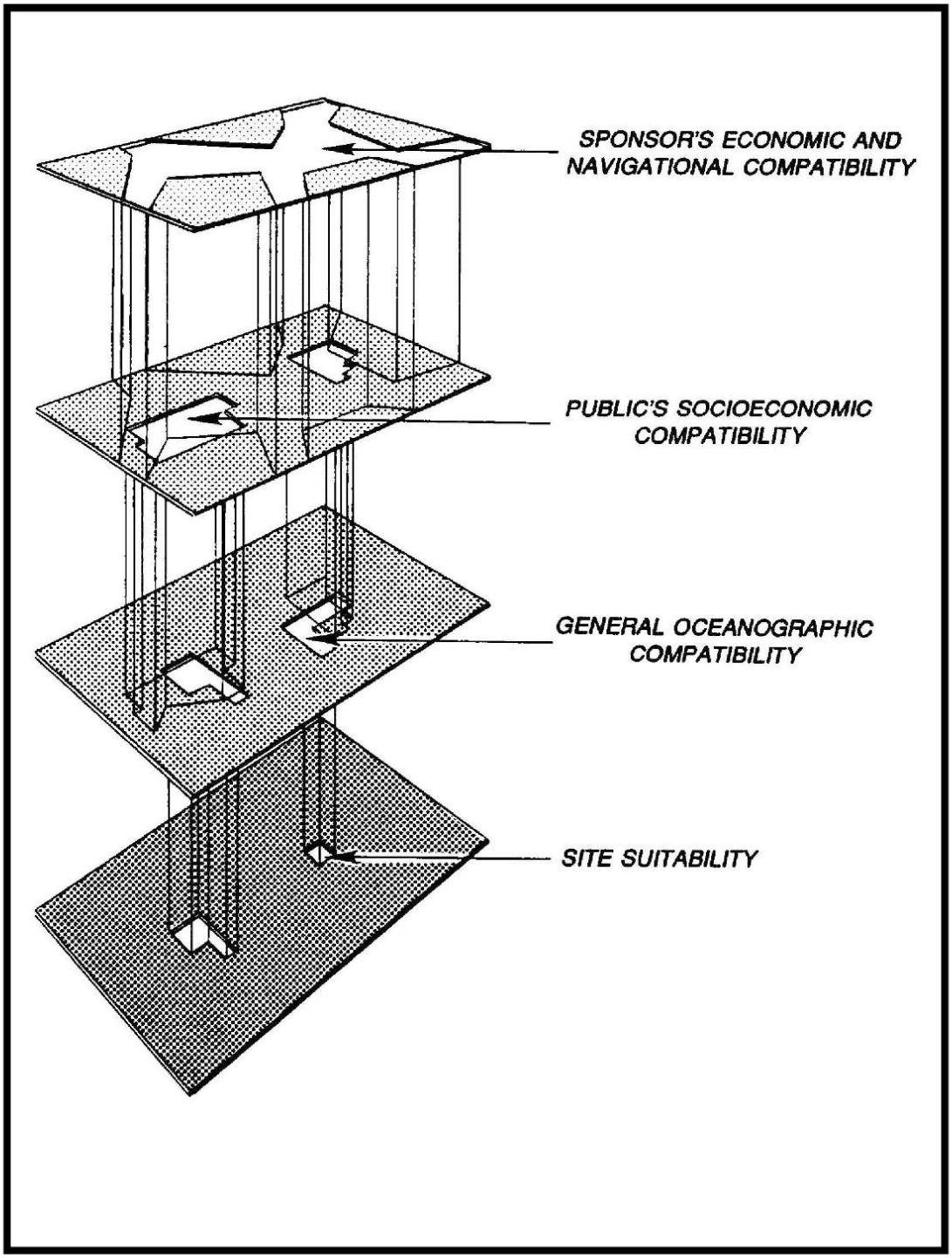


Figure 2.1-2. General Representation of the Screening (Sieve) Technique for Siting

This map and/or digital data is for planning purposes only and should not be used to determine the precise location of any feature.
Data provided as-is. Figure 2.1-2 General Representation of the Screening (Sieve) Technique for Siting_062911. Data Source: Pequegnat 1990

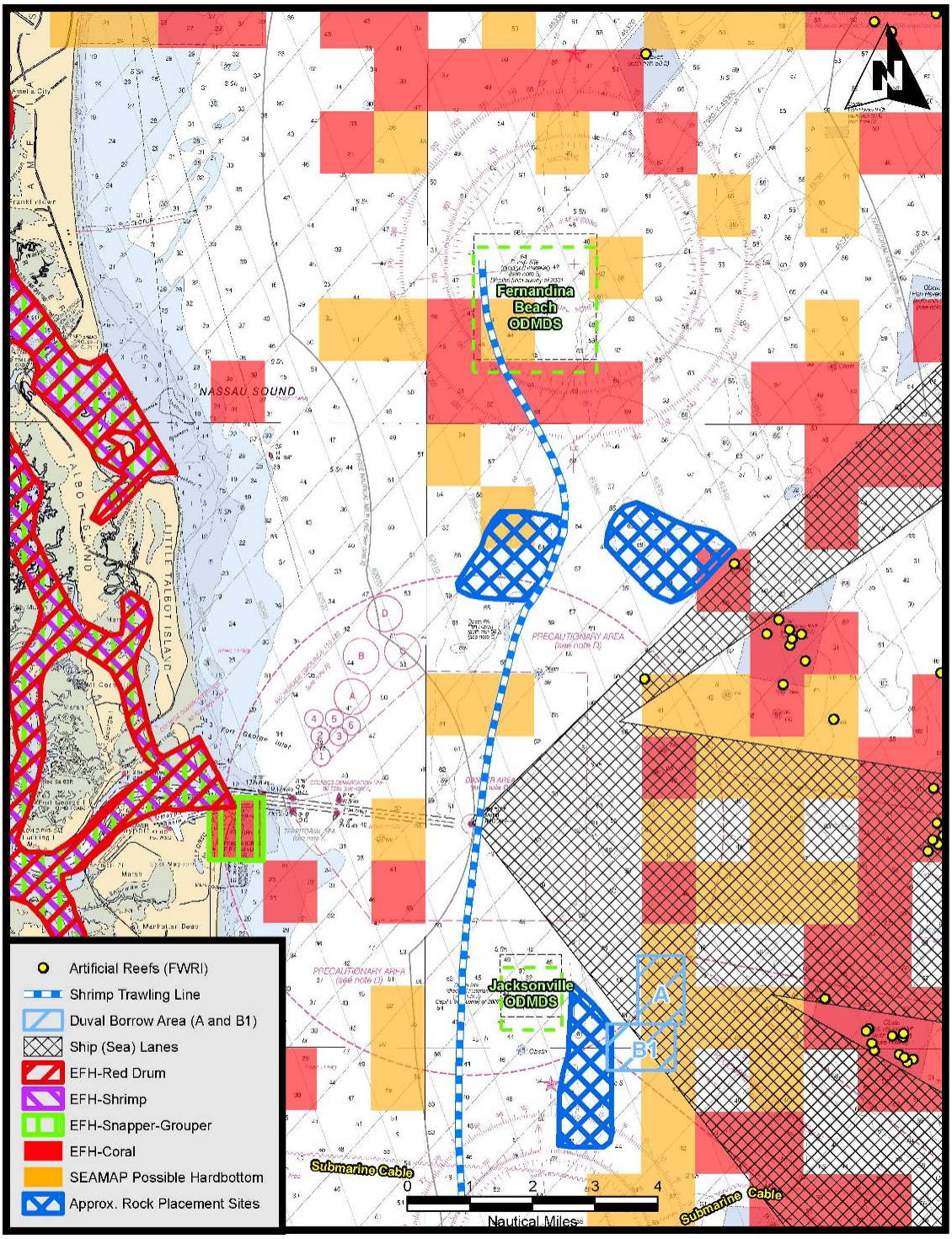


Figure 2.1-3. Resources in Region of Interest

This map and/or digital data is for planning purposes only and should not be used to determine the precise location of any feature. Data provided as-is.
Q:\GIS PROJECTS\JAX_ODMDS\MAPS UPDATED 120110\Figure 2.1-3. Resources in Region of Interest.mxd Data sources: USACE, NOAA, FWRI .

2.1.2.1. Reconnaissance Surveys

Based on the results of the initial environmental screening, economic feasibility analysis, and recommendations from federal and state agencies and the public, two general survey areas (North Survey Area and South Survey Area) were selected by EPA and USACE for additional field research and analysis to identify the least constrained areas within each of the two areas (Figure 2.1-4). In October 2009 and March 2010, sidescan sonar surveys, underwater video transects, and investigative dives were conducted to determine the presence or absence of hard or live bottom resources or archaeological resources within and adjacent to these two areas (ANAMAR 2010). Based on results of those reconnaissance surveys, the configuration of site boundaries was further refined to minimize and/or avoid resource impacts. As a result, three candidate sites (approximately 4 nmi^2 in size) were selected within the two survey areas (Figure 2.1-5). Candidate Site 1 is located adjacent to the Jacksonville ODMDS and would be an expansion of the existing site. Candidate Site 2 is located south of the Jacksonville ODMDS. Candidate Site 3 is located north of the Jacksonville ODMDS and south of the Fernandina ODMDS.

Please note, the three candidate sites evaluated in the site designation studies are presented in this EIS as three alternatives for an ODMDS. For clarification purposes, Table 2.1-1 compares the site name nomenclature used in the site designation survey report to those used in this EIS.

Table 2.1-1. Site Name Nomenclature

Site Designation Study Report	EIS
Candidate Site 1	Alternative 1: Expansion of the Jacksonville ODMDS
Candidate Site 2	Alternative 2: South of the Jacksonville ODMDS
Candidate Site 3	Alternative 3: North of the Jacksonville ODMDS

2.1.2.2. Site Designation Studies

Before either an interim or a new ODMDS can receive final designation, adequate environmental documentation must be prepared, reviewed, and approved by EPA (Pequegnat et al. 1990). Candidate Sites 1, 2, and 3 were evaluated in depth during two site designation studies conducted in March 2010 and September 2010. These studies were designed and conducted by EPA and USACE based on guidance in Pequegnat (1990) and in accordance with five general criteria (40 CFR 228.5) and 11 specific criteria (40 CFR § 228.6) (Table 1.1-1). Per the guidance, the designation of an ODMDS will be based on:

> Environmental studies of each site, regions adjacent to the site, and on historical knowledge of the impact of dredged material disposal on areas similar to such sites in physical, chemical, and biological characteristics (Regulations and Criteria, Part 228.4).

The purpose of the site designation studies is to further describe the physical environment and biological resources of the candidate sites including sediment characteristics (physical and chemical), benthic infauna, epifauna, and water chemistry characteristics. The studies were conducted during two distinct seasons to account for seasonal fluctuations in water physicochemical properties as well as seasonal movements and activity patterns in faunal assemblages. Results from these surveys and studies were used to help further the NEPA process and identify the alternative sites that are evaluated and compared in this EIS for the purpose of ODMDS designation. The results of these surveys are summarized in Chapter 3, Affected Environment. The complete report can be downloaded from the USACE website: http://www.saj.usace.army.mil/Divisions/Planning/Branches/Environmental/DocsNotices_OnLine_DuvalCo.htm.

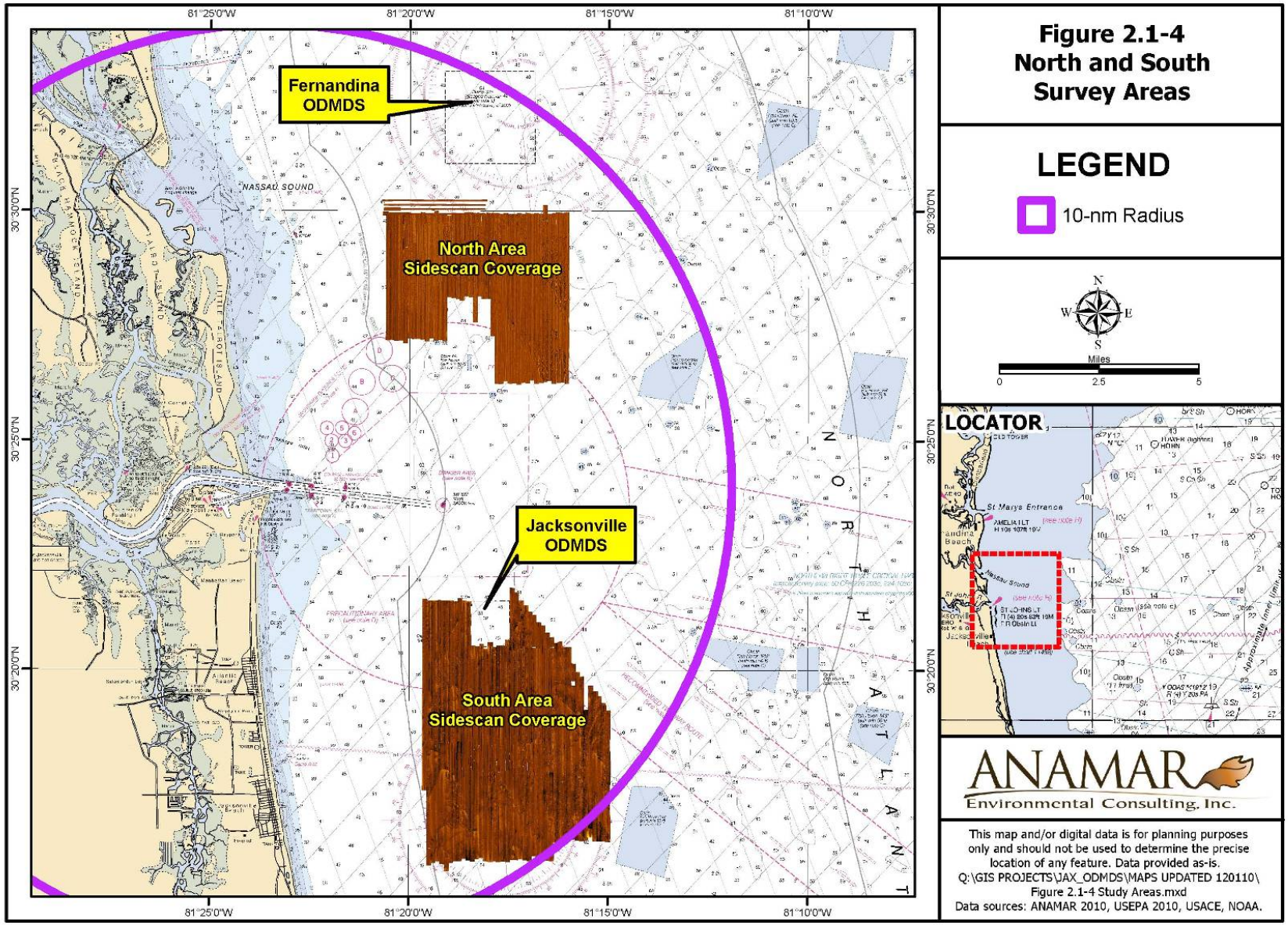


Figure 2.1-4
North and South
Survey Areas
LEGEND
10-nm Radius
Miles
0
2.5
5
LOCATOR
Fernandina ODMDS
North Area Sidescan Coverage
Jacksonville ODMDS
South Area Sidescan Coverage
NASSAU SOUND
81°25'0"W
81°20'0"W
81°15'0"W
81°10'0"W
30°30'0"N
30°25'0"N
30°20'0"N
ANAMAR
Environmental Consulting, Inc.
This map and/or digital data is for planning purposes only and should not be used to determine the precise location of any feature. Data provided as-is.
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Figure 2.1-4 Study Areas.mxd
Data sources: ANAMAR 2010, USEPA 2010, USACE, NOAA.

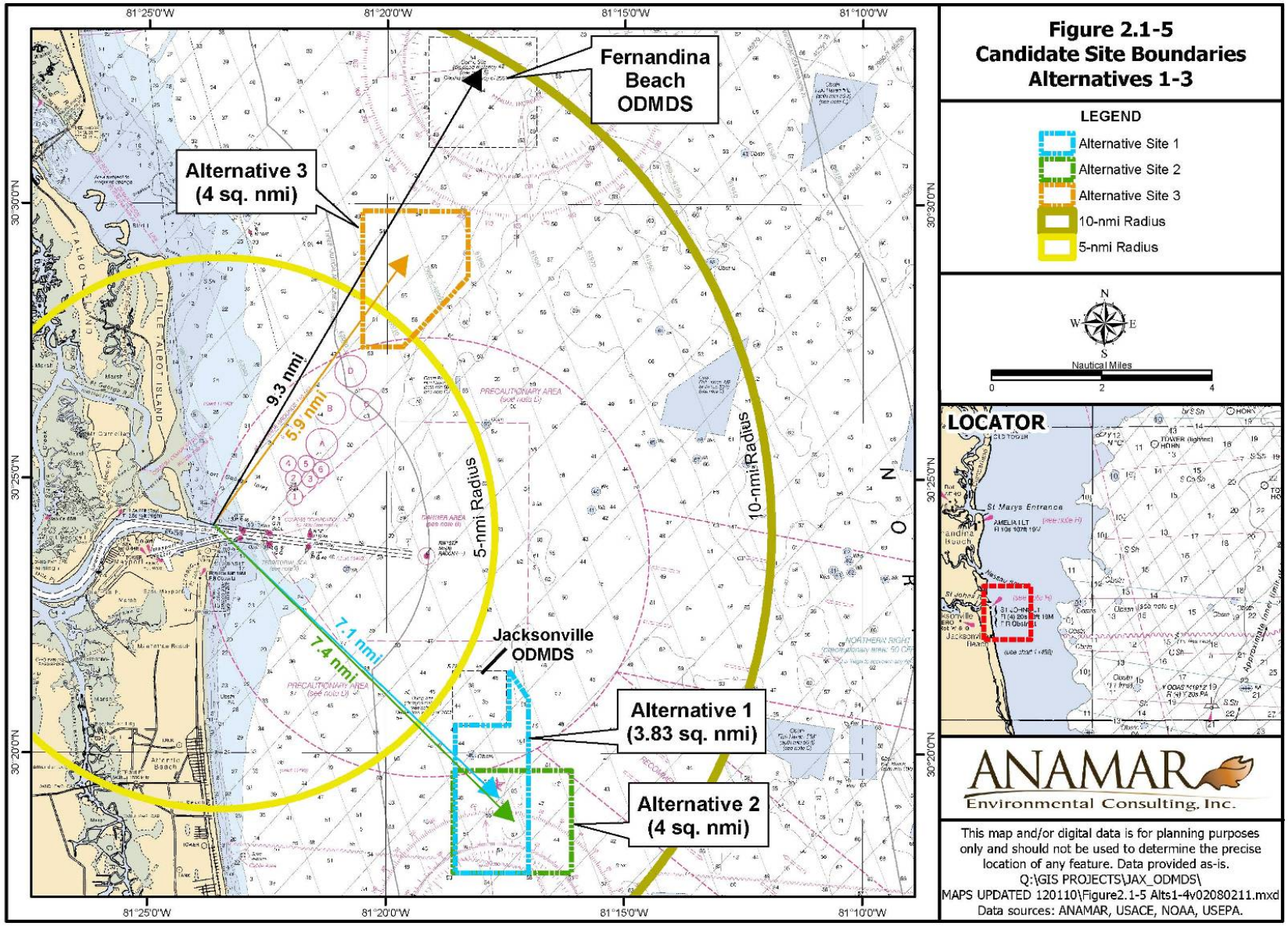


Figure 2.1-5
Candidate Site Boundaries
Alternatives 1-3

2.2. Description of Alternatives

2.2.1. No Action Alternative (Status Quo)

The No Action Alternative means that EPA would not designate a new ODMDS for disposal of suitable dredged material from the Jacksonville Harbor Federal Navigation Project, Naval Station Mayport, or other entities. Without designation of a new ODMDS within 5 to 10 nmi of the mouth of the St. Johns River, material that would normally have gone to the Jacksonville ODMDS may have to go to the Fernandina Beach ODMDS once the Jacksonville ODMDS reaches capacity. The Fernandina Beach ODMDS is the only other designated ODMDS in the region.

As of June 2011, EPA and USACE have determined that the existing Jacksonville ODMDS has a remaining capacity ranging from 3 to 13 years based on disposal of between 1 and 4 million cy from the Naval Station Mayport deepening project and annual maintenance material (see Section 1.4). However, based on potential increases in maintenance volumes and a proposed deepening project for Jacksonville Harbor (currently under study), USACE has determined that the existing Jacksonville ODMDS may reach capacity as early as 2013. When considering the long-term needs of the region (50 years) for ocean disposal of maintenance and new work material, it is estimated that disposal needs could be as much as 60 million cy over the next 50 years.

The Fernandina Beach ODMDS is a 4-nmi^2 site located 7.1 nmi (13.2 km) offshore (as measured to the center), 11.8 nmi (21.9 km) from the entrance to the St. Mary's River, and 9.3 nmi northeast of the mouth of the St. Johns River (Figure 2.1-5). The corner coordinates are provided in Table 2.2-1. As of 2009, it had a depth range of 37 to 69 feet (11.4 to 21.2 m), with an average depth of 53 feet (16.2 m) (USEPA and USACE 2010). In 2008, the U.S. Navy estimated the remaining volume of the Fernandina Beach ODMDS at 65 million cy (NAVFAC 2008).

Table 2.2-1 Fernandina Beach ODMDS Corner Coordinates

Latitude (N)	Longitude (W)
30° 33.00'	81° 16.86'
30° 31.00'	81° 16.86'
30° 31.00'	81° 19.13'
30° 33.00'	81° 19.13'

NAD27 (Feet)

The Fernandina Beach ODMDS has been used for disposal of rock, sand, silt, and clay dredged material since 1987. A total of approximately 20 million cy of dredged material has been disposed at the Fernandina Beach ODMDS (USEPA and USACE 2010). USACE Jacksonville District has projected disposal on the average of 600,000 cy of dredged material every year from maintenance of the Kings Bay Entrance Channel and up to 1 million cy per dredging event (which is infrequent) from the inner channel and turning basin. In addition, the U.S. Navy disposed of approximately 3.2 million cy of new work dredged material from Naval Station Mayport. Additional potential projects that could use the Fernandina Beach ODMDS as a disposal site include the berthing areas adjacent to the federal project maintained by the Fernandina Ocean and Highway Port Authority or the Fernandina Beach City Marina (USEPA and USACE 2010).

There are several concerns associated with the No Action Alternative, including

1. Long-term (50 years) capacity at the Fernandina Beach ODMDS
2. Increase costs associated with fuel consumption
3. Increase in air emissions
4. Increased risk of vessel strikes with the North Atlantic right whale
5. Potential impacts to maintenance dredging and new work due to lack of disposal site capacity

Although there are currently no issues with the capacity of the Fernandina Beach ODMDS, if the No Action Alternative were implemented and maintenance and new work dredging material originating from the Jacksonville area were to be disposed of at the Fernandina Beach ODMDS in addition to maintenance material disposed of annually from Kings Bay Entrance Channel, the Inner Channel, and Turning Basin, this site would reach its capacity in less than 50 years. This alternative does not accomplish the primary objective of the proposed action which is to ensure that adequate environmentally acceptable and economically and logistically feasible ocean disposal site capacity is available for the next 50 years for suitable dredged material generated from new projects and maintenance dredging in the Duval County area. Hauling dredged material from the Jacksonville area up to the Fernandina Beach ODMDS would also require EPA's approval.

If EPA did not approve of disposal at the Fernandina Beach ODMDS, then maintenance of the existing federal navigation projects at Jacksonville Harbor and Naval Station Mayport would be adversely impacted with subsequent effects upon local and regional economies. This, in turn, could result in a negative impact on future maritime and naval operations in the area. Alternative dredge material disposal methods would be required or the dredging and dredged material disposal would have to be decreased or discontinued. Although upland disposal is also considered an option; capacity at existing upland CDFs and space for new or expanded CDFs is limited (see Section 1.4.2).

Use of the Fernandina Beach ODMDS would increase the hauling distance by approximately 1.6 to 3.1 nmi (depending on location of the selected alternative site), which in turn would result in an increase in consumption of fuel resources and in air emissions (see Section 4.1.1 for details). Historically, most dredging projects in the Duval County area have not used the Fernandina Beach ODMDS because of the extra costs and increased environmental impacts associated with transporting the dredged material 9 nmi northeast of the mouth of the St. Johns River. Instead, the Jacksonville ODMDS, located approximately 5 nmi southeast of the mouth of the St. Johns River, has been used.

Critical habitat for the North Atlantic right whale includes the area between the St. Johns River and the Fernandina Beach ODMDS; therefore, transiting between those areas may increase the risk of vessel strikes. Use of the Fernandina Beach ODMDS would require longer transits for the dredges and tug boats through an area of historically high use by right whales (see Section 3.3.1.3 for details on right whale occurrences).

Naval Station Mayport and JAXPORT are an important part of the local economy. Their operations are dependent on the continued maintenance of the entrance channels and turning basin and on future deepening projects. The entrance channels are dredged regularly to maintain navigation access for users of the port and terminals. While some of the material dredged from these areas is suitable for beach nourishment or nearshore placement, the

majority is unsuitable and other management options, such as ocean disposal, are needed. USACE would incur increased costs in the disposal of materials dredged during routine maintenance of navigation channels serving the Jacksonville area if increased shipping distances are required. If routine maintenance dredging of the navigation channels is delayed or halted, it may result in economic hardships on federal, commercial, and private sectors.

Based on these factors, the No Action Alternative is not considered to be an acceptable alternative to the proposed action. However, this option, although not preferred, is maintained throughout the study process to provide a basis for comparison of the effects of other alternatives.

2.2.2. Ocean Disposal Alternatives

2.2.2.1. Alternative 1: Expansion of the Jacksonville ODMDS

Alternative 1 is the expansion of the existing Jacksonville ODMDS to the south and east. Under this alternative, an additional 3.83-nmi^2 area would be added adjacent to the existing Jacksonville ODMDS (Figure 2.2-1). Boundary vertices coordinates are provided in Table 2.2-2. The center of the site is 7.1 nmi southeast of the mouth of the St. Johns River. Water depths at this site range from 43 to 66 feet MLLW, with an average depth of 57 feet MLLW.

Table 2.2-2 Alternative 1 Coordinates (NAD83)

Vertices	Geographic Coordinates[1]		Geographic Coordinates[2]		Plane Coordinates[3]	
	Lat (N)	Long (W)	Lat (N)	Long (W)	x (northing)	y (easting)
Northernmost	30° 21.514’	81° 17.417’	30° 35870	81° 29029	564609.00	2190451.00
Northeastern	30° 21.001’	81° 17.013’	30° 35003	81° 28355	566728.94	2187339.60
Southeastern	30° 17.829’	81° 17.004’	30° 29716	81° 28340	566728.26	2168111.89
Southwestern	30° 17.826’	81° 18.536’	30° 29711	81° 30894	558665.25	2168113.98
Northwestern	30° 20.518’	81° 18.549’	30° 34197	81° 30915	558645.11	2184431.71
North central	30° 20.510’	81° 17.417’	30° 34183	81° 29028	564597.48	2184365.03
Centroid	30° 19.289’	81° 17.739’	30° 32149	81° 29565	562883.97	2176969.70

[1] Degrees, Decimal Minutes
[2] Decimal Degrees
[3] State Plane Florida (Feet)

From an operations and site management standpoint, the advantage of having the new and existing sites contiguous is that it provides additional volume for dumping because the area around the edge of the existing ODMDS that is adjacent to Alternative 1 could be used as well.

With respect to mineral resources, this site is located <1 nmi west of the Duval County sand borrow area (Figure 2.2-1). With respect to environmentally and socioeconomically important resources, this site is approximately 1 nmi east of primary shrimp trawling areas that were identified by commercial shrimpers during the August 2010 scoping meeting. During the sidescan studies conducted in October 2009 and March 2010, areas of hardbottom were observed in patches to the south and east of the existing Jacksonville ODMDS (Figure 2.2-1) (ANAMAR 2010). This imagery was verified by groundtruthing dives and sled camera transects during the sidescan sonar surveys. The distribution pattern, morphology, and proximity of these discrete features to the ODMDS suggest they may be rock from previous disposal events. The total acreage of hardbottom rubble within Alternative 1 boundaries equals 6.9 acres with a maximum relief of approximately 1.5 m. Prior to and including the early 1970s, material was

disposed in an area 0.5 nmi east of the Jacksonville ODMDS, and in the late 1970s material was disposed south of the site (USEPA AND USACE 2007). Therefore, although this area of hardbottom may provide habitat for reef-oriented invertebrates and fishes, it is probably not naturally occurring reef but instead is rock rubble from past disposal events. The quality of the habitat within the rubble area could not be well characterized due to low visibility during groundtruthing dives and video footage.

In October 2009, divers were deployed to inspect a group of metal containers of unknown origin identified during sidescan surveys and located approximately 0.5 nmi south of the Jacksonville ODMDS in the northwestern area of Alternative 1 (Figure 2.2-1). Encrusting sponges and various reef fishes were observed and video data were collected. The structures cover an area approximately 50 feet by 65 feet and have protruding metal parts that, over time, have snagged fishing nets, which remain on the structures. NOAA Chart 11488 identifies the location of this feature, and it is not considered to be of archaeological importance.

Additionally, a feature approximately 70 feet long was recorded on sidescan and is located approximately 1,360 feet south of the site. The structure appears to be a shipwreck based on recent (March 2010) high-resolution sidescan imagery. Two associated objects are visible in the high-resolution imagery that resembles outriggers or masts, one of which is completely separated from the hull and lies on the seafloor nearby. Maximum relief is unknown but appears to exceed 6.5 feet.

2.2.2.2. Alternative 2: South of the Jacksonville ODMDS

Alternative 2 is the designation of a 4-nmi^2 site approximately 1 nmi south of the southernmost boundary of the existing Jacksonville ODMDS (Figure 2.2-2). Boundary vertices coordinates are provided in Table 2.2-3. The center of the site is 7.4 nmi southeast of the mouth of the St. Johns River. Water depths at this site range from 44 to 64 feet MLLW, with an average depth of 55 feet MLLW.

Table 2.2-3 Alternative 2 Coordinates (NAD83)

Vertices	Geographic Coordinates[1]		Geographic Coordinates[2]		Plane Coordinates[3]	
	Lat (N)	Long (W)	Lat (N)	Long (W)	x (northing)	y (easting)
Northwestern	30° 19.692’	81° 18.544’	30° 32820	81° 30906	558658.24	2179422.20
Northeastern	30° 19.697’	81° 16.062’	30° 32828	81° 26770	571707.38	2179419.13
Southeastern	30° 17.831’	81° 16.056’	30° 29719	81° 26761	571709.67	2168110.60
Southwestern	30° 17.826’	81° 18.536’	30° 29711	81° 30894	558665.25	2168113.98
Centroid	30° 18.762’	81° 17.300’	30° 31270	81° 28833	565185.14	2173766.53

[1] Degrees, Decimal Minutes
[2] Decimal Degrees
[3] State Plane Florida (Feet)

With respect to mineral resources, this site is located immediately south of the Duval County sand borrow area (Figure 2.2-2). A small portion of the northern boundary of Alternative Site 2 abuts the southern boundary of the sand borrow area. The westernmost boundary of this site is approximately 1 nmi east of primary shrimp trawling areas that were identified by commercial shrimpers during the August 2010 scoping meeting. During the sidescan studies conducted in October 2009 and March 2010, some worm tube and mollusk aggregations were identified south of the site (Figure 2.2-2). Divers observed aggregations of transverse arks (*Anadara*

transversa) at a station within this sidescan signature approximately 800 feet to the south of the southern boundary of Alternative 2. Aggregations of this bivalve species along with shingle tube worm (*Owenia fusiformis*) colonies and shell fragments were found in many areas of the three alternative sites based on results of faunal surveys (ANAMAR 2011). There is also 0.8 acres of hardbottom rubble within Alternative 2 boundaries. Additionally, a feature approximately 70 feet long was recorded on sidescan and is located approximately 1,360 feet south of the site. The structure appears to be a shipwreck based on recent (March 2010) high-resolution sidescan imagery. Two associated objects are visible in the high-resolution imagery that resembles outriggers or masts, one of which is completely separated from the hull and lies on the seafloor nearby. Maximum relief is unknown but appears to exceed 6.5 feet.

2.2.2.3. Alternative 3: North of the Jacksonville ODMDS

Alternative 3 is the designation of a 4-nmi^2 site approximately 6 nmi north of the existing Jacksonville ODMDS and 1 nmi south of the Fernandina Beach ODMDS (Figure 2.2-3). Boundary vertices coordinates are provided in Table 2.2-4. The center of the site is 5.9 nmi northeast of the mouth of the St. Johns River. Water depths at this site range from 46 to 62 feet MLLW, with an average depth of 55 feet MLLW.

Table 2.2-4 Alternative 3 Coordinates (NAD83)

Vertices	Geographic Coordinates[1]		Geographic Coordinates[2]		Plane Coordinates[3]	
	Lat (N)	Long (W)	Lat (N)	Long (W)	x (northing)	y (easting)
Northwestern	30° 29.873’	81° 20.520’	30° 49789	81° 34200	548454.62	2241166.58
Northeastern	30° 29.869’	81° 18.307’	30° 49782	81° 30513	560066.98	2241109.66
Eastern	30° 28.674’	81° 18.296’	30° 47790	81° 30494	560105.04	2233861.39
Southeastern	30° 27.399’	81° 19.662’	30° 45666	81° 32770	552913.61	2226157.66
Southwestern	30° 27.394’	81° 20.511’	30° 45657	81° 34185	548454.50	2226138.50
Centroid	30° 28.787’	81° 19.532’	30° 47979	81° 32553	553621.89	2234570.18

[1] Degrees, Decimal Minutes
[2] Decimal Degrees
[3] State Plane Florida (Feet)

There is a charted shipwreck approximately 0.3 nmi south, a charted fish haven 1 nmi south, and several artificial reefs (also called Fish Haven/Obstructions) in a permitted zone approximately 3.5 to 5 nmi to the east (see NOAA chart 11488) (Figure 2.2-3). There are also hardbottom areas to the south and east of the site that were identified and delineated during the October and March 2010 sidescan surveys. Two types of hardbottom areas were identified: areas of patchy low relief and an extensive ledge complex with exposed outcroppings. The ledges are within an area of rock covered by a veneer of sand and sessile-attached organisms including sponges, gorgonians, and octocorals.

In October 2009, divers were deployed to a shipwreck/derelict vessel identified in the sidescan imagery. The boat is 39 feet long with a beam 13 feet. It is resting upright on the bottom at a depth of 50 feet and is covered with encrusting organisms, including a video-identified *Oculina* coral, and is utilized by reef fishes. A loggerhead sea turtle (*Caretta caretta*) was observed there by divers.

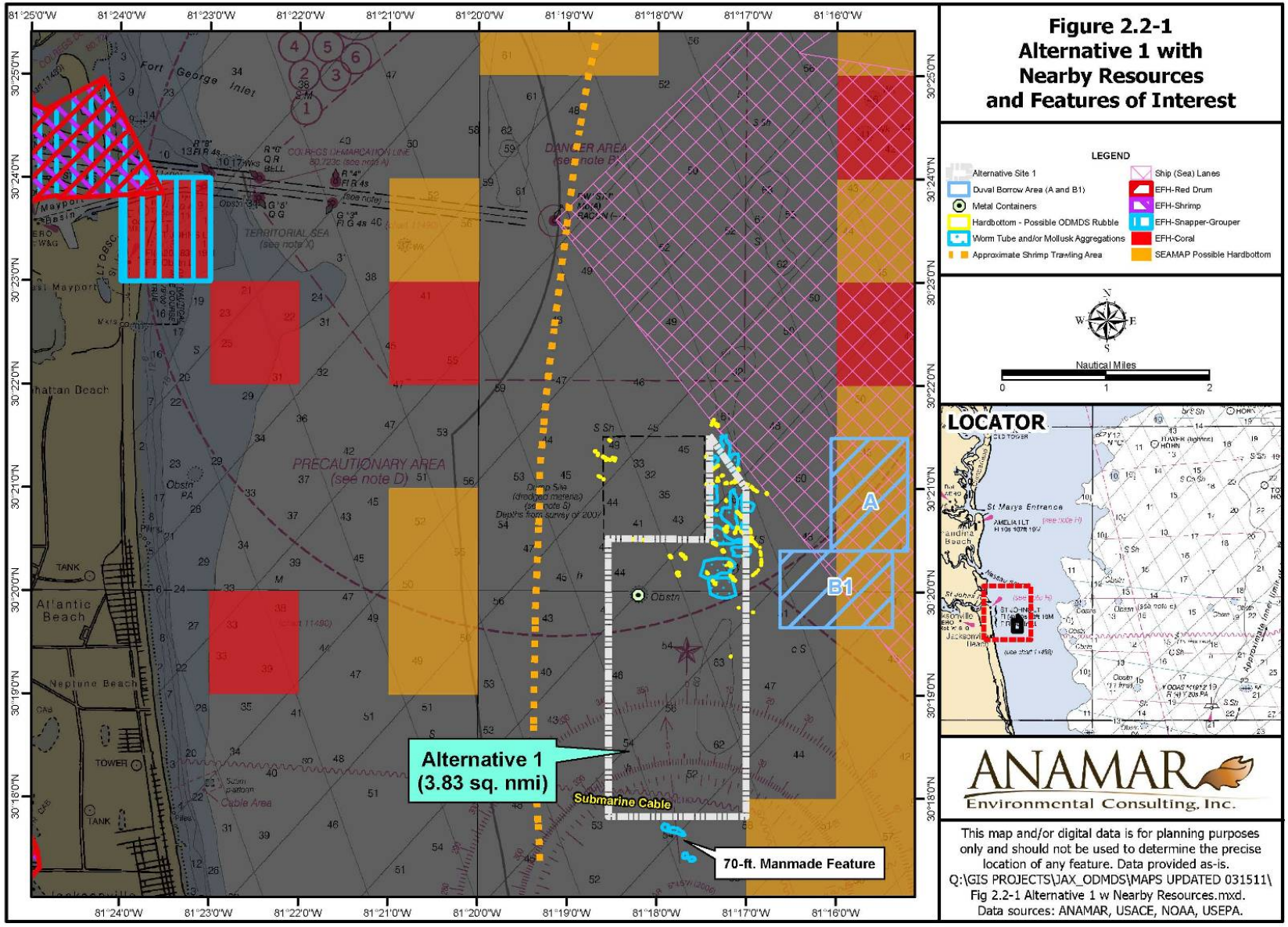


Figure 2.2-1
Alternative 1 with Nearby Resources and Features of Interest

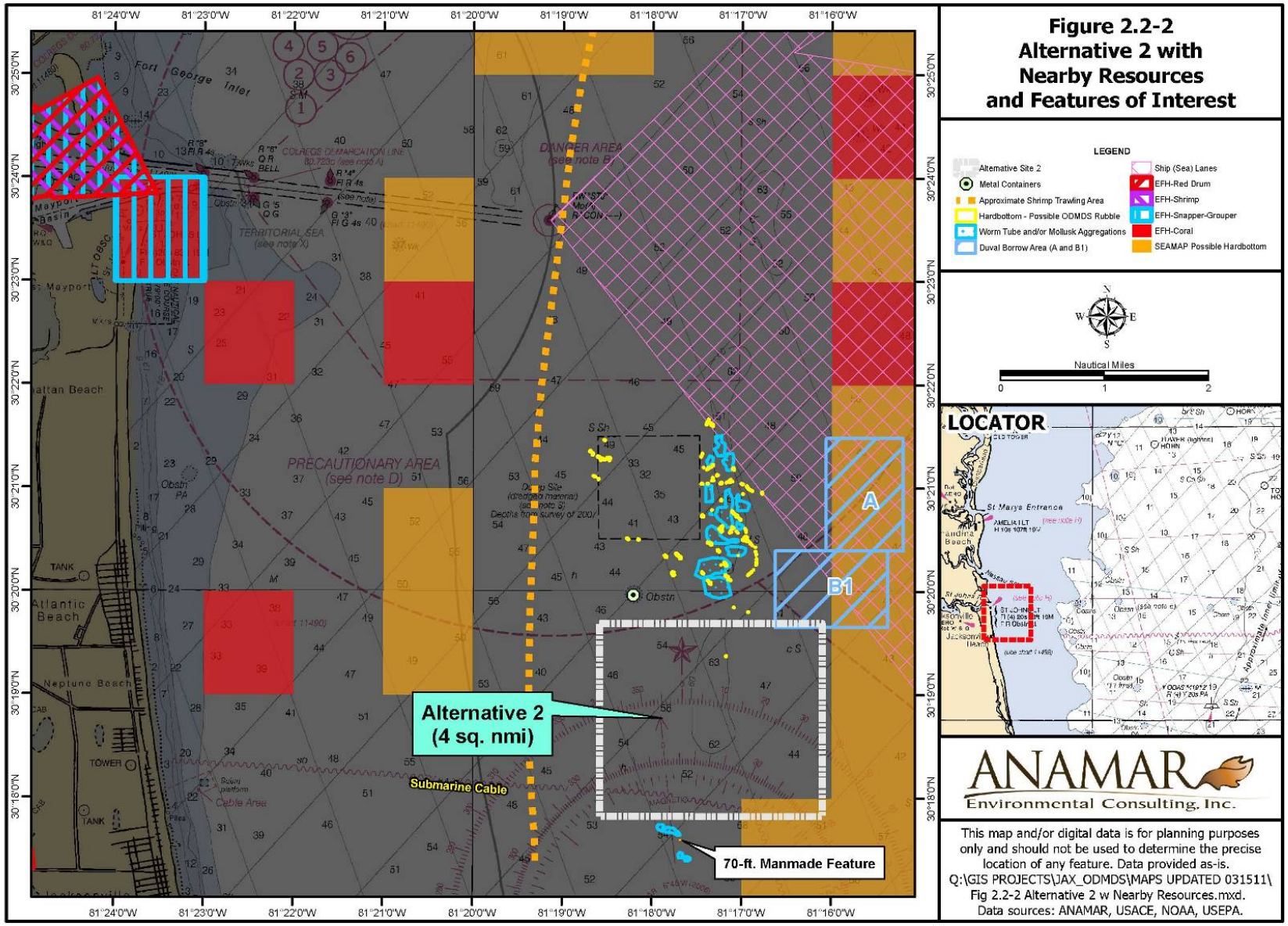


Figure 2.2-2
Alternative 2 with Nearby Resources and Features of Interest

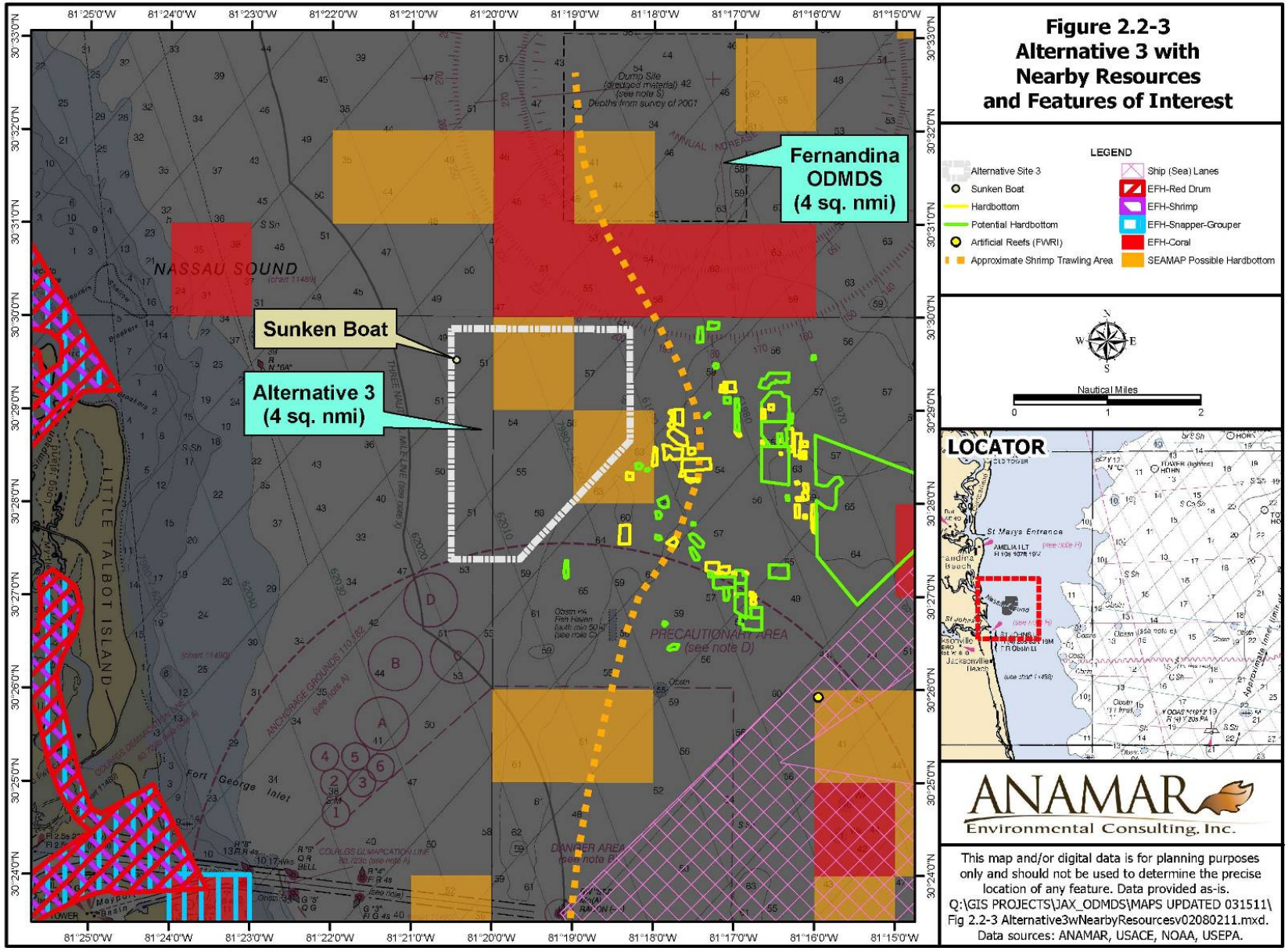


Figure 2.2-3
Alternative 3 with Nearby Resources and Features of Interest

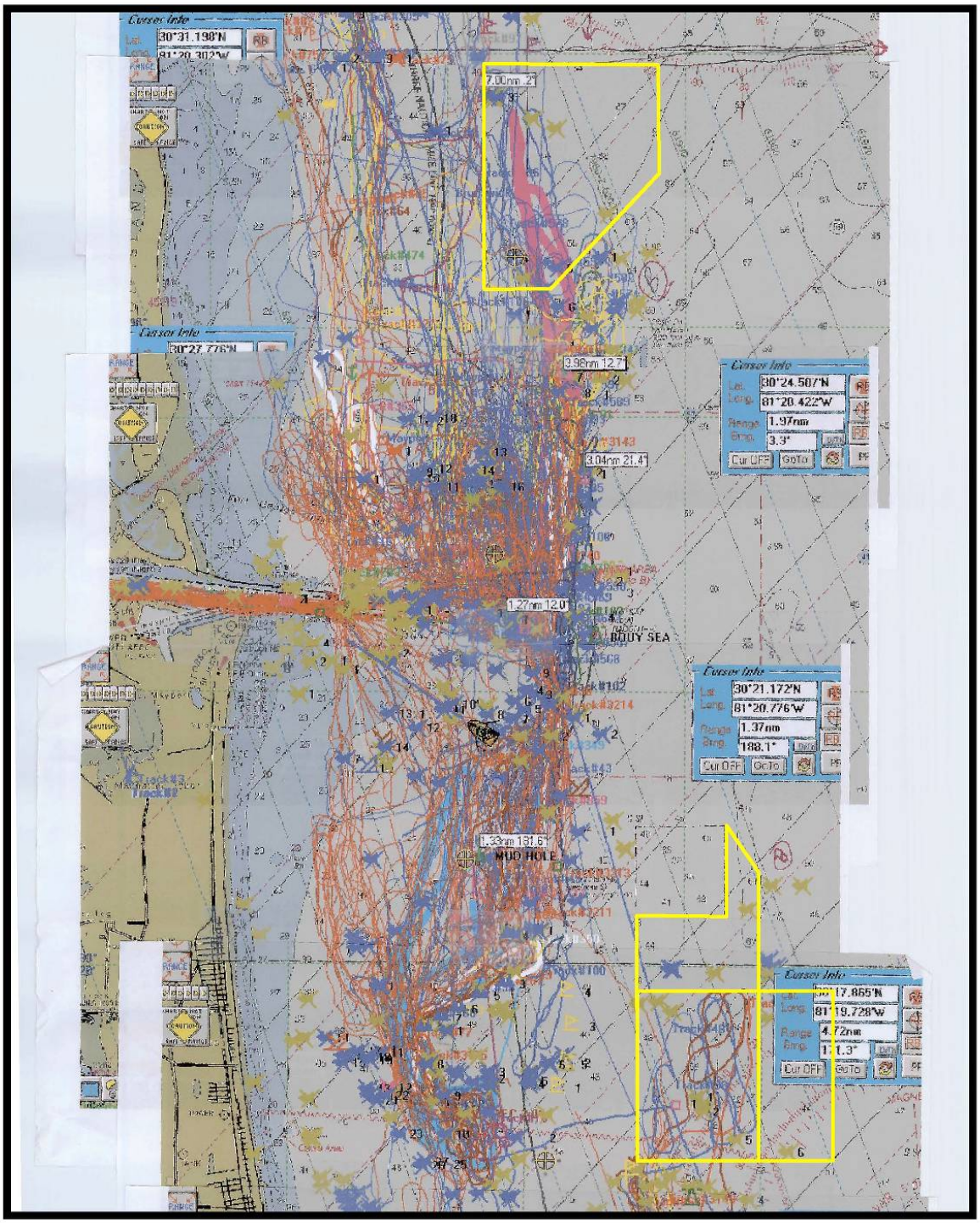


Figure 2.2-4. Shrimp Trawling Lines with Alternative Boundaries 1-3

This map and/or digital data is for planning purposes only and should not be used to determine the precise location of any feature.
Data provided as-is. Data source: USACE Q:\GIS PROJECTS\JAX_ODMDS\MAPS UPDATED 031511\Figure 2.2-4 Shrimp Trawling Lines.mxd SOURCE: Nancy Jones 2010.

During the August 2010 scoping meeting, representatives of the commercial shrimp fishing community commented that this was not a preferred site for them because it is in an area used heavily by commercial shrimp trawlers 9 to 10 months of the year, particularly when state waters are closed (Appendix A, Figure 2.2-4). This site is also located within North Atlantic right whale critical habitat in an area that historically has a high number of recorded occurrences (Figures 3.3-5 and 3.3-6 in Chapter 3). Right whales appear to occur in higher numbers in areas north of the St. Johns River compared to south of the river, and there is concern of increased potential for collision with a hopper dredge or scow during transit to the disposal site.

2.2.2.4. Disposal off the Continental Shelf

The EPA Ocean Dumping Regulations state in Section 228.5(e) that the "EPA will, whenever feasible, designate ocean dumping sites beyond the edge of the continental shelf and other such sites that have been historically used." A deepwater alternative site more than 60 nmi from the mouth of the St. Johns River, off the continental shelf at depths from 492 feet (150 m) to 656 feet (200 m), was evaluated in detail using EPA site selection criteria in a 1983 EIS prepared for the designation of the Jacksonville ODMDS (USEPA 1983). This site has not been used for dredged material disposal, and the potential effects of dredged sediment disposal on benthic infaunal and epifaunal organisms and other resources are presently unknown. The use of this relatively distant site would also greatly increase the cost of hauling material to the site.

Also, based on the results of the ZSF economic feasibility analysis, USACE must locate the ODMDS within a 5- to 10-nmi radius from the mouth of the St. Johns River (USACE 2010b). Disposal off the continental shelf edge would require use of a site located more than 60 nmi from the mouth of the St. Johns River, a distance beyond the point at which dredged material disposal is considered economically and operationally feasible. This limitation to a 5– to 10-nmi radius reflects the economic constraints on dredging and disposal operations for the Jacksonville Harbor area, particularly as they relate to increasing fuel costs which could be as much as seven times higher if a site off the continental shelf were selected. Regular monitoring of the site, as required by the SMMP, would also be more difficult logistically and more costly at a site located beyond the edge of the continental shelf. Based on these factors, the option of using off-shelf sites for disposal of dredged material was eliminated from further consideration.

2.2.3. Non-Ocean Disposal Alternatives

As required by Section 103 of the MPRSA, alternatives to ocean disposal are considered and include upland disposal, beach renourishment, and other beneficial uses.

2.2.3.1. Upland Disposal

Land disposal alternatives are considered by USACE when evaluating the need for ocean disposal. Historically, USACE has used the most economically practicable disposal option which is typically upland CDFs located along the St. Johns River because of their proximity to the dredging site. There are several upland CDFs in the area including Buck Island, Bartram Island, and Blount Island (Figure 1.4-2). However, capacity issues related to Bartram Island and Buck Island may limit upland disposal options. USACE Jacksonville District summarized these issues in an email dated August 13, 2009.

- In 2008, JAXPORT suspended annual mining of 291,000 cy of construction-grade material from the CDF at Buck Island due to complaints from adjacent homeowners and the National Park Service (NPS) concerning truck traffic through their neighborhoods. According to the 2005 Dredged Material Management Plan, this annual removal of material was supposed to continue through 2026. In addition, JAXPORT indicates an

additional 450,000 cy per year from terminal berthing areas will have to go to Buck Island or Bartram Island, and placement of that amount in Buck Island would exhaust its capacity limits by 2011. Adjacent homeowners and NPS have prevented further raising of the dikes on Buck Island due to view shed impacts with their homes and the NPS Ribault Monument at Fort Caroline National Memorial.

- Planned additional raising of the dikes on Bartram Island CDF Cells B, F, and G has not occurred due to recent geotechnical investigations which identified soil stability problems with the existing material in those cells. Continued placement of silty berthing area shoal material in those cells exacerbates the problem. Cell A had enough capacity to handle the quantities from the construction dredging of the federal navigation channel from river miles 14.7 to 20 to a project depth of 40 feet that was conducted in 2009 but completion of that activity nearly filled Cell A. Cell B has restrictions on it now and, because the dikes cannot be raised, has almost no future capacity. As an emergency measure, USACE removed material from Cell F to Cell G to provide emergency capacity for Cell F to hopefully take care of shoaling requirements through 2010. However, Bartram Island is nearing its capacity limits.
- No other upland CDF currently exists for Jacksonville Harbor. For the new Jacksonville Harbor General Re-evaluation Report II (GRR-2) Navigation Study, USACE plans to examine potential upland sites and expansion of Bartram Island CDFs into Mill Cove; however, environmental concerns, future development, and real estate costs may prove problematic.

2.2.3.2. Beach Nourishment, Nearshore Placement, and Other Beneficial Uses

Beach nourishment or nearshore placement using suitable dredged material is the preferred disposal alternative for all dredging projects. However, only beach-compatible material may be used in beach renourishment and nearshore placement projects. Florida Administrative Code Chapter 62B-41.007, Subsections 5(j)-5(k) (the “Florida State Sand Rule”), defines beach-compatible material as material that maintains the general character and functionality of material occurring on a beach and in adjacent dunes and coastal systems. Such material occurs predominantly along beaches and in adjacent dunes and coastal systems. Beach-compatible material is predominantly carbonate, quartz, or other similar material with a particle size distribution ranging from 0.062 mm to 4.79 mm, must be similar in color and grain size distribution to existing material at the placement site, and must not contain any of the following:

- Greater than 5%, by weight, silt, clay, or colloids passing the #230 sieve;
- Greater than 5%, by weight, fine gravel retained on the #4 sieve;
- Coarse gravel, cobbles, or material retained on the ¾-inch sieve in a percentage or size greater than that of material on the native beach;
- Construction debris, toxic material, or other foreign matter; and
- Any materials or characteristics that would result in cementation on the beach.

Sandy sediment derived from dredging projects is deemed suitable for beach placement with up to 10% fine material passing the #230 sieve, provided it meets the above criteria and appropriate water quality standards. Such material containing 10% to 20% fine material passing the #230 sieve and meeting all other sediment and water quality standards is considered suitable for placement on nearshore portions of beaches.

The USACE does propose to dispose of suitable, beach-compatible maintenance dredge material from some cuts of the Jacksonville Harbor Federal Navigation Project in the Pipe and

Barge nearshore placement areas (Figure 1.3-4) (USACE 2011). The U.S. Navy also evaluated the potential to minimize the volume of material from Naval Station Mayport disposed of in the ODMDS by placing any significant quantities of material meeting State of Florida beach compatibility requirements on local beaches. USACE collected vibracore samples in the locations potentially containing thick-enough sand layers in the outer Naval Station Mayport entrance channel and the federal navigation channel. However, USACE concluded that it was not feasible to separate the limited beach-quality lenses (layers) from the non-beach-compatible material (NAVFAC 2008). Therefore, alternative disposal options to beach nourishment or nearshore placement are needed for this material.

Other potential beneficial uses of dredge material include construction fill, cap material in aquatic remediation projects, wetland creation, wetland restoration, landfill daily cover, and recycling into commercial products such as construction aggregate, ceramic tiles, or other building materials. Each of these disposal management options is evaluated when permits are issued for individual dredging projects. Suitability of dredge material for these uses is based, in part, on physical and chemical characteristics of the dredge material.

2.3. Compliance with USEPA Criteria

This section summarizes the assessment of the proposed alternative ODMDSs and the No Action Alternative and their consistency with the EPA general and specific criteria for the selection of a location for an ODMDS. Chapters 3 and 4 of this EIS provide a more detailed discussion of the assessment.

2.3.1. General Site Selection Criteria (40 CFR § 228.5)

This section presents an assessment of the extent to which the proposed alternative ODMDSs and the No Action Alternative meet the five general site selection criteria 40 CFR 228.5 (a) to (e).

2.3.1.1. General Site Selection Criteria 40 CFR § 228.5(a)

> *The dumping of materials into the ocean will be permitted only at sites or in areas selected to minimize the interference of disposal activities with other activities in the marine environment, particularly avoiding areas of existing fisheries or shellfisheries, and regions of heavy commercial or recreational navigation.*

<u>Alternative 1: Expansion of the Existing Jacksonville ODMDS</u>
Historical disposal of dredged material at the existing Jacksonville ODMDS has not interfered with commercial or recreational navigation, commercial fishing, or sportfishing activities. Expansion of this site is not expected to change these conditions. This site avoids any identified major fisheries, natural and artificial reefs, and areas of recreational use. Alternative 1 is approximately 1 nmi east of the areas identified by commercial shrimpers as important shrimp trawling areas (Figures 2.2-1 and 2.2-4). This site minimizes interference with shellfisheries by avoiding areas frequently used by commercial shrimpers. Alternative 1 encompasses an area that is used by commercial shrimpers 1 to 2 months of the year (Nancy Jones, pers. comm.), and the northern part of site is avoided altogether due to the presence of rubble that will damage the nets. Alternative 1 is not expected to adversely affect recreational boating and is located outside of designated shipping/navigation channels and anchorage areas. Therefore, this site is considered to be in compliance with 40 CFR § 228.5(a).

Alternative 2: South of Existing Jacksonville ODMDS

Since Alternative 2 is in close proximity to the existing Jacksonville ODMDS, disposal of dredged material at this site is not expected to interfere with commercial or recreational navigation, commercial fishing, or sportfishing activities. This site avoids any identified major fisheries, artificial reefs, or area of recreational use. This site minimizes interference with shellfisheries by avoiding areas frequently used for shrimp trawling. Alternative 2 is approximately 1 nmi east of the area identified by commercial shrimpers as important shrimp trawling areas (Figures 2.2-2 and 2.2-4). Alternative 2 encompasses an area that is used by commercial shrimpers 1 to 2 months of the year (Nancy Jones, pers. comm.). Alternative 2 is not expected to adversely affect recreational boating and is located outside of designated shipping/navigation channels and anchorage areas. Therefore, this site is considered to be in compliance with 40 CFR § 228.5(a).

Alternative 3: North of Existing Jacksonville ODMDS

This site would impact shellfisheries because the site lies within an area trawled by local commercial shrimpers 9 to 10 months of the year (Figures 2.2-3 and 2.2-4) (Nancy Jones, pers. comm.). The southern boundary of this site is also located adjacent to anchorage grounds. Increased traffic near the anchorage areas due to vessels transiting to the site to dispose of dredged material could have minor impacts on commercial navigation. Therefore, this site is not considered to be in compliance with 40 CFR § 228.5(a).

No Action Alternative: Use of the Fernandina Beach ODMDS

Using the existing Fernandina Beach ODMDS for disposal of dredged material generated from the Duval County region is not expected to interfere with existing fisheries or shellfisheries. This alternative could potentially have minor impacts to regions of commercial and recreational navigation north of the federal navigation entrance channel due to the increase in vessel traffic traveling to the Fernandina Beach ODMDS. However, this site is still considered to be in compliance with 40 CFR § 228.5(a).

2.3.1.2. General Site Selection Criteria 40 CFR § 228.5(b)

> *Locations and boundaries of disposal sites will be chosen so that temporary perturbations in water quality or other environmental conditions during initial mixing caused by disposal operations anywhere within the site can be expected to be reduced to normal ambient seawater levels or to undetectable contaminant concentrations or effects before reaching any beach, shoreline, marine sanctuary, or known geographically limited fishery or shellfishery.*

All of the alternatives are removed far enough from shore (minimum distance of 3.6 nmi) and fishery resources to allow water quality perturbations caused by dispersion of disposal material to be reduced to ambient conditions before reaching any environmentally sensitive areas. Therefore, all alternative offshore disposal sites are considered to be in compliance with 40 CFR § 228.5(b). Dilution rates are expected to range from 140:1 to 2800:1 after 4 hours (USACE 2010c).

2.3.1.3. General Site Selection Criteria 40 CFR § 228.5(c)

> *If at any time during or after disposal site evaluation studies, it is determined that existing disposal sites presently approved on an interim basis for ocean dumping do not meet the criteria for site selection set forth in Sections 228.5 through 228.6, the use of such sites will be terminated as soon as suitable alternate disposal sites can be designated.*

There are no existing sites presently approved on an interim basis in the region.

2.3.1.4. General Site Selection Criteria 40 CFR § 228.5(d)

> *The sizes of the ocean disposal sites will be limited in order to localize for identification and control any immediate adverse impacts and permit the implementation of effective monitoring and surveillance programs to prevent adverse long-range impacts. The size, configuration, and location of any disposal site will be determined as a part of the disposal site evaluation or designation study.*

The location, size, and configuration of the alternative sites allow and facilitate long-term capacity, site management, and site monitoring while limiting environmental impacts to the surrounding area to the extent possible. Based on projected future new work and maintenance dredged material disposal needs of approximately 60 million cy over the next 50 years, it is estimated that the new ODMDS should be 4 nmi^2 in size. An ODMDS of this size should have a capacity of greater than 65 million cy. This estimate is based on a recent calculation of existing capacity at the Fernandina Beach ODMDS which is also 4 nmi^2 in size and is located in water depths similar to those at Alternatives 1, 2, and 3.

A site management and monitoring program will be implemented to determine if disposal at the site is significantly affecting adjacent areas and to detect the presence of long-term adverse effects. At a minimum, the monitoring program will consist of bathymetric surveys, sediment grain size analysis, chemical analysis of
constituents of concern in the sediments, and an assessment of the health of the benthic community. The SMMP is included in Appendix F.

2.3.1.5. General Site Selection Criteria 40 CFR § 228.5(e)

> *EPA will, whenever feasible, designate ocean dumping sites beyond the edge of the continental shelf and other such sites that have been historically used.*

The continental shelf in the study area is approximately 60 to 70 nmi offshore of the coast. Neither of the historically used ocean dumping sites, Jacksonville ODMDS or Fernandina Beach ODMDS, is located beyond the continental shelf. The northern part of Alternative 1 overlays an area of historic dumping as evident by the presence of 6.9 acres of rubble in this area (Figure 2.2-1). None of the alternatives presented in this EIS are located beyond the continental shelf because it is not economically or operationally feasible based on the ZSF economic analysis.

2.3.2. Specific Site Selection Criteria (40 CFR 228.6)

The characteristics of the three offshore alternative sites and the No Action Alternative with respect to EPA's 11 specific criteria for site selection are compared in Table 2.3-1. EPA established these 11 criteria to constitute "…an environmental assessment of the impact of the site for disposal." These comparisons support the decision-making process in selecting the preferred alternative(s) over the other viable alternatives. Detailed information on the physical, chemical, biological, and socioeconomic environment and potential impacts of the proposed action is presented in Chapter 3: Affected Environment and Chapter 4: Environmental Effects and is also summarized in Table 2.5.1.

2.4. Alternatives Eliminated from Further Evaluation

This section presents a discussion of the alternatives that are not being considered for further analysis in Chapters 3 and 4 of the EIS and the rationale for eliminating them.

2.4.1. Disposal Off the Continental Shelf

ZSF study concluded that the site needs to be within a 5- to 10-nmi radius from the entrance channel at the mouth of the St. Johns River (USACE 2010b). The continental slope is located approximately 60 to 70 nmi offshore of Jacksonville. The transportation of material to a site located off the continental shelf is not economically feasible; therefore, this alternative is eliminated from further consideration.

2.4.2. Upland Disposal

Upland disposal is not a viable option for the large quantities of suitable dredged material removed from the Federal navigation channel and Naval Station Mayport turning basin, and Naval Station Mayport entrance channel. Although this alternative has been eliminated from further evaluation as a designated site in this EIS because of present lack of capacity at CDFs currently in use and lack of land availability for the creation of new CDFs, it remains an option for disposal of smaller quantities of materials unsuitable for ocean disposal. Each dredging project will be evaluated separately to determine if upland disposal is an option.

2.4.3. Beach Nourishment, Nearshore Placement, and Other Beneficial Uses

The use of dredged material for beach nourishment, nearshore placement, or other beneficial uses is encouraged, but only if the material meets certain criteria. The suitability of dredged material for these uses is based in part on physical and chemical characteristics of the dredged material. Although this alternative has been eliminated from further evaluation in this EIS, beneficial use is evaluated when permits are issued for individual dredging projects.

2.5. Comparison of Alternatives Considered

Table 2.5-1 lists the alternatives considered and summarizes the direct and indirect impacts of the alternatives, which were evaluated for the potential to meet the project objectives and consistency with project constraints. As discussed in Section 2.4, some alternatives were not evaluated further than the initial screening due to a combination of economic viability, logistics, and other constraints. The screening process eliminated from further consideration and detailed evaluation those alternatives that did not address the overall planning objectives or the purpose and need for the proposed action. The federal planning objectives are to identify an environmentally acceptable and economically and logistically feasible ocean disposal site for long-term (>50 years) disposal of suitable dredged material generated from new projects and maintenance dredging in the vicinity. Only those alternatives that warranted consideration based upon the overall planning objectives were brought forward for further evaluation. Based on the initial screening process, Alternatives 1, 2 and 3 and the No Action Alternative have been carried forward for detailed evaluation in Chapters 3 and 4 of this EIS.

Table 2.3-1. Comparison of ODMDS Alternatives and USEPA Specific Site Selection Criteria (Page 1 of 2)

40 CFR 228.6(a) Criteria	Alternative 1: Expansion of Existing ODMDS	Alternative 2: South of the Existing ODMDS	Alternative 3: North of the Existing ODMDS	No Action Alternative: Fernandina Beach ODMDS
1. Geographical position, depth of water, bottom topography, and distance from the coast.	a. Geographical position: Located on the shallow continental shelf off northeast Florida. The center of the site is 7.1 nmi southeast of the mouth of the St. Johns River (81° 17.739' W; 30° 19.289' N) (Figure 2.1-5). b. Depth of water: Range = 43 to 66 feet MLLW, average depth = 57 feet c. Regional bottom topography is characterized by sand waves, shoals, and moderate-relief reefs. Sediment is predominantly silty sand and poorly graded sand (70–98% sand) (ANAMAR 2011). d. Distance from coast = 4.4 nmi	a. Geographical position: Located on the shallow continental shelf off northeast Florida. The center of the site is 7.4 nmi southeast of the mouth of the St. Johns River (81° 17.300' W; 30° 18.762' N) (Figure 2.1-5). b. Depth of water: Range = 44 to 64 feet MLLW, average depth = 55 feet. c. Regional bottom topography is similar to Alternative 1. Sediment is predominantly silty sand and poorly graded sand (79-99% sand) (ANAMAR 2011). d. Distance from coast = 4.4 nmi	a. Geographical position: Located on the shallow continental shelf off northeast Florida. The center of the site is 5.9 nmi northeast of the mouth of the St. Johns River (81° 19.532' W; 30° 28.787' N) (Figure 2.1-5). b. Depth of water: Range = 46 to 62 feet MLLW, average depth = 55 feet. c. Regional bottom topography is similar to Alternative 1. Sediment is predominantly silty sand and poorly graded sand (81–98%) (ANAMAR 2011). d. Distance from coast = 3.6 nmi	a. Geographical position: Located on the shallow continental shelf off northeast Florida. The center of the site is 9.3 nmi northeast of the mouth of the St. Johns River (Figure 2.1-5). b. Depth of water: Range = 37 to 69 feet MLLW, average depth = 53 feet c. Regional bottom topography is similar to Alternative 1. Sediments are predominantly sand (55–99%) (USEPA 2006). d. Distance from coast = 7.1 nmi
2. Location in relation to breeding, spawning, nursery, feeding, or passage areas of living resources in adult or juvenile phases.	a. The most active fish breeding and nursery areas are located in inshore estuarine waters, along adjacent beaches, or in nearshore reef areas. b. Spawning and migrating adult penaeid shrimp may be present in the vicinity of the site. c. The site is located within North Atlantic right whale critical habitat (Figure 3.3-1). Wintering and calving grounds are located in the vicinity of the site (Figure 3.3-4).	Same as Alternative 1	Same as Alternative 1	Same as Alternative 1
3. Location in relation to beaches and other amenities such as natural and artificial reefs and fishing spots.	The proposed site is approximately 4.4 nmi from coastal beaches and protected inshore waters. Shore-related amenities include Nassau River-St. Johns River Marshes Aquatic Preserve, Little Talbot Island State Park, Kingsley Plantation Historic Monument, and Fort Caroline National Memorial (Figure 2.1-5). These amenity areas are outside the area to be affected by disposal in the proposed ODMDS. The site is approximately 4-5 nmi west of the nearest artificial reef or fishing hotspots (Figures 2.1-3 and 3.4-4).	Same as Alternative 1	The proposed site is approximately 3.6 nmi from coastal beaches and protected inshore waters. Shore-related amenities include Cumberland Island National Seashore, Fort Clinch State Park and Aquatic Preserve, Nassau River-St. Johns River Marshes Aquatic Preserve, Little Talbot Island State Park, Kingsley Plantation Historic Monument, and Fort Caroline National Memorial (Figure 2.1-5). These amenity areas are outside the area to be affected by disposal in the proposed ODMDS. This site is approximately 3-4 nmi west of the nearest artificial reef or fishing hotspots (Figures 2.1-3 and 3.4-4).	The Fernandina Beach ODMDS is located 7 nmi east of the nearest beach and shore-related amenity. Shore-related amenities are the same as Alternative 3. These amenity areas are outside the area to be affected by disposal in the Fernandina Beach ODMDS.
4. Types and quantities of wastes proposed to be disposed of and proposed methods of release, including methods of packaging the waste, if any.	Average annual maintenance material is approximately 0.5 to 1.12 million cy and up to 31.5 million cy of new work material. Sediments dredged from the federal navigation channel are predominantly (69%) sand (USACE 2008). Sediments dredged from Naval Station Mayport range from sand to silty clay (USACE 2008). Hopper dredge, barge, and scow combinations are the usual vehicles of transport for the dredged material. None of the material is packaged in any manner.	Same as Alternative 1	Same as Alternative 1	Same as Alternative 1
5. Feasibility of surveillance and monitoring.	Monitoring of the site is feasible and is described in the SMMP (Appendix F).	Same as Alternative 1	Same as Alternative 1	Same as Alternative 1

Table 2.3-1. Comparison of ODMDS Alternatives and USEPA Specific Site Selection Criteria (Page 2 of 2)

40 CFR 228.6(a) Criteria	Alternative 1: Expansion of Existing ODMDS	Alternative 2: South of the Existing ODMDS	Alternative 3: North of the Existing ODMDS	No Action Alternative: Fernandina Beach ODMDS
6. Dispersal, horizontal transport, and vertical mixing characteristics of the area, including prevailing current direction and velocity, if any.	Waves are predominately out of the east and a few exceed 2 meters (6.6 feet) in height or 15 seconds (s) in period (USEPA 2009a). Waves are the primary factor influencing re-suspension of disposed dredged material, and currents probably affect the direction and magnitude of transport (USEPA 2009a). Currents flow predominately in a north-northwest and south-southeast direction and rarely exceeds 30 cm/s in magnitude (USEPA 2009a). Surface currents are stronger than near-bottom currents. The net direction of transport is to the southeast with surface currents having a stronger southerly component (USEPA 2009a). Dilution rates are expected to range from 140:1 to 2800:1 after four hours (USACE 2010c).	Same as Alternative 1	Same as Alternative 1.	Waves are predominately out of the east and a few exceed 2 meters (6.6 feet) in height or 15 s in period (USEPA 2009a). Waves are the primary factor influencing re-suspension of disposed dredged material, and currents probably affect the direction and magnitude of transport (USEPA 2009a). Currents dominated by tides in the north by northwest and south by southeast directions. Median surface current = 17 cm/s. Median bottom current = 10 cm/s (USEPA 2009a). The net direction of transport was originally to the south followed by a northeasterly trend at the surface and a northwesterly trend near the bottom and throughout the water column average (USEPA 2009a)
7. Existence and effects of current and previous discharges and dumping in the area (including cumulative effects).	Disposal has occurred at the Jacksonville ODMDS. Alternative 1 is in close proximity to the Jacksonville ODMDS (Figure 2.1-5). Based on previous studies, no notable differences were detected between the inside and outside of the Jacksonville ODMDS that appear to have affected the chemical, physical, and biological integrity of this designated area (USEPA 2010a).	Same as Alternative 1	Disposal has occurred at the Fernandina Beach ODMDS. Alternative 3 is in close proximity to the Fernandina Beach ODMDS (Figure 2.1-5). Based on previous studies, no notable differences were detected between the inside and outside of the Fernandina Beach ODMDS that appear to have affected the chemical, physical, and biological integrity of this designated area (USEPA 2006).	Disposal has occurred at the Fernandina Beach ODMDS. Based on previous studies, no notable differences were detected between the inside and outside of the Fernandina Beach ODMDS that appear to have affected the chemical, physical, and biological integrity of this designated area (USEPA 2006).
8. Interference with shipping, fishing, recreation, mineral extraction, desalination, fish and shellfish culture, areas of special scientific importance, and other legitimate uses of the ocean.	Alternative 1 should not interfere with shipping or recreational fishing activities. The site is located within 1 nmi of a sand borrow area (Figure 2.2-1), but is not expected to interfere with sand mining activities. There are no active oil or gas leases in the area. Commercial shrimp trawling activities primarily occur in an area approximately 1 nmi west of the site (Figures 2.2-1 and 2.2-4). The site and surrounding area are not considered to be of special scientific importance.	Alternative 2 should not interfere with shipping or recreational fishing activities. The site is located immediately south of a sand borrow area (Figure 2.2-2), but is not expected to interfere with sand mining activities. There are no active oil or gas leases in the area. Commercial shrimp trawling activities primarily occur in an area approximately 1 nmi west of the site (Figures 2.2-2 and 2.2-4). The site and surrounding area are not considered to be of special scientific importance.	Alternative 3 should not interfere with shipping or recreational fishing activities. There are no sand borrow areas or active oil or gas leases near this site. Commercial shrimp trawling activities occur within the boundaries of Alternative 3 (Figures 2.2-3 and 2.2-4). The site and surrounding area are not considered to be of special scientific importance.	The Fernandina Beach ODMDS has been used since 1987 and interference with shipping and recreational fishing is not expected. There are no sand borrow areas near the Fernandina Beach ODMDS. Since this is an active disposal site, commercial shrimp trawling activities do not occur within the site boundaries. The site and surrounding area are not considered to be of special scientific importance.
9. Existing water quality and ecology of the site as determined by available data or by trend assessment or baseline surveys.	Water quality is good with no evidence of degradation. North Atlantic right whales are endangered and critical habitat occurs within and adjacent to this site. Sea turtles may be present in the vicinity of the site. Annelid worms, arthropods, echinoderms, gastropods, and bivalves are common benthic taxonomic groups. The Atlantic croaker, spotted hake, searobins, drums, and sand flounders are common fish species. Important mollusks include transverse and ponderous arks, mussels, and Atlantic calico scallops.	Similar to Alternative 1	Similar to Alternative 1	Similar to Alternative 1
10. Potentiality for the development or recruitment of nuisance species in the disposal site.	Disposal of dredged material is not expected to attract or result in recruitment of nuisance species to the ODMDS. Previous surveys at the existing Jacksonville ODMDS did not detect the development or recruitment of nuisance species (USEPA 2010a).	Same Alternative 1	Same Alternative 1. Striped barnacles, a nonindigenous invasive species, were identified in one trawl sample from this site (ANAMAR 2011).	Disposal of dredged material is not expected to attract or result in recruitment of nuisance species to the ODMDS.
11. Existence at or in close proximity to the site of any significant natural or cultural features of historical importance.	The survey identified three subbottom features and one magnetic cluster. The features that have potential to be impacted by dredged material disposal will be investigated further by archaeological divers to determine historical significance.	The survey identified three subbottom features and two magnetic clusters. The features that have potential to be impacted by dredged material disposal will be investigated further by archaeological divers to determine historical significance.	No survey was conducted in this area since it is not a preferred alternative.	There are no known adverse effects to submerged historic properties.

Table 2.5-1. Summary of Impacts of the Proposed and No Action Alternatives (Page 1 of 6)

ALTERNATIVE: ENVIRONMENTAL FACTOR:	Alternative 1 Expansion of Existing ODMDS	Alternative 2 South of Existing ODMDS	Alternative 3 North of Existing ODMDS	No-Action Alternative Status Quo
AIR QUALITY	Short-term, localized increases in concentrations of NO_2, SO_2, CO, VOCs, and PM associated with transport of dredged material to the disposal site. No significant impacts to air quality are expected as a result of proposed action.	Effects would be similar to Alternative 1, but air emissions would be slightly higher due to a longer transit distance to the disposal site.	Effects would be similar to Alternative 1, but air emissions would be less due to a shorter transit distance to the disposal site.	No effects to air quality at the proposed alternative sites. Short-term, localized increases in concentrations of NO_2, SO_2, CO, VOCs, and PM associated with transport of dredged material to either the Fernandina Beach ODMDS or upland placement. If the Fernandina Beach ODMDS were used, air quality emissions would be higher compared to Alternatives 1, 2, and 3 due to the longer transit distance. However, no significant impacts to air quality are expected as a result of the No Action Alternative.
WATER QUALITY	Short-term, localized increases in turbidity in the vicinity of the disposal site during disposal operations. No significant impacts to water quality are expected as a result of proposed action.	Similar to Alternative 1.	Similar to Alternative 1.	No effects to water quality at the proposed alternative sites. Potential increases in temporary, localized impacts to water quality (turbidity) in the vicinity of the Fernandina Beach ODMDS due to increased frequency of disposal events. No significant impacts to water quality are expected as a result of the No Action Alternative.

Table 2.5-1. Summary of Impacts of the Proposed and No Action Alternatives (Page 2 of 6)

ALTERNATIVE: ENVIRONMENTAL FACTOR:	Alternative 1 Expansion of Existing ODMDS	Alternative 2 South of Existing ODMDS	Alternative 3 North of Existing ODMDS	No-Action Alternative Status Quo
SEDIMENT QUALITY	Disposal of dredged material will result in the accumulation of dredged material over the seafloor and changes in sediment characteristics within the site and possibly adjacent to the site (transition to sediments containing a higher percentage of silt and clay). Disposal should not cause significant effects on concentrations of contaminants in the sediments.	Similar to Alternative 1.	Similar to Alternative 1.	No effects to sediment quality at the proposed alternative sites. There may be potential increases in the frequency of disposal events at the Fernandina Beach ODMDS. Impacts to sediment quality would be similar to those described for the alternative sites.
PROTECTED SPECIES – Sea Turtles	Impacts to sea turtles associated with dredged material disposal include possible collisions with dredge and support vessels, temporary decreases in foraging due to turbidity and burial of food resources, and underwater noise from dredging equipment. Impacts are expected to be short-term and localized. No significant impacts to sea turtles are expected as a result of proposed action.	Similar to Alternative 1.	Similar to Alternative 1.	No effects to sea turtles at the proposed alternative sites. There may be potential increases in the frequency of disposal events at the Fernandina Beach ODMDS. Impacts to sea turtles would be similar to those described for the alternative sites.
PROTECTED SPECIES – Manatees	Impacts to manatees associated with dredged material disposal include possible, but unlikely, encounters with manatees by dredge and support vessels during hauling and disposal operations. No significant impacts to manatee are expected as a result of proposed action.	Similar to Alternative 1.	Similar to Alternative 1.	No effects to manatees at the proposed alternative sites. There may be potential increases in the frequency of disposal events at the Fernandina Beach ODMDS. Impacts to manatees would be similar to those described for the alternative sites.

Table 2.5-1. Summary of Impacts of the Proposed and No Action Alternatives (Page 3 of 6)

ALTERNATIVE: ENVIRONMENTAL FACTOR:	Alternative 1 Expansion of Existing ODMDS	Alternative 2 South of Existing ODMDS	Alternative 3 North of Existing ODMDS	No-Action Alternative Status Quo
PROTECTED SPECIES – Whales	Impacts to the North Atlantic right whale and humpback whale associated with dredged material disposal include possible collisions with dredge and support vessels, temporary decreases in foraging due to turbidity and burial of food resources, and underwater noise from dredging equipment. Impacts are expected to be short-term and localized. No significant impacts to whales are expected as a result of proposed action.	Effects would be similar to Alternative 1, but risk of collisions may be slightly higher due to a longer transit distance to the disposal site.	Effects would be similar to Alternative 1, but risk of collisions may be slightly higher due to the higher occurrence of North Atlantic right whales north of the St Johns River (Figures 3.3-5 and 3.3-6).	No effects to whales at the proposed alternative sites. There may be potential increases in the frequency of disposal events at the Fernandina Beach ODMDS. Impacts to whale would be similar to those described for the alternative sites, but risk of collisions may slightly higher due to the longer transit distance and higher occurrence of North Atlantic right whales north of the St Johns River (Figures 3.3-5 and 3.3-6).
PROTECTED SPECIES – Fish	Shortnose sturgeon, Atlantic sturgeon, and smalltooth sawfish may be present, but are not likely to be present in the project area. Therefore, no significant impacts to protected fish are expected as a result of proposed action.	Similar to Alternative 1.	Similar to Alternative 1.	No effects to protected fish at the proposed alternative sites. If upland CDFs need to be expanded or created to manage dredged material, there may be impacts to protected fish since they may occur in the St. Johns River where CDFs would be located.
MARINE MAMMALS	See protected whale species above.	See protected whale species above.	See protected whale species above.	See protected whale species above.
SEABIRDS	Potential indirect impacts may include ship-following behavior, temporary reductions in prey items, and visual impairment of marine birds foraging in the vicinity of the disposal plume. No significant impacts to protected seabirds are expected as a result of proposed action.	Similar to Alternative 1.	Similar to Alternative 1.	No effects to seabirds at the proposed alternative sites. If material is hauled to the Fernandina Beach ODMDS, impacts would be similar to those described for the alternative sites. If upland CDFs need to be expanded or created to manage dredged material, there may be impacts to seabird nesting and foraging habitats.

Table 2.5-1. Summary of Impacts of the Proposed and No Action Alternatives (Page 4 of 6)

ALTERNATIVE: ENVIRONMENTAL FACTOR:	Alternative 1 Expansion of Existing ODMDS	Alternative 2 South of Existing ODMDS	Alternative 3 North of Existing ODMDS	No-Action Alternative Status Quo
BENTHIC FAUNA	Potential impacts include direct burial of benthic organisms and change in composition of sediments reducing abundance and diversity of the benthic communities within the site. Suspended sediments can also affect filter feeding organisms and abrade gill tissues. Effects of turbidity would be short-term and localized. Effects of burial and change in sediment composition can potentially be long-term depending upon the frequency of disturbance.	Similar to Alternative 1.	Similar to Alternative 1.	No effects to benthic infauna at the proposed alternative sites. If material is hauled to the Fernandina Beach ODMDS, impacts would be similar to those described for the alternative sites but may be increased due to increased frequency of disposal events, volume, and depth of burial. The increase in disposal activities within the site may impede recolonization at the site resulting in changes in species composition and community structure.
FISHES	Potential impacts include temporary decreases in foraging due to turbidity and burial of food resources. Adult fishes within the disposal area may experience a short-term reduction in dissolved oxygen (DO) uptake through the gills due to the presence of suspended particles. Impacts are expected to be short-term and localized. No significant impacts to fishes are expected as a result of proposed action.	Similar to Alternative 1.	Similar to Alternative 1.	No effects to fishes at the proposed alternative sites. If material is hauled to the Fernandina Beach ODMDS, impacts would be similar to those described for the alternative sites.

Table 2.5-1. Summary of Impacts of the Proposed and No Action Alternatives (Page 5 of 6)

ALTERNATIVE: ENVIRONMENTAL FACTOR:	Alternative 1 Expansion of Existing ODMDS	Alternative 2 South of Existing ODMDS	Alternative 3 North of Existing ODMDS	No-Action Alternative Status Quo
ESSENTIAL FISH HABITAT	Direct effects of sedimentation and turbidity are not expected to be substantial due to the mobility of the majority of federally managed species that may occur within the site and the lack of geographic constraints within the vicinity of the project area. There is 6.9 acres of rubble/hardbottom within the site. No significant impacts to EFH are expected as a result of proposed action.	Similar to Alternative 1. There is 0.8 acres of rubble/hardbottom within the site.	Similar to Alternative 1. There is hardbottom located south and east of the site.	No anticipated effects.
COMMERICAL FISHING	Alternative 1 is located outside of heavily used commercial fishing and shrimp trawling areas. No significant effects to commercial fishing are expected.	Similar to Alternative 1.	Alternative 3 is located within commercial shrimp trawling areas. This area would no longer be available to shrimpers due to potential net damage and would negatively impact commercial shrimpers.	No anticipated effects.
COMMERCIAL SHIPPING	No anticipated effects.	Similar to Alternative 1.	Similar to Alternative 1.	The No Action Alternative could have significant impacts on commercial shipping if dredging projects needed to facilitate those operations are delayed or become infeasible due to limited disposal capacity.
MILITARY USE	No anticipated effects.	Similar to Alternative 1.	Similar to Alternative 1.	The No Action Alternative could have significant impacts on military use if dredged projects needed to facilitate those operations are delayed or become infeasible due to limited disposal capacity.

Table 2.5-1. Summary of Impacts of the Proposed and No Action Alternatives (Page 6 of 6)

ALTERNATIVE: ENVIRONMENTAL FACTOR:	Alternative 1 Expansion of Existing ODMDS	Alternative 2 South of Existing ODMDS	Alternative 3 North of Existing ODMDS	No-Action Alternative Status Quo
MINERAL RESOURCES	Possible effects to sand borrow areas. Impacts will be minimized through site management.	Similar to Alternative 1.	No anticipated effects.	No anticipated effects.
NAVIGATION	No anticipated effects.	Similar to Alternative 1.	Similar to Alternative 1.	No anticipated effects.
RECREATION	No anticipated effects.	Similar to Alternative 1.	Similar to Alternative 1.	No anticipated effects.
HISTORIC PROPERTIES	Potential to adversely affect historic properties. Greater potential than Alternative 2, pending further investigation.	Potential to adversely affect historic properties. Less potential than Alternative 1, pending further investigation.	Potential unknown. No survey was conducted in this area since it is not a preferred alternative.	No effects to historic properties.
UNDERSEA CABLES	No anticipated effects.	Similar to Alternative 1.	Similar to Alternative 1.	No anticipated effects.
PUBLIC HEALTH	No anticipated effects.	Similar to Alternative 1.	Similar to Alternative 1.	No anticipated effects.

Table 2.5-2. Comparison of Alternative Sites Based on Results from the 2010 Site Designation Surveys

Parameter Results	Alternative 1 – Expansion of Jacksonville ODMDS	Alternative 2 – South of Jacksonville ODMDS	Alternative 3 – North of Jacksonville ODMDS
Water Profile (Spring)	No significant differences observed		
Water Profile (Fall)	No significant differences observed		
Water: Chemistry	No significant differences observed		
Sediment: Chemistry	No significant differences observed		
Sediment: Physical	Gravel = 0.0–8.75% Sand = 70.1–97.5% Silt/Clay = 0.50–28.26%	Gravel = 0.0–1.1% Sand = 79.3–98.6% Silt/Clay = 1.3–20.7%	Gravel = 0.3–1.3% Sand = 81.4–98.2% Silt/Clay = 1.5–18.1%
Infauna: Mean Spring Biomass (g)	23.88	23.18	73.11
Infauna: Mean Fall Biomass (g)	9.59	9.13	67.72
Infauna: Spring Mean Density/m^2	3,020	2,600	4,098
Infauna: Fall Mean Density/m^2	3,588	2,977	3,994
Infauna: Mean Shannon Diversity	3.38	3.37	3.29
Mollusk Dredge: Biomass (kg/100 m^2)	1.10	1.04	0.76
Mollusk Dredge: Total Density/100 m^2	>257	>237	137
Mollusk Dredge: Shannon Diversity (mean)	0.58	0.23	0.67
Epifauna: Mean Biomass (kg/1,000 m^2)	3.0	3.2	5.3
Epifauna: Mean Density/1,000 m^2	>173	>184	308
Epifauna: Mean Shannon Diversity	2.57	2.65	2.37
Epifauna: Managed Taxa Density/1,000 m^2	>13	≥14	19
Nonindigenous Species Identified in Samples	0	0	*n* = 100 striped barnacles

2.6. Selection of the Preferred Alternative

Based upon comparison of the three alternatives, Alternatives 1 and 2 have been selected as the preferred alternatives for the following reasons:

- Alternatives 1 and 2 are located within the ZSF radius of 5-10 nmi from the mouth of the St. Johns River.
- Alternatives 1 and 2 best meet EPA's general and specific site selection criteria.
- Alternatives 1 and 2 comply with all international, federal, state, and local regulations.
- Alternatives 1 and 2 would result in minimal environmental and socioeconomic impacts because it is sufficiently removed from amenities such as beaches, heavily used shrimp trawling areas, shipping lanes, areas of hardbottom, artificial reefs, and sand borrow areas.

- The southern portions of Alternative Sites 1 and 2 are only fished approximately 1 to 2 months of the year, if that much, and the northern half of Alternative Site 1 is avoided because of rubble which tears the nets (N. Jones, *pers comm.).* Therefore, Alternatives 1 and 2 minimize impacts to important commercial shrimp trawling areas and are preferred by commercial shrimpers over Alternative 3.
- Alternatives 1 and 2 have a shorter transit for the dredges and scows compared to the No Action Alternative (which may include hauling material to Fernandina Beach).
- Alternatives 1 and 2 avoid the area north of the St. Johns River that historically has had higher use by North Atlantic right whales compared to areas south of the St. Johns River.
- Alternatives 1 and 2 have potentially less impacts to biological resources compared to Alternative 3 based on results from the site designation studies (Table 2.5.2).
- Alternatives 1 and 2 will provide continued availability of an ocean disposal site for long-term management of dredged material from the Jacksonville area.

Based on available results from the submerged cultural resources survey, Alternative Site 1 has greater potential to adversely impact archaeological resources because the anomalies are located near the center of the site and would be harder to buffer and manage with respect to disposal activities. Anomalies identified within Alternative Site 2 are primarily located along the edges, making it easier to buffer these resources and manage disposal operations. However, results from additional archaeology dive surveys will be contributing factors in final site selection. Public comments will also be taken into consideration when selecting the final site for ODMDS designation.

3. EXISTING ENVIRONMENT

Chapter 3: Existing Environment

3.1 Ocean Disposal Site Characteristics
3.2 Physical Environment
3.3 Biological Environment
3.4 Socioeconomic Environment

This chapter describes the existing environment within and adjacent to the areas that may be affected by dredged material disposal operations if any of the alternatives described in Chapter 2 were implemented. This chapter, in conjunction with the description of the No Action Alternative, forms the baseline conditions for assessing and comparing the potential impacts of the proposed action and reasonable alternatives. Characteristics that are susceptible to significant adverse impacts generally are categorized as either physical, chemical, or biological. Additional information, such as physical oceanography and meteorology, is presented because these natural processes also influence the fate and impact of the released dredged material. Commercial, recreational, and cultural resources that may be affected by dredged material disposal are discussed in detail.

Section 3.1 provides an historical assessment of the use and associated environmental effects of dredged material disposal at the nearby existing ODMDSs. Section 3.2, Physical Environment and Section 3.3, Biological Environment describe the existing conditions and resources within and adjacent to the alternative sites. Section 3.4 contains a discussion of the Socioeconomic Environment and Cultural Resources.

The geographic area described and assessed varies for each resource area. The *region of influence* (ROI) for each resource is a geographic area within which the proposed action may exert some influence. For example, discussions of climate or air quality would cover a large geographic ROI, while bathymetry and sediment discussions would be limited to a narrowly defined ROI, such as the immediate vicinity of each alternative site.

Site designation studies were conducted by EPA, USACE, and ANAMAR Environmental Consulting, Inc. to obtain measurements of various physical, chemical, and biological parameters. The physical and biological results of these surveys are incorporated into the discussions of the Physical Environment (Section 3.2) and the Biological Environment (Section 3.3). Chemical parameters were measured to provide data on the background concentrations of potential contaminants of concern in the receiving sediments of the three alternative sites and adjacent areas. Detailed results from these studies are included in ANAMAR (2011). Several additional key documents were used to describe the existing environment as it relates to the proposed action and include, but are not limited to:

ANAMAR. 2011. *Site Designation Studies for a New Ocean Dredged Material Disposal Site off Jacksonville, Florida: Spring and Fall 2010 Survey Results.* Prepared for USACE, Jacksonville District. April 2011.

ANAMAR. 2010. *Jacksonville ODMDS Reconnaissance Sidescan Sonar Survey.* Prepared for USACE, Jacksonville District. August 2010.

USACE. 2008. *Jacksonville Ocean Dredged Material Disposal Site Capacity Report.* May 2008.

USEPA. 1983. *Final Environmental Impact Statement for Jacksonville Harbor, Florida, Ocean Dredged Material Disposal Site Designation.* USEPA Criteria and Standards Division. Washington, D.C.

USEPA. 1986. *Final Supplement to the Jacksonville Harbor Ocean Dredged Material Disposal Site Final Environmental Impact Statement for the Designation of a New Fernandina Harbor, Florida, Ocean Dredged Material Disposal Site.* USEPA Criteria and Standards Division. Washington, D.C. November 1986.

USEPA. 1999a. *Jacksonville, Florida ODMDS 1998 Benthic Community Assessment.* Prepared by Barry A. Vittor & Associates, Inc. for USEPA, Region 4, Wetlands, Coastal, and Water Quality Branch. November 1999.

USEPA. 1999b. *Jacksonville, Florida Ocean Dredged Material Disposal Site (ODMDS) Benthic Surveys: 1995 and 1998.* USEPA, Region 4, Science and Ecosystem Support Division. December 1999.

USEPA. 2006. *Fernandina ODMDS - Status and Trends, August 2005.* U.S. Environmental Protection Agency, Region 4, Water Management Division, Wetlands, Coastal & Nonpoint Source Branch, Coastal Section, SNAFC, 61 Forsyth St. SW, Atlanta, GA 30303.

USEPA. 2009a. *Ocean Current and Wave Measurement at the Jacksonville and Fernandina Beach Ocean Dredged Material Disposal Sites.* U.S. Environmental Protection Agency Region 4, Water Management Division, Coastal Section and Science and Ecosystem Support Division – Ecological Evaluation Section. EPA-904-R-09-001. January 2009.

USEPA. 2010a. *Jacksonville, Florida Ocean Dredged Material Disposal Site (ODMDS) Survey.* USEPA, Region 4, Science and Ecosystem Support Division, Atlanta, GA.

USEPA and USACE. 2007. *Jacksonville Ocean Dredged Material Disposal Site: Site Management and Monitoring Plan.* USEPA and USACE Jacksonville District. November 2007.

USEPA and USACE. 2010. *Fernandina Beach Ocean Dredged Material Disposal Site: Site Management and Monitoring Plan.* USEPA and USACE Jacksonville District. February 2010.

3.1. Ocean Disposal Site Characteristics

This section provides background on the historical use of the study region (Section 3.1.1), a characterization of the dredge material to be disposed including volumes and methods of disposal (Section 3.1.2), existence and effects of previous discharges and dumping at the Jacksonville and Fernandina Beach ODMDSs (Section 3.1.3), and a general discussion of the feasibility of surveillance and monitoring (Section 3.1.4).

3.1.1. Historical Use of Study Region [40 CFR 228.5(e)]

Routine dredged material disposal operations have not occurred within Alternative Sites 1, 2, or 3; however, the Jacksonville ODMDS and Fernandina Beach ODMDS have been historically used for disposal of dredged material in the region (Figure 1.3-1). The existing Jacksonville ODMDS and vicinity have been in use since 1952 for disposal of dredged material (e.g., sand, silt, clay, gravel, shell, and some rock) from the Jacksonville Harbor Navigation Project and the Naval Station Mayport entrance channel and turning basin. The Jacksonville ODMDS received interim site designation status in 1977 and final designation in 1983. Prior to 1970 and in the early 1970s, material was disposed in an area 0.5 nmi east of the Jacksonville ODMDS. In the late 1970s material was disposed south of the site (USEPA AND USACE 2007).

The Fernandina Beach ODMDS was designated by EPA in 1987. The ODMDS received more than 6 million cy of dredged material from new work at the Kings Bay Entrance Channel in 1988. Since then it has received annual maintenance material from the channel of up to 1 million cy per year, with periodic disposal events from the Fernandina Harbor inner channel and turning

basin on the order of 1 million cy (USEPA 2006). In 2011, in addition to annual maintenance material, it received approximately 3.2 million cy from Naval Station Mayport as a result of the deepening project.

3.1.2. Types and Quantities of Wastes Proposed for Disposal [40 CFR 228.6(a)(4)]

The sources of dredged material to be disposed in the new designated ODMDS are anticipated to be primarily from the Jacksonville Harbor Navigation Project and the Naval Station Mayport entrance channel and turning basin. The amount and frequency of dredged material disposal is discussed in detail in Section 1.3. Specific volumes will depend on the characteristics of the dredge materials (evaluated on a per-project basis), potential disposal restrictions in the site management plan, the amount that can potentially be used for beneficial use, and the amount that can be disposed in an upland facility. The method of dredged material disposal is expected to remain comparable to historical dredging operations which have included a combination of mechanical and hydraulic dredging equipment. Clamshell and hopper dredges are typically used in the vicinity of Naval Station Mayport, and larger cutterhead equipment has also been used in the federal navigation channel.

3.1.2.1. Maintenance Material

Maintenance material dredged from the Naval Station Mayport turning basin and entrance channel and the Federal Navigation Channel, Bar Cut 3 has historically been disposed of offshore at the Jacksonville ODMDS. It is anticipated that this material will continue to go offshore and be disposed of in the new ODMDS. The amount of maintenance material going to the ODMDS from Jacksonville Harbor and Naval Station Mayport is expected to be approximately 0.5 to 1.12 mcy annually. The composition of maintenance dredged material is expected to be similar to that previously dumped at the existing Jacksonville ODMDS. The existing Jacksonville ODMDS contains a mixture of silt, sand, and clay sediments as well as coarse material such as shell, gravel, and rock (USEPA and USACE 2007). The majority of the maintenance dredged material destined for disposal in the ODMDS is expected to be composed of silt (10% to 60%) and clay (10% to 30%) (USEPA and USACE 2007). Some of the material dredged to maintain the entrance channel and certain reaches of the St. Johns River near Jacksonville are predominantly fine- to medium-grained sands and are typically used for beach renourishment projects and are not disposed in the Jacksonville ODMDS.

Naval Station Mayport Turning Basin and Entrance Channel. Results from the physical analysis of sediment samples (core borings) collected from the Naval Station Mayport turning basin indicate the maintenance dredged material is predominantly loose to very loose silt (52%) and clay (36%) with some sand (12%). Maintenance dredged material from the Mayport entrance channel consisted of 84% sand and 16% silt and clay (USACE 2008).

Sediment chemistry analysis conducted in 2002 prior to maintenance dredging of the Mayport entrance channel and turning basin revealed that concentrations of aluminum, arsenic, chromium, copper, iron, lead, nickel, and zinc were more than two times greater than amounts obtained at the Atlantic Ocean reference station (near the Jacksonville ODMDS) (ANAMAR 2002). Cadmium and mercury were either undetectable or present at very low levels [0.2 parts per million (ppm)] in both the project area and reference locations. No pesticides or polychlorinated biphenyls (PCBs) were detected, and only low levels of PAHs and organotin (chemical compounds based on tin with hydrocarbon constituents) were detected in some of the sediments in 2002.

Federal Navigation Channel, Bar Cut 3. Sediment characteristics for the federal channel new work (proposed deepening) were derived from the 2007 Navy EIS core borings (NAVFAC 2008). Results indicate that the new work material would consist of approximately 69% sand, 22% clay, and 9% silt (USACE 2008). The results of sediment chemistry analysis indicate that the sediments collected from the navigation channel contain low but detectable concentrations of metals, PCBs, semi-volatile organic compounds (SVOC), pesticides, and cyanide (NAVFAC 2008, Appendix A.3). Of the detected contaminants, only total PCBs from 1 of 10 samples analyzed were detected at concentrations that exceed NOAA sediment quality guidelines for effects range-low (ERL).

3.1.2.2. New Work Material

The new construction material generated from the proposed deepening of Jacksonville Harbor in all segments up to approximately River Mile 14 will vary between silty sand, shell and shelly sand, some areas of silt and clay, as well as areas of limestone and sandy limestone. Upstream from the Mile Point area, scattered rock will be present at varying depths (Figure 1.3-3). In general, the unconsolidated material becomes finer upstream, especially in the areas that have not been previously dredged (e.g. turning basins, wideners). Also, in general, the deeper the proposed project depths for this project, the more rock that will be encountered, with the exception of the area downstream of Mile Point.

The amount of material generated from the proposed deepening of Jacksonville Harbor will depend on the final project depth (between 41 and 50 feet) along each of the project reaches. Based on the Jacksonville Harbor General Re-Evaluation Report 2 preliminary dredging quantities (as of January 2012), the total amount of unconsolidated material (sand, silt, clay) generated from the deepening project could range from 7.6 million cy (based on a 41-foot project depth) up to 28.6 million cy (based on a 50-foot project depth). The total amount of rock generated could range from 60,000 cy (based on a 41-foot project depth) up to 2.9 million cy (based on a 50-foot project depth) (Steve Conger, pers. comm.). Not all of the rock material will likely be disposed of offshore in the ODMDS. It is anticipated that some of this material may be used for beneficial uses such as manufactured soil, artificial reefs, construction fill at Buck Island, filling deep holes at Mile Point, and nearshore beach placement (USACE and JAXPORT 2008).

3.1.3. Existence and Effects of Current and Previous Discharge and Dumping in the Area [40 CFR 228.6(a)(7)]

This section describes significant discharges and dumping into the ocean in the vicinity of the alternative sites where potential cumulative or synergistic impacts are possible. Determination of migration and impact of dredged material at each ODMDS in the region is a goal in the monitoring strategy currently employed by EPA Region 4 (USEPA and USACE 2008). The primary sources of data regarding the existence and effects of current and previous dumping in the area include bathymetry surveys, status and trends surveys including sediment and water chemistry, biological assessments, and dredged material disposal records from both the Jacksonville and Fernandina Beach ODMDSs. Findings from previous monitoring surveys conducted at the Jacksonville and Fernandina Beach ODMDSs are discussed in the following sections and summarized in Tables 3.1-1 and 3.1-2 at the end of the section. This information is helpful in assessing potential short- and long-term effects of dumping at the new designated ODMDS.

3.1.3.1. Jacksonville ODMDS

The Jacksonville ODMDS is an active disposal site that has been in use since 1973 and has been regularly monitored (Table 3.1-1). The Jacksonville ODMDS receives dredged material primarily from the Mayport Naval Station and the Jacksonville Harbor Navigation Project. Historical disposal volumes are summarized in Table 1.3-1. Prior to a new disposal initiative for Mayport Harbor, sediment mapping was conducted in March 1995 using gamma isotope spectroscopy to generate gamma signatures of site sediments. Based on this mapping, a pre-disposal benthic survey was conducted in July 1995. From November 1996 through February 1997, the Jacksonville ODMDS received approximately 1.1 million cy of dredged material from the Naval Station Mayport turning basin and entrance channel. A post-disposal sediment mapping survey was conducted in April 1997 (USEPA 1997). In July 2009, a trend assessment survey was conducted to determine what changes or impacts may have occurred to the sediment, water quality, and benthic community at the disposal site as a consequence of the disposal activities since the last ODMDS survey conducted in July 1998. Sampling maps from the 1995, 1998, and 2009 surveys are provided in Figures 3.1-1, 3.1-2, and 3.1-3. Results of water quality, grain size, sediment chemistry, and benthic infaunal evaluations are summarized below.

Water Quality

Water column chemistry in past studies at ODMDS sites has typically shown little or no impact due to dredged material disposal; therefore, water samples were not collected during the 1995 survey. However, water samples were collected at the Jacksonville ODMDS during 1998 and 2009 surveys to characterize water quality parameters of the disposal site (USEPA 1999b, USEPA 2010a) (Figures 3.1-2 and 3.1-3). Results of the surveys conducted by EPA Region 4 show little or no changes spatially in the chemical constituents in the water column proximate to the other stations.

1998 Survey Results. During the 1998 survey, the following water column parameters were collected: dissolved oxygen (DO), salinity, temperature, nitrogen series which include total phosphorus (TP), nitrate-nitrite nitrogen (NO_2 + NO_3), ammonia (NH_3), and total Kjeldahl nitrogen (TKN), light transmission, and chlorophyll-a. Nutrients at all stations sampled in 1998 were either below analytical detection limits or close to the analytical detection limit values. With the exception of DO, physicochemical parameters (measured by conductivity-temperature-depth profiles; temperature, salinity, oxygen and pH) were at normal levels and consistent between stations. DO appeared to be low in 1998, ranging from 3 to 5 milligrams per liter (mg/l) as opposed to approximately 6 mg/l in 1995 (USEPA 1999b).

2009 Survey Results. The results of the water quality profiles collected during the June 2009 study indicate adequate mixing within the water column (USEPA 2010a). Seapoint turbidity ranged from 0 to 24 formazin turbidity units (FTU), while DO readings ranged from 4.4 to 6.6 mg/l. Temperature and salinity also indicated that the waters within and around the disposal site are well-mixed above 8 meters, with established thermoclines ranging from 2 to 6 meters. Temperatures ranged from 24.2°C to 29.3°C and salinities ranged from 30.8 to 35.7 practical salinity units (PSU).

Chemical analysis of the water samples collected as part of this study showed all analytes to be at or below the detection limit for pesticides, semi-volatiles, PCBs, and tributyl tins. For total metals, there were limited detections of arsenic, copper, lead, nickel and zinc; none of these metals were detected above 5.1 µg/l, which is well below the marine acute and chronic ambient water quality criteria (Buchman 2008).

Sediment Physical and Chemical Analysis

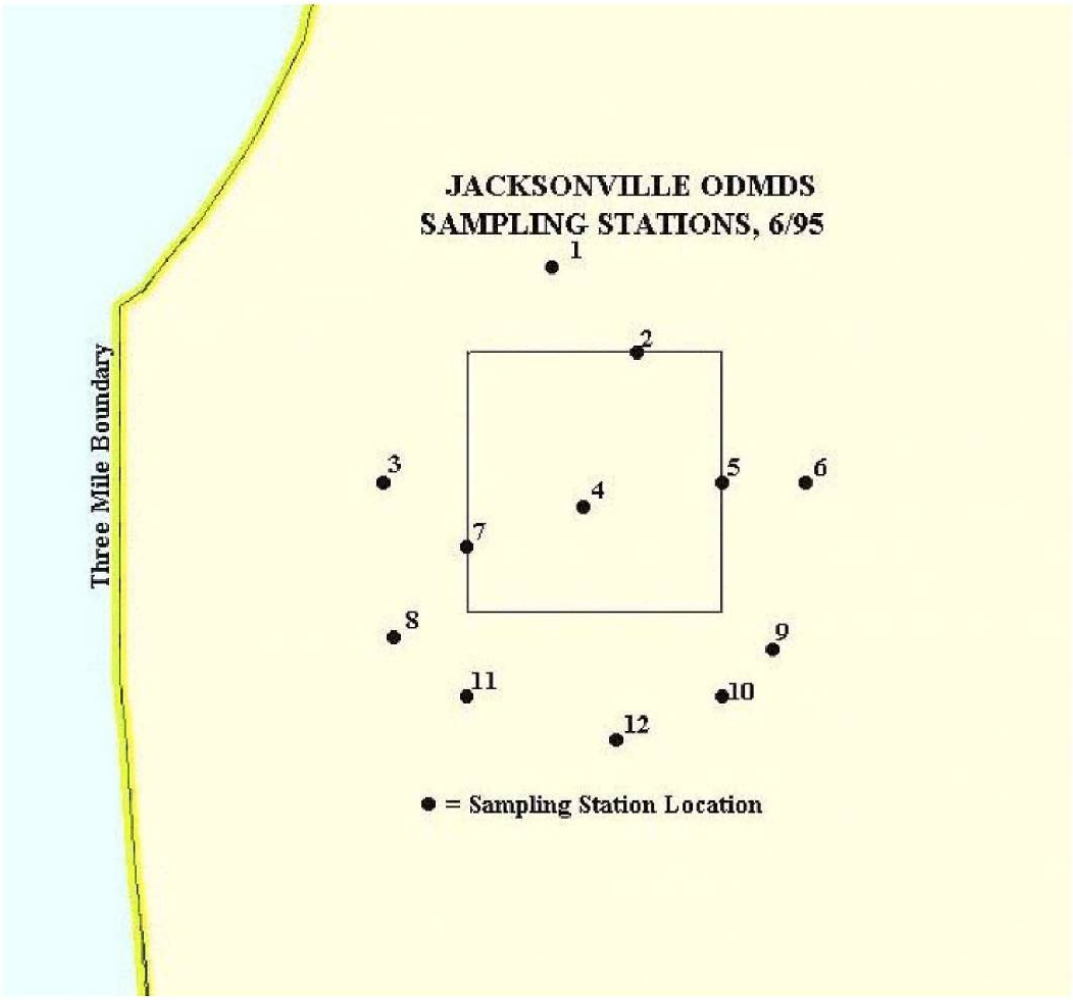
Physical and chemical analyses were performed on sediment samples from the Jacksonville ODMDS in 1977, 1995, 1998, and 2009 (Figures 3.1-1, 3.1-2, and 3.1-3).

Previous Study Results. Sediment analysis in the late 1970s showed higher concentrations of certain heavy metals (nickel, copper, zinc, lead, and chromium), Kjeldahl nitrogen, and organic carbon in sediments within the disposal site versus outside the site (Little et al. 1977, 1978). This is to be expected as dredge material with high metal concentrations, which required a waiver of EPA's criteria, was disposed at the ODMDS in 1972. Sediment analysis as part of the 1995 benthic survey showed that, in general, metal concentrations within the ODMDS remained elevated compared to concentrations outside the ODMDS (USEPA 1996). However, concentrations within the ODMDS have decreased since 1978 and, based on the 1998 study, continue to decrease (Figure 3.1-4). The average percentage of silts and clays at stations within the ODMDS exceeds that of stations outside the ODMDS, but has decreased both inside and outside the ODMDS since 1978 (USEPA 1999a).

A study was conducted in 1997 to determine the location and migration of dredged material. Results indicate an increase in surficial fines, especially in the western portion of the site as indicated by slurry densities and aluminum concentrations (USEPA 1997). Surveys performed in 1995 and 1998 indicated that sediment at all Jacksonville ODMDS sample stations was predominantly sand (greater than 90%) (USEPA 1996, USEPA 1999a). Overall, there was little change in sediment particle size outside the disposal site boundaries (USEPA 1999b). The vast majority of chemical constituents at the ODMDS were either below laboratory analytical detection limits or were at very low concentrations (below EPA Region 4 toxicity screening values).

2009 Results. In general, all stations were found to be predominantly sand or silty sand (Figure 3.1-5). Three notable exceptions were station J05 inside the ODMDS and stations J06 and J09 outside the ODMDS, which contained 7.84%, 8.75%, and 17.47% gravel, respectively. The percent sand and gravel averaged 91.3% and 91.0% at stations inside and outside the ODMDS, respectively. The median particle sizes using a grain size major mode (phi) scale were 2.24 mm inside and 2.23 mm outside the Jacksonville ODMDS. Therefore, this analysis determined that the median particle size was very coarse sand both inside and outside the Jacksonville ODMDS (USEPA 2010a).

Sediment chemistry showed all contaminants to be below the minimum quantitation limits (MQLs) for pesticides, semi-volatiles, and PCB congeners. Eight metals (aluminum, arsenic, chromium, copper, iron, lead, manganese, and zinc) measured inside and outside the Jacksonville ODMDS were above the method reporting limits (MRLs); however, none of the metals were reported above the NOAA threshold effects levels (TELs) or above the ERLs for metals (Buchman 2008). Tri-n-butyltin, di-n-butyltin, and n-butyltin were detected at stations both inside and outside the Jacksonville ODMDS. None of the 26 PCB congeners tested were detected in sediment at the Jacksonville ODMDS.



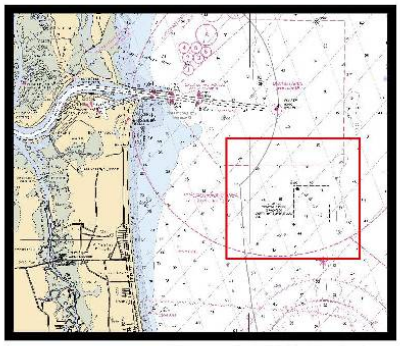
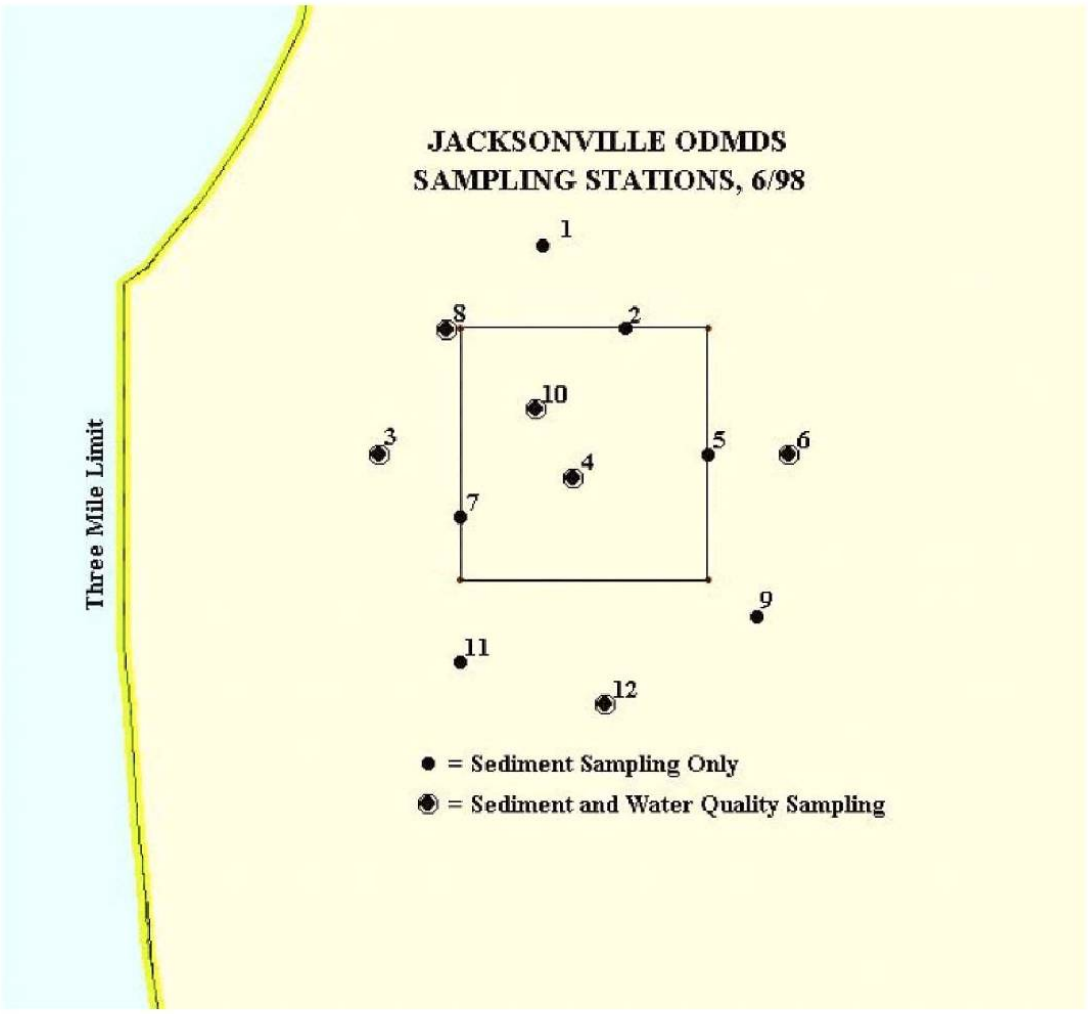


Figure 3.1-1. Jacksonville ODMDS Sampling Stations, June 1995

This map and/or digital data is for planning purposes only and should not be used to determine the precise location of any feature. Source: USEPA 1999b.
Data provided as-is. Q:\GIS PROJECTS\JAX_ODMDS\MAPS UPDATED 031511\3.1-1 Jacksonville ODMDS Sampling Stations, June 1995.mxd



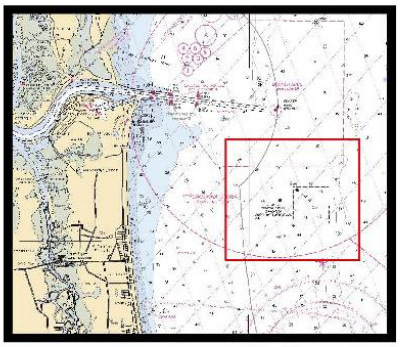
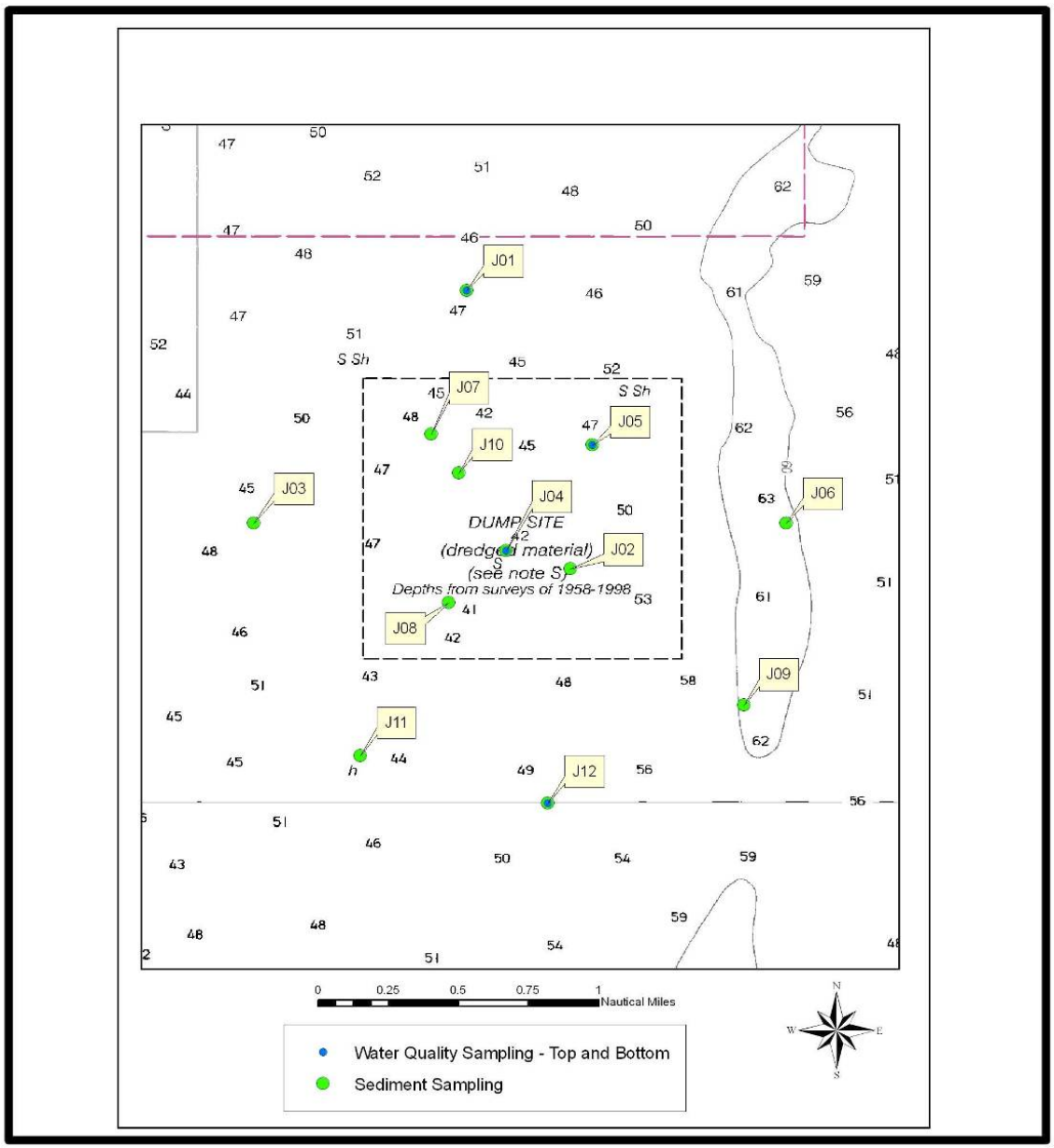


Figure 3.1-2. Jacksonville ODMDS Sampling Stations, June 1998

This map and/or digital data is for planning purposes only and should not be used to determine the precise location of any feature. Source: USEPA 1999b. Data provided as-is. Q:\GIS PROJECTS\JAX_ODMDS\MAPS UPDATED 031511\3.1-2 Jacksonville ODMDS Sampling Stations, June 1998.mxd



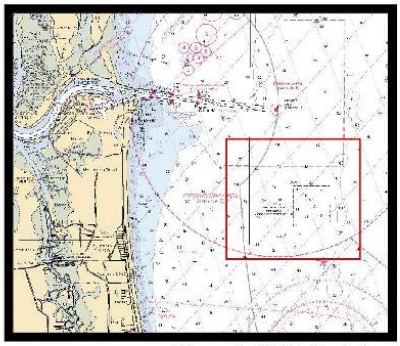
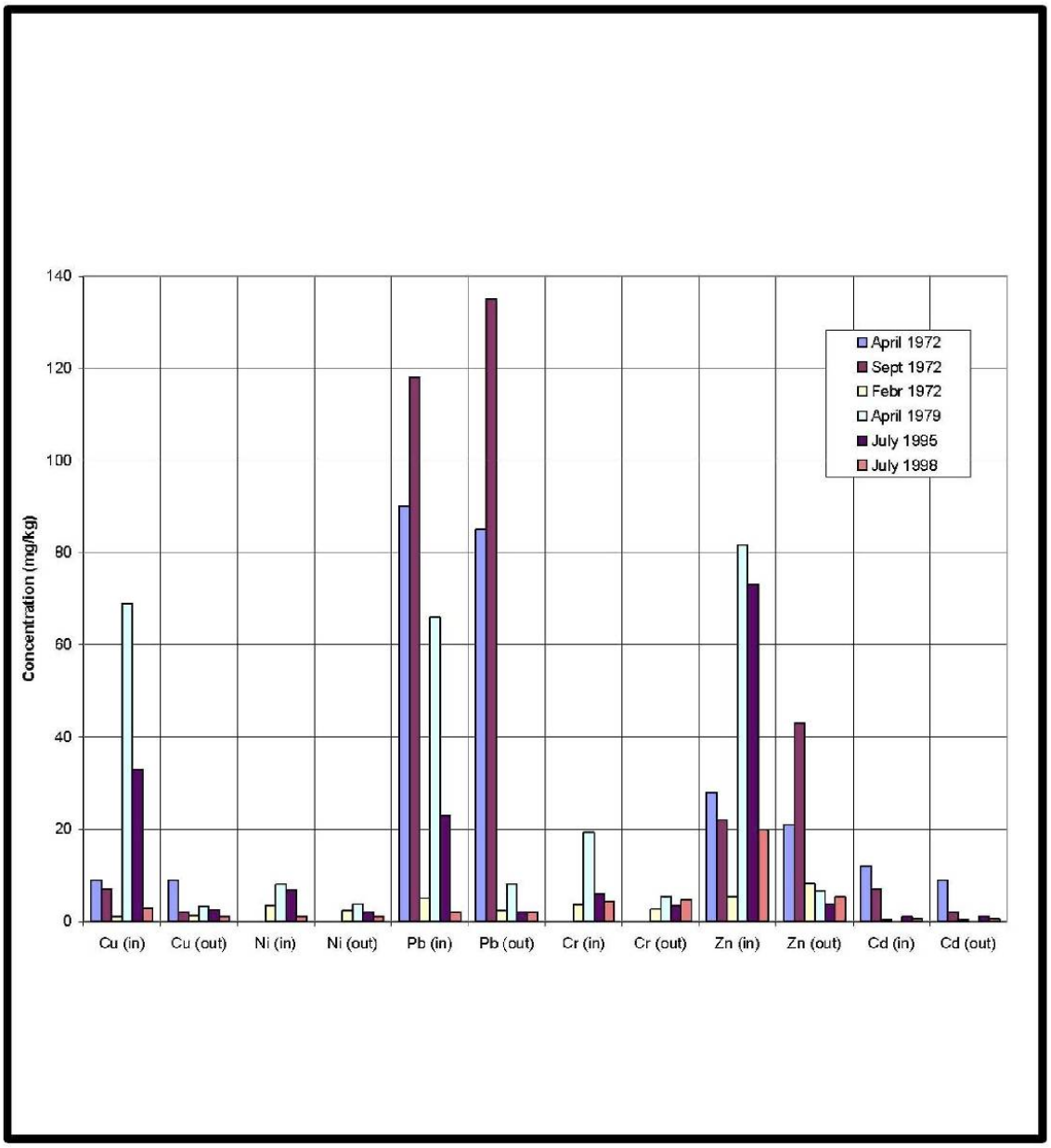


Figure 3.1-3. Jacksonville ODMDS Sampling Stations, June 2009

This map and/or digital data is for planning purposes only and should not be used to determine the precise location of any feature. Source: USEPA 2010. Data provided as-is. Q:\GIS PROJECTS\IAX_ODMDS\MAPS UPDATED 031511\3.1-1 Jacksonville ODMDS Sampling Stations, June 1998.mxd



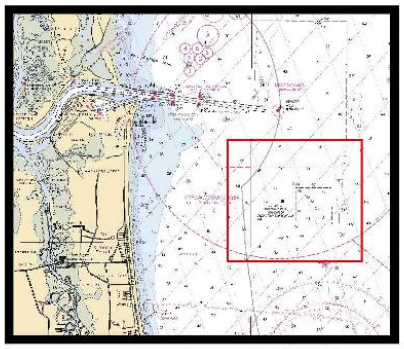


Figure 3.1-4. Jacksonville ODMDS Sediment Chemistry Trends

This map and/or digital data is for planning purposes only and should not be used to determine the precise location of any feature. Source: USEPA 1999b.
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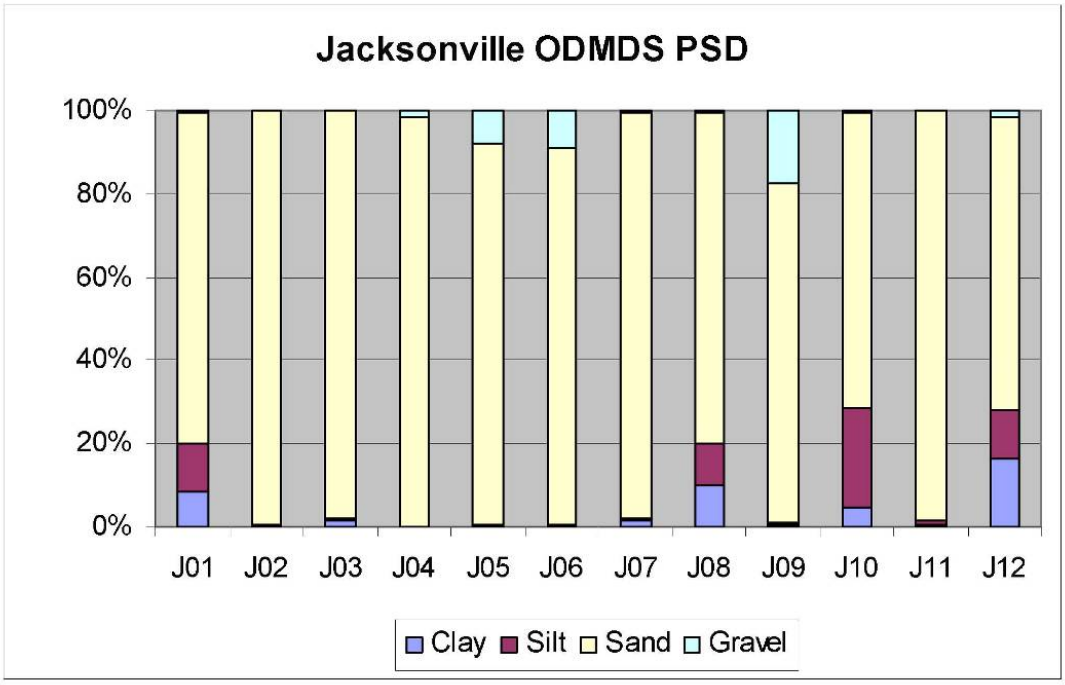


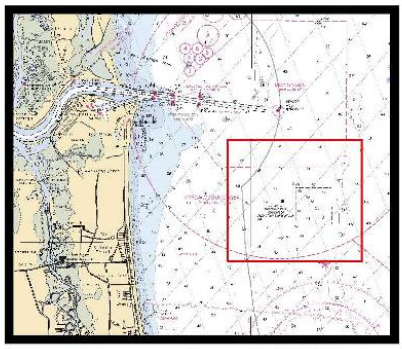


Figure 3.1-5. Jacksonville ODMDS Particle Size Distribution (2009)

This map and/or digital data is for planning purposes only and should not be used to determine the precise location of any feature. Source: USEPA 2010.
Data provided as-is. Q:\GIS PROJECTS\JAX_ODMDS\MAPS UPDATED 031511\3.1-5_Physicals.mxd

Benthic Infaunal Community

Several benthic infaunal surveys have been conducted at the Jacksonville ODMDS as part of the required monitoring program mandated by the SMMP (Table 3.1-1). Results from surveys conducted in 1986, 1995, 1998, and 2009 provide important information regarding the long-term impacts of dredged material disposal on benthic populations in the Jacksonville ODMDS and surrounding area.

Previous Survey Results. Results from the first benthic survey in 1986 indicated no difference between disposal and control stations, and no difference could be found that could be related to active disposal. Samples of benthic infauna were also collected in 1995 and 1998 both inside and immediately adjacent to the ODMDS (Figures 3.1-1 and 3.1-2) (USEPA 1999b). In both 1995 and 1998, the infauna community at all sampling stations, both inside and outside of the site, were extremely diverse with an equitable distribution of taxa relative to other assemblages of organisms that live within the sediment in the region, with 8,214 individuals representing 446 taxa found in 1995 and 7,861 individuals representing 434 taxa found in 1998. In terms of number of individuals and number of taxa, polychaete worms were the most abundant (USEPA 1999b). Bivalves, gastropods, and malacostracan crustaceans were also represented (USEPA 1999a). Numerical classification of the 12 stations tended to group the stations relative to the coarser grain size fractions. The 1998 study showed that communities remained diverse and no significant changes were observed either temporally or spatially.

2009 Results. In the 2009 survey, polychaete worms were the most numerous group inside the ODMDS, representing 41.3% of the total assemblage, and were followed in abundance by malacostracan crustaceans (28.5%) and bivalves (12.7%) (Barry A. Vittor & Associates 2009). Polychaete worms were the most diverse group (44.3% of all taxa) inside the ODMDS, as well as outside the ODMDS (44.1%). Polychaete worms also had the highest density of any infaunal group present outside the ODMDS, representing 47.9% of the total assemblage, and were followed again by malacostracan crustaceans (19.0%) and bivalves (13.7%). Overall, results indicate that assemblages inside and outside the ODMDS are similar. Although there was higher taxa richness, diversity, and density outside the ODMDS, there was not a significant difference between the outside and inside stations.

Comparison of Studies. Benthic infaunal results of a 2009 survey were compared to results from a June 1998 survey (Barry A. Vittor & Associates 1999, 2009). In 1998, 15 replicate diver cores (area = 0.0079 m^2 each) were collected at each of 10 stations and 30 replicate diver cores were taken at an additional 2 stations; 5 stations were sampled inside the ODMDS and 7 stations outside the ODMDS. Sediments at all stations were predominantly sand (>81%). In 1998, taxa richness averaged 22 taxa/station inside the ODMDS and 24 taxa/station outside the ODMDS, while densities averaged 5,454 organisms/m^2 inside and 5,632 organisms/m^2 outside the ODMDS (Barry A. Vittor & Associates 1999). There was no significant difference in taxa richness either inside the ODMDS or outside the ODMDS between 1998 and 2009. Densities inside and outside the ODMDS were significantly lower in 2009 when compared to 1998. However, in the 1999 study, a total of 255 diver core samples (area = 0.0079 m^2 each) were analyzed, whereas in 2009 a single sample was taken at six stations inside and six stations outside the ODMDS with a Young-modified Van Veen grab sampler (0.04 m^2) for a total of 12 samples. The discrepancy in sampling regimes between the 1998 and 2009 surveys is likely the cause of the density differences noted between the two datasets. Statistical analyses showed no differences in the composition of benthic assemblages between 1998 and 2009. Benthic density is typically variable; station density data collected with a single sample in 2009 could fall within the range of the potential variation in the benthic assemblages, and the

observed differences from the data collected in 1998 were not unexpected (Barry A. Vittor & Associates 2009).

Overall, no notable differences were detected between the inside and outside of the Jacksonville ODMDS that appear to be affecting the chemical, physical, and biological integrity of this designated area (USEPA 2010a).

3.1.3.2. Fernandina Beach ODMDS

In October 1985, a field survey of the Fernandina Beach ODMDS was conducted prior to site designation to characterize water quality, sediments, and benthic and epifaunal communities (Continental Shelf Associates 1986). In 1989, another benthic infaunal survey was conducted (Barry A. Vittor & Associates 1990). In 2005, a status and trends assessment was conducted at the Fernandina Beach ODMDS to characterize water quality, sediments, and infaunal communities associated with the dump site (Figure 3.1-6) (USEPA 2006). Surveys and findings conducted at the Fernandina Beach ODMDS are discussed in the following sections and summarized in Table 3.1-2.

Water Quality

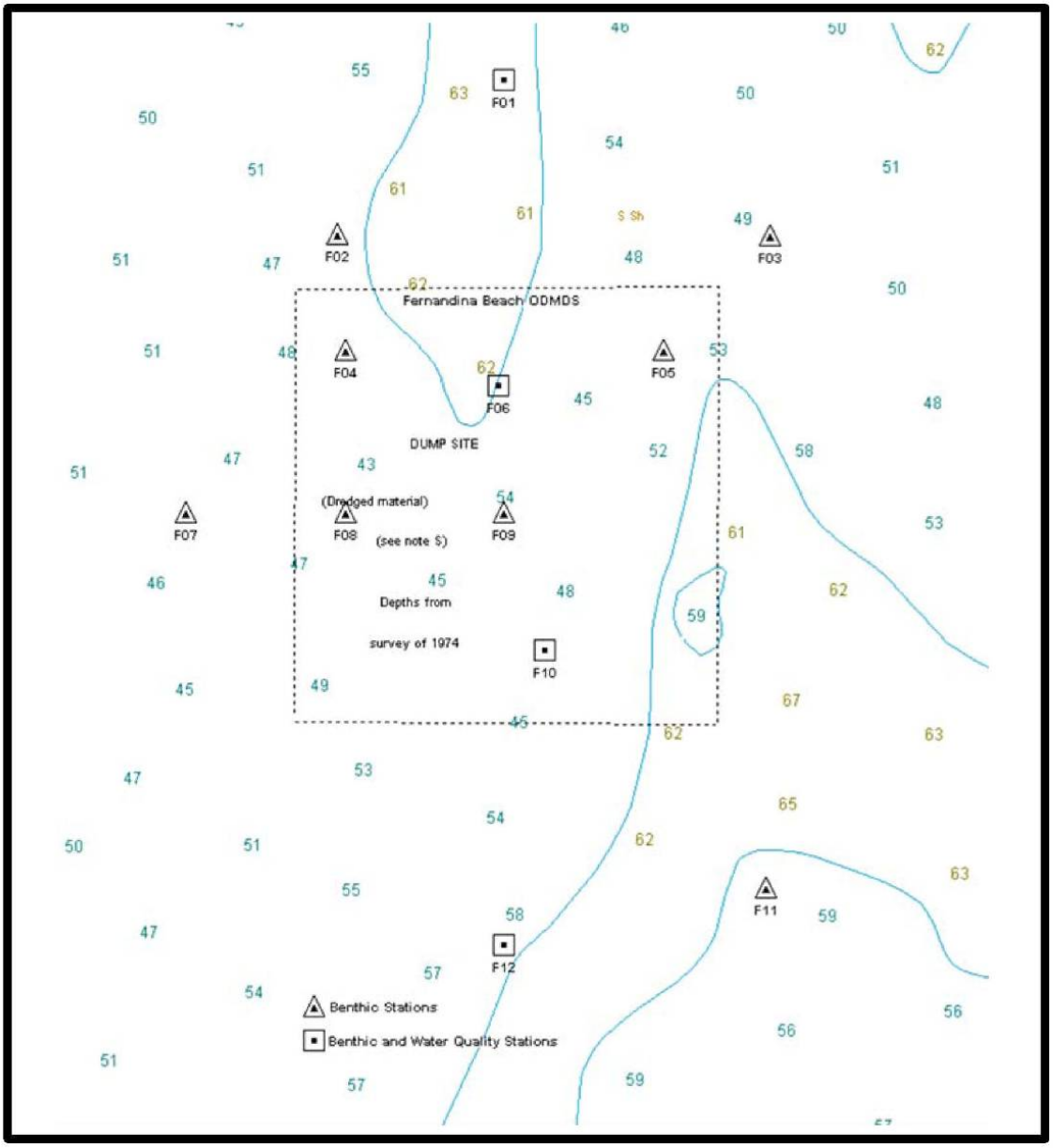
In August 2005, CTD-profiler data were collected at the Fernandina Beach ODMDS (USEPA 2006). Although the data showed the site's water column to be fairly well-mixed, there was a sharp enough change to discern a small-scale pycnocline. Turbidity across the survey area ranged from 0.34 to 2.25 NTU. DO readings also showed a narrow range from 5.53 mg/L (typically near the bottom) to 6.46 mg/L (typically just above the pycnocline). Temperature and salinity profiles indicated that the waters within and around the Fernandina ODMDS are fairly well-mixed. Temperatures ranged from 29.46°C to 30°C, and salinities ranged from 32.65 to 35.58 ppt. Although the profiles show the column was fairly well mixed, it also shows that complete mixing had not occurred. This is particularly evidenced in the turbidity and DO profiles, but also is demonstrated in the temperature and salinity profiles.

Chemical analysis of the water samples collected as part of the 2005 status and trends assessment showed all analytes to be at or below the detection limit with one exception. For all but one of the samples collected, bis(2-ethylhexyl) phthalate was detected in concentrations ranging from 58 to 230 µg/l (USEPA 2006).

Sediment Physical and Chemical Analysis

There is a substantial presence of gravel (18% to 39%) at several stations within the Fernandina Beach ODMDS. The overall percentage of fine-grained material at any of the sampling locations is extremely low. The disposal of dredged material within the Fernandina ODMDS is not resulting in an increase in overall fine-grained material in the offshore sediments (USEPA 2006).

The sediment chemistry showed most contaminants to be below method detection limits (MDLs). The seven exceptions were arsenic, cadmium, chromium, copper, iron, lead, and manganese. With the exception of manganese, mean concentrations of all metals within the Fernandina Beach ODMDS were lower than those outside the ODMDS (USEPA 2006).



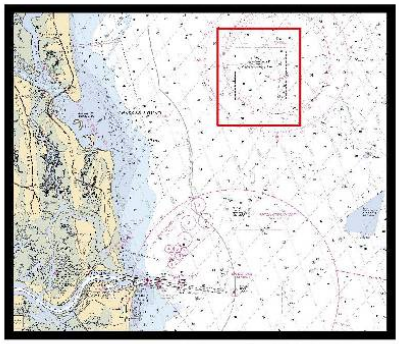


Figure 3.1-6. 2005 Sampling Stations Fernandina Beach ODMDS

This map and/or digital data is for planning purposes only and should not be used to determine the precise location of any feature. Source: USEPA 2010.
Data provided as-is. Q:\GIS PROJECTS\IAX_ODMDS\MAPS UPDATED 031511\3.1-6_Fern Sampling Map.mxd

Benthic Community

The benthic infauna data are summarized in *Fernandina Beach, Florida ODMDS 2005 Benthic Community Assessment* (Barry A. Vittor & Associates 2006). Polychaete worms dominated the total assemblage (58.9%) and also were the most diverse taxonomic group, with 45.1% of all represented taxa. In terms of abundance, the polychaete worms were followed by bivalves (13.3%), malacostracans (10.2%) and gastropods (6.0%). In terms of taxonomic diversity, the polychaete worms were followed by malacostracan crustaceans (23.5%), bivalves (11.4%) and gastropods (9.0%). In general, the stations inside the ODMDS were dominated by a variety of polychaetes, while stations outside the ODMDS were dominated by a mixed assemblage of polychaetes, bivalves, and gastropods.

The dominant taxa consisted of the polychaete *Bhawania heteroseta* (5.2 %); the polychaete family Maldanidae (4.9%); and the polychaetes *Prionospio cristata* (4.6%), *Mediomastus* sp. (3.9%) and *Polygordius* sp. (3.1%). Mean densities ranged from 625 organisms/m^2 to 3,800 organisms/m^2. Although densities averaged 2,025 outside the Fernandina Beach ODMDS compared to 7,354.2 inside the ODMDS, there was not a significant difference in densities between stations inside the site versus those outside the site (Barry A. Vittor & Associates 2006). The mean number of taxa ranged from 20 taxa/station to 88 taxa/station. Again, although taxonomic richness averaged 34 taxa/station outside the Fernandina Beach ODMDS compared to 54 taxa/station inside the ODMDS, there was not a significant difference in mean number of taxa between stations inside versus outside the ODMDS (Barry A. Vittor & Associates 2006). The results of cluster analysis indicate that assemblages inside and outside the ODMDS were not significantly different.

The study concludes that the data show that benthic communities within the disposal footprint of the Fernandina Beach ODMDS compare favorably with those adjacent to the dump site, and at the most basic levels of comparison, no long-term adverse impact from dumping of dredged material has occurred.

Epifaunal Community

In October 1985, trawl samples were collected at three stations as part of the site designation surveys for the Fernandina Beach ODMDS (Continental Shelf Associates 1986). Results of the 1985 survey included significant numbers of searobins, drums, and flounders, all of which compare well with results of the 2010 site designation survey. Bay anchovies were also recorded in relatively large numbers, and portunid crabs were dominant crustaceans. Jellyfish and squid equaled 81% of the total trawl biomass in 1985.

Summary

Although there has been a significant and relatively constant quantity of dredged material disposed at the Fernandina Beach ODMDS, little significant change in bathymetry has been shown (USEPA and USACE 2010). Minimum depths have decreased only by approximately 2 feet. Limited bathymetry changes are probably due to the silty nature of the dredged material disposed at the site. This material is easily removed from the site by currents and waves. The physical properties of the substrate have changed little since designation, and the bottom remains sandy with some areas of gravel. There is no indication of any increases in any chemical constituent in the sediments. The benthic invertebrate community continues to be dominated by polychaete worms, and no significant changes have been observed.

Table 3.1-1. Surveys Conducted at the Jacksonville ODMDS (Page 1 of 3)

Survey Name	Conducted by	Year(s)	Purpose	Findings
Environmental Investigation of a Dredge Spoil Disposal Site near Mayport, Florida	Naval Oceanographic Office	1972–1973	Evaluation of environmental effects of disposal of dredged material with elevated levels of metals	No permanent impairment of the benthic biological community when relative abundance and diversity of benthic infauna in the ODMDS are compared to control stations.
Environmental Investigation of a Dredged Material Disposal Site Near Mayport, Florida	Naval Oceanographic Office	1977–1978	Effects (sediment chemistry, bathymetry) of disposal of material from Mayport Harbor	Significant change in bathymetry (depth decreased from 43 feet to 34 feet), noticed movement of material to the south, and significant difference found in heavy metal concentration between sediments inside the site and outside the site.
Disposal Site Monitoring at the Jacksonville ODMDS	USEPA Region 4	1986	Benthic infaunal survey	No significant benthic infaunal difference between control and disposal stations.
Jacksonville ODMDS Sidescan Sonar Survey	USEPA Region 4	March 1995	Look for presence of natural resources and presence of manmade obstructions on the bottom	No natural resources found; significant amounts of manmade obstructions in north half of site and to the north of the site.
Areal Mapping of Sediment Chemistry at the Jacksonville ODMDS	USEPA Region 4 and Center for Applied Isotope Studies	March 1995	Conduct sediment mapping of site to determine location of dredged material and to provide baseline for future surveys	Two primary areas containing fine-grained sand associated with dredged material were found: one in the east-central sector of the ODMDS and the other along the southernmost portion of the survey area (½ mi south of the site). One area of coarse-grained dredged material was found consisting of a defined mound within the ODMDS boundaries.
Status & Trends Survey of the Jacksonville	USEPA Region 4 and Barry Vittor & Associates	July 1995	Baseline for future surveys of the ODMDS (includes assessment of the macroinfaunal communities within and outside of the ODMDS, sediment grain size, sediment chemistry and water quality)	Comparisons of the stations mean densities and mean number of taxa showed that the only significant differences observed are more likely to be related to the grain size distribution differences seen and not related to the presence or absence of disposed dredged material. Benthic community indices showed that all stations were extremely diverse with an equitable distribution of taxa when compared to known infaunal assemblages from the same general coastal region. In general, metal concentrations (especially lead, copper, and zinc) were higher within than outside the ODMDS. Concentrations were lower in 1995 than in 1978. Organics, pesticides, and PCBs were not detected.

Table 3.1-1. Surveys Conducted at the Jacksonville ODMDS (Page 2 of 3)

Survey Name	Conducted by	Year(s)	Purpose	Findings
Post Disposal Areal Mapping of Sediment Chemistry at the Jacksonville ODMDS	USEPA Region 4 and Center for Applied Isotope Studies	March 1997	Determine location and any migration of dredged material	General indication of increase in surficial fines especially in the western portion of the site as indicated by slurry densities and aluminum concentrations.
Post Disposal Status & Trends Survey of the Jacksonville ODMDS	USEPA Region 4 and Barry Vittor & Associates	June 1998	Monitor for any adverse effects following re-initiation of site use. (Includes assessment of the macroinfaunal communities within and outside of the ODMDS, sediment grain size, sediment chemistry, and water quality)	In general, all stations were extremely diverse with an equitable distribution of taxa relative to other benthic infaunal assemblages in the region. There was no predictable pattern in community indices or biomass between stations within and outside the ODMDS. Copper and zinc concentrations remain elevated within the ODMDS, but to a lesser degree than in 1995. Dissolved oxygen levels throughout the water column were lower (3 to 5 mg/l) in 1998 than in 1995 (6 mg/l).
Pre-Disposal Bathymetry	USACE-Jacksonville	Sept. 2001	Monitor bathymetric trends	Depth maintained at >35 feet throughout the ODMDS.
Post-Disposal Bathymetry Survey	USACE-Jacksonville	Nov 2001	Monitor bathymetric trends	Depth maintained at >34 feet throughout the ODMDS.
Post-Disposal Bathymetry Survey	USACE-Jacksonville	Oct. 2002	Monitor bathymetric trends	Depth maintained at >35 feet throughout the ODMDS.
Post-Disposal Bathymetry Survey	USACE-Jacksonville	April 2003	Monitor bathymetric trends	Depth maintained at >34 feet throughout the ODMDS.
Post-Disposal Bathymetry Survey	USACE-Jacksonville	Sept. 2004	Monitor bathymetric trends	Accretions of 2 to 8 feet of material within the disposal zone since 2002. No measurable change in depth outside the ODMDS boundaries. Depth maintained at >32 feet throughout the ODMDS.
Ocean Current and Wave Measurements at the Jacksonville Ocean Dredged Material Disposal Sites	USEPA Region 4	2006-2007	Determine wave and current climate for water quality modeling and capacity modeling.	Currents in the vicinity of the Jacksonville ODMDSs tend to have a significant tidal component with predominate currents flowing to the north-northwest and south-southeast. Waves in the vicinity of the Jacksonville ODMDS are out of the east-southeast.

Table 3.1-1. Surveys Conducted at the Jacksonville ODMDS (Page 3 of 3)

Survey Name	Conducted by	Year(s)	Purpose	Findings
Pre/Post-disposal Bathymetry Survey	USACE-Jacksonville	June 2007	Monitor bathymetric trends	Accretions of material to the south of the disposal zone since 2004. No measurable change in depth outside of the ODMDS boundaries. Depth maintained at greater than 32 feet throughout the ODMDS.
Jacksonville Ocean Dredged Material Disposal Site Capacity Report	USACE - Jacksonville	2008	Evaluate capacity of Jacksonville ODMDS	The Jacksonville ODMDS can accommodate the 2.0 million cy of new work from the proposed deepening of the federal channel, cut 3; the Mayport entrance channel; and Mayport turning basin. The remaining ODMDS capacity would allow 8 to 10 years or 6.4 to 8.0 million cy of additional in situ maintenance material without violating the minimum depth or 5-cm contour criteria.
Jacksonville Ocean Dredged Material Disposal Site Long Term Fate Analysis	USACE - Jacksonville	2008	LTFATE analysis was required in order to modify the SMMP to decrease the buffer zone	The analysis indicates that a 500-foot buffer would be adequate to ensure that no significant sediment deposition occurs outside the Jacksonville ODMDS.
Pre/Post-disposal Bathymetry Survey	USACE-Jacksonville	Feb 2008 July 2008	Monitor bathymetric trends	No significant changes in mound height were observed.
Jacksonville, Florida Ocean Dredged Material Disposal Site (ODMDS) Survey	USEPA Region 4	2009	A status and trends study to characterize the chemical, physical, and biological characteristics within and surrounding the disposal site	Overall, no notable differences were detected between the inside and outside of the Jacksonville ODMDS that appear to be affecting the chemical, physical, and biological integrity of this designated area.
Post-disposal Bathymetry Survey	USACE-Jacksonville	April 2010	Monitor bathymetric trends	Depth maintained at >30 feet throughout the ODMDS
Pre/Post-disposal Bathymetry Survey	USACE-Jacksonville	Feb 2011	Monitor bathymetric trends	Depth maintained at >29 feet throughout the ODMDS

Table 3.1-2. Surveys Conducted at the Fernandina Beach ODMDS (Page 1 of 2)

Survey Name	Conducted by	Year(s)	Purpose	Findings
Final Report for Field Survey of Fernandina Candidate Ocean Dredged Material Disposal Site	Continental Shelf Associates, Inc. USACE-SAJ	1986	Physical, chemical, and biological characterization of the ODMDS.	Included physical and chemical analysis of the sediments; chemical analysis of the water column; characterization of the benthic infauna, meiofauna, and epifauna; chemical analysis of fish and invertebrate tissue samples. A video survey and bathymetry of the site were also completed.
Final Gamma Radiation Surveillance of Dredged Spoil Site Sediments at Fernandina Beach	USEPA Region 4 and Center for Applied Isotope Studies	1987	Baseline for future surveys.	No significant difference between stations inside site boundaries and stations outside site boundaries.
Post Disposal Areal Mapping of Sediment Chemistry at the Fernandina Beach ODMDS	USEPA Region 4 and Center for Applied Isotope Studies	1989	Conduct sediment mapping of site to determine location of dredged material.	Identified two mounds in eastern half of ODMDS as dredged material.
Fernandina Harbor, Florida, ODMDS, Benthic Communities	USEPA Region 4 and Vittor & Associates	1989	Benthic infaunal survey.	Infaunal communities were generally similar in 1985 and 1989. Some changes occurred in the relative abundance of dominant taxa, but most taxa that were dominant in 1985 were also dominant in 1989.
Bathymetry Survey	USACE SAJ	Feb. 1999	Monitor bathymetric trends.	Minimum depth of 40.5 feet MLLW.
Bathymetry Survey	USACE SAJ	Apr. 2001	Monitor bathymetric trends.	Minimum depth of 33.7 feet MLLW.
Bathymetry Survey	USACE SAJ	Mar. 2002	Monitor bathymetric trends.	Minimum depth of 33.3 feet MLLW.
Bathymetry Survey	USACE SAJ	Nov. 2004	Monitor bathymetric trends.	Minimum depth of 40.0 feet MLLW.
Bathymetry Survey	USACE SAJ	May 2005	Monitor bathymetric trends.	Minimum depth of 38.2 feet MLLW.

Table 3.1-2. Surveys Conducted at the Fernandina Beach ODMDS (Page 2 of 2)

Survey Name	Conducted by	Year(s)	Purpose	Findings
Post Disposal Status & Trends Survey of the Fernandina Beach ODMDS	USEPA Region 4 and Barry Vittor & Associates	Aug. 2005	Assess the extent and trends of environmental impact. (Includes assessment of the infaunal communities within and outside of the ODMDS, sediment grain size, sediment chemistry and water quality).	Water column is well mixed with no elevations in chemical concentrations and no indication of low DO. No significant increase detected in fines within the ODMDS. No increase in sediment chemistry inside the site compared to outside the site. Benthic infauna is similar inside the site to that outside the site.
Post Disposal Bathymetry Survey	USACE SAJ	Mar. 2006	Monitor bathymetric trends.	Minimum depth of 36.3 feet MLLW.
Bathymetry Survey	USACE SAJ	Jun. 2007	Monitor bathymetric trends.	Minimum depth of 36.9 feet MLLW.
Ocean Current & Wave Measurements	USEPA Region 4	Aug 2006–Sept. 2007	Determine wave and current climate for water quality modeling and capacity modeling.	Currents dominated by tides in the NNW and SSE direction. Median surface current = 17 cm/s. Median bottom current = 10 cm/s. Median wave height = 0.8 meters.
Bathymetry Survey	USACE SAJ	Mar. 2008	Monitor bathymetric trends.	Minimum depth of 36.3 feet MLLW.
Bathymetry Survey	USACE SAJ	Apr. 2009	Monitor bathymetric trends.	Minimum depth of 37.3 feet MLLW.

3.1.4. Feasibility of Surveillance and Monitoring [40 CFR 228.5(d) and 228.6(a)(5)]

The U.S. Coast Guard (USCG), EPA, and USACE are responsible for surveillance and enforcement of ocean disposal activities. This includes navigational surveillance and deterrence of unauthorized disposal. It is the responsibility of EPA and USACE to manage and monitor each of the ODMDSs designated by EPA pursuant to Section 102 of MPRSA of 1972. MPRSA Section 102(c)(3) requires development of a SMMP for each ODMDS and review and revision of the SMMP not less frequently than every 10 years. The purposes of monitoring an ocean disposal site are to

- Verify compliance with the site designation criteria, any special management conditions, and permit or federal authorization requirements
- Ensure the environmental integrity of a disposal site and the areas surrounding a site.

The existing Jacksonville ODMDS has been successfully monitored according to the SMMP. A SMMP was first developed for the Jacksonville ODMDS in June 1997 and a new plan was completed in November 2007. Based on the successful completion of previous monitoring activities, it is anticipated that surveillance and monitoring at sites with similar depths and distance from shore will be feasible.

All of the alternatives sites are sufficiently close to shore (<10 nmi) to be readily accessible for monitoring. Discrete sampling, remote sampling, and groundtruthing via SCUBA diving have been conducted at each of the alternative sites during the site designation studies. Assuming appropriate sampling equipment and survey vessels are available, as well as contingencies associated with inclement weather and sea conditions, it is expected that monitoring of environmental effects associated with dredged material disposal operations can be performed at any of the alternative sites.

Elements of a disposal site monitoring program may include evaluation of sediment chemistry, benthic infauna, epifauna (epibenthic invertebrates and demersal fishes), bathymetric conditions, bioaccumulation potential, and oceanographic conditions. A SMMP for the new ODMDS will be designed to detect and minimize adverse impacts through appropriate management options and will be prepared in conjunction with, and referenced in, the Final Rule and the Coastal Zone Consistency Determination. A SMMP has been prepared by EPA and is included in Appendix F. More information on ODMDS monitoring is provided in Chapter 5.

3.2. Physical Environment

The physical environment in the study region includes waters offshore of Jacksonville, Florida, from the surface to the seafloor and the associated physical and oceanographic characteristics of this environment. The following sections include descriptions of the overall climate and air quality, physical oceanography and geology, and characteristics of the water column and marine sediments. Information on characteristics of the various physical parameters allows for a determination of baseline conditions that may be affected by dredged material disposal operations.

3.2.1. Climate

The ROI for climate is the general area of northeast Florida, which includes the three alternative sites and the offshore area between the sites and the coastline. Climatic parameters of interest at an ODMDS are air temperature, rainfall, wind patterns, and the occurrences of storms and

fog. Air temperature interacts with surface waters and may influence the vertical stability of the water during warm periods. Rainfall increases freshwater runoff, thereby decreasing surface salinity and intensifying the vertical stratification of the water. Coastal runoff contributes suspended sediment and chemical contaminants. Winds and storms generate waves and currents which can re-suspend and transport dredged material. A high incidence of fog during particular seasons might affect navigational safety and limit disposal operations.

In the Jacksonville area, high monthly temperatures range from 64° to 91°F (18 to 33°C) throughout the year (ClimateZone.com 2009). High heat indices are not uncommon for the summer months in the Jacksonville area with a heat index range of 105° to 115°F. Average rainfall is approximately 52 inches per year, with the wettest months being June through September. August is the wettest month, averaging 7.9 inches, and November is the driest month, averaging 2.2 inches. Table 3.2-1 summarizes the basic meteorological conditions for Jacksonville.

Table 3.2-1. Summary of Meteorological Conditions for Jacksonville

Weather Elements	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Mean Temperature (°F)	52.4	55.2	61.1	67.0	73.4	79.1	81.6	81.2	78.1	69.8	61.9	55.1	68.0
Precipitation (inches)	3.3	3.9	3.7	2.8	3.5	5.7	5.6	7.9	7.0	2.9	2.2	2.7	51.3
Mean Wind Speed (mph)	8.1	9.0	9.1	8.5	7.9	7.7	7.0	6.7	7.4	7.9	7.6	7.7	7.9
Mean Relative Humidity (%)	74.5	72.0	70.5	68.5	67.0	69.5	73.0	75.0	76.5	77.0	74.5	72.5	74.0

Source: http://www.climate-zone.com/climate/united-states/florida/jacksonville/, *accessed January 10, 2012*

Hurricanes and lesser tropical storms can lead to appreciable precipitation for short periods. Hurricanes in the region have generally traveled parallel to the coastline, either remaining far out to sea or losing much of their force over land. The Florida-Georgia portion of the South Atlantic Bight is struck by hurricanes on the average of once every 2 years and by tropical storms somewhat more frequently (Pequegnat et al. 1990). Although severe tropical storms are not common, seasonal storms have a major influence on water characteristics and sediment chemistry in the vicinity of the Jacksonville ODMDS (USEPA 1983). Storms rework sediments and potentially affect benthic communities within the nearshore areas.

Along the Florida east coast, easterly winds are predominant throughout the year. In the spring, northern Florida experiences winds from the west and the northeast. During the summer, the prevailing winds are southeasterly and southwesterly at low to moderate velocities producing south-to-north longshore drift. During autumn and winter months, recession of the high-pressure system results in an increase in frequency and strength of northerly winds. Wind velocities are generally moderately light, averaging 7 to 10 knots over the year. Sea breezes are generally from the east and land breezes are generally from the west. The wind is generally calm between 15% and 20% of the time during the year. Figure 3.2.1 shows wind roses for the Jacksonville International Airport (1948–1995) and for a temporary monitoring site just north of the St. Johns River Power Park (December 10, 1979, to December 10, 1980).

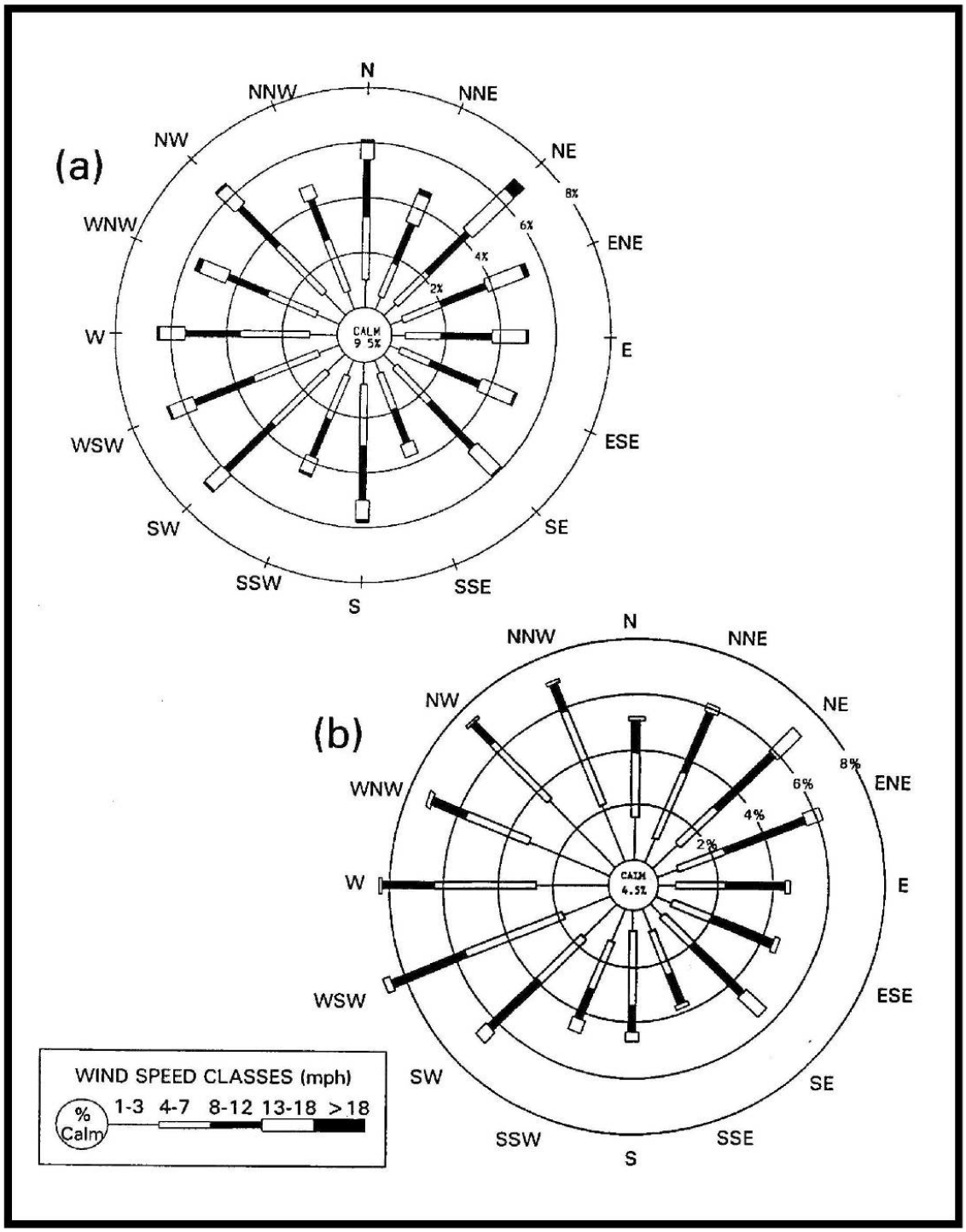


Figure 3.2-1. Wind roses for Jacksonville International Airport (1948-1995) and a Temporary Monitoring Site Just North of the St. Johns River Power Park (December 10, 1979- December 10, 1980)

This map and/or digital data is for planning purposes only and should not be used to determine the precise location of any feature.
Data provided as-is. EIS Q:\GIS PROJECTS\JAX_ODMDS\PHASE 2\EIS\MAPS UPDATED 031511\Figure 3.2-1 Wind roses for Jacksonville International.mxd SOURCE: DOE 2000

3.2.2. Air Quality

The Clean Air Act (CAA) is intended to protect the nation's air quality by regulating emissions of air pollutants. The CAA is applicable to permits and planning procedures related to dredged material disposal within the territorial sea. The proposed action (designation of a new ODMDS) does not permit the actual dredging projects. However, because the CAA is applicable to the proposed action, a basic air quality evaluation to assess and compare potential impacts to air quality resulting from future use of the alternative disposal sites was performed. The evaluation looked at impacts to air quality specifically related to transport of dredged material to the alternative disposal sites. Subsequent projects that would generate material to be disposed at an ODMDS would be subject to further individual environmental review and specific conformity determinations during the permitting process.

The ROI for air quality is defined by the administrative/regulatory boundary of Duval County, which is within the Jacksonville (Florida)-Brunswick (Georgia) Interstate Air Quality Control Region designated by EPA. Understanding air quality for the affected area requires knowledge of

- Applicable regulatory requirements;
- Types and sources of emissions (for stationary sources) and the horizontal and vertical extent of emissions;
- Emissions from mobile sources such as ships;
- Location and context of the affected area associated with the proposed action; and
- Existing conditions (or affected environment).

Regulatory Requirements. The CAA, which was last amended in 1990, requires EPA to set National Ambient Air Quality Standards (NAAQS) (40 CFR part 50) for pollutants considered harmful to public health and the environment. The CAA identifies two types of national ambient air quality standards. ***Primary standards*** provide public health protection, including protecting the health of "sensitive" populations such as asthmatics, children, and the elderly. ***Secondary standards*** provide public welfare protection, including protection against decreased visibility and damage to animals, crops, vegetation, and buildings.

Air quality in a given location is described by the concentration of various pollutants in the atmosphere. A region's air quality is influenced by many factors including the type and amount of pollutants emitted into the atmosphere, the size and topography of the air basin, and the prevailing meteorological conditions. The significance of the pollutant concentration is determined by comparing it to the federal and state ambient air quality standards. EPA has set NAAQS for six principal pollutants, which are called "criteria" pollutants.

1) Ozone (O_3)
2) Carbon monoxide (CO)
3) Nitrogen dioxide (NO_2)
4) Sulfur dioxide (SO_2)
5) Particulate matter (PM) less than 10 microns (PM_{10}) and less than 2.5 microns ($PM_{2.5}$)
6) Lead (Pb)

The NAAQS are presented in Table 3.2-2. These standards represent the maximum allowable atmospheric concentrations that may occur while ensuring protection of public health and welfare with a reasonable margin of safety.

Table 3.2-2. National Ambient Air Quality Standards

Pollutant [final rule cite]		Averaging Time	National Primary NAAQS	National Secondary NAAQS
Carbon Monoxide [76 FR 54294, Aug 31, 2011]		8-hour 1-hour	9 ppm 35 ppm	NA NA
Lead [73 FR 66964, Nov 12, 2008]		Rolling 3 month average	0.15 µg/m^3 (1)	0.15 µg/m^3 (1)
Nitrogen Dioxide [75 FR 6474, Feb 9, 2010] [61 FR 52852, Oct 8, 1996]		1-hour Annual	100 ppb 53 ppb (2)	NA 53 ppb (2)
Ozone [73 FR 16436, Mar 27, 2008]		8-hour	0.075 ppm (3)	0.075 ppm (3)
Particle Pollution [71 FR 61144, Oct 17, 2006]	$PM_{2.5}$	Annual 24-hour	15 µg/m^3 35 µg/m^3	15 µg/m^3 35 µg/m^3
	PM_{10}	24-hour	150 µg/m^3	150 µg/m^3
Sulfur Dioxide [75 FR 35520, Jun22, 2010] [38 FR 25678, Sep 14, 1973]		1-hour 3-hour	75 ppb (4) NA	NA 0.5 ppm

ppm = parts per million, ppb = parts per billion, µg/m^3 = micrograms per cubic meter, NA = not applicable

(1) Final rule signed October 15, 2008. The 1978 lead standard (1.5 µg/m3 as a quarterly average) remains in effect until 1 year after an area is designated for the 2008 standard, except that in areas designated nonattainment for the 1978, the 1978 standard remains in effect until implementation plans to attain or maintain the 2008 standard are approved.

(2) The official level of the annual NO_2 standard is 0.053 ppm, equal to 53 ppb, which is shown here for the purpose of clearer comparison to the 1-hour standard.

(3) Final rule signed March 12, 2008. The 1997 ozone standard (0.08 ppm, annual fourth-highest daily maximum 8-hour concentration, averaged over 3 years) and related implementation rules remain in place. In 1997, EPA revoked the 1-hour ozone standard (0.12 ppm, not to be exceeded more than once per year) in all areas, although some areas have continued obligations under that standard ("anti-backsliding"). The 1-hour ozone standard is attained when the expected number of days per calendar year with maximum hourly average concentrations above 0.12 ppm is less than or equal to 1.

(4) Final rule signed June 2, 2010. The 1971 annual and 24-hour SO_2 standards were revoked in that same rulemaking. However, these standards remain in effect until 1 year after an area is designated for the 2010 standard, except in areas designated nonattainment for the 1971 standards, where the 1971 standards remain in effect until implementation plans to attain or maintain the 2010 standard are approved.

Source: USEPA 2011 (as of October 2011)

Currently, Duval County, Florida, is in attainment for all criteria pollutants. The CAA and Amendments of 1990 define a "nonattainment area" as a locality where air pollution levels persistently exceed the NAAQS or that contributes to ambient air quality in a nearby area that fails to meet standards. Designating an area as nonattainment is a formal rulemaking process, and EPA normally takes this action only after air quality standards have been exceeded for several consecutive years. Nonattainment areas are given a classification based on the severity of the violation and the type of air quality standard they exceed.

3.2.3. Physical Oceanography

3.2.3.1. Geology

The geographical ROI is the general region of the northeast coast of Florida, which includes the three alternatives sites and the offshore area between the sites and the coastline. The northeast coast of Florida is bounded by a shelf that is moderately broad and gently sloping. The shelf is about 70 nmi wide off Jacksonville but narrows to about 26 nmi wide off Cape Canaveral to the south. The South Atlantic Bight (also referred to as the Georgia Bight) geomorphic region encompasses the coastal region of the United States from Cape Hatteras to Cape Canaveral (Pequegnat et al. 1990). Characteristics of the South Atlantic Bight seafloor include low relief, relatively gentle gradients, and smooth bottom surfaces exhibiting physiographic features contoured by erosional processes. In this region the shelf is separated from the true continental slope by the Blake Plateau, the Florida-Hatteras Slope, and a small portion of the Straits of Florida (Figure 3.2-2). The Florida-Hatteras Slope off Jacksonville is considered atypical in that it is a low-gradient (less than 1°), low-relief continental slope interrupted by a broad flat terrace (Blake Plateau) at a depth less than 700 meters (Uchupi 1967, Emery and Uchupi 1972).

The most prominent geological and geomorphological features along the northeast coast of Florida include sand flats and ebb-tidal deltas on the inner shelf; sand waves, shoals, and banks on the middle shelf; and large sand ridges on the outer shelf (Figure 3.2-3) (URS and CPE 2007). Duane et al. (1972) discussed linear shoals on the Atlantic inner continental shelf, including those offshore Florida, and hypothesized on the genesis of different types of shoals. Extensive but poorly developed shoals are found between Fernandina Beach and Matanzas Inlet and are of the linear type which are interpreted as relict interfluves of a late Wisconsin sea-level lowstand (Duane et al. 1972). Deepwater ridges occur along the seaward margin of the study area in water depths ranging from 90 to 150 feet. Sand ridges are a pervasive morphological feature throughout the northeast coast of Florida. In Duval and St. Johns counties, shoreface-attached sand sheets occur and are overlain inshore by ebb-tidal deltas. The cultural resources survey conducted between June 17 and August 2, 2011, identified a submerged feature that could potentially be a spring head (PCI 2012). The feature was identified approximately 10 feet below the sediment surface. It is unknown if there is an active boil associated with this feature. Archaeological divers will be conducting additional surveys; however, this feature may be too deeply buried to be investigated by divers.

Natural reefs are composed of exposed limestone, shell, sand, gravel, and sponge and coral growths (NOAA 1980) and are widely scattered on the continental shelf. Three general types of reef can be identified along the northeast coast of Florida (Henry and Giles 1979): (1) low-relief reef, less than 0.5 meters of relief; (2) moderate-relief reefs, 2 meters or more of relief; and (3) shelf-edge reefs. Low-relief reefs are subjected to periodic sand covering and generally support sparse benthic communities. Moderate-relief reefs support a large benthic and pelagic community. Moderate-relief reefs, commonly referred to as patch reefs, live bottoms, or hardbottoms, are common in water depths from approximately 60 feet (18.3 meters) to 200 feet (61 meters) (Florida Sea Grant Program 1979). Shelf-edge reefs are located on the shelf break and support a large faunal community.

In addition to naturally occurring reefs, numerous artificial reefs have been established to provide additional habitats for recreational fishing and diving purposes. Artificial reefs are composed of various types of material, including car bodies, tires, ship hulls, concrete blocks, and rubble (Florida Sea Grant Program 1979). Natural and artificial reefs are common on the mid-shelf just east of the proposed alternative sites. Section 3.3.7, Essential Fish Habitat, discusses in more detail hardbottom resources identified within the three alternative sites.

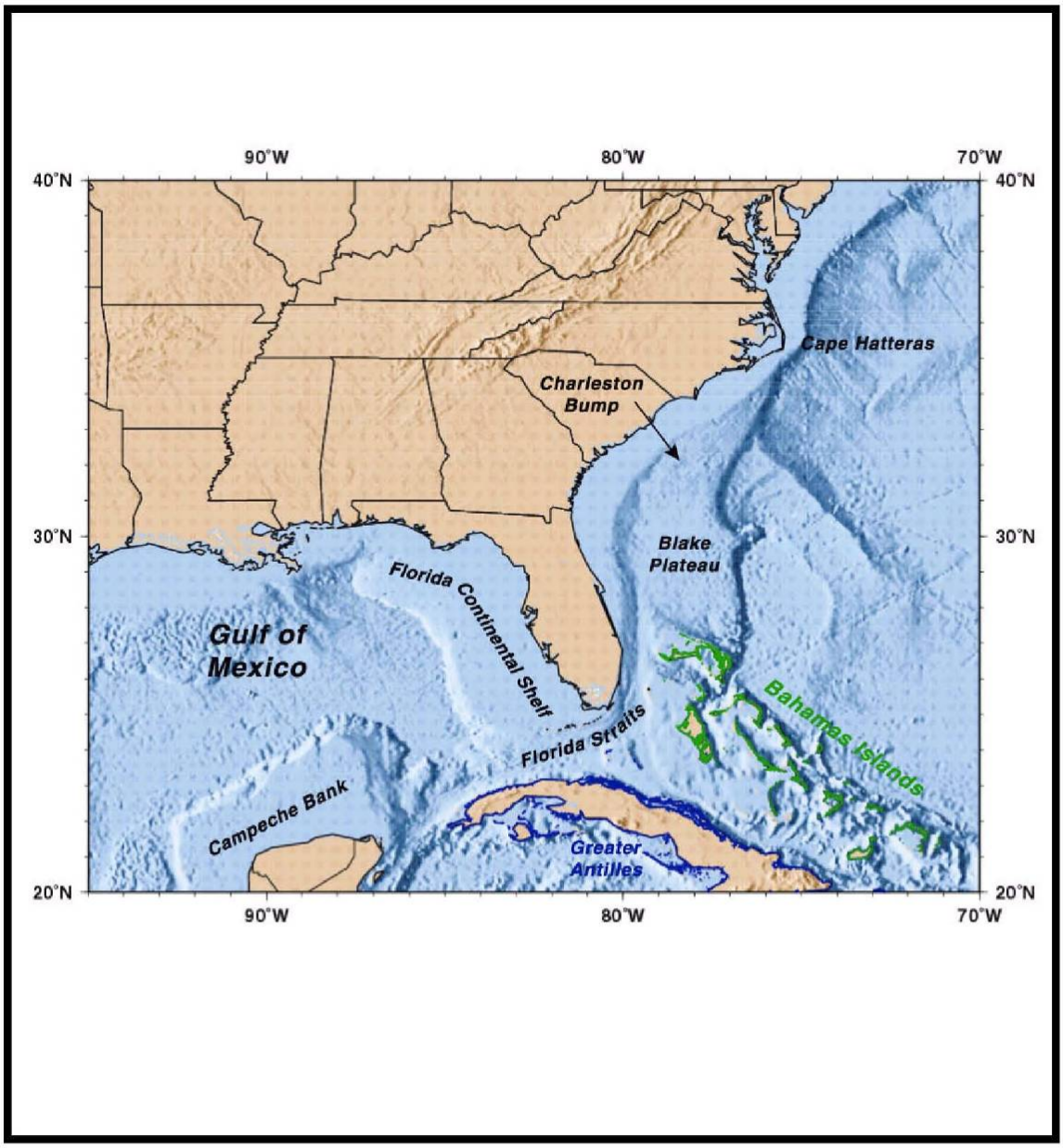


Figure 3.2-2. Physiographic Provinces of the Southeastern United States

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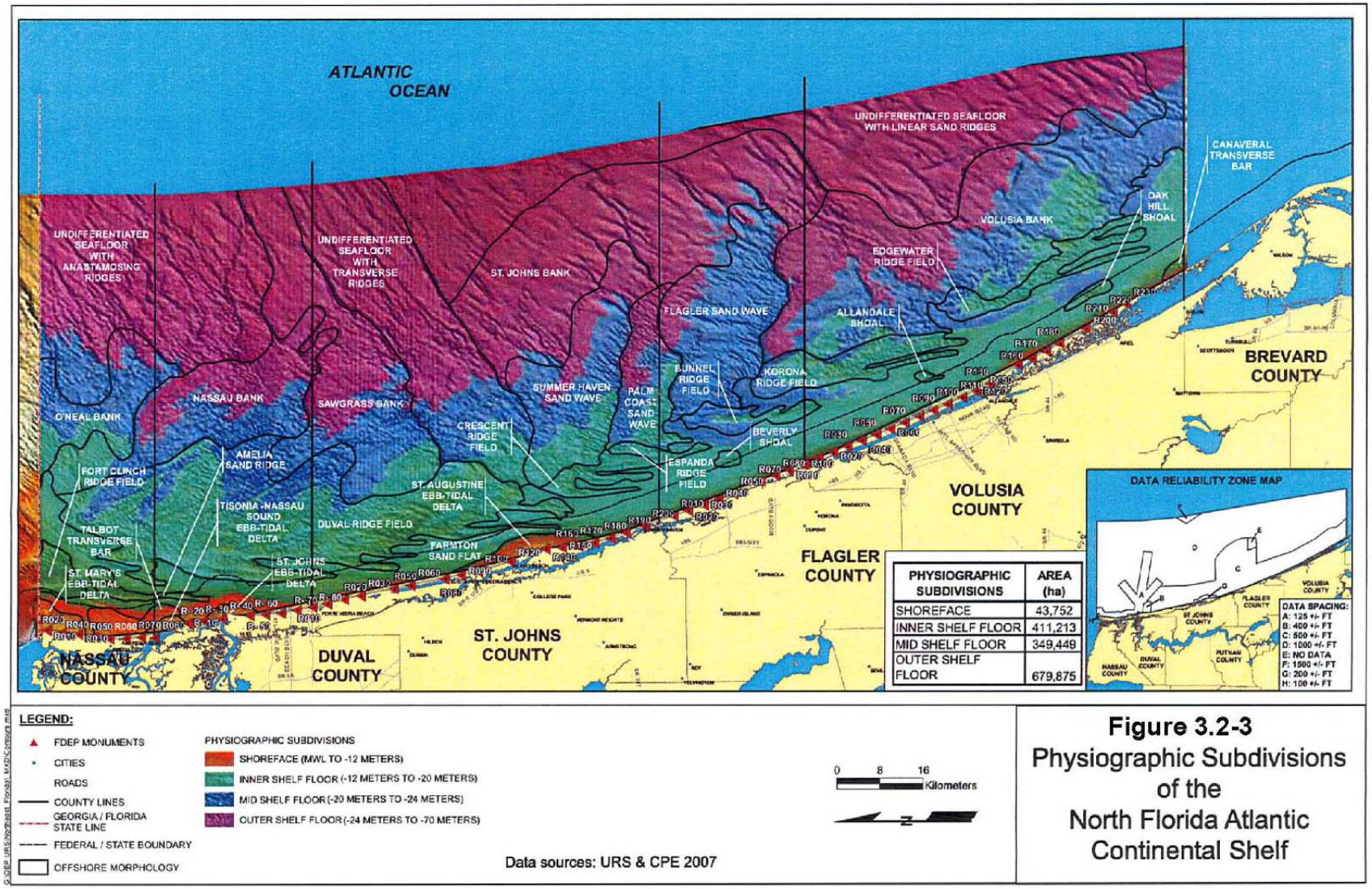
Data provided as-is.15JUN09 Figure 3.2-2. Physiographic Provinces of the Southeastern United States



PHYSIOGRAPHIC SUBDIVISIONS	AREA (ha)
SHOREFACE	43,752
INNER SHELF FLOOR	411,213
MID SHELF FLOOR	349,449
OUTER SHELF FLOOR	679,875

Figure 3.2-3
Physiographic Subdivisions of the North Florida Atlantic Continental Shelf

3.2.3.2. Bathymetry

In October 2009, single-beam bathymetric measurements were collected in the north and south survey areas. Figures 3.2-4a and 3.2-4b show the results of the interpolated bathymetry data (ANAMAR 2010). Depths within the Alternative 1 site range from 43 to 66 feet MLLW, with an average depth of 57 feet. Depths within the Alternative 2 site range from 44 to 64 feet MLLW, with an average depth of 55 feet. Depths within the Alternative 3 site range from 46 to 62 feet MLLW, with an average depth of 55 feet.

As of 2009, the Fernandina Beach ODMDS (No Action Alternative) had a depth range of 37 to 69 feet, with an average depth of 53 feet. There is a small mound in the center of the site, with the deepest portions of the site to the southeast consisting of a north-/south-oriented depression (USEPA and USACE 2010).

3.2.3.3. Waves and Currents

In general, circulation over most continental shelves is governed by tides and winds. The Florida Current dominates circulation along the east Florida continental shelf and is the local manifestation of the Gulf Stream, the intense western boundary current of the North Atlantic that transports heat north from the equator (Hammer et al. 2005). The Florida Current flows northward along the eastern coast of Florida, carrying warm tropical waters that feed the Gulf Stream (Baringer and Larsen 2001). Predominant currents in the area flow southwest in the fall and winter and northeast during spring and summer. Larger waves in the area are predominantly from the east and occur in the winter. North of Cape Canaveral, the general direction of longshore sediment transport off the east coast of Florida is to the south (Davis et al. 1992). The degree of mixing between waters in the coastal region and adjacent shelf region is dependent on the intensity of horizontal and vertical density gradients, tidal currents, and wind-driven currents (Blanton and Atkinson 1978 from USACE 1986b).

As part of a joint agreement to manage and monitor the ODMDSs within the Jacksonville District, EPA was provided funds to characterize the current and wave climate at the Jacksonville and Fernandina Beach ODMDSs (USEPA 2009a). An acoustic Doppler current profiler (ADCP) was deployed for a 1-year period from August 2006 to September 2007 within the boundaries of the Jacksonville and Fernandina Beach ODMDSs (Figure 3.2-5). Waves were sampled every 3 hours and currents every 15 minutes. Data collected from this study have been used to model the capacity of both ODMDSs and to develop standard water quality model input parameters for dredged material environmental evaluations. This information can also be useful in predicting potential water quality impacts and sediment transport of material at the new ODMDS.

Wave roses for the entire deployment period are shown in Figures 3.2-6 (wave heights) and 3.2-7 (peak wave period) for the Jacksonville ODMDS and Figures 3.2-8 (wave heights) and 3.2-9 (peak wave period) for the Fernandina Beach ODMDS. Waves at both sites are predominantly out of the east, and few exceed 6.6 feet (2 meters) in height or 15 seconds in period (USEPA 2009a).

For the Jacksonville ODMDS, a current rose for depth average currents for the entire deployment period is shown in Figure 3.2-10. Currents flow predominately in the north-northwest and south-southeast directions and rarely exceed 30 cm/sec (1.0 ft/sec) in magnitude (USEPA 2009a). Seasonal differences do not appear to be significant. Surface currents are stronger than near-bottom currents. The net direction of transport as shown by a progressive

vector diagram is to the southeast (Figure 3.2-11) with surface currents having a stronger southerly component.

For the Fernandina Beach ODMDS, a current rose for depth average currents for the entire deployment period is shown in Figure 3.2-12. Currents flow predominately in the north-northwest and south-southeast directions and rarely exceed 30 cm/sec (1.0 ft/sec) in magnitude (USEPA 2009a). Seasonal differences do not appear to be significant. Surface currents are stronger than near-bottom currents. The net direction of transport as shown by a progressive vector diagram was originally to the south followed by a northeasterly trend at the surface and a northwesterly trend near the bottom and throughout the water column average (Figure 3.2-13).

The study concluded that waves are the primary factor influencing re-suspension of disposed dredged material at these ODMDSs, whereas currents probably affect the direction and magnitude of transport (USEPA 2009a).

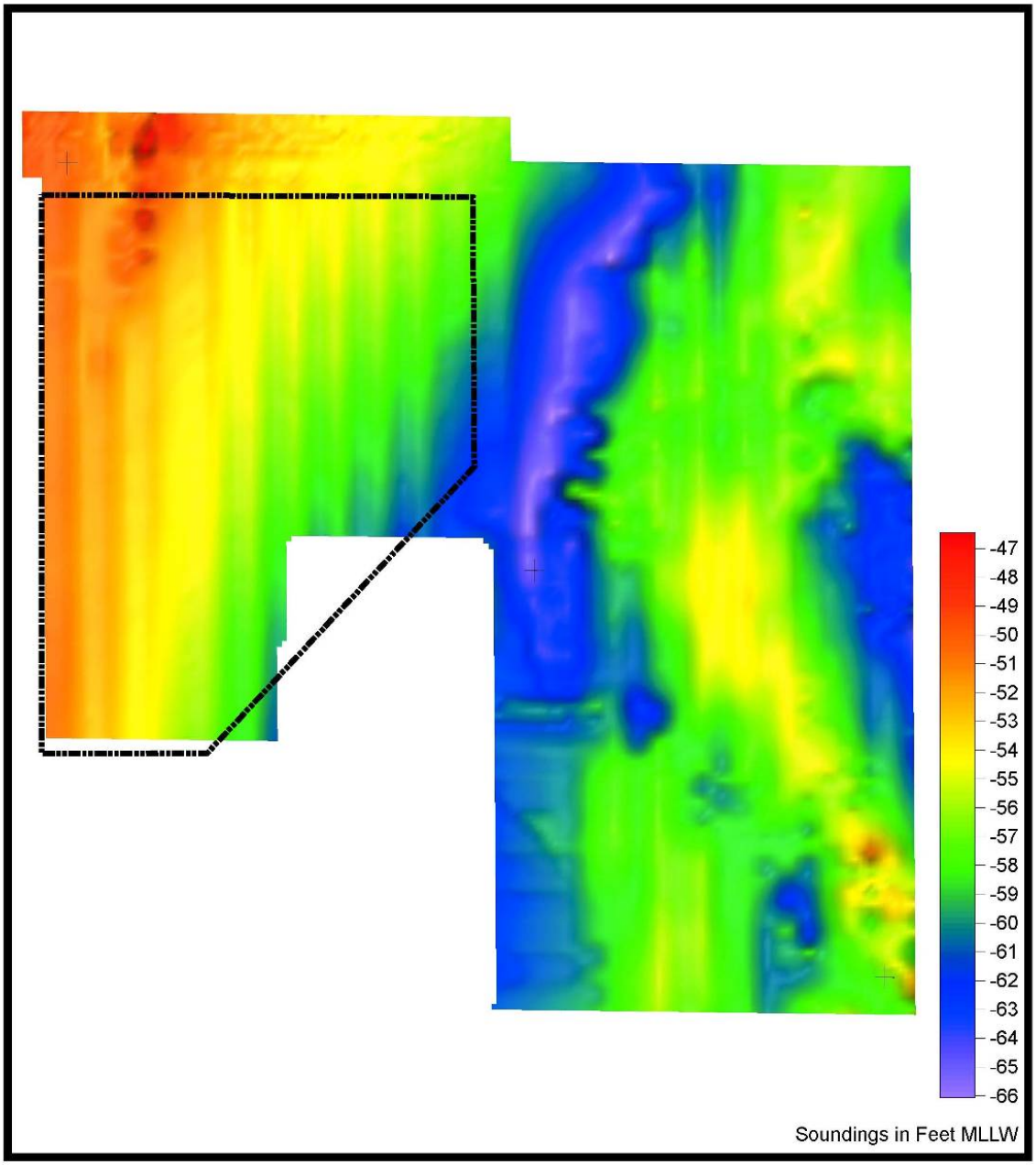


Figure 3.2-4a. North Area Bathymetry with Alternative 3 Boundary

This map and/or digital data is for planning purposes only and should not be used to determine the precise location of any feature.
Data provided as-is. Q:\GIS PROJECTS\JAX_ODMDS\MAPS UPDATED 120110\Figure 3.2-4a Bathy North Area2.mxd Data source: ANAMAR 2010, USEPA 2010.

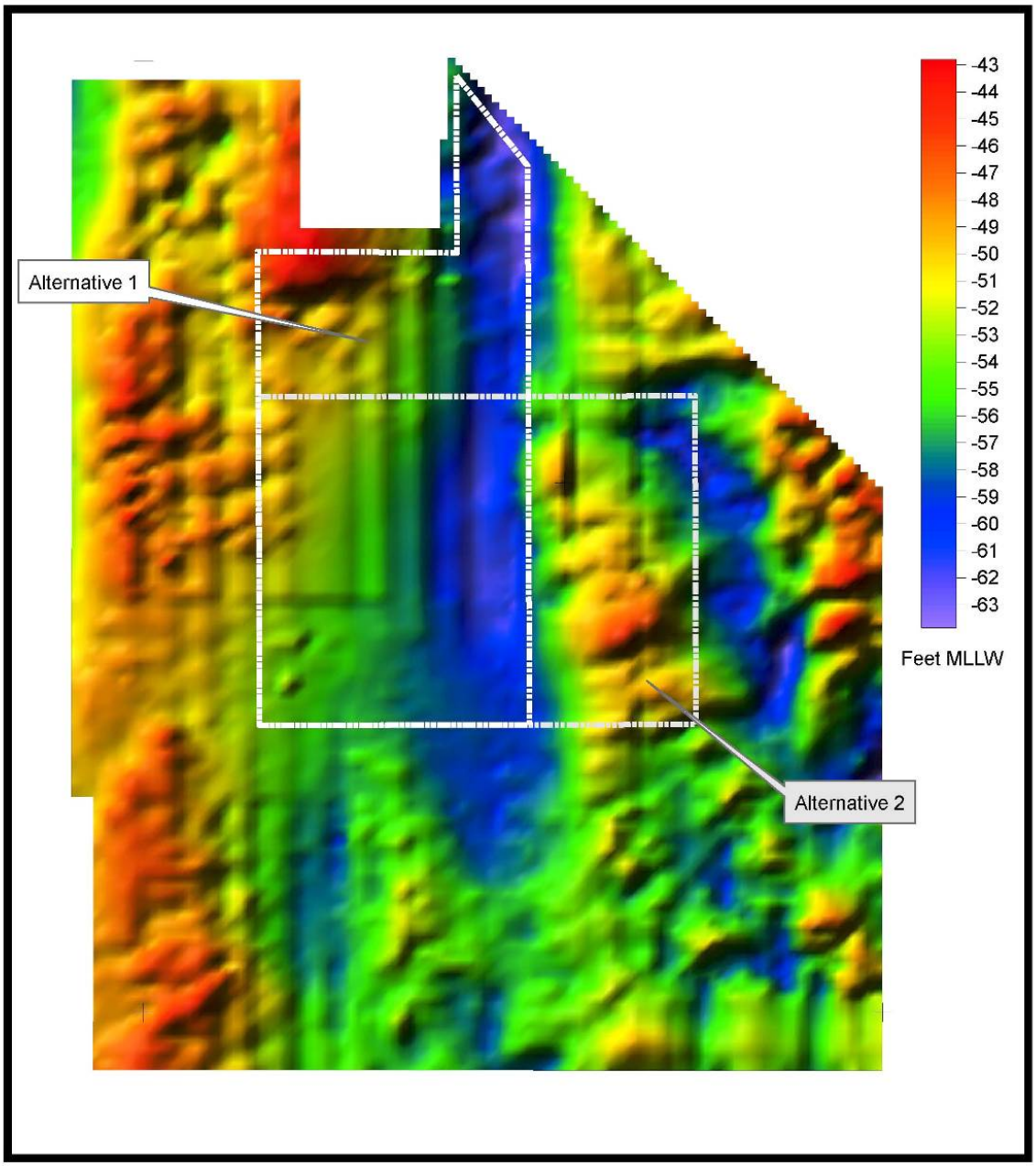


Figure 3.2-4b. South Area Bathymetry with Alternatives 1 and 2 Boundaries

This map and/or digital data is for planning purposes only and should not be used to determine the precise location of any feature.
Data provided as-is. Q:\GIS_PROJECTS\JAX_ODMDS\MAPS UPDATED 120110\Figure 3.2-4b Bathy South Area.mxd Data source: ANAMAR 2010, USEPA 2010.

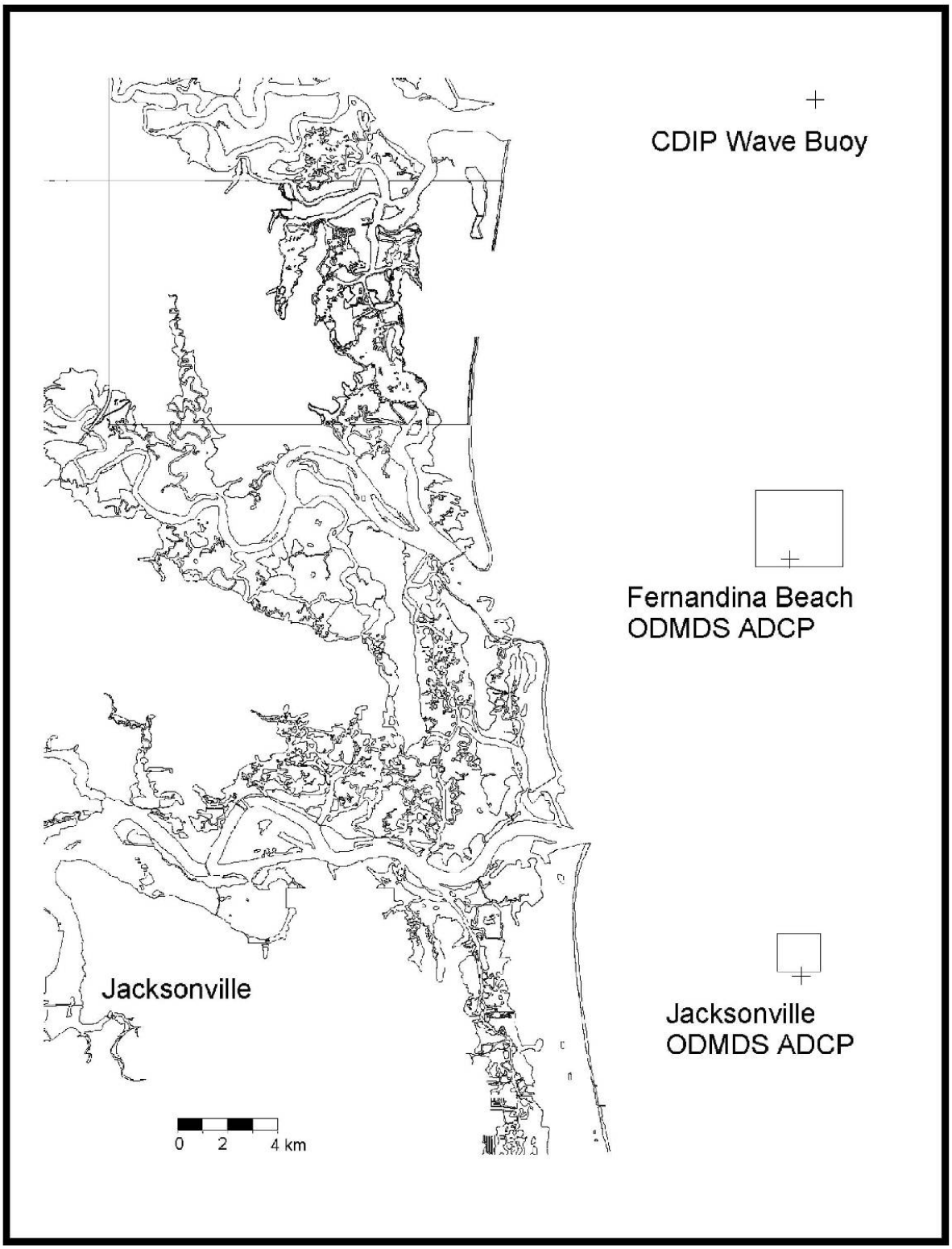


Figure 3.2-5: Instrument Location Map

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Data provided as-is. Data source: EPA 2010 Q:\GIS PROJECTS\JAX_ODMDS\MAPS UPDATED 120110\Figure 3.2-5 Instrument Loc Map Wave & Current.mxd 120610

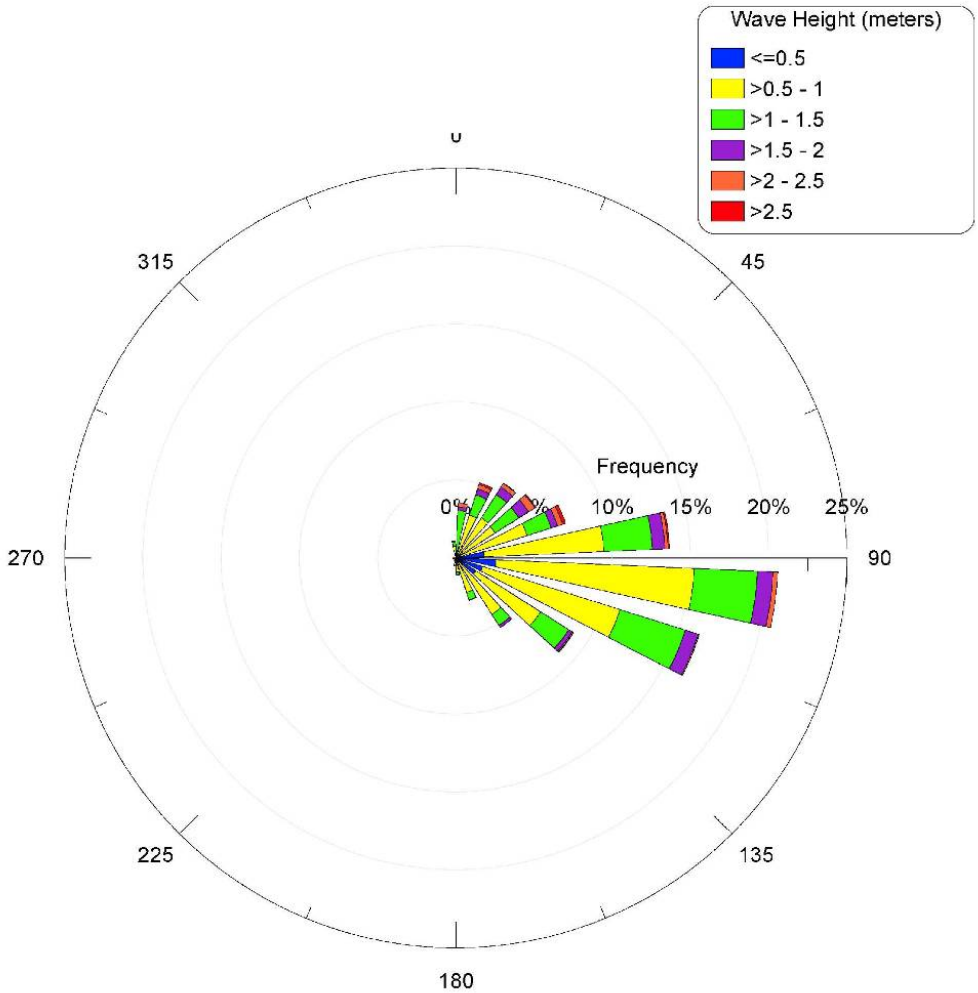

Figure 3.2-6: Jacksonville ODMDS Wave Rose for Significant Wave Height

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Data provided as-is. Data source: EPA 2010 Q:\GIS PROJECTS\JAX_ODMDS\MAPS UPDATED 120110\Figure 3.2-6 Wave Rose Sig Wave Height.mxd 120610

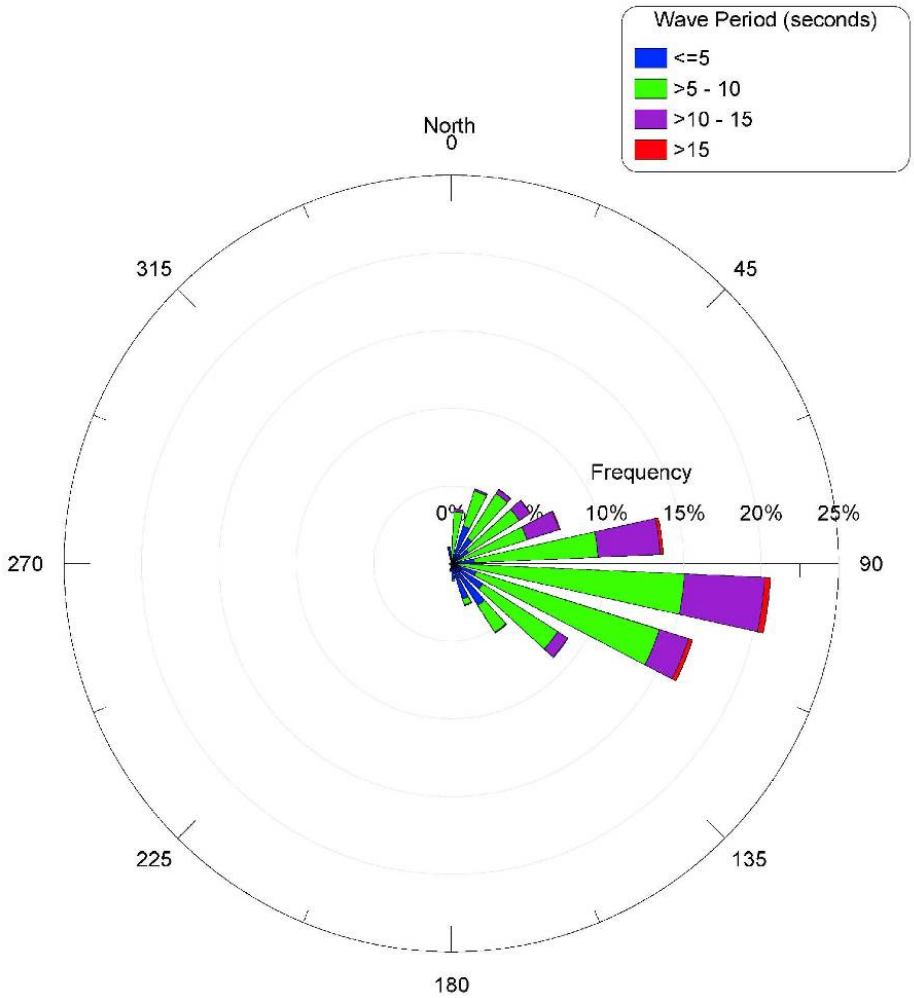

Figure 3.2-7: Jacksonville ODMDS Wave Rose for Peak Wave Period

This map and/or digital data is for planning purposes only and should not be used to determine the precise location of any feature.
Data provided as-is. Data source: EPA 2010 Q:\GIS PROJECTS\JAX_ODMDS\MAPS UPDATED 120110\Figure 3.2-7 Figure 3.2-7 Wave Rose Peak Wave Period.mxd.mxd 120610

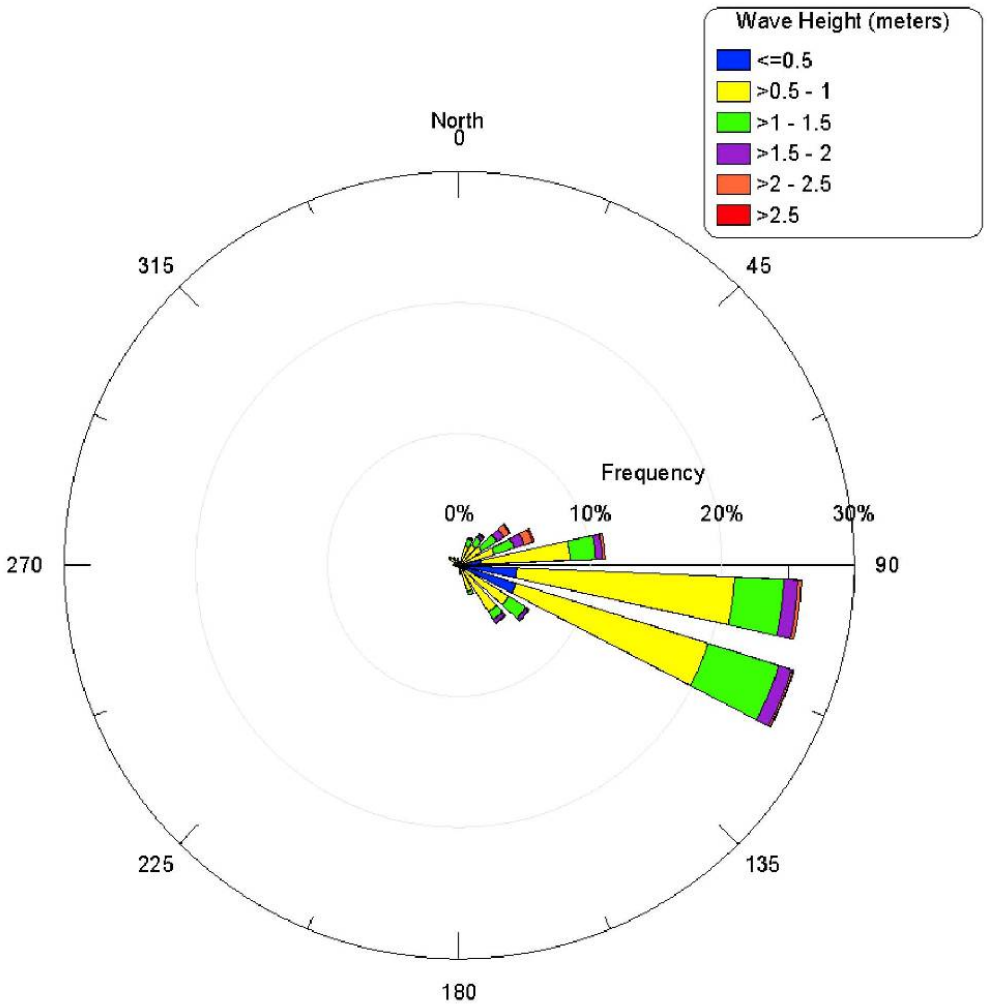

Figure 3.2-8: Fernandina Beach ODMDS (CDIP Station 132) Wave Rose for Significant Wave Height

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Data provided as-is. Data source: EPA 2010 Q:\GIS PROJECTS\JAX_ODMDS\MAPS UPDATED 120110\Figure 3.2-8 Fern Wave Rose Sig Wave Height.mxd 120610

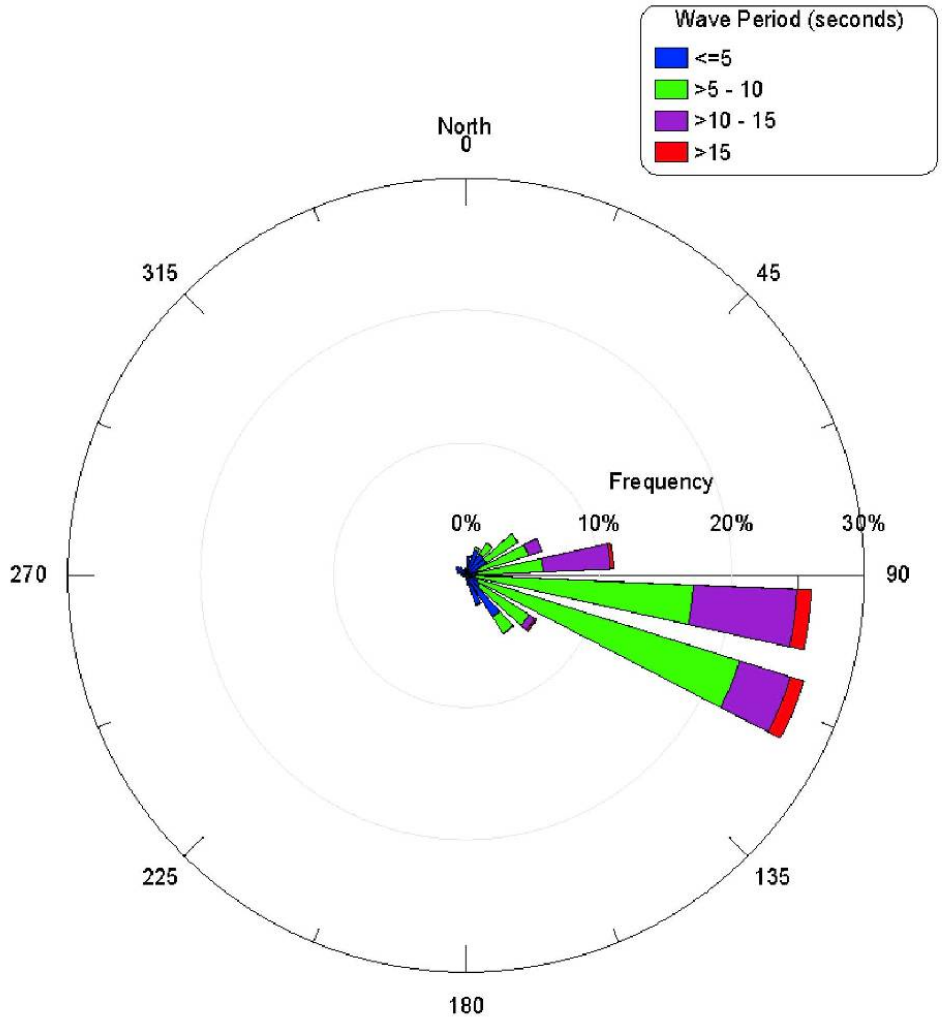


Figure 3.2-9: Fernandina Beach ODMDS (CDIP Station 132) Wave Rose for Peak Wave Period

This map and/or digital data is for planning purposes only and should not be used to determine the precise location of any feature.
Data provided as-is. Data source: EPA 2010 Q:\GIS PROJECTS\JAX_ODMDS\MAPS UPDATED 120110\Figure 3.2-9 Fern Wave Rose Peak Wave Period.mxd 120610

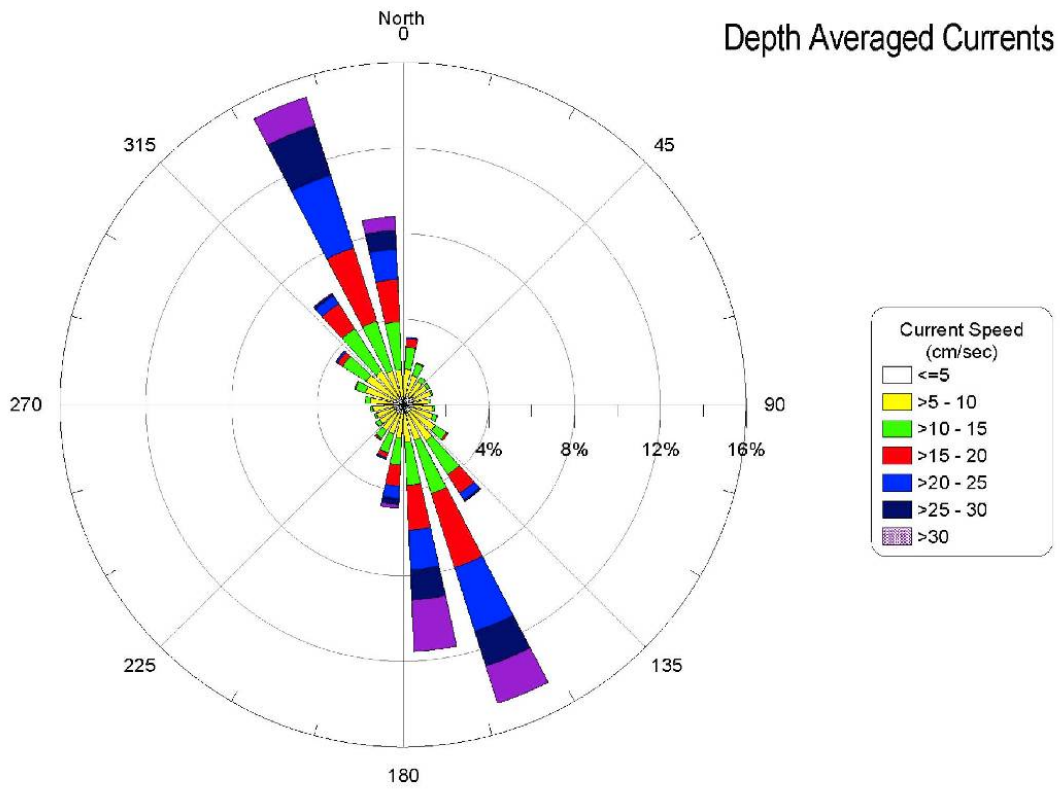


Figure 3.2-10: Jacksonville ODMDS Depth Averaged Current Rose Diagram

This map and/or digital data is for planning purposes only and should not be used to determine the precise location of any feature.
Data provided as-is. Data source: EPA 2010 Q:\GIS PROJECTS\JAX_ODMDS\MAPS UPDATED 120110\Figure 3.2-10 Jax ODMDS Depth Avg Current Rose.mxd 120610

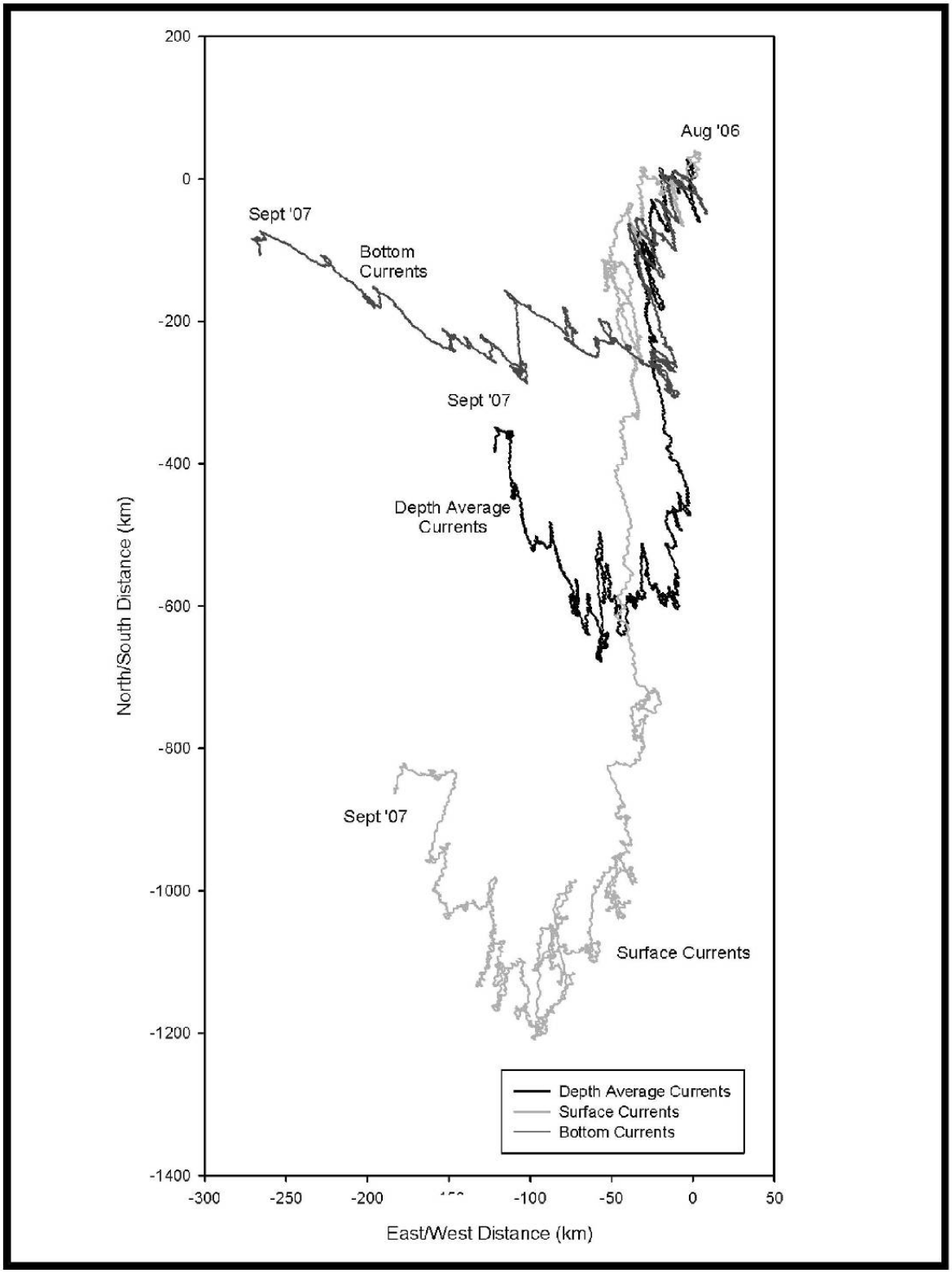


Figure 3.2-11: Jacksonville ODMDS Progressive Vector Diagram

This map and/or digital data is for planning purposes only and should not be used to determine the precise location of any feature.
Data provided as-is. Data source: EPA 2010 Q:\GIS PROJECTS\JAX_ODMDS\MAPS UPDATED 120110\Figure 3.2-11 Jax Progressive Vector.mxd 120610

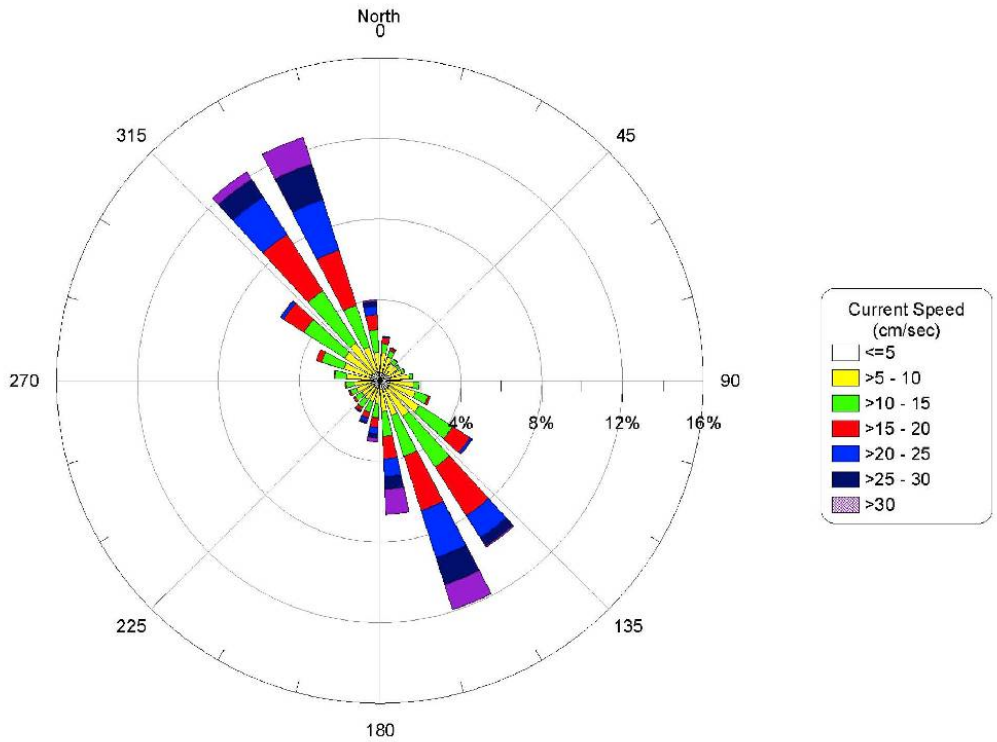


Figure 3.2-12: Fernandina Beach ODMDS Depth Averaged Current Rose Diagram

This map and/or digital data is for planning purposes only and should not be used to determine the precise location of any feature.
Data provided as-is. Data source: EPA 2010 Q:\GIS PROJECTS\JAX_ODMDS\MAPS UPDATED 120110\Figure 3.2-12 Fern Depth Avg Current.mxd 120710

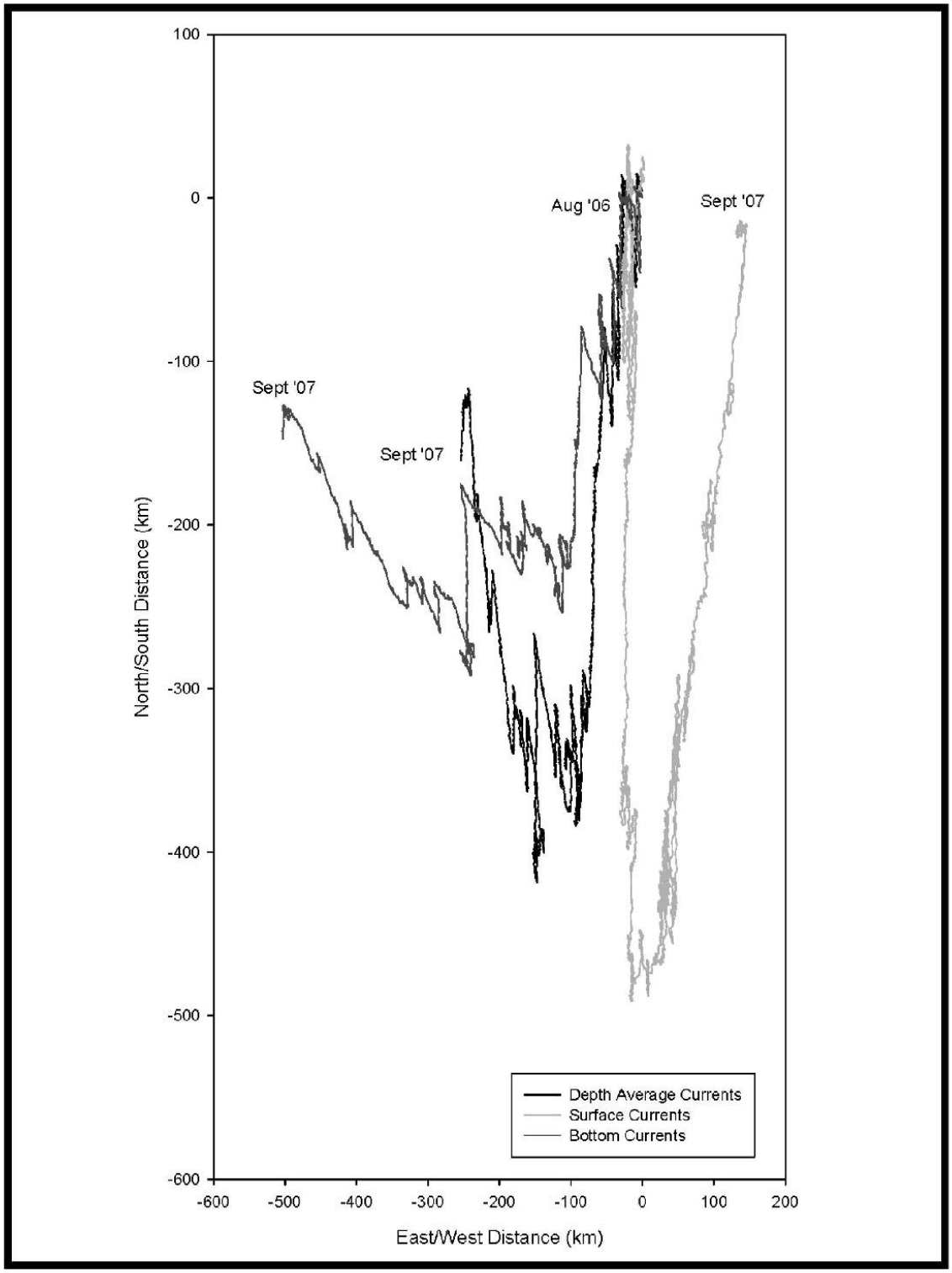


Figure 3.2-13: Fernandina Beach ODMDS Progressive Vector Diagram

This map and/or digital data is for planning purposes only and should not be used to determine the precise location of any feature.
Data provided as-is. Data source: EPA 2010 Q:\GIS PROJECTS\JAX_ODMDS\MAPS UPDATED 120110\Figure 3.2-13 Fern Progressive Vector.mxd 120710

3.2.3.4. Sediment Transport

Along the shelf in the vicinity of northeast Florida, sediment transport is dominated by waves and currents due to extratropical storm events and frontal passages which occur, on average, once or twice a month during the fall, winter, and spring months, and to a lesser extent tropical events which occur during the summer and fall months about once every 2 years (USACE 2008). Bathymetric surveys conducted at the Jacksonville ODMDS provide information on sediment transport in the vicinity.

Pre- and post-disposal bathymetry surveys were conducted at the Jacksonville ODMDS in 1977/1978, 1995, 2001, 2002, 2003, 2004, 2007, 2008, 2010, and 2011. Monitoring activities during the 1970s indicated significant mounding occurring at the site and that a small amount of dredged material had been transported to the south, as demonstrated by bathymetric, physical, and chemical analysis of sediments. Since re-initiation of disposal activities at the ODMDS, mounding has increased, and the bathymetric trends indicate that the site is not dispersive and that a significant amount of disposed material remains on site (Figure 3.2-14). However, the 1978 study of the site and the 1995 and 1998 sediment mapping surveys indicated the presence of fine-grained dredged material south of the site boundaries. It is possible that some southerly transport of dredged material occurs in the fall and winter due to wave-induced re-suspension (USEPA and USACE 2008).

There were two disposal operations at the Jacksonville ODMDS between 2004 and 2007 associated with maintenance of Mayport Harbor and Jacksonville Harbor, respectively. Figures 3.2-15 and 3.2-16 illustrate the bottom changes that occurred from September 2004 to June 2007 and from June 2007 to February 2008, respectively. Areas A and B were the primary locations that gained and lost sediment during the period of analysis (USACE 2008).

Between 2004 and 2007, the primary change was within area A, which gained approximately 390,000 cy, presumably from the 2006 disposal of Mayport turning basin sediments. No areas of the ODMDS experienced significant volume loss between 2004 and 2007. During the 2007-to-2008 time frame, area A lost 489,000 cy, accounting for more than a 100% volume loss of the turning basin sediments deposited in 2006. During that same time, area B gained approximately 305,000 cy.

Area B is the shallowest portion of the ODMDS and is thus subjected to the highest wave-generated currents at the site. This was also the location in which all of the 2007 Jacksonville Harbor material was deposited. Therefore, it is likely that observed volume gains in area B were a result of new deposits in area B and not the result of movement of sediment from area A to area B. The data do not indicate any net volume gain outside of the ODMDS boundary during either time frame, which indicates that volume losses in area A can be attributed either to consolidation or to sediment being eroded and carried away in the water column.

Sandy dredged material appears to be stable at the site; however, silt and clay erode due to wave action. Erosion of the silt and clay material increases when dredged material is placed in shallower water depths. Survey and dredging records indicate that significant volumes of fine-grained dredged material have eroded from the site on relatively short time scales. However, monitoring data indicate that there have been no net volumetric gains outside of the ODMDS. Further studies were conducted to determine if eroded sediment has the potential to be re-deposited outside the ODMDS borders. Subsequent analysis with the Long Term Fate (LTFATE) model better describes the processes of consolidation and erosion at the site.

Using the LTFATE model, predictions of erosion and deposition amounts were determined for representative storm conditions which occurred during the ADCP data collection period from September 2006 to August 2007. The analysis shows that large volumes (400,000 to 500,000 cy) of sediment are removed during one storm event before much consolidation occurs, which is consistent with the MDFATE analysis. Two storm events remove about 100,000 cy of more consolidated sediment. These volume losses can be attributed to sediment transport and consolidation; however, the analysis indicates that a 500-foot buffer would be adequate to ensure that no significant sediment deposition would occur outside the Jacksonville ODMDS (USACE 2008).

3.2.4. Water Quality

The ROI for all water column characteristics is the water column within the three alternative sites. Chemical parameters pertinent to evaluation of an ODMDS include suspended solids, nutrients important to phytoplankton growth (e.g. nitrates and phosphates), dissolved and particulate trace metals, pesticides, and PAHs. Potential impacts depend on the concentrations of constituents released from dredged material and physical factors such as mixing and dilution rates.

3.2.4.1. Regional Characteristics

Turbidity

Turbidity in near-bottom waters of the Georgia Bight correlate with suspended sediment concentrations (Bothner 1979). Because of river discharges and re-suspension of bottom sediments by waves and currents, suspended sediment concentrations in the Georgia Bight are highest near the coast and decrease rapidly seaward (Manheim et al. 1970).

Water clarity at the alternative sites is influenced by stormwater runoff and other coastal processes. The St. Johns River transports suspended particulates and nutrients to the nearshore region. Wave, storm surges, and wind can re-suspend bottom sediments and increase suspended particulates in the water, especially along the bottom.

Nutrients

Nutrients (e.g., phosphates, nitrates, ammonia, and silicates) are essential to the growth of phytoplankton. Nutrients can be released in measurable quantities during disposal operations, but the overall nutrient enrichment of the receiving water (i.e., after initial mixing) is rarely of sufficient magnitude to measurably alter phytoplankton productivity (USEPA 1983).

Rivers commonly transport relatively large loads of nutrients to the ocean, but this nutrient load is typically restricted to within 20 km of the coast within the Georgia Bight (BLM 1980a). All three alternative sites lie within this zone; however, nutrient concentrations are low, probably as a result of rapid biological uptake (USEPA 1983). Nearshore waters do not exhibit vertical gradients of dissolved nutrients (USEPA 1983; Atkinson 1975, 1976). Nitrogen-to-phosphorus ratios indicate that phytoplankton productivity is nitrogen-limited.

Trace Metals

Trace metals in Georgia Bight waters are derived from land drainage (stormwater runoff) and industrial waste discharges (Windom et al. 1971). Suspended particulates, both biogenic and terrigenous, often elevate levels of trace contaminants by advection, biological activity, adsorption, flocculation, precipitation, and co-precipitation. As a result, contaminants may be transported to the benthos or to the food chain or both (Windom and Betzer 1979).

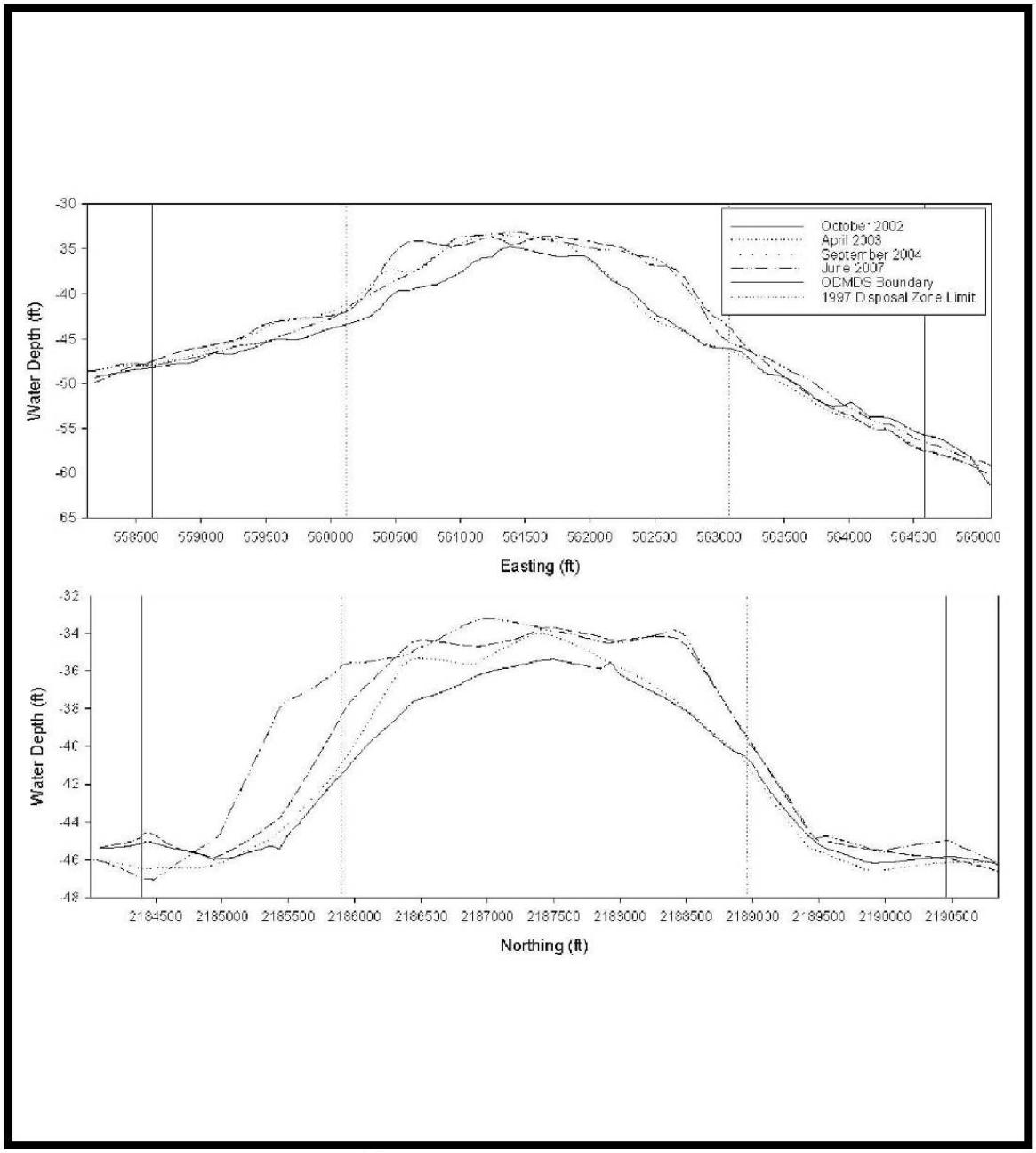


Figure 3.2-14. Jacksonville ODMDS Bathymetric Changes 2002 to 2007

This map and/or digital data is for planning purposes only and should not be used to determine the precise location of any feature. Data provided as-is. Source: USEPA & USACE 2007.
Q:\GIS PROJECTS\JAX_ODMDS\PHASE 2\EIS\MAPS UPDATED 03\51\Figure 3.2-14 Jax ODMDS Bathy Changes_graphs.mxd

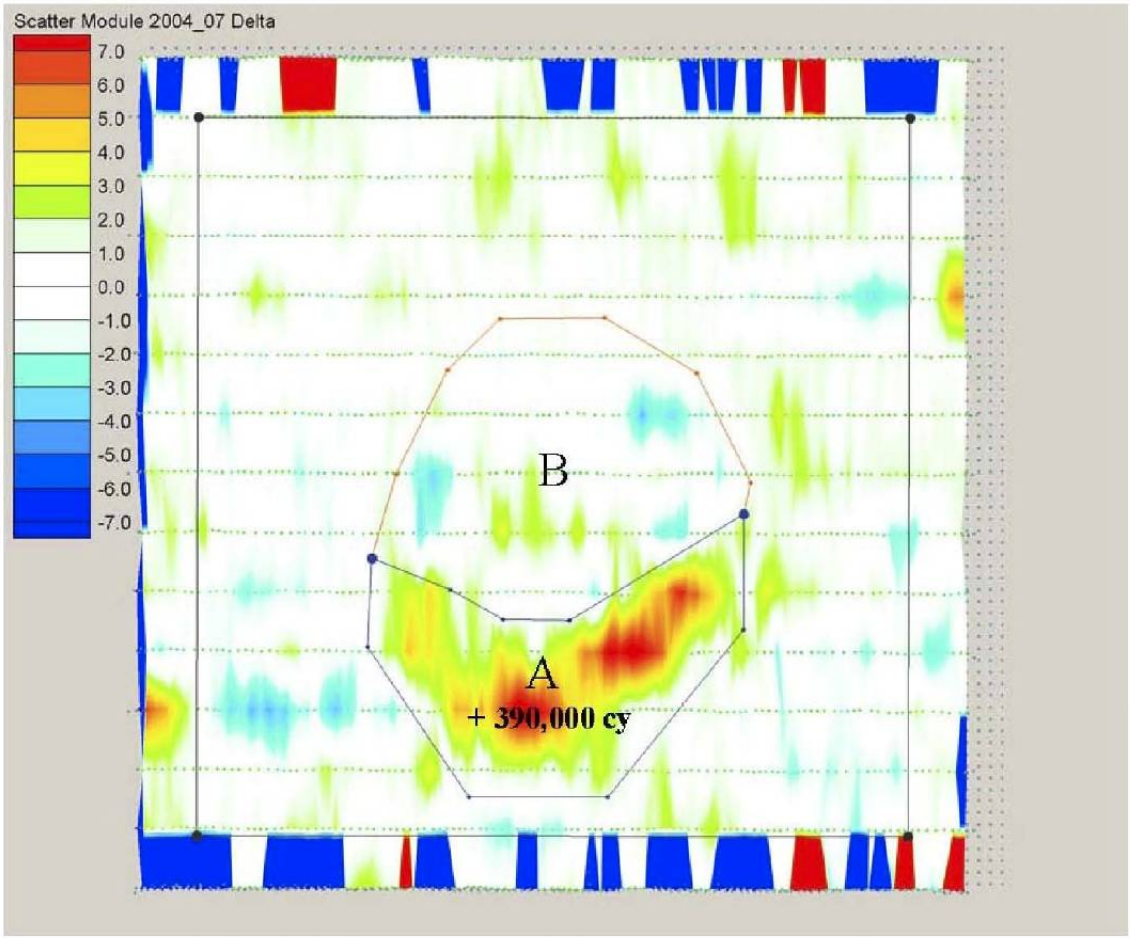


Figure 3.2-15. Contour Plot of Bottom Changes Between the September 2004 and June 2007 Hydrographic Surveys of Jacksonville ODMDS

This map and/or digital data is for planning purposes only and should not be used to determine the precise location of any feature. Data provided as-is. USACE 2008.
Q:\GIS PROJECTS\JAX_ODMDS\PHASE 2\EIS\MAPS UPDATED 031511\Figure 3.2-15. Contour Plot of Bottom Changes_04-07.mxd

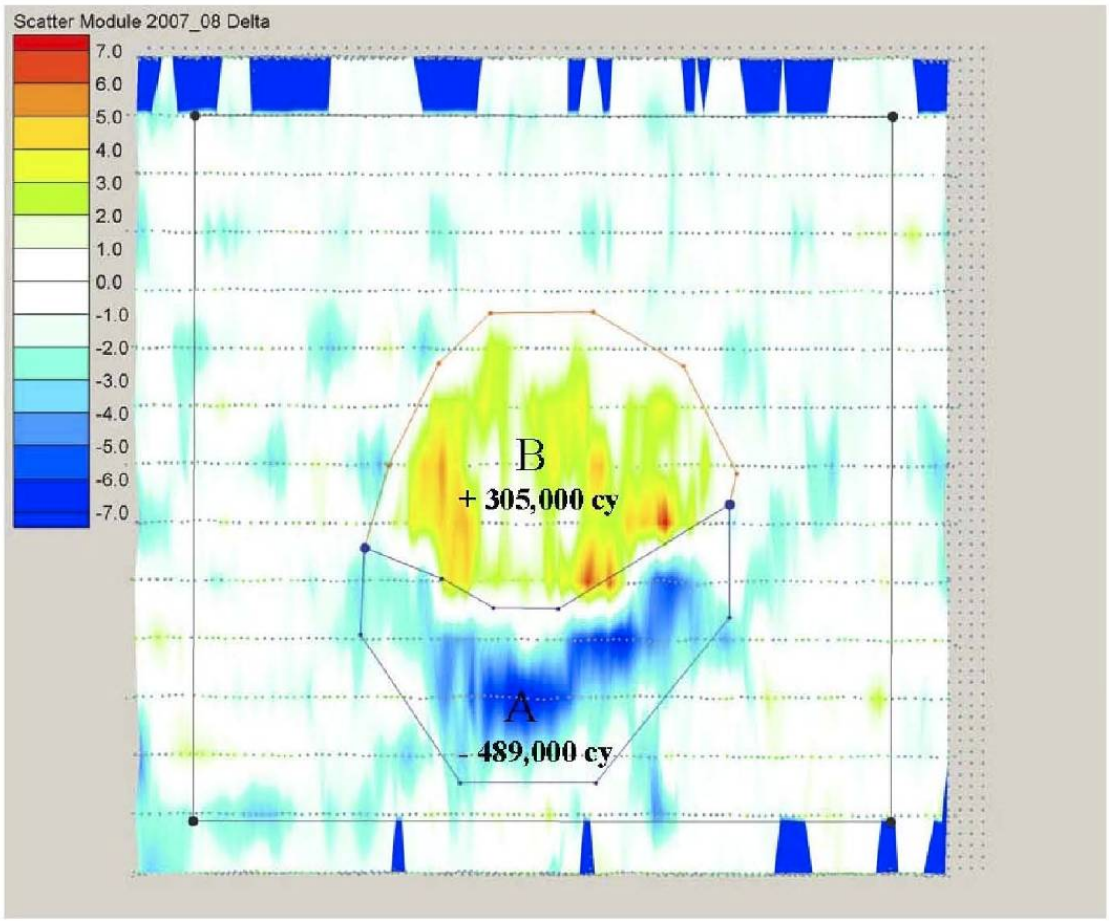


Figure 3.2-16. Contour Plot of Bottom Changes Between the June 2007 and February 2008 Hydrographic Surveys of Jacksonville ODMDS

This map and/or digital data is for planning purposes only and should not be used to determine the precise location of any feature. Data provided as-is. USACE 2008.
Q:\GIS PROJECTS\JAX_ODMDS\PHASE 2\EIS\MAPS UPDATED 031511\Figure 3.2-16. Contour Plot of Bottom Changes_07-08.mxd

3.2.4.2. Alternative Sites Characteristics

As part of the spring and fall 2010 site designation studies, water quality samples were collected to characterize water columns at the proposed Alternative Sites 1, 2, and 3. Water chemistry samples and CTD profiles were collected at stations within and adjacent to the three alternative sites (Figures 3.2-17a through d) (ANAMAR 2011). A Sea-Bird SBE 9 CTD-profiler was used to record continuous water column parameters including depth, temperature, salinity, dissolved oxygen, turbidity, and photosynthetically active radiation (PAR). In addition, water samples were collected and analyzed for metals, total suspended solids, organochlorine pesticides, and PAHs. Results from both studies are summarized in the following sections. Complete results are provided in the site designation report (ANAMAR 2011). This report can be downloaded at http://www.saj.usace.army.mil/Divisions/Planning/Branches/Environmental/DocsNotices_OnLine_DuvalCo.htm.

Water Column Parameters

Tables 3.2-3a and b summarize the CTD data for spring and fall 2010 surveys for Alternative Sites 1, 2, and 3. No thermocline or pycnocline was observed during either survey. Temperature was approximately 12°C warmer and salinity was approximately 3 ppt higher in fall than in spring. Spring and fall survey results for all sites show a narrow range of measurements for DO (5.7 to 8.2 mg/L), salinity (32.5 to 36.1 ppt), and temperature (15.0°C to 16.8°C in the spring and 27.7°C to 28.6°C in the fall). Turbidity ranged from -0.03 (clear water) to 24.7 FTU.

Table 3.2-3a. Spring and Fall 2010 CTD Profile Data

Alternatives Sites	Season	Dissolved Oxygen (mg/L)	Salinity (ppt)	Temperature (°C)	Turbidity (FTU)	Maximum Normalized PAR (%)
Alternative Sites 1 and 2	Spring	7.4 – 8.2	32.5 – 33.9	15.2 – 16.4	0.9 – 14.6	42.3
	Fall	6.3 – 6.8	36.0 – 36.1	27.7 - 28.3	-0.01 – 2.9	76.9
Alternative Site 3	Spring	7.2 – 8.0	33.3 – 33.6	15.0 – 16.4	0.0 – 24.7	64.2
	Fall	5.7 – 7.0	35.9 – 36.1	27.7 – 28.5	-0.03 – 4.7	85.4

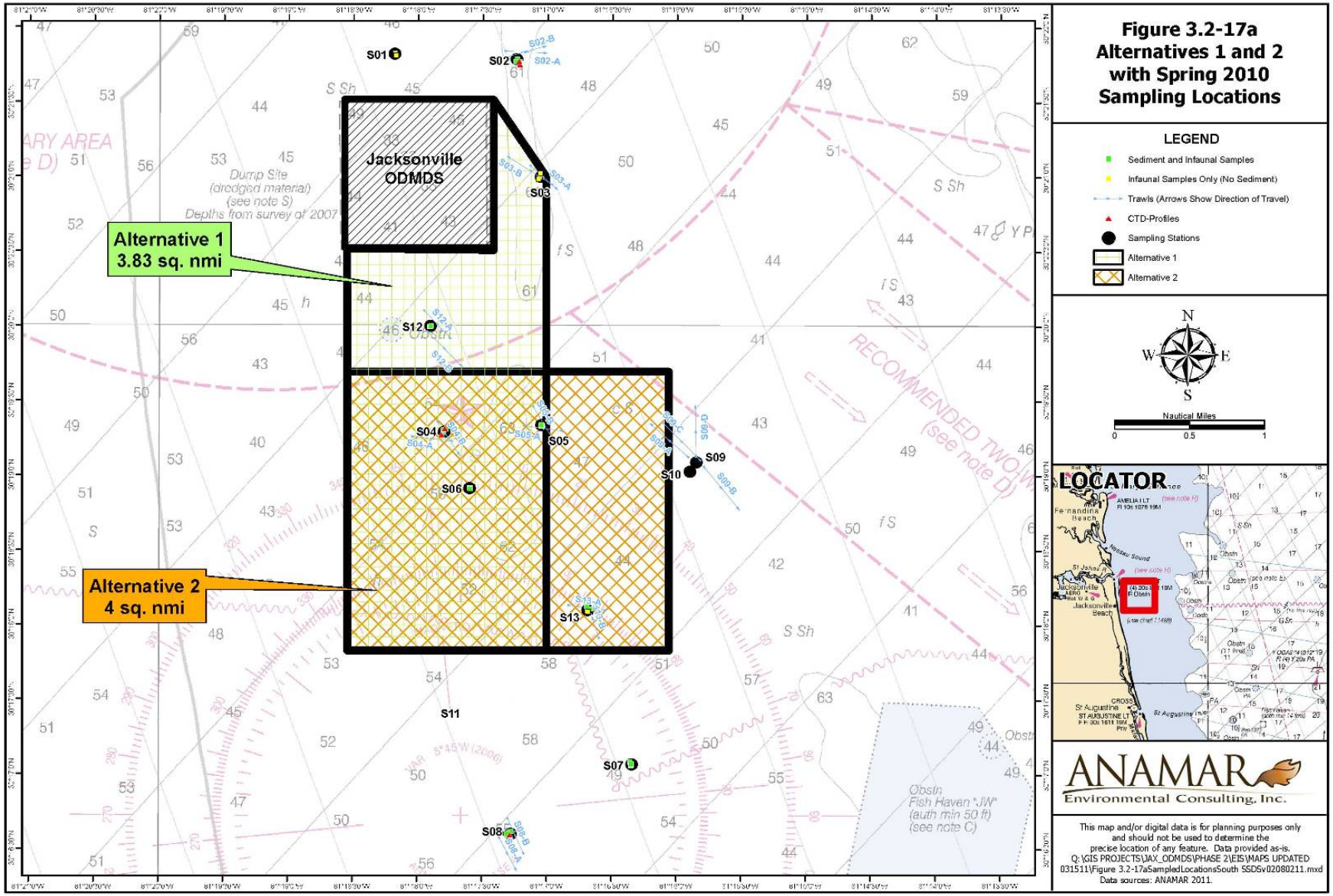
Source: ANAMAR (2011)

Table 3.2-3b. Spring and Fall 2010 CTD-Profile Depth at Light Extinction

Alternatives Sites	Season	Range of Depths at Light Extinction[1] (ebb and flood tides combined)	
		Depth (feet)	Depth (meters)
Alternative Sites 1 and 2	Spring	9.0 – 18.0	2.75 – 5.50
	Fall	42.6 – 44.3	13.00 – 13.50
Alternative Site 3	Spring	10.7 – 28.7	3.25 – 8.75
	Fall	30.4 – 34.4	9.25 – 10.50

[1] Depth at light extinction is defined as the depth at which normalized PAR values are ≤2% of surface PAR values.

Source: ANAMAR (2011)


Jacksonville ODMDS
Alternative 1
3.83 sq. nmi
Alternative 2
4 sq. nmi
Dump Site
(dredged material)
(see note S)
Depths from survey of 2007
S01
S02
S03
S04
S05
S06
S07
S08
S09
S10
S11
S12
S13
Obstn
Fish Haven "JW"
(auth min 50 ft)
(see note C)
RECOMMENDED TWOWAY
(see note D)
LOCATOR
Fernandina Beach
Nassau Sound
Jacksonville
Jacksonville Beach
St Augustine
Figure 3.2-17a
Alternatives 1 and 2
with Spring 2010
Sampling Locations
LEGEND
Sediment and Infaunal Samples
Infaunal Samples Only (No Sediment)
Trawls (Arrows Show Direction of Travel)
CTD-Profiles
Sampling Stations
Alternative 1
Alternative 2
N
W
E
S
Nautical Miles
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1
ANAMAR
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precise location of any feature. Data provided as-is.
Q:\GIS PROJECTS\JAX_ODMDS\PHASE 2\EIS\MAPS UPDATED
031511\Figure 3.2-17aSampledLocationsSouth SSDSv02080211.mxd
Data sources: ANAMAR 2011.

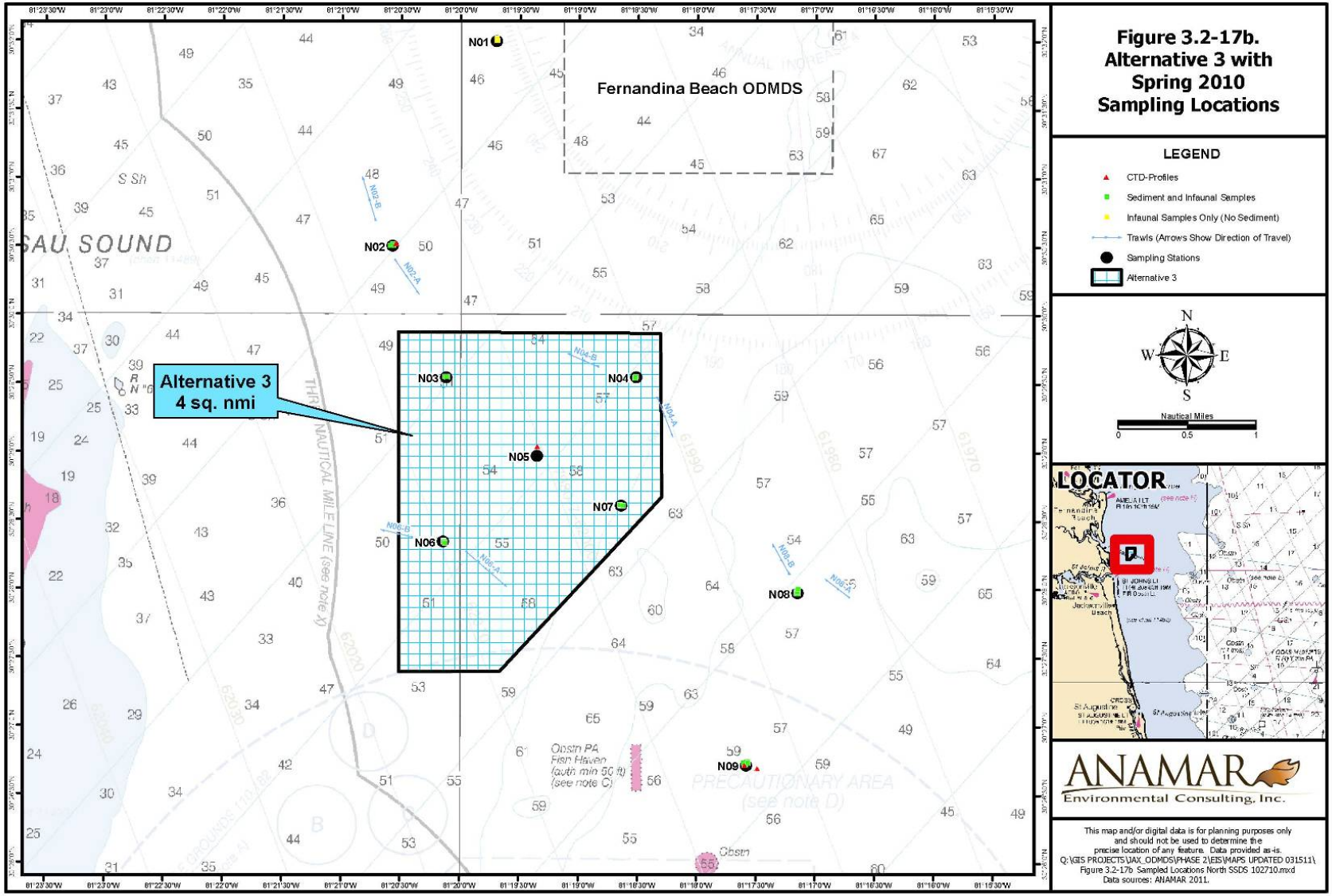
Figure 3.2-17b.
Alternative 3 with
Spring 2010
Sampling Locations
LEGEND
CTD-Profiles
Sediment and Infaunal Samples
Infaunal Samples Only (No Sediment)
Trawls (Arrows Show Direction of Travel)
Sampling Stations
Alternative 3
N
W
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Nautical Miles
0
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LOCATOR
ANAMAR
Environmental Consulting, Inc.
This map and/or digital data is for planning purposes only and should not be used to determine the precise location of any feature. Data provided as-is.
Q:\GIS PROJECTS\JAX_ODMDS\PHASE 2\EIS\MAPS UPDATED 031511\
Figure 3.2-17b Sampled Locations North SSDS 102710.mxd
Data sources: ANAMAR 2011.
Fernandina Beach ODMDS
Alternative 3
4 sq. nmi
N01
N02
N03
N04
N05
N06
N07
N08
N09
SAU SOUND
THE NAUTICAL MILE LINE (see note X)
PRECAUTIONARY AREA
(see note D)
Obstn PA
Fish Haven
(auth min 50 ft)
(see note C)
Obstn

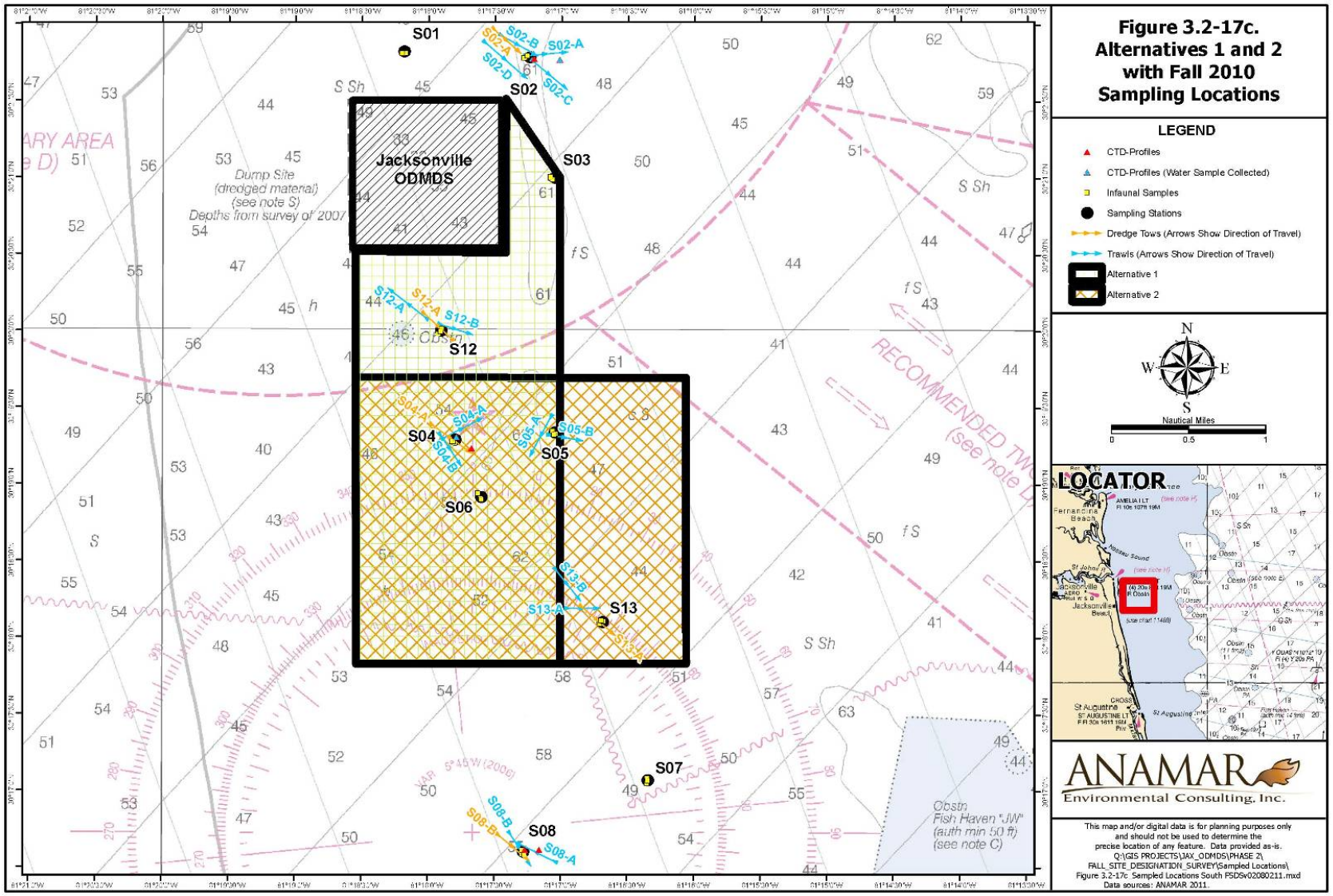
Figure 3.2-17c.
Alternatives 1 and 2
with Fall 2010
Sampling Locations
LEGEND
CTD-Profiles
CTD-Profiles (Water Sample Collected)
Infaunal Samples
Sampling Stations
Dredge Tows (Arrows Show Direction of Travel)
Trawls (Arrows Show Direction of Travel)
Alternative 1
Alternative 2
N
W
E
S
Nautical Miles
0
0.5
1
LOCATOR
ANAMAR
Environmental Consulting, Inc.
This map and/or digital data is for planning purposes only and should not be used to determine the precise location of any feature. Data provided as-is.
Q:\GIS PROJECTS\JAX_ODMDS\PHASE 2\FALL_SITE_DESIGNATION_SURVEY\Sampled Locations\Figure 3.2-17c Sampled Locations South FSDSv02080211.mxd
Data sources: ANAMAR 2011.
Jacksonville ODMDS
Dump Site (dredged material) (see note S)
Depths from survey of 2007
RECOMMENDED TWO
(see note D)
Obstn Fish Haven "JW" (auth min 50 ft) (see note C)
S01
S02
S03
S04
S05
S06
S07
S08
S12
S13
S02-A
S02-B
S02-C
S02-D
S04-A
S04-B
S05-A
S05-B
S08-A
S08-B
S12-A
S12-B
S13-A
S13-B

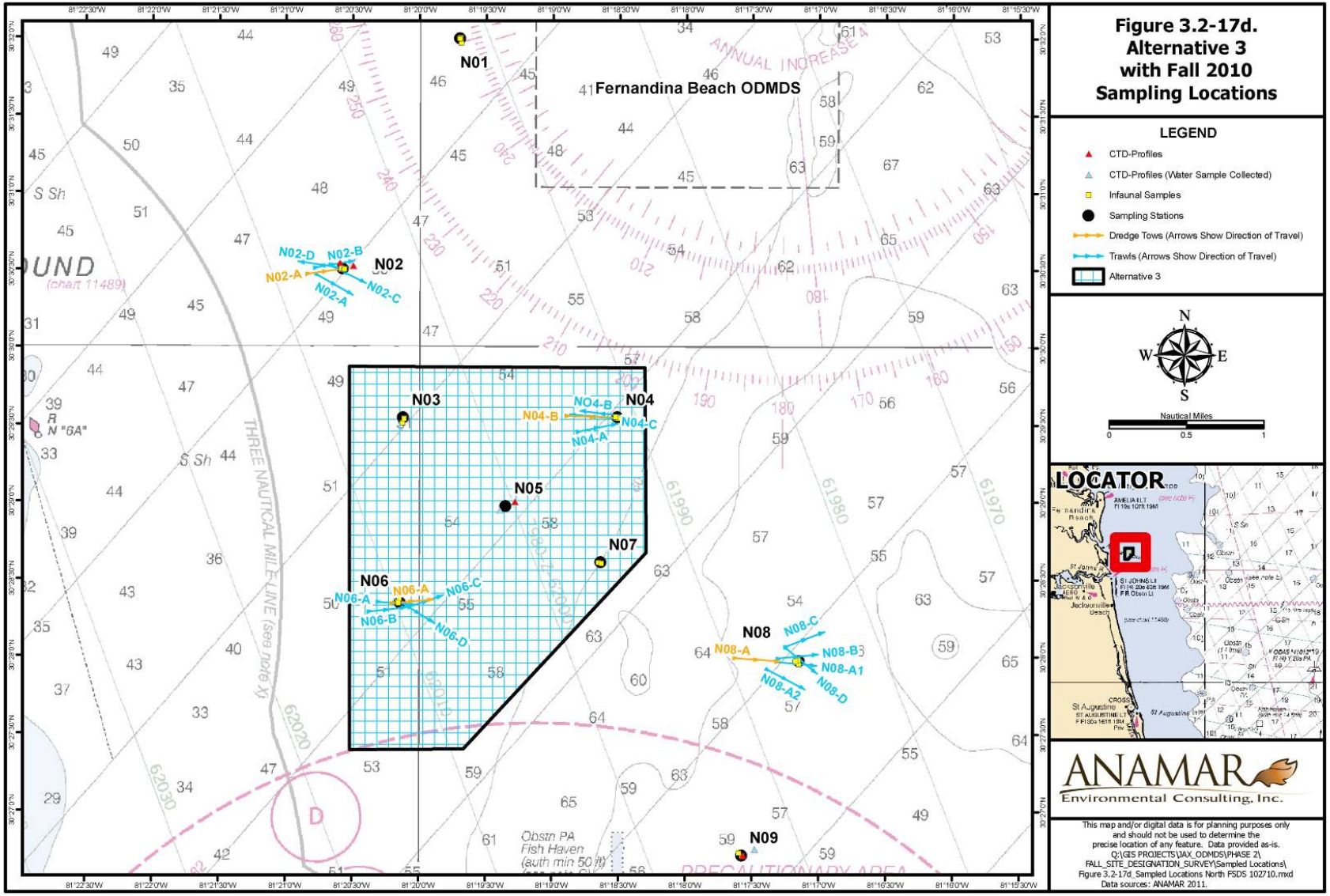
Figure 3.2-17d.
Alternative 3
with Fall 2010
Sampling Locations
LEGEND
CTD-Profiles
CTD-Profiles (Water Sample Collected)
Infaunal Samples
Sampling Stations
Dredge Tows (Arrows Show Direction of Travel)
Trawls (Arrows Show Direction of Travel)
Alternative 3
N
W
E
S
Nautical Miles
0
0.5
1
LOCATOR
ANAMAR
Environmental Consulting, Inc.
This map and/or digital data is for planning purposes only and should not be used to determine the precise location of any feature. Data provided as-is.
Q:\GIS PROJECTS\IAX_ODMDS\PHASE 2\FALL_SITE_DESIGNATION_SURVEY\Sampled Locations\Figure 3.2-17d_Sampled Locations North FSDS 102710.mxd
Data sources: ANAMAR 2011.
Fernandina Beach ODMDS
N01
N02
N03
N04
N05
N06
N07
N08
N09
N02-A
N02-B
N02-C
N02-D
N04-A
N04-B
N04-C
N06-A
N06-B
N06-C
N06-D
N08-A
N08-B
N08-C
N08-D
N08-A1
N08-A2
THREE NAUTICAL MILE LINE (see note X)
ANNUAL INCREASE
Obstn PA
Fish Haven
(auth min 50 ft)
PRECAUTIONARY AREA

Water Chemistry Characteristics

Table 3.2-4 summarizes the range of concentrations of detected analytes for the fall 2010 survey. Note that Alternative Sites 1 and 2 shared the water quality station S04. Two samples were collected at each station: near the surface and near the bottom. No significant differences in analyte concentrations were detected between the surface and the bottom of the water column.

Overall, water chemistry results were similar between Alternative Sites 1, 2, and 3. Of the 11 metals tested, arsenic, beryllium, cadmium, chromium, copper, lead, nickel, and zinc were detected in concentrations greater than the MRL in all three alternative sites. Silver was not detected above the MDL at any of the alternative sites. Of the 28 pesticide analytes tested, only δ-hexachlorocyclohexane (δ-BHC) was detected in concentrations below the MRL but at or above the MDL at Alternative Sites 1 and 2. Of the 18 PAHs tested, 1-methylnaphthalene, 2-methylnaphthalene, fluoranthene, fluorene, and pyrene were detected in concentrations greater than the MDL but less than the MRL at all three alternative sites. Naphthalene was detected in concentrations greater than the MRL at all three alternative sites.

All sample results were well below USEPA water quality criteria indicators (the criteria maximum concentration [CMC] and criterion continuous concentration [CCC]) for the analytes tested (USEPA 2009b).

Table 3.2-4. Range of Concentrations of Detected Analytes at Alternative Sites

Analytes	Alternative Sites 1 and 2 (µg/L)	Alternative Site 3 (µg/L)
Metals		
Arsenic	1.42 – 1.46	1.40 – 1.50
Beryllium	0.0012 – 0.0029	0.001 – 0.0041
Cadmium	0.012	0.010
Chromium	0.16 – 0.20	0.20 – 0.29
Copper	0.166 – 0.223	0.176 – 0.192
Lead	0.026 – 0.048	0.028 – 0.076
Mercury	<0.02	<0.02 – 0.02
Nickel	0.19 – 0.21	0. 23 – 0.25
Selenium	<0.2	0.2
Zinc	0.40 – 0.60	0.91 – 1.07
Pesticides		
δ-BHC	<0.00057 – 0.0011	<0.00057
PAHs		
1-methylnaphthalene	0.0011 – 0.0012	0.0012
2-methylnaphthalene	<0.00065 – 0.00069	<0.00065 – 0.00082
Fluoranthene	<0.00024 – 0.0017	0.0014 – 0.0016
Fluorene	0.00052 – 0.00053	0.00058 – 0.00065
Naphthalene	0.053 – 0.057	0.047 – 0.056
Pyrene	<0.00025 – 0.00050	0.00056 – 0.00058

Results with a "<" indicate analyte was not detected at or above the MDL. The value given is the lowest MDL.
Source: ANAMAR (2011)

3.2.5. Sediment Characteristics

The ROI for sediment characteristics is the ocean floor within and adjacent to the three alternative sites. A variety of trace contaminants such as metals, pesticides, PAHs, PCBs, and total organic carbon can accumulate in bottom sediments. Elevated levels of sediment contaminants are generally the result of anthropogenic inputs such as municipal and industrial waste disposal, urban and agricultural runoff, atmospheric fallout, and accidental spillage.

3.2.5.1. Regional Characteristics

Sediments occurring on the continental shelf are highly variable in terms of grain size characteristics, particle shape, and mineralogy (Meisburger and Field 1975). Trends in sediment distribution appear to be related to both shelf and surface morphology and subbottom (geological) structure. In general, surficial sediments are detrital quartz sands that overlie older carbonate-rich quartz sand deposits (URS and CPE 2007).

Off Fernandina Beach and Jacksonville, quartz sand is thick (up to 8.2 feet) and uniform in lateral extent, probably due to the presence of the St. Johns and St. Mary's rivers (URS and CPE 2007). Late Tertiary dolomite silts and white foraminiferal sands occur several feet below the surface of the seafloor. Weathered materials representing the remains of Quaternary soils or groundwater profiles also occur below the surficial blanket sediments. Organic-rich muds also occur in the area at -59 feet MLLW (URS and CPE 2007). Hollister (1973) depicts surficial sediments on the continental shelf east of Florida to be predominantly sand except for the nearshore area between St. Augustine and Cape Canaveral (south of the study area), which is classified as silty sand. Hard banks and reefs are sparsely scattered along almost the entire east coast of Florida.

Nearshore continental shelf sediments off northeastern Florida contain low concentrations of trace metals (USEPA 1983). Average concentrations from a study conducted by Windom and Betzer (1979) were 0.04 mg/kg for cadmium, 0.60 mg/kg for copper, 3.1 mg/kg for lead, and 1.8 mg/kg for zinc. These low concentrations are likely due to the predominantly sandy sediments because most trace metals are positively correlated with the silt and clay content of the sediment (Windom and Betzer 1979).

3.2.5.2. Alternative Sites Characteristics

Sediment characteristics considered for an ODMDS designation include grain size, organic content, and chemical contaminant constituents. As part of the spring and fall 2010 site designation studies, surface sediment samples were collected to characterize the sediment at the proposed Alternative Sites 1, 2, and 3. Sediment samples were collected at stations within and adjacent to the three alternative sites (Figure 3.2-17a through d) (ANAMAR 2011). Analytical results from these samples are summarized in the following sections. Complete results are provided in the site designation report (ANAMAR 2011), which can be downloaded at http://www.saj.usace.army.mil/Divisions/Planning/Branches/Environmental/DocsNotices_OnLine_DuvalCo.htm.

Physical Analysis

Grain size is an important physical characteristic of sediment. Information on sediment grain size is used in determining trends of chemical processes, surface processes related to transportation and deposition, sample permeability/stability, affinities of contaminants, and movement of subsurface fluids (Blatt et al. 1972; McCave and Syvitski 1991). This information is used to characterize the sediment at each site and to determine if there are any significant differences between the sites and areas adjacent to the sites. Results of grain size analysis for each alternative site are summarized in Table 3.2-5.

Results of grain size analysis for Alternative Sites 1, 2, and 3 indicate a predominance of sand (70.1% to 98.6%). Based on the results, Alternative Sites 1 and 2 had somewhat higher percent silt and clay content than Alternative Site 3. Alternative Site 1 had a slightly higher percent gravel content compared to Alternative Sites 2 and 3. Other physical characteristics are analogous between sites.

Table 3.2-5. Summary of Sediment Grain Size Analysis for Alternative Sites

Alternative Sites	% Gravel[1] (Range)	% Sand[1] (Range)	% Silt & Clay[1] (Range)	USCS[2] Classification(s)
Alternative Site 1	0.0 – 8.75	70.1 – 97.5	0.50 – 28.26	SM-SP
Alternative Site 2	0.0 – 1.1	79.3 – 98.6	1.3 – 20.7	SM-SP
Alternative Site 3	0.3 – 1.3	81.4 – 98.2	1.5 – 18.1	SM-SP

[1] Particle sizes: gravel ≥4.750 mm, sand = 0.075–4.749 mm, silt and clay <0.075 mm.
[2] Unified Soil Classification System codes are: SM = silty sands, SP = poorly graded sand
Source: ANAMAR (2011)

Chemical Analysis

The ranges of detected concentrations of metals, pesticides, PAHs, and organotin analytes for each alternative site are summarized in Tables 3.2-6 through 3.2-10. Complete analytical results are provided in the site designation report (ANAMAR 2011).

Trace Metals

Although many metals are biologically essential in trace amounts, excessive quantities can interfere with fundamental physiological processes in organisms. Both localized and dispersed metal pollutants such as cadmium, lead, mercury, and silver are not biodegradable, are toxic in solution, and are subject to biomagnification in the tissues of marine organisms, thus causing adverse environmental impacts (Lau et al. 1998). Metals are introduced in marine systems as a result of the weathering of soils and rock and from a variety of human activities involving mining, processing, or use of metals and/or substances that contain metals (USEPA 2010b). Concentrations in sediments are typically orders of magnitude greater than concentrations in overlying water (Luoma 1989). A portion of the biologically available forms of metals is generally chemically fixed and largely unavailable to organisms without chemical changes in the sediment.

Concentrations of 11 metals were analyzed in sediment samples from the three alternative sites, and results are summarized in Table 3.2-6. Similar to the water samples, arsenic, beryllium, cadmium, chromium, copper, lead, nickel, and zinc were detected in concentrations greater than the MRL at all three alternative sites. Mercury, selenium, and silver were detected in concentrations greater than the MDL but less than the MRL at all three alternative sites.

Table 3.2-6. Range of Concentrations for Metals Detected at Alternative Sites

Analyte	Alternative Site 1 (mg/kg)	Alternative Site 2 (mg/kg)	Alternative Site 3 (mg/kg)
Arsenic	0.90 – 3.09	0.89 – 3.09	1.92 – 4.74
Beryllium	0.073 – 0.238	0.066 – 0.238	0.126 – 0.286
Cadmium	0.076 – 0.125	0.047 – 0.125	0.091 – 0.184
Chromium	1.5 – 9.42	2.62 – 9.42	3.90 – 11.2
Copper	0.3 – 2.01	0.20 – 2.01	0.34 – 2.05
Lead	0.738 – 4.6	0.556 – 3.24	0.977 – 3.98
Mercury	<0.019 – 0.010	<0.002 – 0.010	0.004 – 0.010
Nickel	0.65 – 2.64	0.57 – 2.64	0.82 – 3.19
Selenium	0.2 – 0.6	0.2 – 0.6	0.3 – 0.7
Silver	0.013 – 0.016	<0.006 – 0.016	0.009 – 0.019
Zinc	1.5 – 8.9	1.7 – 8.9	2.6 – 10.5

Results with a "<" indicate the analyte was not detected at or above the MDL. The value given is the lowest MDL or the range of MDLs.
Source: ANAMAR (2011)

Polycyclic Aromatic Hydrocarbons (PAHs)

PAHs are some of the most widespread organic pollutants due to their collective natural and manufactured origins (USEPA 2010b). They are a group of more than 100 different chemicals that occur naturally in oil, coal, and tar deposits and are formed during the incomplete combustion of petroleum products, garbage, and tobacco. PAHs are also manufactured in their pure form and are used in medicines and to make dyes and plastics. Because of their chemical affinity for lipids, PAHs in the marine environment are found primarily in carbon-rich sediments. Of the 18 PAHs tested, 13 were detected at Alternative Sites 1 and 2 and 11 were detected at Alternative Site 3 (Table 3.2-7).

Table 3.2-7. Range of Concentrations for PAHs Detected at Alternative Sites

Analyte	Alternative Site 1 (mg/kg)	Alternative Site 2 (mg/kg)	Alternative Site 3 (mg/kg)
2-Methylnaphthalene	<0.46 – 0.59	<0.46 – 0.59	0.50 – 0.80
Anthracene	<0.58 – 0.84	<0.58 – 0.84	<0.58 – 0.83
Benzo(a)anthracene	<0.72 – 9.1	<0.72 – 1.5	<0.72 – 1.5
Benzo(a)pyrene	<0.76 – 6.2	<0.76 – 2.0	<0.76 – 1.3
Benzo(b)fluoranthene	<0.92 – 5.7	<0.92 – 3.4	<0.92 – 2.3
Benzo(g,h,i)perylene	<0.85 – 3.0	<0.85 – 3.0	<0.85
Benzo(k)fluoranthene	<0.87 – 1.8	<0.87 – 1.8	<0.87
Chrysene	<0.80 – 9.1	<0.80 – 1.5	<0.80 – 1.0
Fluoranthene	<0.98 – 11.0	<0.98 – 3.6	<0.98 – 2.5
Indeno(1,2,3-cd)pyrene	<0.87 – 2.9	<0.87 – 2.9	<0.87 – 1.7
Naphthalene	<0.60 – 1.2	<0.60 – 1.2	<0.60 – 1.1
Phenanthrene	<1.4 – 18.0	<1.4 – 3.9	<1.4
Pyrene	<0.76 – 19.0	<0.76 – 6.5	<0.76 – 2.1

Results with a "<" indicate the analyte was not detected at or above the MDL. The value given is the lowest MDL.
Source: ANAMAR (2011)

Organochlorine Pesticides/PCBs

Unlike PAHs, organochlorine pesticides and PCBs are solely human-related in origin. DDT is the first and one of the most renowned chlorinated organic insecticides. In the 1970s and 1980s, applications of DDT were banned in most developed countries, although its limited use in disease control continues in certain parts of the world where malaria persists (Larson 2007). While the DDT family is the best known organochlorine pesticide, it is only one of a large number of related compounds used for a variety of pest control needs.

Due to their chemical stability and nonflammable properties, PCBs are valuable as coolants and insulating fluids, stabilizing additives, pesticide extenders, cutting oils, flame retardants, hydraulic fluids, sealants, adhesives, wood finishes, paints, aspirating agents, and in carbonless copy paper (USEPA 2010b). There are theoretically 209 PCB congeners, although only approximately 130 of these are found in commercial PCB mixtures. Aroclor is the trade name of a commercial PCB mixture marketed from the 1930s until its ban in the 1970s. Commercial PCBs are known to be contaminated with levels of other significantly toxic compounds, such as dioxins and furans, through chemical reactions with oxygen (USEPA 2010b).

Of the 28 pesticide analytes tested, only o,p' (2,4')-DDT was detected in concentrations greater than the MRL and only at Alternative Sites 1 and 2 (Table 3.2-8). Four other pesticides were detected in concentrations greater than the MDL but less than the MRL in Alternative Sites 1 and 2. No pesticides were detected in Alternative Site 3. Of the 26 PCBs tested, 18 were detected at Alternative Sites 1 and 2 and one was detected at Alternative Site 3 (Table 3.2-9). Although Sites 1 and 2 had the majority of maximum detected concentrations, PCB concentrations did not significantly differ between sites.

Table 3.2-8. Range of Concentrations for Organochlorine Pesticides Detected at Alternative Sites

Analyte	Alternative Site 1 (µg/kg)	Alternative Site 2 (µg/kg)	Alternative Site 3 (µg/kg)
γ (trans)-Chlordane	<0.090 – 0.73	<0.090 – 0.73	<0.090
p,p' (4,4')-DDE	<0.11 – 0.16	<0.11 – 0.16	<0.11
o,p' (2,4')-DDT	<0.58 – 1.1	<0.58 – 1.1	<0.058
Endosulfan I	<0.063 – 0.29	<0.063 – 0.29	<0.063
Heptachlor Epoxide	<0.15 – 0.14	<0.14 – 0.14	<0.084

Results with a "<" indicate the analyte was not detected at or above the MDL. The value given is the lowest MDL.

Source: ANAMAR (2011)

Table 3.2-9. Range of Concentrations for PCBs Detected at Alternative Sites

Analyte	Alternative Site 1 (µg/kg)	Alternative Site 2 (µg/kg)	Alternative Site 3 (µg/kg)
PCB 18	<0.099 – 0.38	<0.099 – <0.49	<0.099
PCB 28	<0.16 – <1.4	<0.099 – 0.38	<0.16
PCB 44	<0.047 – 0.19	<0.047 – 0.24	<0.047
PCB 49	<0.042 – 0.15	<0.042 – 0.19	<0.042
PCB 52	<0.062 – 0.54	<0.062 – 0.33	<0.062
PCB 66	<0.048 – 0.31	<0.048 – 0.31	<0.048
PCB 87	<0.031 – 0.64	<0.031 – 0.64	<0.031
PCB 101	<0.091 – 1.7	<0.091 – 1.7	<0.091
PCB 105	<0.053 – 0.38	<0.053 – 0.38	<0.053
PCB 118	<0.025 – 0.97	<0.025 – 0.97	<0.025 – <0.066
PCB 128	<0.040 – 0.35	<0.040 – 0.35	<0.040
PCB 138	<0.040 – 1.6	<0.040 – 1.6	<0.040
PCB 153	<0.057 – 1.1	<0.057 – 1.1	<0.057
PCB 156	<0.045 – 0.24	<0.045 – 0.24	<0.045
PCB 170	<0.036 – 0.37	<0.036 – 0.37	<0.036
PCB 180	<0.052 – 0.44	<0.052 – 0.44	<0.052
PCB 183	<0.043 – 0.22	<0.043 – 0.22	<0.035
PCB 187	<0.076 – 0.20	<0.076 – 0.20	<0.076
PCB 206	<0.038 – 0.11	<0.038 – 0.11	<0.038 – 0.43

Results with a "<" indicate the analyte was not detected at or above the MDL. The value given is the lowest MDL or the range of MDLs.

Source: ANAMAR (2011)

Organotins

Organotin compounds, or stannanes, have no known natural sources and therefore have exclusively human-related origins. These compounds are used in plastics manufacturing, as wood preservatives, slimicides, and disinfectants. Organotins are also potent biocides for cooling systems, power station cooling towers, pulp and paper mills, breweries, leather processing, textile mills, and marine antifouling paints (USEPA 2010b). The environmentally toxic biocidal properties of organotins are unique to tributyltin. The monobutyltins and dibutyltins do not exhibit these properties. Controls on the use of tributyltin in antifouling paints were introduced in 1986 when the sale of TBT-based paints was banned. In 1987, the use of TBT-based paints on boats under 25 meters and mariculture equipment was also prohibited (USEPA 2010b). These measures have reduced the potential routes of entry into the marine environment and successfully reduced environmental concentrations (Waite et al. 1991). Organotins have low water solubility and a tendency to adsorb strongly to suspended materials and sediments (Laughlin et al. 1986). Samples from two stations within Alternative Site 1 had detectable concentrations of organotins (Table 3.2-10).

Table 3.2-10. Range of Concentrations for Organotins Detected at Alternative Sites

Analyte	Alternative Site 1 (µg/kg)	Alternative Site 2 (µg/kg)	Alternative Site 3 (µg/kg)
Tri-n-butyltin Cation	<0.43 – 17	<0.56 – <0.68	<0.57 – <0.79
Di-n-butyltin Cation	<0.19 – 2.0	<0.25 – 0.66	<0.25 – <0.35
N-butyltin Cation	<0.26 – 1.3	<0.34 – <0.41	<0.34 – <0.48

Results with a "<" indicate the analyte was not detected at or above the MDL. The value given is the lowest MDL or the range of MDLs.

Source: ANAMAR (2011)

Summary

In general, Alternative Site 3 appears to have slightly higher concentrations of metals compared to the other sites. Alternative Sites 1 and 2 appear to have slightly higher concentrations of pesticides and PCBs compared to Alternative Site 3. Alternative Site 1 appears to have higher concentrations of PAHs compared to Alternative Sites 2 and 3. Overall, the physical and chemical characteristics of sediments collected from the three alternative sites are similar. All analytical chemical results were below guidance or target detection limits, with the exception of several samples where the limits were exceeded due to background matrix interference. A discussion of these exceedences can be found at Section 5 (QA/QC Review) of the site designation survey report.

3.3. Biological Environment

Biota in the water and benthic environments within and adjacent to the alternative sites are described in this section. Marine biological resources include threatened, endangered, and special-status species (Section 3.3.1), non-threatened marine mammals (Section 3.3.2), seabirds (Section 3.3.3), plankton (Section 3.3.4), benthic communities (Section 3.3.5), and fish communities (Section 3.3.6). EFH is also discussed for the study areas (Section 3.3.7). The ROI for biological resources includes marine areas in the vicinity of the alternative sites and the areas that vessels would transit between the dredge project area and the alternative sites.

As part of the spring and fall 2010 site designation studies, benthic and epifaunal samples were collected to characterize the infaunal and epifaunal communities at proposed Alternative Sites 1, 2, and 3. Benthic grabs, mollusk dredge samples, and trawl samples were collected at stations within and adjacent to the three alternative sites (Figures 3.2-17a through d) (ANAMAR 2011). The purpose of conducting two surveys is to account for seasonal fluctuations in assemblages. Specifically, information is presented on biomass, abundance, diversity, species richness, nonindigenous species, and federally managed taxa within the study area. Assessment of the current conditions of biological resources in the study area will allow for a determination of baseline conditions that may be affected by project activities. Results from samples collected from within and adjacent to the alternative sites are summarized in Section 3.3.5 (Benthic Communities) and Section 3.3.6 (Epifaunal and Fish Communities). Complete results are provided in the site designation report (ANAMAR 2011).

3.3.1. Threatened, Endangered, and Special Status Species

Ten species listed as threatened or endangered under the ESA potentially occur within the vicinity of the alternative ODMDS sites (Table 3.3-1). Critical habitat for the North Atlantic right whale has been designated in the area within and adjacent to the three alternative ODMDS

sites (Figure 3.3-1). Federal and state agencies and the public are encouraged to consider these species during project planning so potential impacts may be avoided or minimized.

Consultation with USFWS and NMFS is required under Section 7 of the ESA for all federal projects that could adversely affect any federally listed species and designated critical habitat. To support ESA consultation with USFWS and NMFS, a Biological Assessment (BA) has been prepared to assess the impacts of the proposed action on ESA-listed species and designated critical habitat (Appendix C). A Letter of Concurrence will be obtained from USFWS and a Biological Opinion (BO) from NMFS prior to issuance of the Rulemaking of this EIS.

The following sections briefly summarize important life history traits and distribution within the ROI. The BAs include a more detailed discussion of the behavior and life history, habitat associations, and distribution of each species.

Table 3.3-1. Status of Listed Species and Critical Habitat Potentially Occurring in the Region of Interest

Common Name	Scientific Name	Status
SEA TURTLES		
Loggerhead sea turtle	*Caretta caretta*	T
Green sea turtle	*Chelonia mydas*[1]	E/T
Kemp's ridley sea turtle	*Lepidochelys kempii*	E
Leatherback sea turtle	*Dermochelys coriacea*	E
MARINE FISH		
Shortnose sturgeon	*Acipenser brevirostrum*	E
Atlantic sturgeon – South Atlantic DPS	*Acipenser oxyrinchus oxyrinchus*	Proposed Endangered
Smalltooth sawfish	*Pristis pectinata*	E
MARINE MAMMALS		
North Atlantic right whale	*Eubalaena glacialis*[2]	E, CH
Humpback whale	*Megaptera novaeangliae*	E
Florida manatee	*Trichechus manatus latirostris*	E

CH = critical habitat; E = endangered; T = threatened; SOC = Species of Concern, DPS = distinct population segment

[1] Green turtles in U.S. waters are listed as threatened except for the Florida breeding population, which is listed as endangered.

[2] Based on the 2006 re-listing of separate right whale species in the northern Pacific and northern Atlantic oceans, NMFS is in the process of re-designating critical habitat for the North Atlantic right whale. A proposed critical habitat rule for this species will be submitted to the Federal Register for publication in the second half of 2011.

Source: NMFS (2009c); USFWS (2009)

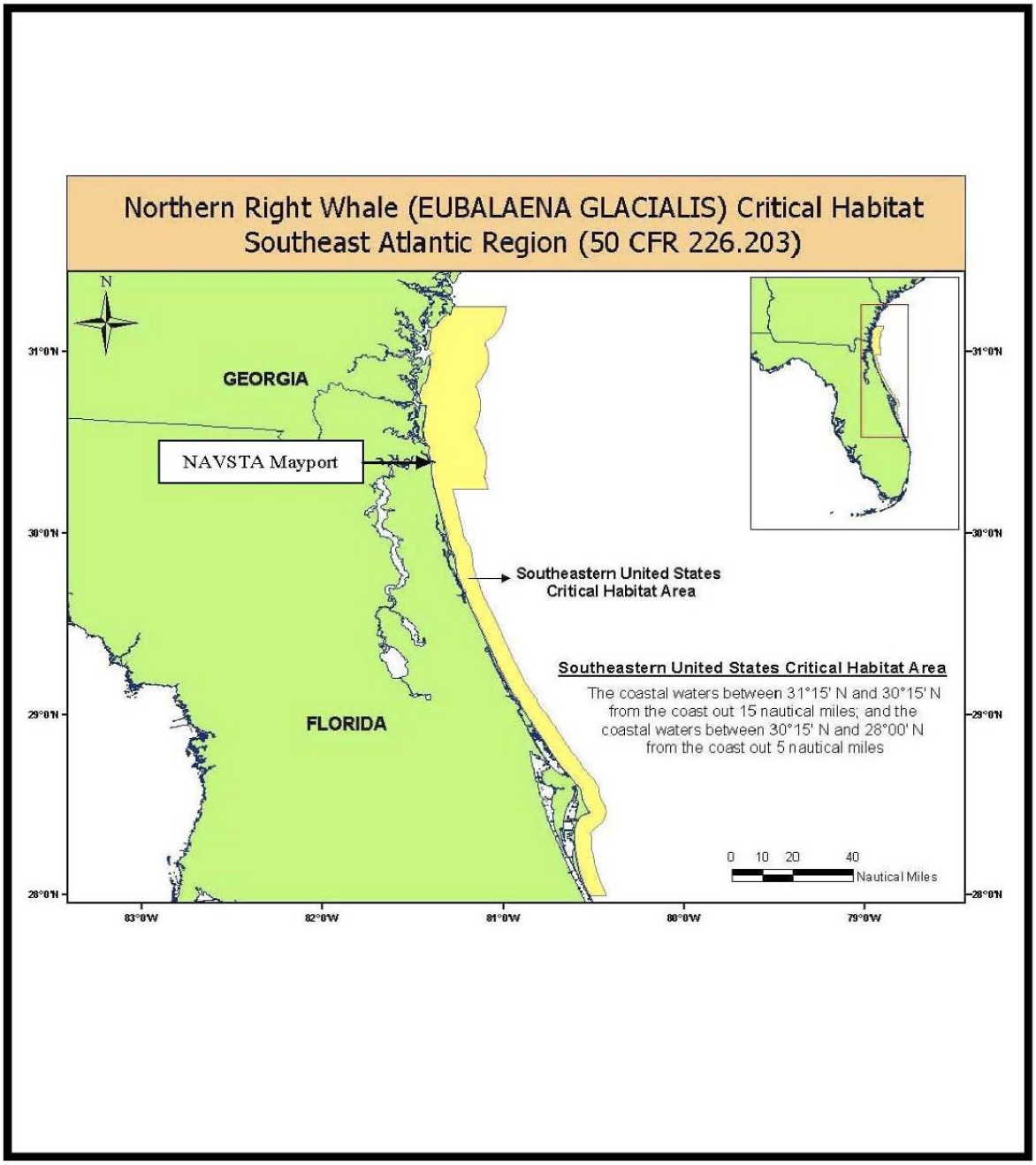

Figure 3.3-1. North Atlantic Right Whale Critical Habitat - Southeastern United States

This map and/or digital data is for planning purposes only and should not be used to determine the precise location of any feature.
Data provided as-is. Source: NMFS 2007 Q:\GIS PROJECTS\JAX_ODMDS\PHASE 2\EIS\MAPS UPDATED 031511\Figure 3.3-1 North Atlantic Right Whale.mxd

3.3.1.1. Sea Turtles

Sea turtles occur in tropical, subtropical, and cool ocean waters throughout the world. They are air-breathing but spend a majority of their lives in the water. Adult females will spend the most time on land when they return to beaches to lay their eggs. The sea turtle species potentially occurring within the vicinity of the three alternative sites include loggerhead, leatherback, Kemp's ridley, and green sea turtles. Nesting habitat is defined as all beaches adjoining the waters of the Atlantic Ocean, the Gulf of Mexico, and the Straits of Florida and located within Bay, Brevard, Broward, Charlotte, Collier, Dade, Duval, Escambia, Flagler, Franklin, Gulf, Indian River, Lee, Manatee, Martin, Monroe, Nassau, Okaloosa, Palm Beach, Pinellas, St. Johns, St. Lucie, Santa Rosa, Sarasota, Volusia, and Walton counties and all inlet shorelines of those beaches (FAC 62B-55.003). Beaches extending from the south jetties of Naval Station Mayport south through Jacksonville Beach within Duval County are nesting habitat for loggerhead, leatherback, and green turtles. These beaches would be candidate sites for beach nourishment if a sufficient quantity of compatible sand is encountered during dredging.

Although sea turtles occasionally enter estuaries, they generally prefer higher-salinity waters. Nesting may occur throughout the most of their range, but most nesting occurs on restricted areas of beach that turtles return to each nesting season. Foraging areas are often distant from nesting beaches and turtles may migrate long distances to nest. Mating generally takes place in offshore waters near the nesting beach, and males rarely come ashore (Fuller 1978).

The protection of sea turtles is regulated by multiple federal agency jurisdictions and is largely due to the endangered or threatened status. Turtles in the water are under the jurisdiction of NMFS, while nesting turtles, eggs, and hatchlings are under USFWS jurisdiction. In recent years, critical habitat has been established for some turtle species in the U.S. Virgin Islands and Puerto Rico; however, no critical habitat has been designated in the study area. Marine turtles are also listed by the State of Florida under the jurisdiction of FWC and/or FDEP. State designations are the same as the federal status for each species (68A-27.003-004 F.A.C.)

The Florida Sea Turtle Stranding and Salvage Network is an organization led by NMFS with assistance from FWC's Fish and Wildlife Research Institute (FWRI). FWRI biologists collect data on stranded (i.e., dead, sick, or injured) sea turtles in Florida. Strandings are documented between January and August each year. In 2007, 43, 58, and 78 strandings of sea turtles were documented in Nassau, Duval, and St. Johns County, respectively (FWRI 2009).

Loggerhead Sea Turtle

Loggerhead sea turtles (*Caretta caretta*) are circumglobal and occur throughout the warm and temperate oceanic waters worldwide. The species has been observed as far as 500 miles offshore. Loggerheads frequent natural and manmade structures, including oil and gas platforms where they forage on benthic invertebrates, fish, and aquatic vegetation. About 90% of the total nesting in the United States occurs on the south Atlantic coast of Florida (Fritts et al. 1983). Loggerhead densities seem to be highest during summer months (Fritts et al. 1983).

In the southeastern United States, nesting season for loggerheads occurs between early May and early September (FWC 2002). Like other sea turtles, loggerhead females most often return to nest within about 5 km of where they had nested previously (termed nesting site fidelity) (Schroeder et al. 2003). Females can lay multiple clutches of eggs (potentially up to seven) in a single season at high energy, narrow, steeply sloped, coarse-grained ocean beaches. There are about 110 eggs in an average-size clutch (Miller et al. 2003). After approximately a 2-month incubation period, eggs hatch between late June and mid-November. The hatchlings head to

the surf and swim away from land for one to several days until they take refuge in the downward current of surface water of the ocean with floating vegetation (such as pelagic sargassum) to rest and forage. Several months are often spent in these nursery areas until ocean currents move the young turtles farther offshore to grow. By 7 to 12 years of age, the juveniles migrate back to nearshore coastal areas where they resort to a benthic mode of feeding and will reach maturity. Age at maturity for loggerheads remains unclear and varies among populations, but is reached between 12 and 37 years (Witherington 2003).

The beaches inshore of the action area are habitat for loggerhead nesting, and the nearshore areas are sufficient for pelagic juvenile habitat and adult feeding activities (NAVFAC 2008). The 2011 FWC Index Nesting Beach Survey identified 152 loggerhead nests along Duval County beaches, which is the highest since the surveys began in 1990 (see Table 2-1 in Appendix C for more details) (FWRI 2011). Loggerheads are the most commonly sighted sea turtles off the Atlantic coast of north Florida (DoN 2002) and are expected to occur in the vicinity of the alternative sites throughout the year.

Green Sea Turtle

The green sea turtle (*Chelonia mydas*) usually frequents shallow reefs, shoals, lagoons, and bays where seagrasses and algae are plentiful. Its preferred nesting areas are steeply sloped beaches, well above high tide, in the Yucatan Peninsula, Caribbean, and Florida. The preferred habitats of this species are seagrass beds and worm-rock reefs, which are located primarily in shallow water environments along the Atlantic coast.

Nesting season takes place from April through September, with an incubation period of approximately 2 months (FWC 2002, DoN 2007b). Although green sea turtles are known to nest in substantial numbers in the southeast U.S., in Florida they typically nest along the beaches from Brevard County south to Broward County, south of the project area (DoN 2002). However, they do nest in low numbers along the beaches of Duval County. The 2011 FWC Index Nesting Beach Survey identified 3 green turtle nests along Duval County beaches (see Table 2-1 in Appendix C for more details) (FWRI 2011).

South of North Carolina, green sea turtles are expected to occur year-round in waters between the shoreline and the 50-meter isobath. Therefore, green sea turtles are expected to occur within the vicinity of the alternative sites throughout the year.

Kemp's Ridley Sea Turtle

Kemp's ridley sea turtles (*Lepidochelys kempii*) are shallow-water benthic feeders and primarily inhabit the Gulf coasts of Mexico and the United States, but are occasionally found as far north as Nova Scotia and Newfoundland in the North Atlantic. The Kemp's ridley sea turtle is probably the most endangered of the sea turtles. Kemp's ridleys commonly inhabit shallow coastal and estuarine waters. Their nesting is largely restricted to a small stretch of beach near Rancho Nuevo, Ramaulipas, Mexico, although some nesting occurs along Padre Island, Texas, and rarely along Florida's Gulf coast. The waters off the Atlantic coast of north Florida, including the ODMDS, are most suitable for Kemp's ridley sea turtles from May through October (DoN 2002). Kemp's ridley sea turtles may be present in the vicinity of the three alternative sites.

Leatherback Sea Turtle

After loggerheads, the leatherback sea turtle (*Dermochelys coriacea*) is the second most commonly seen sea turtle off the Atlantic coast of north Florida (DoN 2002). The leatherback sea turtle is the most widely distributed sea turtle species and is probably the most oceanic of all

sea turtles, preferring deep waters (Rebel 1974). Leatherback sea turtles migrate widely and have been reported as far north as Nova Scotia (Lazell 1980). Major rookeries are rare for this species, and dispersed nesting is common.

Leatherbacks are found in tropical, temperate, and even sub-arctic waters. Although generally a deep-diving pelagic species that feeds on jellyfish, they do move seasonally into coastal waters to feed on large jellyfish that are associated with rivers and frontal boundaries. Nesting occurs from March through July, with an incubation period of 55 to 75 days (DoN 2007b). Leatherbacks typically nest along the beaches from Brevard County south to Broward County, south of the vicinity of the project area. However, they do nest in very low numbers along the beaches of Duval County. In 2011, 3 leatherback turtle nests were recorded in Duval County (Table 2-1) (FWRI 2011).

Leatherbacks are the second most commonly seen sea turtle, after loggerheads, off the Atlantic coast of north Florida (DoN 2002) and are expected to occur within the vicinity of the alternative sites throughout the year.

3.3.1.2. Fish

Shortnose Sturgeon

Shortnose sturgeon (*Acipenser brevirostrum*) inhabit rivers and estuaries. It is an anadromous fish that spawns in the coastal rivers along the east coast of North America from the St. John River in Canada to the St. Johns River in Florida (http://www.nmfs.noaa.gov/pr/species/fish/shortnosesturgeon.htm, accessed December 28, 2010). In the southern portion of the range, they are found in the St. Johns River in Florida; the Altamaha, Ogeechee, and Savannah rivers in Georgia; and, in South Carolina, the river systems that empty into Winyah Bay and the Santee/Cooper River complex that forms Lake Marion. It prefers the nearshore marine, estuarine, and riverine habitats of large river systems. Shortnose sturgeon, unlike other anadromous species in the region such as shad or salmon, do not appear to make long-distance offshore migrations. They are benthic feeders. Juveniles are believed to feed on benthic insects and crustaceans, and adults primarily feed on mollusks and large crustaceans.

Anecdotal and archival data indicate that sturgeon were frequently caught in the St. Johns River as by-catch in commercial gill nets between 1970 and 1990 (ASSRT 2007). Five shortnose sturgeon were collected in the St. Johns River in the late 1970s (Dadswell et al. 1984), and in 1981, three sturgeon were collected by FWC. No sturgeon were caught incidentally during a survey aimed at other species from 1980 through 1993 when a total of 21,381 hours of effort with 100-yard gill nets was conducted. The most recent directed survey for sturgeon in the St. Johns River was conducted by FWC utilizing the NMFS survey protocol; the 2001-2004 FWC shortnose survey captured a single shortnose sturgeon south of Federal Point near Palatka on January 22, during 4,493 net hours and within 3 kilometers of the area where most historical catches occurred. Interestingly, none of the collections were recorded from the estuarine portion of the basin; all captures occurred far upstream in an area heavily influenced by artesian springs with high mineral content. Shortnose sturgeon are known to use freshwater springs in other southern rivers, but only eight individual fish have been observed in the numerous freshwater springs found upstream in the St. Johns River system; these sightings occurred in the 1970s and early 1980s.

Shortnose sturgeon are not expected to occur in the offshore areas in the vicinity of the three alternative sites or in transit from the dredge areas to the ODMDSs.

Atlantic Sturgeon

The historic range of the Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus*) is from St. Croix, Maine, to the St. Johns River, Florida. They spend most of their lives in marine waters and migrate up rivers in February and March to spawn. Threats from dredging, water quality, and commercial by-catch likely contribute to the population decline of this species. Due to habitat degradation, the St. Johns River is suspected to serve as only a nursery for existing Atlantic sturgeon that still utilize the waterway system (NMFS and USFWS 1998). Only 37% of Atlantic sturgeon habitat still exists in the St. Johns River. It is not currently used for spawning and historical use of the river is unknown (Atlantic Sturgeon Status Review Team 2007). Therefore, it is unlikely that the Atlantic sturgeon will inhabit the waters within the Naval Station Mayport or the federal navigation channel. However, because the Atlantic sturgeon spends a majority of its life in marine waters, they may be present in the offshore areas in the vicinity of the three alternative sites and in the transit areas between the dredge project area and the ODMDS (Figure 3.3-2).

A large U.S. commercial fishery (100,000–250,000 lb/year) existed for the Atlantic sturgeon from the 1950s through the mid-1990s; the origin of the fishery dates back to colonial times (NOAA NMFS 2009). The Atlantic sturgeon is managed under a fishery management plan (FMP) implemented by the Atlantic States Marine Fisheries Commission (ASMFC). They implemented a coast-wide moratorium on the harvest of wild Atlantic sturgeon in late 1997/early 1998. This moratorium is to remain in effect until there are at least 20 protected-year classes in each spawning stock (anticipated to take up to 40 or more years). NMFS followed this with a similar moratorium for federal waters.

The status of Atlantic sturgeon was initially reviewed in 1998 after USFWS and NMFS received a petition to list the species under the ESA; it was determined at that time that listing was not warranted. In 2003, a workshop sponsored by NMFS and USFWS was held to review the status of the Atlantic sturgeon. The workshop concluded that some populations seemed to be recovering while others continued to be depressed (NOAA NMFS 2009). As a result, NMFS initiated a second status review of the Atlantic sturgeon in 2005 to re-evaluate whether this species required protection under the ESA. That status review was completed in 2007, and the Status Review Team recommended that Atlantic sturgeon in the United States be divided into the following five distinct population segments (DPSs): Gulf of Maine; New York Bight; Chesapeake Bay; Carolina; and South Atlantic. After reviewing the available information on the two DPSs located within the NMFS Southeast Region (Carolina and South Atlantic), NMFS determined that listing these two DPSs as endangered is warranted. Therefore, NMFS proposes to list these two DPSs as endangered under the ESA (Federal Register, Volume 75, No. 193).

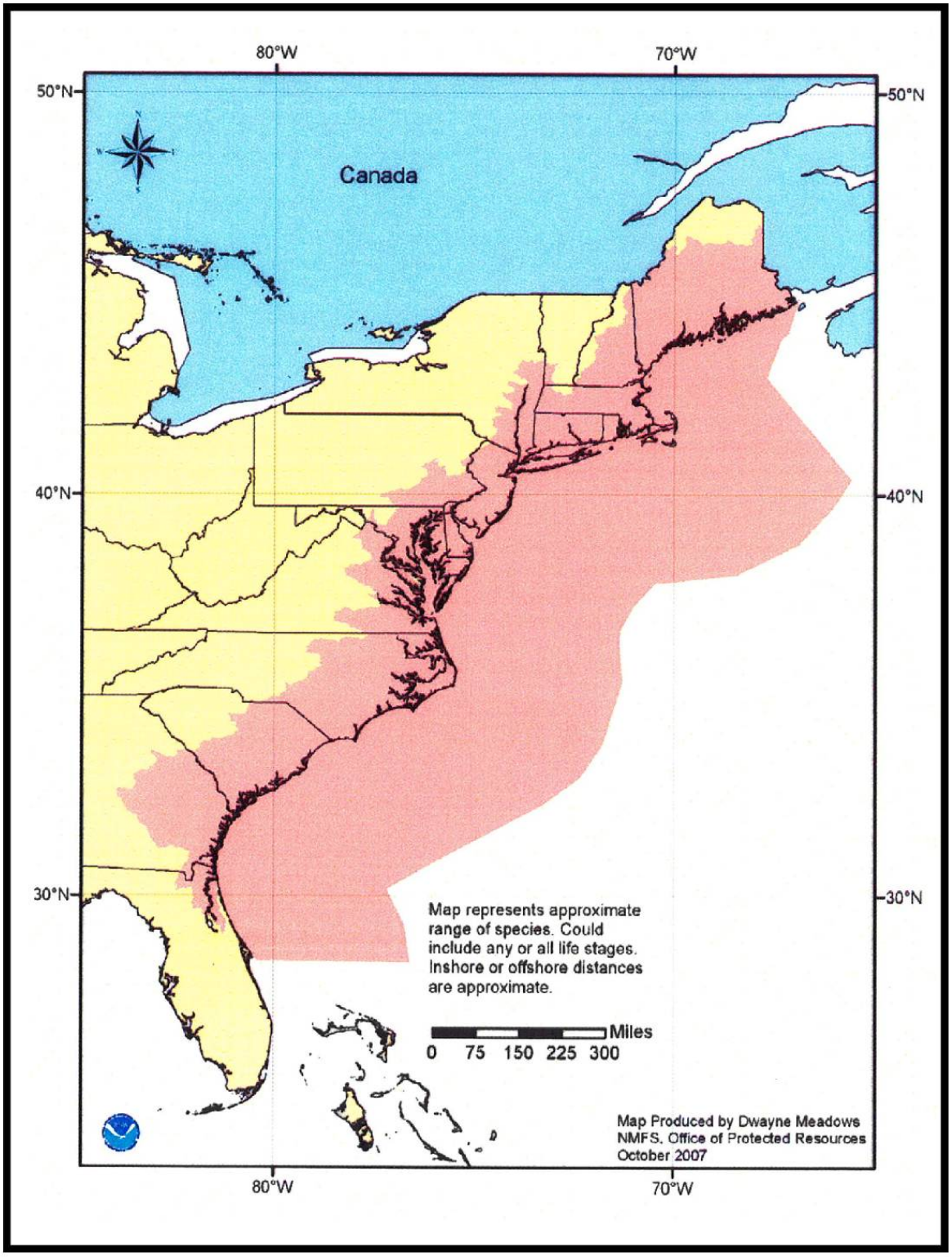

Figure 3.3-2. Range of the Atlantic Sturgeon

This map and/or digital data is for planning purposes only and should not be used to determine the precise location of any feature. Data provided as-is.
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Smalltooth Sawfish

The smalltooth sawfish (*Pristis pectinata*) inhabits both coasts of the Atlantic Ocean and is restricted to tropical and subtropical coastal margins (Faria 2007). The observed range, as currently known, contrasts with literature accounts describing the species as circumglobally distributed (Faria 2007). They are usually found in shallow waters very close to shore over muddy and sandy bottoms. They are often found in sheltered bays, on shallow banks, and in estuaries or river mouths (http://www.nmfs.noaa.gov/pr/species/fish/smalltoothsawfish.htm, accessed December 28, 2010). Adults can also be found in open marine waters in depths to at least 400 feet (Poulakis and Seitz 2004).

Historically, the U.S. population was common throughout the Gulf of Mexico from Texas to Florida and along the east coast from Florida to Cape Hatteras, North Carolina, with rare strays having been documented as far north as New York in summer. The current range of this species has contracted to peninsular Florida, and smalltooth sawfish are relatively common only in the Everglades region at the southern tip of the state (NMFS 2009b) (Figure 3.3-3). No critical habitat occurs within the region of interest for this proposed action.

The loss of habitat for juveniles and high incidence of bycatch for adults is suspected cause of the decline in population (Seitz and Poulakis 2006). NMFS convened the Smalltooth Sawfish Recovery Team comprised of fish biologists and fisheries managers to develop a plan to recover the U.S. DPS of smalltooth sawfish. The team published the final recovery plan in January 2009, and it recommends specific steps to recover the DPS by focusing on reducing fishing impacts, protecting important habitats, and educating the public. Prior to the ESA listing of the species, some states had already taken steps to protect it; Florida, Louisiana, and Texas have prohibited the "take" of sawfish. Florida's existing ban on the use of gill nets in state waters is an important conservation tool.

Smalltooth sawfish are not expected to occur in the offshore areas in the vicinity of the three alternative sites or in transit from the dredge areas to the ODMDSs.

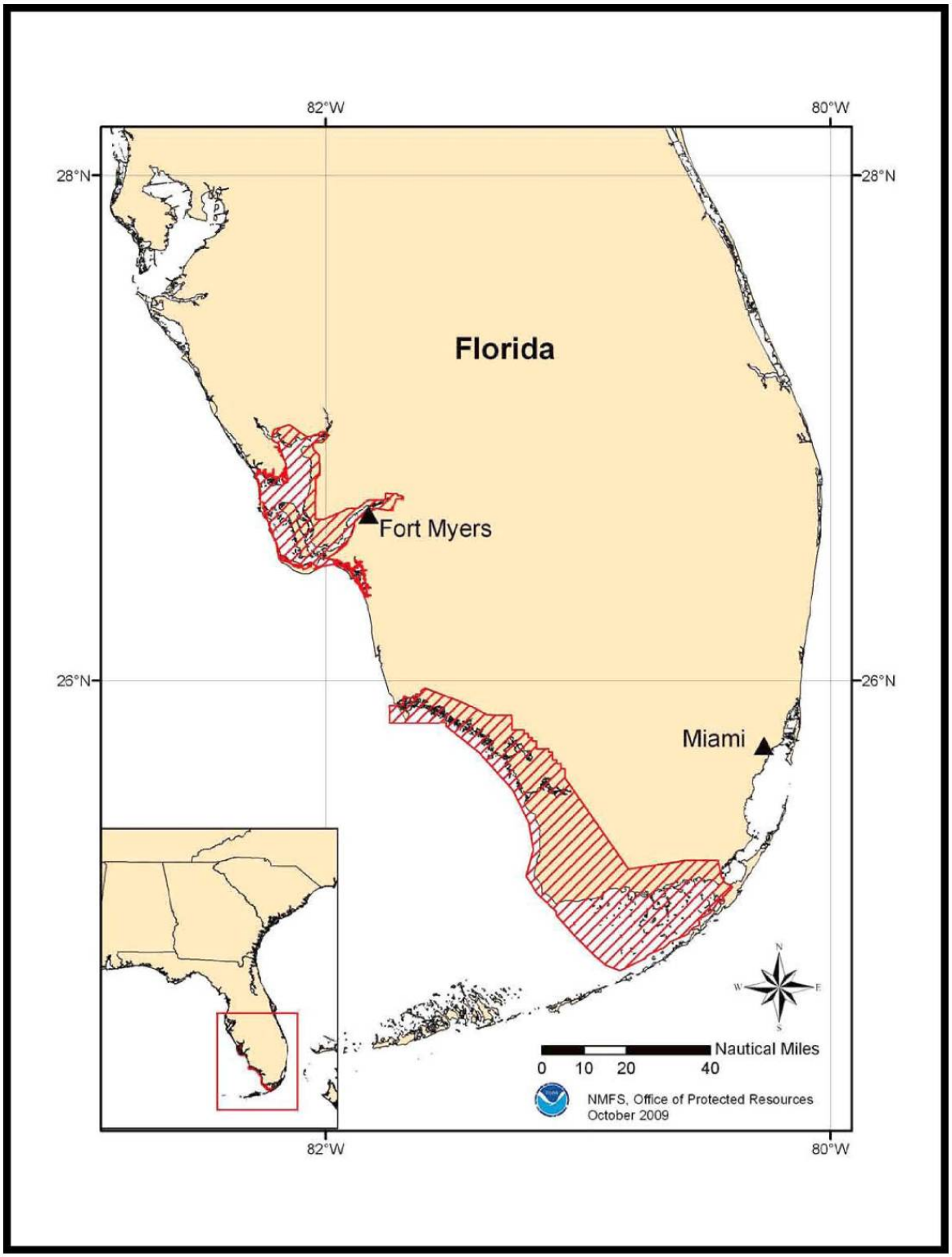

Figure 3.3-3. Smalltooth Sawfish Critical Habitat

This map and/or digital data is for planning purposes only and should not be used to determine the precise location of any feature. Data provided as-is.
Q:\GIS PROJECTS\JAX_ODMDS\PHASE 2\EIS\MAPS UPDATED 031511\Sawfish.mxd. Data source: NMFS.

3.3.1.3. Marine Mammals

All marine mammals are protected under the MMPA of 1972 and are under the jurisdiction of NMFS. The MMPA prohibits, with certain exceptions, the taking of marine mammals in U.S. waters by U.S. citizens on the high seas and the importation of marine mammals and marine mammal products into the U.S. (NMFS 2005). Therefore, all marine mammals encountered in the offshore region of Jacksonville must be given due consideration. The emergence of terms, legislation, and monitoring organizations created after the MMPA, such as the ESA of 1973, the USFWS Endangered Species Program, and the International Union for the Conservation of Nature require that certain species be given greater protection and consideration (IUNC 2008). These populations are more sensitive to and are negatively impacted by factors such as habitat loss, pollution, harvesting, and vessel traffic. Therefore, regulation that protects these species from extinction is fundamental.

Federally protected species that regularly occur along Florida's northeast coast are the North Atlantic right whale (*Eubalaena glacialis*) and the Florida manatee (*Trichechus manatus latirostris*). They are also listed as endangered by the State of Florida (FWC 2010). In addition, the Florida manatee is protected by the Manatee Sanctuary Act of 1978 and may be protected by local regulations as well. The humpback whale (*Megaptera novaeangliae*) is also a state and federally listed endangered species, though occurrence in the project study area is expected to be limited.

North Atlantic Right Whale

The North Atlantic right whale is one of the world's more endangered whale species (Clapham et al. 1999, Perry et al. 1999, IWC 2001). According to the 2011 North Atlantic right whale report card released annually by the North Atlantic Right Whale Consortium, the best estimate of catalogued North Atlantic right whale population was 490 individuals (NARWC 2011). The coastal waters off Georgia and northern Florida are the only known calving ground for the North Atlantic right whale between November and April (Figure 3.3-4) (Geo-Marine 2007). Designated critical habitat, which is the core of the calving ground and essential to the conservation of this species, is shown in Figure 3.3-1. Critical habitat was designated in 1994 for the coastal areas of southern Georgia and northern Florida from shore out to 15 nmi offshore from the mouth of the Altamaha River, Georgia, to Jacksonville, Florida, and then from shore out 5 nmi offshore from Jacksonville to approximately Sebastian Inlet, Florida (NMFS 1994). All three of the alternative sites are located within North Atlantic right whale critical habitat and calving grounds. North Atlantic right whales are expected to occur in the study area, especially in winter. Feeding primarily occurs from spring until fall in coastal waters of the northeast United States and Canada where their prey (zooplankton) is abundant.

Based on annual surveys from December through March 1985 to 2007, the North Atlantic right whale occurs within and in the vicinity of all three alternative sites, the area that would be transited between the dredge project area and the designated ODMDS, and near the federal navigation channel (Slay et al. 2001, 2002; Zani et al. 2003, 2004, 2005, 2006; DoN 2007a, Right Whale Consortium 2007) (Figure 3.3-5). The number of occurrences within the Fernandina Beach ODMDS (No Action Alternative) is higher than that of the three alternative sites. Figure 3.3-6 shows the sightings-per-unit-effort for North Atlantic right whales. These data indicate that North Atlantic right whales occur in higher densities (red coloring) in areas north of the St. Johns River, particularly in and around the Fernandina ODMDS. Alternative 3 is just south of the area with the highest sightings-per-unit effort.

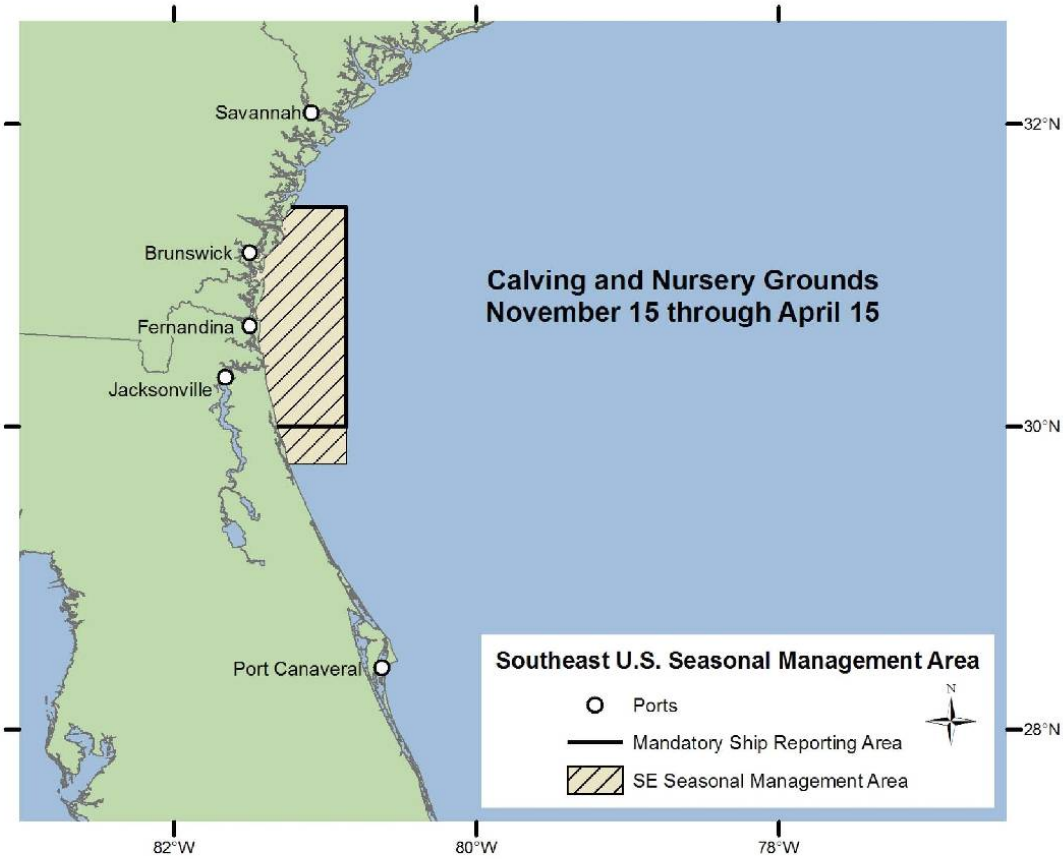

Figure 3.3-4. Calving Grounds of the North Atlantic Right Whale

This map and/or digital data is for planning purposes only and should not be used to determine the precise location of any feature.
Data provided as-is. Source: NAVFAC 2008 Q:\GIS PROJECTS\JAX_ODMDS\PHASE 2\EIS\MAPS UPDATED 031511\Figure 3.3-4 NAWR calving.mxd

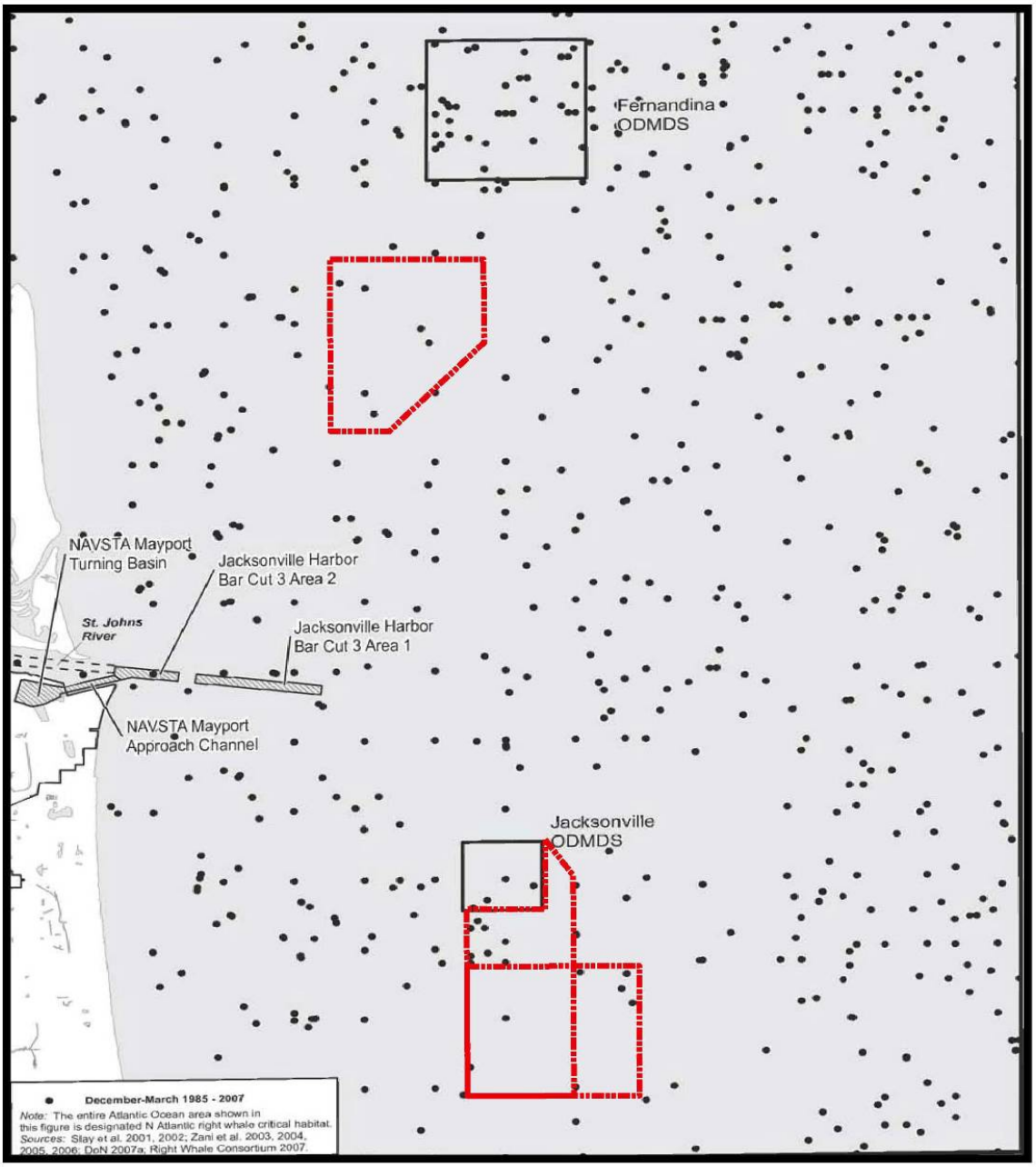

Figure 3.3-5. North Atlantic Right Whale Occurrences within the Region of Interest

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Data provided as-is. Q:\GIS PROJECTS\JAX_ODMDS\PHASE 2\EIS\MAPS UPDATED 031511\Figure 3.3-5 North Atlantic Right Whale Occur.mxd

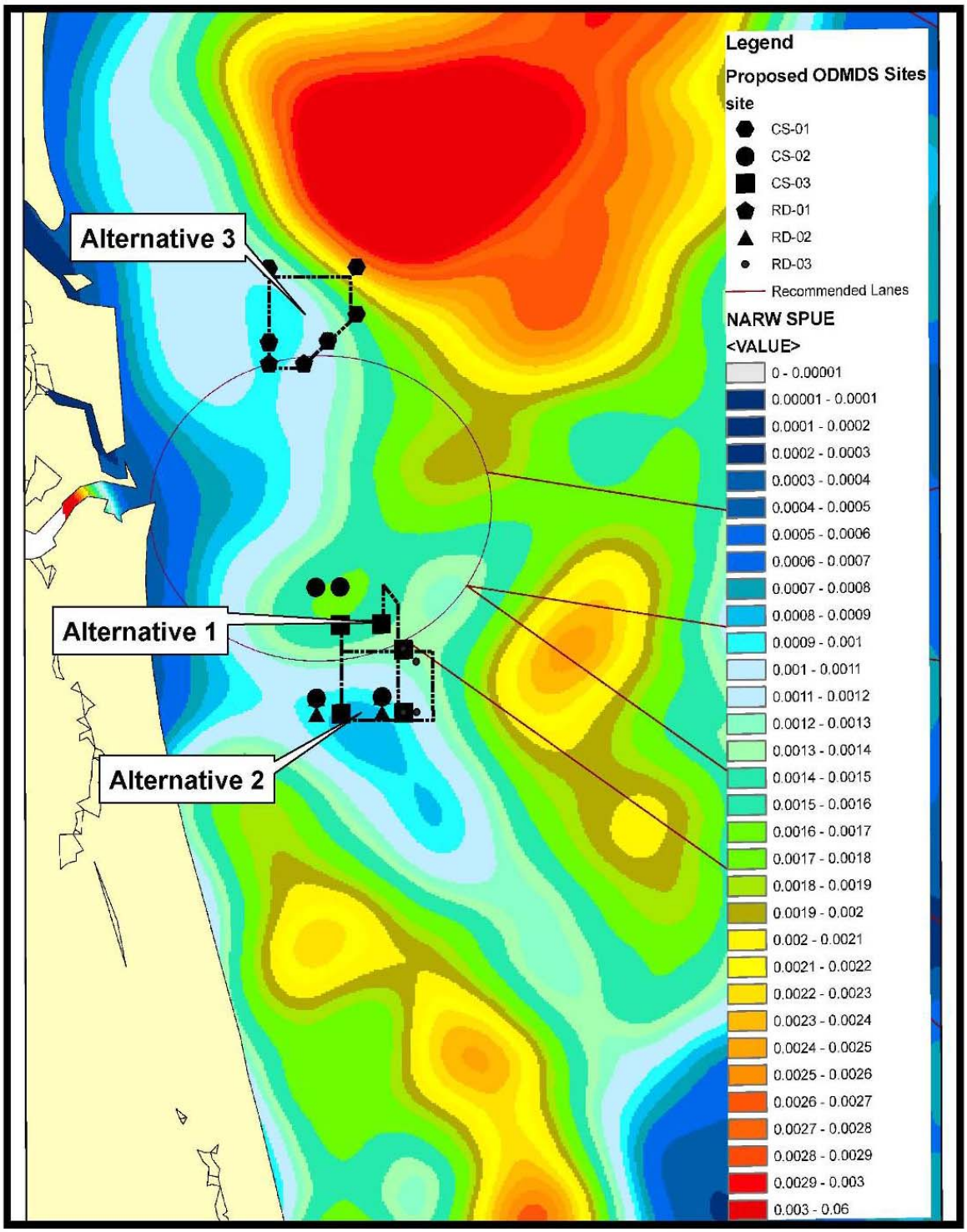


Figure 3.3-6. SPUE Data for NARW 1985-2007

This map and/or digital data is for planning purposes only and should not be used to determine the precise location of any feature.
Data provided as-is. Data source: pers. comm. FWRI (2011) Q:\GIS PROJECTS\JAX_ODMDS\MAPS UPDATED 031511\Figure 3.3-6 NARW SPUE with Alt Boundaries_V02_080211.mxd

According to the February 2011 Mid-Season Report from the southeastern U.S. calving area, 292 right whale alerts to mariners were disseminated, approximately 80% of which were off the coast of Florida (Woods Hole Oceanographic Institute 2011). A total of 18 mother/calf pairs have been documented during the 2010-2011 season. At the end of February 2011, preliminary data indicate 139 individual adult and juvenile whales (excluding calves) have been sighted from South Carolina to Florida. Thirty-six of these are thought to be 1- to 2-year-old whales, one of which swam into the St. Johns River on January 24, 2011, resulting in the closing of the river entrance to large-vessel traffic before the whale exited the river at the end of the day. Other notable sightings include a lone calf off the coast of Georgia that was observed for several hours with no sightings of a mother, and though a carcass was never found, it is unlikely that this calf could survive on its own. Also off the coast of Georgia, an aerial survey team sighted and catalogued a whale with fresh propeller wounds that were thought to be life-threatening. As of February, no further sightings of this individual have been reported. Five new entanglements have been documented involving four juveniles and a 2011-season mother. Of these, two carcasses have been found, one of which was towed to Butler Beach, Florida, and subsequently necropsied. Another 2011-season mother was documented gear-free after having severe entanglement involving both flippers in 2007. Several disentanglement operations are assumed to have led to her shedding the gear. This mother had not calved since 2006. Several juvenile whales on a “watch list” for various wounds were sighted in the southeastern U.S. calving area and appeared to be in relatively good health.

Humpback Whale

Western North Atlantic humpback whales are generally found during the summer on high-latitude feeding grounds from southern New England to Norway, and during the winter in the Caribbean over shallow banks and along continental coasts, where calving occurs. Calving peaks from January through March, with some animals arriving as early as December and a few not leaving until June. Since humpback whales migrate south to calving grounds during the fall and make return migrations to the northern feeding grounds in spring, they are not expected off the coast of Florida during summer, when they will be on their northern feeding grounds. The coastal region of Florida is not designated as an area of concentrated occurrence for humpback whales (DoN 2002). Humpback whales have been spotted in the St. Johns River as recently as 2003 and may be present in the vicinity of the ODMDS on rare occasions. The habitat in the action area is not ideal for foraging or breeding humpback whales, but would serve as a migration corridor to feeding and breeding grounds. Based on sightings, strandings, and life history characteristics, humpbacks are expected to occur occasionally within the offshore areas in the vicinity of the three alternative sites during fall, winter, and spring.

Florida Manatees

The manatee is federally protected under the MMPA as a depleted species, was listed as an endangered species throughout its range in 1967 (32 FR 4061), and received federal protection with the passage of the ESA. Although critical habitat was designated in 1976 for the Florida subspecies [50 CFR 19.95(a)], there is no federally designated critical habitat in the project area. Florida provided further protection in 1978 by passing the Florida Marine Sanctuary Act, designating the state as a manatee sanctuary and providing signage and speed zones in Florida’s waterways. Annual winter synoptic surveys from 1991 to 2007 resulted in population estimates between 1,267 and 3,300 individuals (FWC 2009).

Florida manatees winter in the warmer river waters and then disperse along the coast during the summer. Manatees could occur within the nearshore areas to be transited to and from the ODMDS; however, due to the distance from shore to the three alternative sites, manatees would

not occur within the vicinity of the alternative sites. Critical habitat has been designated for the Florida manatee in coastal and inland waterways and does not include offshore areas.

Other Whales

During summer, sei whales (*Balaenoptera borealis*), fin whales (*Balaenoptera physalus*), and blue whales (*Balaenoptera musculus*) are found at their higher-latitude breeding areas. During fall, winter, and spring, these species are expected to occur primarily east of the 2,000-meter isobaths. Sperm whales (*Physeter macrocephalus*) are found along the shelf break (approximately 200-meter isobaths) and eastward (DoN 2002). Depths at the three alternative sites range from 43 to 66 feet MLLW. Since these species occur in much deeper water they are not expected to occur within the vicinity of the three alternative sites. Therefore, these species are not carried forward for detailed effects analysis in this EIS.

3.3.2. Non-Threatened Marine Mammals

The ROI for marine mammals includes the three alternative sites and the offshore area between the sites and the coastline. The Georgia Bight supports seasonal and permanent populations of cetaceans (whales, dolphins, and porpoises) and sirenians (manatees) (USEPA 1983). The distribution of whales in the Georgia Bight encompasses the full expanse of the continental shelf; therefore, whales may pass through any disposal site situated off the coast of northeastern Florida. The MMPA of 1972 protects all marine mammals from take including killing, injuring, and harassing within the borders of the United States, regardless of status. Therefore, all marine mammals encountered in the offshore region of Jacksonville must be given due consideration.

This section describes marine mammals that are not listed as threatened and endangered. Key biological aspects of marine mammal species that could possibly occur in the proposed action areas are summarized below. The ESA-listed species are discussed in detail in Section 3.3.1 and in the BA submitted to NOAA NMFS (Appendix C).

3.3.2.1. Whales

Bryde's Whale

Bryde's whales (*Balaenoptera brydei)* are found offshore and near the coast in tropical and subtropical waters, in both deep and shallow waters, and generally do not range north of 40° in the northern hemisphere or south of 40° in the southern hemisphere (Jefferson et al. 1993). These whales opportunistically feed on plankton (e.g., krill and copepods) and crustaceans (e.g., pelagic red crabs, shrimp) as well as schooling fish (e.g., anchovies, herring, mackerel, pilchards, and sardines). Bryde's whales use different methods to feed, including skimming the surface, lunging, and creating bubble nets (http://www.nmfs.noaa.gov/pr/species/mammals/cetaceans/brydeswhale.htm, accessed December 22, 2010). There are no confirmed sightings for this species off the north coast of Florida; therefore, Bryde's whales are expected to be rare along the coastline and in the vicinity of the three alternative sites throughout the year (DoN 2002).

Other Whale Species

Although expected to occur very rarely within the vicinity of the three alternative sites, strandings of Gulf Stream (or Gervais') beaked whale *(Mesoplodon europaeus)*, Cuvier's beaked whale *(Ziphius cavirostris)*, pygmy sperm whale (*Kogia* sp.), and minke whale *(Balaenoptera acutorostrata)* have been recorded along the coastline (Figure 3.3-7).

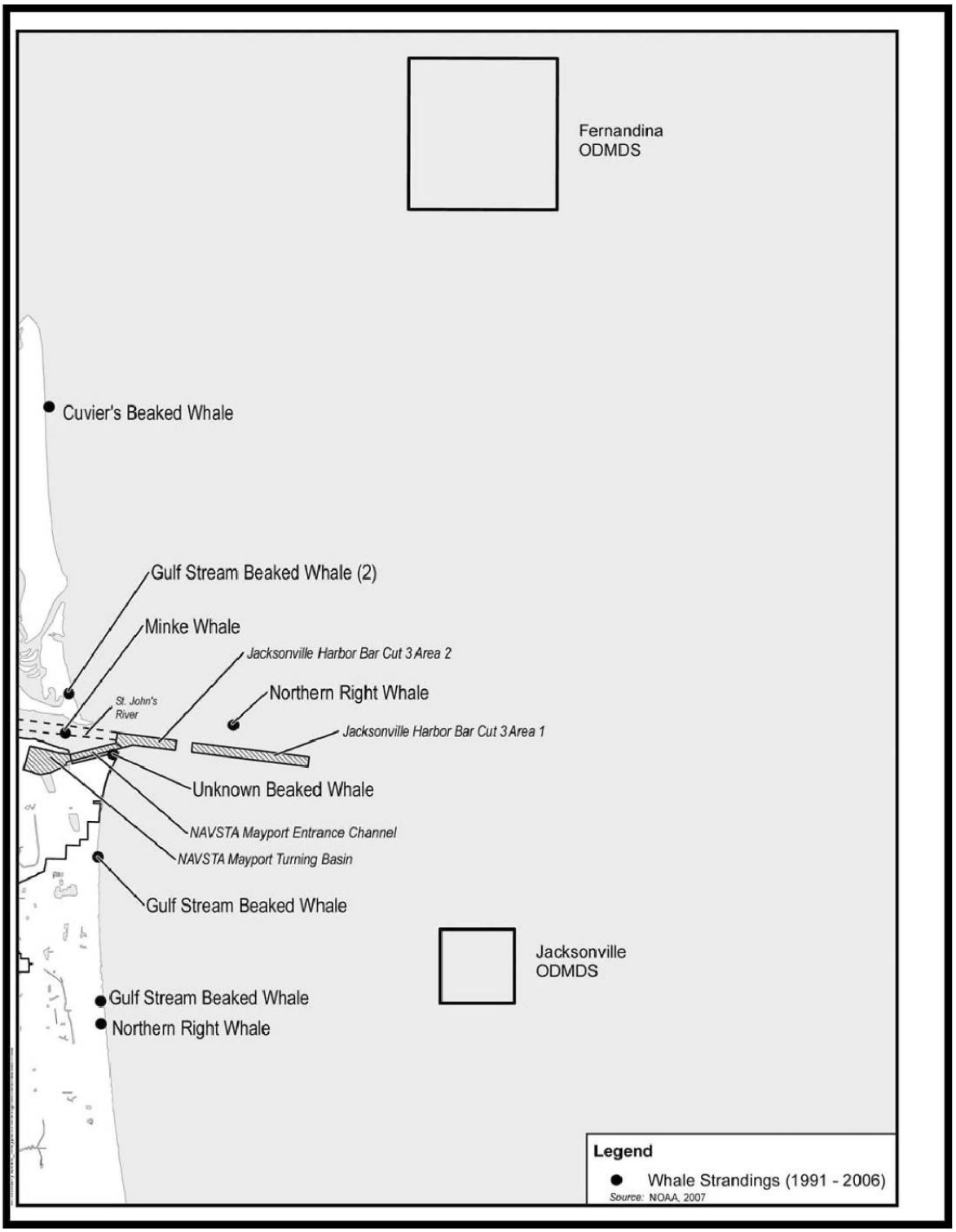


Figure 3.3-7. Whale Strandings within the Project Area (1991-2006)

This map and/or digital data is for planning purposes only and should not be used to determine the precise location of any feature.
Data provided as-is.Q:\GIS PROJECTS\JAX_ODMDS\PHASE 2\EIS\MAPS UPDATED 031511\Figure 3.3-7_Whale Strandings_1991-2006.mxd

3.3.2.2. Dolphins

Bottlenose Dolphin

Bottlenose dolphins *(Tursiops truncatus*) are very sociable and are typically found in groups of two to 15 individuals, although groups of 100 have been reported in offshore populations. They are opportunistic feeders, taking a wide variety of fishes, cephalopods, and shrimp. There are two morphologically and genetically distinct forms of bottlenose dolphins: a nearshore (coastal) and an offshore form (Duffield et al. 1983, Duffield 1986). The offshore form is distributed primarily along the outer continental shelf and continental slope in the northwest Atlantic Ocean; however, the offshore morphotype has been documented to occur relatively close to shore over the continental shelf south of Cape Hatteras, NC. Caldwell (2001) investigated the social structure of nearshore bottlenose dolphins inhabiting the estuarine waters between the St. Mary's River and Jacksonville Beach, Florida, and determined that there are two resident inshore populations of bottlenose dolphins in the St. Johns River: the Intracoastal south/St. Johns River population (also referred to as the Southern community) and the Intracoastal north population (also referred to as the Northern community). Only the offshore form is expected to occur within the vicinity of the three alternative sites (NMFS 2008a).

Atlantic Spotted Dolphin

Atlantic spotted dolphins (*Stenella frontalis*) prefer the tropical-to-warm temperate waters along the continental shelf of the Atlantic Ocean. This species generally occurs in coastal or continental shelf waters 65 to 820 feet (20 to 250 meters) deep, but can be found occasionally in deeper oceanic waters. The population in the western North Atlantic is estimated at 36,000 to 51,000 animals (http://www.nmfs.noaa.gov/pr/species/mammals/cetaceans/spotteddolphin_atlantic.htm, accessed December 22, 2010). Group size for the Atlantic spotted dolphin may range from just a few dolphins to several thousand. They prey on epipelagic (surface dwelling) fishes, squid, and crustaceans. Atlantic spotted dolphins may occur but are expected to be uncommon within the vicinity of the three alternative sites.

Pantropical Spotted Dolphin

Pantropical spotted dolphins (*Stenella attenuata*) often occur in groups of several hundred to 1000 animals. They are considered quite gregarious, often schooling with other dolphin species, such as spinner dolphins. Although specific migratory patterns haven't been clearly described, they seem to move inshore in the fall and winter months and offshore in the spring. They feed primarily on mesopelagic cephalopods and fishes (http://www.nmfs.noaa.gov/pr/species/mammals/cetaceans/spotteddolphin_pantropical.htm, accessed December 22, 2010). Pantropical spotted dolphins may occur but are expected to be uncommon within the vicinity of the three alternative sites.

Spinner Dolphin

Spinner dolphins (*Stenella longirostris*) are distributed in oceanic and coastal tropical waters (Leatherwood et al. 1976). This is presumably an offshore, deep-water species (Schmidly 1981; Perrin and Gilpatrick 1994), and its distribution in the Atlantic is very poorly known. In the western North Atlantic, these dolphins occur in deep water along most of the U.S. coast south to the West Indies and Venezuela, including the Gulf of Mexico. Spinner dolphin sightings have occurred exclusively in deeper (>2,000 meters) oceanic waters (CETAP 1982; Waring et al. 1992; NMFS unpublished data) off the northeast U.S. coast. Spinner dolphins often occur in groups of several hundred to several thousand animals. They are considered quite gregarious, often schooling in large groups and with other dolphin species, such as spotted dolphins. Spinner dolphins feed primarily at night on mid-water fishes and deep-water squid, while resting for most of the daylight hours. In most places, spinner dolphins are found in the deep ocean

where they likely track prey. Spinner dolphins may occur but are expected to be uncommon within the vicinity of the three alternative sites.

Striped Dolphin

Striped dolphins (*Stenella coeruleoalba*) are some of the most abundant and widespread dolphins in the world. This species occurs in the United States off the west coast, in the northwestern Atlantic, and in the Gulf of Mexico. In general, striped dolphins appear to prefer continental slope waters offshore to the Gulf Stream (Leatherwood et al. 1976; Perrin and Gilpatrick 1994; Schmidly 1981). Striped dolphins are usually found in tight, cohesive groups averaging between 25 and 100 individuals, but occasionally have been seen in larger groups of up to several hundred and even thousands of animals. Striped dolphins feed on a diverse diet consisting of various species of relatively small, closely-packed, midwater, "benthopelagic" and/or "pelagic" shoaling/schooling fish (e.g., "myctophids" and cod) and cephalopods (e.g., squid and octopus) throughout the water column. Recent abundance estimates for the Western Atlantic population is between 68,500 and 94,500 (http://www.nmfs.noaa.gov/pr/species/mammals/cetaceans/stripeddolphin.htm, accessed December 22, 2010). Striped dolphins may occur within the vicinity of the three alternative sites.

Risso's Dolphin

Risso's dolphins (*Grampus griseus*) are distributed worldwide in tropical and temperate seas and occur in the northwest Atlantic from Florida to eastern Newfoundland (Leatherwood et al. 1976; Baird and Stacey 1990). Off the northeast U.S. coast, Risso's dolphins are distributed along the continental shelf edge from Cape Hatteras northward to Georges Bank during spring, summer, and autumn (CETAP 1982; Payne et al. 1984). In winter, the range is in the mid-Atlantic Bight and extends outward into oceanic waters (Payne et al. 1984). In general, the population occupies the mid-Atlantic continental shelf edge year round and is rarely seen in the Gulf of Maine (Payne et al. 1984). Risso's dolphins are found in groups of 5 to 50 animals, though groups typically average between 10 and 30 animals. They have been reported as solitary individuals, pairs, or in loose aggregations in the hundreds and thousands. Occasionally this species associates with other dolphins and whales. The western North Atlantic stock is estimated to be 13,000 to 20,500 animals (http://www.nmfs.noaa.gov/pr/species/mammals/cetaceans/rissosdolphin.htm, accessed December 21, 2010). Risso's dolphins may occur within the vicinity of the three alternative sites.

Pygmy Killer Whale

Pygmy killer whales (*Feresa attenuata*) are small members of the dolphin group and are found primarily in deep waters throughout tropical and subtropical areas of the world. Pygmy killer whales usually occur in groups of 50 or less. They are generally less active than other oceanic dolphins; frequently they are seen "logging" (resting in groups at the surface with all animals oriented the same way). They prefer deeper areas of warmer tropical and subtropical waters where their prey are concentrated. The numbers of pygmy killer whales off the U.S. or Canadian Atlantic coast are unknown, and seasonal abundance estimates are not available for this stock since it was rarely seen in any surveys. A group of six pygmy killer whales was sighted during a 1992 vessel survey of the western North Atlantic off Cape Hatteras, North Carolina, in waters >1500 meters deep (Hansen et al. 1994), but this species was not sighted during subsequent surveys (NMFS 1999; NMFS 2002; Mullin and Fulling 2003). Pygmy killer whales are expected to be uncommon within the vicinity of the ODMDS.

False Killer Whale

False killer whales (*Pseudorca crassidens*) are large members of the dolphin family. They are gregarious and form strong social bonds. They are usually found in groups of 10 to 20 that belong to much larger groups of up to 40 individuals in Hawaii and 100 individuals elsewhere. False killer whales are also found with other cetaceans, most notably bottlenose dolphins. They feed during the day and at night on fishes and cephalopods. False killer whales occur in the United States in Hawaii, along the entire west coast, and from the Mid-Atlantic coastal states south. They prefer tropical to temperate waters that are deeper than 3,300 feet (1000 meters) (http://www.nmfs.noaa.gov/pr/species/mammals/cetaceans/falsekillerwhale.htm, accessed December 22, 2010). Since false killer whales prefer deeper water, they are expected to be uncommon within the vicinity of the three alternative sites.

Short-finned Pilot Whale

Short-finned pilot whales (*Globicephala macrorhynchus*) are found in warm temperate and tropical waters and occur primarily along the Atlantic coast south of Cape Hatteras. Strandings along the east coast of Florida have occurred during fall, winter, and spring (Figure 3.3-7). As they occur predominantly in the offshore waters of Florida beyond the continental shelf, pilot whales are not expected to occur nearshore or in the vicinity of the three alternative sites (DoN 2002).

Orcas

Orcas (*Orcinus orca*) normally occur in small groups and feed on bony fishes, sharks, rays, skates, cephalopods, seabirds, sea turtles, and other marine mammals. Orca sightings off the coast of northern Florida have been close to shore. However, just to the north off the coast of North Carolina, there have been sightings in deep waters seaward of the continental shelf break. Orcas are expected to be rare throughout the year between the coastline and within the vicinity of the three alternative sites.

3.3.3. Seabirds

The ROI for seabirds includes the three alternative sites and the offshore area between the sites and the coastline. Several species of pelagic, migrant, and coastal birds inhabit the eastern inner shelf of Florida. Bird species observed along the coastal regions of east Florida can be divided into six general guilds (shorebirds, waterfowl, wading birds, seabirds, raptors, and passerines) based on utilization of habitats and the relative amount of time spent in the open oceanic waters of the Atlantic. Species most likely to occur in the study area are pelagic birds, pelicans, gulls, and terns. The term “seabirds” is used to describe birds that obtain the majority of their food from coastal waters (neritic species) or from open ocean (pelagic species) (Zarillo et al. 2009). Neritic seabirds use the land for feeding or resting at certain times, whereas pelagic seabirds are largely independent of the land except for nesting (Browne et al. 2004). The study area falls narrowly between pelagic and neritic habitats.

Regulatory protection of seabirds in northeast Florida is covered under three provisions: the USFWS ESA, the MBTA, and the Florida Endangered and Threatened Species Act. In some cases, local counties or towns also have ordinances protecting seabirds. With the exception of non-native species, all birds identified as potentially occurring in the northeast Florida area are protected under the MBTA (Williams 2004).

3.3.3.1. Pelagic Seabirds

Information on the population status and movements of pelagic birds is limited, largely due to the vast geographical areas, the differences among species-specific migration, the difficulty in studying bird movement during adverse weather conditions, and the lack of standard methodology (Tasker et al. 1984, Michel and Burkhard 2007). Pelagic seabirds represent a wide range of species that spend much of their time in or over water and are capable of staying far from land for long periods of time. Most of these birds have adaptive salt glands that allow them to regulate the salt content in their blood (Ehrlich et al. 1988). Some species, such as albatross, frigatebirds, shearwaters, boobies, gannets, and petrels, spend the majority of their life cycle offshore, while others, such as gulls, terns, pelicans, and cormorants, divide their time more or less equally between offshore and coastal waters (Ehrlich et al. 1988). Most species in this guild are also colonial nesters that leave the nest to venture far from natal areas (Zarillo et al. 2009). Pelagic seabirds typically feed in upwellings on abundant fish and zooplankton species. Some pelagic seabirds that may occur in the project area are listed in Table 3.3-2.

3.3.3.2. Neritic Seabirds

Pelicans, gulls, terns, and cormorants are considered neritic, meaning that they are more common in the coastal waters, although some can be seen with regularity well offshore (Ehrlich et al. 1988). These species are common in nearly all offshore environments. The east coast of Florida populations of brown pelican (*Pelecanus occidentalis*) are listed as a species of special concern by the State of Florida (FWC 2010), but they are excluded from the MBTA list. Some neritic seabirds that may occur in the study area are listed in Table 3.3-2.

Table 3.3-2. Seabirds Potentially Occurring within the Study Area

Common Name	Scientific Name	Common Name	Scientific Name
Frigatebirds		**Terns**	
Magnificent Frigatebird	*Fregata magnificents*	Black Tern	*Childonias niger*
Shearwaters		Least Tern	*Sterna antillarum*
Cory's Shearwater	*Calonectris diomeda*	Sooty Tern	*S. fuscata*
Greater Shearwater	*Puffinus gravis*	Common Tern	*S. hirundo*
Sooty Shearwater	*P. griseus*	Roseate Tern	*S. dougallii*
Audubon's Shearwater	*P. lherminieri*	Sandwich Tern	*S. sandvicensis*
Manx Shearwater	*P. puffinus*	Caspian Tern	*S. caspia*
Boobies		Forster's Tern	*S. forsteri*
Brown Booby	*Sula leucogaster*	Royal Tern	*S. maxima*
Gannets		Gull-billed Tern	*S. nilotica*
Northern Gannet	*Morus bassanus*	**Gulls**	
Petrels		Herring Gull	*Larus argentatus*
Wilson's Storm-Petrel	*Oceanites oceanicus*	Ring-billed Gull	*L. deltawarensis*
Cormorants		Laughing Gull	*L. atricilla*
Double-crested Cormorant	*Phalacrocorax auritus*	Greater Black-backed Gull	*L. marinus*
Anhinga	*Anhinga anhinga*	Bonaparte's Gull	*L. Philadelphia*
Jaegers		Black-legged Kittiwake	*Rissa tridactyla*
Parasitic Jaeger	*S. parasiticus*	**Pelicans**	
Pomarine Jaeger	*S. pomarimus*	Brown Pelican*	*Pelecanus occidental*
		White Pelican	*P. erythrorhynchos*

*Excluded from MBTA, listed as Florida Species of Special Concern
Source: Zarillo et al. (2009)

3.3.4. Plankton

The ROI for plankton communities includes the three alternative sites and the offshore area between the sites and the coastline. Plankton are defined as organisms that float or drift and cannot maintain their direction against the movement of currents (Parsons et al. 1984). For the most part, they are at the mercy of their aquatic environment, moving in the direction of the prevailing current. Many zooplankton migrate vertically in the water column, which may place them under the influence of different currents than occur at the surface and allow them to indirectly control their lateral movement (Lalli and Parsons 1997). Plankton include phytoplankton (plant-like organisms), zooplankton (animals), bacterioplankton (bacteria), and meroplankton (individual life stages of some organisms, like the eggs or larvae of certain fish species) (Geo-Marine 2007). In general, planktonic organisms are very small or microscopic, although there are exceptions. Jellyfish and pelagic sargassum, for example, are unable to move against the surrounding currents and therefore are considered plankton despite the fact that both are quite large.

3.3.4.1. Macroalgae Sargassum

Two dominant species of free-floating brown macroalgae in the North Atlantic are *Sargassum natans* and *S. fluitans* (both referred to by the common name sargassum). Sargassum continually grow in the form of clumps and mats at the sea surface and reproduce through asexual reproduction (fragmentation) (Coston-Clements et al. 1991). Sargassum is frequently seen in large quantities along the continental shelf off the southeastern United States. Floating sargassum serves as habitat for several pelagic fish species that settle or take refuge in the mats formed by this algae and can be used by post-hatch sea turtles as rafts. More than 100 species of fish are associated with sargassum habitat, and it is considered EFH for dolphinfish, which feed primarily on sargassum. Sargassum is susceptible to various pollution sources such as petroleum from ships creating oil slicks which enters gaps in the mat and remains trapped, ultimately leading to mortality in the sargassum mat (Butler et al. 1983). Sargassum would likely be present in the vicinity of each alternative ODMDS site, but it is mobile and patchy due to movement with physical features such as currents and wind.

3.3.4.2. Phytoplankton

Phytoplankton are single-celled organisms that float in the open ocean and are similar to plants because they photosynthesize using sunlight and chlorophyll. Phytoplankton are often referred to as primary producers because they are at the base of the food chain and are essential to the overall productivity of the ocean. Phytoplankton standing crops generally are higher nearshore than offshore; however, considerable patchiness occurs and is correlated with nutrient availability. Tidal influence and water exchange between the mouth of the St. Johns River and the Atlantic Ocean support a diversity of phytoplankton populations. Salinity tolerances combined with limited photosynthetic capabilities are the main influences regarding what species inhabit the area, and abundance of certain species fluctuates throughout the year.

Phytoplankton populations of the Georgia Bight are composed primarily of diatoms, dinoflagellates, and coccolithophorids (Table 3.3-3). The phytoplankton of the continental shelf waters are usually dominated by diatoms (Hulburt 1967); however, dinoflagellates often become abundant during the summer months (Roberts 1974). Coccolithophorids are frequently abundant in the outer shelf waters and are ubiquitous in the Gulf Stream (USEPA 1983).

Table 3.3-3. Phytoplankton Species Typically Found in the Waters of the Georgia Bight

Diatoms	**Haptophyta**
Asterionella japonica	*Phaeocystis puchetii*
Bacteriastrum cosmosum	**Dinoflagellates**
Chaetoceros affinis	*Amphidium* sp.
C. decipines	*Ceratium furca*
Eucampia zoodiacus	*C. fusus*
Leptocylindrus danicus	*C. tripos*
Nitzschia closterium	*Gymnodinium* sp.
N. delicatissum	**Coccolithophorids**
N. serrata	*Coccolithys huxleyi*
Navicula sp.	*Syracosphera mediteranea*
Rhizosolenia alata	*S. pulchra*
R. stolterfothii	**Chrysophyta**
Skeletonema costatum	*Rhodomonas amphioxeia*
Thassionema nitzschoides	

Sources: Hulburt and MacKenzie 1971, Marshall 1971

3.3.4.3. Zooplankton

Zooplankton are small, mostly microscopic animals such as crustaceans and fish larvae that inhabit the water column. Zooplankton biomass is influenced by seasonal fluctuations in hydrography and phytoplankton abundance (Lalli and Parsons 1997). Zooplankton populations at the ODMDS are composed of copepods, chaetognaths (arrow worms), tunicates (sea squirts), jellyfishes, opisthobranchs (pelagic sea snails and sea slugs), decapod crustaceans, and a variety of planktonic larvae (USEPA 1983). Calenoid copepods typically are the most abundant group, contributing up to 95% of the total numbers (Bowman 1971). Shrimp, crab, and fish larvae are abundant on the continental shelf and become fairly uncommon offshore (BLM 1977). Maximum concentrations of planktonic larvae generally occur during the spring; however, many larvae are also present in the summer and fall. Shrimp larvae exhibit greatest abundance on the inner shelf during the spring, where they may comprise up to 16% of the total zooplankton present (USEPA 1983).

3.3.5. Benthic Communities

The ROI for benthic communities is the ocean floor within and adjacent to the three alternative sites. Benthic communities consist of organisms living in or on the bottom of the ocean. These organisms are often characterized by body size and where they live in relation to the seafloor. For the study region, the focus is on those invertebrates that live in the sediments (infauna and meiofauna), as these organisms are less able to move from an area if disturbed. Benthic infauna is defined here as those organisms living within the sediment and that are retained in a standard U.S. #35 (0.5-mm) mesh size sieve. Meiofauna are those organisms living within the sediment which can pass unharmed through a standard U.S. #35 mesh size sieve but which would be retained by a 30- or 45-µm mesh sieve, excluding microscopic animals such as protozoans and rotifers.

3.3.5.1. Regional Characteristics

Benthic habitats are comprised of a variety of sediments, substrates, and marine life that are commercially and economically valuable. The benthic community inhabiting the continental shelf off Jacksonville can be divided into two categories: (1) a benthic infaunal community

associated with the softbottom substratum of the shelf and slope, and (2) a diverse epifaunal community associated with various reef outcrops (termed "live bottom") (USEPA 1983). The predominant infaunal invertebrates inhabiting the sand-bottom habitats of the nearshore east Florida shelf include polychaete worms, crustaceans, echinoderms, and mollusks (Zarillo et al 2009). The fauna is dominated by semi-mobile, non-tube-dwelling polychaete worms (Tenore 1985). The inner shelf assemblage includes dominant magelonid, prionospionid, and nereid polychaetes, and both burrowing and surface brittlestars. Other more recent studies by Lotspeich and Associates (1997) and Barry A. Vittor & Associates (1999) also reported that the inner shelf infaunal assemblages in the area are dominated by polychaete worms in terms of overall numerical abundance and species richness. Amphipods, gastropods, and bivalves are also well represented. Infaunal assemblages that inhabit the study area are similar to those of sand-bottom habitats of other regions in that they exhibit spatial and seasonal variability in their distributions (Zarillo et al. 2009)

Benthic organisms such as crustaceans, echinoderms, anthozoans, annelid worms, mollusks, and demersal fish play a major role in altering underlying benthic substrates and in breaking down organic material which provides sustenance for economically important species of pelagic fishes (Sumich 1988). These organisms are important marine ecological community members because they burrow within and oxygenate the sediments, may filter large volumes of water, contribute organic materials to the overall marine system, and serve as food for bottom-feeding fish and other invertebrates.

Benthic communities can be limited by sedimentation. Increased sedimentation caused by storms, currents, waves, and anthropogenic disturbances such as coastal development, dredging, dredged material disposal, runoff, cold water influxes from storms, and red tide can negatively impact the benthic fauna and flora which in turn affects foodwebs and ecosystems (Jones et al. 1985, Rogers 1990, Liddell et al. 1997).

3.3.5.2. Alternative Sites Characteristics

As part of the spring and fall 2010 site designation surveys, benthic infaunal samples were collected to characterize the infaunal communities at the proposed Alternative Sites 1, 2, and 3. Grab samples were collected at stations within and adjacent to the three alternative sites (Figures 3.2-17a through d). Benthic infauna data from each of the alternative sites and adjacent areas were assessed using various indices common to ecological community structure evaluations, including composition (species present), biomass (grams of wet weight), density (number of individuals/m^2), species richness (number of species), and species diversity indices (number of different species relative to the total number of individuals; weighted for evenness of species composition). Results are summarized in the following sections. Complete results and methods are provided in the site designation study report (ANAMAR 2011).

<u>Biomass</u>

Table 3.3-4 and Figures 3.3-8 and 3.3-9 summarize the total biomass of Alternative Sites 1, 2, and 3 and adjacent areas for the spring and fall 2010 surveys. The area adjacent to Alternative Site 3 had the highest mean total biomass during both surveys, while the area adjacent to Alternative Sites 1 and 2 had the lowest mean total biomass during both surveys. Alternative Site 3 had a much higher mean total biomass than Alternative Sites 1 and 2. The factor or factors responsible for the significant differences in infaunal biomass between sites have not been determined.

Figure 3.3-8. Mean Benthic Infaunal Biomass during the Spring 2010 Survey

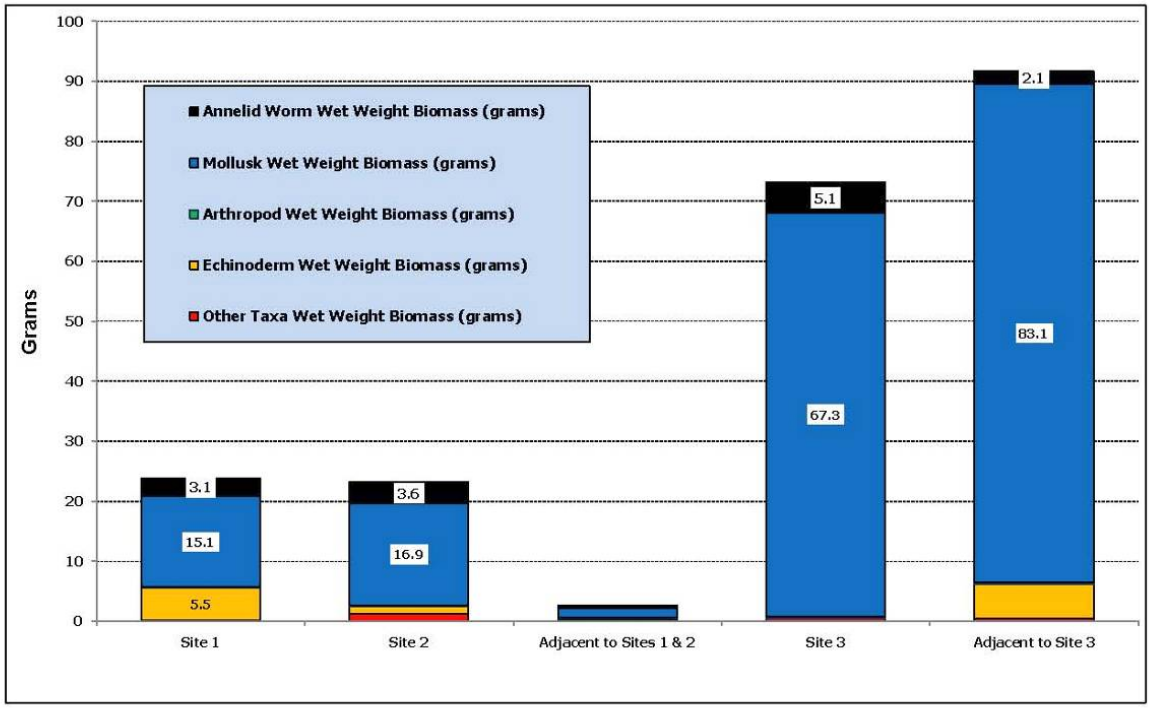
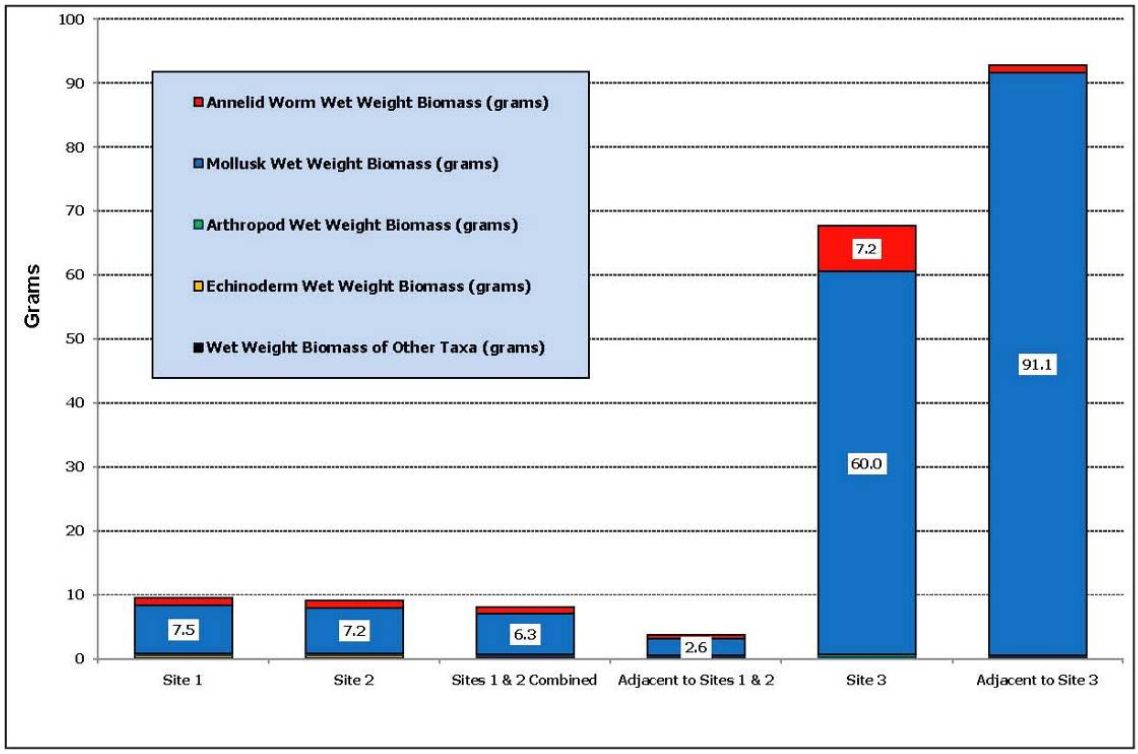


Figure 3.3-9. Mean Benthic Infaunal Biomass during the Fall 2010 Survey



Note: Mean infaunal biomass of each site determined by taking the mean of associated station biomass.
Source: ANAMAR (2011)

Table 3.3-4 Total Wet Weight Biomass of Benthic Infauna, Listed by Rank

Alternative Sites and Adjacent Areas	Mean of Stations: Total Wet Weight Biomass (grams)	
	Spring Survey	Fall Survey
Adjacent to Alternative Site 3	91.67	92.77
Alternative Site 3	73.11	67.72
Alternative Site 1	23.88	9.58
Alternative Site 2	23.18	9.13
Adjacent to Alternative Sites 1 and 2	2.70	3.64

Source: ANAMAR (2011)

Density

Table 3.3-5 summarizes the total mean infaunal densities from the spring and fall surveys. Based on mean total infaunal densities (individuals/m^2), most sites and adjacent areas were ranked the same during both seasons. The area adjacent to Alternative Site 3 had the highest mean density overall. The lowest mean density was at Alternative Site 2 during both seasons. Among the alternative sites, Alternative Site 3 had the highest mean density during both seasons. It should be noted, however, that mean infaunal densities ranged greatly between stations, even within a particular site and during a given season.

Table 3.3-5 Total Mean Infaunal Densities, Listed by Rank

Alternative Sites and Adjacent Areas	Total Mean Infaunal Density/m^2	
	Spring Survey	Fall Survey
Adjacent to Alternative Site 3	6,480.6	5,661.1
Alternative Site 3	4,097.9	3,993.8
Alternative Site 1	3,020.0	3,588.3
Adjacent to Alternative Sites 1 and 2	2,556.3	3,693.8
Alternative Site 2	2,600.0	2,977.1

[1]Ranked using the sum of the combined surveys per site or adjacent area.

Source: ANAMAR (2011)

Taxonomic Richness and Diversity

Figure 3.3-10 illustrates infaunal diversity by numbers of taxa by major group identified from the combined spring and fall survey samples. A total of 474 infaunal taxa were identified during the two surveys, with 303 taxa identified in the spring and 403 taxa identified in the fall. A total of 7,552 individuals were identified in the spring and 8,195 individuals were identified in the fall. Annelid worms and arthropods (crabs, shrimps, etc.) were among the most diverse taxonomic groups.

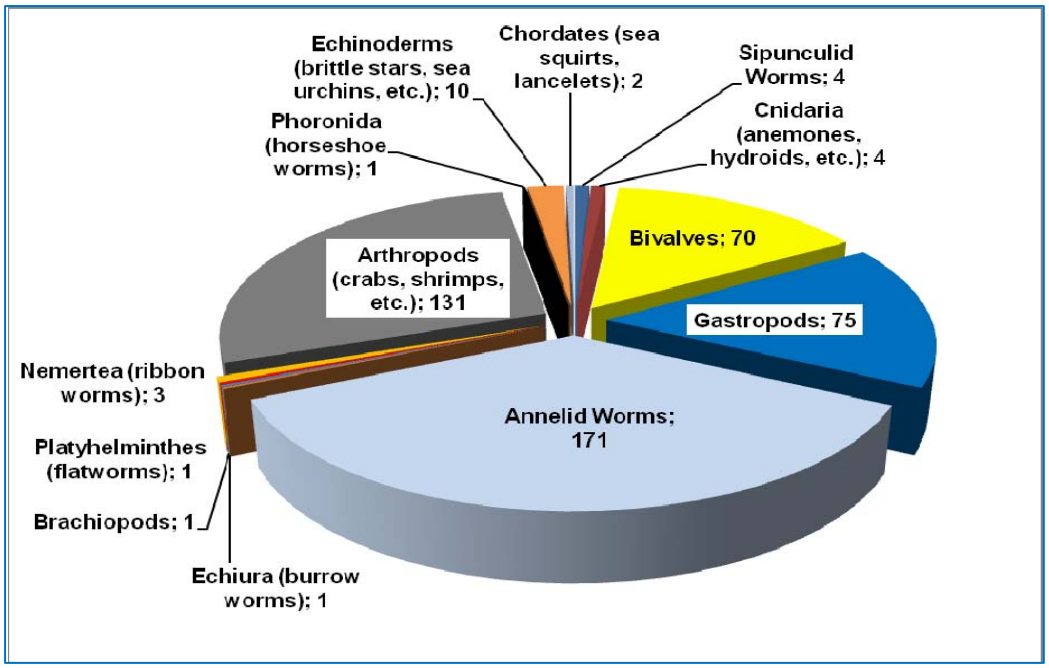


Figure 3.3-10. 474 Identified Infaunal Taxa by Major Taxonomic Group
(includes all grab samples from the combined surveys)

The Shannon diversity index is commonly used to measure biological diversity by accounting for numbers of taxa represented in a given sample and evenness of the distribution of individuals across taxa within that sample. The scores derived from this index fit within a range of 0 to 5 (normally 1.5 to 3.5), with scores of less than 1 suggesting relatively polluted and degraded habitat and scores higher than 3 considered indicative of stable and balanced habitat (Türkmen and Kazanci 2010). The Pielou evenness index is essentially derived from the Shannon index and operates on a scale of 0 to 1 (Pielou 1966). The closer the Pielou index value is to 1, the greater the distribution of individuals among taxa represented in samples (*ibid*.). The Margalef richness index is similar to the Shannon diversity index in that it is used to measure variation among a group of taxa. However, unlike the Shannon index, the Margalef richness index does not account for the even distribution of individuals among taxa (evenness).

Table 3.3-6 summarizes the mean diversity index values within and adjacent to Alternative Sites 1, 2, and 3 of spring and fall 2010 surveys combined. Mean Shannon diversity index values varied little between the alternative sites and adjacent areas, ranging between 3.28 and 3.48. The area adjacent to Alternative Site 3 had the highest mean Shannon diversity value at 3.48. The area adjacent to Alternative Sites 1 and 2 had the lowest mean Shannon index value at 3.28. Alternative Site 1 had a slightly higher mean Shannon index value (3.38) compared to other sites. Mean Pielou evenness index values were very similar between sites and adjacent areas (range = 0.77 to 0.80). Mean Margalef richness index values showed slightly more variation among sites and adjacent areas (range = 9.39 to 14.35) when compared with Pielou evenness values.

Table 3.3-6 Mean Infaunal Diversity Index Values, Listed by Rank

Alternative Sites and Adjacent Areas	H' Shannon Diversity Index (log e) Values		J' Pielou Evenness Index		D Margalef Richness Index Values	
	Mean	Range	Mean	Range	Mean	Range
Adjacent to Alternative Site 3	3.48	3.38 – 3.58	0.81	0.80 – 0.82	12.87	11.39 – 14.35
Alternative Site 1	3.38	3.28 – 3.49	0.79	0.79 – 0.80	11.95	10.77 – 13.12
Alternative Site 2	3.37	3.29 – 3.46	0.79	0.79 – 0.80	12.06	11.29 – 12.84
Alternative Site 3	3.29	3.25 – 3.33	0.77	0.75 – 0.79	12.49	10.87 – 14.11
Adjacent to Alternative Sites 1 and 2	3.28	2.97 – 3.59	0.80	0.78 – 0.82	11.44	9.39 – 13.49

Source: ANAMAR (2011)

Mollusks

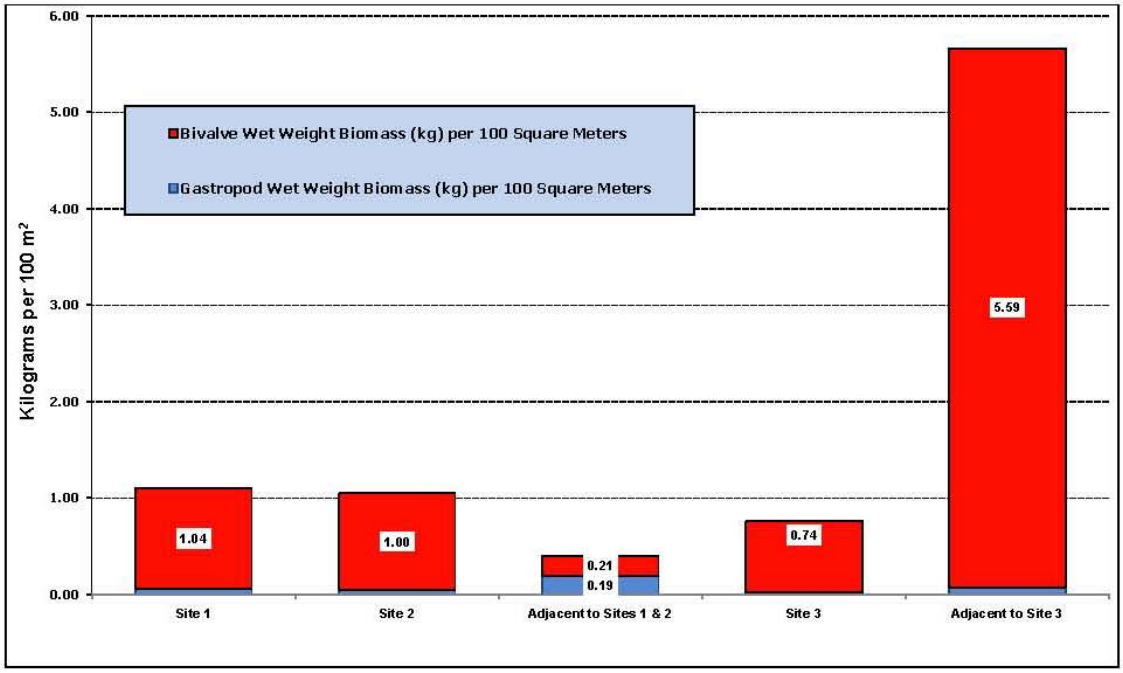
Bivalves and gastropods were collected during the fall 2010 survey using a rocking-chair dredge. Table 3.3-7 and Figures 3.3-11 and 3.3-12 summarize biomass and density data for Alternative Sites 1, 2, and 3 and adjacent areas. Overall, the area adjacent to Site 3 had the highest mollusk biomass and density. Of the alternative sites, Site 1 had the highest biomass and density, with bivalves accounting for nearly all of the weight (98.9%). More than 7,973 mollusks representing 19 taxa were collected during dredge sampling. Most were bivalves (57.9%, 11 taxa), with the remaining 42.1% being gastropods (8 taxa). The most numerous taxon represented in dredge samples was the transverse ark (*n* = 7,506; 94.14% of all mollusks). Other abundant taxa consisted of the ponderous ark (*Noetia ponderosa*; *n* = 148, 1.86% of all mollusks), the mussel genus *Brachidontes* (*n* = 136, 1.70%), and the common Atlantic slippersnail (*n* = >95, >1.19%). Complete lists of taxa collected during each survey are provided in the site designation study report (ANAMAR 2011).

Table 3.3-7 Mollusk Wet Weight Biomass and Density, Listed by Rank

Alternative Sites and Adjacent Areas	Wet Weight Biomass (kg/100 m^2)	Mollusk Density (Individuals per 100 m^2)
Adjacent to Alternative Site 3	5.65	1,333.04
Alternative Site 1	1.10	>257.28
Alternative Site 2	1.04	>237.47
Alternative Site 3	0.76	136.94
Adjacent to Alternative Sites 1 and 2	0.40	24.48

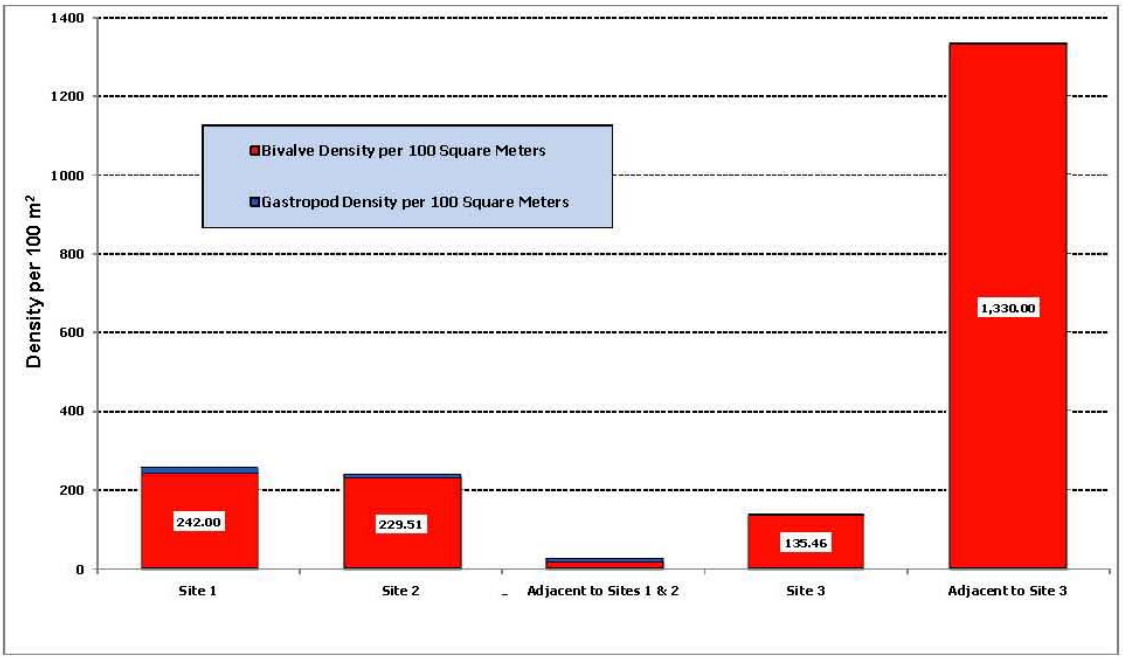
Source: ANAMAR (2011)

Figure 3.3-11. Bivalve and Gastropod Biomass during the Fall 2010 Survey



Notes: Biomass calculated by pooling station data per site and dividing by the estimated surface area sampled.
Estimated surface area sampled = length of tow(s) (m) x 0.37 (sampling width of dredge in meters).
Each site or adjacent area consists of pooled data from two of more stations contained within a given area.
Source: ANAMAR (2011)

Figure 3.3-12. Bivalve and Gastropod Biomass during the Spring 2010 Survey



Notes: Densities calculated by pooling station data per site and dividing by the estimated surface area sampled
Estimated surface area sampled = length of tow (m) x 0.37 (sampling width of dredge in meters).
Sites 1 and 2 use dredge data which omits common Atlantic slippersnails (*Crepidula fornicata*) from Station S04 that were too numerous to count.
Sources: ANAMAR (2011)

Benthic Infauna Community Structure

Based on spring and fall sampling results, the infaunal community is complex and diverse at all alternative sites and adjacent areas. The following are examples of some of the important taxonomic groups represented. The annelid worms were diverse and included *Mediomastus californiensis*, *Polygordius* sp., and *Owenia fusiformis*. Arthropods were also important components of infaunal samples and included *Erichthonius brasiliensis*, *Photis pollex*, and ostrocods such as *Parasterope hulingsi*. Most of the ostrocod species identified from spring and fall samples, such as *Rutiderma mollitum* and members of the *Eusarsiella* genus, represent benthic species from an otherwise pelagic group (myodocopida) (G.D. Hecht *pers. comm*.). Bivalve mollusks included *Parvilucina multilineata* and *Tellina* sp. Gastropod mollusks included *Atys sandersoni* and *Tectonatica pusilla*. Echinoderms were important components of infaunal biomass when present in a sample, but represented low diversity and low numbers of individuals among stations sampled. Echinoderms included two-lined sea stars (*Astropecten duplicatus*), lined sea stars, sea urchins (echinoids), and sea cucumbers (holothuroids). Relatively minor components of the infaunal community included sipunculid worms (e.g., *Aspidosiphon albus*), ribbon worms (nemerteans), cnidaria (e.g., actiniaria), chordates such as sea squirts (ascidiacea) and lancelets (e.g., *Branchiostoma* sp.), one genus of horseshoe worm (phoronids; *Phoronis* sp.), and flatworms (platyhelminthes) of the turbellaria group. Complete lists of taxa collected during each survey are provided in the site designation study report (ANAMAR 2011).

3.3.6. Epifaunal and Fish Communities

The ROI for epifaunal and fish communities is the water column and ocean floor within and adjacent to the three alternatives sites.

3.3.6.1. Regional Characteristics

Wenner and Read (1982), who reported on decapod crustaceans collected by trawl over a wide area of the South Atlantic Bight between Cape Fear, North Carolina, and Cape Canaveral, Florida, suggested that site and species group distributions were related to depth and depth-related changes in groups and that seasonal variation was minimal. Species groups consisted of an inner shelf assemblage, an open shelf assemblage, and an upper slope assemblage. Epifaunal populations have distributions limited by depth-related temperature variability and sedimentary habitat (Cerame-Vivas and Gray 1966, Wenner and Read 1982). Wenner and Read found an inner shelf assemblage that was numerically dominated by roughneck shrimp (*Rimapenaeus constrictus*)*;* iridescent and blotched swimming crabs, *Portunus gibbesii* and *P. spinimanus,* respectively; and coarsehand lady crab, *Ovalipes stephensoni.* Dominant conspicuous epifauna observed during a study of a sand borrow site located approximately 1 nmi east of the Jacksonville ODMDS consisted of several species of echinoderms, including the arrow sand dollar and sea stars *Luidia clathrata* and *Astropecten* spp., respectively (Lotspeich and Associates 1997).

The continental shelf of the southeastern United States, including the study area, harbors diverse marine fauna and supports large commercial and recreational fisheries. The distribution of demersal fishes inhabiting the continental shelf of the Georgia Bight is determined primarily by temperature, bottom topography, and substrate composition (Struhsaker 1969). Rich assemblages of demersal fish congregate around the numerous reefs located off the coast of Jacksonville because of the shelter and associated abundance of benthic organisms that serve as food (NMFS 1978, Moe 1963). Specific fisheries complexes are snapper-grouper, which include groupers, temperate basses, snappers, and tilefishes; coastal migratory pelagic species

such as king and Spanish mackerel; and highly migratory species such as dolphinfishes, swordfish, billfishes, and many species of sharks (SAFMC 2007).

In a comprehensive 10-year (1990 to 1999) survey conducted by the South Carolina Department of Natural Resources and NMFS to monitor the abundance, habitat requirements, and life history attributes of coastal fishes and macroinvertebrates from Cape Hatteras to Cape Canaveral (now called the Southeast Area Monitoring and Assessment Program–South Atlantic [SEAMAP-SA]), 195 finfish taxa, 30 elasmobranch species, and 90 decapod crustacean taxa were collected (SCDNR, no date). Fish captures within open sand-mud substrates were numerically dominated by two species: spot (*Leiostomus xanthurus*) and Atlantic croaker (*Micropogonias undulatus*). Other abundant taxa included Atlantic bumper (*Chloroscombrus chrysurus*), porgies (*Stenotomus* spp.), and striped anchovy (*Anchoa hepsetus*).

3.3.6.2. Alternative Sites Characteristics

Trawl samples were collected during the spring and fall 2010 site designation surveys to characterize epibenthic invertebrates and demersal fishes within Alternative Sites 1, 2, and 3. Trawl samples were collected at stations within and adjacent to the three alternative sites (Figures 3.2-17a through d). Data from each of these sites and adjacent areas were assessed using various indices common to ecological community structure evaluations, including composition (species present), biomass (grams of wet weight), density (number of individuals/m^2), species richness (number of species), and species diversity indices (number of different species relative to the total number of individuals; weighted for evenness of species composition). Results are summarized in the following sections. Complete results and methods are provided in the site designation study report (ANAMAR 2011).

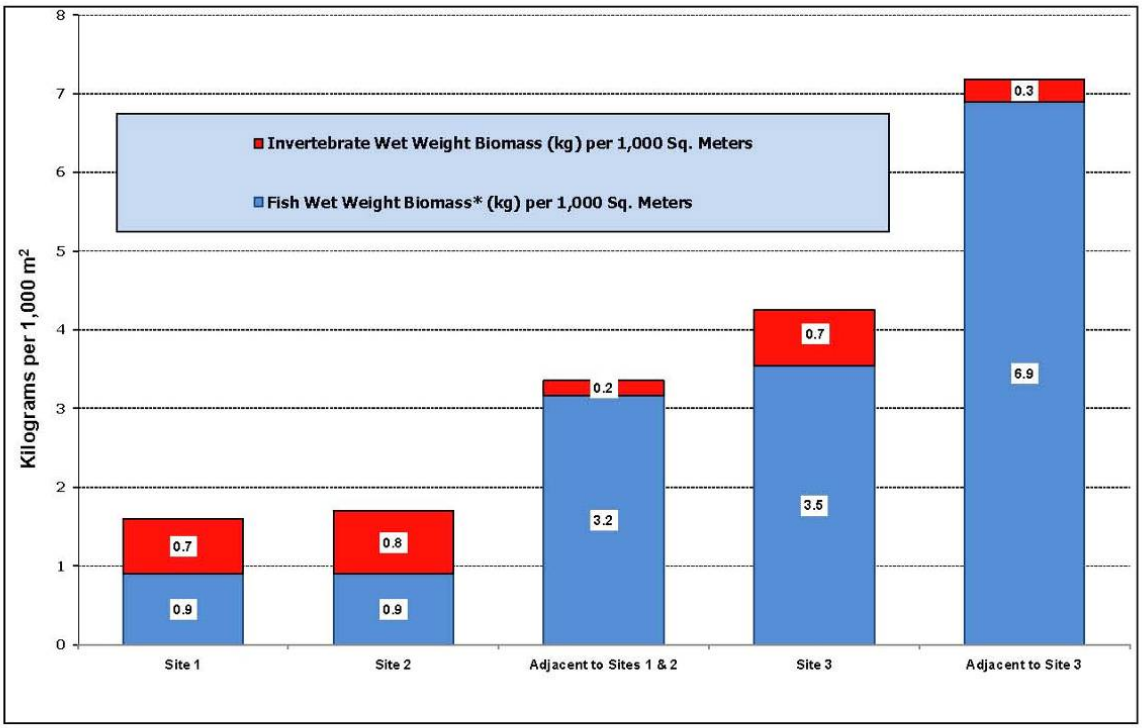
<u>Biomass</u>
Fish biomass dominated over invertebrate biomass in most spring samples while the opposite was true for most fall samples (Figures 3.3-13 and 3.3-14). The epifaunal biomass for each alternative site and adjacent areas were compared after converting to kilograms per 1,000 m^2 sampled. Table 3.3-8 summarizes the epifaunal wet weight biomass. Alternative Site 3 and the adjacent area had the highest mean total biomass. Alternative Sites 1 and 2 and the adjacent areas had similar mean total biomass results.

Table 3.3-8 Epifaunal Wet Weight Biomass, Listed by Rank

Alternative Sites and Adjacent Areas	Total Wet Weight Biomass (kg/1,000 m^2)	
	Mean of Surveys	Range of Surveys
Adjacent to Alternative Site 3	5.9	4.6 – 7.2
Alternative Site 3	5.3	4.3 – 6.4
Alternative Site 2	3.2	1.7 – 4.7
Adjacent to Alternative Sites 1 and 2	3.1	2.7 – 3.4
Alternative Site 1	3.0	1.6 – 4.3

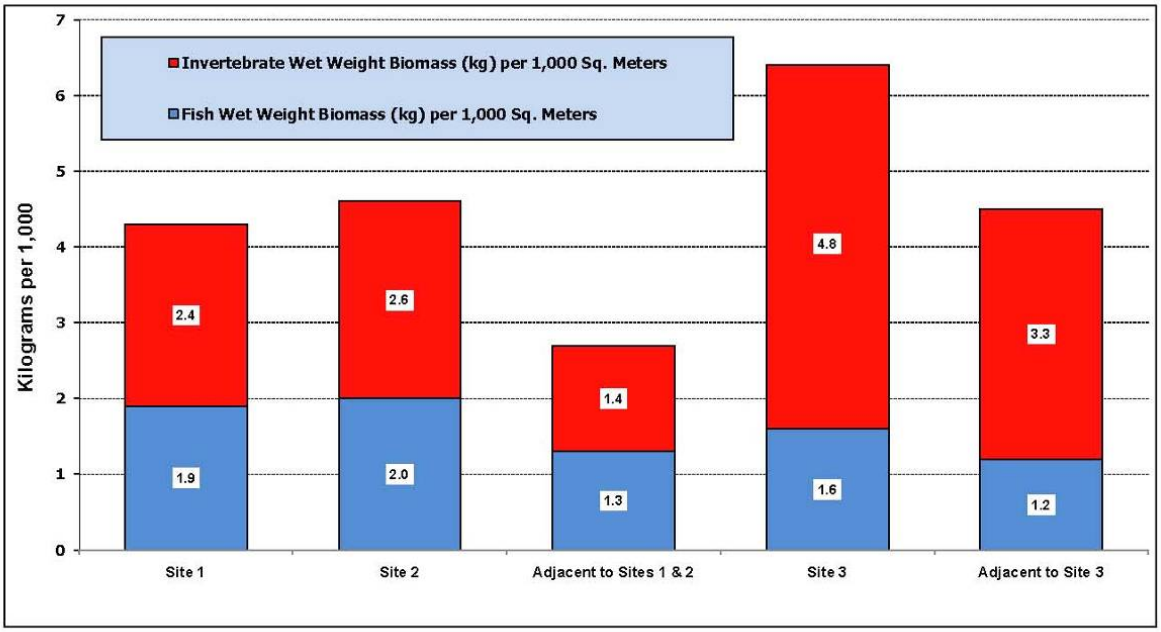
Source: ANAMAR (2011)

Figure 3.3-13. Invertebrate and Fish Biomass during the Spring 2010 Survey



Notes: Biomass calculated by pooling station data per site and dividing by the estimated surface area sampled.
Estimated surface area sampled = length of tow (nmi) x 1,852 (meters per nmi), sum x 7.317 (width of trawl in meters).
Each site or adjacent area consists of pooled data from two or more stations contained within a given area.
*Fish wet weight biomass for one trawl sample at Station S09 (JAX-Sp10-S09-EPI-D) included a roughtail stingray which exceeding the maximum weights of our scales. Its weight was estimated at 81.6 kg based on weights in Bigelow and Schroeder (1953).
Source: ANAMAR Environmental Consulting, Inc.

Figure 3.3-14. Invertebrate and Fish Biomass during the Fall 2010 Survey



Notes: Biomass calculated by pooling station data per site and dividing by the estimated surface area sampled.
Estimated surface area sampled = length of tow (nmi) x 1,852 (meters per nmi), sum x 7.317 (width of trawl in meters).
Each site or adjacent area consists of pooled data from two or more stations contained within a given area.
Source: ANAMAR Environmental Consulting, Inc.

Taxonomic Richness and Diversity

Between both surveys, more than 23,423 invertebrates belonging to 125 taxa and 10,622 individual fish representing 72 species were collected (197 taxa total). Complete phylogenetic lists of invertebrate taxa and fish species are provided in the site designation study report (ANAMAR 2011). In terms of diversity within each major taxonomic group, fishes dominated all other groups (36.5% of all epifaunal taxa). However, if all invertebrate taxa were determined to the species level, one or more major groups may be more diverse than fishes. Other groups representing significant percentages of total epifaunal taxa consisted of arthropods (26.4%), echinoderms (9.6%), bivalves (9.1%), gastropods (6.1%), and cnidaria (5.6%) based on phylogeny in Camp et al. (1998), Turgeon et al. (1998), and Williams et al. (1989). Figure 3.3-15 shows numbers of epifaunal taxa by major group collected during the two surveys.

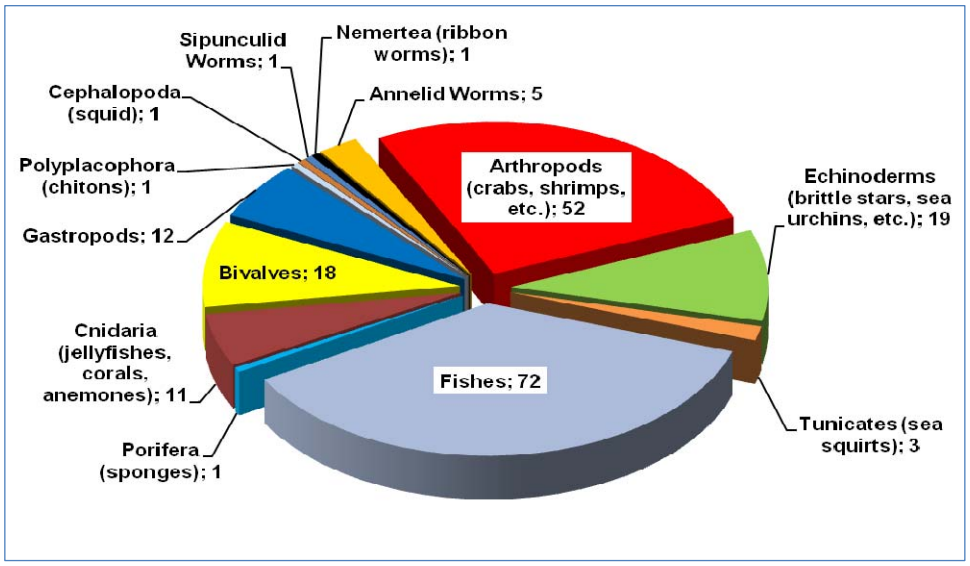


Figure 3.3-15. 197 Identified Epifaunal Taxa by Major Taxonomic Group
(includes all trawl samples from the combined surveys)

Fishes as a group were diverse, with 34 families representing 13 orders based on phylogeny in Nelson (2006). The order Perciformes was the most diverse (29 species, 40.3% of all fish species collected), although Pleuronectiformes (9 species, 12.5%), Myliobatiformes (6 species, 8.3%), and Scorpaeniformes (6 species, 8.3%) also contributed greatly to diversity. Figure 3.3-16 shows fish species by order.

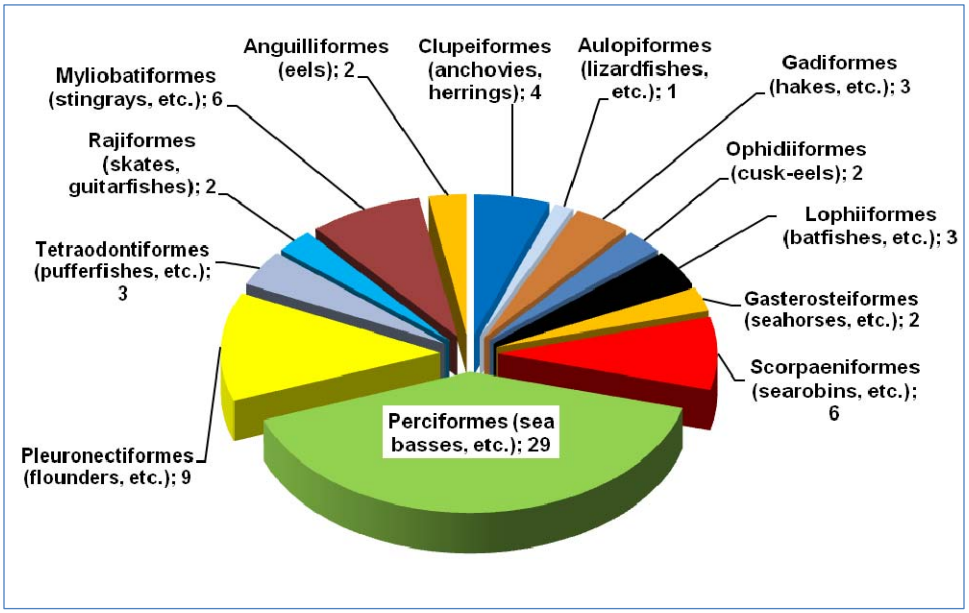


Figure 3.3-16. 72 Identified Fish Species by Order
(includes all trawl samples from the combined surveys)

Table 3.3-9 summarizes mean epifaunal diversity indices for each alternative site and adjacent areas for both surveys combined. Areas adjacent to Alternative Sites 1 and 2 had the highest mean Shannon diversity index value. Alternative Site 2 had a slightly higher mean diversity value than Alternative Site 1, with values of 2.65 and 2.57, respectively. The lowest mean diversity value overall was at the area adjacent to Alternative Site 3, which had a slightly lower mean diversity value compared to the other alternative sites. Mean Pielou evenness (r = 0.9956) and Margalef richness (r = 0.9679) values show a strong positive correlation to mean Shannon diversity values in this comparison.

Table 3.3-9 Mean Epifaunal Diversity, Listed by Rank

Alternative Sites and Adjacent Areas	H' Shannon Diversity Index (log e) Values		J' Pielou Evenness Index		D Margalef Richness Index Values	
	Mean	Range	Mean	Range	Mean	Range
Adjacent to Alternative Sites 1 and 2	2.81	2.54 – 3.22	0.69	0.65 – 0.75	8.54	7.58 – 9.98
Alternative Site 2	2.65	2.49 – 2.80	0.67	0.66 – 0.68	7.70	6.51 – 8.89
Alternative Sites 1	2.57	2.48 – 2.69	0.65	0.65 – 0.65	7.51	6.78 – 8.49
Alternative Sites 3	2.37	2.37 – 2.38	0.60	0.58 – 0.62	6.75	6.27 – 7.23
Adjacent to Alternative Site 3	1.74	1.33 – 2.16	0.46	0.38 – 0.54	5.56	4.36 – 6.77

Source: ANAMAR (2011)

Density and Abundant Taxa

Table 3.3-10 summarizes major group densities for each alternative site and adjacent area for both surveys combined. In general, total epifaunal densities (individuals/1,000 m^2) per alternative site or adjacent area resulted in a mean of >117.49 during the spring survey and >306.95 during fall. Greater fall densities can be attributed in part to increased temperature. Alternative Site 3 and the area adjacent to this site had highest mean total densities overall. Alternative Sites 1 and 2 and adjacent areas had the lowest mean total densities.

The relatively high mean densities in fall reflect relative abundance of echinoderms, arthropods (64.59), bivalves (61.10), and cnidaria (>8.14). Gastropods and fishes also contributed greatly to epifaunal densities during both surveys; these groups were slightly more abundant in fall samples. Sipunculid worms, ribbon worms, and annelid worms did not significantly affect epifaunal densities at any station regardless of survey and were often not present in trawl samples (due to gear selectivity).

Table 3.3-10 Total Epifaunal Density, Listed by Rank

Alternative Sites and Adjacent Areas	Individuals/1,000 m^2	
	Mean	Range
Alternative Site 3	308.18	132.90 – 483.46
Adjacent to Alternative Site 3	273.58	183.19 – 363.97
Alternative Site 2	>183.68	100.61 – >266.75
Alternative Site 1	>173.12	>101.84 – >244.40
Adjacent to Alternative Sites 1 and 2	122.55	68.90 – 176.19

Source: ANAMAR (2011)

Lined sea stars were the most abundant invertebrate taxa (27.52%, *n* = 6,446). The Atlantic croaker was the most abundant fish species (27.30%, *n* = 2,900), of which 90.69% were caught during the spring survey. The spotted hake (*Urophycis regia*) equaled 7.04% (*n* = 748) of all fish caught despite the complete absence of this temperate water species in fall.

Community Structure

The two surveys revealed that sea anemones are perhaps the most important cnidarians of the epibenthic community based on trawl densities. Sponges (porifera) were relatively unimportant to the softbottom community based on trawl catches. Important mollusks included transverse and ponderous arks, mussels, and Atlantic calico scallops based on high densities captured. Transverse arks formed dense mats over portions of the seafloor based on sled video footage taken within the alternative sites. The hardbottom-like substrate created from dense patches of these bivalves may provide suitable structure for reef-oriented species such as various sea basses. Lined sea stars appear to be predators of transverse arks, as individuals were seen swallowing these bivalves on several occasions during trawl sampling and in dredge samples. This species and other sea stars, such as the common sea star (*Asterias forbesi*), help churn the uppermost layer of sediment while foraging. Mojarras (*Eucinostomus* spp.) are small bioturbators that use their protrusible mouths to sift sediment to obtain buried invertebrates (Randall 1967), helping churn sediment in the process. Mojarras were common in fall survey catches.

Of the arthropods, penaeid shrimp, especially the roughneck shrimp (*Rimapenaeus constrictus*), are important scavengers, predators, and prey items. Hermit crabs (paguroidea) are scavengers and grazers in the area and probably are important prey items for larger animals. Portunid crabs, especially the redhair swimming crab (*Portunus ordwayi*), act as predator and prey in the softbottom community.

Clearnose skates were common in spring samples but absent in fall when they were partially replaced by other rays such as Atlantic guitarfish (*Rhinobatos lentiginosus*) and southern stingrays (*Dasyatis americana*). During cool spring months, the clearnose skate appears to use the areas within and adjacent to the alternative sites as nurseries in addition to foraging areas, as evidenced by several fertile egg capsules captured during spring tows.

Along with rays, the hakes (*Urophycis* spp.), searobins (*Prionotus* spp.), drums (Sciaenidae), and sand flounders (Paralichthidae) are also important to the epibenthic community. Generalist feeders such as the Atlantic spadefish still likely affect the epibenthic community, as this species is known to consume sponges, sea squirts, gorgonians, and hard corals such as *Oculina diffusa* (Randall 1967). The pelagic striped anchovy was commonly captured during spring and fall, while the bay anchovy (*Anchoa mitchilli*) was found in low densities in spring and was absent from fall samples.

Members of the drum family probably use the areas within and adjacent to the alternative sites for feeding and perhaps other important uses. For instance, the star drum (*Stellifer lanceolatus*) may use Alternative Site 3 as a nursery area in fall, as suggested by the mean length of individuals captured (ca. 25 mm SL). Many Atlantic croaker from fall samples showed pre-spawning conditions as evidenced by late-stage ova and spermatozoa observed during tissue sampling. Atlantic croaker of the size caught during the trawl surveys feed primarily on polychaete worms, crustaceans, and mollusks (Springer and Woodburn 1960). Another drum, the weakfish (*Cynoscion regalis*), may be using the area during spring for spawning, based on ripe ova observed during brief dissections. Spot were the second most abundant drum captured in spring and are likely important epibenthic community members. Spot feed primarily on amphipods and ostracods as well as small mollusks and annelid worms (Hildebrand and Cable 1930) and are likely feeding on the abundant infauna within the alternative sites.

3.3.7. Fish and Essential Fish Habitat

The ROI (also referred to as ‘project area” in this section) for fish and essential fish habitat is the water column and ocean floor within and adjacent to the three alternatives sites.

The Magnuson-Stevens Fishery Conservation and Management Act (MSA 16 U.S.C. 1855 (b)) requires federal agencies to consult with NMFS on activities that may adversely affect EFH. This EIS is consistent with guidance provided by NMFS Southeast Regional Office to USACE Jacksonville District regarding EFH consultation according to NEPA requirements. EFH is defined as “those waters and substrates necessary to fish for spawning, breeding, or growth to maturity” (NMFS 2004, MSA § 3(10)). Guidance published in 2002 states that “EFH must be identified and described for each life stage and for all species in the fishery management unit, as well as the physical, biological, and chemical characteristics of EFH and, if known, how these characteristics influence the use of EFH by each species and life stage (NMFS 2008b)

Habitat areas of particular concern (HAPC) are described as ecologically important rare subsets of EFH and are particularly susceptible to environmental degradation due to proximity to human activities. Fishery management councils (FMCs) are encouraged to designate HAPC under the Magnuson-Stevens Act. Some HAPC are geographically-defined or habitat-specific, while others are taxa-specific or even life-stage-specific. EFH guidelines published in federal regulations define HAPC as types or areas of habitat within EFH that are identified based on one or more of the following considerations:

- The importance of the ecological function provided by the habitat;
- The extent to which the habitat is sensitive to human-induced environmental degradation;
- Whether, and to what extent, development activities are or will be stressing the habitat type; and
- The rarity of the habitat type (50 CFR 600.815(a)(8)).

Based on these considerations, FMCs and NMFS have designated both 'areas' and 'habitat types' as HAPC. In some cases, HAPC identified by means of specific habitat type may overlap with the designation of a specific area. Designating HAPC facilitates the consultation process by identifying ecologically important, sensitive, stressed, or rare habitats that should be given particular attention when considering potential non-fishing impacts. Their identification is the principal way in which the South Atlantic Fishery Management Council (SAFMC), NMFS, and other FMCs can address these impacts (SAFMC 1998). HAPC are afforded no additional regulatory protection under the MSA. However, actions by federal agencies thought to impact such HAPC will be scrutinized during the EFH consultation process. Additionally, such agencies may be faced with more stringent conservation recommendations.

EFHs and HAPC within or in the vicinity of the proposed action area are managed by the SAFMC and NMFS. Although the alternative sites are outside of the management area of the Mid-Atlantic Fishery Management Council (MAFMC), EFH for MAFMC-managed species have been identified as far south as the Florida Keys (NMFS 2008c), since councils have the ability to designate EFH outside their region of jurisdiction (Geo-Marine 2008).

EFH identified by SAFMC applicable to this project consists of live/hardbottom, coral and coral reefs, artificial reefs, sargassum, and water column habitats (NMFS 2008c). Estuarine EFH will not be discussed considering water column and faunal data collected during the spring and fall 2010 surveys suggest the alternative sites are non-estuarine (ANAMAR 2011). Geographically-defined HAPC applicable to this project consist of hardbottom (part of Coral, Coral Reefs, and Live/Hardbottom Habitat FMP) and sargassum habitat (NMFS 2008c). Although sargassum EFHs and HAPC have not yet been identified (P. Wilber, *pers comm*.), they are included here following NMFS (2008). An EFH assessment has been prepared for this EIS and is included in Appendix D.

3.3.7.1. Marine Water Column

SAFMC (1998) describes habitats within the water column as "gradients and discontinuities in temperature, salinity, density, nutrients, light, [and other parameters]" that are affected by spatial and temporal forces. This fluidly structured habitat is identified as EFH by SAFMC and MAFMC in various FMP amendments (NMFS 2008c).

All managed species discussed within this document utilize the water column during at least one life stage, and therefore are profoundly affected by changes to water parameters. Based on spring and fall 2010 survey results, the project area water column is well mixed and water quality is good.

3.3.7.2. Pelagic Sargassum

Pelagic sargassum habitat focuses on two species of pelagic brown macroalgae, *Sargassum fluitans* and *S. natans*, both having the common name of sargassum. These macroalgae drift with the current, provide complex and important habitat for hundreds of marine species, and are thus managed as habitat (SAFMC 2002). Sargassum also provides important forage areas for many bird species (SAFMC 2002). The majority of sargassum off the east coast of the United States occurs along the western edge of the Gulf Stream (SAFMC 2002).

No pelagic sargassum EFHs or HAPC are currently identified on the NOAA EFH Mapper within the ROI (NOAA Fisheries 2011). The SAFMC has not yet formally identified EFH or HAPC for

sargassum (SAFMC 2002), and formal designation is not expected to occur until 2012 or later (P. Wilber *pers. comm*.).

No sargassum was recorded during spring and fall 2010 trawl surveys or otherwise observed during the surveys (ANAMAR 2011). The genus was recorded in October 1985 as part of the trawl catch at the Fernandina Beach ODMDS (Continental Shelf Associates 1986), but no biomass or other metrics were given. Sargassum is not thought to contribute greatly to the habitats of the project area due to the considerable distance between the project area and the Florida Current or other significant source of the pelagic macroalgae.

3.3.7.3. Live/Hardbottom

Live/hardbottom habitat is included in the Coral, Coral Reefs, and Live/Hardbottom Habitat (Coral) FMP (SAFMC [no date]) and is also managed as habitat (SAFMC 1998). The Coral FMP includes all taxa belonging to the classes hydrozoa and anthozoa, along with habitats broadly termed coral reefs, and assemblages of live organisms attached to hardbottom (termed 'live rock') (SAFMC [no date]). This complex of mineral and biological factors that make up hardbottom habitat provide shelter and other necessities for innumerable species, both managed and non-managed.

Small live/hardbottom EFH polygons appear to be within the vicinity of the project area and possibly contained within the project area based on the NOAA Fisheries EFH Mapper (NOAA Fisheries 2011). EFHs are mapped for coral, coral reefs, and live/hardbottom habitat as a collective unit and are not broken down by life stage, taxa, or type (NOAA Fisheries 2011). HAPC for coral reefs and hardbottom appear to be in the vicinity of the project area or contained within the project area (NOAA Fisheries 2011). The nearest Oculina Bank HAPC is located far southeast of the project site, associated with the edge of the continental shelf off Palm Beach County, Florida (NOAA Fisheries 2011).

Several members of the classes hydrozoa and anthozoa were captured by trawl in spring and fall 2010 within and adjacent to Alternative Sites 1, 2, and 3. Most of these taxa were caught in very small numbers except for sea anemones, which were among the most abundant invertebrates caught (ANAMAR 2011). A small number of northern star coral (*Astrangia poculata*) colonies were also captured by mollusk dredge south of Alternative Sites 1 and 2. All northern star coral colonies were small (approximately 10-mm diameter) and were attached to shell fragments or to live transverse arks. Ivory tree coral (*Oculina* cf. *varicosa*) fragments were found in only one trawl sample from northeast of the current Jacksonville ODMDS (ANAMAR 2011). A small number of gorgonia were observed during reconnaissance sled camera tows within and adjacent to Alternative Sites 1 and 2.

Densities of managed corals within the alternative sites were low (range = none caught to 0.46 individuals/1,000 m^2) with the exception of anemones (range = >3.91 to 10.96 individuals/1,000 m^2), which constituted >3.09% of all invertebrates caught by trawl (ANAMAR 2011). The following table presents density per taxa and total density of managed corals per alternative site collected during the trawl surveys. Table 3.3-11 presents densities of taxa managed under the Coral FMP that were collected by trawl during the spring and fall 2010 surveys within Alternative Sites 1, 2, and 3.

Table 3.3-11. Densities of Taxa Managed under the Coral FMP Captured by Trawl during Spring and Fall 2010

Scientific Name	Common Name or Vernacular	Taxa Densities[1] (individuals/1,000 m^2)		
		Alternative Site 1	Alternative Site 2	Alternative Site 3
Hydrozoa: Hydroidolina	hydroids	>0.39	0.46	None Caught
Carijoa sp.	snowflake coral genus	0.02	0.02	None Caught
Leptogorgia sp.	a sea whip genus	0.02	0.02	0.03
Renilla sp. including *R. reniformis*	sea pansies	0.41	0.41	0.13
Actiniaria	sea anemones	>3.91	4.81	10.96
Astrangia poculata	northern star coral	None Caught	≥0.02	None Caught
Oculina cf. *varicosa*	ivory tree coral	≥0.02	None Caught	None Caught
Total Taxa Density		**>4.77**	**≥5.74**	**11.12**

[1]Spring and fall survey data are combined here. Densities from trawl samples from adjacent and outside of alternative sites are excluded. See ANAMAR (2011) for further details on managed species caught during trawl sampling.

Source: ANAMAR (2011)

Hydroids were collected during October 1985 trawl sampling in and around the Fernandina Beach ODMDS, although the number collected was not recorded (Continental Shelf Associates 1986). Sea pansies were collected during March and December 1979 trawl sampling in and around the current Jacksonville ODMDS (USEPA 1983).

3.3.7.4. Artificial Reefs

Artificial reefs are defined by SAFMC (1998) as intentionally placed structures within the marine environment for the purpose of creating, restoring, or improving long-term habitat for the exploitation, conservation, or protection of the resulting marine ecosystems that establish on these materials. SAFMC (1998) further states that artificial reefs should be viewed primarily as fishery management tools.

No structures fitting the above definition are found in or adjacent to the alternative sites; however, there are anthropogenic structures fitting the Other Manmade Structures subsection of the Artificial Reefs section in SAFMC (1998). The two shipwrecks and the group of metal containers discussed in Section 2.2.2 (Ocean Disposal Alternatives) all fit the SAFMC (1998) description of other manmade structures to varying degrees and thus are considered EFHs. Only the metal containers are positioned within an alternative site (Site 1), while the remaining two objects are outside of the three alternative sites. The faunal assemblages associated with the shipwrecks are not expected to be significantly impacted by proposed dredged material disposal activities.

3.3.7.5. Species Managed by SAFMC

Species and species groups managed by SAFMC with identified EFHs or which may occasionally occur within the vicinity of the alternative sites are briefly discussed in this section. A complete discussion of EFHs associated with the alternative sites can be found in the EFH Assessment in Appendix D.

Sargassum — The sargassum species complex managed under the FMP was discussed as pelagic habitat in Section 3.3.7.2 (Pelagic Sargassum).

Coral, Coral Reefs, and Live/Hardbottom Habitat — The Coral FMP was discussed in Section 3.3.7.3 (Live/Hardbottom Habitat).

Shrimp — The Shrimp FMP consists of six species belonging to three families. Penaeid shrimp managed by this plan include northern brown shrimp (*Farfantepenaeus aztecus*), northern pink shrimp (*Farfantepenaeus duorarum*), northern white shrimp (*Litopenaeus setiferus*), and seabob (*Xiphopenaeus kroyeri*) (SAFMC [no date], P. Wilber *pers. comm*.). In a scoping response letter to EPA and USACE, NMFS has expressed concern that the northern brown shrimp and northern white shrimp may be affected by the proposed action (Appendix A). Non-penaeid shrimp managed in this FMP include the brown rock shrimp (*Sicyonia brevirostris*) and the royal red shrimp (*Pleoticus robustus*) (SAFMC [no date]). The royal red shrimp will not be discussed further because EFH for this species is not identified in the vicinity of the alternative sites and is not expected to occur in the area.

Penaeid shrimp EFH includes estuarine nursery areas, offshore habitats, and connecting waterways for spawning and growth to maturity (SAFMC 1998). Nursery areas included as EFH consist of tidal freshwater, coastal wetlands (e.g., intertidal marshes, tidal forests, mangroves), estuaries, nearshore flats, and submerged aquatic vegetation (SAFMC 1998). HAPC include coastal inlets, state-identified nursery habitats of importance to this group, and state-identified overwintering areas (SAFMC 1998). Tidal creeks and salt marshes serving as nurseries are perhaps the most important habitats for penaeid shrimp (SAFMC 1998).

Brown rock shrimp EFH consists of terrigenous and biogenic sand substrate in offshore waters from 60 to 600 feet deep, including Florida's east coast (SAFMC 1998). Included in brown rock shrimp EFHs are "shelf current systems" near Cape Canaveral, Florida, which provide transport to planktonic larvae (SAFMC 1998). Also, the Gulf Stream is EFH due to its significant role in larval dispersal (SAFMC 1998). HAPC are not currently identified for brown rock shrimp, but it is suggested that such deepwater areas as the Oculina Bank may be important nursery grounds (SAFMC 1998). Brown rock shrimp EFH is not currently identified on the NOAA EFH Mapper (NOAA Fisheries 2011).

Penaeid shrimp EFH (in the form of HAPC) is identified by the NOAA EFH Mapper, and is not broken down by life stage (NOAA Fisheries 2011). HAPC are identified for penaeid shrimp as being included within the St. Johns and Nassau rivers, but not extending east of the river mouths (NOAA Fisheries 2011).

No managed penaeid shrimp were identified during the trawl catches despite a large number (n = 2,164) of penaeid shrimp caught during the 2010 surveys (ANAMAR 2011). A small number (n = 9) of northern brown shrimp were collected during October 1985 trawl sampling in and around the Fernandina Beach ODMDS (Continental Shelf Associates 1986). No managed penaeid shrimp were recorded from March and December 1979 trawl sampling in and around the current Jacksonville ODMDS (USEPA 1983).

The brown rock shrimp was the only member of this FMP identified from spring and fall 2010 trawl samples (ANAMAR 2011). A total of 73 brown rock shrimp were taken by trawl, most of which measured 10 to 20 mm post-orbital carapace length (ANAMAR 2011). Most females had not yet reached maturity based on length-at-maturity data presented by FWC (2008). Brown

rock shrimp densities (individuals/1,000 m^2) were low in trawl catches and ranged from a low of 0.04 at Alternative Site 2 to a high of 0.51 at Alternative Site 3 (ANAMAR 2011). No brown rock shrimp were recorded from trawl data from October 1985 trawl sampling in and around the Fernandina Beach ODMDS (Continental Shelf Associates 1986) or from March and December 1979 trawl sampling in and around the current Jacksonville ODMDS (USEPA 1983).

Spiny Lobster — In a scoping response letter to EPA and USACE, NMFS has expressed concern that the Caribbean spiny lobster (*Panulirus argus*), the only member within this FMP (SAFMC [no date]), may be affected by the proposed action (Appendix A).

EFH for this species includes microhabitats used as shelter (e.g., rocks, reefs, seagrass beds, artificial shelter) (Tavares 2002a) plus unconsolidated bottom (soft sediment), hardbottom, sponges, algal communities (e.g., *Laurencia* spp.), and mangrove habitat (e.g., red mangrove prop roots) (SAFMC 1998). The Gulf Stream, including the Florida Current, also provides EFH due to its role in dispersion of larvae (SAFMC 1998).

EFH is identified in the NOAA EFH Mapper for all combined life stages (NOAA Fisheries 2011). Identified EFH includes the alternative sites and surrounding area, including much of the inshore, nearshore, and offshore waters of the area (NOAA Fisheries 2011). HAPC is identified nearby in a very small square between the St. Johns River mouth and Atlantic Beach (NOAA Fisheries 2011).

No spiny lobster were collected during the spring and fall 2010 trawl surveys (ANAMAR 2011) or in previous surveys of existing disposal sites of the area (USEPA 1983, Continental Shelf Associates 1986). Considering the paucity of most types of suitable structure, this species is not likely to regularly use the project area.

Snapper-Grouper Complex — A total of 73 species representing 10 families in two orders are included in the Snapper-Grouper Complex FMP (SAFMC [no date]). Table 1 of the EFH Assessment provides a complete list of species managed (Appendix D). Most species are demersal, while some, such as the jacks (Carangidae), are pelagic. There is substantial variation in life history patterns and habitat usage among this diverse multi-family and multi-order group (SAFMC 1998).

Structures utilized by many members of this group consist of coral reefs, artificial reefs, hardbottom, ledges, cavities, and sloping softbottom surfaces (SAFMC 1998). Juveniles of some species may instead inhabit inshore and estuarine habitats such as seagrass beds, mangroves, lagoons, and bays (SAFMC 1998).

A total of 740 individuals representing five species managed in the Snapper-Grouper FMP were caught during spring and fall 2010 trawl sampling in and around the three alternative sites (ANAMAR 2011). In addition, several members of this FMP were recorded on sled video footage taken during October 2009 reconnaissance surveys in and around the project area. Eight rock sea bass (*Centropristis philadephica*) were captured during October 1985 trawl sampling in and around the Fernandina Beach ODMDS (Continental Shelf Associates 1986). Black sea bass were collected during March and December 1979 trawl sampling in and around the Jacksonville ODMDS (USEPA 1983), but the number collected was not indicated (USEPA 1983). Table 3.3-12 provides a breakdown of densities of each member of this FMP caught within alternative sites during spring and fall 2010 site designation surveys.

Table 3.3-12. Densities of Taxa Managed under the Snapper-Grouper FMP Captured by Trawl during Spring and Fall 2010

Scientific Name	Common Name	Species Densities[1] (individuals/1,000 m^2)		
		Alternative Site 1	Alternative Site 2	Alternative Site 3
Centropristis philadelphica	rock sea bass	4.29	5.37	2.81
Centropristis striata	black sea bass	1.06	1.17	None Caught
Lutjanus campechanus	red snapper	0.22	0.28	None Caught
Stenotomus caprinus	longspine porgy	0.48	0.65	0.19
Chaetodipterus faber	Atlantic spadefish	0.02	0.02	None Caught
Total Species Density		**6.07**	**7.49**	**3.00**

[1] Spring and fall survey data are combined here. Densities from trawl samples from adjacent areas are not included. See ANAMAR (2011) for further details on managed species caught during trawl sampling.

Source: ANAMAR (2011)

EFH is defined for the complex as a whole and includes coral and artificial reefs, live/hardbottom, submerged aquatic vegetation, and medium- to high-relief outcroppings from nearshore to water 600 feet deep (to at least 2000 feet deep for wreckfish [*Polyprion americanus*]) (SAFMC 1998). Water temperature must be warm enough to sustain adults of tropical and sub-tropical members of the complex (SAFMC 1998). EFH includes the water column above suitable adult habitat and pelagic habitats such as floating sargassum, which are used by larvae and post-larvae of certain species (SAFMC 1998). The Gulf Stream, including the Florida Current, is also EFH as a means of dispersal for pelagic larvae (SAFMC 1998). Certain nearshore and estuarine-oriented species need EFHs such as attached macroalgae; seagrass beds; emergent estuarine vegetation including saltmarshes, tidal creeks, and mangroves; oyster reefs; unconsolidated bottom (soft sediment); artificial and coral reefs, and live/hard bottom (SAFMC 1998).

The HAPC subset of EFH is defined for this group as including habitats vital to each life stage (i.e., egg, larval, post-larval, juvenile, and adult stages) (SAFMC 1998).

The NOAA Fisheries EFH Mapper includes the project area and surrounding waters in the EFH for this group, including inshore, nearshore, and most offshore waters from Florida to Virginia (NOAA Fisheries 2011). The EFH includes all life stages for the complex as a collective unit (NOAA Fisheries 2011). HAPC are identified near the project area, but nearer to shore, including much of the St. Johns and Nassau rivers (NOAA Fisheries 2011).

Coastal Migratory Pelagics — The Coastal Migratory Pelagics FMP consists of cobia (*Rachycentron canadum*) and four scombrid species (cero [*Scomberomorus regalis*], little tunny [*Euthynnus alletteratus*], king mackerel [*Scomberomorus cavalla*], and Spanish mackerel [*Scomberomorus maculatus*]) (SAFMC [no date]).

SAFMC (1998) defines EFH for this group as a whole and also defines species-specific EFHs for certain members of this group. Habitats deemed essential consist of sandy shoals associated with capes and offshore sandbars, high-profile rocky bottom, and the windward sides of barrier islands (SAFMC 1998). Sargassum habitat is also included as EFH for coastal migratory pelagics (SAFMC 1998). These features can be found from inshore out to the Gulf

Stream (SAFMC 1998). Coastal inlets are included as EFH, as are any state-designated nursery areas of particular importance (SAFMC 1998). The Gulf Stream itself is EFH as it allows dispersal of these fishes, especially during the larval stage (SAFMC 1998). EFH specific to cobia includes high salinity bays, estuaries, and seagrass beds (SAFMC 1998). EFH for king mackerel, Spanish mackerel, and cobia include the South Atlantic and Mid-Atlantic bights (SAFMC 1998).

The NOAA EFH Mapper identifies EFH for the Coastal Migratory Pelagics group to include a circular polygon within the vicinity of the project area (NOAA Fisheries 2011). The EFH polygon surrounds St. Johns Bar Cut (NOAA Fisheries 2011) and another EFH polygon surrounds the entrance to Nassau Sound (NOAA Fisheries 2011). Additional delineations appear in portions of the St. Johns and Nassau rivers (NOAA Fisheries 2011). EFH is not broken down by life stage (NOAA Fisheries 2011). No HAPC is currently identified in the EFH Mapper (NOAA Fisheries 2011).

Of the Coastal Migratory Pelagics group, only the Spanish mackerel was collected during spring and fall 2010 trawl sampling (ANAMAR 2011). One post-larva [53-mm standard length (SL)] specimen was taken during fall south of Alternative Site 2 (ANAMAR 2011) and must have hatched in spring or summer of 2010 based on size classes and spawning times in Powell (1975). No members of this FMP were collected during October 1985 trawl sampling in and around the Fernandina Beach ODMDS (Continental Shelf Associates 1986) or during March and December 1979 trawl sampling in and around the current Jacksonville ODMDS (USEPA 1983).

3.3.7.6. Atlantic Highly Migratory Species Managed by NMFS

Species and species groups managed by the Atlantic Highly Migratory Species division of NMFS with identified EFHs within the vicinity of the three alternative sites are briefly discussed below.

Large Coastal Sharks — The Large Coastal Sharks FMP addresses the nurse shark (*Ginglymostoma cirratum*), seven requiem shark species, and three hammerhead species. Large coastal requiem sharks consist of the blacktip shark (*Carcharinus limbatus*), bull shark (*C. leucas*), lemon shark (*Negaprion brevirostris*), sandbar shark (*C. plumbius*), silky shark (*C. falciformis*), spinner shark (*C. brevipinna*), and tiger shark (*Galeocerdo cuvier*) (NMFS 2009a). Many of these sharks have important nursery areas or other EFH within the state. Large coastal hammerheads of this FMP consist of the great hammerhead (*Sphyrna mokarran*), scalloped hammerhead (*S. lewini*), and smooth hammerhead (*S. zygaena*).

NOAA (2009) and NOAA Fisheries (2011) address EFHs and HAPC for this group on a per-species basis. Table 5 in the EFH Assessment (Appendix D) outlines EFHs and HAPC identified in the NOAA EFH Mapper. EFH is broken down by species below.

<u>Nurse Shark</u>—Nurse Shark nursery areas are identified in McCandless et al. (2002) as certain large estuaries along Florida's Gulf coast and the Dry Tortugas. McCandless et al. (2002) also identified a possible secondary nursery area for juveniles (age 1+) just north of Cape Canaveral, Florida based on capture locations. Castro (2000) found juveniles associated with shallow coral reef and grass flat habitats along Florida's east coast and in the Bahamas. Adults generally rest in structured habitat, but occur over a wide variety of habitats when active (Castro 2000, Dodrill 1977). Microhabitats of juveniles reported by Castro (2000) included holes in reefs and under rocks and ledges. Dodrill (1977) reported a neonate measuring 29.0 cm total length (TL)

captured close to shore at Hutchison Island (St. Lucie County) Florida in January. Juvenile nurse sharks were landed year-round off Brevard County, Florida, while adults and sub-adults were caught only during warmer months (Dodrill 1977). NOAA (2009) identified juvenile and adult EFH to include the project area and surrounding waters. The NOAA EFH Mapper identifies juvenile and adult nurse shark EFH to include the project area and extends north and south along the coastline, from nearshore to the edge of the continental shelf (NOAA Fisheries 2011). Neonate nurse shark EFH is not currently identified on the EFH Mapper (NOAA Fisheries 2011). No HAPC is currently identified (NOAA Fisheries 2011).

Bull Shark — Gulf of Mexico estuaries provide nursery areas for this species (Castro et al. 1999), as do coastal lagoons along Florida's Atlantic coast (Snelson et al. 1984). Estuarine habitats used by young bull sharks often have very low salinity (Castro et al. 1999). Curtis (2008) stated that the northern portion of Indian River Lagoon, Florida, appears to be a nursery area.

NOAA (2009) identified neonate and young-of-year bull shark EFH to be clustered around Cape Canaveral, Florida and does not include the Jacksonville area. Juvenile and adult EFH is identified by NOAA (2009) to include the project area and surrounding waters. The NOAA EFH Mapper identifies juvenile and adult bull shark EFH as including the area around and within the project area and extending north and south from nearshore to near the edge of the continental shelf (NOAA Fisheries 2011). The nearest neonate EFH is far south of the project area, associated with the Indian River Lagoon (NOAA Fisheries 2011). No HAPC is currently identified in the EFH Mapper (NOAA Fisheries 2011).

Lemon Shark — Lemon shark nursery areas are in shallow mangrove habitats (Castro et al. 1999). McCandless et al. (2002) identified nursery areas within the Gulf of Mexico, off Georgia (St. Andrews Sound), and along South Carolina (North Edisto Estuary), but did not identify any along Florida's east coast.

NOAA (2009) identifies neonate and young-of-year EFH to be absent from Florida's east coast, except along the Florida Keys. Juvenile and adult EFH are identified by NOAA (2009) to include the project area and surrounding waters. The NOAA EFH Mapper identifies lemon shark juvenile and adult EFH to include the project area along with nearshore to offshore waters (NOAA Fisheries 2011). The nearest neonate EFH is far south of the project area in nearshore and inshore waters of the Florida Keys and Florida Bay (NOAA Fisheries 2011). No HAPC is currently identified in the EFH Mapper (NOAA Fisheries 2011).

Sandbar Shark — Neonate sandbar sharks use shallow coastal waters from Long Island, New York, to Cape Canaveral, Florida, as nurseries (Castro et al. 1999). Springer (1960) suggested the principal nursery areas of the western Atlantic include relatively shallow water from Long Island to Cape Canaveral. Springer further suggested that secondary nursery areas include the northwestern Gulf of Mexico near the mouth of the Mississippi River. McCandless et al. (2002) identified nursery areas in the western Atlantic, none of which were found off Florida's east coast.

The nearest neonate and young-of-year sandbar shark EFH identified by NOAA (2009) is located in southern Georgia nearshore areas including an area approaching or within the alternative sites. Juvenile and adult EFH is identified by NOAA (2009) to include the project area and surrounding waters and extending north and south along the coast. Sandbar shark EFH for all combined life stages includes the project area and extending north and south from nearshore to the outer continental shelf according to the NOAA EFH Mapper (NOAA Fisheries

2011). Neonate sandbar shark EFH is identified in the vicinity of the project area and continues north in nearshore waters (NOAA Fisheries 2011). The nearest HAPC is located off North Carolina and Virginia (NOAA Fisheries 2011).

Spinner Shark — Nursery areas for the spinner shark are located in shallow coastal waters (Castro et al. 1999). McCandless et al. (2002) included Cape Canaveral and nearby areas as neonate, young-of-year, and juvenile nursery habitat. NOAA (2009) identifies neonate, young-of-year, juvenile, and adult EFH to include the project area and surrounding waters for a distance north and south along the coast. Spinner shark EFH is identified for all combined life stages to include the project area and extending north and south from nearshore to outer continental shelf waters (NOAA Fisheries 2011). The NOAA EFH Mapper does not currently identify HAPC for the spinner shark (NOAA Fisheries 2011).

Tiger Shark — The nearest tiger shark nursery area identified by McCandless et al. (2002) is off South Carolina. NOAA (2009) identified neonate, young-of-year, and juvenile EFH to include the project area and surrounding waters. Adult EFH appears to approach, but does not include, the project area based on NOAA (2009). Tiger shark EFH for all life stages is identified in the NOAA EFH Mapper to include the project area and extends beyond the continental slope (NOAA Fisheries 2011). No HAPC is currently identified in the EFH Mapper (NOAA Fisheries 2011).

Great Hammerhead — McCandless et al. (2002) identified nursery areas to occur within the Gulf of Mexico but not off Florida's east coast. Great hammerhead EFH is identified for all combined life stages to include the project area and extending farther north and south along the coast, from nearshore waters to the outer continental shelf (NOAA 2009, NOAA Fisheries 2011). No HAPC is currently identified in the EFH Mapper (NOAA Fisheries 2011).

Scalloped Hammerhead — The scalloped hammerhead uses shallow coastal waters as nurseries (Castro et al. 1999). McCandless et al. (2002) included the northeast Florida coast south to Cape Canaveral as neonate, young-of-year, and juvenile nursery areas. NOAA (2009) identified neonate and young-of-year EFH to include coastal nearshore waters from southern North Carolina to the Atlantic coast of central Florida, including the project area. NOAA (2009) also identified juvenile and adult EFH to include the project area and extending north and south along the coast and out to the continental slope. The NOAA EFH Mapper identified scalloped hammerhead EFH for all combined life stage to include the project area and extending north and south along the coastline (NOAA Fisheries 2011). No HAPC is currently identified in the EFH Mapper (NOAA Fisheries 2011).

Small Coastal Sharks — Small coastal requiem sharks included here are the Atlantic sharpnose shark (*Rhizoprionodon terraenovae*), blacknose shark (*Carcharhinus acronotus*), and finetooth shark (*Carcharhinus isodon*) (NMFS 2009a). The bonnethead (*Sphyrna tiburo*) is the only species of hammerhead included in this FMP.

Atlantic Sharpnose Shark — In a scoping response letter to EPA and USACE, NMFS has expressed concern that the Atlantic sharpnose shark may be impacted by the proposed action (Appendix A). McCandless et al. (2002) identified neonate, young-of-year, and juvenile nursery areas to include the northeastern Florida coast south to Cape Canaveral. NOAA (2009) and NOAA Fisheries (2011) identify Atlantic sharpnose shark neonate, young-of-year, juvenile, and adult EFH to include the alternative sites and areas and extending both north and south along the coast. EFHs extend along the continental shelf on both sides of Florida and adjacent states

(NOAA 2009, NOAA Fisheries 2011). No HAPC is currently identified in the EFH Mapper (NOAA Fisheries 2011).

Blacknose Shark — Nursery areas for the blacknose shark include the shallow coastal waters of South Carolina (Castro 1983). No neonates or young-of-year were observed during an extensive survey of a Brevard County (Florida) beach despite the capture of 45 specimens (Dodrill 1977), suggesting that the area does not represent a nursery ground. McCandless et al. (2002) identified nursery areas for this species, but none were identified on Florida's east coast. Blacknose shark juvenile and adult EFHs are identified by NOAA (2009) and NOAA Fisheries (2011) to include the project area and extending along both Florida coastlines from nearshore to approaching the edge of continental shelf. The nearest neonate EFH is several miles north of the project area, along the coastline (NOAA 2009, NOAA Fisheries 2011). No HAPC is currently identified by NOAA (NOAA 2009, NOAA Fisheries 2011).

Finetooth Shark — Nursery areas are in shallow coastal waters (Castro et al. 1999), and the population off Florida's east coast may migrate to the Carolinas to give birth in May and early June (Castro 1993). Nursery areas identified by McCandless et al. (2002) did not include Florida's east coast. Finetooth shark neonate and young-of-year EFH identified by NOAA (2009) and by the NOAA EFH Mapper (NOAA Fisheries 2011) approaches or includes the project area and extends north along the coastline to Georgia and beyond. The NOAA neonatal and young-of-year EFH geographic range information conflicts with the data presented by Castro (1993). Juvenile and adult EFH includes the project area along with much of Florida's east coast nearshore waters (NOAA Fisheries 2011). No HAPC is currently identified in the EFH Mapper (NOAA Fisheries 2011).

Bonnethead — In a scoping response letter to EPA and USACE, NMFS has expressed concern that the bonnethead may be affected by the proposed action (Appendix A). McCandless et al. (2002) identified neonate, young-of-year, and juvenile nursery areas to include the northeastern coast of Florida south to Cape Canaveral. Neonate, juvenile, and adult EFH identified by the NOAA EFH Mapper (NOAA Fisheries 2011) and NOAA (2009) includes the project area and extends along the shallow coastal and inshore waters of the Atlantic and Gulf coasts of Florida. No HAPC is currently identified in the EFH Mapper (NOAA Fisheries 2011).

Prohibited Sharks — Prohibited sharks are those species that cannot be possessed or retained. Two sand tigers are included, the bigeye sand tiger (*Odontaspis noronhai*) and the sand tiger (*Carcharias taurus*) (NMFS 2009a). The white shark (*Carcharodon carcharias*) and the longfin mako (*Isurus paucus*) are the only mackerel sharks included in the Prohibited Sharks group (NMFS 2009a). Prohibited requiem sharks consist of the bignose shark (*Carcharhinus altimus*), Caribbean reef shark (*C. perezi*), Caribbean sharpnose shark (*Rhizoprionodon porosus*), dusky shark (*C. obscurus*), Galapagos shark (*C. galapagensis*), narrowtooth shark (*C. brachyurus*), night shark (*C. signatus*), and the smalltail shark (*C. porosus*) (NMFS 2009a). Only species likely to occur within the project area are discussed below.

Sand Tiger — The nursery areas for the sand tiger are not known but birthing may occur over a wide area (Castro et al. 1999). Dodrill (1977) reported two gravid females caught off southern Brevard County, Florida in June and July, 1976. McCandless et al. (2002) identified nursery areas along the northeastern U.S. coast and found none in Florida waters. Sand tiger adult EFH includes the vicinity of the project area in shallow water off Jacksonville (NOAA 2009, NOAA Fisheries 2011). Juvenile EFH occurs just south of the project area (NOAA 2009, NOAA Fisheries 2011). Neonate EFH consists of discrete polygons located to the north and south of

the project area, but does not include the project area (NOAA 2009, NOAA Fisheries 2011). No HAPC is currently identified (NOAA 2009, NOAA Fisheries 2011).

White Shark — Occurrences of the white shark along Florida's continental shelf waters are mainly during the cold months when the surface water temperature drops below 22°C (Adams et al. 1994), and the species is considered rare south of Cape Hatteras, North Carolina (Castro 1983, Casey and Pratt 1985, Adams et al. 1994).

White shark nursery areas were not identified in an overview of the shark nursery areas of the U.S. east coast in McCandless et al. (2002). Castro et al. (1999) stated nursery habitat and location remain unknown, but that nurseries will likely be found in the warmer parts of the range in deep water. NOAA (2009) identified EFH for all combined life stages to include the project area, from nearshore to beyond the continental slope. The NOAA EFH Mapper identifies EFH of all combined life stages to include the project area and surrounding areas (NOAA Fisheries 2011). White shark HAPC is not identified in the EFH Mapper (NOAA Fisheries 2011).

Dusky Shark — Nursery areas for the dusky shark are in coastal waters, including Bulls Bay, North Carolina (Castro et al. 1999). Nursery areas identified by McCandless et al. (2002) did not include Florida waters. Neonate, young-of-year, juvenile, and adult EFHs appear to include the project area and the general vicinity (NOAA 2009, NOAA Fisheries 2011). No HAPC are currently identified (NOAA 2009, NOAA Fisheries 2011).

Billfishes — Five species of billfish are included here: the blue marlin (*Makaira nigricans*), longbill spearfish (*Tetrapturus pfluegeri*), roundscale spearfish (*Tetrapturus georgii*), sailfish (*Istiophorus albicans*), and the white marlin (*Tetrapturus* [*Kajikia*] *albidus*) (NMFS 2009). Only the sailfish is expected to occasionally occur within the project area and is discussed below.

Sailfish — Freeman and Walford (1976) identified sailfish as occurring within the vicinity of the project area during their study of species of fisheries interest along the Florida east coast. Juvenile EFH appears to include the project area (NOAA 2009, NOAA Fisheries 2011). Adult EFH is identified just south of the project area, along the coastline (NOAA 2009, NOAA Fisheries 2011). Spawning EFH is located many miles south of the project area (NOAA 2009, NOAA Fisheries 2011). No HAPC is currently identified (NOAA 2009, NOAA Fisheries 2011).

3.3.7.7. Species Managed by MAFMC

Species groups managed by MAFMC with identified EFH within the project area or species that were captured within the project area during spring and fall 2010 trawl surveys include the Atlantic Mackerel, Squid, and Butterfish Fishery; Bluefish Fishery; and the Summer Flounder, Scup, and Black Sea Bass Fishery. These species groups are briefly discussed below.

Atlantic Mackerel, Squid, and Butterfish — This FMP manages stocks of two species of squid (longfin inshore squid [*Loligo pealeii*] and the northern shortfin squid [*Illex illecebrosus*]), each representing a different family, the butterfish (*Peprilus triacanthus*), and the Atlantic mackerel (*Scomber scombrus*) (NMFS 2008c). The NOAA EFH Mapper does not currently identify EFH for any of these species (NOAA Fisheries 2011). The range of the Atlantic mackerel does not extend into Florida and is not discussed further.

Although a total of 501 squid identified to the genus *Loligo* were caught in spring and fall 2010 trawl catches (ANAMAR 2011), it is unknown if the longfin inshore squid was among those captured. Numbers caught per alternative site ranged from a low of 34 individuals at Alternative

Site 2 to a maximum of 137 individuals at Alternative Site 3 (ANAMAR 2011). *Loligo* sp. density per 1,000 m^2 ranged from a low of 0.74 at Alternative Site 2 to a high of 4.33 at Alternative Site 3 (ANAMAR 2011). No longfin inshore squid or northern shortfin squid were collected during October 1985 trawl sampling in and around the Fernandina Beach ODMDS (Continental Shelf Associates 1986) or during March and December 1979 trawl sampling in and around the Jacksonville ODMDS (USEPA 1983).

Butterfish were collected only during spring 2010 trawl sampling (ANAMAR 2011) and most captured butterfish had not yet reached maturity based on length-to-maturity ratios given in Cross et al. (1999). Alternative Site 1 had the highest number captured (n = 37) of any site, and Alternative Site 3 had the least number captured (n = 10) (ANAMAR 2011). Densities per 1,000 m^2 ranged from 0.32 at Alternative Site 3 to Alternative 0.66 at Site 1 (ANAMAR 2011). No butterfish were collected during October 1985 trawl sampling in and around the Fernandina Beach ODMDS (Continental Shelf Associates 1986) or during March and December 1979 trawl sampling in and around the Jacksonville ODMDS (USEPA 1983).

Bluefish — In a scoping response letter to EPA and USACE, NMFS has expressed concern that the bluefish (*Pomatomus saltatrix*) may be affected by the proposed action (Appendix A). Adult, juvenile, and egg EFHs in Florida include all pelagic waters along the east Florida coast through Key West along with all estuaries north of and including the St. Johns River (MAFMC 2006). Larval EFH is similar to that of older life stages except that it is limited to water 15 meters deep or greater (MAFMC 2006). No bluefish EFH or HAPC were identified on the EFH Mapper (NOAA Fisheries 2011). However, based on the written description of bluefish EFH in MAFMC (2006), the project area and surrounding waters are within adult, juvenile, and egg EFH. Additionally, most of the project area is also within larval bluefish EFH (MAFMC 2006).

No bluefish were collected during spring and fall 2010 trawl sampling (ANAMAR 2011), during October 1985 trawl sampling in and around the Fernandina Beach ODMDS (Continental Shelf Associates 1986), or during March and December 1979 trawl sampling in and around the Jacksonville ODMDS (USEPA 1983). However, the species is known to be common along Florida's east coast and is likely to inhabit the project area, at least occasionally.

Summer Flounder, Scup, and Black Sea Bass Fishery — Summer flounder (*Paralichthys dentatus)* is briefly discussed below. Scup and black sea bass have been previously addressed under the Snapper-Grouper Complex in Section 3.3.7.5 (Species Managed by SAFMC).

In a scoping response letter to EPA and USACE, NMFS has expressed concern that local populations of the summer flounder may be adversely affected by the proposed action (Appendix A). The species prefers soft substrates such as sand or silt (Packer et al. 1999). Post-larval and juvenile summer flounder utilize salt marshes and tidal flats in high-salinity estuaries as nursery areas (Packer et al. 1999). EFH is not currently identified (NOAA 2009, NOAA Fisheries 2011).

No summer flounders were collected during spring and fall 2010 trawl sampling, although eight other members of the sand flounder family were represented in the samples, including the closely related Gulf and southern flounders (*Paralichthys albigutta* and *P. lethstigma*) (ANAMAR 2011). No summer flounders were collected during October 1985 trawl sampling in and around the Fernandina Beach ODMDS (Continental Shelf Associates 1986) or during March and December 1979 trawl sampling in and around the Jacksonville ODMDS (USEPA 1983). Although Packer et al. (1999) did not appear to clearly define EFH over non-essential habitat,

the location of the project area is well outside of the center of primary abundance (Packer et al. 1999), and thus is likely outside of summer flounder EFH.

3.3.7.8. State Managed Species in Federal Waters

The MSA allows states to extend their fishery regulations into federal waters if a particular fishery is not already federally managed (eRegulations 2011, L. Gregg *pers. comm*.). However, state-listed taxa lack EFH except those which are also managed by a FMC or by NMFS. Currently, FWC applies its state regulations in federal waters for some, but not all, of its fisheries (eRegulations 2011, FWC 2011, L. Gregg *pers. comm*.). This section presents and discusses state managed fisheries which are either currently extended into adjacent federal waters or are planned for extension by the end of 2011. For some fisheries, such as the Florida stone crab (*Menippe mercenaria*), management in federal waters will change hands by the end of 2011 from the Gulf of Mexico Fishery Management Council to the State of Florida, who will then assume full management responsibility.

A total of 14 (40%) of the approximately 35 invertebrate groups managed by Florida in federal waters were captured by trawl from one or more alternative sites during the 2010 site designation surveys. Most of these taxa are managed as Marine Life Species under Chapter 68B-42.001 F.A.C. (species harvested live for the aquarium trade), except for the Atlantic calico scallop (*Argopecten gibbus*) and the Florida stone crab, which are managed as commercial fisheries under Chapter 68B-53 F.A.C. Small numbers of Atlantic calico scallops (up to $n = 2$ per site) were collected during the 2010 surveys.

Table 3.3-13 presents densities of state-managed invertebrate taxa collected within the three alternative sites. Alternative Site 3 had nearly double the total density of state-managed invertebrates captured by trawl (105 individuals per 1,000 m^2) compared to Alternative Sites 1 and 2. Alternative Site 1 had the lowest total density of state-managed invertebrates (44 individuals per 1,000 m^2). The lined sea star (*Luidia clathrata*) had the highest density of any invertebrate taxa (up to 84 individuals per 1,000 m^2 per site). Overall, the relative densities of invertebrates between the three alternative sites indicate that Alternative Sites 1 and 2 appear to have more taxa associated with hardbottom (e.g., sponges, hydroids, soft corals) while Alternative Site 3 appears to have several species of sea stars. In addition, the sea pen (*Virgularia presbytes*), longtail grass shrimp (*Periclimenes* cf. *longicaudatus*), banded sea star (*Luidia alternata*), and the sea cucumber *(Phyllophorus* [*Urodemella*] *arenicola)* were found in samples outside and adjacent to the three alternative sites.

Table 3.3-13. Invertebrate Taxa Managed by the State of Florida Extending into Federal Waters and Captured by Trawl during the Spring and Fall 2010 Surveys[1]

Scientific Name	Common Name or Vernacular	Taxa Densities[2] (individuals/1,000 m^2)		
		Alternative Site 1	Alternative Site 2	Alternative Site 3
Demospongiae	demosponges	≥0.20	≥0.20	None Caught
Hydrozoa: hydroidolina	hydroids	>0.39	0.46	None Caught
Carijoa sp.	snowflake coral genus	0.02	0.02	None Caught
Leptogorgia sp.	sea whips	0.02	0.02	0.03
Renilla sp. (including *R. reniformis*)	sea pansies	0.41	0.41	0.13
Actiniaria	sea anemones	>3.91	4.81	10.96
Argopecten gibbus	Atlantic calico scallop	1.08	2.83	3.47
Armina wattle	nudibranch	0.02	None Caught	None Caught
Aeolidia papillosa	shag-rug aeolis	0.02	None Caught	None Caught
Lysmata sp.	cleaner shrimp genus	0.02	0.02	None Caught
Paguristes sp.	hermit crab genus	None Caught	0.02	None Caught
Metoporhaphis calcarata	false arrow crab	0.04	0.02	None Caught
Menippe mercenaria	Florida stone crab	0.07	0.09	None Caught
Asterias forbesi	common sea star	0.95	1.17	1.67
Astropecten spp. (incl. *A. articulatus* and *A. duplicatus*)	sea stars	0.68	0.70	1.58
Luidia clathrata	lined sea star	33.19	40.36	84.32
Ophiuroidea (incl. *Ophiolepis* sp. and *Ophiotrix* sp.)	brittle stars	1.60	1.50	2.40
Arbacia punctulata	purple-spined sea urchin	1.31	2.46	0.44
Lytechinus variegates	green sea urchin	0.05	0.22	0.28
Moira atropos	sea urchin	0.02	0.02	0.03
Thyonella pervicax	sea cucumber	None Caught	0.02	None Caught
Sclerodactyla briareus	hairy sea cucumber	0.05	0.04	None Caught
Holothuria spp. (incl. *H. [Halodeima] floridana and H. [Theelothuria] princeps*)	sea cucumbers	0.02	0.04	None Caught
Total Density		**>44.07**	**>55.43**	**105.31**

[1] Regulations extend into federal waters adjacent to state waters pursuant to the MSA (L. Gregg *pers. comm.*). Only invertebrate taxa managed under either Florida recreational, commercial, or marine life (aquarium) taxa regulations (Chapter 68B-42.001 F.A.C.) and extending into federal waters are included.

[2] Data from spring and fall surveys are combined. Densities from trawl samples from adjacent areas are not included.

Source: ANAMAR (2011)

Table 3.3-14 presents densities of state-managed fish species collected within the three alternative sites. A total of nine (20%) of the approximately 46 fish species or species-groups managed by Florida in federal waters were captured within one or more of the alternative sites. All nine species are managed as part of the Marine Life Species under Chapter 68B-42.001 F.A.C. Densities of state-managed fish species within the three alternative sites ranged from a high of 0.22 individuals per 1,000 m^2 to zero. Alternative Site 2 had the highest total density of state-managed fishes (0.79 individuals per 1,000 m^2). Alternative Site 3 had the lowest total density of state-managed fishes (0.18 individuals per 1,000 m^2). Overall, densities of state-managed fish species within the three alternative sites are considered low, with less than one individual collected per 1,000 m^2 sampled by trawl in any site. In addition, the polka-dot batfish (*Ogcocephalus cubifrons*) and the dwarf sand perch (*Diplectrum bivittatum*) were found in samples outside and adjacent to the three alternative sites.

Table 3.3-14. Fish Species Managed by the State of Florida Extending into Federal Waters and Captured by Trawl during the Spring and Fall 2010 Surveys[1]

Scientific Name	Common Name	Species Densities[2] (individuals/1,000 m^2)		
		Alternative Site 1	Alternative Site 2	Alternative Site 3
Opsanus tau	oyster toadfish	0.02	0.02	None caught
Ogcocephalus corniger	longnose batfish	0.05	0.07	None caught
Hippocampus erectus	lined seahorse	0.20	0.22	0.03
Syngnathus louisianae	chain pipefish	0.07	0.09	0.06
Diplectrum formosum	sand perch	0.14	0.13	None caught
Serraniculus pumilio	pygmy sea bass	0.11	0.20	0.09
Serranus subligarius	belted sandfish	0.02	0.02	None caught
Gobiosoma ginsburgi	seaboard goby	0.04	0.02	None caught
Chilomycterus schoepfii	striped burrfish	0.02	0.02	None caught
Total Density		**0.67**	**0.79**	**0.18**

[1] Regulations extend into federal waters adjacent to state waters pursuant to the MSA (L. Gregg *pers. comm.*). Only fish taxa managed under either recreational, commercial, or marine life (aquarium) taxa regulations (Chapter 68B-42.001 F.A.C.) and extending into federal waters are included.

[2] Data from spring and fall surveys are combined. Densities from trawl samples from adjacent areas are not included.

Source: ANAMAR (2011)

3.4. Socioeconomic Environment

The availability of suitable ocean disposal sites to support ongoing maintenance and capital improvement projects is essential for the continued use and economic growth of the vital commercial and recreational activities in the region. The Florida shelf in the vicinity of the three alternative sites offers considerable economic resources including commercial and recreational fisheries, tourism, recreation, and mining of sand resources.

3.4.1. Commercial Fishing

A wide variety of fish species that dwell in softbottom, hardbottom, and coastal pelagic (i.e., at or near the sea surface in the water column) habitats are caught and landed off the coast of northeast Florida. Important commercial fisheries species from these groups include northern brown shrimp, northern white shrimp (softbottom), snappers, and king mackerel (coastal pelagic).

Shrimp is the main commercial fishery that may be present in the vicinity of the three alternative sites. The commercial shrimp fishery in the lower St. Johns River basin is based upon three penaeid shrimp species: northern white shrimp, northern brown shrimp, and northern pink shrimp which are trawled in coastal waters with depths between 20 feet and 80 feet (USDOI MMS 1984). Year-to-year variations in rainfall control the extent of upstream migration of these species. The shrimping year can be divided into three seasons: (1) the off season (January through May); (2) brown shrimp season (June through August); (3) white shrimp season (late August to January). Large white shrimp migrate to commercial fishing areas from August through December, while brown and pink shrimp remain in estuaries during winter (SAFMC 1998). The bulk of the shrimp harvest takes place in the Atlantic Ocean during the 9-month period from June through February. Bait shrimp used as live bait are caught along the river (DoN 1997). Rock shrimp are harvested offshore in deep water. Spawning and migrating adult shrimp may be present in the vicinity in and around the alternative sites. Nearshore shrimp trawling grounds are located between the alternative sites and the coastline (Figures 2.2-1, 2.2-2, and 2.2-3), and particularly within and adjacent to Alternative Site 3.

A review of northeast Florida fishery landings data provide a means for identifying species that may cause economic harm to northeast Florida coastal communities if disturbed by dredged material disposal (or other anthropogenic actions). NMFS and FWC collect landings data from monthly reports submitted by commercial harvesters and dealers. Landings represent the part of the fish catch that is brought ashore. Landings record catch in weight and by land location and do not include information on water depth or distance from shore. The 2009 commercial landings data provided in Table 3.4-1 focus on the dominant species from landings in Nassau, Duval, and St. Johns counties. Of the 10 most dominant species, food shrimp (including brown shrimp and pink shrimp) comprised 73.6% of the total, followed by blue crab at 9.0% (Table 3.4-2). The top finfish landed was snapper (representing several species within the family Lutjanidae) with 5.2% for Duval, Nassau, and St. Johns counties combined.

In 2009, Mayport accounted for 6.4 million pounds of landings, valued at approximately $9.1 million (Table 3.4-3). The commercial fishing landings for Mayport from 1993 to 2009 totaled over 76 million pounds with a monetary value of $139.7 million. On average, from 1993 to 2009, the commercial fisheries industry for Mayport landed 5 million pounds, or approximately $9.3 million, annually. Although an additional 0.3 million pounds of fish were landed in 2009 than in 2008, the monetary value of the landings was $4.1 million less in 2009. Mayport ranks 59th for 2009 landings by pound compared to other ports around the country.

Table 3.4-1. 2009 Mean Commercial Annual Landings for Duval, Nassau, and St. Johns Counties in Florida

Species	Pounds of Landings (2009)			
	Duval County	Nassau County	St. Johns County	Total
Amberjacks	66386	31	48656	115073
Cobia	6144	0	3401	9545
Dolphinfishes	29877	43	106704	136624
Flounders	18896	1761	23056	43713
Groupers[1]	41140	57	23215	64412
Kingfish (Whiting)	147758	22701	25999	196458
Mackerel, King	15027	0	2519	17546
Mullet, Black	66464	172	63005	129641
Porgies	14216	0	10674	24890
Seatrout[2]	7857	86	303	8246
Shark	131826	135082	4074	270982
Sheepshead	12818	775	5263	18856
Snapper[3]	279164	601	144696	424461
Swordfish	3749	0	90643	94392
Triggerfish	23307	11	16508	39826
Tuna[4]	150	0	36466	36616
Crab, Blue (Hard)	443584	56711	234966	735261
Crab, Blue (Soft)	692	0	11957	12649
Lobster, Spiny	2129	0	3801	5930
Oyster	0	0	40277	40277
Squid	8199	292	434	8925
Shrimp (total shrimp food)[5]	4993914	825717	213155	6032786

1 Includes black grouper, gag grouper, Nassau grouper, red grouper, scamp grouper, snowy grouper, Warsaw grouper, yellowedge grouper, yellowfin grouper, mixed grouper , and other grouper.

2 Includes sand seatrout, silver seatrout, spotted seatrout, and weakfish seatrout.

3 Includes gray snapper (mangrove), lane snapper, mutton snapper, red snapper, silk snapper, vermilion snapper, yellowtail snapper, mixed snapper, and other snapper.

4 Includes albacore tuna, bigeye tuna, blackfin tuna, bluefin tuna, skipjack tuna, yellowfin tuna,, and mixed tuna.

5 Includes brown shrimp, pink shrimp, rock shrimp, royal red shrimp, white shrimp, and other shrimp.

Source: FWRI (2010)

Table 3.4-2. Top Species in Commercial Landings Ranked by Average Pounds Landed in 2009 in Duval, Nassau, and St. Johns Counties Combined

Species	Average (in pounds)	Percent 2009
Shrimp (total shrimp food)	6,032,786	73.6
Blue Crab (hard)	735,261	9.0
Snapper	424,461	5.2
Shark	270,982	3.3
Kingfish (Whiting)	196,458	2.4
Dolphin	136,624	1.7
Mullet, Black	129,641	1.6
Amberjacks	115,073	1.4
Swordfish	94,392	1.2
Groupers	64,412	0.8
Total	**8,200,090**	**100%**

Source: FWRI (2010)

Table 3.4-3. Monetary Value of Commercial Landings in Mayport, Florida, from 1993 to 2009

Year	Weight of Fish Landed (millions of pounds)	Monetary Value ($ millions)
1994	6.4	$13.5
1995	4.3	$8.0
1997	3.9	$6.1
1998	3.5	$7.3
1999	3.9	$7.7
2000	4.5	$9.9
2001	4.0	$8.3
2002	4.5	$8.4
2003	4.0	$7.4
2004	7.2	$7.9
2005	4.7	$8.1
2006	6.4	$12.8
2007	6.3	$12.0
2008	6.1	$13.2
2009	6.4	$9.1
Total	76.1	$139.7

Source: NMFS (2009d)

The life history characteristics of select economically valuable northeast Florida fish and invertebrate species are summarized in the following tables. Habitats utilized by different life stages for these species are summarized in Table 3.4-4, and their spawning seasons are listed in Table 3.4-5.

Table 3.4-4. Summary of Habitats Used by Different Life Stages of Economically and Ecologically Important Fish and Epibenthic Invertebrate Species of the Study Area

Common Name	Spawning Habitat	Juvenile Habitat	Adult Habitat
Sharks	E,C,P	E,C,P	E,C,P
Kingfish	E,C	E,C	E,C
King Mackerel	C	C,P	C,P
Flounders	C	C,E,S	C,E,S
Vermilion Snapper	C	C,R	C,R
Amberjack	C	C,R,P	C,R,P
Gag Grouper	C	E	C,R
Red Snapper	C	C,R,S	C,R
Sheepshead	C	C,E	C,E
Dolphin	E,C	C,P	C,P
Rock Shrimp	C	C	C
Blue Crab	C	E	C,E
White Shrimp	C	E	C,E
Brown Shrimp	C	E	C,E
Pink Shrimp	C	E	C,E

C = Coastal/Offshore, E = Estuary/Seagrass, R = Rock/Reef Substrate, S = Sand/Mud Substrate, P = Pelagic

Source: Adapted from Zarillo et al. (2009)

Table 3.4-5. Spawning Seasons of Economically and Ecologically Important Fish and Invertebrate Species within the Study Area

Common Name	J	F	M	A	M	J	J	A	S	O	N	D
Sharks			X	X	X	X	X	X	X	X		
Kingfish				X	X	X	X	X	X	X		
King Mackerel					X	X	X	X	X	X		
Flounders	X	X									X	X
Vermilion Snapper				X	X	X	X	X	X			
Amberjack			X	X	X	X	X					
Gag Grouper		X	X									
Red Snapper						X	X	X	X			
Sheepshead	X	X									X	X
Dolphin	X	X	X	X	X	X	X				X	X
Rock Shrimp	X										x	X
Blue Crab						X	X	X	X			
White Shrimp				X	X	X	X	X	X	X		
Brown Shrimp			X	X								

X = Peak Spawning Period

Source: Adapted from Zarillo et al. (2009)

3.4.2. Commercial Shipping

Shipping is a major component of commerce in Jacksonville Harbor. JAXPORT is an international trade seaport in northeast Florida and is the largest deepwater port on the east coast of Florida, consisting of 27 principal piers and wharves. JAXPORT's primary marine terminals are located inland from the Atlantic Ocean along the St. Johns River and include Blount Island at River Mile 9, Dames Point Bulk Terminal and MOL/TraPac Terminal between River Mile 10 and 13, and the Talleyrand Marine Terminal at River Mile 20 (Figure 1.3-3). The interim JaxPort Cruise Terminal is located near Dames Point. There are also several private oil terminals and the U.S. Navy Fuel Depot between River Mile 14 and River Mile 20.

JAXPORT's marine facilities provide significant economic benefits to northeast Florida through direct employment, sales and tax revenue, and local firms that engage in international trade and travel. Cargo and cruise business at Jacksonville's seaport supports 65,000 jobs across the region and generates a total of $19 billion in annual economic impact (www.jaxport.com, accessed April 19, 2011).

JAXPORT handles both cargo ships and passenger cruise ships. In fiscal year (FY) 2010, more than 8.0 million tons of cargo comprised of automobiles, goods shipped in containers, and bulk goods passed through the port, with the majority of automobiles and bulk goods inbound and the majority of containerized goods outbound (Table 3.4-6). There has been a growing import trade from Asia calling on the MOL/TraPac Terminal which became operational in 2009, and JAXPORT has positioned itself to be a key containerized cargo importer via larger vessels (Panamax and Post-Panamax). Inbound and outbound tonnage statistics from FY 2010 indicate that inbound cargo is a significant portion of the total trade volume (Table 3.4-7). Other principle imports include petroleum products, coffee, iron and steel products, cement, limestone, chemicals, pulpwood, lumber, alcoholic beverages, and general cargo. The principle exports include paper products, citrus products, naval stores, phosphate rock, fertilizers, feed, clay, chemicals, tallow, scrap metal, and general cargo. In addition to cargo trade, a burgeoning cruise ship industry has seen the number of cruise vessel calls increase from zero in FY 2003 to 74 in FY 2010, with 173,568 passengers served (JAXPORT 2011).

Continued use of the port facilities depends on routine dredging of federal and non-federal navigation channels and berthing areas. The current channel depth of 40 feet is being fully utilized with some vessels using the tide and/or light loading due to the channel depth constraint (USACE 2005). Moreover the trend toward larger vessels means that in the future the channel depth at Jacksonville Harbor will continue to be fully utilized and will require continued maintenance dredging and adequate disposal capacity (USACE 2005).

Table 3.4-6. JAXPORT's Cargo Statistics from 2006-2010

Port Statistics	FY 2006	FY 2007	FY 2008	FY 2009	FY 2010
Vessel Calls	1,799	1,800	1,827	1,765	1,947
Tonnage					
Containerized	4,075,907	3,638,715	3,600,716	3,894,595	4,419,331
Breakbulk	1,212,917	1,161,775	952,553	774,765	990,353
Bulk	2,203,249	2,252,900	2,475,868	1,697,080	1,515,161
Automobiles	1,204,470	1,255,811	1,366,373	915,523	1,119,080
Total	8,696,543	8,309,201	8,395,510	7,281,963	8,043,925

Source: http://www.jaxport.com/cargo/maritime-resources/marine-statistics, accessed June 3, 2011.

Table 3.4-7. JAXPORT's 2010 Inbound and Outbound Tonnage Statistics

Cargo Type		FY 2010 Tonnage
Containerized Goods	Inbound	665,787
	Outbound	1,803,715
Breakbulk	Inbound	442,590
	Outbound	83,377
Bulk Cargo	Inbound	810,624
	Outbound	65,949
Auto/Tractors	Inbound	296,536
	Outbound	363,440

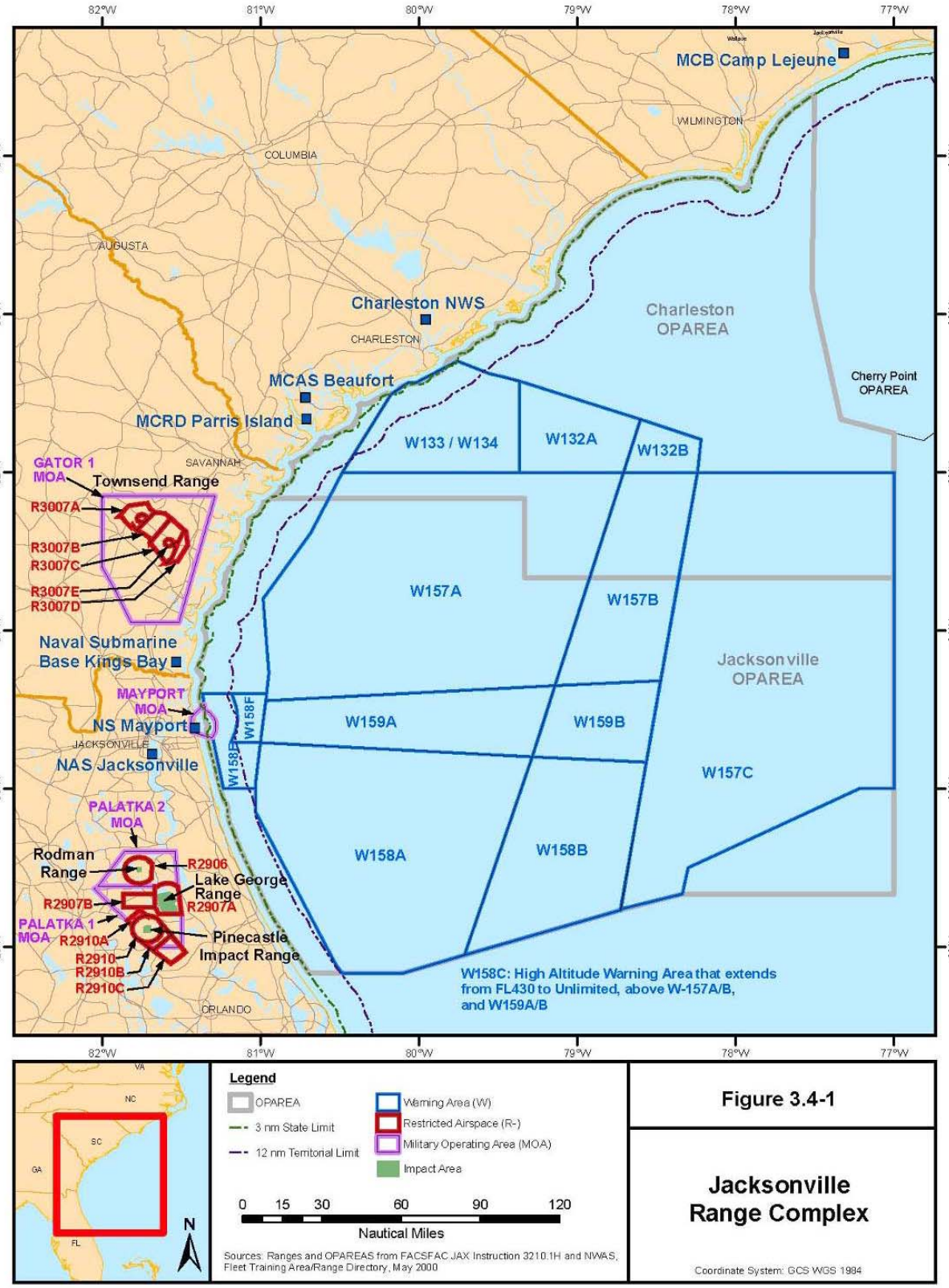
Source: http://www.jaxport.com/cargo/maritime-resources/marine-statistics, accessed June 3, 2011.

3.4.3. Military Use

The U.S. Naval Station at Mayport is one of the most active naval facilities on the east coast of the United States and is situated on the south bank of the St. Johns River, seaward of downtown Jacksonville (Figure 1.3.2). Mayport turning basin is adjacent to the Jacksonville Harbor entrance channel and provides direct and immediate access to the ocean for naval vessels. Naval Station Mayport occupies 3,500 acres of land and serves as home port for five major components of the Atlantic Fleet, a helicopter fleet airwing, and several training and administrative units. The existing facilities provide berthing for both deep- (e.g., aircraft carriers) and medium-draft naval ships.

A portion of the JAX Range Complex is located within the region of interest. The JAX Range Complex encompasses an offshore area that is used for Navy Atlantic Fleet training, research, development, testing, and evaluation activities and associated range capabilities enhancements in the Jacksonville and Charleston operating areas (Figure 3.4-1). The Georgia Bight sea and air space are utilized for testing and training of surface, submarine, and air units of the U.S. armed forces. The fleet operating area extends from approximately 40 to 200 nmi off Jacksonville (DoN 2009).

Offshore anchorage areas have been established off Fort George Inlet consisting of anchorages for aircraft carriers and other deep-draft vessels (four circular areas, each with a radius of 600 yards) and anchorages for destroyers and other ships of similar size (six circular areas, each with a radius of 300 yards) (Figure 1.3-1). One of the four anchorages for aircraft carriers and other deep-draft vessels is designated as an explosives anchorage for use during periods when ammunition must be handled outside the limits of Naval Station Mayport. The regulations for all designated anchorage areas specify that use of these areas by naval vessels shall predominate when necessary for military requirements; at such times other vessels shall remain clear of the areas. When the explosive anchorage is occupied by a vessel handling explosives, additional regulations apply, including that no other vessel may enter the area unless authorized by the enforcing agency (NOAA 2006a). Alternative 3 is less than 1 nmi north of the anchorage areas.


82°W
81°W
80°W
79°W
78°W
77°W
34°N
33°N
32°N
31°N
30°N
29°N
MCB Camp Lejeune
WILMINGTON
COLUMBIA
AUGUSTA
Charleston NWS
CHARLESTON
Charleston OPAREA
Cherry Point OPAREA
MCAS Beaufort
MCRD Parris Island
SAVANNAH
GATOR 1 MOA
Townsend Range
R3007A
R3007B
R3007C
R3007E
R3007D
Naval Submarine Base Kings Bay
MAYPORT MOA
NS Mayport
JACKSONVILLE
NAS Jacksonville
PALATKA 2 MOA
Rodman Range
R2906
Lake George Range
R2907A
R2907B
PALATKA 1 MOA
R2910A
R2910
R2910B
R2910C
Pinecastle Impact Range
ORLANDO
W133 / W134
W132A
W132B
W157A
W157B
W157C
W158A
W158B
W158F
W158E
W159A
W159B
Jacksonville OPAREA
W158C: High Altitude Warning Area that extends from FL430 to Unlimited, above W-157A/B, and W159A/B
VA
NC
SC
GA
FL
N
Legend
OPAREA
3 nm State Limit
12 nm Territorial Limit
Warning Area (W)
Restricted Airspace (R-)
Military Operating Area (MOA)
Impact Area
0 15 30 60 90 120
Nautical Miles
Sources: Ranges and OPAREAS from FACSFAC JAX Instruction 3210.1H and NWAS, Fleet Training Area/Range Directory, May 2000
Figure 3.4-1
Jacksonville Range Complex
Coordinate System: GCS WGS 1984

3.4.4. Mineral Resources

3.4.4.1. Oil and Gas Resources

Mineral resources are managed by the Department of the Interior Bureau of Ocean Energy, Management, Regulation, and Enforcement (BOEMRE, formerly Minerals Management Service [MMS]). The Atlantic outer continental shelf area is divided into four planning areas along the Atlantic seaboard: the North Atlantic, Mid-Atlantic, South Atlantic, and the Straits of Florida (Figure 3.4-2) (http://gomr.boemre.gov/homepg/offshore/atlocs/atlleas.html, accessed March 25, 2011). There have been no oil and gas leases off the Atlantic Coast since November 17, 2000 (USDOI/MMS 2006a). However, the MMS estimates that undiscovered oil and gas resources could be as high as 3.8 billion barrels of oil and 1.1 trillion cubic meters (37 trillion cubic feet) of natural gas (USDOI/MMS 2006b). The South Atlantic Planning Area lies offshore the southern Atlantic states and extends from South Carolina to Florida. The area encompasses approximately 54.34 million acres. Of the 109 blocks leased, none remains active. Six exploratory wells and one Continental Offshore Strategic Test well were drilled in this planning area. There are no active leases in this area.

3.4.4.2. Sand Borrow Areas

BOEMRE is also authorized to convey rights to the outer continental shelf sand, gravel, or shell resources for shore protection, beach or wetland restoration projects, or construction projects wholly or partly funded or authorized by the federal government. The vehicle for conveyance is normally a lease agreement between BOEMRE and the lessee.

Previously and Currently Used Borrow Areas

There is an offshore sand borrow area called the Duval Borrow Area (DBA) located approximately 8 miles (12.8 km) northeast of Jacksonville Beach, Florida and approximately 1 nmi east of the Jacksonville ODMDS (Figure 2.1-3). Figure 3.4-3a shows the borrow area being developed, the location of the area used for previous projects, and potential areas for future use. The current borrow area, comprised of Area A and B1, is located in 45- to 55-foot water depth and contains, on average, 5 to 7 feet of clean sand (USACE 2004). Areas within the borrow area vary in useable sand thickness from 0 to 19 feet. Anticipated excavation ranges from –53.0 feet to –56.0 feet MLLW, with an additional 2-foot allowable dredging buffer. The material in this borrow area consists primarily of sand that is gray quartz, fine- to medium-grain, well sorted, and ranges from clean to slightly silty with a small percentage of clay present.

The offshore borrow areas adjacent to the current DBA have supplied sand for several beach nourishment projects in Duval County since 1976 (Figure 3.4-3a) (USEPA 1983). Between May 1978 and October 1980, 2.9 million cy of sand was dredged for the Duval County Hurricane and Storm Protection Project (USACE 2004). From 1985 to 1987, 1,732,000 cy of sand was dredged from the DBA. In 1991, 300,000 cy of sand was dredged from the borrow area. In 1995, 1.2 million cy of sand was dredged from the DBA. And most recently, in 2005, 700,000 cy of sand was dredged from region “A” within the DBA. Approximately 1.6 million cy of material are available from this area. An additional 4.5 million cy is within the requested permit limits but will require additional investigations for resources.

Borrow sites are selected for quality and quantity of sand, for proximity to the beach, and for minimizing impact to valuable underwater resources (reef, hard ground, potential historic/cultural resources). The DBA produces high-quality sand, despite dredged material disposal at the Jacksonville ODMDS. The borrow material is excavated and transported by hopper dredge.

Potential Borrow Areas

Studies of the outer continental shelf resources offshore of central and northeast Florida were initiated because of the increased demand for beach-quality sand in the state. A reconnaissance-level project was conducted to determine the sand resource potential on the continental shelf along the northeast Florida Atlantic coast (URS and CPE 2007). The results of this project have been incorporated into the Reconnaissance Offshore Sand Search (ROSS) database for the State of Florida, Bureau of Beaches and Coastal Systems. Some areas within the ROI for this proposed action show promise as sand sources, such as the shoal located 6 miles offshore from Jacksonville and St. Augustine where the sand volume is estimated by Meisburger and Field (1975) to be on the order of 177.9 x 106 cy (178 million cy). As a result of this study, three potential sand source areas have been delineated offshore of Duval County (Figure 3.4-3b). Two of these areas, DU-Primary 1 and DU-Primary 2, are within the 3-mile federal marine boundary and the other, DU-Secondary 1, is outside of this boundary (URS and CPE 2007). None of the alternative sites are located in these delineated sand resource areas.

Another study was conducted by MMS (currently called BOEMRE) to characterize the physical and biological environments of northeast Florida's offshore sand sources and to identify and address potential environmental impacts that may result from dredging specific sand borrow sites (Zarillo et al. 2009). This study looked at five specific shoals identified by Meisburger and Field (1975) which identified sand and gravel resources on the inner continental shelf. Two of these shoals (A4 and A5) are located in the vicinity of Alternative Sites 1 and 2 (Figure 3.4-3c) and have potential for holding beach-quality sand. Table 3.4-8 summarizes the spatial features of the shoals A4 and A5.

Table 3.4-8 Shoal Dimensions

Shoal Name	Distance from Shoreline (miles)	Minimum Crest Elevation (feet, MSL)	Perimeter (miles)	Area (miles)
A4	7.5	-45	12	4.5
A5	4.5	-45	7.5	2

Source: Zarillo et al. 2009

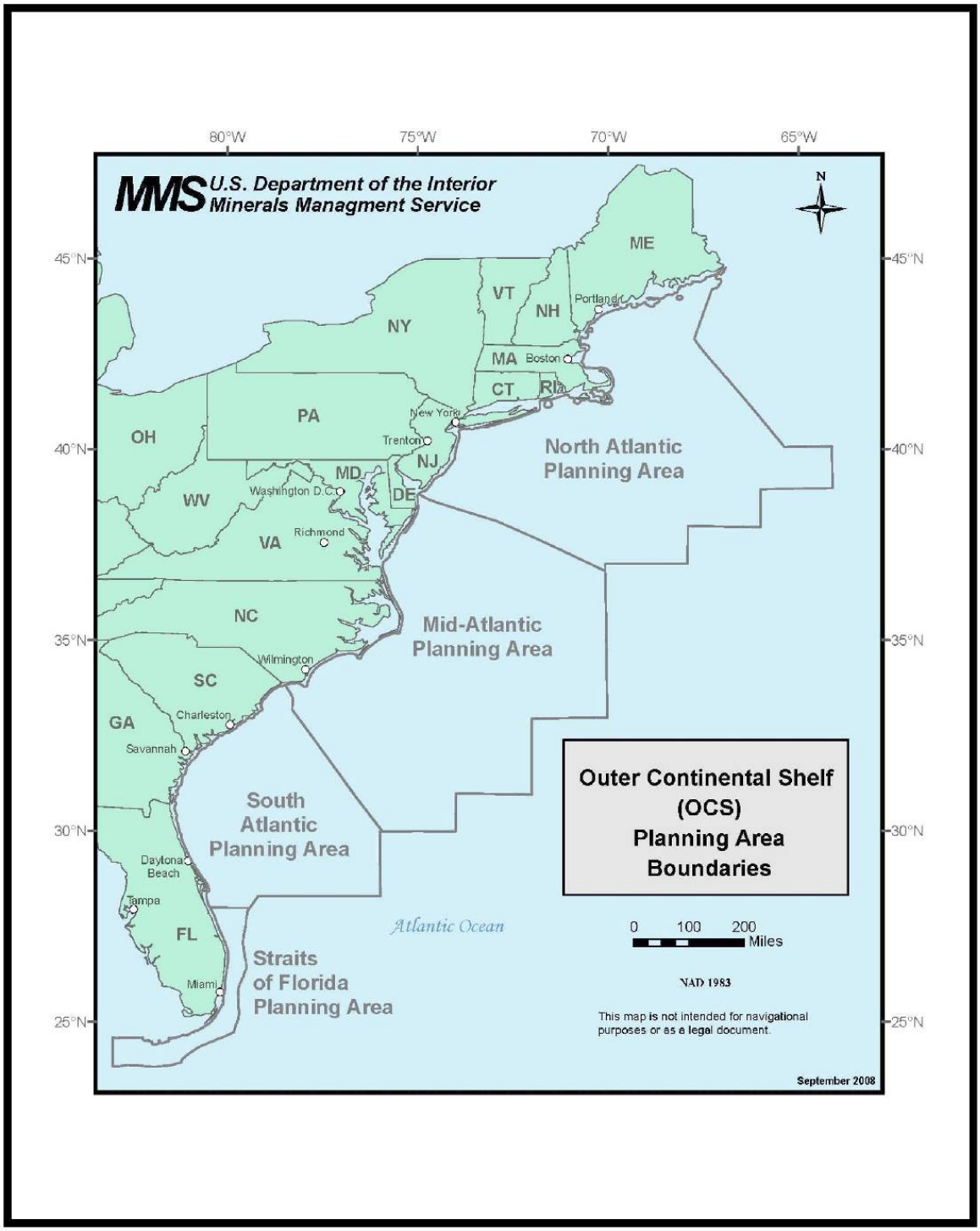


Figure 3.4-2. Outer Continental Shelf Planning Area Boundaries

This map and/or digital data is for planning purposes only and should not be used to determine the precise location of any feature.
Data provided as-is. Q:\GIS PROJECTS\JAX_ODMDS\PHASE 2\EIS\MAPS UPDATED 031511\Figure 3.4-2_OCS Planning Area Bounds MMS.mxd. Data source: MMS 2008.

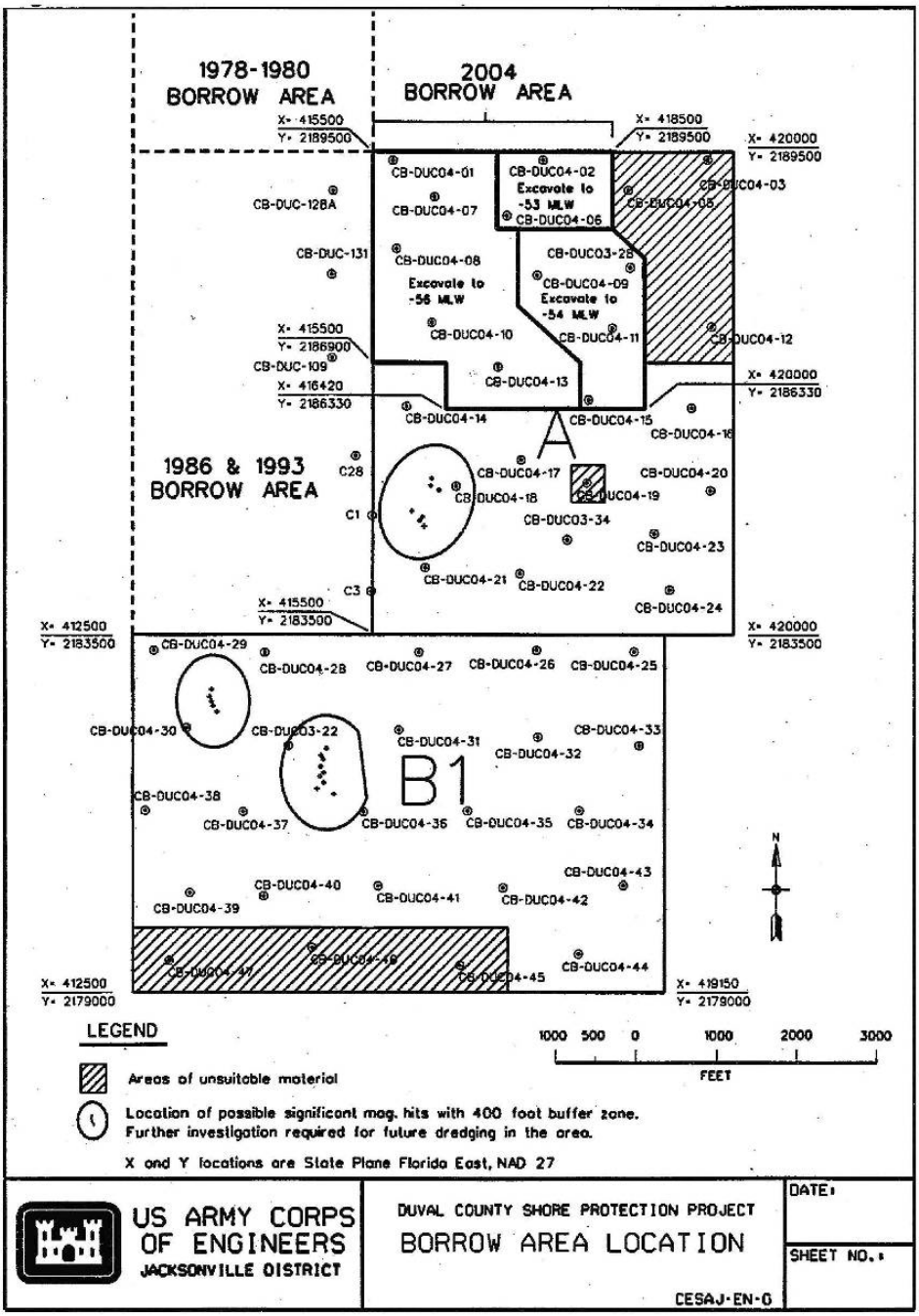


Figure 3.4-3a. Duval Borrow Area

This map and/or digital data is for planning purposes only and should not be used to determine the precise location of any feature. Source: USACE 2004. Data provided as-is.
Q:\GIS PROJECTS\JAX_ODMDS\PHASE 2\EIS\MAPS UPDATED 031511\Figure 3.4-3a Duval Borrow Area.mxd

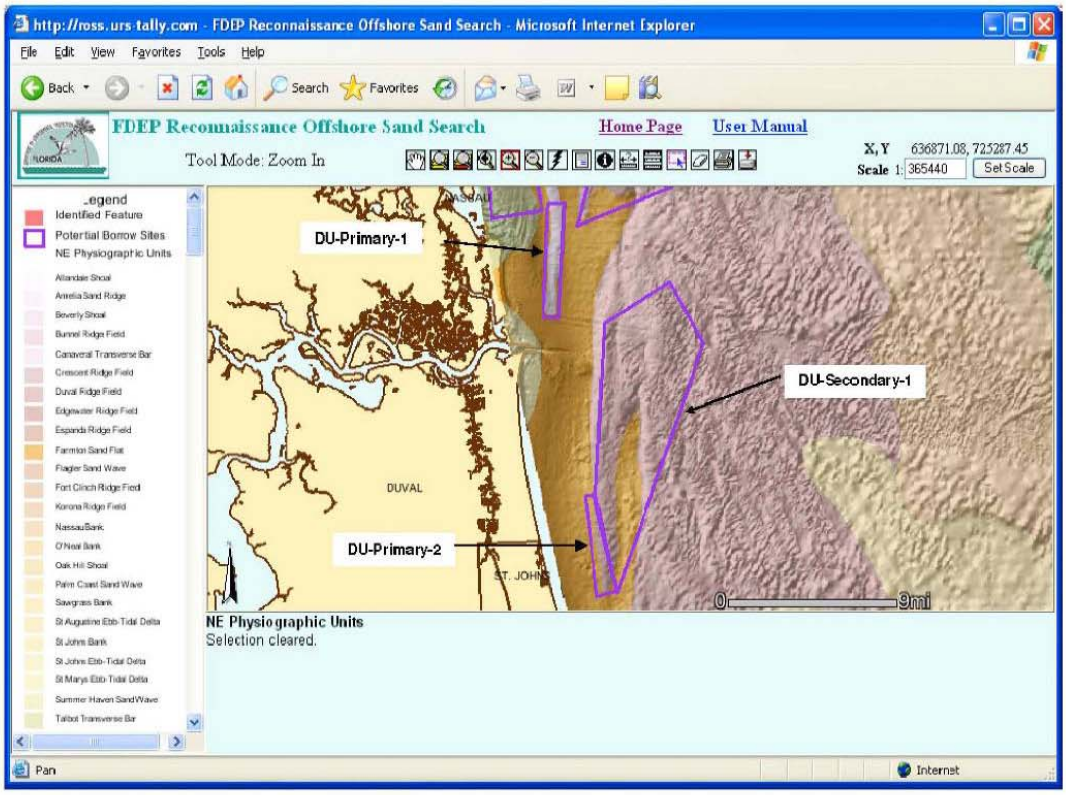


Figure 3.4-3b. Duval County Area Showing Nearshore Potential Sand Borrow Areas and Physiographic Zones

This map and/or digital data is for planning purposes only and should not be used to determine the precise location of any feature. Source: URS & CPE 2007. Data provided as-is.
Q:\GIS PROJECTS\JAX_ODMDS\PHASE 2\EIS\MAPS UPDATED 031511\Figure 3.4-3 Sand Borrow Areas.mxd

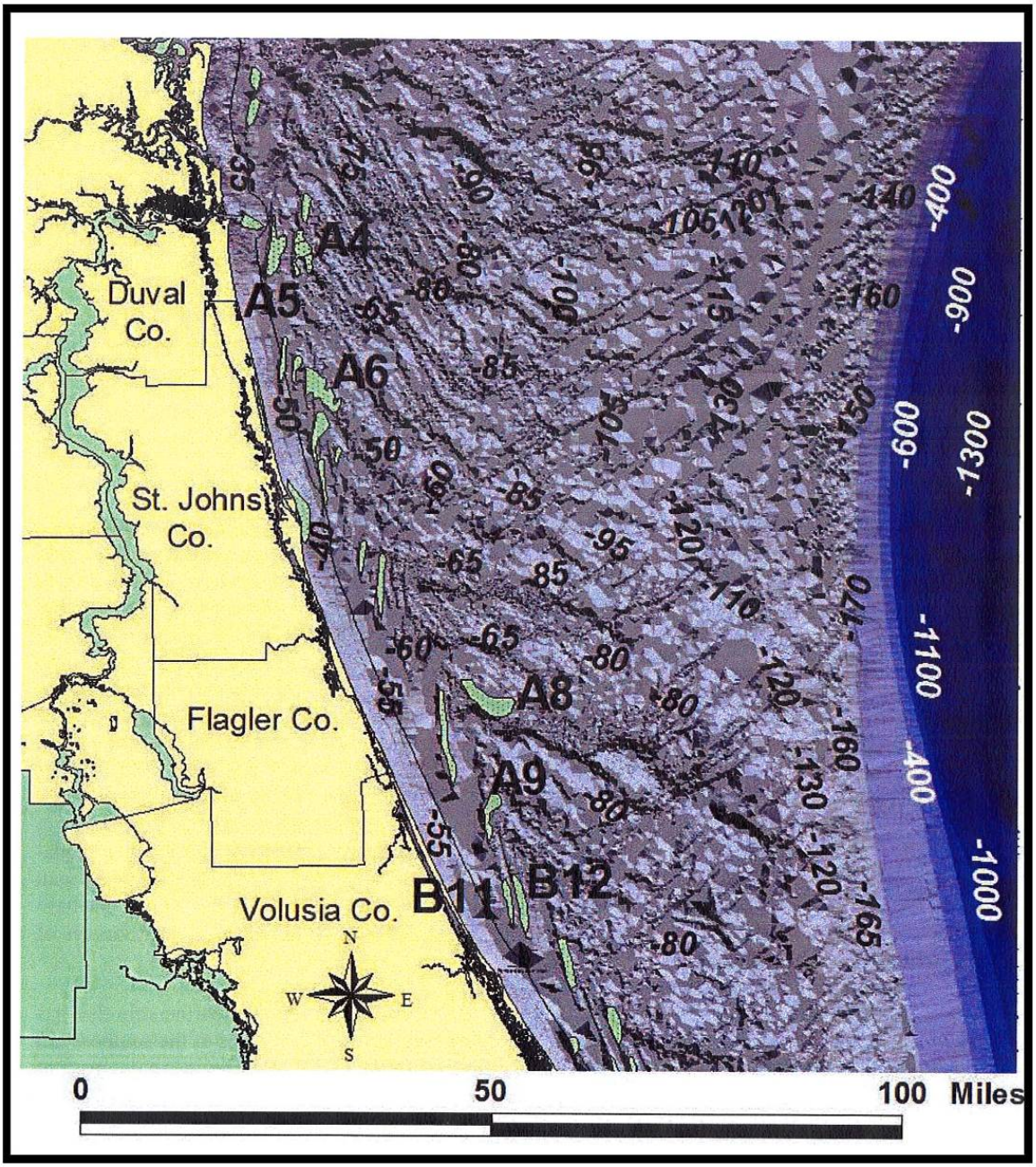


Figure 3.4-3c. Potential Sand Borrow Areas

This map and/or digital data is for planning purposes only and should not be used to determine the precise location of any feature.
Data provided as-is. Source: Zarillo et al. 2009. Q:\GIS PROJECTS\JAX_ODMDS\PHASE 2\EIS\MAPS UPDATED 031511\Figure 3.4-3c Potential Sand Borrow Areas.mxd

3.4.5. Recreational Use

The marine environment of northeastern Florida provides outstanding recreational opportunities for residents and tourists which generates considerable revenue for local businesses and the State of Florida. Millions of dollars are spent annually on activities associated with marine recreational fishing (e.g., tackle, baits, boats, fuel, and services). Other important recreational activities in the project area include swimming, scuba diving, boating, and sailing.

3.4.5.1. Recreational Fishing

USFWS and the U.S. Census Bureau's 2006 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation reported that 2.8 million residents and nonresidents age 16 years or older sport-fished in Florida, of which 68% were Florida residents. Expenditures included food, lodging, transportation, equipment rental, bait, and cooking fuel (USDOI et al. 2006). Table 3.4-9 summarizes total recreation expenditures for fishing in Florida in 2006.

Based on interviews with local sport fisherman (Strate 2007, Sipler 2007, St. Laurent 2007), the jetties and St. Johns River Inlet are considered popular fishing locations due to the variety, size, and amount of fish caught. Top species that sport fisherman catch by the jetties are sheepshead, redfish, tarpon, cobia, and flounder. Popular offshore catches that may occur in the dredging areas are black drum, sharks, spawning redfish, and sheepshead. Popular offshore fish that may occur in the vicinity of the alternative ODMDS locations are groupers, snappers, sea basses, amberjacks, and king mackerel.

Local annual sport fishing tournaments occur in Mayport, Florida, from early spring to fall. In Jacksonville, tournaments occur mostly in the spring and summer months. As shown in Figure 3.4-4, fishing hot spots often occur in association with artificial reef sites, which are created to promote marine life and to benefit commercial and sports fishing. Artificial reefs are made of heavy, stable, durable and non-polluting material, including old boats and concrete placed on sand or mud and not on a live bottom where coral and gorgonian grow. The artificial reefs located offshore are not in the immediate vicinity of the alternative ODMDS locations.

Table 3.4-9. Sport Fishing Expenditures in Florida for State Residents and Non-Residents 16 Years and Older

Expenditure	Cost
Trip-Related	$2.0 billion
Equipment	$1.9 billion
Other	$393 million
Total	**$4.3 billion**

Source: USDOI et al. (2006)

Recreational fishing is most intense during spring and summer off northeastern Florida. Most fishermen pursue the demersal fishes associated with the natural and artificial reefs of the mid-shelf region, such as snapper, grouper, black seabass, porgies, and grunts (USEPA 1983). However, mid-water predators (e.g., cobia, mackerel, jacks, barracuda, and sharks) also are commonly caught near the reefs. Major recreational finfish caught in the Atlantic coastal zone include spotted seatrout, summer flounder, Atlantic croaker, bluefish, and black seabass (http://www.st.nmfs.noaa.gov/st1/publications.html, accessed April 19, 2011).

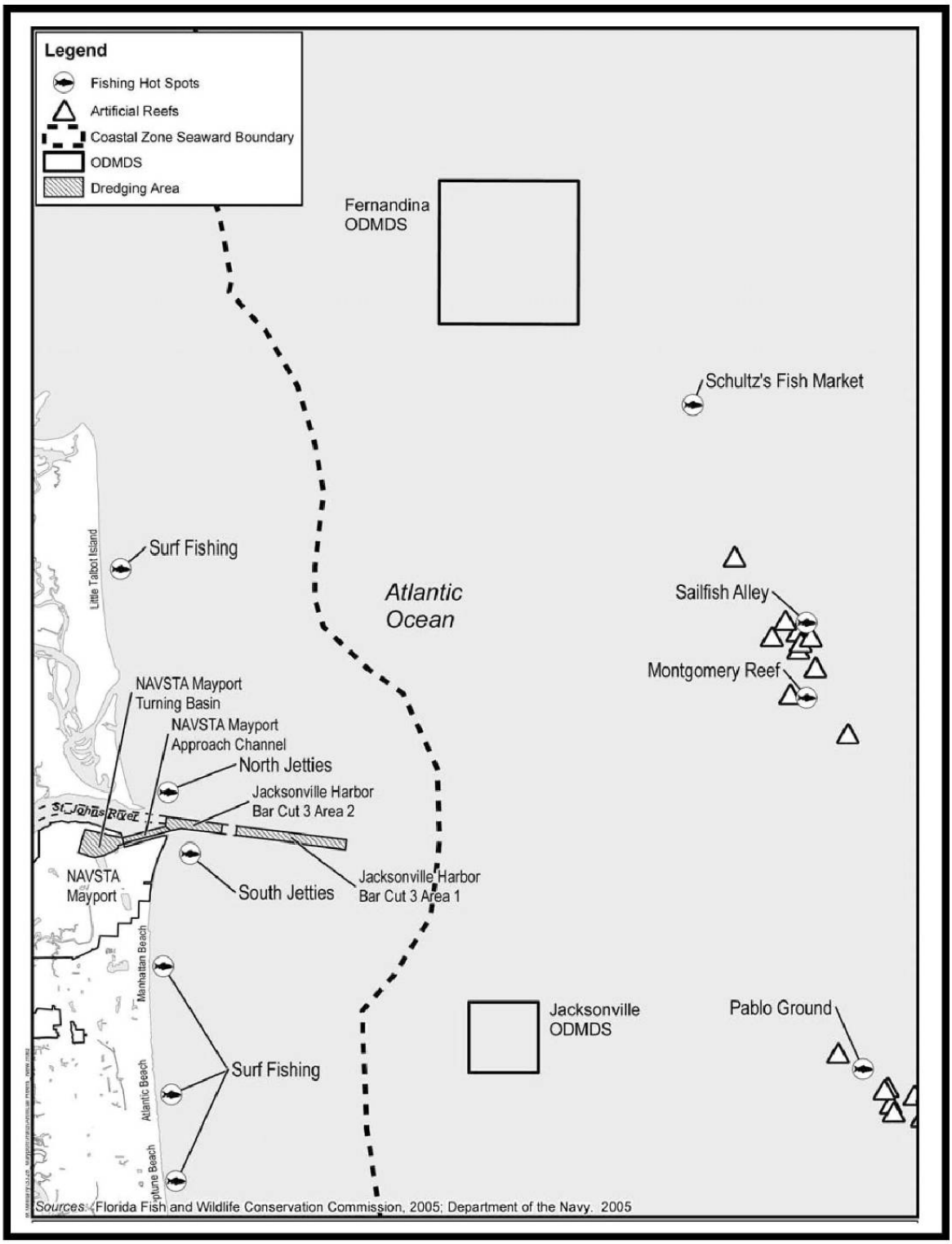


FIGURE 3.4-4. Artificial Reefs and Fishing Hot Spots

This map and/or digital data is for planning purposes only and should not be used to determine the precise location of any feature.
Data provided as-is. Q:\GIS PROJECTS\JAX_ODMDS\PHASE 2\EIS\MAPS UPDATED 031511\Figure 3.4-2 Artreefs_fishhotspots.mxd. Data source: NAVFAC 2008.

3.4.5.2. Recreational Boating

In 2006, the Florida Department of Highway Safety and Motor Vehicles reported 33,518 vessels for pleasure registered in Duval County, Florida (NAVFAC 2008). The total number of registered vessels has remained relatively constant over the years. Between the St. Johns River inlet and the Talleyrand Marine Terminal there are numerous marinas and public boat ramps. Adjacent to Naval Station Mayport, in the Village of Mayport, are the Mayport Boat Ramp and Mayport Marina.

A survey conducted by Jacksonville University in 1994 randomly interviewed boat captains at 51 boat ramps in Duval County to determine the primary purpose and destination of their trips. Results indicated that for 1,196 recreational boaters (61.6%), recreational fishing was the primary purpose of the trip followed by recreational cruising (18.5%). Among those polled, the Mayport Jetties, a popular fishing location, was the primary destination with 9.3%, followed by Julington Creek with 7.4% (Jacksonville City Council 2006).

3.4.5.3. Diving/Snorkeling

The area offshore of Jacksonville contains a number of popular sites for recreational scuba diving and snorkeling. Dive sites in the area are typically associated with live hardbottom (i.e., natural reefs), artificial reefs (e.g., reefballs), and shipwrecks. These structures range widely in size, type, and architecture. Because Florida waters have the warm water temperatures throughout the year, diving can occur off Florida in any season, but the best times are during summer when the winds are light and turbidity is at its lowest (Deloach 2000). Jacksonville is a very popular area for diving in northeastern Florida where waters can attain visibility up to 37 meters (Deloach 2000). Various reefs and limestone ledges throughout the Jacksonville coastal zone and offshore region create habitat for vast amounts of coral, sponge, and tropical fish species. Clayton's Holler is the most popular dive spot off Jacksonville and has three relatively large reefs about 1.6 km in length and between 26 and 29 meters in depth (Deloach 2000). This area of reefs and ledges lies 16.7 miles from the Mayport jetties.

3.4.6. Archaeological, Historical, and Cultural Resources

3.4.6.1. Historic Properties

Because the once-exposed continental shelf was available for occupation during prehistory and due to the long maritime history of the Atlantic coast and the St. Johns River, there is potential for submerged historic properties to be adversely impacted by the proposed action.

Due to changes in sea level, there is the potential for Prehistoric resources to be present within the project area. The earliest widely accepted date of occupation by aboriginal inhabitants of Florida dates from around 12,000 years ago (Milanich 1994). This earliest cultural period, called the Paleo-Indian period, lasted until about 10,000 YBP (years before present). Sea level was lower during this period, and the continental shelves were exposed--an area almost twice the width of the current size of the state. The entire Jacksonville ODMDS project area within the 20-meter (~60 feet deep) bathymetric contour was exposed and available for occupation during the Paleo-Indian and Archaic time periods (12,000-9,000 YBP) (PCI 2012). Few Paleo-Indian terrestrial archaeological sites are recorded in northeastern Florida; however, a fluted projectile point indicative of this time period was discovered at Jacksonville Beach in the 1950s (Milanich 1994).

During the Archaic period (ca. 10,000 YBP to ca. 2500 YBP), a wider range of resources was exploited and may have led to a more sedentary existence. Known terrestrial archaeological

sites in Duval County mostly date to the Late Archaic time period and are located along inland waterways and marshes. Presumably, Early Archaic sites (~9,000 YBP) are now located in drowned river valleys and positive relief features offshore since sea level rise around 10,000 years ago. Two inundated, prehistoric sites are recorded in the St. Johns River, including one of the earliest recorded Archaic sites in Duval County (9DU21117) dated to around 6,000 to 7,000 YBP. After 7000 YBP, no occupation of the project area occurred because it was submerged and not available for occupation.

The potential for shipwrecks dates back as far back as 1520 with the discovery of the St. Johns River by the Spanish. From the early Colonial period onward, numerous sailing vessels transited into the St. Johns River and sailed up and down the Atlantic Coast. Steamships began using the area in 1829 (PCI 2012). .

While Florida was not a major participant during the Civil War, it supplied men and goods to the Confederacy (Tebeau 1999). Many steamer captains in Jacksonville became blockade runners to supply these goods, but by 1862, the Union had blockaded the river and Confederate forces had abandoned Jacksonville (PCI 2012).

More than 50 shipwrecks have been recorded in the vicinity of Duval County and the project area (Singer 1996). None are previously recorded in the project area by the Florida Master Site File (FMSF). To the north of the project area in Nassau County, there are four known 18th and 19th century shipwrecks recorded near the shore.

Between June 17 and August 2, 2011, Panamerican Consultants, Inc. (PCI) conducted a submerged cultural resources survey within Alternative Site 1 and Alternative Site 2 pursuant to the Florida Division of Historic Resources Performance Standards for Submerged Remote Sensing Surveys (Florida DHR, Version 2.1). The survey incorporated use of a magnetometer, sidescan sonar, and subbottom profiler to identify both positive relief and buried archaeological features. The results of this survey are presented in the final report titled: “Cultural Resources Remote Sensing Survey of the Jacksonville Harbor Project Potential Ocean Dredged Material Disposal Sites Alternatives 1 and 2 Duval County, Florida,” (PCI 2012).

Within the two sites, the survey identified a total of seven anomalies, including three magnetic clusters and four subbottom features (PCI 2012). Within Alternative Site 1, there are three subbottom features and one magnetic cluster. Within Alternative Site 2, there are three subbottom features and two magnetic clusters. The three magnetic anomalies have characteristics indicative of debris fields that could be remnants of historic shipwrecks. However, none of the magnetic anomalies have corresponding sidescan images, indicating they are buried beneath the sediment surface. The four subbottom anomalies (two beneath the sediment surface and two positive relief features) represent prehistoric landforms once exposed by lower sea levels and have the potential to contain significant prehistoric archaeological sites from the Paleo-Indian and Early Archaic time periods (12,000-9,000 YBP). The two buried features (6 to 10 feet below the surface) consist of a paleochannel (relict river/stream bed) and a possible springhead feature. The positive relief features (possible dunes and/or shell middens) lie on the existing seafloor.

To help further determine the significance of these anomalies/features as related to the potential effects of dredged material disposal, PCI recommended that any of the targets that will be impacted and cannot be avoided be investigated by archaeological divers. The results of this survey will be used to determine if these targets do indeed represent cultural resources sites.

Section 4.3.7 discusses the potential effects to cultural resources within Alternative Site 1 and Alternative Site 2.

3.4.7. Subsea Cables

The ocean bottom in the vicinity of the continental shelf may sometimes contain communication cables or gas pipelines. One communication cable is identified on the NOAA chart 11490 (Figure 3.4.5). It is the Florida-St.Thomas-2 cable owned by AT&T and is no longer active. This cable was retired from service in 1993 (Gino Montes, *pers. comm*., February 19, 2010). A portion of the cable intersects the southeast corner of proposed Alternative 2. If Alternative 2 is selected as the preferred alternative, dredged material would be disposed of on top of this inactive cable (Figure 2.2-2).

The Navy is also planning to install a cabled training range (Figure 3.4-5). There is an area at the shelf break where there will be cabled sensors on the seabed and routine military exercises. The sensor data will come ashore via a cable landing in Mayport. However, this cable will be located north of Alternatives 1 and 2 and south of Alternative 3 and is not expected to interfere with installation or operation of the cable.

Lucent is tentatively planning to land a new fiber optic cable in the Jacksonville area. Currently they are looking at a landing the new cable near where the old AT&T cable came ashore. Their cable route stays south of Alternative 2 (Figure 3.4-5).

3.4.8. Public Health and Welfare

Health and welfare concerns for the population of northeast Florida relative to the proposed designation of an ODMDS offshore of Jacksonville involve the potential for release of toxic substances, hazards to navigation, conflicts between marine traffic and disposal operations, and visual effects.

Potential health hazards may result if dredged material disposed in the ocean releases toxic substances that are bioaccumulated in marine organisms, including fish and shellfish, which are then consumed by humans. As discussed in Chapter 1, ocean disposal is only allowed when USEPA and USACE determine, on a case-by-case basis, that the dredged material is environmentally suitable (e.g., non-toxic) according to testing criteria (40 CFR Parts 225 and 227), as determined from physical, chemical, and bioassay/bioaccumulation testing. In accordance with national testing guidance, all material to be dredged would be tested for the presence of contaminants as well as the potential for toxicity and bioaccumulation prior to dredging.

The disposal of dredged material has the potential to raise the elevation of the seafloor and create a navigation hazard in the vicinity of the disposal site. Siting criteria defined in Table 1.1-1 provide that disposal will be permitted only at sites or in areas selected to minimize the interference of disposal activities with areas of heavy commercial or recreational navigation. An operational minimum depth of -30 feet is established in the SMMP to prevent navigational hazards. There is also a potential for disposal barges and hopper dredges to interfere with shipping traffic as they travel to and from the disposal sites, but this has not been a problem historically. Dredged material that is deposited at a disposal site could affect the visual aesthetics of an area if it became visible to boaters or divers below the surface. Visual impacts would more likely be caused by disposal barges and hopper dredges transiting to and from the disposal site.

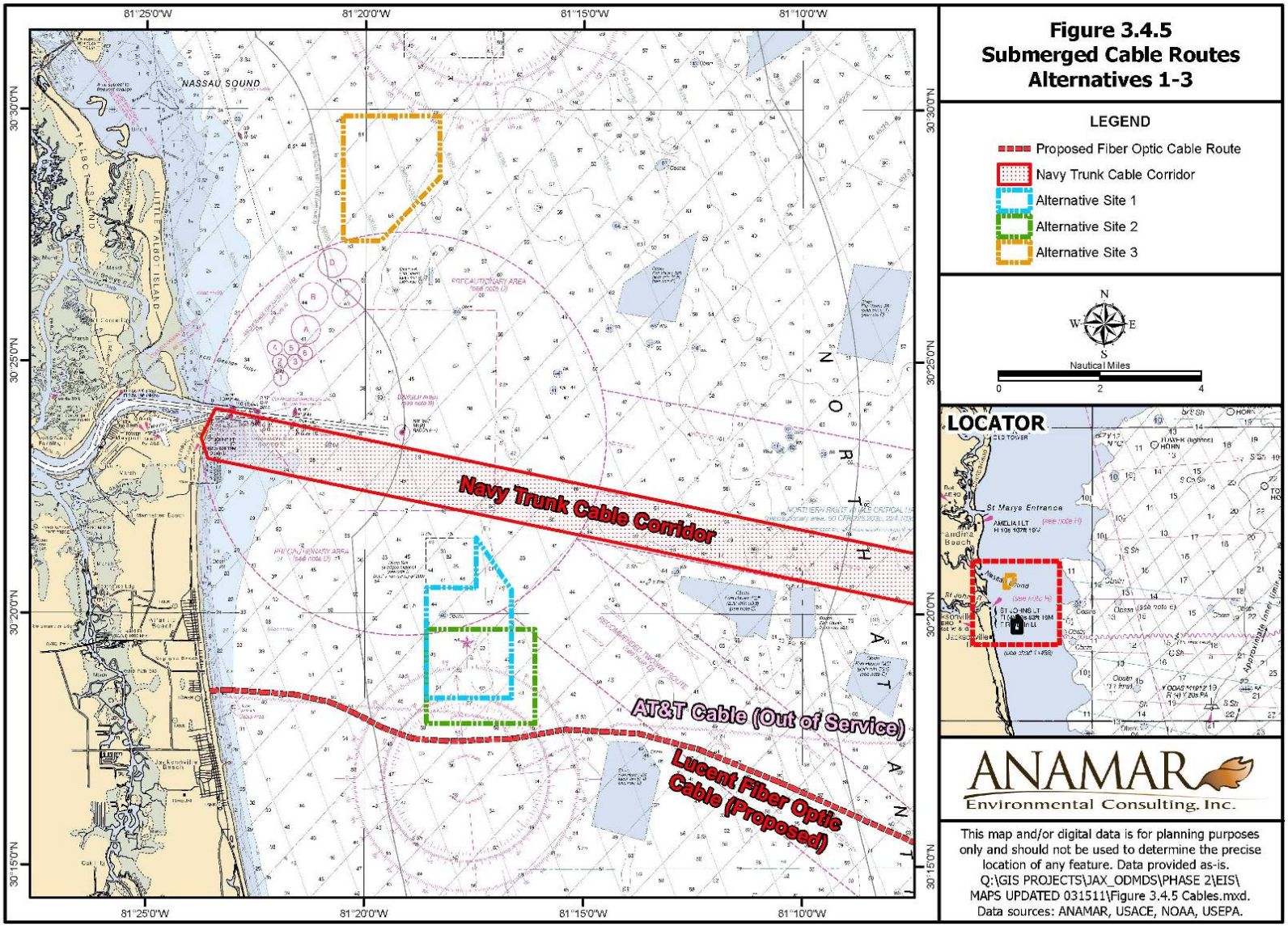


Figure 3.4.5
Submerged Cable Routes
Alternatives 1-3
LEGEND
Proposed Fiber Optic Cable Route
Navy Trunk Cable Corridor
Alternative Site 1
Alternative Site 2
Alternative Site 3
N
W
E
S
Nautical Miles
0
2
4
LOCATOR
ANAMAR
Environmental Consulting, Inc.
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Q:\GIS PROJECTS\JAX_ODMDS\PHASE 2\EIS\MAPS UPDATED 031511\Figure 3.4.5 Cables.mxd.
Data sources: ANAMAR, USACE, NOAA, USEPA.
81°25'0"W
81°20'0"W
81°15'0"W
81°10'0"W
30°30'0"N
30°25'0"N
30°20'0"N
30°15'0"N
NASSAU SOUND
Navy Trunk Cable Corridor
AT&T Cable (Out of Service)
Lucent Fiber Optic Cable (Proposed)

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4. ENVIRONMENTAL EFFECTS

This chapter is the scientific and analytic basis for comparing and contrasting the alternatives, and it evaluates the significance of potential effects of the proposed action on the physical, biological, and socioeconomic resources at the alternative sites. The potential impacts are evaluated for the

- Alternative 1 – Expansion of the Jacksonville ODMDS (Preferred)
- Alternative 2 – South of the Jacksonville ODMDS (Preferred)
- Alternative 3 – North of the Jacksonville ODMDS
- No Acton Alternative

Chapter 4: Environmental Effects

4.1 Effects on Physical and Chemical Environment
4.2 Effects on Biological Environment
4.3 Effects on Socioeconomic Environment
4.4 Unavoidable Adverse Environmental Impacts
4.5 Long-Term Impacts
4.6 Cumulative Impacts
4.7 Relationship between Short-Term & Long-Term Resource Uses
4.8 Irreversible or Irretrievable Commitment of Resources

Table 2.5-1 in Chapter 2 provides a summary of the potential direct and indirect impacts on the physical, biological, and socioeconomic environments for each of the alternatives. Additional comparisons and evaluation of the alternatives relative to EPA's specific site selection criteria are presented in Table 2.3-1.

Effects of dredged material disposal on the marine ecosystem are of public concern. Given that some effects are large-scale and immediately apparent and others are subtle, it can be difficult to differentiate between changes due to natural fluctuations and those resulting from human perturbations. The consequences of effects may be difficult to interpret in light of incomplete knowledge of biological pathways, ecology of organisms, and community dynamics. However, such effects may have far-reaching consequences (e.g., damage to fisheries) or may be minor. Long-term effects are the most difficult to assess because they are often indirect and may be cumulative.

Effects of dredged material on the ecosystem depend upon several factors:

- Physical and chemical characteristics of dredged sediments
- Degree of similarity between dredged sediments and those of the ODMDS
- Amount of material to be dumped
- Frequency of disposal
- Contaminants associated with dredged material
- Turbidity associated with disposal operations

The adjective "significant" is used to describe the level of severity of impacts resulting from the proposed action. In the following sections, significant is defined as a substantial (or potentially substantial) change to resources in the vicinity of the proposed alternative sites. Along with significance, the spatial (localized versus widespread) and temporal (short-term versus long-term) extents of the impacts are discussed. Significance criteria were developed and applied to the environmental impact assessment for each of the resource areas evaluated in the EIS (adapted from USEPA 1995a). Specific significance criteria for physical, biological, and socioeconomic resources are presented at the beginning of each section. Additional mitigation measures are discussed where potentially significant impacts are identified.

In addition to the impact analysis discussed in this chapter, verification that significant impacts do not occur outside of the site boundaries will be demonstrated through implementation of the SMMP that has been developed by EPA as part of the final site designation process. The SMMP will include physical monitoring to confirm that the material deposited is landing where it is supposed to land, as well as monitoring to confirm that the sediment chemistry conforms to the pre-disposal testing requirements. More detailed information on site monitoring is provided in Chapter 5. The SMMP is included in Appendix F of this EIS.

In general, the primary impact-producing factors associated with dredged material disposal at any of the alternative sites are:

1) Temporary water column perturbations (turbidity plumes, release of chemicals, lowering dissolved oxygen concentration);
2) Burial of the site's benthic biota;
3) Changing the site bathymetry; and
4) Altering the site's sediment composition.

4.1. Effects on the Physical and Chemical Environment

The following sections examine the potential effects of dredged material disposal on the physical and chemical environment including local and regional air quality, water quality, bathymetry, and sediment quality at the three alternative sites and for the No Action Alternative.

4.1.1. Air Quality

Significance criteria for air quality impacts are based on federal, state, and local air pollution standards and regulations. An impact was considered significant if project emissions are projected to:

- Increase ambient pollutant concentrations above the NAAQS; or
- Substantially contribute to an existing or projected air quality standard violation.

Potential impacts to regional air quality associated with dredged material disposal operations at the three alternative sites were evaluated using an EPA air quality model. Air quality impacts from dredged material disposal activities were estimated from combustion emissions of fossil-fuel-powered equipment used for transporting dredged material to the ODMDS. Factors needed to derive the source emission rates were obtained from *Compilation of Air Pollution Emission Factors, AP-42, Volume 1* (USEPA 1995b), Table 3.3-1. Load factors were estimated at 60% for the hopper dredge and tugboat engines. Tugs and hopper dredges would be carrying a full load to the disposal site and returning to the dredging site empty. Information on dredge volumes, barge and hopper capacity, number of trips to the ODMDS per day, speed and horsepower of hopper dredge, tugboat, and survey vessel was provided by USACE Jacksonville District and Norfolk Dredging personnel. Details on how emissions were calculated are provided in Appendix E.

There is a potential for short-term impacts to air quality primarily due to the dredging equipment and the tug engines used in transport of dredged materials to the ODMDS. However, no significant impacts to regional air quality are expected as a result of the transport and disposal of dredged materials to any of the proposed alternative sites. Air quality impacts at dredging sites associated with the dredge plant during dredging operations were not assessed in this EIS because they will be assessed on a project-specific basis. Emissions from the tug vessels and

hopper dredges include particulate matter (PM), nitrogen oxides (NO_x), sulfur dioxide (SO_2), carbon monoxide (CO), and volatile organic carbons (VOCs; hydrocarbons).

4.1.1.1. Alternatives 1 through 3

The primary difference between the three alternative sites and the No Action Alternative as it relates to emissions and air quality is based on the distance from the entrance channel to the disposal site. The distance from the mouth of the St. Johns River to the center of the sites is as follows: Alternative 1 = 7.1 nmi, Alternative 2 = 7.4 nmi, Alternative 3 = 5.9 nmi, and Fernandina Beach ODMDS (No Action Alternative) = 9.3 nmi. Using these distances, the projected annual emissions generated from hauling material from the entrance channel to the ODMDS for each of the alternatives were calculated. For air quality impact analysis, dredged material transport operations were assumed to be comprised of either a tugboat (clamshell dredging) or a hopper dredge transiting to the site, so both types of equipment were used in the analysis. In addition, two scenarios were evaluated to provide a range of potential emissions as it relates to maintenance work or new work (Jacksonville Harbor deepening). The intent of this air quality analysis is to present a basis for comparing the relative impacts to air quality that could result due to implementation of each of the proposed alternatives or the No Action Alternative. The complete air quality analysis is provided in Appendix E.

Tables 4.1-1 and 4.1-2 summarize annual emissions (tons/years) produced from hauling operations of maintenance material and new work material, respectively, from the entrance channel to each alternative site using a scow towed by a tugboat (used during clamshell dredging operations) and a hopper dredge. For this analysis, the hopper dredge *Liberty Island* was used, which has a 9,920-hp engine. A typical tugboat has a 3,200-hp engine. For comparison purposes, the relative percent difference in annual emissions between the three alternative sites was calculated. Results indicate that approximately 4% more emissions would be produced annually during hauling operations to Alternative Site 2 compared to Alternative Site 1. Approximately 16% more emissions would be produced annually during hauling operations to Alternative Site 1 compared to Alternative Site 3. Approximately 19% more emissions would be produced annually during hauling operations to Alternative Site 2 compared to Alternative Site 3.

Table 4.1-1. Comparison of Emissions Produced Annually for Maintenance Material Only Using a Clamshell or a Hopper Dredge[1]

Dredge Type	Clamshell Dredge					Hopper Dredge				
Emission Type	VOC	CO	NO_x	SO_2	PM	VOC	CO	NO_x	SO_2	PM
	Tons/yr					*Tons/yr*				
Alternative 1	0.435	1.228	5.456	0.361	0.387	1.496	4.229	18.781	1.242	1.333
Alternative 2	0.451	1.273	5.654	0.374	0.401	1.552	4.385	19.473	1.288	1.382
Alternative 3	0.371	1.050	4.662	0.308	0.331	1.276	3.606	16.013	1.059	1.136
No Action (Fernandina ODMDS)	0.535	1.511	6.713	0.444	0.476	1.846	5.215	23.163	1.532	1.644

[1] Minimum maintenance material volume is estimated at 500,000 cy annually

Table 4.1-2. Comparison of Emissions Produced Annually for New Work Material Using a Clamshell or a Hopper Dredge[1]

Dredge Type	Clamshell Dredge					Hopper Dredge				
Alternative	**VOC**	**CO**	**NO_x**	**SO_2**	**PM**	**VOC**	**CO**	**NO_x**	**SO_2**	**PM**
	tons/yr	*tons/yr*	*tons/yr*	*tons/yr*	*tons/yr*	*tons/yr*	*tons/yr*	*tons/yr*	*tons/yr*	*tons/yr*
Alternative 1	4.53	12.81	56.88	3.76	4.04	15.79	44.61	198.13	13.10	14.06
Alternative 2	4.70	13.28	59.98	3.90	4.19	16.37	46.26	205.46	13.59	14.58
Alternative 3	3.86	10.91	48.47	3.21	3.44	13.45	38.00	168.79	11.16	11.98
No Action (Fernandina ODMDS)	5.59	15.81	70.20	4.64	4.98	19.49	55.07	244.58	16.17	17.36

[1] New work material volume is estimated at 5.3 million cy annually. The annual amount of 5.3 million cy is based on a total of 32 million cy/6 years (estimated time to complete deepening project; Steve Conger, pers. comm.)

Some of the estimated emission levels from the dredging activities associated with the Jacksonville Harbor Deepening Project are above the *de minimis* threshold values of 100 tons/year of NOx that are applicable to nonattainment and maintenance areas for all pollutants as specified in 40 CFR 93.153(b)(1)(2). However, since the Proposed Action is to designate a new ODMDS and is not actually permitting a dredging project, the Proposed Action will not conflict with conformity requirements of Section 176 of the Clean Air Act for federal actions. For each individual dredging project, a detailed air quality analysis will be performed to assess and quantify impacts to air quality. The Proposed Action evaluated in this EIS will not have a significant impact on local or regional air quality within the context of the Clean Air Act, NEPA or applicable state, or local environmental laws and regulations.

4.1.1.2. No Action Alternative (Status Quo)

Under the No Action Alternative, a new ODMDS would not be designated offshore of Jacksonville, and therefore conditions at the alternative sites would not change. However, if an ODMDS is not designated, the volume of material dredged from Jacksonville Harbor and Naval Station Mayport would still need to be managed. Once the existing Jacksonville ODMDS reaches capacity, dredged material originating in Duval County could potentially be disposed of at the existing Fernandina Beach ODMDS. If material is hauled to the Fernandina Beach ODMDS, the emissions produced to haul material there from the Jacksonville area would be higher than the three alternative sites because it is farther away. Approximately 21% more emissions would be produced annually when disposing of dredged material at Fernandina Beach ODMDS (No Action Alternative) compared to Alternative Site 1. Approximately 17% more emissions would be produced annually when disposing of dredged material at Fernandina Beach ODMDS (No Action Alternative) compared to Alternative Site 2. Approximately 36% more emissions would be produced annually when disposing of dredged material at the Fernandina Beach ODMDS (No Action Alternative) compared to Alternative Site 3. Therefore, if the No Action Alternative were implemented, air emissions associated with transport of dredged material offshore would be increased due to the increase in hauling distance compared to the three alternative sites. However, if dredging and disposal of dredged material offshore were decreased due to limited ODMDS capacity, then impacts to air quality could potentially be decreased.

4.1.2. Physical Oceanography

4.1.2.1. Bathymetry and Sediment Transport

Impacts would be significant if the disposal of dredged material would (1) alter the regional and site-specific bathymetry, (2) interfere with or change sediment transport processes, (3) alter the existing characteristics of the seafloor (e.g., change the substrate from predominantly sand to silt and clay), or (4) create a navigation hazard.

4.1.2.1.1. Alternatives 1 through 3

Since all of the alternative sites occur in the same region, have similar bathymetry, and are of similar size, the effects of dredged material disposal on bathymetry and sediment transport are expected to be similar regardless of which alternative site is designated as an ODMDS. The disposal of dredged material at an ODMDS is not expected to have any measureable effect on the regional bathymetric conditions or sediment transport processes. However, over the life of the ODMDS (50+ years), accumulations of material and changes in bathymetry could be substantial within the boundaries of the site, causing impacts to substrate characteristics and benthic organisms. Assuming dredged material is distributed evenly across the site and there is no transport of material outside the site, the depth of the site could be reduced to -30 feet over the life of the site, which is the operational minimum depth established in the SMMP. Frequent movement of the dredged material discharge point should lessen mounding and changes to site bathymetry.

Typically, a disposal mound is formed consisting of all material that is not in the turbidity plume which has settled after the passive dispersion phase. The extent of the mound depends on factors such as water depth, volume of release, ambient currents, and composition of material being released. Successive disposal events will increase the size of the mound. A typical disposal mound from a single dump is likely to have a maximum thickness of 18 cm and a radius of 750 m (USEPA 1994).

Based on MDFATE studies conducted at the Jacksonville ODMDS, sandy dredged material appears to be stable at the site; however, silt and clay erode due to wave action (USACE 2008). Erosion of the silt and clay material increases when dredged material is placed in shallower water depths. Survey and dredging records indicate that significant volumes of fine-grained dredged material have eroded from the site on relatively short time scales. However, monitoring data indicate that there have been no net volumetric gains outside of the Jacksonville ODMDS.

In order to determine if eroded sediments have the potential to be re-deposited beyond the site boundaries, further LTFATE modeling studies were conducted. Using the LTFATE model, predictions of erosion and deposition amounts were determined for representative storm conditions which occurred during the ADCP data collection period from September 2006 to August 2007. The analysis shows that large volumes (400,000 to 500,000 cy) of sediment can be removed during a storm event if the event occurs before the mound has consolidated. Once consolidated, the dredged material is less susceptible to erosion. The model predicted the removal of approximately 100,000 cy over two storm events for consolidated material (USACE 2008).

A monitoring and modeling program, similar to the one in place for the Jacksonville ODMDS, could detect a potential concern and aid in the prevention of any adverse effects. See Chapter 5 and the SMMP in Appendix F for more information on site management and monitoring. The potential for impacts to sediment characteristics and the benthic community are discussed in Sections 4.1.4 and 4.2.6, respectively.

4.1.2.1.2. No Action Alternative (Status Quo)

Under the No Action Alternative, the ODMDS would not be created, and therefore conditions at the alternative sites would not change. However, there would likely be accelerated mounding at the Fernandina Beach ODMDS if material from the Jacksonville area were hauled to that site. The Jacksonville ODMDS would continue to be used until the -30 feet threshold is reached throughout the site.

4.1.2.2. Waves and Currents

Physical oceanographic impacts would be significant if the disposal of dredged material would alter the regional and site-specific wave and current patterns. Changes to the wave and current patterns may adversely impact coastal processes or increase the erosion rate of sediments deposited on the seafloor.

4.1.2.2.1 Alternatives 1 through 3

The disposal of dredged material at any of the three alternative sites is not expected to have any measurable effect on the regional or site-specific physical oceanographic conditions, which in general are driven ultimately by energy from the sun and the rotation of the earth. Atmospheric circulation (e.g., wind) generates friction on the ocean surface, in effect creating waves and surface currents. Temperature and salinity changes in ocean water due to processes such as heating, evaporation, precipitation, and the freezing and melting of ice create density differences between surface and underlying water which drive vertical circulation, (e.g., thermohaline circulation) (Brown et al. 1989).

Conversely, the regional and site-specific physical oceanographic conditions will influence the fate and transport of dredged material disposed at an ODMDS. The predominant wind-driven and tidal currents will affect the dispersion, settling, and deposition of dredged material through the water column to the seafloor. Dredged material disposed at the proposed ODMDS will initially fall vertically through the water column under the influence of gravity. Once the dredged material reaches a point of neutral buoyancy through the entrainment of water, vertical transport is replaced with horizontal spreading. Subsequently, site-specific oceanographic currents and turbulence dominate the movement of dredged material until the material is deposited on the seafloor (USEPA and USACE 1998). The impacts associated with the dispersion of dredged material into the water column and the deposition of dredged material onto the seafloor are discussed in subsequent sections specific to water quality (Section 4.1.3), sediment quality (Section 4.1.4), and biological resources (Section 4.2).

To help assess potential impacts to wave height due to long-term disposal operations at the new ODMDS, EPA conducted an analysis of wave height transformations over the proposed ODMDS mound using an analysis based on linear wave theory. The primary assumption is that waves will be transiting from water depths of 60 feet (incident condition) to depths of up to 30 feet (shallowest depth at the mound). It is also assumed that wave refraction and/or diffraction effects are negligible, as per the methodology outlined in the USACE's Shore Protection Manual (USACE 1984). The incident wave characteristics were based on the wave periods measured at the existing Jacksonville ODMDS (USEPA 2009a). The shoaling coefficient or the change in wave height as a wave travels over a changing water depth is a function of the water depth and the wave length or wave period.

A brief sensitivity analysis was conducted to examine the differences between incident and shoaled wave heights as a result of waves transiting the disposal mound. The input variables in

this analysis are wave period and the water depth. The output was determined using equation 2-44 in the Shore Protection Manual (USACE 1984) and using the measured mean wave height of 3 feet at the Jacksonville ODMDS (USEPA 2009a). For wave periods less than 8 seconds, the wave heights will decrease as the waves move over the disposal mound. For wave periods greater than 8 seconds the wave heights will increase. Thirty percent of waves measured at the Jacksonville ODMDS had wave periods greater than 8 seconds (USEPA 2009a). The greatest shoaled wave heights were 14% greater than the incident wave height occurring with a mound height of 30 feet and the longest period waves of 16 seconds. Examples of the results of this analysis are provided in Table 4.1-3.

Table 4.1-3. Wave Height Analysis

Incident Wave Ht. (feet)	Wave Period (second)	Disposal Mound Height (feet)	Shoaling Coefficient	Wave Height at ODMDS (feet)
3.00	6	10	0.98	2.94
3.00	14	10	1.03	3.09
3.00	8	20	1.01	3.03
3.00	10	30	1.09	3.27
3.00	16	30	1.14	3.43

Disposal of dredged material at any of three alternative sites is not expected to have any significant negative effect on site-specific oceanographic current and wave patterns.

4.1.2.2.2 No Action Alternative (Status Quo)

Under the No Action Alternative, the ODMDS would not be created and therefore conditions at the alternative sites would not change. However, there would likely be accelerated mounding at the Fernandina Beach ODMDS if material from the Jacksonville area were hauled to that site. Effects of this mounding on wave height near the site would be similar to those discussed for the alternative sites. There would be no effect of the No Action Alternative on regional oceanographic current and wave patterns.

4.1.3. Water Quality

The EPA's Green Book (USEPA and USACE 1991) specifies two criteria related to dilution of dredged material:

- Criterion 1. The maximum concentration of a constituent outside the disposal site boundary at any time after discharge must satisfy applicable water quality standards.
- Criterion 2. The maximum concentration of a constituent within the disposal site four hours after discharge must satisfy the water quality standards. The final concentration of a conservative constituent after mixing is expressed as the initial concentration divided by the dilution factor, assuming an ambient concentration of the constituent of zero.

4.1.3.1. Alternatives 1 through 3

Since the three alternative sites occur in the same region and have similar currents, water depths, and water column chemistry (as discussed in Sections 3.2.3. and 3.2.4), the effects on water quality are expected to be similar regardless of which alternative site is designated as an ODMDS. Impact-producing factors associated with dredged material disposal depend on the concentrations of constituents released from dredged material and on physical factors such as mixing and dilution rates. Because of the low-level releases, dilution, and the transient natures of water masses, adverse effects to water quality should be local and short-term and should

have minimal effect on the region (USEPA 1983). Most organisms are not seriously affected by suspended sediments in the water (Hirsch et al. 1978). The exceptions are those in systems sensitive to water clarity, such as coral reefs (Hirsch et al. 1978). Physical and chemical effects of ocean dredged material disposal on water resources and water quality are discussed below.

Physical Effects on Water Quality

Bottom-dumping hopper dredges or bottom-dumping barges would transit from the dredging site to the disposal location within the ODMDS and release dredged material for disposal on the ocean floor. There are a number of physical water quality effects resulting from ocean disposal of dredged material. Plumes of suspended sediment associated with sinking dredged materials would result in increases in turbidity levels, suspended particulate concentrations, and decreased light transmittance. High concentrations of suspended solids can reduce light penetration through the water column which could inhibit phytoplankton productivity or clog respiratory structures of fishes and other organisms. Duration of the turbidity plume formed depends on particle size, currents, and turbulent mixing (Wright 1978). These effects have been extensively researched at ocean disposal sites in the United States. The effects are limited to disposal operations and are localized, short-term effects dissipated by natural dispersion, mixing, and eventual sinking of particles (USEPA 2004).

The extent suspended material concentrations increase during and after barge or hopper dumping at ocean disposal sites has been studied by a transmissometer. NOAA has demonstrated that the suspended material concentrations typically returned to ambient levels in both surface and near-bottom waters in as little as 1 hour (DoN 2004). Similar trends are expected for disposal of the dredged material at the proposed ODMDS. The possibility of re-suspension of dumped sediments has also been studied at open water disposal sites as part of the Disposal Area Monitoring System monitoring undertaken by USACE (SAIC 1980, 1989 in DoN 2004). Generally, these studies have found that ocean disposal mounds sited within depositional areas at proper depth were quite stable even during storm events.

Typically, the disposal of dredged material will result in short-term, localized effects to water quality parameters. The discharge of dredged material will result in a localized turbid plume that will dissipate with distance from the disposal site. The turbidity plume consists of the transport-diffusion of the collapsed dredged material cloud and fine material lost to the water column at the top of the collapsing cloud (USEPA 1994). Heavier sediments, such as coarse particles, will descend more rapidly than finer sediments. Finer sediments, such as silt and clay particles, will descend more slowly but will be subject to dispersal and dilution. Suspended sediment concentrations are greatest near the bottom and decrease towards the surface. In addition, the plume is transported more quickly near the surface than along the bottom due to the current gradient. Dissolved oxygen concentrations may be decreased within the plume.

Background turbidity levels within the project area range from 5 to 9 mg/l, based on results from the 2010 site designation study (ANAMAR 2011). Modeling conducted at similar ODMDSs offshore of Tampa and Fort Pierce, Florida, indicate that turbidity plume concentrations can be expected to decrease to background levels of 0.5 to 3.0 mg/l (Tampa area) and between 5.0 and 24 mg/l (Fort Pierce) within 6 hours of disposal and a distance of 1 to 2 nmi (USEPA 1994, USACE 1993).

Chemical Effects on Water Quality

If sediment contaminants are present within the plume (e.g., trace metals, hydrocarbons, pesticides, nutrients, etc.), it may result in temporary elevated levels in the affected water column. Nutrients are essential for growth and reproduction of phytoplankton; however, under

certain conditions and at elevated levels, these nutrients can promote eutrophication and subsequent depletion of dissolved oxygen. Several trace metals are necessary micronutrients for life processes of organisms. However, elements such as mercury and cadmium can be toxic and/or and cause sublethal effects when ingested in sufficient quantities by marine organisms.

EPA regulations (40 CFR 227.29) require that water quality modeling be conducted (e.g., the STFATE model) prior to disposal of dredged material to determine if contaminants in the sediment will reach levels exceeding the water quality criteria. The STFATE model of dredged material disposal in open water is used to evaluate dissolved contaminant concentrations in the water column resulting from the disposal of dredged sediment from barges and hopper dredges. The model can determine the potential for water column impacts by comparison of predicted dissolved contaminant concentrations, as determined by an elutriate test, with the applicable water quality standards, considering the effects of mixing with ambient waters. The results of STFATE simulations are the maximum dissolved concentration of a contaminant within a defined mixing zone over a 4-hour period. This concentration is compared to the water quality standard to determine if the discharge complies with water quality guidelines.

In general, the range of dilution factors for maintenance dredged material would be expected to be similar for the alternative sites based on the similarity in water depths, current velocities, and sediment physical characteristics of dredged material. Sediment physical characteristics, disposal volumes, and the dredging technique affect the amount of dilution. Based on previous evaluations of dredged material disposal at the existing Jacksonville ODMDS, dilution rates can range from 140 to 2760 after 4 hours (USACE 2010c).

Sediment characteristics from material historically dredged from Naval Station Mayport and the Jacksonville Harbor Navigation Project are provided in Section 3.1.2. Material from these areas has been disposed of offshore since the 1970s and earlier. Tier III analyses and evaluation have been performed previously on material originating from these areas to evaluate the impact of disposal of dredge material from these sites. Tier III tests include (1) determination of water column toxicity and (2) assessment of toxicity and bioaccumulation from the material to be dredged. These tests indicate that no long-term impacts to water quality have been documented.

Water column chemistry at ODMDS sites has typically shown little or no impact due to dredged material disposal in past studies. Results from status and trends assessments conducted by EPA Region 4 at the Jacksonville ODMDS show little or no changes spatially in the chemical constituents in the water column proximate to the other stations (USEPA 2010a). Previous surveys of the Fernandina Beach ODMDS indicate the water column is well mixed with no elevations in chemical concentrations and no indication of low dissolved oxygen (USEPA 2006). Based on previous survey results from the two OMDMSs in the region, disposal operations at the proposed alternative sites should not cause significant effects on concentrations of contaminants in the water column given that only dredge material of suitable quality will be permitted for disposal.

Mitigating Measures. Short-term water quality (primarily turbidity) impacts during disposal operations are unavoidable. All dredge material will be tested for the presence of contaminants as well as the potential of toxicity and sublethal effects prior to dredging using national testing guidance (USEPA and USACE 1991). Only sediments that are suitable for ocean disposal will be placed at the site. Screening of the dredge material will ensure that no significant effects to water quality would result from the ocean disposal of the material at the ODMDS.

4.1.3.2. No Action Alternative (Status Quo)

Under the No Action Alternative, a new ODMDS would not be designated offshore of Jacksonville, and therefore conditions at the alternative sites would not change. Once the existing Jacksonville ODMDS reaches capacity, dredged material originating in Duval County could potentially be disposed of at the existing Fernandina Beach ODMDS. If dredged material is hauled to the Fernandina Beach ODMDS, there may be an increase in temporary localized impacts to water quality in the vicinity of the Fernandina Beach ODMDS due to increased frequency of disposal events. These effects would be similar to those discussed for the alternative sites. However, if dredging and disposal of dredged material offshore were decreased due to limited ODMDS capacity, then impacts to water quality could potentially be decreased.

4.1.4. Sediment Characteristics

Sediment quality impacts would be significant if the sediments proposed for disposal at the proposed ODMDS were determined to be unsuitable for ocean disposal (e.g., did not meet the limiting permissible concentration [LPC] for the ocean disposal of dredged material as specified in 40 CFR 227). National testing guidance (USEPA and USACE 1991) sets forth procedures for comparative testing of sediments collected from proposed dredging areas and reference sites to ensure suitability for offshore disposal.

4.1.4.1. Alternatives 1 through 3

In general, the physical and chemical characteristics of sediments collected from stations located in the three alternative sites are similar (as discussed in Section 3.2.5.2); therefore, the effects of dredged material disposal are expected to be similar regardless of which alternative site is designated as an ODMDS. Overall, disposal of dredged material at any of the alternative sites is expected to result in accumulation of dredged material over the seafloor and changes in sediment characteristics within the site and possibly adjacent to the site.

Sediments that contain appreciable quantities of silt and clay have a greater adsorptive capacity for trace contaminants than coarser sediments because of their large surface area-to-volume ratios and charge densities. Accumulation of trace elements and chlorinated and petroleum hydrocarbons in sediment can have short- and long-term negative effects on marine organisms. Many benthic organisms are non-selective deposit feeders, ingesting substantial quantities of bottom sediments. The potential for bioaccumulation of trace sediment contaminants (mercury, cadmium, lead, and some chlorinated hydrocarbons) by these organisms is of particular environmental concern.

Prior to dredging and ocean disposal, sediments must be evaluated and screened using national testing guidance (USEPA and USACE 1991) to ensure that chemical constituents are below biologically significant concentrations that have adverse ecologic effects on marine organisms. In addition to toxicity assessment using acute and chronic bioassays, material should be physically and chemically consistent with an ODMDS. Only dredge material deemed acceptable under these protocols would be approved for disposal at an ODMDS. Disposal of dredged material is not expected to produce significant long-term environmental effects related to sediment chemistry and contaminants of concern.

However, sediment composition within the site may be significantly altered as a result of clay and silty material disposal on otherwise sandy sediments. Progressive transition to sediments containing a higher percentage of silt and clay is inevitable with long-term use of the site. Changes in sediment composition will likely alter the benthic community structure. However,

based on previous benthic studies, permanent or long-term adverse impacts due to changes in sediment composition are not expected. Effects on the benthic community are discussed in more detail in Section 4.2.6.

The sources of dredge material to be disposed of in the new designated ODMDS are anticipated to be primarily from the Jacksonville Harbor Navigation Project and the Naval Station Mayport entrance channel and turning basin. The physical and chemical composition of maintenance dredged material proposed for disposal in the new designated ODMDS is expected to be similar to that previously dumped at the Jacksonville ODMDS. However, there may also be a substantial amount of rock (estimated between 0.6 and 2.9 million cy) generated from the Jacksonville Harbor Deepening Project. This material would be different from what was historically placed at the Jacksonville ODMDS. This material will be managed in a separate area of the ODMDS that is specifically designated for rock disposal. The effect of placing rock in this area could potentially be beneficial by creating habitat for fish.

Results from status and trends assessments conducted by EPA Region 4 at the Jacksonville ODMDS showed all contaminants in the sediment (primarily maintenance dredged material from the Naval Station Mayport) to be below the MRLs for pesticides, semi-volatiles and PCB congeners (USEPA 2010a). Eight metals (aluminum, arsenic, chromium, copper, iron, lead, manganese, and zinc) were measured both inside and outside the Jacksonville ODMDS above the MRLs. None of the metals were reported above the NOAA TELs or above the ERLs for metals (Buchman 2008). Tri-n-butyltin, di-n-butyltin, and n-butyltin were detected at stations both inside and outside the Jacksonville ODMDS. None of the 26 PCB congeners were detected in sediment at the Jacksonville ODMDS.

Based on previous survey results from the Jacksonville ODMDS, disposal operations at the proposed alternative sites should not cause significant effects on concentrations of contaminants in the sediments. Only material that has been evaluated in accordance with EPA and USACE protocols will be deemed suitable for ocean disposal (e.g., non-toxic); therefore, no unacceptable adverse chemical or biological impacts are expected outside the disposal site boundary.

Mitigating Measures. Impacts related to changes in bathymetry and sediment composition as a result of accumulations of dredged material in the site are unavoidable. To minimize the significance and monitor impacts of disposal on the site, several measures have been incorporated in the SMMP (Appendix F), including:

- Periodic monitoring of the site and surrounding area will be conducted to determine changes in bathymetry, sediment composition, short-term and long-term fate of materials, and benthic community structure.
- Disposal of material will be initiated within the disposal zone. Project-specific release zones can be defined within the disposal zone to better distribute dredged material throughout the ODMDS.
- An electronic tracking system will be utilized to provide surveillance of the transportation and disposal of dredged material.

4.1.4.2. No Action Alternative (Status Quo)

Under the No Action Alternative, a new ODMDS would not be designated offshore of Jacksonville, and therefore conditions at the alternative sites would not change. Once the existing Jacksonville ODMDS reaches capacity, dredged material originating in Duval County

could potentially be disposed of at the existing Fernandina Beach ODMDS. If dredged material is hauled to the Fernandina Beach ODMDS, the additional volume of dredged material historically going to that site would increase and cause it to reach capacity sooner. Effects of sediment disposal at Fernandina ODMDS would be similar to those discussed for the alternative sites.

4.2. Effects on the Biological Environment

The following sections examine the potential effects of dredged material disposal on the biological environment at the three alternative sites and for the No Action alternative. Biota include phytoplankton, zooplankton, benthic fauna composed of infaunal and epifaunal organisms, fishes, seabirds, and marine mammals.

A biological impact was considered significant if it

- Is expected to affect the population status of a state or federally listed, proposed, or candidate threatened or endangered species or is expected to affect the breeding or foraging habitat of such species so as to result in increased mortality or reduced reproductive success;
- Causes the loss or long-term degradation of any environmentally sensitive species;
- Interferes substantially with the movement of any resident or migratory fish or wildlife species; or
- Causes a measureable change in species composition or abundance of a sensitive community or causes a substantial, long-term change to marine habitats.

Relevant statutory and regulatory protections include the ESA (protects listed species and their critical habitats), MMPA (protects all marine mammals), CWA (protects the nation's waters), MSA (protects essential fish habitat), MPRSA (ensures that ocean dredged material disposal activities will not unreasonably degrade or endanger the amenities or the marine environment), and the MBTA and Executive Order 13186 (protects migratory birds and their habitats). Temporary impacts of limited extent would not normally be considered significant, provided applicable regulatory requirements are satisfied.

4.2.1. Threatened, Endangered, and Special Status Species

The mandate of the ESA is to ensure that endangered and threatened species are protected and that government departments and agencies take all reasonable and prudent precautions to assure that their activities do not jeopardize the continued existence, or destroy or adversely modify the critical habitats of listed species (Dickerson et al. 2004). Other non-USACE users of the ODMDS will be responsible for conducting their own ESA consultations as part of their permitting process and similar reasonable and prudent measures are expected to be required.

As described in Section 3.3.1, ten species listed as threatened or endangered under the ESA potentially occur within the vicinity of the three alternative sites (Table 3.3-1). Within the project area, critical habitat has been designated for the North Atlantic right whale (Figure 3.3-1) and includes calving and nursery grounds (Figure 3.3-4). The Biological Assessment included with this EIS (Appendix C) discusses life history traits of threatened and endangered species in detail, identifies potential impacts on the species as a result of the proposed action, and provides protection and conservation recommendations.

It is not expected that dredged material disposal at any of the alternative sites will adversely affect these threatened and endangered species because the area of the site is small (4 nmi^2) in comparison to their total available ocean habitat, because of the wide-ranging habits of these species, and because they are highly mobile and can avoid areas during dumping activities. No loss of critical foraging habitat, significant increases in mortality, or reductions in reproductive success for these species is expected to occur relative to the entire region as a result of the proposed action. It is unlikely that dredged material disposal operations would affect migration, feeding, or reproductive activities of marine mammals and sea turtles. While many marine species, including the North Atlantic right whale, may pass through the alternative sites, passage is not geographically restricted to these areas.

4.2.1.1. Sea Turtles

The impacts of dredging operations on sea turtles have been assessed by NMFS in the various versions of the South Atlantic Regional Biological Opinion (SARBO). The SARBO also includes the life history of the sea turtle species commonly found in north Florida; this information has been incorporated in the Biological Assessment prepared for this EIS (Appendix C). In addition, the species' individual recovery plans are incorporated by reference (NMFS 2003; NMFS and USFWS 1991a, 1991b, 1992b, 1993, 1995).

The SARBO has established environmental windows that restrict dredging operations during the nesting season to minimize impacts to nesting sea turtles. USACE will comply with the terms and conditions of the most current SARBO for all maintenance dredging actions. Permit applicants will also comply with the SARBO. New work projects will require their own Biological Opinion. It is important to note that this EIS does not address effects specifically associated with dredging activities on sea turtles because they are addressed for each individual dredging project.

4.2.1.1.1 Alternatives 1 through 3

Since all of the alternative sites occur in the same region, are located a similar distance offshore (between 3.6 and 7.1 nmi), and have similar depths (average depth between 53 and 57 ft), there is no significant difference in the occurrence or abundance of sea turtles between the three alternative sites. Therefore, given the similarity of existing conditions, the effects on sea turtles associated with designating a new ODMDS in the area would be similar for all three of the alternative sites. The impact-producing factors associated with dredged material disposal include:

- Vessel traffic
- Foraging
- Turbidity
- Underwater noise from dredging equipment

<u>Vessel Traffic</u>
Since sea turtles spend time breathing and sunning on the surface of the water, the potential impacts to sea turtles as a result of the proposed action are primarily associated with an increased risk of collisions with vessels (e.g., hopper dredges, tugboats, and scows) transiting to and from the designated disposal site. The risk would vary depending upon location, vessel speed, and visibility.

During the hatching season, it is believed that hatchling turtles leave their nesting beaches and swim offshore to areas of water mass convergence. A moving vessel may have difficulty spotting hatchling and juvenile turtles in these areas, especially when the individuals lie within

patches of floating sargassum. Female turtles departing from a nesting site are known to stay nearshore in shallow water and may be less capable of reacting to and avoiding vessels (NMFS and USFWS 1992). However, adult turtles are generally visible at the surface during periods of daylight and clear visibility.

Foraging and Turbidity

Disposal activities at the ODMDS can potentially reduce food availability by burying and altering the benthic habitat and creating temporary increases in turbidity. The effect of increased turbidity on sea turtles is expected to be minimal due to the short duration of the reduced water clarity. The effects of burial on benthic infauna could be persistent within the boundaries of the ODMDS since disposal operations repeatedly impact the same area, potentially making it difficult to for benthic infauna to fully recover within the disposal footprint or altering species composition. However, the 4-nmi^2 ODMDS represents only a small portion of this type of benthic habitat available in the region, and only a small portion of the ODMDS would be impacted during each disposal event. Additional information on impacts to benthic resources is discussed in Section 4.2.5.

Underwater Noise from Dredging Equipment

Little is known about how sea turtles may respond to noise from offshore disposal activities. In contrast to marine mammals, relatively little is known about sea turtle hearing ability or their dependency on sound, passive or active, for survival cues. Only two species, loggerhead and green sea turtles, have undergone auditory investigations. The anatomy of the sea turtle ear does not lend itself to aerial conduction but rather is structured for sound conduction through bone and water (Békésy 1948, Lenhardt 1982, Lenhardt and Harkins 1983). Auditory testing and behavioral studies show that turtles can detect low-frequency sounds (Ridgeway et al. 1969, Bartol et al. 1999).

It is likely that sea turtles could hear low-frequency underwater noise from vessel engines as they transit to and from the disposal sites and could possibly experience some disturbance. The most likely impacts would be short-term behavioral changes such as evasive maneuvering, disruption of activities, or short-term departure from the area. Impacts are considered negligible and therefore not likely to adversely affect sea turtles within the project area.

Sea Turtle Mitigation Measures

In general, to minimize the potential for collisions, vessels transporting dredged materials to the ODMDS are expected to implement protective measures, where feasible, to avoid interactions with sea turtles, including maneuvering away from the animal or slowing the vessel, particularly during poor sighting conditions (i.e., fog, high sea state, darkness). During transport of dredged material to the ODMDS and when returning to the dredging site, vessels would use caution and proceed at a speed such that the vessel can safely take proper and effective action to avoid a potential collision with a sea turtle; this preventative action would significantly reduce the potential for a vessel strike with a sea turtle. Any collision with and/or injury to a sea turtle shall be reported immediately to the NMFS's Protected Resources Division and the local authorized sea turtle stranding/rescue organization.

Despite these precautions, turtles may prove very difficult to spot from a moving vessel when they are resting below the water surface, during nighttime, and during periods of inclement weather. It is assumed, however, that a collision between a sea turtle and moving vessel is unlikely. Adult, subadult, and perhaps juvenile turtles are capable of avoiding moving dredge-related vessels, especially when the vessels operate within these limited areas at slow to

relatively slow speeds. Impacts from collisions are, consequently, not likely to adversely affect marine turtle populations within the project area.

Biological Assessment
More detailed information on sea turtle life history traits and impacts associated with the proposed action is available in the Biological Assessment submitted to NMFS and included in Appendix C. It is the determination of EPA that while designation of a new ODMDS may affect sea turtles under NMFS jurisdiction, the project is not likely to adversely affect them. Concurrent with the distribution of this draft EIS, EPA has requested that NMFS concur with the above determination.

4.2.1.1.2 No Action Alternative (Status Quo)

Under the No Action Alternative, a new ODMDS would not be designated offshore of Jacksonville. Once the existing Jacksonville ODMDS reaches capacity, dredged material originating in Duval County could potentially be disposed of at the existing Fernandina Beach ODMDS. If material is hauled to the Fernandina Beach ODMDS, effects of ocean dredged material disposal on sea turtles would be similar to those discussed above. Due to the increased hauling distance to the Fernandina Beach ODMDS, the risk of collisions may be increased. If ocean dredged material disposal were decreased due to a lack of capacity at ODMDSs in the region, then impacts related to vessel collisions, offshore foraging, and noise associated with hauling and dumping would be decreased.

4.2.1.2. Fishes

4.2.1.2.1 Alternatives 1 through 3

As discussed in Section 3.3.1.2, shortnose sturgeon, Atlantic sturgeon, and smalltooth sawfish may be present, but are not likely occur in the project area. Since the alternative sites occur in the same region, the effects associated with designating a new ODMDS in the area would be similar for all three of the alternative sites. The impact-producing factors associated with dredged material disposal include:

- Vessel traffic
- Foraging
- Turbidity
- Underwater noise from dredging equipment

Vessel Traffic
FWRI concluded that with the lack of current sightings in surveys, the patchy and extremely infrequent catch of small individuals, and the historic low numbers, it is highly unlikely that a significant population of shortnose or Atlantic sturgeon currently resides within the St. Johns River. The proposed ODMDS will be located several miles offshore of the mouth of the St. Johns River where the presence of shortnose or Atlantic sturgeon is unlikely. In the unlikely event shortnose or Atlantic sturgeon are present in the project area, they should not be affected by the dredges transiting to or from the ODMDS because the dredges (or other vessels) advance at a slow pace and are noisy, giving mobile shortnose or Atlantic sturgeon the opportunity to get out of the way. Therefore, impacts to sturgeons associated with vessels transiting to and from the disposal site would be minimal and are not likely to adversely affect them.

Smalltooth sawfish have not been sighted in the project area. The closest sawfish encounter documented in Mote Marine Laboratory's Sawfish Encounter Database (1999 to 2006) (now

part of the National Sawfish Encounter Database at the Florida Museum of Natural History) was in the Atlantic Ocean near St. Augustine (Simpendorfer and Riley 2006). In the unlikely event sawfish are present in the project area, they should not be affected by the dredge vessels transiting to and from the ODMDS because the vessels advance at a slow pace and are noisy, giving mobile sawfish the opportunity to get out of the way. Also, smalltooth sawfish would be closer to the bottom than near the surface so collisions with transiting vessels are not anticipated. Therefore, smalltooth sawfish are not likely to be adversely affected by the proposed action.

Foraging and Turbidity
Disposal activities will cause an increase in turbidity at the disposal site. Increased turbidity due to suspended sediments in the water column may physically stress fish by clogging their opercular cavities and gill filaments and reducing the absorption of dissolved oxygen. Adults can avoid the suspended material by moving out of the area, but juvenile fish may be more vulnerable and susceptible to stress (USEPA 1986b). Due to the short duration of the reduced water clarity and the unliklihood of occurrence in the project area, impacts on shortnose sturgeon, Atlantic sturgeon, and smalltooth sawfish are considered negligible.

Underwater Noise from Dredging Equipment
In general, the sources and levels of underwater noise generated during transit to the site and disposal activities are expected to be short-term. Since these species are not likely to occur in the project area and could easily move away from or avoid disturbance caused by disposal activities, no impacts are expected.

Biological Assessment
More detailed information on the life history traits of shortnose and Atlantic sturgeon and smalltooth sawfish is available in the Biological Assessment submitted to NMFS and included in Appendix C. It is the determination of EPA that the designation of a new ODMDS is not likely to adversely affect these species. Concurrent with the distribution of this draft EIS, EPA has requested that NMFS concur with the above determination.

4.2.1.2.2 No Action Alternative (Status Quo)

Under the No Action Alternative, a new ODMDS would not be designated offshore of Jacksonville. Once the existing Jacksonville ODMDS reaches capacity, dredged material originating in Duval County could potentially be disposed of at the existing Fernandina Beach ODMDS. The effects of ocean dredged material disposal on fishes in the vicinity of the Fernandina ODMDS would be similar to those discussed for the alternative sites.

4.2.1.3. Marine Mammals

As discussed in Section 3.3.1.3, North Atlantic right whales may be present in the project area during the wintering and calving period. All of the alternative sites and existing ODMDSs are also located within right whale critical habitat (Figure 3.3-1). Humpback whales may also travel through the project area. Florida manatees may, but are not likely to, occur within the any of the alternative sites. However, they could be encountered during travel to the ODMDS so they are considered in this effects assessment.

4.2.1.3.1 Alternatives 1 through 3

Since the alternative sites occur in the same region, the effects to threatened and endangered marine mammals associated with designating a new ODMDS in the area would be similar for all

three alternative sites. The impact-producing factors associated with dredged material disposal include:

- Vessel traffic
- Foraging
- Turbidity
- Underwater noise from dredging equipment

Vessel Traffic

Marine mammals are unlikely to be physically injured by disposal operations because they generally do not rest on the bottom and most can avoid contact during disposal operations. However, physical injury from vessel strikes as the dredge and support vessels travel to and from the disposal site is a concern, particularly for the North Atlantic right whale and humpback whale. Right whales are particularly susceptible due to their surface resting and slow swimming habits. Vessel strikes account for the largest number of confirmed right whale deaths (Zani et al. 2008). According to the NMFS Large Whale Ship Strike Database, as of 2004, right whales were the fourth most commonly struck whale species in the world. The region comprised of the southeastern United States and the Caribbean had the fifth-highest number of vessel strikes on all whale species in the world and was highest in vessel strikes for all of North America. When speed was recorded for individual vessel strike events, the most common vessel speed was 13 to 15 knots. Substantially fewer strikes occurred for vessels traveling at speeds less than 10 knots (Jensen and Silber 2004).

The project area is inside the Early Warning System (EWS) areas between Brunswick, Georgia, and St. Augustine, Florida, and the Cape Cod Bay and Mid-Atlantic zones. The project area is also located within right whale critical habitat; therefore, there is a possibility of encounters with right whales while transiting to/from any of the alternative sites. The risk varies depending upon location, vessel speed, and visibility. With regard to location, historical occurrence data and sightings-per-unit-effort data indicate there is a higher abundance of right whales in areas north of the St. Johns River (Figures 3.3-5 and 3.3-6). Alternative 3 and the Fernandina Beach ODMDS are both located north of the St. Johns River, which may increase the risk of collisions during transit to and from the dredging site.

Impacts to Florida manatees are not expected at the ODMDS alternative sites. Sightings of manatees are typically restricted to warm freshwater, estuarine, and extremely nearshore coastal waters (DoN 2007). Florida manatees rarely occur in offshore waters, where abundant seagrass and vegetation are not available (Reynolds III and Odell 1991). However, they are extremely vulnerable to vessel strikes within inshore waters from transiting vessels.

Foraging and Turbidity

The discharge of dredged material will result in a localized turbid plume that will dissipate with distance from the disposal site. Marine mammals in and near the disposal site may encounter turbid water during disposal activities. Temporary impairment of foraging activities may be attributable to disturbances caused by disposal and subsequent reductions in water clarity (USEPA 1993); however, the animals could easily swim to avoid turbid areas. Burial of food resources such as crustaceans and epipelagic (surface dwelling) fish could also potentially impact foraging success. Due to the limited extent and short duration of the reduced water clarity, potential impacts on marine mammals related to turbidity (such as reduced foraging) are considered negligible. The effects of burial on benthic infauna could be persistent within the boundaries of the ODMDS since disposal operations repeatedly impact the same area, potentially making it difficult to for benthic infauna to fully recover within the disposal footprint or

altering species composition. However, the 4-nmi^2 ODMDS represents only a small portion of this type of benthic habitat available in the region, and only a small portion of the ODMDS would be impacted during each disposal event.

Underwater Noise from Dredging Equipment

Hopper dredge sounds consist of a combination of sounds emitted from two relatively continuous sources: engine and propeller noise similar to that of large commercial vessels and sounds of dragheads moving in contact with the substrate (Clarke et al. 2003; Thomsen et al. 2009). Noise sources at the ODMDS would only involve engine and propeller noise during transit and disposal activities.

To date, no studies specific to U.S. marine mammals and noise associated with dredging activities have been conducted. The studies that do exist focus more specifically on impacts related to noise created during actual dredging activities (dragheads) as opposed to during transit and disposal activities (engine and propeller noise). Results from some of these studies are provided below for informational purposes; however, the noise levels created during transit and disposal activities are expected to be much less than during actual dredging activities.

Previous studies conducted in the United Kingdom indicate that dredging can trigger avoidance reaction in marine mammals and marine fish can detect dredging noise over considerable distances (Richardson et al. 1995, Defra 2003). Noise associated with dredging is predominantly of low frequency (below 1 kHz), and the estimated source sound pressure levels range between 168 and 186 dB re 1 μPa at 1 m (Thomsen et al. 2009). Defra (2003) measured sound spectrum levels emitted by an aggregate dredger at different distances and found most energy to be below 500 Hz.

Richardson et al. (1995) provides an overview of investigations into behavioral responses of cetaceans to dredging. Bowhead whales (*Balaena mysticetus*) did not apparently respond to a suction dredge in one study, but individuals avoided these dredges when exposed to 122 to 131 dB re 1 μPa (or 21-30 dB above ambient noise) in another investigation (Richardson et al. 1990). Gray whales (*Eschrichtius robustus*) ceased to use a particular breeding lagoon after an increase in industrial activities, including shipping and dredging (Bryant et al. 1984). However, it is not clear if this was due to sound or the increased presence of ships.

Noise levels are not sufficient to cause hearing loss or other auditory damage to marine mammals (Richardson et al. 1995). However, marine mammals in the vicinity may exhibit avoidance during disposal activities. An additional potential impact may be alteration of marine mammal passage routes to avoid noise from ship traffic or from increased water turbidity during or following disposal activities (USEPA 1993). To date, NMFS has not made a determination that sound generation associated with dredging operations, or any other vessel operations, will be considered Type B harassment (significant disruption of behaviors critical to survival and reproduction) which would require an Incidental Harassment Authorization for operations.

Marine Mammal Mitigation Measures

To minimize project impacts on right whales and other marine mammals related to transporting dredged material to the new ODMDS, USACE will comply with the terms and conditions of the most recent Biological Opinion.

Biological Assessment

More detailed information on life history traits of endangered marine mammals and potential impacts is available in the Biological Assessment submitted to NMFS and included in

Appendix C. It is the determination of EPA that while designation of a new ODMDS may affect right whales and humpback whales, the project is not likely to adversely affect them. It is the determination of EPA that designation of a new ODMDS is not likely to adversely affect manatees. Concurrent with the distribution of this draft EIS, EPA has requested that NMFS concur with the above determination.

4.2.1.3.2 No Action Alternative (Status Quo)

Under the No Action Alternative, a new ODMDS would not be designated offshore of Jacksonville. Once the existing Jacksonville ODMDS reaches capacity, dredged material originating in Duval County could potentially be disposed of at the existing Fernandina Beach ODMDS. Since the Fernandina Beach ODMDS is located north of the St. Johns River and farther away than the three proposed alternative sites, there could be an increased risk of vessel strikes involving right whales and humpback whales a due to increased vessel traffic and the increase in hauling distance through right whale critical habitat. However, if dredging operations are limited due to lack of offshore disposal capacity in the region, impacts to right whales and humpback whales could be decreased.

4.2.2. Non-Threatened Marine Mammals

4.2.2.1. Alternatives 1 through 3

As a result of the homogeneity of water quality and prey distribution between the three alternative sites, the impacts of ocean dredged material disposal on the marine mammals are expected to be similar for each alternative. Potential disposal impacts on marine mammals may include provisional impairment of foraging behavior as well as alteration of migratory passage routes ascribable to disposal noise disturbances, reductions in water clarity caused by the subsequent disposal plume, and the possible reduction in prey items. These potential effects are constrained to the duration of discrete disposal operations.

Noise from commercial vessel traffic is considered the most dominant continuous and ubiquitous source of anthropogenic noise in the ocean (Payne and Webb 1971). Most marine mammals are either attracted to or repelled by the occurrence of a ship, and many seek to avoid vessels. Responses usually consist of moving toward the ship (some dolphins and porpoises), away from the ship (some dolphins, porpoises, and whales), or submerging (all marine mammals). Acoustic pollution is of special concern for cetaceans, which are known to be a very vocal taxonomic group dependent on sound for communicating, navigating, and foraging. Increased stress levels, abandonment of important habitat, and the obscuring or interference of natural sounds (known as masking) are some of the ways populations may be threatened by noise (Weilgar 2007). Such population-level effects are, however, particularly difficult to detect in cetaceans because of a deficiency of accurate basal population estimates. Cetaceans have also exhibited short-term responses to human-produced reverberations including longer dive times, shorter surface intervals, evasive movements away from the sound source, attempts to shield young, increased swimming speed, changes in song note durations, and departure from the area (Croll et al. 2001).

The contribution of acoustic pollution by dredged material disposal vessels can be considered minor in relation to the vast majority of existing commercial ship and recreational boating traffic in the area. Impairment of foraging behavior as well as alteration of migratory passage routes ascribable to disposal noise disturbances can be considered provisional to the duration of disposal operations and constrained within the vicinity of the disposal plume. Disposal of fine material characteristic of Naval Station Mayport will result in a greater temporary localized increase of water column turbidity relative to disposal of coarse-grained material characteristic

of Jacksonville Harbor. This will consequently reduce the availability and accessibility of marine mammal prey such as squid, small schooling fishes, and pelagic fishes. Owing to the patchy allocation of these prey species, this effect on marine mammals is considered localized as well as temporary. Due to these spatial and temporal impact constraints coupled with the ability of marine mammals to employ assorted avoidance behaviors, dredged material disposal impacts are designated as less than significant in the three alternative sites.

4.2.2.2. No Action Alternative (Status Quo)

Under the No Action Alternative, the ODMDS would not be designated, and therefore conditions at the alternative sites would not change. The No Action Alternative would not have any effects on marine mammals at the alternative sites. However, if an ODMDS is not designated, the planned volume of material to be dredged from Jacksonville Harbor and Naval Station Mayport would still need to be managed. Once the existing Jacksonville ODMDS reaches capacity, dredged material originating in Duval County could potentially be disposed of at the existing Fernandina Beach ODMDS. The effects of ocean dredged material disposal at the Fernandina ODMDS on marine mammals would be similar to those discussed for the alternatives sites.

4.2.3. Seabirds

4.2.3.1. Alternatives 1 through 3

Seabirds common in the study area include frigate birds and members of the families Laridae (gulls) and Sternidae (terns). Species federally listed as threatened that may feed in the study area are the least tern and roseate tern. The least tern is present in all but the winter months (November through February), with peak numbers occurring during nesting season from April to August (Zarillo et al. 2009). Roseate terns may occur in the study area as they migrate throughout Florida in spring and fall.

As a result of the homogeneity of water quality and prey distribution between the three alternative sites, the impact of ocean dredged material disposal on the marine birds is expected to be similar for each of the alternative sites. Currently there is inadequate information on the potential influences of ocean dredged material disposal on local and transient bird populations, as no directed studies of impacts have been conducted. However, since the project area is located offshore, away from known breeding colonies, disposal of dredged material at any of the alternative sites would have no direct effect on nesting areas. Potential direct impacts to seabird species involve ingestion of discarded debris during disposal. Potential indirect impacts may include ship-following behavior, temporary reductions in prey items, and visual impairment of marine birds foraging in the vicinity of the disposal plume (USEPA 1993). It is anticipated that many pelagic prey organisms will exhibit various escape behaviors in response to dredged material disposal, which may result in reduced populations of some organisms in the immediate area. Therefore, foraging success of marine birds may be reduced temporarily following disposal activities (USEPA 1993). It has been suggested that reductions in water clarity following disposal operations may temporarily inhibit feeding activities of marine birds that typically forage in surface waters (DoN 1993). However, significantly reduced clarity in surface waters will be restricted to the immediate release site. These potential impacts should be localized and of relatively short duration and are not expected to significantly affect the breeding, feeding, or passage of marine birds that occur in the study region. These prospective effects are constrained to the duration of discrete disposal operations.

Disposal of fine silty material will take longer to settle than coarser sandy material. Disposal of fine material characteristic of Naval Station Mayport would result in a greater temporary, localized increase of water column turbidity relative to disposal of coarse-grained material

characteristic of Jacksonville Harbor. This would consequently reduce the availability and/or accessibility of prey, along with potentially limiting the foraging efficiency of plunge-and pursuit-diving seabirds. Owing to the patchy allocation of these prey species near the ocean surface and the availability of similar open-ocean foraging habitat in the region, this effect on marine birds is considered localized as well as temporary.

4.2.3.2. No Action Alternative (Status Quo)

Under the No Action Alternative, the ODMDS would not be designated and conditions at the alternative sites would not change. The No Action Alternative would not have any effects on marine birds at the alternative sites. However, if an ODMDS is not designated, the planned volume of material to be dredged from Jacksonville Harbor and Naval Station Mayport would still need to be managed. Once the existing Jacksonville ODMDS reaches capacity, dredged material originating in Duval County could potentially be disposed of at the existing Fernandina Beach ODMDS. The effects of ocean dredged material disposal at the Fernandina ODMDS on marine birds would be similar to those discussed for the alternatives sites.

4.2.4. Plankton

4.2.4.1. Alternatives 1 through 3

Since Alternatives 1 through 3 are in the same region, effects on plankton are expected to be similar. Any potentially significant impacts would most likely involve contact with slower-settling silt and clay particles in the disposal plume and extended impact zone. Potential effects of disposal-related turbidity on planktonic organisms are difficult to assess due to the transient nature of the dredged material plume and the free-floating or mobile characteristics of the organisms (USEPA 1993). Additional factors that complicate impact assessments are seasonal and annual variations in plankton productivity, standing stock, and species composition.

Dredged material disposal impacts could include the direct loss of entrained organisms in the discharge plume, temporary inhibition of phytoplankton photosynthesis due to increased turbidity, physical interference of food ingestion by filter-feeding organisms, and the uptake and potential bioaccumulation of particulate-bound contaminants (e.g., ingestion or filter feeding).

Turbid plumes associated with dredged material disposal can provisionally attenuate light penetration in the photic zone, thereby reducing primary production by as much as 50% prior to plume dissipation (Chan and Anderson 1981). Zooplankton can ingest clay and mineral particles that in turn take up space in the gut that might otherwise be occupied by food particles. Because suspended sediments impede the ingestion and assimilation of food particles, events that increase suspended sediment concentrations for even short periods of time, without otherwise altering food concentrations, could reduce growth or reproduction (USEPA 2010b). Increased proportions of sediment in fecal pellets as measured in sediment concentrations greater than 1,000 mg/L have been correlated with decreased egg production by the copepod *Acartia tonsa* (White and Dagg 1989).

The duration of the effect on primary production in a disposal plume will depend on the time it takes for the plume to dissipate (See Section 4.1.3). Disposal of mostly coarse-grained material, such as that from Jacksonville Harbor, is expected to have an insignificant effect on plankton communities within any of the disposal areas. Slower-settling silt and clay particles, such as those from Naval Station Mayport, may have potentially significant temporary localized impacts on plankton communities. Potential adverse effects on planktonic organisms will likely occur during the first few hours following disposal, before mixing processes dilute the discharge. Discontinuous disposal activity at the ODMDS can minimize effects since plankton communities

are subject to high turnover rates. Even the complete loss of the plankton community within the disposal mixing zone would likely produce only a temporary impact as plankton can reproduce rapidly. The major concern would be for planktonic egg and larval stages of benthic or nektonic marine species that can be affected during their presence in the plankton community. Even this potential impact could be considered minimal if the disposal site was significantly small relative to the size of the regional spawning grounds and larval transport routes; or if the time allocated to disposal operations represented only a short period in the entire breeding season (Alden et al. 1982). Rapid dilution of the suspended sediment plume with increasing time and distance from the point of discharge makes it unlikely that there would be any unacceptable adverse impacts to the plankton communities outside of the disposal site boundaries.

4.2.4.2. No Action Alternative (Status Quo)

Under the No Action Alternative, the ODMDS would not be designated and conditions at the alternative sites would not change. The No Action Alternative would not have any effects on plankton at the alternative sites. However, if an ODMDS is not designated, the planned volume of material to be dredged from Jacksonville Harbor and Naval Station Mayport would still need to be managed. Once the existing Jacksonville ODMDS reaches capacity, dredged material originating in Duval County could potentially be disposed of at the existing Fernandina Beach ODMDS. Impacts to plankton associated with disposal activities at the Fernandina Beach ODMDS would potentially be increased due to an increased frequency of disposal events. These effects are similar to those described for the three alternatives.

4.2.5. Benthic Fauna

Benthic biota, especially the infauna, are generally sedentary and cannot readily emigrate from an area of disturbance. Therefore, the infauna can be important indicators of environmental conditions.

4.2.5.1. Alternatives 1 through 3

Since the alternative sites occur in the same region and have similar benthic communities, the effects to benthic infauna associated with dredged material disposal would be similar for all three of the alternative sites. The impact-producing factors associated with dredged material disposal include:

- Burial of benthic organisms
- Change in composition of sediments

Benthic communities provide an important food or energy resource for higher trophic levels, including demersal fish and large epifaunal organisms (Zarillo et al. 2009, Feller and Kaczynski 1975, Elmgren 1976, Ahheit and Scheibel 1982). As a result, changes in benthic community structure may result in changes in other trophic levels dependent upon the benthos. Table 4.2-1 summarizes the possible direct effects of physical disturbance, such as dredged material disposal, at various levels of benthic community organization.

Table 4.2-1. Possible Effects of Dredged Material Disposal on Offshore Benthos

Level of Organization	Possible Effects
Individual	Increased probability of death or injury
	Energetic cost of re-establishing
	Effect on reproductive output
	Effect on food availability
	Exposure to predation or displacement
	Provision of colonizable space
	Competitive release
Population	Changes in density
	Changes in recruitment intensity and/or variability
	Changes in dispersion patterns
Community	Changes in species diversity
	Changes in overall abundance
	Changes in productivity
	Changes in the patterns of energy flow or nutrient recycling

Source: Hall 1994

Effects of Burial

Deposition of dredged materials will bury and smother localized populations of benthic organisms, thereby reducing abundance and diversity of the benthic communities in the immediate area of dumping. The magnitude of this impact will depend on the extent of the affected area, volume of dredged material disposed, depth and duration of burial, frequency of disposal events, textural and mass properties of the deposited sediment, water temperature, the species experiencing burial, and specific tolerances of affected species to periodic burial (USEPA 1993, 2004).

The ability of buried infauna (or epifauna) to re-establish normal depths and orientations within bottom sediments is an adaptation for surviving burial from natural events such as storm-related changes in sedimentation. Highly mobile epifaunal species have the potential to avoid areas subject to burial, while infaunal species are unlikely to avoid material as it is deposited. However, infaunal species tend to be more resistant to burial than epifaunal species since the infauna have a greater ability to burrow through the sediments once buried. The recovery of impacted areas will reflect the ability of buried organisms to burrow through the sediment layer and the ability of adjacent populations to recolonize the area. Differences in grain size characteristics between the dredged materials and the existing site sediments could exacerbate impacts to the benthic fauna. Alterations in the bottom sediment texture could affect the survival of existing species or recruitment of new species. Benthic assemblages requiring hard substrate or structure will be less tolerant of burial and less able to recolonize than those assemblages associated with sand or sand-silt substrates (USEPA 2004).

As dredged material is placed at the ODMDS, most sessile (stationary) marine invertebrates are not expected to survive burial. Some motile (capable of movement) marine organisms would be buried and unable to survive, while others such as burrowing specialists may survive. Survival rates depend primarily on burial depth and frequency of disturbance. Repeated burials could weaken benthic and motile organisms, resulting in direct or indirect mortality (e.g., greater susceptibility to predation, parasites, disease). Frequencies of disturbance that are less than 1 year tend to keep the colonizing benthos in an early successional stage, while burial frequencies much greater than 1 year allow colonization of higher-order successional species with longer mean life spans and more conservative reproductive strategies (Rhoads et al. 1978).

The impact of burial has been quantified for several species in estuarine environments. For example, Kranz (1974) determined the depth of burial that caused mortality of several bivalve species. The critical burial depth for epifaunal suspension feeders was less than 5 cm, while infaunal deposit-feeders could survive and burrow through as much as 50 cm of overburden. *In situ* burial experiments by Nichols et al. (1978) indicated that overburden thicknesses of 5 to 10 cm did not cause significant mortality to mud-dwelling invertebrates as most of these motile infauna could initiate escape responses by burrowing upward, while organisms covered with overburdens of 30 cm could not initiate escape responses. Similar results for estuarine organisms were documented in a laboratory study by Maurer et al. (1981), who also noted critical overburden thicknesses of 5 to 10 cm. Therefore, estimates of critical burial depths are highly variable, ranging from 2 to 19.7 inches (5 to 50 cm), as determined by the depth of material from which infauna cannot burrow or excavate to reach the surface (USEPA 2010b). Consequently, areas of the potential disposal sites that receive materials that accumulate at depths greater than this threshold have the potential to be adversely impacted by dredged material disposal. The response of a species to a specific overburden thickness can be estimated from how frequently a species population experiences natural sediment burial. For example, species living on rippled bottoms or sediments subjected to re-suspension are better able to withstand burial by relatively thick sediments layers than species living in low-kinetic-energy and low-sedimentation-rate areas (USEPA 1993).

MDFATE model results for the Jacksonville ODMDS were used to estimate thickness and aerial coverage of dredged material during a typical disposal event (USACE 2010a). For silty material originating from the Mayport Turning Basin, the average thickness on the seafloor from a single load of approximately 2000 cy is 6 inches (15 cm) and covers an area of about 2.0 acres or 0.001 acres/cy. For sandy material originating from the Federal Navigation Entrance Channel, the average thickness on the seafloor from a single load varying from 2000 to 4000 cy is about 24 inches (61 cm) and covers an area of about 1.0 acre or 0.00025 acres/cy. Maintenance dredging operations are generally conducted every year with approximately 500,000 cy to 700,000 cy placed at the ODMDS. This represents about 250 to 350 individual disposal events (about two to three per day), which can accumulate 14 to 48 inches (61 to 122 cm) of thickness depending on the disposal area and specific material. Disposal volumes and bathymetric data from October 2002 through April 2003 at the Jacksonville ODMDS were also used to provide a frame of reference for an estimated amount of area impacted during a dredging project. During this period, 1.5 million cy was disposed at the 1-nmi^2 (640-acre) site, and based on a pre- and post-disposal bathymetric surveys it is estimated that 138 acres within the site were impacted during this time period. Future projects are expected to have similar impacts.

Studies conducted at the Tampa and Fort Pierce ODMDS also provide additional information on thickness and aerial coverage of dredged material on the seafloor during disposal operations. Based on a modeling study conducted at the Tampa ODMDS, the deposition thickness from a single dump of 3,600 cy was expected to be less than 2 inches (5 cm) at distances exceeding 540 feet from the disposal point and have a maximum thickness of 7.4 inches (19 cm) (USEPA 1994). The total area impacted by more than 1 inch of deposition from a single disposal event was estimated at 10 acres. A similar modeling study conducted at the Fort Pierce ODMDS indicated that accumulation from a single dump did not exceed 2 inches (5 cm) per dump at distances greater than approximately 470 feet from the disposal site (USACE 1993). Disposal at the alternative sites is expected to have similar effects.

Effects on Colonization after Deposition

Brooks et al. (2006) reviewed existing literature on offshore benthic assemblages along the U.S. east and Gulf of Mexico continental shelf. From the few studies available, it appears that general "recovery" from anthropogenic disturbance by offshore benthic assemblages occurs within 3 months to 2.5 years. However, the authors concluded that presently it is difficult to draw conclusions about approximate recovery times following anthropogenic activities such as sand mining and/or disposal operations because of the paucity of studies.

As detailed in Section 3.1.3, previous benthic studies of the Jacksonville and Fernandina Beach ODMDSs have shown similar data for benthic communities within and just outside the disposal sites (USEPA 1999a, 2006, 2010). While the abundance of the species at the Jacksonville ODMDS is similar inside and outside the site boundaries, the composition of benthic species differs slightly with the changes in surficial substrata caused by disposal of dredged material at the sites. Specifically, assemblages within the ODMDS are dominated by various polychaetes, while a mixed assemblage of polychaetes, bivalves, and gastropods occurs outside the ODMDS. However, the uniformity in community indices and abundance within and outside the ODMDS indicate that benthic habitats within the ODMDS are healthy. While there would be localized impacts to the benthic invertebrate community, the impact within the designated ODMDS site is expected to be minimal and temporary in nature.

Colonization by infaunal organisms of deposited dredged material has been well documented in shallow-water environments. In most cases, the colonization process in shallow water begins within a few days following cessation of discharges (Germano and Rhoads 1984, Scott et al. 1987). The mode of colonization is sensitive to the thickness of the deposit (USEPA 1993). For thin overburden (≤10 cm), buried adults have an upward escape response, with selective survival based on the ability of different species to re-establish their natural vertical depth positions within the new sediments. When dredged material accumulates in a thick mound, only the thin, distal edges of the deposit may be colonized by this means. The thicker part of the deposit is colonized primarily through larval recruitment or immigration of organisms from adjacent undisturbed areas (USEPA 1993).

Brooks et al. (2006) found that, in most cases, polychaetes were the first to recolonize dredged or disposal sites, with crustaceans, specifically amphipods, also recolonizing relatively quickly. In shallow water (less than 50 meters depth), colonization by adults (reburrowing) and larval recruitment normally is very rapid, taking only a few days to weeks to establish a low diversity but numerically abundant pioneering community (USEPA 1993). Rapid colonization is attributed to the presence of competition-free space and the availability of detrital organic food that commonly is in greater concentration in dredged material than on the ambient seafloor (USEPA 1993).

In shallow-water disposal site studies, three phases of macrofaunal recolonization have been described (Rhoads and Germano 1982, 1986, 1990; Scott et al. 1987). The first infaunal organisms (Stage I) to colonize a disposal site by larval recruitment are usually small opportunistic polychaetes. Within 1 or 2 years, polychaete assemblages may be replaced by dense aggregations of tubiculous amphipods and tellinid bivalves (Stage II). Densities of pioneering species on dredged material often are significantly higher than densities on the ambient bottom (USEPA 1993).

Larval recruitment and establishment of Stage III species on a disposal site require several years because these organisms tend to have more conservative reproductive strategies, slower population and developmental growth rates, and longer mean life spans (Pearson and Rosenberg 1978, Rhoads et al. 1978, Hecker 1982). Stage III species are "head-down" deposit feeders and are commonly encountered as part of the equilibrium community on ambient mud bottoms adjacent to disposal sites.

These successional changes for shallow water disposal sites apply only to sites that experience "normal" succession, which involves rapid initial colonization progressing to Stage III within 1 to 2 years (USEPA 1993). Such a progression can be retarded or stopped if disposal operations are continuous or frequent, if the disposed material experiences erosion and dispersal, or if the disposal area is seasonally or permanently affected by low DO (USEPA 1993). The relationship between near-bottom DO and the successional model indicated that mobile epifauna or demersal species avoid regions with DO concentrations below approximately 3 mg/l (USEPA 1993). DO concentrations below about 1.4 mg/l appear to prevent successful colonization of Stage III taxa (Tyson and Pearson 1991).

Mitigating Measures. Significant accumulations of dredged materials and associated burial of infaunal organisms are unavoidable impacts within the site. To ensure that impacts to benthos are isolated to the site, USACE will conduct post-disposal bathymetric surveys to verify the non-dispersive nature of the site. A baseline survey of the benthic community was also conducted during the site designation study to provide a basis for comparison with future post-disposal status and trends surveys. These data will be used to assess short- and long-term impacts to benthic communities. USACE also requires that accurate positioning is used during disposal events and that performance data (position, time, draft, disposal area) be collected to verify dredged material disposal within the site. USACE will also be required by EPA to conduct periodic monitoring to verify the nontoxic nature of disposed sediments and that significant quantities of sediments have not been transported out of the site. More information on site management and monitoring is provided in the SMMP (Appendix F) and in Chapter 5.

4.2.5.2. No Action Alternative (Status Quo)

Under the No Action Alternative, a new ODMDS would not be designated offshore of Jacksonville, and therefore conditions at the alternative sites would not change. The No Action Alternative would not have any effects on the invertebrate communities at the alternative sites. However, if an ODMDS is not designated, the planned volume of material to be dredged from Jacksonville Harbor and Naval Station Mayport would still need to be managed. Once the existing Jacksonville ODMDS reaches capacity, dredged material could potentially be disposed at the existing Fernandina Beach ODMDS. If material is hauled to the Fernandina Beach ODMDS, impacts to benthic infauna at that site may be increased due to increased frequency of disposal events, volume, and depth of burial. The increase in disposal activities within the site may impede recolonization at the site, resulting in changes in species composition and community structure. Impacts to benthic infauna associated with dredged material disposal would be similar to those described for the three alternative sites.

4.2.6. Fishes

4.2.6.1. Alternatives 1 through 3

Since the alternative sites occur in the same region, the effects associated with designating a new ODMDS in the area would be similar for all three alternative sites. The impact-producing factors include:

- Direct burial
- Change in composition of sediments
- Temporary water column perturbations (turbidity plumes, lowered dissolved oxygen concentrations)

Disposal activities at the alternative sites are expected to only minimally affect pelagic fishes. The area affected by disposal operations is small relative to the distribution of pelagic fishes in the region, and their presence within the affected area during disposal operations would be minimal. Pelagic fishes passing through the immediate area might be forced to change their route during discharge operations. Adult fishes within and immediately adjacent to the disposal area may experience a short-term reduction in dissolved oxygen uptake through the gills due to the presence of suspended particles clogging opercular cavities and gill filaments (Doudoroff 1957), as well as a slight decrease in available oxygen due to the biological oxygen demand of the dredged material. Adult fishes may also experience stress from avoidance reactions (USEPA 1995a). However, conditions which could impact pelagic fishes are expected to be short-term (hours) and localized (less than a mile), and the effects on pelagic adults in the water column are not expected to be significant.

Juveniles may be more susceptible to the effects of released dredged material (USEPA 1995a). Juveniles passing through a turbidity plume may be subject to interference with oxygen exchange through the gill membrane and slightly lowered oxygen availability due to the biological oxygen demand of the suspended sediments. The presence of juvenile fishes within the affected area would be minimal relative to their distribution along the coast.

Effects of Disposal

Disposal of dredged material at the alternative sites could impact demersal fish habitat. The immediate local effect of dredged material disposal would be the burial of adult and juvenile demersal fishes such as hakes (*Urophysis* spp.), searobins (*Prionotus* spp.), sand flounders (Paralichthyidae), and the blackcheek tonguefish (*Symphurus plagiusa)* as well as their epifaunal and infaunal food resources. Over the long term, dredged material disposal at the site may result in a localized decrease in demersal fish species diversity and abundance. These reductions could be caused, in part, by reduced food availability (USEPA 1995a). Benthic infauna and epifauna populations, which are the main food sources for demersal fishes, decline when disposal occurs frequently because benthic fauna are unable to re-establish themselves (USEPA 1986). Some recovery of the benthic community occurs within months, but complete recovery of the original benthic communities requires 1 to 3 years (Germano and Rhoads 1984, Dillon 1984, Scott et al. 1987). When dumping occurs more than once a year, it is likely that the benthic community will be reduced and will support a more limited demersal fish community (USEPA 1995a).

Disposal of dredged material in the ODMDS could potentially affect commercial and sport fisheries because increased sedimentation levels occurring from dredging operations can decrease the abundance of fishes in affected areas. However, in some instances, the deposition of dredged material at an ODMDS provides forage and draws king mackerel (*Scomberomorus cavalla*), amberjack (*Seriola* spp.), and great barracuda (*Sphyraena barracuda*) (Strate 2007, Sipler 2007, St. Laurent 2007). Artificial reefs are located far outside the alternative sites and would not be impacted by dredged material disposal activities (Figure 2.1-3).

Though information is limited, most studies on the effects of dredging and dredged material disposal on fish communities have focused on larvae and eggs in estuarine environments (Auld and Schubel 1978, Johnston and Wildish 1981). Results from these studies suggest that if disposal of dredged material does not significantly affect these sensitive life stages, then plankton, fishes, or commercial fisheries should be similarly unaffected by disposal events (USEPA 1993).

Effects of Turbidity

After dredged material is dumped, much of the fine-grained sediment would remain suspended near the ocean floor (Hirsch et al. 1978). This may physically stress fish by reducing the absorption of dissolved oxygen (USEPA 1995a), but this type of stress has not been positively identified as being harmful to fish in terms of overall survival (USEPA 1983). Adult pelagic fishes can probably avoid the suspended material by moving out of the area, but juveniles may be more vulnerable and susceptible to stress (USEPA 1986). More sedentary fish (e.g., flatfishes) usually have a higher tolerance to suspended particles and would experience only minimal effects of suspended solids on their respiration (O'Connor et al. 1977). Turbidity plumes associated with dredged material disposal are so brief that these effects probably do not occur to any significant degree (See Section 4.1.3 for more details).

Turbidity tests done by Wallen (1951) using montmorillonite clay (a 2:1 smectite clay) particles and 16 warm-water fish species showed no behavioral changes in fish until the turbidity levels were very high (nearing 20,000 ppm of silicone dioxide). Further, Wallen showed that most fish withstood concentrations above 50,000 ppm before mortality took place, and many of the fish were able to endure concentrations of more than 100,000 ppm for a week or longer before succumbing when turbidity reached between 175,000 and 225,000 ppm. In highly turbid conditions, harmful dissolved substances (whether natural or man-made) can impair the gas exchange capacity of the gills as much as or more than the particulate matter can (Doudoroff 1957). The impairment of gill function ascribable to chemically inert suspended particles can apparently only occur when turbidity is exceedingly high (Doudoroff 1957), and so it is thought to only minimally affect fish gill functions during disposal activities.

Nekton are generally not adversely affected by dredged material disposal because of their high mobility (USEPA 1983). During a disposal event, the greatest impacts to fish species may be from increased turbidity within the disposal plume, which may limit the feeding efficiency of visually oriented predators (USEPA 1993). However, highly mobile fish species will likely avoid the disposal plume.

The maximum suspended sediment concentrations observed at the Tampa and Fort Pierce ODMDSs are much lower than the turbidity levels that caused mortality in the studies mentioned above. The maximum suspended concentration of 9,000 mg/l was documented at the Tampa ODMDS at a depth of 65 feet (USEPA 1994). Therefore, the effect of turbidity on fish during dumping operations is expected to be minor.

Mitigating Measures. To reduce the effects of suspended sediments on fish, very fine-grained sediments (such as those from the Naval Station Mayport turning basin and entrance channel) should be deposited in the smallest area possible so that the least amount of benthic habitat is affected (Hirsch et al. 1978). However, sandy sediment similar to the native sediment should be dispersed over a larger area. The similar-grained sediment should minimally modify the disposal area, and a thin layer of sediment would allow demersal fish a better chance of surviving burial (Hirsch et al. 1978). The SMMP details how material will be managed within the ODMDS to minimize impacts (Appendix F).

4.2.6.2. No Action Alternative (Status Quo)

Under the No Action Alternative, a new ODMDS would not be designated offshore of Jacksonville, and therefore conditions at the alternative sites would not change. The No Action Alternative would not have any effects on the fish communities at the alternative sites. However, if an ODMDS is not designated, the planned volume of material to be dredged from Jacksonville Harbor and Naval Station Mayport would still need to be managed. Once the existing Jacksonville ODMDS reaches capacity, dredged material could potentially be disposed of at the existing Fernandina Beach ODMDS. If material is hauled to the Fernandina Beach ODMDS, impacts to fish at that site may be increased due to increased frequency of disposal events, volume, and depth of burial. Impacts to fish associated with dredged material disposal at the Fernandina Beach ODMDS would be similar to those described for the three alternative sites.

4.2.7. Essential Fish Habitat

A complete discussion of impacts to EFH associated with the alternative sites can be found in the EFH assessment in Appendix D.

4.2.7.1. Pelagic Sargassum

Minimal effects to sargassum are expected because it only occasionally drifts through any of the alternative sites and is more commonly associated with the Florida Current, which occurs along the continental shelf.

4.2.7.2. Coral, Coral Reefs, and Live/Hardbottom Habitat

As discussed in Section 3.3.7., members of the Coral FMP are present in only very low numbers within the project area, except for sea anemones, which are common based on trawl catches (ANAMAR 2011). Such sessile organisms can experience long-term impacts from sedimentation and short-term impacts from temporarily increased turbidity caused by disposal activities. Only minor impacts to most Coral FMP members are expected due to the very low densities and relative paucity of suitable attachment sites. Anemones may experience some impacts due to their relatively higher densities at the alternative sites. However, anemones appear capable of extending themselves above newly placed sediment to a limited extent, and consequently only minor effects are expected for this taxon.

According to the SMMP, rock material would be disposed of in a designated zone within the ODMDS (Appendix F). Therefore, it is possible that the selected disposal site may experience an increase in coral densities if disposal material includes limestone rubble.

4.2.7.3. Species Managed by SAFMC

Sargassum — The effects of the proposed action to the *Sargassum* species complex managed under this FMP is discussed in Section 4.2.7.1.

Coral, Coral Reefs, and Live/Hardbottom Habitat — The Coral FMP is discussed in Section 4.2.7.2.

Shrimp — Alternative Sites 1 and 2 are located approximately 1 nmi east of primary shrimp trawling areas identified by commercial shrimpers during the August 2010 scoping meeting. Alternative Sites 1 and 2 are only fished approximately 1 to 2 months of the year, if that much, and the northern half of Alternative Site 1 is avoided because of rubble which tears the nets

(N. Jones, *pers. comm.).* However, Alternative Site 3 is located entirely within an area used by commercial shrimpers 9 to 10 months of the year (N. Jones, *pers. comm.)*. The designation of a new 4-nmi^2 ODMDS may actually provide shrimp a haven from trawlers because disposal sites are generally avoided for fear of net damage (J. Thomas, *pers. comm*.). Considering that much of the dredged material will consist of silts and clays, it appears likely that the area may remain suitable for penaeid shrimp, but may be less suited to the brown rock shrimp. Overall, minimal effects to shrimp are expected.

Spiny Lobster — Caribbean spiny lobster is not expected to be affected in any of the alternative sites or adjacent areas due to the paucity of suitable structural habitat resulting in very low abundance.

Snapper-Grouper Complex — Within the project area, sea basses are thought to use soft substrates along with very low profile substrates (transverse ark and shingle tube worm colonies) which are common throughout the project area. The fact that black sea bass and rock sea bass utilize soft and shelly bottoms is established in the literature (McEachran and Fechhelm 2005, Drohan et al. 2007, Kells and Carpenter 2011). Since the area of the proposed ODMDS (4 nmi^2) is only a small portion of the total available habitat in the region, there should continue to be suitable substrate for black sea bass and rock sea bass and, therefore, only minimal effects within the boundaries of the site itself are expected.

Only minimal impacts to other managed serranids are expected given the paucity of structure suitable for habitation of groupers such as gag grouper, black grouper (*Mycteroperca bonaci*), red grouper (*Epinephelus morio*), and Goliath grouper (*Epinephelus itajara*) within the project area.

A review of red snapper management efforts in the Gulf of Mexico by Hood et al. (2007) stated that management success was limited in part to high levels of juvenile mortality associated with shrimp trawling. Based on results of Hood et al. (2007), it appears the establishment of a new ODMDS may actually provide a haven for juvenile red snapper considering that shrimp trawlers are known to avoid disposal sites for fear of net damage (J. Thomas, *pers. comm*.). A new 4-nmi^2 disposal site would increase the area avoided by shrimp trawlers and decrease trawler bycatch mortality of juvenile red snapper and other managed species affected by the shrimp fishery. Mature-sized red snapper are unlikely to inhabit the alternative sites given the relatively shallow water depths and lack of suitable structure (Anderson 2002, McEachran and Fechhelm 2005). Only low densities of gray snapper (*Lutjanus griseus*) are likely to inhabit any of the alternative sites due to the paucity of suitable structure (McEachran and Fechhelm 2005). Therefore, no significant impacts to managed lutjanids are expected.

Since dredged material is likely to increase the amount of fine sediment within the boundaries of the site, longspine porgy, which favor soft substrate such as sand and mud (McEachran and Fechhelm 2005), should continue to find suitable habitat in the area. Scup may also inhabit the project area, but only in low densities considering the species is more structure-oriented than the longspine porgy (Steimle et al. 1999, McEachran and Fechhelm 2005). For similar reasons, sheepshead probably inhabit the area in low numbers. Therefore, only minor effects to sparids are expected.

The three alternative sites lack large structures favored by the larger jack species, and numbers of managed jacks within the sites are thought to be low based on trawl data from the site designation surveys (ANAMAR 2011). Therefore, minimal or no effect on managed jacks is expected.

Minimal or no effect on triggerfishes is expected considering the paucity of suitable high-relief structure, clear water, and reef habitat preferred by these species.

Minimal or no effects on hogfish and puddingwife are anticipated considering the minimal amount of suitable habitat available in the alternative sites and adjacent areas.

When present, the Atlantic spadefish probably occurs only in low densities within the alternative sites based on trawl sampling results (ANAMAR 2011), and the species may migrate elsewhere during the cooler months. Therefore, only minimal effects on Atlantic spadefish are expected.

Coastal Migratory Pelagics — Cobia probably move through the area occasionally but are unlikely to find enough structure for prolonged habitation. Due to the paucity of structure within the alternative sites and adjacent area, only minimal impacts to cobia are expected. Minimal impacts to cero are expected considering the lack of suitable structure and seagrass beds.

Minimal effects to coastal migratory pelagics are expected considering their pelagic lifestyle, high mobility, and relatively low densities within the alternative sites. Effects are expected to be limited to increased turbidity for short periods of time.

4.2.7.4. Atlantic Highly Migratory Species Managed by NMFS

Large Coastal Sharks — Increases in turbidity may affect some species, but it is likely that most individuals would be able to avoid the area during disposal events if conditions were adverse. The propensity for bull sharks to inhabit turbid water (river mouths, estuaries) suggests this species can endure increased turbidity associated with disposal events with no ill effects. The disposal of dredged material is not expected to impact these pelagic species. The designation of a 4-nmi^2 dredged material disposal site may help decrease bycatch mortality of neonates and young-of-year considering that shrimp trawlers are likely to avoid this area.

Small Coastal Sharks — It is unknown whether one or more species of small coastal sharks would avoid the area during disposal events or would actively feed on the temporarily displaced epibenthic invertebrates and demersal fishes during such events. Larger juvenile and adult small coastal sharks are capable of moving out of the affected area if conditions are adverse during disposal events. Locally abundant species such as Atlantic sharpnose sharks probably utilize the alternative sites and surrounding areas regularly and may be impacted during disposal events. However, such species are frequently seen as bycatch in shrimp trawl fisheries, and large numbers of neonates have been observed dead in such fisheries (Castro 1993). Local populations inhabiting the selected alternative site are expected to experience a decrease in shrimp-trawl-related mortality once the site is designated as an ODMDS. It is expected that any negative effects of the proposed project will be partially mitigated by decreased bycatch mortality, and thus only a minor overall impact is expected for small coastal sharks.

Prohibited Sharks — Juvenile and adult sand tigers are expected to be able to avoid adverse conditions during dredged material disposal activities, and therefore only minor impacts are expected for the sand tiger. The white shark is not common and is not expected to occur within the project area with any regularity. White sharks can easily avoid the area during disposal activities and so no impacts are expected. The dusky shark probably only occasionally inhabits the project area and the species is most often associated with waters farther offshore (Bigelow and Schroeder 1948, Bass et al. 1973). Juvenile and adult dusky sharks should be able to

avoid the area during disposal activities. Therefore, only minimal effects are expected for the sand tiger, white shark, and dusky shark.

Billfishes — The sailfish is an essentially oceanic species (Nakamura 1985) and likely occurs in the area only occasionally during sporadic nearshore migrations (Nakamura 1985, Robins and Ray 1986); therefore, no effects are anticipated. No other billfishes are likely to occur in the vicinity of the alternative sites.

4.2.7.5. Species Managed by MAFMC

Atlantic Mackerel, Squid, and Butterfish — Only minimal effects to the longfin inshore squid and the northern shortfin squid are expected from disposal activities. The northern shortfin squid may not commonly inhabit the alternative sites because temperatures within the sites appear to be at or beyond the upper threshold for the species at least during spring and fall based on data from the site designation surveys (ANAMAR 2011). Any adverse impacts to these species may be mitigated by a reduction in shrimp trawling (and consequently reduced bycatch of this species) within the newly designated disposal site.

It is possible that members of the local butterfish population may experience temporary distress from increased turbidity during disposal events. However, impacts to the butterfish are expected to be minor due to its seasonal occurrence in the project area and relatively low abundance.

Bluefish — Bluefish may be negatively affected by increased turbidity during disposal activities, but these effects will occur over relatively short periods of time. Therefore, only minor impacts are expected for bluefish.

Summer Flounder, Scup, and Black Sea Bass Fishery — The effects of the proposed action on the summer flounder is briefly discussed below. Effects on scup and black sea bass have been previously addressed under the Snapper-Grouper Complex in Section 4.2.7.3. (Species Managed by SAFMC).

The project area appears to be far removed from the center of primary abundance for the summer flounder as written in Packer et al. (1999). Any summer flounder that occur within the project area would likely continue to find acceptable soft substrate after the addition of fine sediment from dredged material disposal activities. Larger juveniles and adults should easily be able to move out from under newly placed sediment during disposal events. Therefore, the effects on summer flounder are expected to be minimal.

4.2.7.6. SAFMC Policy Concerning Dredged Material Disposal Activities

Most of the sediments dredged from inshore areas are fine-grained, contain some degree of contamination, and produce at least short-term impacts such as turbidity plumes when removed or deposited. The overall effects of dumping on or near EFH may be serious but are not well studied. The SAFMC policy on dumping (see Section 5.2.2.1 of SAFMC 1998) provides additional detail on the subject.

EFH impacts include direct removal/burial of organisms as a result of dredging and placement of dredged material; turbidity/siltation effects, including increased light attenuation from turbidity; contaminant release and uptake of nutrients, metals, and organics; release of oxygen-consuming substances; noise disturbance to aquatic and terrestrial organisms; and alteration of hydrodynamic regimes and physical habitat.

Threats to EFH are most significant in terms of possible burial of benthic communities in the vicinity of dump sites and in connection with turbidity from dumped materials. Contamination of the water column and bottoms is also possible if the dredged material is contaminated. Sediments may also be re-dispersed after being dumped in offshore sites and burial of productive bottoms is possible. On occasion, designated dump sites are not adequately studied or they change, and high quality benthic habitat may be damaged or destroyed.

Threats associated with ocean dumping sites include covering of livebottom areas in or near a dump site, impacts to nearshore coral reefs and livebottoms by disposal plumes, offsite transport of disposed dredged material and subsequent burial of nearby hardbottom communities, designated sites that are too small to handle the load, migration of material to fishing grounds, and the location of dumping sites within critical habitat of endangered species such as the North Atlantic right whale.

Even with the use of approved practices and disposal sites, ocean disposal of dredged materials is expected to cause environmental harm since contaminants will continue to be released, productive bottoms will still be buried, and localized turbidity plumes and reduced oxygen zones will occur.

SAFMC has developed policies for disposal of dredged material in waters under its jurisdiction. With regard to use of ODMDS the policy provides that;

- The ODMDS should be designated or re-designated so as to avoid the loss of live or hardbottom habitat and minimize impacts to all living marine resources.
- Notwithstanding the fluid nature of the marine environment, all impacts from disposal activities should be contained within the designated perimeter of the ODMDS.
- The final ODMDS designation should be contingent upon the development of suitable management plans and a demonstrated ability to implement and enforce those plans.
- SAFMC encourages EPA to press for the implementation of such management plans for all designated ODMDSs.
- All activities within the ODMDS are required to be consistent with the approved management plan for the site. The Council's Habitat and Environmental Protection Advisory Panel, when requested by the Council, will review such management plans and forward comment.

4.2.7.7. Overall Effects to Essential Fish Habitat

EFH exists throughout the project area for several species and species groups. Effects to the water column, such as increased turbidity, are expected to be temporary. Direct effects of sedimentation are not expected to be substantial due to the mobility of the majority of federally managed species that may occur within the alternative sites and the lack of geographic constraints within the vicinity of the project area. Benthic infaunal organisms and sessile organisms that serve as prey or that provide microhabitats to managed species are expected to be affected by disposal activities. Species and species groups preferring soft sediment (e.g., penaeid shrimp) may find the addition of fine sediment attractive and may even benefit from disposal activities. The designation of a new 4-nmi^2 ODMDS may provide some refuge for epibenthic invertebrates (e.g., penaeid shrimp, brown rock shrimp) and demersal fishes (e.g., black sea bass, rock sea bass, juvenile red snapper) from shrimp trawler activities as disposal

sites are avoided by trawlers for fear of net damage. Overall, there is expected to be minimal effect on EFH and federally managed species in the area.

4.3. Effects on Socioeconomic Environment

Direct and indirect impacts of the ODMDS alternatives on the socioeconomic environment of the region of influence would be significant if they adversely impacted commercial and recreational fishing, military uses, recreation and tourism, commercial shipping, historic resources, or public health.

Significant impacts would include effects on fisheries or commercial fishing operations that result in a measurable loss of revenues to local economy or in failures of commercial fishing businesses and disruptions in the use of recreational fishing and water sports areas resulting in a loss in tourism participation and revenues related to these activities or a measurable loss in traditional fishing practices of the local population.

The disruption of or interference with military operations or commercial shipping on a frequent basis would be a significant impact. Impacts to archaeological, historical, or cultural resources would be significant if they resulted in damage to the resources or qualities that make a resource eligible for the National Registry of Historic Places. Significant impacts to the socioeconomic environment would include adverse effects on public health and welfare that might be caused by disposal of contaminated material, the creation of hazards to navigation, or impairment of important visual qualities.

Under the No Action Alternative, an ODMDS would not be designated and either the Fernandina Beach ODMDS or multiple upland disposal sites would be required to accommodate the dredging needs of projects anticipated in the reasonably foreseeable future. The potential impacts associated with upland disposal include impacts to air quality, odor, noise, visual resources, loss of developable land, traffic, and energy use.

4.3.1. Commercial Fishing

4.3.1.1. Alternatives 1 through 3

Socioeconomic impacts to commercial fishing associated with dredged material disposal may include a loss of productive fishing grounds due to several factors including but not limited to direct burial of resources, sedimentation, and loss of foraging. These impacts could potentially result in a loss of income. Alternative Sites 1 and 2 are located approximately 1 nmi east of important commercial shrimp trawling grounds (Figures 2.2-1, 2.2-2, and 2.2-4). Alternative Site 3 is located within important commercial shrimp trawling grounds that are fished 9 to 10 months of the year (Figures 2.2-3 and 2.2-4) (Nancy Jones, *pers. comm.*). Commercial shrimpers will likely avoid areas designated as ODMDSs because of potential net damage or loss.

The three alternative sites are outside primary commercial fishing areas. Commercial and recreational fin fisheries are concentrated or restricted around the numerous reefs located seaward of the three alternative sites (Figure 3.4-4). Although the pelagic fishery occurs throughout the waters offshore of Jacksonville, it is not concentrated to the proposed alternative sites. Furthermore, the pelagic fishery is temporally and spatially dynamic, with individual species having greater ranges than the area of the disposal site such that the relative percentage of the potentially impacted area (4 nmi^2) in relation to the entire fishery is small.

If Alternative Site 3 were to be selected, there would be direct impacts to commercial shrimp trawling because 4-nmi^2 area used 9 to 10 months of the year would be avoided due to the potential for net damage. Alternative Sites 1 and 2 are located far enough away from primary shrimp trawling grounds that significant adverse impacts are not anticipated. Past use of the Jacksonville and Fernandina Beach ODMDSs has not resulted in any known adverse impacts to commercial fishing.

4.3.1.2. No Action Alternative (Status Quo)

Under the No Action Alternative, a new ODMDS would not be designated offshore of Jacksonville, and therefore conditions at the alternative sites would not change. The No Action Alternative would not have any effects on fishing areas and would not impact commercial fishing.

4.3.2. Commercial Shipping

4.3.2.1. Alternatives 1 through 3

As discussed in Section 3.4.2, shipping is a major component of commerce in Jacksonville Harbor. JAXPORT is an international trade seaport in northeast Florida and is the largest deepwater port on the east coast of Florida, consisting of 27 principal piers and wharves. JAXPORT's primary marine terminals are located inland from the Atlantic Ocean along the St. Johns River between River Mile 10 to 20 (Figure 1.3-3). JAXPORT's marine facilities provide significant economic benefits to northeast Florida through direct employment, sales and tax revenue, and local firms that engage in international trade and travel. Continued use of the port depends on routine dredging of federal and non-federal navigation channels and berthing areas. The Jacksonville Harbor channel system also provides the only access to Naval Station Mayport.

All three alternative sites are located outside of major shipping channels. Use of any of the sites should not conflict with normal commercial shipping traffic to and from the JAXPORT provided routine navigational precautions are observed. However, Alternative 3 is located just north of the anchorage areas. The presence of hopper dredges and scows may represent an obstacle to vessels approaching the harbor entrance from the north; this is considered a minor problem because no conflicts have been recorded by USACE from use of existing sites.

4.3.2.2. No Action Alternative (Status Quo)

Without designation of a new ODMDS in the Jacksonville area, maintenance dredging may be limited and new work projects may not be approved. Continued use of JAXPORT and other wharfs depends on routine dredging of federal and non-federal navigation channels and berthing areas. Natural shoaling processes will continue and could preclude passage of modern deep-draft vessels in the absence of dredging and deepening of the navigation channels. Any decrease in operating depths though the Jacksonville Harbor channel system could potentially limit economically important ship traffic to and from Jacksonville. The No Action Alternative could have significant impacts on commercial shipping if dredging projects needed to facilitate those operations are delayed or become infeasible because a dredged material disposal site is not available or is limited in capacity.

4.3.3. Military Use

4.3.3.1. Alternatives 1 through 3

Naval Station Mayport is a major port of call for all U.S. naval vessels of the Atlantic Fleet. All three alternative sites are located in waters used by the U.S. Navy and other vessels of the

Atlantic Fleet during transit between Mayport Harbor and the southern missile range of the Atlantic Fleet Weapons Training Facility. None of the sites are in a restricted area; therefore, disposal operations would have no effect on military operations. Coordination between the U.S. Navy and USACE regarding dredging and disposal operations is expected and will reduce the possibility of conflicts.

4.3.3.2. No Action Alternative (Status Quo)

The No Action Alternative may have adverse impacts on military uses if dredging projects needed to facilitate those operations are delayed or become infeasible, either because an upland site with adequate capacity is not available or if the Fernandina Beach ODMDS is not available. The turning basin and entrance channel to Naval Station Mayport require annual dredging to maintain access for Navy vessels. Therefore, Naval Station Mayport is a primary user of the Jacksonville ODMDS and depends on having access to a dredged material disposal site.

4.3.4. Mineral Resources

4.3.4.1. Alternatives 1 through 3

Oil and gas exploration in the Georgia Bight indicates that the middle and outer Continental Shelf may contain sufficient quantities of oil and gas for exploitation (USEPA 1983). The three alternative sites are located within the South Atlantic Planning Area. This area is slated for potential seismic studies with no leasing before 2017 (Figure 3.4-2). None of the alternative sites are expected to affect oil and gas development.

USACE has used sand borrow areas off Jacksonville for beach nourishment projects and several other potential borrow areas have been identified (Figures 2.1-3 and 3.4-3a). The Duval Borrow Area is located approximately 1 nmi east of the Jacksonville ODMDS and has been used for this purpose since 1976 (USEPA 1983). This site continues to produce high quality sand, despite dredged material disposal at the Jacksonville ODMDS. Alternative Site 1 is located <1 nmi west of the sand borrow area (Figure 2.2-1). A portion of Alternative Site 2's northern boundary abuts the southern boundary of the sand borrow area (Figure 2.2-2). Alternative 3 is not located near any existing sand borrow areas (Figure 2.2-3). There are also some potential sand borrow areas in the vicinity of all three sites that have not been formally designated (Figures 3.4-3b,c).

The SMMP details how dredged material disposal at the site will be managed to minimize impacts to beach quality sand within the borrow areas (Appendix F).

4.3.4.2. No Action Alternative (Status Quo)

Under the No Action Alternative, a new ODMDS would not be designated offshore of Jacksonville, and therefore there would be no additional effects on oil and gas development or sand borrow areas.

4.3.5. Navigation

4.3.5.1. Alternatives 1 through 3

Navigation hazards may develop from excessive mounding of dredged material at the site and from movement of disposal vessels to and from the site. However, navigational safety should not be adversely affected by disposal operations at any of the alternative sites with the exception of Alternative Site 3, which is located just north of the anchorage area. Increased hopper dredge, barge, and/or scow traffic in the vicinity of the anchorage area could potentially increase the risk of interference with anchoring ships. Although there is some risk of collision

wherever the hopper dredges are operating or in transit to the site, the risk is negligible considering the short-term and intermittent schedule of disposal operations. No incidence of such problems has been reported during use of the Jacksonville ODMDS or the Fernandina Beach ODMDS. Long-term use of the designated site may eventually result in mounding to the point where deep-draft vessels might have difficulty passing through the site.

Mitigation Measures. Placement methods will be used to prevent mounding of dredged materials from becoming an unacceptable navigational hazard. Dredged material will be placed so that at no point will depths less than -30 feet MLLW occur (i.e., a clearance of 30 feet above the bottom will be maintained). When necessary, USACE, in consultation with EPA Region 4, will specify zones within the ODMDS for dredged material from each specific ocean dumping activity. Depths at the time of disposal will be monitored to detect if adjustments of disposal methods are needed to prevent unacceptable mounding. Disposal shall be initiated within the disposal release zone and shall be completed (doors closed) prior to the vessel departing from the ODMDS.

4.3.5.2. No Action Alternative (Status Quo)

If a new ODMDS is not designated in the region and dredged material is hauled to the Fernandina Beach ODMDS, the impacts to navigational safety would be similar to those discussed for the three alternatives. If ocean disposal of dredged material is limited due to capacity issues at existing ODMDSs, vessel traffic going to and from the sites would decrease and lessen the risk of collision. However, if navigation channels are not maintained, significant impacts to vessel traffic could occur.

4.3.6. Recreational Activities

4.3.6.1. Alternatives 1 through 3

The three alternative sites are outside of primary recreational fishing areas. Most recreational fishing and sport diving activities occurring off Jacksonville are associated with the natural and artificial reefs on the mid-shelf seaward of the three alternative sites (Figure 3.4-4). However, some recreational fishing occurs in the vicinity of these sites and may be disturbed temporarily as a result of disposal operations. Any adverse impacts to recreational fishing and diving activities are expected to be minimal and of short duration. Adverse effects on Jacksonville beaches are not expected because of prevailing currents and distance from shore (Section 3.2.3.3). No impacts to local beaches have been reported during past disposal activities. Because water sports and diving activities occur nearshore or at natural and artificial reefs sites (Section 3.3.7.3, Figure 2.1-2), they would not be affected by disposal at the alternative sites.

The infrequent and short durations of disposal operations are not expected to result in significant adverse impacts.

4.3.6.2. No Action Alternative (Status Quo)

Under the No Action Alternative, a new ODMDS would not be designated offshore of Jacksonville, and therefore conditions at the alternative sites would not change. The No Action Alternative would not have any effects on water-based recreational uses in the region of influence.

4.3.7. Archaeological, Historical, and Cultural Resources

Consultation with the Florida SHPO was initiated on November, 24 2010, and is ongoing in accordance with the NHPA of 1966, as amended, and as part of the requirements and

consultation processes contained within the NHPA implementing regulations of 36 CFR 800. This project is also in compliance through ongoing consultation with the Archeological Resources Protection Act (96-95); Abandoned Shipwreck Act of 1987 (PL 100-298; 43 U.S.C. 2101-2106); American Indian Religious Freedom Act (PL 95-341); Executive Orders 11593, 13007, and 13175; and the Presidential Memo of 1994 on Government to Government Relations. Consultation is ongoing with the SHPO and appropriate federally recognized tribes. Additional comments and recommendations will be included in Appendix A and will be incorporated into the Final EIS.

4.3.7.1. Alternatives 1 through 3

Between June 17 and August 2, 2011, PCI conducted a submerged cultural resources survey within Alternative Site 1 and Alternative Site 2 pursuant to the Florida Division of Historic Resources Performance Standards for Submerged Remote Sensing Surveys (Florida DHR, Version 2.1). Results from the survey are presented in "*Cultural Resources Remote Sensing Survey of the Jacksonville Harbor Project Potential Ocean Dredged Material Disposal Sites Alternatives 1 and 2, Duval County, Florida."* The survey incorporated the use of a magnetometer, sidescan sonar, and subbottom profiler to identify positive relief and buried features. Alternative 3 was not included in this survey because it is not a preferred alternative for this proposed action.

Within the two sites, the survey identified a total of seven anomalies, including three magnetic clusters and four subbottom features (PCI 2012). Some of these anomalies occur within both Alternative Sites 1 and 2 in the area where the two sites overlap. The three magnetic anomalies have characteristics of potentially significant historical resources (area of complex debris or shipwrecks). None of the magnetic anomalies have corresponding sidescan images, indicating they are buried beneath the sediment surface. The four subbottom anomalies (two beneath the sediment surface and two positive relief features) represent prehistoric landforms once exposed by lower sea levels and have the potential to contain significant prehistoric archaeological sites from the Paleo-Indian and Early Archaic time periods (12,000-9,000 YBP). The two buried features (6 to 10 feet below the surface) consist of a paleochannel (relict river/stream bed) and a possible springhead feature. The two positive relief features (possible dunes and/or shell middens) lie on the existing seafloor.

Within the boundaries of Alternative Site 1 there are three subbottom features (two buried and one positive relief) and one magnetic cluster. Several of these anomalies are located near the middle of the site. Within Alternative Site 2, there are three subbottom features (two buried and one positive relief) and two magnetic clusters. These anomalies are located near the edges of the site.

The Advisory Council on Historic Preservation has considered the burial of archeological sites to have a potential adverse effect. The intentional burial of archeological sites may be either beneficial or detrimental to the preservation of the site, depending on site characteristics, type of burial materials (sand, clay, silt, geotextiles), methods of burial, and the chemical and physical processes that may affect the classes or artifacts present in a site once buried. The method of preservation should not contribute to the further destruction and deterioration of the site, which would be considered an adverse effect. Submerged archeological sites have been preserved by burial using controlled, systematic methods such as sandbag or metal cofferdams and geotextiles. The uncontrolled disposal of large volumes of soil and rock atop a shipwreck or archeological feature on or near the surface could be damaging to its integrity and would be considered an adverse effect.

Burial by the dredge disposal material of the two buried subbottom features would likely not have an adverse effect as they are currently buried under 6 to 10 feet of sediment. However, placing disposal material on the positive relief features that may contain archeological sites could crush, distort, and displace archeological deposits and would be considered an adverse effect to the resource. Depending on how shallowly or deeply buried the potentially significant historic anomalies (magnetic) are, uncontrolled burial would have an adverse effect because of the crushing weight of the dredge disposal material and the disposal methods on a ship's hull structure (wooden or iron) and other elements associated with the shipwrecks, such as boilers and windlasses.

To help further determine the historical significance of the magnetic clusters and subbottom features as related to the potential effects of dredged material disposal at the two alternative sites, PCI recommends that all of the targets that could be impacted by dredged material disposal and cannot be avoided be investigated in more detail by archaeological divers to determine if they do indeed represent cultural resource sites. All targets determined to be significant cultural resources sites will be avoided or buffered to prevent adverse impacts caused by disposal of dredged material, or if not feasible, will be mitigated before construction.

Based on current information, there is a potential for submerged historic properties to be adversely impacted by the proposed action of designating a new ODMDS offshore of Jacksonville, Florida. However, USACE and EPA will make a final determination of effects when the anomalies are further characterized during the dive survey. Currently, Alternative Site 1 has greater potential to adversely impact archaeological resources because the anomalies are located near the center of the site and would be harder to buffer and manage with respect to disposal activities. Anomalies identified within Alternative Site 2 are primarily located along the edges, making it easier to buffer these resources and manage disposal operations.

4.3.7.2. No Action Alternative (Status Quo)

There are no adverse effects to submerged historic properties under the No Action Alternative.

4.3.8. Subsea Cables

4.3.8.1. Alternatives 1 through 3

There is one communication cable identified on the NOAA chart 11490 (Figure 3.4-5). It is the Florida-St. Thomas-2 cable owned by AT&T and is no longer active. This cable was retired from service in 1993 (Gino Montes, *pers. comm*., February 19, 2010). A portion of the cable intersects the southeast corner of Alternative Site 2. If Alternative Site 2 is selected as the preferred alternative, dredged material would be disposed of on top of this inactive cable (Figure 2.2-2). However, effects of burial are not expected to be significant since the cable is inactive. No impacts from this subsea cable are expected if Alternative Sites 1 or 3 are designated as an ODMDS.

The Navy is also planning to install a cabled training range (Figure 3.4-5) and has been contacted regarding the location of the proposed alternative sites. Since this cable will be located north of Alternatives 1 and 2 and south of Alternative 3, none of the proposed sites are expected to interfere with installation or operation of this cable.

Lucent is tentatively planning to land a new fiber optic cable in the Jacksonville area. Currently they are looking at a landing the new cable near where the old AT&T cable came ashore. Since

their cable route stays south of all of the alternative sites (Figure 3.4-5), none of the proposed sites are expected to interfere with installation or operation of this cable.

4.3.8.2. No Action Alternative (Status Quo)

Under the No Action Alternative, a new ODMDS would not be designated offshore of Jacksonville and there would be no effects on existing or proposed subsea cables.

4.3.9. Public Health

4.3.9.1. Alternatives 1 through 3

Health and welfare concerns for the population of northeast Florida relative to the proposed designation of an ODMDS near Jacksonville involve the potential release of toxic substances, hazards to navigation, conflicts between marine traffic and disposal operations equipment, and visual effects. The potential impacts of the three alternatives sites on public health and welfare were determined to be less than significant.

The nature of the disposal operations and type of material to be dumped may have direct or subtle indirect effects on public health and safety. Many health hazards may not be obvious, such as the potential for bioaccumulation of toxic chemicals from dredged material by organisms that may be consumed by the public. Similarly, dredged material harboring pathogenic bacteria and viruses may limit recreational water activities and human consumption of fish and shellfish taken from the disposal site vicinity.

The disposal of dredged material would not result in a navigation hazard, although there is a potential for hopper dredges and tugboats pulling disposal barges within the shipping lanes to encounter other marine traffic during transit to and from the disposal site. However, given that hopper dredges and tugboats pulling barges would be required to operate in accordance with navigation regulations, no significant impacts to other marine vessels would be expected.

Visual impacts would be considered adverse if the quality of important scenic vistas were to be impaired by the dredged material disposal operations. Although barges transiting to the ODMDS may be visible in the distance from viewpoints at higher elevations, they would look the same as other ship traffic and the impact would be less than significant.

Mitigating Measures. All material to be dredged would be tested according to federal testing criteria (40 CFR Parts 225 and 227) for the presence of contaminants as well as the potential for toxicity and bioaccumulation prior to dredging. Should the testing indicate that the accumulation of contaminants in the disposal area(s) represent an unacceptable risk to the marine environment or to human health, material could not be disposed in the ocean unless a waiver from the criteria was requested and granted by EPA (40 CFR 225.3 and 225.4). This could include determining that dredge material is unsuitable for ocean disposal.

4.3.9.2. No Action Alternative (Status Quo)

Under the No Action Alternative, a new ODMDS would not be designated offshore of Jacksonville, and therefore conditions at the alternative sites would not change. If a new ODMDS is not designated in the region and dredged material is hauled to the Fernandina Beach ODMDS, the impacts to public health would be similar to those discussed for the three alternatives.

4.4. Unavoidable Adverse Environmental Impacts

Use of any of the alternative sites for dredged material disposal may potentially produce the following unavoidable adverse environmental effects:

1. Temporary water column perturbations (e.g., turbidity plume, release of chemicals, lowering dissolved oxygen concentration)
2. Burial of the site's benthic infauna
3. Changing the site bathymetry
4. Altering the site's sediment composition that would potentially affect organism abundance, diversity, and possibly community structure at the site

Some of the unavoidable adverse effects are of short duration and of limited impact due to the rapid dilution of the material after release. Other impacts pose little environmental consequence because of the limited size of the site. However, changes within a site are acceptable as long as areas outside the site remain unaffected.

With regard to water column perturbations, the effects should be local and short-term and should have minimal regional effects. NOAA has demonstrated that the suspended material concentrations returned to ambient levels in both surface and near-bottom waters in as little as 1 hour (DoN 2004). Similar trends are expected for disposal of the dredged material in the alternative sites.

Some adverse effects of disposal activities can be lessened through proper management of the disposal site by implementing an SMMP (Appendix F). The monitoring plan will concentrate on the benthic environment to determine possible long-term adverse effects on the benthic community and to determine dredged material distribution on the ocean floor. Mounding of disposed material can be prevented through judicious placement and movement of the disposal zone and by periodically monitoring the site's bathymetry. Effects outside the disposal site can be minimized by confining most disposal activities to the central portion of the site. In addition, a monitoring program could detect a potential concern and aid in the prevention of any undue adverse effects that might occur outside the site boundaries. The composition of the site sediments will be altered because of the introduction of silt, clay, and rock. There is potential that some of the finer material could be transported outside the site boundaries, particularly during large storm events. Periodic monitoring will be conducted to assess any significant movement of dredged material off site.

4.5. Long-Term Impacts

Long-term significant impacts on the biological community are expected to be localized within the boundaries of the preferred alternative site. Impacts may include a decrease in benthic infaunal and epifaunal populations and lowered fish diversity. Benthic infaunal communities at the preferred alternative site are expected to be affected as long as the site is actively used (50 years). Benthic infauna would be buried during disposal and, depending on the volumes dumped, the thickness of deposited material on the bottom, and the length of time between disposal operations, might not have sufficient time to recolonize. The long-term effect of dredged material disposal on demersal fish populations at the preferred site may be a decrease in species diversity and abundance. These reductions are partially caused by reduced benthic infauna and epifauna populations, important food sources for many fish species.

Overall, disposal of dredged material at the preferred alternative site is not expected to affect any geographically limited species or affect any unique habitats, breeding areas, or critical areas that are essential to commercially important or rare and endangered species.

Status and trends assessment studies have been conducted at the Jacksonville ODMDS. Comparison of results from studies conducted in 1998 and 2009 at the Jacksonville ODMDS found no notable differences between the inside and outside of the ODMDS affecting the chemical, physical, or biological integrity of the site (USEPA 2010a).

4.6. Cumulative Impacts

CEQ's regulations (40 CFR 1500-1508) implementing the procedural provisions of NEPA, as amended (42 U.S.C. 4321 et seq.), define cumulative effects as

> *The impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions (40 CFR 1508.7).*

A cumulative impact may be additive or interactive. Interactive effects may be either countervailing (where the net adverse cumulative effect is less than the sum of individual effects) or synergistic (where the net adverse cumulative effect is greater than the sum of the individual effects). Cumulative impacts can result from individually minor but collectively significant actions that take place over time. Accordingly, a cumulative impact analysis identifies and defines the scope of other actions and their interrelationship with the alternatives if there is an overlap in space and time. Cumulative impacts are most likely to occur when there is an overlapping geographic location and a coincident or sequential timing of events. Because the environmental analysis required under NEPA is forward-looking, the aggregate effect of past actions is analyzed to the extent relevant and useful in determining whether the reasonably foreseeable effects of a proposed action may have a continuing, additive, and significant relationship to those effects.

Section 4.6.1 discusses potential cumulative impacts associated with the proposed action (i.e., designation of a new ODMDS offshore of Jacksonville) in the context of similar and unrelated activities occurring in the ROI, which include ocean disposal of dredged material at existing sites, sand borrow areas, military activities, installation of telecommunication cables, commercial and recreational fishing, and vessel operation. Section 4.6.2 discusses potential cumulative impacts associated with the proposed action in the context of physical, chemical, and biological resources. Table 4.6-1 summarizes the impacts of such cumulative actions by identifying the past, present, and reasonably foreseeable future conditions of the various resources that are directly or indirectly impacted by the proposed action and its alternatives. The table includes the with-project and without-project conditions (the difference being the incremental impact of the project).

Regardless of which alternative site is selected, the cumulative effects would be similar due to the similarity of their resources and geographical locations. Under the No Action Alternative, a new ODMDS would not be designated offshore of Jacksonville, and therefore conditions at the alternative sites would not change. However, if an ODMDS is not designated, the planned volume of material to be dredged from Jacksonville Harbor, Naval Station Mayport, and other areas would still need to be managed. Once the existing Jacksonville ODMDS reaches capacity, dredged material could potentially be disposed of at the existing Fernandina Beach

ODMDS. If material is hauled to the Fernandina Beach ODMDS, impacts to resources at that site may be increased due to increased frequency of disposal events, volume, and depth of burial. If material is not taken to the Fernandina Beach ODMDS, then maintenance and new work dredging may be limited due to lack of disposal options and would impact navigation and commerce in the area.

Table 4.6-1. Summary of Cumulative Impacts (Page 1 of 3)

Resource	Past and Present (Baseline/Existing Conditions)	Future Without Project (No Action Alternative)	Future With Proposed Action
Threatened and Endangered Species: Sea Turtles	Four sea turtle species occur in the area (loggerhead, green, Kemp's ridley, and leatherback). Loggerhead, green, and leatherback turtles nest on area beaches. Past and current threats to sea turtle populations include artificial lighting, beach armoring, anthropogenic disturbance, trawling, dredging, vessel strikes, fishing gear entanglement, and ingestion of discarded anthropogenic marine debris.	Sea turtles will continue to occur in the offshore area. Project-specific impacts will be avoided, but ongoing threats to sea turtle populations will continue. In the absence of the project, dredged material will still need to be disposed of at the Fernandina Beach ODMDS or CDFs. Material suitable for beach placement will be used to help nourish eroded beaches in the area which will help increase suitable nesting habitat.	Sea turtles may be disturbed by turbidity and noise during disposal activities. There is a small risk of sea turtles being struck by a vessel while transiting to the disposal site; these risks will be minimized through vessel-strike avoidance measures. Due to the temporal nature of disposal activities and distance from nesting beaches, no significant cumulative impacts are expected.
Threatened and Endangered Species: Marine Mammals	Three endangered marine mammal species may occur in the area: Florida manatee, humpback whale, and North Atlantic right whale. Only the North Atlantic right whale is expected to be present in the vicinity of the alternative sites. Manatee and humpback whale occurrences at the alternative sites would be rare, if ever. Past and current threats to marine mammal populations include vessel strikes, fishing gear entanglement, ingestion of marine debris, pollution, and underwater noise.	Marine mammals will continue to occur in the area. Project-specific impacts will be avoided, but ongoing threats to marine mammal populations will continue.	In addition to ongoing threats, marine mammals may be disturbed by turbidity and noise from disposal activities. There is a small risk of marine mammals being struck by a vessel while transiting to the disposal site; mortality of a North Atlantic right whale would represent a significant cumulative impact due to the small remaining population. The risk will be minimized through vessel-strike avoidance measures.
Threatened and Endangered Species: Fish	The shortnose sturgeon, Atlantic sturgeon, and smalltooth sawfish are endangered species inhabiting shallow, nearshore waters. Historically, their populations and ranges have declined, mainly due to fisheries bycatch. Other past and current threats are habitat loss and degradation, entanglement in marine debris, pollution, and anthropogenic disturbance.	If local populations are present, these fish will continue to inhabit the area. Project-specific impacts will be avoided, but ongoing threats to populations will continue and may result in further decreases in population size and range.	Due to low population numbers, it is unlikely these fish species occur in the vicinity of the alternative sites; therefore, no significant cumulative impacts are expected.

Table 4.6-1. Summary of Cumulative Impacts (Page 2 of 3)

Resource	Past and Present (Baseline/Existing Condition)	Future Without Project	Future With Proposed Action
Fish and Wildlife Resources	Offshore waters and softbottom habitats support a variety of invertebrates, pelagic and demersal fishes, and seabirds. Infaunal and epifaunal species are represented primarily by annelid worms, gastropods, bivalves, crustaceans, and echinoderms. Most of these species are used as food by demersal fishes. Past and current threats are habitat loss and degradation, dredging, entanglement in marine debris and fishing gear, overfishing or bycatch, pollution, and anthropogenic disturbance.	Fish and wildlife resources will continue to occur in the area. Project-specific impacts will be avoided, but ongoing threats will continue. Softbottom communities would continue to be affected by natural sand movement and dredging activities. Fish and shellfish communities will be affected by commercial and recreational fishing/trawling, pollution, and other anthropogenic disturbances.	In addition to ongoing processes affecting softbottom fish and wildlife resources, there will be localized effects of dredged material disposal within the site that may persist. Fish and wildlife species could be impacted in a number of different ways, including direct mortality, sublethal impairment, and degraded habitat. Effects are not likely to be significant because resident fish and wildlife species are generally wide-foraging or migratory and spend only a portion of their life cycle at the disposal site. No significant cumulative impacts are expected.
Essential Fish Habitat	EFH exists throughout the study area for several species and species groups. EFH in the project area include sargassum and hardbottom habitats. Managed species and species-groups include penaeid shrimp, spiny lobster, snapper-grouper complex, coastal migratory species, highly migratory species, Atlantic mackerel, squid, butterfish, bluefish, summer flounder, scup, and black sea bass. Past and current threats are habitat loss and degradation, entanglement in marine debris and fishing gear, overfishing or by-catch, pollution, and anthropogenic disturbance.	EFH and managed species will continue to occur in the area. Project-specific impacts will be avoided, but ongoing threats will continue.	Hardbottom/rubble habitat (between 0.8 and 6.9 acres within Alternatives 2 and 1, respectively) will be impacted by disposal activities over the life of the site. However, artificial reefs are located approximately 4 nmi east of the sites and no cumulative impacts to these resources are expected. Rock disposal at the site may create some hardbottom habitat within the site. Direct effects of increased turbidity and sedimentation are not expected to be substantial due to the mobility of the majority of managed species that may occur within the project area. Effects are not likely to be significant because resident managed species are generally wide-foraging or migratory and spend only a portion of their life cycle at the disposal site. No significant cumulative impacts to EFH are expected.

Table 4.6-1. Summary of Cumulative Impacts (Page 3 of 3)

Resource	Past and Present (Baseline/Existing Condition)	Future Without Project	Future With Proposed Action
Water Quality	Water quality in the study area is affected by a variety of activities, including seasonal fluctuations from the St. Johns River, dredged material disposal, and release of pollutants from vessels. Urbanization and population growth in the region contribute to coastal water quality degradation due to stormwater and effluent runoff resulting in increased nutrients and freshwater inputs to the nearshore coastal areas. Baseline results from water quality samples collected during the site designation studies were well below USEPA water quality criteria indicators.	Project-specific impacts would be avoided, but impacts from existing sources are expected to continue to some extent. Water quality may deteriorate due to unrelated anthropogenic sources such as stormwater and effluent runoff.	In addition to the ongoing natural and anthropogenic fluctuations in water quality, local, short-term turbidity would occur at the disposal site due to disposal activities. However, due to the small spatial extent and short duration of project impacts, no significant cumulative impacts are expected.
Sediment Quality	Sediment quality of dredge material is affected by industry, development, stormwater runoff, etc. which can affect sediment quality at the ODMDS. Baseline results from sediment samples collected during the site designation studies were below guidance or target detection limits.	Project-specific impacts would be avoided because dredged material would be disposed of elsewhere.	Sediment quality within the boundaries of the site would be impacted over the life of the project. Sediment composition would change over time from primarily sand to primarily finer-grained material or rock. There is also potential for synergistic effects with regard to sediment contaminants over time as sediments accumulate within the site.

4.6.1. Relevant Past, Present, and Future Actions

Table 4.6-2 summarizes the current and proposed projects and activities that may contribute to cumulative impacts within the project area. While Table 4.6-2 may not include an exhaustive list of projects that may contribute to regional cumulative impacts, the analysis of the cumulative impact of these projects are representative of the effects that could arise from any other similar existing or future projects that have not yet been identified. These projects and activities and their potential cumulative effects are discussed in more detail in this section. The potential impacts associated with these projects that are most likely to be cumulatively significant are related to sediment quality, benthic resources, threatened and endangered species, and socioeconomics. A detailed description of potential cumulative impacts by resource category is presented in Section 4.6.2.

Table 4.6-2. Past, Present, and Reasonably Foreseeable Projects/Activities

Project/Activity	Description	Region of Impact
Ocean Dredged Material Disposal Activities	The Jacksonville ODMDS has been used since the 1950's. The Fernandina Beach ODMDS has been used since 1987.	Confined within site boundaries.
Jacksonville Harbor Deepening Project	Involves proposed deepening of the federal navigation channel from River Mile 0 past River Mile 14 (Figure 1.3-3) creating between 7.6 and 32 million cy of dredged material.	St. Johns River and adjacent areas and ODMDS receiving dredged material.
Sand Borrow Areas	Dredging of sand for local beach nourishment projects.	Confined within site boundaries.
Other Activities	Other activities include but are not limited to military activities, subsea cables, recreational and commercial fishing, and beach nourishment.	Offshore area between the coastline and the alternative sites.

4.6.1.1. Ocean Dredged Material Disposal

Between the 1950's and 1970's, some dredged material disposal occurred within the northern portion of Alternative Site 1 (adjacent to the existing Jacksonville ODMDS). No disposal operations have occurred within Alternative Sites 2 and 3.

Ongoing and historical dredged material discharges occur in the ROI at the Jacksonville and Fernandina Beach ODDMSs and are described in detail in Sections 1.3.1 and 3.1. On average over the past 10 years, approximately 640,000 cy of dredged material are disposed of annually at the Jacksonville ODMDS. Once the site reaches capacity (as early as 2013), disposal operations will decrease at this site and disposal operations will be moved to the new site if designation is approved. This will allow eventual recovery of benthic species within the Jacksonville ODMDS.

The Fernandina Beach ODMDS receives approximately 1 million cy of annual maintenance material per year from the Fernandina Harbor inner channel and turning basin (USEPA 2006). In 2011, in addition to annual maintenance material, it received approximately 3.2 million cy from Naval Station Mayport. Past, present, and reasonably foreseeable future disposal of dredged material at the Fernandina ODMDS, Jacksonville ODMDS, and the newly designated ODMDS could contribute to cumulative effects associated with physical ocean properties and biological resources. As required under MPRSA, dredge material must meet all applicable

criteria to be eligible for ocean disposal. The SMMP discusses how the site will be monitored to help identify and minimize impacts over the life of the disposal site (Appendix F).

Cumulative effects as a result of multiple ocean disposal sites in the region are not expected to be significant because the sites are small relative to the size of the entire area. As discussed in this chapter, impacts to the physical, biological, and socioeconomic resources are expected to be limited to the area within the boundaries of the site (e.g., impacts to benthic communities, changes in bathymetry, changes in sediment composition) or to be temporary in nature during disposal operations (e.g., increases in turbidity, air emissions, risk of vessel collisions with marine mammals and sea turtles).

However, it is expected that there will be an increase in the amount of material being dredged from the Jacksonville Harbor area and Naval Station Mayport compared to historical volumes. Annual volumes of maintenance material are expected to range from 0.5 to 1.12 million cy. There is also potential for additional new work material from the Jacksonville Harbor Deepening Project ranging from 7.6 to 32 million cy. This increase in disposal volumes compared to historical volumes could potentially result in cumulative impacts primarily related to physical and biological resources such as sediment quality, water quality, and benthic resources.

As with the Jacksonville and Fernandina Beach ODMDSs, the newly designated ODMDS would be monitored to help minimize cumulative impacts related to disposal of dredged material at the site. Details of the monitoring and management plan are provided in the SMMP (Appendix F). Also, existing pollutions controls in combination with sediment testing should help minimize cumulative effects related to contaminants in the sediments.

4.6.1.2. Jacksonville Harbor Deepening

The Jacksonville Harbor Deepening Project will result in a significant increase in new work and maintenance dredged material that would require disposal either upland or offshore. As discussed in Section 1.4.2, capacity at upland CDFs is becoming limited; therefore, dredged material generated from this project that is not used for beneficial purposes (beach nourishment, construction material, artificial reefs, etc) will likely be disposed offshore at an ODMDS.

The large volume of dredged material being disposed of during the deepening project would exceed volumes that have historically been disposed of offshore. Historically, the annual average volume of dredged material disposed at the Jacksonville ODMDS is approximately 640,000 cy. During the multi-year deepening project, approximately 5.3 million cy would be disposed of annually for 6 years (totaling 32 million cy) based on a 50-foot project depth. This increase in frequency and volume of disposal of dredged material over a relatively short period of time would increase impacts to resources within the site. For example, the benthic resources, which have some ability to burrow up through the disposal layer, would not have as much time to recover due to the increased frequency of disposal events. Additionally, although the dredged material is tested before disposal permits are issued to determine the suitability of the material for offshore disposal, the increase of sediments (particularly silts and clays) may result in an accumulation of contaminants within the site that may over time significantly affect sediment quality. The deepening of Jacksonville Harbor will likely also result in expansion and development of port facilities. This increase in development may introduce more contaminants into the river due to increased stormwater runoff from these areas. These contaminants may become accumulated in the dredge material, which eventually will end up at the ODMDS. This would be an example of a synergistic cumulative effect because cumulative impacts can result from individually minor but collectively significant actions that take place over time.

Also, during the deepening project itself, there will be an increase in vessel traffic to the ODMDS to dispose of dredged material. The deepening of Jacksonville Harbor will also likely result in a long-term increase in maritime traffic related to expanded port and terminal facilities. This increase in vessel traffic could increase the risk of vessel collisions with North Atlantic right whales and sea turtles. Since the North Atlantic right whale is critically endangered, loss of a single individual is considered significant.

4.6.1.3. Sand Borrow Areas

BOEMRE (formerly MMS) has conducted studies to characterize the physical and biological environments of northeast Florida's offshore sand sources to identify suitable sand borrow sites in the region (Zarillo et al. 2009). Current and proposed sand borrow areas within the ROI are depicted in Figures 2.1-3 and 3.4-3a through c.

Lotspeich and Associates (1997) performed pre- and post-mining benthic faunal and sediment studies at the existing sand borrow area approximately 1 nmi east of the Jacksonville ODMDS. Results from this study indicate a change in the composition of the borrow area benthic community following dredging, as compared to nearby control stations. Gastropods disappeared, bivalves and annelid worms declined, and crustaceans increased. Species richness and abundance at both dredged and control stations declined dramatically after dredging. Two years after dredging, species richness and abundance had returned to pre-dredging levels and there were no observable differences in substratum conditions. The decline of borrow area and control station invertebrate populations following dredging was attributed to a series of hurricanes crossing the area during 1996, making identification of dredging effects on benthic communities difficult to detect.

If Alternative Site 1 or 2 is selected for designation as an ODMDS, there is a potential for cumulative effects to benthic communities related to dredged material disposal and dredging of sand since the areas where these two activities are taking place are within 1 nmi of each other. The proximity of ODMDS and sand borrow areas could impact the ability of benthic infauna to recolonize disturbed areas. The SMMP discusses how the dredged material will be managed within the site and monitoring activities that will be conducted to help minimize cumulative impacts (Appendix F).

4.6.1.4. Other Activities

Additional activities that occur within the project area include military activities, installation of telecommunication cables, and commercial and recreational fishing. These activities have occurred in the past and present and will continue into the foreseeable future. Impacts from these sources are expected to continue to some extent with or without the proposed action. The impacts associated with commercial and recreational fishing, shipping traffic, and military activities may include vessel strikes with marine mammals or sea turtles. However, adherence to vessel strike and avoidance procedures will minimize the effects of these activities. Installation of telecommunication cables may temporarily impact bottom sediments and benthic habitat, but those impacts should cease once the cable is installed. Additional impacts caused by other activities include gear entanglement, bycatch mortality, pollution, and noise.

Activities that may occur in the foreseeable future within the project area include potential exploration in support of energy independence and renewable energy. Oil and gas exploration in the Georgia Bight indicates that the middle and outer Continental Shelf may contain sufficient quantities of oil and gas for exploitation (USEPA 1983). The three alternative sites are located

within the South Atlantic Planning Area, which is slated for potential seismic studies with no leasing before 2017 (Figure 3.4-2). These activities could potentially lead to offshore oil and gas platforms and pipelines and offshore infrastructure for renewable energy such as wind, solar, and marine hydrokinetic energy and associated transmission cables. None of the alternative sites are expected to affect oil, gas, and renewable energy development. If these activities do occur within the project area, EPA and USACE have no authority to prevent multi-use of the ODMDS for these other purposes.

4.6.2. Cumulative Impact Analysis

4.6.2.1. Air Quality

Any cumulative effects associated with the proposed action are expected to be insignificant because, as discussed in Section 4.1.1, the designation of a new ODMDS is not anticipated to have a significant direct or indirect impact on regional air quality or sensitive receptor populations. In summary, the two scenarios analyzed in Section 4.1.1 anticipate disposing of 0.5 million cy (Naval Station Mayport maintenance material only) to up to 5.3 million cy (Jacksonville Harbor Deepening) of dredged material annually. The larger volume associated with the deepening project would be of a limited duration (approximately 6 years) until the deepening project is completed. Depending upon the scenario and dredge type, the number of disposal round trips per day could range from two to four for 42 (maintenance) to 349 (deepening) days per year. Use of hopper dredges would result in almost 3.5 times the emissions per trip compared to barges pulled by tugs and would require approximately 11 percent more trips. One or two vessels are anticipated to be used for transporting dredged material, and they are expected to operate at similar speeds to other ship traffic and should not significantly add to existing or future projections of increased ship traffic.

Since the Jacksonville Harbor Deepening Project is dependent upon this proposed action, there is a reasonably foreseeable potential for increased air emissions associated with anticipated increases in shipping traffic resulting from the deepening project. For example, at JAXPORT the new MOL/TraPac terminal is equipped with six Post-Panamax container cranes and the necessary infrastructure to load/unload two large vessels concurrently to meet the growing demand for all-water service between the U.S. east coast and Asia and the expanding trade with Latin America.[1] This new terminal is projected to double the existing container traffic passing through JAXPORT and make it one of only 12 U.S. ports able to handle over 1 million TEUs (twenty-foot equivalent units; a typical shipping container is 40 feet long and equivalent to two TEUs) annually.[2] Moreover, the number of JAXPORT vessel calls increased from 1,799 in 2006 to 1,947 in 2010.

It is the EIS associated with the Jacksonville Harbor Deepening Project, not this proposed action, for which the air-quality analysis is expected to cover air emissions created during the harbor expansion (including harbor maintenance/deepening) activities and any associated increased ship traffic.

4.6.2.2. Water Quality

Any cumulative effects associated with the proposed action are expected to be insignificant because, as discussed in Section 4.1.3, water-column chemistry results from previous sampling at the neighboring Jacksonville and Fernandina Beach ODMDSs has shown little to no impact due to dredged material disposal. Consequently, the best available information indicates that

[1] http://www.mol.co.jp/pr-e/2005/e-pr-2522.html
[2] http://www.halcrow.com/Our-projects/Project-details/Dames-Point-Container-Terminal-USA/

the designation of the proposed ODMDS is not anticipated to have a significant direct or indirect impact upon water quality in either the area of the proposed ODMDS or the area transited by barge or hopper dredges during transport of the dredged material for disposal in the ODMDS.

Impacts to water quality from the disposal of maintenance-dredged material are expected to be short in duration and limited to the immediate vicinity of the proposed ODMDS. Any associated impacts are expected to be limited to a period of 67 days per year. Maintenance material is expected to be comprised of fine- to medium-grade sand containing silt, shell, and limestone fragments. Anticipated impacts are those associated with sediment plumes generated from the disposal of fine- to medium-grade sand and silt from the disposal vessel and possible subsequent re-suspension of fine-grained material in the ODMDS each time a barge load is disposed (see Section 4.1.3).

The greatest potential for cumulative water quality impacts is represented by the disposal of dredged material generated by the harbor deepening project due to the anticipated duration and intensity of disposal; i.e., the disposal of dredged material almost daily for a period of 7 years. Core borings from the harbor indicate an upper layer of fine- to medium-grade sand with silt, shell, and limestone fragments; an intermediate layer of sandy limestone and limestone; and an underlying deeper layer of shelly sandstone and limestone. Preliminary geotechnical investigations of the harbor indicate that 50% of the deepening project requires blasting and associated disposal of limestone. Disposal of this rock is expected to generate less of a sediment plume than that expected with the disposal of maintenance-dredged material (i.e., the upper layer) and will be managed to minimize any disturbance of previously disposed material and maximize potential habitat creation. For example, rock will be disposed in a separate zone where no previous disposal activities have occurred, thereby minimizing any sediment re-suspension (see SMMP in Appendix F for more details).

Any sediment plume generated by rock disposal is expected to be minor and dissipate quickly between disposal events (see Section 4.1.3.1). Additionally, 40 CFR 227.13(c) requires the dredged material to be disposed such that all suspended and dissolved portions after dilution meet all applicable water quality criteria [40 CFR 227.13(c)(2)(i)] and do not cause any adverse biological effects [40 CFR 227.27(b)]. The goal of these requirements is to eliminate any adverse effects associated with individual contaminants or any synergistic effects of multiple contaminants present in the dredged material. Consequently, with these described safeguards, the proposed action is not expected contribute significantly to the cumulative impacts of regional activities on water quality. For example, in the late 1980s, the dredged material from the Kings Bay deepening project was disposed at the Fernandina Beach ODMDS. Approximately 6 million cy of material was disposed, including rock, over an approximate period of 1 year. Subsequent monitoring of the site has shown no significant changes in water quality (USEPA 2006).

CEQ's NEPA regulations (40 CFR § 1508.7) define cumulative impact as *the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other action*. Other reasonably foreseeable actions that have a potential to impact water quality include:

- The offshore Florida Current,
- Hurricanes and other storm events,
- Seasonal fluctuations from the St. Johns River,

- Seasonal and diurnal fluctuations in tidal currents,
- Potential sea-level rise and other climate-change related impacts,
- Dredged material disposal associated with other unforeseen projects, and
- Vessel-associated pollutant releases.

4.6.2.3. Sediment Quality

Cumulative effects of dredged material disposal on sediment quality are possible. Historical information from the Jacksonville ODMDS monitoring and previous 103 sediment evaluations of material that has historically been place at the site indicates no significant increase in contaminants within and outside of the site. However, the Jacksonville Harbor Deepening Project will result in new work material being placed at the new ODMDS. This material has not been previously tested so the chemical contaminants present in this material are unknown, but it will be evaluated prior to disposal to see if it meets the ocean disposal criteria (40 CFR 227). If the material does not meet criteria it cannot be placed at the ODMDS. However, even material that does meet criteria, there is a potential for cumulative effects related to the increased volume and frequency of disposal of material at the ODMDS during the deepening project and subsequent maintenance dredging.

Verification that significant impacts do not occur outside of the ODMDS boundaries will be demonstrated through implementation of the site-specific SMMP developed as part of the proposed action (Appendix F). The SMMP includes physical monitoring to confirm that the material that is deposited is landing where it is supposed to land as well as monitoring to confirm that the deposited sediment quality appears consistent with results of pre-disposal testing. Because resources are limited, monitoring programs are designed to be flexible, cost-effective, and based on scientifically sound procedures and methods to meet site-specific monitoring needs. After each disposal event, the site will be monitored according to the SMMP (Appendix F). Chapter 5 also provides more detail on the management and monitoring of the site. Results of the monitoring are compiled and discussed in status and trends reports that are published by USEPA.

4.6.2.4. Sea Turtles

Although there is a chance for vessel strikes involving sea turtles during transit to and from the disposal sites, sea turtles are not likely to incur lethal harm directly from disposal activities. Effects from disposal activities are unlikely to have significant cumulative effects on the recovery of any sea turtle species or populations known to inhabit or frequent the northeast Florida Atlantic region. Sea turtles are more likely to incur potential lethal harm from entrainment during dredging activities occurring in the Jacksonville Harbor entrance channel, Naval Station Mayport, and sand borrow areas. However, incidences of sea turtle mortality involving dredging operations can be reduced by implementing a combination of protective actions including setting environmental windows, conducting pre-dredge turtle surveys, trawling and relocation, defining operational methods, and using turtle deflectors on hopper dredges. Therefore, cumulative effects to sea turtles are not expected to be significant.

4.6.2.5. Marine Mammals

North Atlantic right whales and dolphin species may be present in all of the alternative sites and in the areas that will be used for vessels transiting to and from the dredging site. It is also possible, but unlikely, that humpback whales and Florida manatees may also be present. Routine activities associated with dredged material disposal are not expected to have short- or long-term adverse effects on the productivity of any marine mammal species.

Recommendations for avoiding vessel strikes with marine mammals during transit and disposal operations, as discussed in Section 4.2.1.2, will be followed.

4.6.2.6. Seabirds

Impacts to seabirds and seabird habitats from disposal and dredging activities in the project area are expected to be sublethal and short-term, or if lethal, extremely rare. Seabirds observed along the east coast of Florida are dominantly trans-migrants, shorebirds, wading birds, and waterfowl that may occupy the project area briefly, if ever, or use the dredges and support vessels for temporary resting places. Seabirds may ingest discarded debris or drown from diving into the scow during dredge fill or disposal activities. Disposal of dredged material at any of the alternative sites is not expected to have short- or long-term effects on the size and productivity of any seabird species or populations endemic to the area. Shorebirds and beach nesting habitat were not discussed in this study since disposal activities take place offshore and away from nesting activities. The best avoidance measure is to manage debris.

4.6.2.7. Benthic Fauna

The abundance, species richness, and diversity of the benthic community within the disposal area may recover to background levels relatively rapidly after a disposal event; however, attaining pre-disposal species composition may take longer (Section 4.2.6). In terms of cumulative impacts, if disposal events occur multiple times in the same area over a relatively short period (e.g., annually), recovery of the impacted area will be prolonged. With respect to Alternative Sites 1 and 2, recovery of the benthic community may also be impacted by dredging activities in the sand borrow area that is located in close proximity to these two proposed sites (Figure 3.4-3b). Because recolonization is partially dependent on recruitment from undisturbed adjacent areas, impacts to benthic populations due to dredging activities within the nearby sand borrow areas may impact recruitment and slow recovery within the ODMDS. Section 4.6.1.3 discusses the impacts to benthic populations related to dredging activities within the sand borrow area. Studies indicate a change in the composition of the borrow area benthic community following dredging, as compared to nearby control stations (Lotspeich and Associates 1997).

Slow-moving and burrowing animals such as sand dollars, brittle stars, and decapod crustaceans inhabiting the site would most likely experience a reduction in density due to sediment disposal. However, some species that are adapted to sedimentation due to natural events such as storms should be able to burrow up through the deposited sediment, depending on the depth of the newly deposited layer. It is anticipated that more motile epifaunal species may be able to avoid the area during the disposal event. Motile epifauna generally are migratory and are not restricted to the disposal site.

The SMMP discusses how the dredged material will be managed within the site and monitoring activities that will be conducted to help minimize and detect potential cumulative impacts (Appendix F). Recolonization and management of mound placement are expected to minimize impacts to benthic resources.

4.6.2.8. Fish and Essential Fish Habitat

Cumulative impacts to the local fish fauna are expected to be minimal. Disposal operations will most adversely affect softbottom demersal fishes through burial or reduction of their invertebrate forage base. However, given the planktonic dispersal strategies of most fishes and the relatively high mobility of adult fishes, recolonization of the disposal site should occur following each disposal event. This recolonization should occur relatively rapidly because the species

assemblage outside the disposal site appears similar, offering a proximate source of both adults and young recruits. However, sand mining activities within the Duval sand borrow area located within 1 nmi of Alternative Sites 1 and 2 may impact or slow recolonization of adults and young recruits due to disturbances caused by dredging activities within the borrow area. Therefore, community composition within the disposal site may not rapidly return to its pre-disposal state, especially if changes in sediment composition and associated benthic invertebrate assemblage persist for several years. Any such delay would have negligible ecosystem-level consequences since most fish species expected at the proposed sites are common and widespread along the northeast Florida shelf. Cumulative impacts to reef fishes are of minor concern due to the paucity of hardbottom found within the proposed disposal sites. Impacts to pelagic fish species are also negligible given their high mobility and limited reliance on substrate type and benthic invertebrate prey.

4.6.2.9. Bioaccumulation

Bioaccumulation is defined as the uptake and retention of contaminants into tissues of organisms from all possible external sources. While bioaccumulation of a contaminant by an organism may or may not result in detrimental impacts to that organism, it can be an indicator that the population, similar organisms, and higher tropic-level organisms that prey on the contaminated organisms may be potentially at risk of adverse impacts. The cumulative sources of contaminants which may bioaccumulate include historical disposal of dredged material, new disposal activities, and other contaminant sources to a region. The placement of dredged material at a disposal site can alter the conditions controlling bioaccumulation, resulting in a localized change in the rate of uptake and possible risks of associated adverse health effects. However, evaluation and management of dredged material is designed to minimize this effect. Sediments found to pose a potential for unacceptable adverse effects due to bioaccumulation are not accepted for offshore disposal. Through the use of these risk-based evaluations, it is expected that tissue concentrations (and subsequent risks) would not change significantly as a result of the placement of dredged material at any of the alternative sites over time.

4.6.3. Conclusion

The designation of a new ODMDS offshore of Jacksonville is not expected to result in adverse cumulative impacts although short-term, temporary impacts may occur such as topographic change, changes in sediment composition, burial of organisms in the disposal area, changes in the benthic community, and potential changes to the local food web. Such temporary changes have been ongoing at existing sites for decades. The evaluation conducted in this EIS did not, however, find evidence that any of these changes has resulted in significant unacceptable adverse impacts to the region's resources. As discussed in SMMP, short-term temporary impacts may be minimized or mitigated through management methods. If significant effects are documented at the site during monitoring, actions will be taken to address those impacts.

The SMMP provides a summary of the monitoring strategies for the ODMDS, and thresholds for management actions are presented in Table 4 of the SMMP (Appendix F). The ODMDS will be monitored for transport of material offsite, especially towards the borrow areas to the east. Additionally, any habitat created from rock disposal will be monitored to assess its functional benefit.

Should future disposal at the ODMDS result in unacceptable adverse impacts as documented in trend assessment surveys, further studies may be required to determine the persistence of these impacts, the extent of the impacts within the marine system, and/or possible means of

mitigation. In addition, the management plan presented may require revision based on the outcome of any monitoring program.

4.7. Relationship Between Short-Term and Long-Term Resource Uses

NEPA requires consideration of the relationship between short-term use of the environment and the impacts such use could have on the maintenance and enhancement of long-term productivity of the affected environment. Impacts that narrow the range of beneficial uses of the environment are of particular concern. Such impacts include the possibility that choosing an alternative site could reduce future flexibility to pursue other alternatives, or that choosing a certain use could eliminate the possibility of other uses at the site.

The designation of any of the alternative sites as an ODMDS is not expected to produce significant, long-term adverse impacts to resources, including the physical, biological, and socioeconomic environments within the study region. Impacts to benthic invertebrates within the site are expected to persist as long as the site is used for disposal (approximately 50 years); however, impacts outside of the site boundaries are expected to be minimal and insignificant. Cessation of disposal operations should result in a gradual recovery over time within the site boundaries. Recolonization of a diverse and stable benthic community would probably occur within 1 to 3 years after cessation of disposal operations (Dillon 1984, Scott et al. 1987).

Use of any of the alternative sites is not expected to interfere with the long-term use of any resource in the area. No significant effects to commercial fishing or sportfishing are expected to occur because the sites represent a small percentage of total fishing grounds offshore of Jacksonville. In addition, the sites constitute only a very small part of the Georgia Bight region. It is not anticipated that short-term perturbations at any of the sites will significantly affect the long-term productivity of the region. No significant mineral or oil and gas resources occur within any of the alternative sites. Therefore, use of the ODMDS does not represent a potential conflict with the long-term use of such resources.

Any impacts or restricted use of resources within the site boundaries would represent a very small percentage of these resources within the study region. The only effect to resources on-site expected as a result of dredged material disposal operations is a minor reduction in biological productivity at the disposal site due to physical impacts from deposition of suitable sediments on the ambient seabed. This marginal loss of some resources is balanced by the significant benefit that would be derived from the proposed action. In contrast, lack of a designated ODMDS capable of receiving large quantities of dredged material could have a significant adverse effect on the economic productivity associated with Jacksonville Harbor and Naval Station Mayport. The benefits of dredging include maintaining and expanding the channels and waterways in the area for recreational, commercial, and military traffic.

4.8. Irreversible or Irretrievable Commitment of Resources

NEPA (42 U.S.C. § 4332 Section 102(2)(C)(v) as implemented by CEQ regulation 40 CFR 1502.16) requires an analysis of significant, irreversible effects resulting from implementation of a proposed action. An irreversible commitment of resources is one in which the ability to use and/or enjoy the resource is lost forever. An irretrievable commitment of resources is one in which, due to decisions to manage the resource for another purpose, opportunities to use or enjoy the resource as they presently exist are lost for a period of time.

Implementation of the proposed action would indirectly result in an irreversible commitment of energy and resources used to dredge, transport, and dispose of the material; economic costs associated with ocean disposal activities; temporarily limited physical benthic resource within the disposal site associated with dredged material deposition on the ambient seabed; and human labor associated with these dredging and disposal activities. Energy (electricity and natural gas) and water consumption, as well as demand for services, would not increase significantly as a result of implementation of the proposed action. The commitment of these resources is undertaken in a regular and authorized manner, and does not present significant impacts within this EIS.

5. MANAGEMENT OF THE DISPOSAL SITE

Chapter 5. Management of the Disposal Site

5.1 Ocean Disposal Permits
5.2 Site Management & Monitoring

As discussed previously, verification that significant impacts do not occur outside of the ODMDS boundaries will be demonstrated through implementation of the SMMP developed as part of the proposed action. The SMMP includes physical monitoring to confirm that the material that is deposited is landing where it is supposed to land as well as monitoring to confirm that the deposited sediment quality appears consistent with results of pre-disposal testing. An appropriately developed SMMP will be implemented regardless of which alternative is selected for implementation.

The main purpose of the SMMP is to provide a structured framework for resource agencies to ensure that dredged material disposal activities will not unreasonably degrade or endanger human health, welfare, the marine environment, or economic potentialities as stated in Section 103(a) of the MPRSA. The main objectives for management of any of the three proposed dredged material disposal sites are:

- Verify compliance with the site designation criteria, any special management conditions, and permit or federal authorization requirements
- Ensure the environmental integrity of a disposal site and the areas surrounding a site.

The USEPA Region 4 and USACE Jacksonville District personnel will achieve these objectives by jointly administering the following activities:

- Regulation and administration of ocean disposal permits.
- Development and maintenance of a site monitoring program.
- Evaluation of permit compliance and monitoring results.
- Maintenance of an active database for dredged material testing and site monitoring results to document non-degradation goal and compliance with annual disposal volume targets in order to facilitate future revisions to the SMMP.

5.1. Ocean Disposal Permits

The disposal of dredged material in ocean waters is regulated under the MPRSA of 1972. The transportation of dredged material for the purpose of disposal into ocean waters is permitted by USACE, or in the case of federal projects, is authorized for disposal under MPRSA applying environmental criteria established by EPA (USEPA and USACE 1996). Section 103(b) of the MPRSA requires that USACE used dredged material disposal sites designated by EPA to the maximum extent feasible. MPRSA requires that all permits be consistent with the SMMP, and permits may include the following information:

- The type and amount of material authorized to be transported for dumping or to be dumped;
- The location where such transport for dumping will be terminated or where such dumping will occur;
- Such requirements, limitations, or conditions as are necessary to assure consistency with any site management plan

- Any special provisions deemed necessary by the Administrator or the Secretary, as the case may be, after consultation with the Secretary of the Department in which the Coast Guard is operating, for the monitoring and surveillance of the transportation or dumping; and
- Such other matters as the Administrator or the Secretary, as the case may be, deems appropriate.

In accordance with the requirements and procedures defined in the EPA's Ocean Dumping Regulations (40 CFR Parts 220, 225, 227, and 228), the suitability of dredged material proposed for disposal at the ODMDS must be demonstrated through appropriate physical, chemical, and biological testing. Ocean dumping regulation Section 227.6 prohibits the disposal of certain contaminants other than trace chemical constituents of dredged material. Further, regulatory decisions rely on assessments of the potential for unacceptable adverse impacts based on persistence, toxicity, and bioaccumulation of the constituents instead of specific numerical limits (USEPA and USACE 1991).

Determining the suitability of dredged material involves a multi-tiered testing procedure. Lower tiers apply existing or easily obtained information and limited chemical testing to predict effects. If it is predicted that the dredged material has any potential for significant adverse effects, higher tiers are activated. Water column and benthic bioassay and bioaccumulation tests are utilized in higher tiers to determine effects on representative marine organisms.

EPA Green Book (USEPA and USACE 1991) protocols will be used when testing the bioaccumulation potential of dredged material proposed for ocean disposal. Decisions regarding the suitability of dredged material to be disposed of in the ocean will be guided by the criteria contained in the MPRSA and EPA's Ocean Dumping Criteria. USACE is authorized by the MPRSA to issue permits for dredged material disposal. USACE Jacksonville District will prepare the public notice concerning the proposed disposal operation. EPA Region 4, as well as other federal and state agencies, will participate in the review of the application. EPA Region 4, in accordance with 40 CFR § 220.4(c), will approve, disapprove, or propose conditions on the MPRSA Section 103 permit before USACE can issue a permit. EPA Region 4 will not approve disposal of material into the ocean that has the potential for significant adverse biological impacts.

Additional conditions on the disposal operations may be imposed for disposal permits subsequently issued for individual projects in order to preclude or minimize potential interference with other activities and/or uses of the ocean. There are several management options for the permitting process including but not limited to: disposal volume limits, seasonal restrictions, full or partial approval of dredged material proposed for disposal, disposal within a spatially-limited portion of the disposal site, or other requirements such as dredged material barge operators to stay within a specified transit path, utilize navigation equipment for specified accuracy, and maintain appropriate ship logs.

EPA Region 4 will work with USACE Jacksonville District and USCG to monitor, inspect, and conduct surveillance of disposal operations in the ODMDS area. As authorized under MPRSA Section 105(a), EPA Region 4 may take appropriate enforcement actions if violations of the permit(s) are detected.

5.2. Site Management and Monitoring

In accordance with 40 CFR § 228.3, EPA is responsible for management of ocean disposal sites. Additionally, in accordance with 40 CFR § 228.9(c), EPA requires full participation of the permittees and encourages participation by state, federal, and local agencies in the development and implementation of monitoring programs for disposal sites.

In concert with the implementation of this proposed action, a detailed SMMP has been developed by EPA. The SMMP, which is included as Appendix F, will undergo pubic review as part of this EIS. The main purpose of the SMMP is to provide a structured framework for resource agencies to ensure that dredged material disposal activities will not unreasonably degrade or endanger human health, welfare, the marine environment, or economic potentialities (Section 103(a) of the MPRSA). It is the next step in the continuum of effective resource management that starts with the site designation process. The SMMP shall include, but not be limited to:

- A baseline assessment of conditions at the site;
- A program for monitoring the site;
- Special management conditions or practices to be implemented at each site that are necessary for the protection of the environment;
- Consideration of the quantity of the material to be disposed of at the site, and the presence, nature, and bioavailability of the contaminants in the material;
- Consideration of the anticipated use of the site over the long term, including the anticipated closure date for the site, if applicable, and any need for management of the site after the closure; and
- A schedule for review and revision of the plan (which shall not be reviewed and revised less frequently than 10 years after adoption of the plan, and every 10 years thereafter.) (USEPA and USACE 1996).

Management of the ODMDS involves regulating the times, quantity, and physical/chemical characteristics of dredged material that is dumped at the site; establishing disposal controls, conditions, and requirements to avoid and minimize potential impacts to the marine environment; and monitoring the site environs to verify that unanticipated or significant adverse effects are not occurring from past or continued use of the disposal site and that permit terms are met (USEPA and USACE 1996).

Monitoring programs should be flexible, cost effective, and based on scientifically sound procedures and methods to meet site-specific monitoring needs. A monitoring program should have the ability to detect environmental change and assist in determining regulatory and permit compliance. Major monitoring requirements are summarized in Table 5.2-1.

Table 5.2-1. Major Monitoring Requirements for the Proposed ODMDS

Requirements	Purpose
Bathymetric survey/analysis	To determine movement (if any) of dredged material outside the site. Aids in prudent site management by detecting excessive mounding.
Dredged material fate studies	Further aids in tracking the migration of sediments out of the site.
Disposal compliance monitoring	To ensure management and permit requirements are being met.
Trend assessment studies	Select trace concentrations would record long-term trends of accumulation in the sediments. Absence from the site of pollution sensitive biota would indicate adverse impacts at the disposal site.

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