UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Southeast Regional Office
263 13th Avenue South
St. Petersburg, Florida 33701-5505
http://sero.nmfs.noaa.gov

October 4, 2018 F/SER47:CC/PW

Ms. Emily Biondi
Director, Office of Project Development and Environmental Review
Federal Highway Administration
U.S. Department of Transportation
1200 New Jersey Avenue, Southeast
Washington, D.C. 20590

Attention: Daniel Buford

Dear Ms. Biondi:

NOAA's National Marine Fisheries Service (NMFS) reviewed the letter, dated May 10, 2018, from the Federal Highway Administration (FHWA) requesting a programmatic essential fish habitat (EFH) consultation, pursuant to the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act), for common transportation projects undertaken or funded by the FHWA in the states of North Carolina, South Carolina, and Georgia. The FHWA included with the letter *Programmatic Essential Fish Habitat Assessment for Transportation Activities and Projects Regularly Undertaken in North Carolina, South Carolina, and Georgia* (Programmatic EFH Assessment), dated April 2018. The Programmatic EFH Assessment describes a suite of frequently occurring or routine activities implemented in the aforementioned states; the FHWA requests a programmatic EFH consultation to cover these activities over five years (i.e., October 1, 2018, through September 30, 2023).

Programmatic consultations under the EFH provisions of the Magnuson-Stevens Act are described at 50 CFR 600.920 (j). Programmatic EFH consultations allow the NMFS and a federal agency to consult regarding a potentially large number of similar individual actions in a similar geographic setting when sufficient information is available to address all reasonably foreseeable adverse effects on EFH individually and cumulatively. A federal agency may request programmatic consultation by providing the NMFS with an EFH assessment in accordance with 50 CFR 600.920 (e), which describes required and recommended contents of an EFH assessment. In short, those contents are descriptions of the actions, analyses of the potential adverse effects on EFH and managed species, and actions the federal agency will take to avoid, minimize, and mitigate those effects. In addition to those contents, the NMFS normally requires programmatic consultations to include a mechanism for ensuring timely verification that impact thresholds are not exceeded.

The Programmatic EFH Assessment describes the effects of various projects, including new alignments/roadways and roadway construction; new bridge, bridge replacement, and bridge widening, as well as new and replacement piers; bridge repair, maintenance, and retrofit, as well as pier repair and maintenance; culvert installation, replacement, repair, maintenance, and cleaning; installation, maintenance, and removal of shoreline stabilization; and pavement preservation. Activities related to these projects include the installation, maintenance, and removal of temporary erosion, turbidity, and sedimentation control devices; staging areas; site preparation; geotechnical

drilling and hazardous waste sampling; installation, maintenance, and removal of scientific survey devices; temporary platforms, access fills, and cofferdams; pile installation and removal; blasting; dredging and underwater excavation; and use of various equipment. Section 6.1, Section 6.3, and Appendix D of the Programmatic EFH Assessment provide details on these projects and activities. Important to appropriate use of the Programmatic EFH Assessment, Section 6.2 identifies project thresholds that are outside the scope of this EFH consultation. Lastly, Section 7.4 provides the estimated number of projects/actions by type within the aforementioned states over five years.

To help ensure covered projects neither individually nor cumulatively exceed impact limits, Section 7 of the Programmatic EFH Assessment describes 12 General Conservation Measures (GCMs) applicable to all projects undertaken and over 61 Conservation Measures (CMs) applicable to at least one project type. Section 8 provides three CMs for guiding compensatory mitigation when impacts to EFH are unavoidable. To support the GCMs and CMs, the FHWA and the NMFS collaborated on *Best Management Practices Manual for Transportation Actions in North Carolina, South Carolina, and Georgia*, which FHWA will distribute to state Departments of Transpiration and to FHWA division offices in North Carolina, South Carolina, and Georgia.

Section 4.1 of the Programmatic EFH Assessment describes how the FHWA and state Departments of Transportation will use the assessment to document consultations required by the Magnuson-Stevens Act, and Appendix C provides a Verification Form to facilitate this documentation. Upon receipt of the Verification Form, the NMFS will respond within 15 days confirming the project is within the scope of the Programmatic EFH Assessment or explaining why the project is not. Should the latter be the case, the NMFS will identify changes that would bring the project within the scope of the Programmatic EFH Assessment. Finally, Section 4.3 and Section 4.4 describe annual reviews the FHWA and NMFS will conduct to ensure the program is on track and to identify efficiencies gained through modifications to the Programmatic EFH Assessment.

Conclusion

For the same rationales described in the Programmatic EFH Assessment, the NMFS concludes transportation projects within the scope described in the assessment and abiding by the GCMs and CMs are taking all reasonable measures to conserve and protect EFH and federally managed fishery species. Accordingly, the NMFS provides no additional EFH conservation measures for those actions. Please note Section 4.1 and Appendix C of the Programmatic EFH Assessment direct how the FHWA and state Departments of Transportation are to use the assessment for individual projects. In consultation with FHWA staff, the NMFS made minor changes to the Programmatic EFH Assessment submitted by the FHWA. The revised Programmatic EFH Assessment, dated October 2018, is enclosed with this letter.

This programmatic EFH consultation is valid through September 30, 2023. Before then, reinitiation of consultation under the Magnuson-Stevens Act will be necessary if the projects or activities change from the descriptions provided in the Programmatic EFH Assessment, project/activity environments change (including new designations of EFH), or new information shows project effects differ from those reviewed in the Programmatic EFH Assessment.

The NMFS looks forward to further cooperation with the FHWA on other projects to ensure the conservation of EFH and federally managed fishery species. If you have any questions on this consultation, please contact Cindy Cooksey, Fishery Biologist, at (843) 460-9922 or by email at Cynthia.Cooksey@noaa.gov.

Sincerely,

Virginia M. Fay
Assistant Regional Administrator
Habitat Conservation Division

Enclosure: *Programmatic Essential Fish Habitat Assessment for Transportation Activities and Projects Regularly Undertaken in North Carolina, South Carolina, and Georgia*

cc: FHWA, Danile.Buford@dot.gov, Brian.Yanchik@dot.gov
F/SER3, Robert.Hoffman@noaa.gov; Michael.Barnette@noaa.gov
F/SER4, David.Dale@noaa.gov
F/SER47, Cynthia.Cooksey@noaa.gov

Programmatic Essential Fish Habitat Assessment for Transportation Activities and Projects Regularly Undertaken in North Carolina, South Carolina, and Georgia

Prepared in Collaboration through an Interagency Agreement by:

National Marine Fisheries Service, Southeast Regional Office
263 13th Avenue South, St. Petersburg, Florida 33701

With and for:

Federal Highway Administration, Office of Project Development and Environmental Review
1200 New Jersey Avenue SE, Washington, DC 20590

Assisted by:

Volpe, The National Transportation Systems Center, U.S. Department of Transportation
55 Broadway, Kendall Square, Cambridge, MA 02142

October 2018

1. Table of Contents

2. Introduction

Section 305(b)(2) of the Magnuson-Stevens Fishery Conservation and Management Act (MSA) requires federal agencies to consult with NOAA's National Marine Fisheries Service (NMFS) on any actions the federal agency funds, authorizes, or carries out that may adversely affect essential fish habitat (EFH). The implementing regulation, at 50 CFR 600.920 (j), encourages consultations to be addressed programmatically when sufficient information is available to identify EFH Conservation Recommendations that will address all reasonably foreseeable adverse impacts on EFH of similar individual actions occurring within a given geographic area. The Federal Highway Administration (FHWA) proposes to meet its MSA obligations in North Carolina (NC), South Carolina (SC), and Georgia (GA) through a programmatic EFH consultation on regularly undertaken transportation projects in the states. FHWA bases this proposal on a review of MSA consultations these three State Departments of Transportation, FHWA, and NMFS have completed successfully during the last 5 years. To further support this proposal, the FHWA has worked with the NMFS to complete the *FHWA/NMFS-SERO Best Management Practices (BMP) Manual*, which evaluates the more common transportation projects and activities and identifies BMPs to address the reasonably foreseeable adverse impacts. The BMP Manual should reduce the number of projects requiring individual, in-depth EFH consultations with the NMFS. The BMP Manual also addresses anadromous fish and identifies measures to avoid and minimize impacts to anadromous species and their habitats. Appendix A of this document covers anadromous fish and their habitats.

Pursuant to §305(b)(2) of the MSA, FHWA submits this programmatic EFH Assessment for transportation actions regularly undertaken in NC, SC, and GA. This is intended to reduce the number of projects that undergo full consultation by SERO HCD on an individual basis without detailed information on a specific project or site. Below is a list of the activities and projects proposed for the programmatic consultation, with certain limitations and restrictions (including specific impact limitations), occurring within NC, SC, and GA. This consultation will be applicable in tidally influenced waters and wetlands of the U.S. and non-tidal waters supporting anadromous fish (pursuant to the authorities of the Fish and Wildlife Coordination Act).

Activities (common to several project types)

1. Installation, maintenance, and removal of temporary erosion, turbidity, and sedimentation control devices
2. Staging areas
3. Site preparation
4. Geotechnical drilling and hazardous waste sampling
5. Installation, maintenance, and removal of scientific survey devices
6. Temporary platforms, access fills, and cofferdams
7. Pile installation and removal
8. Blasting
9. Minor dredging/underwater excavation

10. Equipment

Project Types

1. New alignments/roadways and road widening (roadway construction)
2. New bridge, bridge replacement, and bridge widening; new and replacement piers
3. Bridge repair, maintenance, and retrofit; pier repair and maintenance
4. Culvert installation, replacement, repair, maintenance, and cleaning
5. Installation, maintenance, and removal of shoreline stabilization
6. Pavement preservation

3. Background Statutory and Regulatory Information

In 1996, the U.S. Congress amended the Magnuson-Stevens Fishery Conservation and Management Act (MSA) to establish procedures to identify, conserve, and enhance essential fish habitat (EFH) for those species regulated under a Federal fisheries management plan (FMP). The MSA implementing regulations (50 CFR 600.05 – 600.930) provide the process for federal agencies, NMFS and the fishery management councils (FMCs) to satisfy the EFH consultation requirement under §305 (b)(2)-(4)) of the MSA. Pursuant to §305(b)(2) of the MSA, federal action agencies which fund, permit (authorize), or carry out activities that may adversely affect EFH are required to consult with NMFS regarding the potential impacts of their actions on EFH. In the southeast region, the Federal Highway Administration (FHWA) or its designated non-federal representative, such as state Departments of Transportation (DOTs), initiates EFH consultations under the MSA with the Habitat Conservation Division (HCD) of the Southeast Regional Office (SERO) of NMFS. FHWA/DOTs must consult with NMFS on all actions that may adversely affect EFH. When appropriate, NMFS provides EFH Conservation Recommendations (which may include measures to avoid, minimize, mitigate, or otherwise offset adverse effects on EFH) for activities that would adversely affect EFH. SERO HCD may also make recommendations pursuant to the Fish and Wildlife Coordination Act.

FHWA provides stewardship over the construction, maintenance, and preservation of the Nation's highways, bridges, and tunnels. FHWA funds projects, which are typically carried out by DOTs, through the Federal-Aid Highway Program (FAHP) and Federal Lands Highway Program. The FAHP provides the financial resources and mechanism to assist States and local public agencies (LPAs) in constructing, preserving, and improving transportation for the movement of people and goods. The Federal Lands Highway Program provides financial resources and technical assistance to support a coordinated program of public roads that service the transportation needs of Federal and Tribal lands.

Programmatic Consultations

Programmatic consultation is an efficient and effective mechanism for implementing the EFH consultation requirements by incorporating many individual actions that may adversely affect EFH into one consultation. The EFH regulations (at 50 CFR 600.920(j)(1)) encourages programmatic consultation when there is sufficient information available to develop EFH Conservation Recommendations, if appropriate, that will address all reasonably foreseeable adverse impacts on EFH of an entire program, parts of a program, or a number of similar individual actions occurring within a given geographic area.

Programmatic consultations allow NMFS and other Federal agencies to take a comprehensive review of Federal programs for their adverse effects on EFH. The goal of a programmatic consultation should be to address as many adverse effects as possible through programmatic EFH Conservation Recommendations, if applicable. Any adverse effect that cannot be addressed programmatically will have to be addressed through individual consultation.

4. Programmatic Consultation Procedures

The first two steps for state DOTs/FHWA using this programmatic EFH consultation are (1) determining if a given transportation action occurs within tidally influenced waters or wetlands or where anadromous fish occur, and (2) whether the project/activity is applicable under this consultation. In North Carolina, South Carolina, and Georgia, the EFH designations include all tidally influenced areas, including areas where the tidal influence occurs less often than daily[1]. Projects and their effects not occurring in tidally influenced areas and not extending downstream to a tidally influenced area do not require an EFH consultation under the MSA. Table 1 and Section 6 describe the projects/activities covered by this programmatic consultation. A project adversely affecting tidally influenced waters or wetlands but not among the projects/activities covered by the programmatic consultation will require an individual EFH consultation under the MSA. A project within tidally influenced waters or wetlands and among the project types covered by the programmatic consultation will not require further consultation provided the programmatic conservation measures described in Section 7 of this document are integrated into project design plans or included as environmental commitments to contractors in all applicable actions. Project changes that result in non-compliance with the programmatic consultation will require initiation of individual EFH consultation.

4.1 Project Verification Requirements

For each use of the programmatic EFH consultation, state DOTs/FHWA will provide all of the required project-specific information to SERO HCD, via the Verification Form in Appendix C. The Verification Form will serve as a record of the activity and be used to account for aggregate effects of the activities funded or authorized by FHWA. State DOTs/FHWA and SERO HCD will track and analyze the activities on an annual basis.

Upon receipt of the Verification Form, SERO HCD will confirm that a project is eligible for the programmatic through a three-step process: by confirming (1) the transportation action occurs within tidally influenced waters or wetlands or where anadromous fish occur; (2) the project/activity is applicable under this consultation; and (3) justification for any EFH conservation measures that were not included is sufficient. Following determination that the project is eligible for the programmatic EFH consultation, SERO HCD may notify state DOTs/FHWA of any concerns or if SERO HCD requires additional information. State DOTs/FHWA *must* receive concurrence from SERO HCD for a project to proceed under the programmatic EFH consultation. SERO HCD will respond within 15 days of submittal. For projects that do not incorporate all applicable programmatic EFH conservation measures, but the effects to EFH are not substantial and an individual EFH consultation is not otherwise required,

[1] The South Atlantic Fishery Management Council's (SAFMC's) EFH designation for shrimp applies to all waters from the EEZ to the landward most influence of the tide. Some areas, including tidal freshwater wetlands and forested areas, are at least periodically (and sometimes infrequently) influenced by salinity in the form of storm surge, high tidal amplitudes, and salt water intrusion (especially in times of drought).

FHWA/DOT will indicate which EFH conservation measures were not included and provide additional justification in the Verification Form.

4.2 Individual EFH Consultation

Individual EFH consultation is required for proposed transportation actions that do not fit within the described projects and activities, do not follow all the applicable EFH conservation measures (except where justification is provided and SERO HCD concurs via Verification Form), or do not meet impact thresholds.

Transportation actions not characterized under one of the six main project types, but include actions common to several project types described herein, will need to undergo individual consultation. However, incorporating the conservation measures for activities described in section 7 could lead to a streamlined consultation.

4.3 Annual Meeting

Following the implementation of the programmatic EFH consultation, FHWA, state DOTs and SERO HCD will meet annually, either in-person or over the phone. FHWA, State DOTs and NMFS may subsequently agree to meet less often if both agencies agree the programmatic EFH consultation is functioning as intended and if less frequent meetings will not undermine the goals of the programmatic EFH consultation. At the meeting, FHWA, state DOTs and NMFS will:

- discuss the annual tracking of covered projects;
- evaluate and discuss the continued effectiveness of the programmatic EFH consultation;
- account for any new information or technology;
- ensure that activities authorized by the programmatic consultation continue to minimize adverse effects to EFH; and/or
- update the procedures and conservation measures, if necessary.

4.4 Annual Report

State DOTs/FHWA will provide an annual report of the activities carried out under this programmatic EFH consultation for the purpose of determining the effectiveness of the programmatic EFH consultation and calculating aggregate effects. State DOTs/FHWA will provide the compiled information to SERO HCD for the previous year of activities, each year that the programmatic EFH consultation is in effect. The reporting period ends June 30 of each year and the Annual Report will be due 90 days later.

The Annual Reporting Spreadsheet and description of results will be sent electronically to:

nmfs.ser.efhprogrammaticconsultation@noaa.gov

4.5 Revisions

State DOTs/FHWA and SERO HCD will discuss the need for revisions at the annual meetings, as noted above. Revisions may be needed to account for new information or technology or to better streamline the coordination process. SERO HCD and FHWA may revise this document at any time by agreement of both agencies. At any time, SERO HCD or FHWA may revoke or restrict the scope of this programmatic EFH consultation if it is not being implemented as intended in all states. SERO HCD and FHWA may

first attempt to address any issues before revoking the programmatic EFH consultation or restricting its scope.

4.6 Supplemental Consultation

Pursuant to 50 CFR 600.920(l), FHWA must reinitiate EFH consultation with SERO HCD if the proposed action considered under this programmatic is substantially revised in a manner that may adversely affect EFH, or if new information becomes available that affects the basis for NMFS' EFH conservation recommendations. In addition, if SERO HCD receives new or additional information that may affect the programmatic EFH conservation recommendations, SERO HCD may request additional consultation, modify the EFH conservation recommendations, or provide additional EFH conservation recommendations.

5. Description of the Action Area and Resources

Transportation activities under the programmatic EFH consultation would occur in areas designated EFH for various life stages of fish species managed by the Councils and NMFS and in areas that support prey species and anadromous fish. FHWA/DOTs conduct several kinds of routine and repetitive activities and projects that typically result in predictable effects. The geographic scope of this programmatic consultation includes all tidally influenced areas designated EFH and tidally influenced and non-tidal areas that support anadromous fish in the jurisdiction of SERO HCD in NC, SC, and GA. Specifically, this includes estuarine/inshore and wetland areas; this consultation will not include impacts to marine areas.

The South Atlantic Fishery Management Council (SAFMC), Mid-Atlantic Fishery Management Council (MAFMC), and the NMFS have designated in their fishery management plans EFH germane to transportation projects in NC, SC, and GA. The NMFS directly manages highly migratory species (HMS), though few EFH designations within the fishery management plan for this group extends into waters where impacts from transportation projects may occur. The MAFMC and NMFS fishery management plans designate EFH for some species in the waters of NC, SC, and GA; however, many of these EFH designations are broad and overlap EFH designated by the SAFMC. A list of species and EFH most commonly impacted by transportation projects in NC, SC, and GA is provided in the *FHWA/NMFS-SERO BMP Manual*.

5.1 EFH Description

EFH includes all types of aquatic habitat (waters and substrates) necessary to fish for spawning, breeding, feeding, or growth to maturity. The official EFH designation language for those managed species found in waters of NC, SC, and GA are contained in each relevant FMP, related amendments, and relevant habitat/ecosystem plans. The designations describe the geographical extent in which EFH is found, the type of habitats utilized by each species, and in some cases, each life-stage of a species. Specific plans, amendments, descriptions of EFH and other information can be found at http://safmc.net/, http://www.mafmc.org/ and https://www.fisheries.noaa.gov . Many descriptions of EFH can be found in the South Atlantic Fishery Management Council's *Fishery Ecosystem Plan of the South Atlantic Region, Volume II: South Atlantic Habitats and Species, April 2009.*

Broadly, EFH can be grouped into two categories: estuarine/inshore areas and marine areas. However, estuarine/inshore areas are predominantly impacted by transportation projects, whereas transportation projects rarely affect marine areas. The primary estuarine/inshore areas that may be impacted by transportation projects in NC, SC, and GA include, but are not limited to, estuarine and marine emergent wetlands (intertidal marshes; salt and brackish marsh), tidal creeks, oyster/shell habitat, subtidal and intertidal non-vegetated flats, and tidal freshwater (palustrine) wetlands. Due to the combinations and overlapping nature of EFH designations in various FMPs, all tidally influenced areas in NC, SC, and GA are designated EFH. Tidally influenced areas include areas where the tidal influence occurs less often than daily.

6. Covered Transportation Actions

6.1 Transportation Actions Covered Under this Programmatic Consultation

FHWA supports state and local governments in the design, construction, and maintenance of the nation's highway system. The programmatic EFH consultation applies to a subset of transportation activities that are typically funded or authorized by FHWA that may adversely affect EFH or anadromous fish. This is specific to road, bridge, and highway projects and activities, and does not include other project types such as dredging. FHWA/DOTs may use this consultation for applicable projects or consult with SERO HCD on a case-by-case basis through individual EFH consultation. Complete information on the project design in relation to effects to EFH must be available for each of the projects using this consultation.

This programmatic EFH consultation will satisfy MSA requirements for a covered transportation project and conclude consultation, as confirmed through a completed Verification Form and response from SERO HCD. Individual transportation projects that undergo programmatic EFH consultation may require permits issued by federal agencies including the U.S. Army Corps of Engineers or the U.S. Coast Guard. In these cases, FHWA will be the lead federal agency for the purposes of EFH consultation with SERO HCD on FHWA funded or authorized projects and provide the completed Verification Form and response in any other permit application materials, as necessary, to confirm EFH consultation is complete.

The activities and projects covered under this consultation include the following, with certain limitations and restrictions, occurring within North Carolina, South Carolina, and Georgia. This consultation is applicable in tidally influenced waters and wetlands of the U.S. and non-tidal waters that support anadromous fish within NC, SC, and GA.

These activities and projects include:

Table 1. Covered Transportation Projects and Activities

Project Types	**Activities (common to several project types)**
New alignments/roadways and road widening (roadway construction)	Installation, maintenance, and removal of temporary erosion, turbidity, & sedimentation control devices
New bridge, bridge replacement, and bridge widening; new & replacement piers	Staging areas
Bridge repair, maintenance, and retrofit; pier repair and maintenance	Site preparation
Culvert installation, replacement, repair, maintenance, and cleaning	Geotechnical drilling and hazardous waste sampling
Installation, maintenance, and removal of shoreline stabilization	Installation, maintenance, and removal of scientific survey devices
Pavement preservation	Temporary platforms, access fills, and cofferdams
	Pile installation and removal
	Blasting
	Dredging/underwater excavation
	Equipment

The actions included under this programmatic EFH consultation will not have a substantial adverse effect on EFH, because the projects will be implemented in a manner that avoids and minimizes impacts to EFH and sensitive life stages of managed species and other trust resources by adhering to all EFH conservation measures described in Section 7 (and 8).

Transportation projects and activities will adhere to all the applicable conservation measures provided in Section 7 for a project to be part of this programmatic EFH consultation, except where justification is provided and SERO HCD concurs via Verification Form that the project does not have substantial effect on EFH or that impacts have been minimized as much as possible. Projects that deviate from the activity descriptions or fail to implement the appropriate conservation measures herein will require individual EFH consultation if they may adversely affect EFH or anadromous fish.

6.2 Transportation Actions Not Covered Under this Programmatic Consultation

Transportation actions that will not be covered under this programmatic consultation include:

- Any actions not included in those outlined in 6.1 and described in 6.3.
- Any actions that exceeds 0.75 total acre of impacts to EFH, which can include up to 0.5 acre of tidally influenced estuarine/brackish area impacts, 0.25 acre of tidal freshwater area impacts, or 0.01 acre of oyster/shell habitat impacts for a single and complete project. Specific project limits are found in *Table 3*.
- Any action with impacts to submerged aquatic vegetation/seagrasses, coastal inlets, all state-designated nursery habitats of particular importance to shrimp and snapper-grouper, state-

identified overwintering areas for shrimp, and marine areas. [2]

- Any actions that do not adhere to all applicable conservation measures, except when expressly allowed by SERO HCD.

6.3 Description of Transportation Actions

FHWA/DOTs conduct several kinds of common projects and activities that typically result in predictable effects. This programmatic EFH consultation covers the following six (6) general project types and ten (10) activities common to several project types in NC, SC, and GA, with certain limitations and/or conditions:

Project Types

1. New alignments/roadways and road widening (roadway construction)
2. New bridge, bridge replacement, and bridge widening; new and replacement piers
3. Bridge repair, maintenance, and retrofit; pier repair and maintenance
4. Culvert installation, replacement, repair, maintenance, and cleaning
5. Installation, maintenance, and removal of shoreline stabilization
6. Pavement preservation

Activities (common to several project types)

1. Installation, maintenance, and removal of temporary erosion, turbidity, and sedimentation control devices
2. Staging areas
3. Site preparation
4. Geotechnical drilling and hazardous waste sampling
5. Installation, maintenance, and removal of scientific survey devices
6. Temporary platforms, access fills, and cofferdams
7. Pile installation and removal
8. Blasting
9. Dredging/underwater excavation
10. Equipment

Information on the stressors produced by such activities and the effects to EFH, managed species, and anadromous fish and their habitat is provided in more detail in the **FHWA/NMFS-SERO BMP Manual.** These activities are commonly coordinated between FHWA and SERO HCD and are expected to have minimal impacts with the incorporation of the programmatic EFH conservation measures. Each project

[2] Further explanations and descriptions can be found in the *Users Guide to Essential Fish Habitat Designations by the South Atlantic Fishery Management Council*. November 2016.

and activity is described below in Table 2. The programmatic EFH conservation measures contain descriptors and thresholds for the specific actions are also included.

Table 2. Likely impacts from each project type

	Project Type					
Potential Impacts	New alignments & Widening	Bridge, Piers & Docks	Bridge Repair & Maintenance	Culverts	Shoreline Stabilization	Pavement
Habitat loss and alteration (fill, shading, sediment compaction, clearing)	x	x	x	X	X	x
Physical injury and mortality	x	x	x	X	X	
Hydroacoustic		x	x	X	X	
Habitat barriers	x	x		X		
Water quality	x	x	x	X	X	x
Impingement/entrainment	x	x	x	X	X	
Vessel Traffic	x	x	x		X	

Impacts from activities common to several project types are included within the analysis of the six (6) covered project types.

The dominant impact from transportation projects and activities is habitat loss and alteration. This includes reducing the quantity (loss/elimination) and quality (reduced function) of EFH and habitats important to anadromous fish. This is primarily a result of fill activities and the placement of structures that result in shading.

6.3.1 Description of Proposed Projects

Below are short summaries of project types. Descriptions that are more detailed can be found in Appendix D.

6.3.1.1 New Alignments/Roadways and Road Widening (Roadway Construction)

New alignments or roadways include constructing roadways in new locations, where there is no existing infrastructure and include placing fill/embankment. Road widening projects typically include placing fill immediately adjacent to the existing roadway to match the existing grade, paving, and preparing side slopes. Installation of guardrails, medians, and other safety components are typically included in these road projects. Shoreline stabilization on newly formed side slopes is common to these projects. These activities may also include constructing new bicycle/pedestrian/multi-use facilities.

6.3.1.2 New Bridge, Bridge Replacement, and Bridge Widening; New, Replacement, or Relocated Piers and Docks

New bridges (also piers and docks) include constructing structures where there is no existing infrastructure. Activities may consist of the permanent placement of substructures and approach fill into waters of the U. S. necessary for the construction of structures. Additional activities may include the placement of bridge components including substructures, superstructures, and shoreline stabilization. Bridge widening and replacement activities typically replace functionally obsolete and/or structurally deficient bridges or expand, restore, or improve safety and functionality of existing bridges. Bridge widening projects expand the roadway width and typically consist of adding girders, interior bents and expanding the bridge deck, consistent with the components of the existing structure. Bridge replacement projects construct new bridges parallel to, or on the same alignment as, an existing bridge; no structural components from the existing bridge are used in the new bridge. For bridge replacement projects the

existing bridge typically is removed following completion of the new bridge. These activities may also include constructing or replacing new bicycle/pedestrian/multi-use facilities.

6.3.1.3 Bridge Repair, Maintenance and Retrofit; Dock and Pier Repair, Maintenance, and Retrofit

Bridge (also pier and dock) repair, maintenance, and retrofit activities are implemented to prolong the use and function of bridges, ensure motorist safety, and protect the environment. Bridge repair typically consists of removing and replacing deteriorated deck concrete or rehabilitating other existing components of the bridge, including piles and girders. Bridge repairs may also consist of seismic retrofitting, which includes such items as strengthening pilings and bents. Whether a bridge is repaired, rehabilitated, or replaced depends on the age of a bridge and damage that may occur to a bridge (e.g., from a storm event, earthquake, or vehicle or boat collision). Scour repair work is a common type of bridge maintenance where materials (typically riprap) are placed in the water to protect existing substructures. Maintenance activities may include washing, painting, debris removal from bridge piers, guardrail repairs, lighting and signage repairs, and structural rehabilitation. Seismic retrofitting activities involve modifying existing structures for increased resistance to seismic activities. This can include replacing bolts and rivets and adding longitudinal restrainers. Maintenance can also include adding pile jackets to protect existing pilings.

6.3.1.4 Culvert Installation, Replacement, Repair, Maintenance, and Cleaning

Culvert projects consist of replacing undersized, broken, or damaged culverts with new structures to sustain adequate flows, or placing (installing or constructing) new culverts in areas where they did not previously occur. Culvert maintenance projects include making repairs to the structural integrity of the culvert or protecting an existing culvert with shoreline stabilization. Cleaning involves removing sediments or debris from within or near the opening of a culvert

6.3.1.5 Shoreline Stabilization

Shoreline stabilization involves the direct protection of embankments at bridges, culverts, and roadway sections from erosive forces of flowing water. A variety of structures or materials can be built or placed parallel to shore on an existing, restored, or modified shoreline. Revetments, bulkheads, seawalls, and gabions protect the area immediately behind them, but afford no protection to adjacent areas or areas in front. These structures stabilize shorelines by enclosing and protecting areas, preventing the shoreline from functioning normally. Living shorelines may also be used, which is shoreline stabilization made up mostly of native material, often incorporating vegetation or other living, natural elements.

6.3.1.6 Pavement Preservation

Pavement preservation consists of patching, repairing, and replacing roadway surfaces and pavement. These include three types of pavement: (1) asphalt, (2) chip seal, and (3) concrete. If the existing pavement is in good condition, it may be covered over with a new layer of asphalt. Repair of badly deteriorated pavement could require grinding of existing pavement or replacement of the road foundation material prior to repaving. This typically involves grinding off and replacing the existing asphalt pavement.

6.3.2 Description of Activities

Below are short summaries of activities common to numerous project types. Descriptions that are more detailed can be found in Appendix C.

6.3.2.1 Installation, Maintenance, and Removal of Temporary Erosion, Turbidity, and Sediment Control Devices

The installation of temporary erosion, turbidity, and sediment control measures is a necessary component of active construction sites. Prior to most construction activities, erosion and sediment control measures are typically installed on the perimeter of active construction sites (including off-site and staging areas) to prevent erosion and water pollution. Siltation control fence (SCF) is commonly used on the perimeter of sites, but typically requires small amounts of clearing and grubbing for installation. Numerous measures are commonly used in NC, SC, and GA, and include berms, silt basins, dams, and sediment tubes.

6.3.2.2 Staging Areas

Staging areas are used for delivery and storage of construction materials and equipment, contractor office and storage trailers, and employee parking. These areas are typically contractor-selected and permitted, and are often fenced and located in close proximity to project construction. Depending on site conditions, construction staging areas vary in size and may require vegetation clearing, grubbing, and grading or excavation to level the site and install drainage improvements. Extensive alterations to establish a staging area, such as blasting, are extremely unlikely. Staging, fueling, and storage areas are typically located in areas that minimize potential effects to sensitive areas. Specialized best management practices (BMPs) are employed around concrete-handling areas to prevent water contamination from uncured cement entering water bodies or stormwater facilities. Temporary erosion and sediment control measures are implemented prior to, or immediately following, ground disturbance on these sites.

6.3.2.3 Site Preparation

Site preparation begins with vegetation removal, which may be permanent or temporary. Permanent conversion of a vegetated area into a developed area includes clearing vegetation then grubbing out the roots, stumps, and other debris. Together, these are typically referred to as “clearing and grubbing” and are a sub-activity of earthwork. Temporary vegetative clearing includes cutting vegetation but maintaining the root mass to allow for regrowth. Preliminary earthwork consists of stripping topsoil from an area and either removing earth or placing and compacting earth for roadway prism construction or slope construction. Completed cut or fill prisms may then be covered by any number of treatments, such as rock base and pavement, rock stabilization and rip-rap, or mulch and seeding. Drainage and utility work often accompany excavation and embankment. Temporary road construction is often necessary for equipment access and involves similar site preparation activities as conducted for permanent roads. A variety of temporary construction BMPs are used for site preparation, including silt fences, check dams, and siltation ponds. Erosion control measures are installed and operational before commencement of ground- disturbing activities. Areas where vegetation should be preserved are clearly marked or fenced.

6.3.2.4 Geotechnical Drilling and Hazardous Waste Sampling

Subsurface sampling and testing to determine soil characteristics is often an important step in the engineering design process. Subsurface sampling is accomplished by drilling test holes up to 300 ft. deep

or digging soil pits up to 8 ft. deep. A drill rig can be mounted on a variety of transportation vehicles including trucks, tractors, skids, drill rigs, and barges. The drill is typically 5 to 10 inches in diameter. When drilling is done off the roadway, impacts are minimized as much as possible through the selection of an appropriate sized and mounted drill rig, and limited vegetation removal. Subsurface sampling for hazardous materials may also be necessary for each program/category. It is very similar to subsurface sampling for geotechnical purposes. Durations will vary for these activities depending on number of bore holes and substrate composition.

6.3.2.5 Installation, Maintenance, and Removal of Scientific Survey Devices

Numerous scientific survey devices are installed in or near project sites to collect data on environmental conditions, processes, and impacts. These types of devices are typically removed in less than 24 months. Many survey devices are installed with anchored buoys, vinyl poles, or single piles installed by hand or jetted in place from a barge. The amount of impact from this category of activity typically varies from $1ft^2$ to 50 ft^2. This type of installation can typically be completed in 1 or 2 days. Examples include installation or removal of staff gages, tide cages, current gages, and water quality testing devices.

6.3.2.6 Temporary Platforms, Access Fills, and Cofferdams

Temporary work platforms and fills may be required for new construction and to support maintenance activities (typically for bridges and causeways). Equipment typically includes the use of barges, cranes, pumps, boats, front-end loaders, and track hoes. Examples of temporary platforms and fills include:

- Space-frame structures (i.e., truss-like, lightweight rigid structure constructed from interlocking struts in a geometric pattern) that provide high capacity working platforms.
- Work trestles (i.e., a rigid frame used as a support, especially referring to a bridge composed of a number of short spans supported by such frames)
- Temporary haul road fill (i.e., temporary roads of fill created in or adjacent to the waterbody to transport equipment and materials).
- Fill platforms (i.e., temporary islands or access roads of fill created to support equipment).

Cofferdams are temporary steel or concrete boxes used to keep water out of work areas and are common to in-water work operations. Cofferdams can also include inflatable (typically made of geotextile) devices, where the walls are filled with water and the interior areas are pumped out; these types of cofferdams are typically used in areas where sheet piles cannot penetrate the bottom substrate. Cofferdams enclose work areas and reduce turbidity, sedimentation, and hydroacoustic impacts, while excluding organisms from areas where construction work is occurring. Cofferdams composed of steel sheet piles installed with vibratory hammers in a generally rectangular configuration are included in this evaluation.

6.3.2.7 Pile Installation and Removal

Pile Installation

Pile installation methods can be categorized as displacement or replacement. Displacement piles are driven or vibrated into the ground, displacing the surrounding soil. Replacement piles are placed or

constructed within previously drilled boreholes, replacing the excavated soil. Various methods exist for displacement and replacement pile installation and a combination of methods are typically used.

Pile driving is a type of displacement method using mechanical force to drive piles into substrates. Impact hammers and vibratory hammers are the most common type of pile drivers. Impact hammers use a heavy ram weight raised hydraulically or mechanically above a pile, which is then dropped or propelled onto the head of a pile to move the pile into the substrate. Vibratory hammers vibrate piles at frequencies that move soil particles, significantly reducing friction around the pile shaft. Electrically or hydraulically produced vibrations are transmitted from the pile to the soil, allowing for penetration. Vibratory hammers are most effective in granular soils, but can also be effective in cohesive soils. Vibratory hammers produce non-impulsive sounds. For all pile drivers, pile diameter and hammer energy are correlated; with increased pile diameters, requiring increased hammer energy.

Jetting, or water jetting, is another type of displacement pile driving method. Jetting uses high-pressure water pumps to force a hole in the bottom substrate for the placement of piles. Cast-in-place (CIP) piles are the primary type of replacement pile installation method. CIP piles are reinforced concrete piles cast on-site in holes drilled to predetermined depths. CIP piles are commonly referred to as "drilled shafts." For CIP piles in aquatic environments, steel casings are typically installed using a vibratory hammer, after which drilling takes place inside of the casing with an auger or other type of drilling equipment (e.g., drilling buckets) to the desired depth.

Footings

Footings are constructed to support piles or columns, both of which are composed of reinforced concrete. In aquatic environments, cofferdams facilitate construction of footings (and below-water sections of piles or columns). Cofferdams are typically rectangular structures composed of steel sheet piles installed with a vibratory hammer. Once a cofferdam is in place, it is dewatered to create dry conditions and work proceeds as if on land: the soil is excavated and foundation is constructed with reinforced concrete.

Pile and Footing Removal

Pile and footing removal takes place for various reasons, such as piles or footings are structurally deficient or functionally obsolete or piles are part of temporary structures. There are four general types of pile and footing removal including direct pull, pile hammer, cutting, and blasting.

6.3.2.8 Blasting

Blasting involves using explosive charges to break-up or remove rock, reinforced concrete, or other structures for excavation, construction, or demolition purposes. Blasting charges use various explosive weights and time delays that generate high-energy impulsive sounds and pressure waves. For transportation projects, underwater blasting is typically employed to remove sub-structure components of old/existing bridges or excavate bottom sediments (e.g., rock) for the placement of new sub-structures.

6.3.2.9 Dredging

Dredging is defined as underwater excavation and involves removing bottom sediments from the aquatic environment. Dredging is typically done to create or maintain waterways to support navigation, vessel access to channels, ports, and marinas. Dredging can also consist of removing debris, sediments, or other obstructions from the aquatic environment. For transportation projects, dredging is typically used to gain access to project sites and remove sediments to place piles.

6.3.2.10 Equipment

General equipment associated with roadway construction includes, but is not limited to, pick-up trucks, dump trucks, front-end loaders, cranes, asphalt grinders, paving machines, compaction rollers, bulldozers, chainsaws, vibratory and impact pile drivers, barges, vessels (boats), explosives, excavators, hoe rams, rock crusher (if blasting is used for on-site fill) track or pneumatic drills, graders, jack hammers, stingers, wire saws, air compressors, traffic control devices, generators, and other heavy equipment.

7. Proposed Programmatic EFH Conservation Measures

FHWA/DOTs will adhere to the proposed conservation measures for each applicable project for actions in North Carolina, South Carolina, and Georgia and activities common to those projects. Only projects that follow these conservation measures will be applicable under the programmatic consultation, with limited exception and justification.

7.1 General Conservation Measures Applicable to All Projects and Activities

Project sponsors implement standard measures as part of other environmental compliance processes (e.g., USACE wetland permitting), and many of these measures reduce potential effects on EFH and anadromous fish in NC, SC, and GA. These include:

- Wetland avoidance/minimization/compensation
- Clearly delineating vegetative clearing limits; maintaining riparian buffers/minimizing impacts to riparian buffers.
- Compliance with State water quality standards through Storm Water Pollution Prevention Plans (SWPPP), which include erosion and sediment control, spill control, runoff detention, and treatment.

In addition, specific conservation measures (CMs) will be implemented where applicable. Conservation measures (some of which are impact thresholds) are expected to reduce potential impacts of the stressors and overall extent of impacts to EFH and anadromous fish.

General conservation measures applicable to all projects include:

*[3]GCM1 Erosion, turbidity, and sedimentation control measures will be used throughout construction to control erosion, turbidity, and sedimentation to ensure there are no violations of state or federal water quality standards. Control measures will be monitored to (1) ensure species are not entangled or trapped in the project area, (2) will be removed promptly upon project completion and the return of ambient water quality conditions, (3) and will not appreciably block entry to or exit from habitats. Siltation barriers will be made of material in which listed species cannot become entangled (i.e., reinforced impermeable polycarbonate vinyl fabric [PVC]). Turbidity curtains may not be practical in dynamic systems such as surf zones and could actually do more harm than good if the curtains become detached (e.g., they could entrap pelagic organisms). For this reason, this CM can be waived if it is determined that the use of the turbidity barrier will have an adverse effect on the species or when noted in the

[3]Asterisks ("*") denote conservation measures also applicable to anadromous fish and their habitat (see Appendix A).

activity-specific PDCs below.

*GCM2 Petroleum products, chemicals, live (uncured) concrete, or water contaminated by these will not be allowed to enter flowing waters.

*GCM2.1 To the maximum extent practicable, refueling will be done at least 250 feet from any water body and be outside of active stream channels, outside of any tidal areas, and away from ditches or channels that enter flowing waters; designated refueling sites in upland areas at least 250 feet away from receiving waters is preferred. Refueling of boats and heavy machinery such as cranes positioned atop temporary work platforms over the water will take all relevant precautions to avoid spills into waterbodies.

*GCM2.2 To the maximum extent practicable, concrete washout pits/pans/pools will be located at least 500 feet from any water body and be outside of active stream channels, outside of any tidal areas, and away from ditches or channels that enter flowing waters; designated sites in upland areas at least 500 feet away from receiving waters are preferred.

*GCM2.3 A Spill Plan will be created, and the Plan and all materials necessary to implement the plan will be accessible on site.

*GCM3 Construction personnel will ensure all materials placed in the water, including sheet piles, concrete piles, and erosion control materials, will be free of sediments and/or contaminants.

GCM4 All over-water structures will incorporate measures to increase ambient light transmission and reduce shading. Such measures include, but are not limited to, maximizing the height of the structure and minimizing the width of the structure, minimizing the number of instream pilings/piers, and using grated decking material. Though not a requirement of this consultation, newly constructed (new or replacement) bridges, piers, multi-use paths, or docks with a height-width ratio of 0.7 or greater are preferred. This ratio is also recommended for temporary work structures, such as trestle systems/work bridges.

*GCM5 All projects will incorporate measures to minimize permanent fill. Such measures may include, but are not limited to, using 2:1 side slopes for embankment and reducing approach fills/extending bridges (increasing bridge lengths).

*GCM6 Temporary fills will not be used when other methods are available to facilitate construction, such as temporary work trestles, timber/crane mats, and floating barges.

GCM6.1 To the maximum extent practicable, the placement of timber/crane mats in salt marsh habitat should be limited to 6 months (180 days) for a given location and barge grounding should be minimized.

GCM7 Earthen fill of any kind (temporary or permanent) is not authorized in tidal creek habitat.

GCM8 Impacts to oyster/shell habitat and will be limited to 0.01 acre for a single and complete project.

GCM8.1 Oyster/shell that will be impacted by a proposed project (e.g., through fill activities) will be relocated with the assistance of SERO HCD and State Natural Resource agencies.

Oyster/shell colonizing piles/piers/columns that will be removed are exempt from this relocation provision.

GCM9 Impacts to submerged aquatic vegetation/seagrasses, coastal inlets, all state-designated nursery habitats of particular importance to shrimp and snapper-grouper, state-identified overwintering areas for shrimp, and marine areas will not occur.

*GCM10 Projects and activities will not meaningfully impede or obstruct passage of species.

*GCM11 All temporary work areas, modified or disturbed portions of streams, banks, and riparian areas will be restored to pre-construction conditions and/or natural and stable contours (elevations, profile, and gradient) following completion of work.

*GCM12 All structures necessary for in-water work will be removed immediately following completion of in-water work.

Conservation Measures: Limits for Programmatic EFH Consultation

*Projects will adhere to impact thresholds in order to be authorized under this programmatic consultation. There are no exemptions to impact thresholds.

- Impacts to tidally influenced areas (EFH) from projects/activities of any kind will not exceed 0.75 acre for a single and complete project. This will include permanent and temporary impacts. All projects will adhere to specific impact thresholds for individual project types, which are found in Table 3.
- Impacts to oyster/shell habitat from projects/activities of any kind will not exceed 0.01 acre for a single and complete project. This will include permanent and temporary impacts.
- Impact thresholds apply to each single and complete project in Table 3, defined by the stated purpose of the proposed project. Multiple sets of impact thresholds may not be used on the same project. All impacts include both permanent and temporary impacts.

***Table 3. Specific Project Limits**

Project Type	Tidally influence area limits
New roadways & road widening	0.75 acre total impacts, which can include up to 0.5 acre tidally influenced estuarine/brackish areas, 0.25 acre tidal freshwater areas, and 0.01 acre oyster/shell habitat
New & replacement bridges, docks, & piers.	0.75 acre total impacts, which can include up to 0.5 acre tidally influenced estuarine/brackish areas, 0.25 acre tidal freshwater areas, and 0.01 acre oyster/shell habitat
Bridge/dock/pier repair and maintenance	0.5 acre total impacts, which can include up to 0.35 acre tidally influenced estuarine/brackish areas, 0.15 acre tidal freshwater areas, and 0.01 acre oyster/shell habitat
Culvert installation, maintenance, repair, and cleaning	0.5 acre total impacts, which can include up to 0.35 acre tidally influenced estuarine/brackish areas, 0.15 acre tidal freshwater areas, and 0.01 acre oyster/shell habitat
Shoreline stabilization	0.35 acre total impacts, which can include up to 0.25 acre or 2,500 linear feet tidally influenced estuarine/brackish areas, 0.1 acre tidal freshwater areas, and 0.01 acre oyster/shell habitat
Pavement preservation	0.15 acre total impacts, which can include up to 0.1 acre tidally influenced estuarine/brackish areas, 0.05 tidal freshwater areas; impacts to oyster/shell habitat is not authorized.

7.2 Conservation Measures for Activities Common to Several Project Types

Several project types include common construction practices and techniques that facilitate work, and avoid and minimize impacts to species and their habitats. Almost all projects require erosion and sediment control measures, and usually include staging areas and some form of site preparation. Many projects include geotechnical drilling, offsite use areas, use of temporary platforms, access fills, and cofferdams, pile installation and removal activities, and blasting. Numerous equipment types and incidental or miscellaneous construction practices and techniques are also common to several project types.

#1 - Activity specific CMs for the installation, maintenance, and removal of erosion, turbidity, and sediment control devices:

*CM1 Temporary erosion, turbidity, and sediment control devices are required to be installed prior to any clearing and grubbing activities, to the maximum extent practicable. In areas where clearing and grubbing is necessary to provide access and area for the installation of temporary erosion, turbidity, and sediment control devices, those devices should be installed immediately following the minimal amount of clearing and grubbing that is necessary.

*CM2 Temporary erosion, turbidity, and sediment control devices are required on all project-related areas, including off-site use areas, staging areas, and in/around temporary access roads and other areas.

*CM3 All devices designed to control erosion, turbidity, and sedimentation should be regularly inspected for effectiveness and promptly repaired or replaced if deficient.

*CM4 All temporary devices designed to control erosion, turbidity, and sedimentation throughout the construction process should be removed immediately following project completion.

*CM5 Installation of silt/turbidity curtains is limited to no more than 50% of the width of a waterbody.

*CM6 Siltation control fence or other stationary measures must be placed, at a minimum, parallel to the shoreline and may not be placed waterward of the mean high water line (MHWL) or ordinary high water mark (OHWM). Fencing will not be placed in the water, perpendicular from the shoreline extending outward into the water.

#2 - Activity specific CMs for staging areas:

CM7 Staging areas are limited to 0.25 acre of tidally influenced area impacts, not to include oyster/shell, and will adhere to other restrictions within this section. Impacts to oyster/shell habitat for staging areas are not authorized. All areas must be restored to pre-construction conditions following construction.

*CM8 To the maximum extent practicable, staging areas should be located in upland areas and have appropriate temporary erosion, turbidity, and sediment controls, including, but not limited to stabilized construction exists/entrances and sediment control fence.

*CM9 Staging areas will not be located in active channels (e.g., streams, tidal creek creeks, or rivers) or open water areas and will not be located in tidal areas (e.g., all staging areas will be located above MHWL); staging areas will be setback a minimum of 15 feet from the OHWM and MHWL.

#3 - Activity specific CMs for site preparation activities:

*CM10 To the maximum extent practicable, site preparation (e.g., earthwork, obstruction removal, etc.) will begin following installation of temporary erosion, turbidity, and sedimentation control measures, including perimeter sediment control fence.

*CM11 Riparian and shoreline clearing, grading, and preparing will be completed by hand or with construction machinery (e.g., mini-excavator or bobcat/skid-steer); whichever method best avoids and minimizes erosion, sedimentation, and turbidity. All appropriate precautions will be used to avoid and minimize erosion, sedimentation, and turbidity.

*CM12 Construction machinery may not be located in an active channel or below the MHWL or OHWM for site preparation purposes. Machinery may be placed atop work structures, such as work trestles, mats, or barges.

*CM13 Riparian and shoreline vegetation will not be cleared, trimmed, or otherwise altered if the area is not essential for project construction or facilitation of construction.

#4 - Activity specific CMs for geotechnical drilling and hazardous waste sampling activities:

*CM14 Drilling will occur from existing structures (e.g., bridges, temporary work trestles), barges, vessels, or low ground bearing pressure tracked rigs. Barge grounding is not authorized.

*CM15 All areas will be restored to pre-drilling/pre-sampling conditions and elevations.

#5 - Activity specific CMs for installation, maintenance, and removal of scientific survey devices:

*CM16 The installation, maintenance, and removal of temporary devices are authorized if they are intended to measure and/or record scientific data in tidal and freshwater areas, such as staff gages, tide and current gages, biological observation devices, water quality testing and improvement devices, and similar instruments.

CM17 No later than 24 months from initial installation, or upon completion of data acquisition, whichever comes first, the measuring device and any other structure or fill associated with that device (e.g., anchors, buoys, lines) must be removed and the site must be restored to pre-construction elevations.

#6 - Activity specific CMs for temporary platforms, access fills (including rock/rip rap jetties), and cofferdam activities:

*CM18 All [water-dependent] activities are limited to 180 days or less ("temporary" is defined as 120 days or less), except temporary work platforms/trestles. Temporary work platforms/trestles are limited to 24 months or less, though extensions/exceptions can be coordinated with the NMFS on a case-by-case basis.

*CM19 Temporary work platforms/trestles will be installed following the conservation measures in the Pile Installation and Removal section (below).

*CM20 Placement of geotextile barriers is required prior to placement of the temporary access fills to ensure that the fill will be removed completely at the end of construction. Geotextile fabric may not be practical in dynamic systems and could actually do more harm than good if the fabric becomes detached or is swept away (e.g., they could entrap pelagic organisms). For this reason, this CM can be waived if it is determined that the use of the fabric will have an adverse effect on the species. If geotextile fabric is not used, only rock rip-rap may be used for temporary fills.

*CM21 Temporary fill materials must be placed in a manner that will not be eroded/displaced by high water flows. Temporary fills must be removed in their entirety and the affected areas returned to pre-construction conditions/elevations.

*CM22 The navigability of the waterway will remain uninterrupted and freely open for species movement in/out of project work areas.

*CM22.1 Cofferdams and fills will be limited to no more than 50% of the width of the waterbody. This includes all cofferdams and fills in place at any given time, not individual cofferdams/fills. In tidal areas (e.g., tidal creeks), the width of the water body should be considered/measured at mean low water (MLW); cofferdams are authorized in tidal creeks, temporary fills are not.

*CM23 Appropriate measures must be taken to maintain normal downstream flows and minimize flooding to the maximum extent practicable, when temporary structures, work and discharges, including cofferdams, are necessary for construction activities, access fills, or dewatering of the construction sites.

*CM24 For temporary inflatable cofferdams, the footprints of the walls will be included into the overall impact area.

*CM25 Steel sheet pile cofferdams will only be installed/removed with a vibratory hammer.

#7 - Activity specific CMs for pile installation and removal activities:

*CM26 In most cases, hydroacoustic impacts will be addressed by requirements pursuant to the Endangered Species Act (ESA). If ESA consultation is unnecessary for a project, vibratory hammers will be used to install/remove temporary and permanent piles, when/where possible. If vibratory hammers are not practicable and impact hammers must be used, noise attenuation devices/methods may be employed for steel piles greater than 18-inches in diameter and concrete piles greater than 48-inches in diameter. See FHWA/NMFS-SERO BMP Manual for further information on attenuation devices/methods.

*CM27 In most cases, hydroacoustic impacts will be addressed by requirements pursuant to the ESA. If ESA consultation is unnecessary for a project, one of the following methods may be used to give any animals the opportunity to leave an area prior to full-force pile driving. These procedures will be used for a minimum 5 minutes prior to full-force pile driving:

- "Ramp up" method (i.e., pile driving starts at a very low force and gradually builds up to full force),
- "Dry firing" method (i.e., operating the pile hammer by dropping the hammer with no compression), or
- "Soft start" method (i.e., noise from hammers is initiated for 15 seconds, followed by a 1-minute waiting period – this sequence is repeated multiple times).

*CM28 In most cases, hydroacoustic impacts will be addressed by requirements pursuant to the ESA. If ESA consultation is unnecessary for a project, pile installation (both in-water and "in the dry" [behind cofferdam]), will take place for a maximum of 18 hours per 24-hour period, to the maximum extent practicable. This will allow a 6-hour (must be 6 consecutive hours) quiet period for animals to move up- and downstream of the project area.

*CM29 Where appropriate, silt or turbidity curtains will be used to reduce the impact of suspended sediments and potential for siltation/sedimentation of adjacent habitats.

*CM30 Piles will be placed in a way that does not impede the navigability of the waterway for species movement in the area.

*CM30.1 Pile placement in rivers, streams or tidal creeks (including at the mouths[4] of rivers, streams or tidal creeks) is limited to no more than 50% of the width of the waterbody. In tidal areas (e.g., tidal creeks), the width of the water body should be considered/measured at MLW.

*CM30.2 Pile placement at the mouths of rivers, streams or tidal creeks is not authorized.

[4] Mouths of rivers/streams/creeks are generally where the lotic system (referring to moving waters such as rivers and streams) enters another system, such as a river, stream, bay, or harbor. In some instances, a mouth is also referred to as an inlet. Here, the mouth will be considered from a river/stream distance of 0.25 kilometer (0.15 miles), measured from the mouth (or inlet) and extending upstream.

*CM30.3 Pile placement in the main channels of rivers, streams or tidal creeks will be avoided; piles will be placed at the periphery of rivers, streams or tidal creeks, to the maximum extent practicable.

*CM31 Water jetting will be avoided, to the maximum extent practicable, in areas with fine sediments to reduce turbidity plumes and the release of nutrients and contaminants. If jetting is necessary, silt curtains will be used.

*CM32 Vibratory hammers should be used to remove piles. Piles that cannot be removed with vibratory hammers, may be done with direct pull/clamshell methods. If both methods are not practicable, piles will be cut off at or below the mud line.

CM33 In intertidal areas, piles will be installed/removed during low tide periods when sediments are exposed and work can proceed temporarily "in-the-dry," to the maximum extent practicable.

#8 - Activity specific CMs for blasting activities:

*CM34 Only confined blasts with stemmed charges will be used; blast mats will be employed to contain "fly rock."

#9 - Activity-specific CMs for dredging/underwater excavation activities:

*CM35 Minor dredging/underwater excavation for (1) work site access; (2) placement of erosion and scour control-measures or shoreline stabilization (usually required to embed geotextile fabric or riprap in order to avoid reducing the navigable depth of channels or waterways, or so the toe of the slope can be stabilized to allow smooth transition of the work to the natural surrounding elevation); (3) creation of "pilot holes" for pilings; and (4) to remove pilings/footers is allowed. Minor dredging/underwater excavation is limited to -5.0 ft MLW and limited in size to 1000 ft^2 for a single and complete project.

*CM36 All spoil material must be placed in an approved upland disposal site, EPA-designated open water disposal site, USACE Dredged Material Management Area, or USACE approved beneficial use sites for mitigation or restoration and will employ erosion control measures such as upland erosion control or in-water turbidity curtains. Return water from an upland contained dredged material disposal area is allowed provided the quality of the return water meets Section 401 certification. Beneficial use and ocean disposal sites must have undergone Section 7 consultation to determine the potential effects of disposal on ESA-listed species and critical habitat. Projects will not include placement of material on beaches within USACE jurisdiction (e.g., sand could be placed in the uplands beyond the jurisdiction of the USACE).

*CM37 Hydraulic dredging and knockdown/bed-leveling are not authorized.

 # 10 - Activity specific CMs for equipment:

*CM38 Equipment will only be used for its primary/intended purpose.

*CM39 All equipment will be checked daily for leaks; 1 spill kit will be readily available on the project site at all times.

*CM40 Equipment will not be used until leaks, or other maintenance issues, are repaired or new equipment is brought in for replacement.

*CM41 To the maximum extent practicable, all equipment maintenance and other work that may release pollutants/toxicants will occur in contained maintenance areas at least 500 feet (preferred) from any water body and be outside of active stream channels, outside of any tidal areas, and away from ditches or channels that enter flowing waters.

*CM42 Heavy equipment such as excavators, cranes, and bulldozers will not be located in the water to conduct work; buckets or extensions may reach into the water from atop the bank/platform/trestle to conduct work.

7.3 Conservation Measures for Specific Transportation Project Types

#1 - Project specific CMs for new alignments/roadway and road widening (roadway construction):

*CM43 Projects will not impede or restrict normal flows in/out of tidally influenced areas..

*CM44 Projects are not authorized if they contribute sediments, toxicants, or pollutants into areas tidally influence areas.

*CM45 Projects will use stormwater collection and treatment systems that discharge stormwater that meets or exceeds State Water Quality Standards into tidally influenced areas.

#2 - Project specific CMs for new bridges and piers, replacement/relocation piers, replacement bridges, and bridge widening projects:

*CM46 New Bridges

*CM46.1 Installation of new crossings/bridges that span (no in-water piers/piles/columns) the waterbody (e.g., river, stream, or tidal creek) are authorized; new crossings/bridges with in-water structures (piers/piles/columns/footers) are not authorized.

*CM46.2 Approach/causeway fill will not be placed in tidal creek habitat or oyster/shell habitat, or restrict/impede normal flows in/out of tidally influenced areas.

*CM46.3 Shoreline stabilization for new bridges (approaches/causeway/embankment) will adhere to Shoreline Stabilization conservation measures (see below).

*CM47 New Piers/Replacement Piers

*CM47.1 Take-off/causeway fill for piers will not be placed in tidal creek habitat or oyster/shell habitat, or restrict/impede normal flows in/out of tidally influenced.

*CM48 Bridge Replacements

*CM48.1 Bridge replacements on existing or parallel alignments are authorized, provided all unused portions of the old/existing structure are completely removed. Complete removal is preferred, though removing structures at or below the mud line is acceptable.

*CM48.2 Bridge replacements on existing or parallel alignments that span the waterbody and remove all old/existing structures from the waterway are authorized. Complete removal is preferred, though removing structures at or below the mud line is acceptable.

*CM48.3 For bridge replacements on existing or parallel alignments, approach-fills no longer used due to modifications of the bridge design (e.g., lengthening) or fills not intended to be

used for stormwater treatment, should be removed and graded to adjacent habitat levels, as determined through on-site surveys.

#3 - Project specific CMs for bridge and pier repair, maintenance, and retrofit projects:

*CM49 Scour repair projects are limited to the minimum amount necessary to achieve the project goal, which includes: (1) the area of previously authorized scour protection (e.g., original footprint of previously authorized riprap around columns/piers/piles), and (2) 0.5 acre of new riprap for scour protection (typically upstream or adjacent to columns/piers/piles). Total scour protection (new + previously authorized) will not exceed 0.5 acre (or 0.01 acre of oyster/shell habitat).

*CM49.1 Scour holes at the base of bridge piers or abutments will be repaired by placing the minimum amount of riprap necessary to mitigate the scour.

*CM50 Scour repair projects will not use poured concrete, reinforced concrete, or concrete mattresses for scour protection outside of the originally authorized project footprint. Only riprap will be used for scour protection outside of the originally authorized project footprint.

*CM51 Maintenance projects are authorized, provided there is no introduction of debris, pollutants, toxicants, sediments, or other materials or chemicals into the waterbody. Full containment, such as diaper curtains, will be used when necessary, to avoid/eliminate any possible introductions of materials or chemicals.

*CM52 Installation of pile jackets, cathodic protection, and seismic retrofit components are authorized, provided there are only small increases (0.001 acre/jacket) in impact area to the bottom (substrate).

*CM53 Projects will not appreciably change the bottom elevation (or water depth) of the area; riprap (or other scour protection) may be placed at a maximum 2 feet above the original bottom of the waterbody.

#4 - Project specific CMs for culvert installation, replacement, repair, maintenance, and cleaning projects:

*CM54 New and replacement culverts will be sized to handle all expected/predicted flows, including low-flow conditions, normal flows, high flows, storm flows, and the full range of tidal flows.

*CM54.1 Channel width, depth, velocity, and slope that provide upstream and downstream passage of aquatic organisms will be preserved or enhanced according to current NMFS criteria or as developed in cooperation with NMFS to accommodate site-specific conditions (see the FHWA/NMFS-SERO BMP Manual for further information).

*CM54.2 Culverts will allow for normative physical processes within the stream-floodplain corridor by promoting natural sediment transport patterns, providing unaltered fluvial debris movement, and restoring or maintaining functional longitudinal continuity and connectivity of the stream-floodplain system.

*CM54.3 Culvert replacement projects that will decrease the culvert size are not authorized.

*CM54.4 Culverts may be replaced with small bridges.

*CM55 Scour holes at culvert inlets/outlets will be repaired by placing the minimum amount of riprap

necessary to mitigate the scour and no more than 0.5 acre for a single, complete project.

#5 - Project specific CMs for installation, maintenance, and removal of shoreline stabilization:

*CM56 Installation of new shoreline stabilization:

*CM56.1 May not exceed 2500 linear feet in length (for any type: e.g., seawalls, riprap, revetments) or 0.25 acre of tidally influenced estuarine/brackish areas, 0.1 acre of tidal freshwater areas, and 0.01 acre EFH-HAPC.

Seawalls/Bulkheads/Retaining Walls

*CM56.2 Must not extend any further waterward than 6 inches as measured from the mean high water line (MHWL) if located in tidally influenced areas. Must not extend waterward from the MHWL is areas where oyster/shell habitat is present. Must not extend waterward into tidal creek habitat.

Riprap/Revetments

*CM56.3 Must not extend more than 2.5 feet waterward of the MHWL (including the toe) in tidally influenced areas; must not extend more than 3 feet below the MHWL or OHWM.

*CM56.4 Shoreline stabilization materials must be free of debris and are limited to sand cement, concrete, and quarry stone. Slope paving, poured concrete, or reinforced concrete is not authorized.

Living Shorelines[5]

*CM56.5 Living shoreline projects will adhere to NOAA guidance and criteria provided in *Guidance for Considering the Use of Living Shorelines, 2015.* Artificial reef projects are not authorized.

*CM56.6 Living shorelines are limited to 500 linear feet in length, no more than 30 feet waterward of the high tide line/ordinary high water mark or 5 feet waterward of the existing wetlands (whichever distance is greater), or result in no more than 0.5 acre area between the natural shoreline and outermost structure (breakwater) in areas designated EFH.

*CM56.7 All shore-parallel wave attenuation structures must include a minimum 5 ft opening/gap between structures at least every 100 feet and may be staggered or overlapped or left open so long as the five-foot separation between sections is maintained.

*CM56.8 Discharge of earthen fill material, other than material associated with vegetative planting is not authorized.

*CM56.9 Living shoreline projects should be developed in cooperation with NMFS SERO HCD to accommodate site-specific conditions.

*CM57 Maintenance/replacement of existing shoreline stabilization:

*CM57.1 Is only allowed in the previously authorized (permitted) footprint of the original/existing shoreline stabilization (i.e., no waterward extension or lateral expansion beyond the previous footprint).

[5] Living Shorelines are defined and described at length in the BMP Manual.

*CM58 Removal of any length of shoreline stabilization (e.g., seawall, riprap) is allowed, provided the shoreline is stabilized.

*CM59 Placement of backfill is authorized if it is necessary for stabilization/leveling.

*CM60 Construction and/or repairs to groins, jetties, breakwaters that are perpendicular to shore, and beach nourishment/renourishment are not authorized.

#6 - Project specific CMs for pavement preservation:

*CM61 Slope preparation and small impacts tidally influenced areas are authorized provided they do not exceed 0.15 acre.

Specific CMs for Mitigation:

See below (Section 8).

7.4 Estimated Number of Projects

The estimated number of projects and activities in Table 4 are based on previous number of annual projects undertaken by FHWA and DOTs in NC, SC, and GA as well as forecasts for anticipated projects in the upcoming 5 years.

Table 4. Number of Projects Estimated to be Undertaken Using this Programmatic Consultation annually during the Next 5 Years

	Category of Project	Number of Projects during the Next 5 Years	Average Number of Projects Per Year
1	New alignment/roadway; road widening	60	12
2	New/replacement bridge & pier; bridge widening	75	15
3	Bridge & pier repair, maintenance & retrofit	100	20
4	Culvert installation, replacement, repair & maintenance	60	12
5	Shoreline stabilization	90	18
6	Pavement Preservation	60	12

8. Compensatory Mitigation

Compensatory mitigation is undertaken to offset unavoidable impacts to waters of the U.S. authorized through the issuance of Department of the Army permits pursuant to section 404 of the Clean Water Act (33 U.S.C. 1344) and/or section 9 or 10 of the Rivers and Harbors Act of 1899 (33 U.S.C. 401, 403). Compensatory mitigation replaces the loss of existing aquatic resource functions through various options, including mitigation banks, in-lieu-fee programs, in-kind mitigation, and out-of-kind mitigation. The most appropriate form of compensatory mitigation for a particular project should be determined in

accordance with the 2008 Mitigation Rule. If no mitigation banks are available with credits suitable for offsetting impacts to EFH, the NMFS generally recommends in-kind, permittee responsible mitigation within the same watershed as the project and as close to the project as practicable, rather than out-of-kind mitigation through a mitigation bank or in-lieu-fee program.

Specific CMs for Mitigation:

*CM62 Compensatory mitigation for unavoidable impacts to salt marsh habitat, which includes tidal creeks and mudflats normally adjacent to vegetated salt marsh, will be offset by purchase of credits from a mitigation bank with suitable credits (salt marsh credits) in the primary or secondary service area of the bank. If banks are not available with suitable credits or in the appropriate service area, in-kind, permittee responsible mitigation will be undertaken with assistance from SERO HCD as close to the project as practicable. Restoration activities, such as removing old bridge fills and restoring elevations to those found in nearby salt marshes may provide the necessary mitigation.

*CM63 Compensatory mitigation for unavoidable impacts to tidal freshwater areas and areas where anadromous fish occur will be offset by purchase of credits from a mitigation bank with suitable credits in the primary or secondary service area of the bank. If banks are not available with suitable credits, FHWA/DOTs may purchase credits from a bank in the same watershed as the impact site at a 2:1 ratio, to adjust for out-of-kind mitigation. If banks are not available with suitable credits for purchase at a 2:1 ratio, in-kind permittee responsible mitigation will be undertaken with assistance from SERO HCD as close to the project as practicable. Restoration activities, such as removing old bridge fills and restoring elevations to those found in nearby wetlands or shorelines may provide the necessary mitigation.

*CM64 For projects with impacts to oyster/shell habitat, oyster/shell compensatory mitigation will be coordinated with SERO HCD in conjunction with the appropriate State Natural Resource agency.

Appendix A. Anadromous Fish Consultations

The Federal Highway Administration (FHWA), or its designated non-federal representative, such as state Departments of Transportation (DOTs), consult with the National Marine Fisheries Service (NMFS) on actions that adversely affect anadromous fish and their habitat[6]. In the southeast region, the Habitat Conservation Division (HCD) of the Southeast Regional Office (SERO) of NMFS conducts consultations on anadromous fish. When appropriate, NMFS provides recommendations (which may include measures to avoid, minimize, mitigate, or otherwise offset adverse effects) for activities that would adversely affect anadromous fish and their habitat.

Programmatic Consultation Procedures

The programmatic consultation procedures are the same as those outlined in Section 4 of the body of the programmatic document. Should a project only involve adverse effects to anadromous fish or their habitat, and not include essential fish habitat (EFH), the same procedures will be adhered to, omitting any reference or responsibilities related directly to EFH.

Description of the Action Area and Resources

Transportation activities covered under the programmatic EFH consultation would occur in areas that support anadromous fish and where anadromous fish habitat is present. FHWA/DOTs conduct several kinds of routine and repetitive activities and projects that typically result in predictable effects. The geographic scope of this consultation includes all areas that support anadromous fish in the jurisdiction of SERO HCD in NC, SC, and GA. Specifically, this includes estuarine areas, wetland areas, and inland freshwater rivers, streams and creeks. Additionally, this includes activities that take place in upland areas if the effects extend into areas that support anadromous fish.

Anadromous fish are those that spend their adult lives in the marine environment, and then return to freshwater areas to spawn. Some species will migrate hundreds of kilometers from the ocean up freshwater rivers to find appropriate spawning habitat. A list of anadromous species regularly impacted by transportation projects in NC, SC, and GA is provided in the *FHWA/NMFS-SERO BMP Manual*. Blueback herring (*Alosa aestivalis*) and American shad (*Alosa sapidissima*) are most commonly impacted by transportation projects in these three states.

Covered Transportation Actions

The covered transportation actions are the same as those outlined in Section 6 of the body of the programmatic document.

Acreage Limits

For projects involving impacts to EFH as well as anadromous fish and their habitat, all specific project limits must be adhered to as outlined in the body of the programmatic document, specifically *Table 3*.

For projects only involving anadromous fish and their habitat, specifically non-tidally influenced rivers, streams, creeks and wetlands, the specific impact thresholds for individual project types are found below in *Table A*. Impact limits apply to each single and complete project and will include all temporary and permanent impacts.

[6] The U.S. Army Corps of Engineers is also required to conduct anadromous fish consultations and often does so for transportation projects.

Table A. Specific Project Limits

Project Type	Impact area limits
New roadways & road widening	3.0 acres non-tidal, freshwater impacts
New & replacement bridges, docks, & piers.	3.0 acres non-tidal, freshwater impacts
Bridge/dock/pier repair and maintenance	2.0 acres non-tidal, freshwater impacts
Culvert installation, maintenance, repair, and cleaning	2.0 acres non-tidal, freshwater impacts
Shoreline stabilization	1.5-acre non-tidal, freshwater impacts
Pavement preservation	0.5-acre non-tidal, freshwater impacts

Proposed Programmatic Conservation Measures

FHWA/DOTs will adhere to the proposed conservation measures for each applicable project for actions in North Carolina, South Carolina, and Georgia and activities common to those projects. Only projects that follow these conservation measures will be covered under the programmatic consultation, with limited exception and justification. The programmatic conservation measures that are applicable to both EFH and anadromous fish and their habitat are denoted with an asterisk ("*") in Section 7 of the body of the programmatic document. Additional conservation measures to avoid and minimize impacts to anadromous fish and their habitat are outlined below. These additional measures are only applicable to anadromous fish and their habitat and do not apply to EFH.

Conservation Measures Specific to Anadromous Fish

ACM1 Staging areas are limited to 0.5 acre of anadromous fish habitat. All areas must be restored to pre-construction conditions following construction.

ACM2 Pile/column/footing installation is not authorized at the mouths[7]/inlets of estuaries/rivers/streams/creeks where anadromous fish are known to migrate to/from spawning areas.

ACM3 Blasting is not authorized in freshwater rivers when anadromous fish are migrating or spawning (see list of dates in A.CM6 for migration/spawning times).

ACM4 Blasting is not authorized at the mouths/inlets of estuaries/rivers/streams/creeks where anadromous fish are known to migrate to/from spawning grounds.

ACM5 Shoreline stabilization construction/activities are not authorized at the mouths/inlets of estuaries/rivers/streams/creeks where anadromous fish are known to migrate to/from spawning grounds.

ACM6 From January 16 through June 30 in waters where anadromous fish migrate and spawn, in-water work will be avoided and minimized to the maximum extent practicable, though full in-water work moratoria are preferred.

[7] Mouths of rivers/streams/creeks are generally where the lotic system (referring to moving waters such as rivers and streams) enters another system, such as a river, stream, bay, or harbor. Here, this will apply to a linear distance of 0.25 kilometer (0.15 miles), beginning at the mouth and extending upstream.

There are slight temporal differences for spawning and migration periods throughout NC, SC, and GA. Specific dates can be coordinated with SERO HCD depending on the exact waterbody location and other project elements. However, the following moratoria dates can be used for the three states and one specific river:

North Carolina: March 1 - June 30;

South Carolina: Feb 16 – June 15;

Georgia: January 16 – April 30

Savannah River: January 16 – May 15

Mitigation

Compensatory mitigation measures for unavoidable impacts to anadromous fish habitat are the same as those outlined in Section 8 of the body of the programmatic document.

Appendix B. Definitions

Adverse effect: any impact which reduces the quality and/or quantity of essential fish habitat. Adverse effects may include direct or indirect physical, chemical, or biological alterations of the waters or substrate and loss of, or injury to, benthic organisms, prey species and their habitat, and other ecosystem components, if such modifications reduce the quality and/or quantity of essential fish habitat (EFH). Adverse effects to EFH may result from actions occurring within EFH or outside of EFH and may include site-specific or habitat-wide impacts, including individual, cumulative, or synergistic consequences of actions. (50 CFR 600.810)

Essential fish habitat (EFH): those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity (MSA § 3(10)). For the purpose of interpreting the definition of essential fish habitat: "Waters" include aquatic areas and their associated physical, chemical, and biological properties that are used by fish and may include aquatic areas historically used by fish where appropriate; "substrate" includes sediment, hard bottom, structures underlying the waters, and associated biological communities; "necessary" means the habitat required to support a sustainable fishery and the managed species' contribution to a healthy ecosystem; and "spawning, breeding, feeding, or growth to maturity" covers a species' full life cycle. EFH is described by the Councils in amendments to Fishery Management Plans, and is approved by the Secretary of Commerce acting through NMFS. (50 CFR 600.10)

EFH Assessment: an analysis of the effects of a proposed action on EFH. The level of detail in an EFH Assessment should be commensurate with the complexity and magnitude of the potential adverse effects of the action. Mandatory contents are: a description of the proposed action; an analysis of the potential adverse effects of that action on EFH and the managed species; the Federal action agency's conclusions regarding the effects of the action on EFH; and proposed mitigation, if applicable. If appropriate, the assessment should also include: the results of on-site inspections; the views of recognized experts on affected habitat or fish species; a review of pertinent literature; an alternatives analysis; and any other relevant information. (50 CFR 600.920 (e)).

EFH Conservation Recommendation: a recommendation provided by NMFS to a Federal or state agency pursuant to section 305(b)(4)(A) of the MSA regarding measures that can be taken by that agency to conserve EFH. EFH Conservation Recommendations may be provided as part of an EFH consultation with a Federal agency, or may be provided independently by NMFS to any Federal or state agency whose actions would adversely affect EFH.

EFH consultation: the process of satisfying the Federal agency consultation and response requirements of section 305(b)(2) and 305(b)(4)(B) of the MSA, and the EFH Conservation Recommendation requirement of section 305(b)(4)(A) of that Act. When completed, an EFH consultation generally consists of: 1) notification to NMFS of a Federal action that may adversely affect EFH, 2) an EFH assessment provided to NMFS, 3) EFH Conservation Recommendations provided by NMFS to the Federal action agency, and 4) the Federal agency's response to NMFS' EFH Conservation Recommendations.

Federal action: any action authorized, funded, or undertaken, or proposed to be authorized, funded, or undertaken by a Federal agency. (50 CFR 600.910; MSA § 305(b)(2)).

Appendix C. Verification Form

This form will be filled out by the Federal Highway Administration (FHWA) or applicable state Department of Transportation (DOT) for all transportation activities using the programmatic Essential Fish Habitat (EFH) consultation with NOAA's National Marine Fisheries Service, Southeast Regional Office, Habitat Conservation Division (SERO HCD). Upon obtaining sufficient information, FHWA/DOT will submit the form to SERO HCD for their review and response. After receiving a response from SERO HCD, FHWA/DOT will keep the completed form(s) for reporting purposes. FHWA/DOTs must include the completed Verification Form as part of a permit application with any other federal agency, such as U.S. Army Corps of Engineers, to confirm that EFH consultation is complete.

For FHWA Divisions/DOTs currently using the *Essential Fish Habitat Screening Form*, the Screening Form can be used/adopted in place of **Part I** of this Verification Form. **Part II** must be completed as it appears in this document. Figures, maps, and other additional information may be included as attachments.

In addition to the information required below, FHWA/DOTs must also provide a list of all conservation measures that will not be adhered to (with justification provided). This list may use the same numbers as the conservation measures in Section 7.

PART I.

Project Activity Type

☐ 1. New alignments/roadways and road widening (roadway construction)
☐ 2. New bridge, bridge replacement, and bridge widening; new and replacement piers
☐ 3. Bridge repair, maintenance, and retrofit; pier repair and maintenance
☐ 4. Culvert installation, replacement, repair, maintenance, and cleaning
☐ 5. Installation, maintenance, and removal of shoreline stabilization
☐ 6. Pavement preservation

Transportation Project Information

Project Sponsor:			
State:		Waterway:	
Address:			
Latitude (e.g., 42.625884):			
Longitude (e.g., -70.646114):			
Work Description:			

Total area of impact to EFH (in acres), broken down by individual types of EFH: Include locus map with area of impact.	
Area of impacts to oyster/shell habitat (in square feet):	
Area of impact to anadromous fish habitat:	
Pile installation/removal required?	If yes, explain in detail types of piles, hammer(s), and attenuation devices to be used (if applicable).
Proposed Mitigation (be as specific as possible: e.g., bank(s), credits, etc.)	Coordinate all permittee-responsible mitigation with SERO HCD.

Part II.

FHWA's Determination of Effects to Essential Fish Habitat

FHWA/DOT will select the appropriate determination:

☐ The activity complies with all elements of the EFH programmatic consultation, including all programmatic EFH conservation measures, and adverse effects to EFH will not be substantial.

☐ The activity does not comply with all of the elements of the EFH programmatic consultation, including some programmatic EFH conservation measures. However, the justification below demonstrates that the adverse effects to EFH are not substantial. This does not apply to EFH Conservation Recommendations that are not applicable to the project.

[8]Justification for Not Incorporating All EFH conservation measures

If the project is not in compliance with all of the applicable programmatic EFH conservation measures and FHWA/DOT has still determined that the effects of a project on EFH are not substantial and the project is otherwise consistent with the FHWA programmatic EFH consultation, provide justification below and identify which conservation measures are not included:

_____

_____

_____

_____

_____

_____

_____

FHWA/DOT preparer:

_____ _____

Name Signature

_____

Date

[8] Does not apply to impact thresholds.

Part III.

SERO HCD Determination (To be filled out by NMFS SERO HCD)

After receiving the Verification Form, SERO HCD will contact FHWA/DOT with any concerns.

☐ SERO HCD concurs with FHWA's determination that the proposed project is consistent with the programmatic EFH consultation (without the need for justification).

☐ SERO HCD concurs with FHWA's determination that the proposed project is consistent with the programmatic EFH consultation, with justification described above.

☐ SERO HCD does not concur with FHWA's determination that the project is consistent with the programmatic EFH consultation. FHWA/DOT must conduct additional coordination with SERO HCD and a separate individual EFH consultation may be required.

SERO HCD reviewer:

_____ _____

Name Signature

_____

Date

Appendix D. Project and Activity Descriptions

Project Type #1 - New Alignments/Roadways and Road Widening (Roadway Construction)

Roadway construction activities generally include installation of the roadway itself, and associated facilities such as retaining walls, noise walls, and stormwater treatment. Roadways are generally constructed by first creating embankments, or raised areas of fill, onto a prepared site. The construction of roadway embankment consists of building up soil or rock to create a new ground surface at the elevation needed for the new roadway or structure. Roadway embankments slope outward; therefore, the higher the embankment, the wider the surface area needed at the base. To avoid future settlement, rollers and hauling equipment thoroughly compact each layer of soil or rock. Retaining walls are used to support the embankment fill area where other constraints may exist along the alignment. Once final grading is achieved, the roadway is paved, striped, and signed. Guardrails may also be installed if applicable.

Retaining walls are used to minimize the footprint width of the roadway cut or fill. Because retaining walls can be nearly vertical, they allow for a much smaller footprint than an earth slope. They can be used to support the roadway when the roadway is higher than the surrounding ground and can also be used in situations where the road is lower than the surrounding ground. In this case, the retaining wall supports the adjacent soil and prevents soil from slumping onto the roadway. Retaining walls are also used in areas where there is a high possibility of erosion such as near a bridge abutment or water. The walls must have an area of free drainage between the retained soil and the back of the retaining wall to prevent water pressure from developing and adding to the soil loads. The drainage is usually provided by placing a layer of clean gravel and drainage pipes against the back of the retaining wall. There is a variety of wall types (soldier pile, mechanically stabilized earth [MSE], soil nail, etc.); the type used depends on the structure it supports, the ground slope being retained, and available area.

Noise walls are mitigation measures designed to reduce noise impacts on sensitive receivers. They are typically precast panels or cast-in-place walls. They can be cast in a wide variety of patterns to improve their aesthetics. On bridges, noise walls may be cast into the traffic barrier. Noise walls are constructed to withstand the forces of wind and seismic loads.

Stormwater facilities are typically constructed to collect and treat stormwater runoff from impervious surfaces such as roads and bridges. The type of facility constructed will depend on the topography, profile of the road or bridge segment, availability of land, and availability and proximity of an outfall site for collected and treated water. A variety of approaches are utilized, such open ditches and pipes to convey water, bioswales, constructed stormwater wetlands and ponds, vaults, and where possible, infiltration and dispersion basins.

Primary project objectives for new alignment/roadway or road widening projects may include mobility and/or safety improvements. Example projects range between construction with large project footprints, such as new interchanges, new general purpose lanes, realignments, new road corridors, and bypass routes to smaller footprints such as reconstructing existing interchanges, minor realignments, adding shoulders or increasing shoulder widths, bicycle/pedestrian facilities, and new sidewalks.

New alignments/roadways include constructing roadways in new locations, where there is little or no existing infrastructure. Road widening consists of expanding existing roadways, typically to add additional travel lanes or shoulder width. Activities for new alignments/roadways and road widening may

consist of placing permanent fill material into waters necessary for the construction of new road surface. Road widening projects typically include placing fill immediately adjacent to the existing roadway to match the existing grade, paving, and preparing side slopes. Installation of guardrails, medians, and other safety components are typically included in new alignment/roadway and road widening projects. Bank stabilization on newly formed side slopes are also components of these projects.

Several additional activities and components are common to new alignment/roadway and road widening projects such as staging area establishment, culvert extension and installation (described later), and drainage system installation and enhancements. Blasting may also be required for these projects. Projects designed to increase mobility often occur in urban areas. In these cases, very little undeveloped or undisturbed property is affected and most of the impacts would occur in the existing rights of way. New highway interchange construction could occur in areas that are highly developed or within areas that are becoming increasingly developed, but do not typically occur in rural areas.

Some new road construction is designed to improve the safety of the highway system. These projects include installation of sidewalks, slope flattening (which often require culvert extensions), and alignment modifications. Slope flattening and clear zone maintenance reduces hazards for automobiles that inadvertently leave the roadway. The clear zone is the total roadside border area that is available for safe, unobstructed use by errant vehicles. Slope flattening typically involves the placement and removal of fill material on existing cutslopes. Slopes are flattened to make them more traversable and improve site distance. Slope and ditch repair involves re-grading ditches and slopes to the current safety standards and design slopes. It may also include filling in or repairing sides of the ditches where necessary. Alignment modifications may include adding auxiliary lanes (e.g., truck climbing and acceleration lanes), channelization (new turn lanes), on- and off-ramp extensions, or realigning an intersection to improve the sight distance. If a new lane is added, an alignment modification of the adjacent road may be necessary to maintain continuity of the roadway.

Alignment modifications may also straighten curves or approaches to bridges. Alignment modifications could range in length from a few hundred ft. to a couple thousand ft. for curve realignments, or up to a few miles for realigning a major section of roadway. Truck lanes, turn lanes, and acceleration lanes typically average between 10 and 12 ft. wide. Sidewalk widths vary from 5 to 10 ft. wide, depending on jurisdiction and intended use. Road realignments and widenings often range between 0.25 and 5.0 miles in length. New interchanges and interchange improvements are also common safety projects.

Project Type #2 - New Bridge, Bridge Replacement, and Bridge Widening; New Piers and Replacement/Relocated Piers

While roadway bridges are the most common type of bridge in a transportation project, pedestrian bridges, bicycle (multi-use) bridges, and fishing piers are also common. Bridges typically span from one upland location to another, whereas fishing piers extend from the shore into the water. A variety of other over-water structures exist, such as floating docks or floating breakwaters, but the FHWA/state DOT projects in NC, SC or GA rarely include these other structures.

Both bridges and piers have substructures and superstructures. The main substructure components are abutments, piers (interior bents), end-bents, footings, and piles/columns. The substructure supports the superstructure, which consists of the horizontal components spanning the obstacle or feature the bridge crosses and includes primary and secondary load-carrying members and connections. The main superstructure components are girders (beams), the bridge deck, rails (e.g., guardrails), drainage features,

sidewalks, and lighting. For this evaluation, bridges and piers are discussed together with an understanding that materials and techniques will differ depending on the structure.

New bridge, bridge replacement, and bridge widening activities are typically undertaken to replace functionally obsolete and/or structurally deficient bridges or expand, restore, or improve safety and functionality of existing bridges. New bridge projects include constructing bridges in new locations, where there is no existing infrastructure. Bridge replacement projects construct new bridges parallel to, or on the same alignment as, an existing bridge; no structural components from the existing bridge are used in the new bridge. Bridge replacement projects may utilize approach fills from old/existing bridges. Bridge widening projects expand the roadway width and typically consist of adding girders, interior bents and expanding the bridge deck, consistent with the components of the existing structure. For bridge replacement projects the existing bridge typically is removed following completion of the new bridge. Bridge widening projects typically add girders (beams), add interior bents, and expand the bridge deck.

Bridge construction may be a component of a larger roadway construction project or a stand-alone project. There are multiple types of bridges including but not limited to concrete slab, concrete arch, concrete box girder, concrete T beam, steel beam, pre-tensioned concrete beam, post-tensioned concrete beam, steel truss, and timber trestle. Bridges can span wetlands, streams, and other water bodies as well as roadway and other transportation infrastructure. Some bridges span the stream systems they are crossing, while others have piers in the channel. Small bridges may be precast (prefabricated) and transported to a site for installation. The number of piers in the channel varies by bridge. Most new bridges are designed to span as much of the river as possible, and to provide the least amount of constriction that is practicable on the system. Many bridge piers are now deep foundations such as driven piles or drilled shafts, eliminating willow footings that are susceptible to scour.

Bridge replacements tend to be long-term projects requiring one or more years to complete. Installation of new bridges may require construction of a detour bridge. Occasionally, bridges use two different spans, and one new span is constructed adjacent to the old bridge and acts as the detour bridge while the original is removed and replaced with the second span. Most bridge replacements use the same alignment or are constructed parallel to the old alignment. Temporary construction platforms are typically built to facilitation construction of new or replacement bridges. Generally, in-water work is timed to minimize impacts to sensitive aquatic species. Some sedimentation of the waterway may occur during pile driving and removal. Hydroacoustic impacts also occur during pile driving and removal. Bridge removal can also result in sediment and small concrete debris entering the water. Concrete debris is typically removed from the aquatic environment following demolition.

Major bridge replacement construction activities often include:

- Clearing and grading for road widening
- Clearing and grubbing of existing streamside vegetation
- Construction of stormwater facilities
- Excavation for new bridge abutments
- Constructing temporary work platforms/cofferdams
- Construction of bridge columns/piers/abutments

- Concrete pouring
- Pile installation and removal
- Riprap placement
- Paving with asphalt or concrete
- Bridge demolition

Piles are installed using several different methods, as described above (Section 5.1.2). Cofferdams are often installed to create an isolated work area, which can be dewatered for bridge construction (Section 5.1.2).

Bridges can be removed using several methods, including: (1) dismantled over water from adjacent bridge deck or approach; (2) dismantled over the water and lowered onto a barge and barged out to a dismantling site; (3) dismantled over water and sections removed by crane; and (4) falsework (temporary structures) can be built under and around the bridge, and the bridge dismantled by sections. Bridge removal methods are selected based on a number of factors, including the structure of the bridge, the size of the bridge and river, the location within the system, the topography, and the amount of access to the bridge and the banks. Since many older bridges have bridge piers in the system, these also need to be removed. Concrete piers can be removed by demolition using a hoe ram (as long as pieces do not enter the water), or removed by a vibratory hammer; they can be cut off two ft. below the ground level, or a temporary cofferdam can be constructed and the material can be hydraulically removed. The bridge demolition method will be determined by site and project-specific conditions. Blasting is also used for bridge/pier demolition.

Bridge replacement projects often require column construction within stream channels, which typically involves the isolation of the column location through the use of a large diameter steel sleeve that is driven into the stream substrate. All work, including excavation for the footing, placement of forms, and pouring of the concrete, would then be completed within the sleeve at each column location. This technique helps minimize construction impacts by isolating the work from the stream.

Bridge replacements may require more than one construction season, due to multiple factors such as project complexity or if the in-water work may be limited to certain periods to minimize impacts to sensitive aquatic species. Often, work on the out-of-water portions or behind cofferdams will occur year-round. Bridge replacements on parallel alignment are the most common bridge project type in NC, SC, and GA because this approach maintains traffic and access to locations during construction. Bridges replaced on parallel alignment may make use of existing bridge fill and approaches. Old bridges are removed following construction of the new bridges. Bridge replacement on existing alignment is less common. In coastal areas dominated by salt marshes and tidal creeks, access to barrier islands is typically via a single bridge making replacement on existing alignment relatively difficult and costly.

Transportation agencies regularly include fishing piers to enhance the value of roadway projects. Fishing piers extend from the shoreline, terminate in the water, and are typically composed of wood planking, composite planking, or grated decking. Barges or temporary work trestles are commonly used for pier construction.

The superstructures of small fishing piers can be easily removed by hand or small machinery; removing larger piers may require excavators, jackhammers, or other specialized equipment. Pier substructures can

be removed in various ways, including direct pull of piles. Chapter **Error! Reference source not found.** discusses demolition of pier substructures. Demolition of pier components leading to accumulation of material in waterbodies may require dredging to remove the material.

Project Type #3 - Bridge Repair, Maintenance, and Retrofit; Pier Repair and Maintenance

Bridge repair, maintenance, and retrofit activities are implemented to prolong the use and function of bridges, ensure motorist safety, and protect the environment. Bridge repair typically consists of removing and replacing deteriorated deck concrete or rehabilitating other existing components of the bridge, including piles and girders. Bridge repairs may also consist of seismic retrofitting, which includes such items as strengthening pilings and bents. Whether a bridge is repaired, rehabilitated, or replaced depends on the age of a bridge and damage that may occur to a bridge (e.g., from a storm event, earthquake, or vehicle or boat collision). The length of stream and/or wetland potentially affected by bridge repair and maintenance depends upon the scale of the bridge project and the required actions. Bridge replacement activities are described above.

Bridge scour repair work tends to occur during low-water times of year, and bridge painting may only occur late spring through fall when temperatures are high enough to allow the paint to dry properly. Seismic retrofit activities are not temperature and/or time sensitive and may occur anytime throughout the year, while joint replacement and bridge deck replacement are temperature dependent activities, limited to the warmer months. Bridge maintenance projects can be long-term, lasting more than one construction season.

Scour Repair Projects

Scour at bridge piers can become a major safety issue for some bridges. Repair of scoured bridge piers can include construction of temporary cofferdams around affected piers to isolate work areas; concrete or gabion repair to footing, columns or abutments; placement of riprap at scour locations; or installation of concrete armor tetrapods (four-legged, interlocking concrete structures).

Construction of temporary access fills or trestles may be required to provide a working platform for machinery. Working platforms are usually constructed of light, loose riprap matched to the material necessary for the repair. The platform material is then repositioned as the machinery backs away from the work site. Installation methods vary on a site-specific basis. In navigable waters, access from a barge may be required. Whenever possible, equipment, such as excavators, will operate from stream banks, bridges, or temporary work platforms to avoid in-channel operation. If in-water equipment operation is necessary, aquatic spider excavators are often used, especially if access to the site is difficult, as they are small, relatively light, and have rubber tires to minimize substrate disturbance. Aquatic spiders are typically used in small streams, because the size of rock they can pick up is limited. Sometimes materials can be placed directly on the streambed with little to no excavation; in other instances, excavation is necessary to key in materials. Often, stream flow and anticipated erosion will determine specific aspects of design such as anchoring.

Maintenance Projects

Bridge maintenance activities may include washing, painting, debris removal from bridge piers, guardrail repairs, lighting and signage repairs, and structural rehabilitation. Such activities generally include work such as repairing damage or deterioration in various bridge components; cleaning out drains; repairing

expansion joints; cleaning and repairing structural steel; sealing concrete surfaces; concrete patching; and sanding and painting. Bridge painting involves washing the bridge with highly pressurized water, abrasive sand blasting to remove all corrosion, and then applying a minimum of a number of coats of paint. Paint must be applied when temperatures are above 40°F, and it is not raining. Steel bridges also require rivet replacement and crack stabilization. These activities are often added to a bridge painting contract. Debris removal can be accomplished in a variety of ways depending on the type and quantity of debris, and the size and configuration of the bridge. Hand removal is possible in some instances, although the use of mechanical aids, such as chainsaws, winches, and heavy equipment, are often necessary. Structural rehabilitation may include replacement or repair of degraded steel superstructure, repair to bridge approaches, or repair or replacement of bridge rail. Work is typically conducted in a stepwise fashion, moving from one section of the structure to the next, rather than on the entire structure at once.

Bridge deck repair and replacement is another activity that occurs regularly. Removal may involve traditional mechanical methods such as jackhammers, concrete saws, and cold-milling (grinding), or hydro-demolition (hydro-milling). Hydro-demolition uses a high pressure water jet stream (up to 20,000 PSI) to remove unsound concrete. Concrete debris is contained and then removed with vacuum equipment. Deck repair can involve either partial-depth or full-depth patching. Partial-depth replacement repairs surficial damage to the travel surface by cleaning and filling voids with a suitable material (concrete, asphalt, etc.). In general, when full-depth patching occurs, a temporary form is held against the underside of the deck and material fills the void from above. Longer bridges have finger joints that must be repaired and replaced as needed.

Seismic Retrofit Projects

Many bridges are undergoing or have undergone seismic retrofits. Retrofits can involve any of the following depending on the structure: (1) removing and replacing bolts and or rivets with high-strength connections; (2) installation of concrete catcher blocks at piers (not typically pre-cast, but constructed using steel-reinforced forms filled with concrete poured on site); (3) installation of pier sleeves (collars) to the depth of the spread footing; and (4) installation of longitudinal restrainers, transverse girder restrainers, and/or transverse deck restrainers which are typically installed under the bridge as looped steel cables or bolts. No fill or pile driving is required for their installation. Longitudinal restrainers prevent abutting spans from being pulled apart during an earthquake. Transverse restrainers pin abutting spans together, preventing them from being sheared apart vertically or laterally during an earthquake.

Pile Jackets

Pile jackets are a material or sleeve applied around a pile as protection. Types of equipment involved in pile jacket construction typically include barges, cranes, pumps, boats, etc. The equipment will be trucked, self-propelled or barged to the site. Turbidity curtains, silt fences, sand bags, synthetic bales or some combination of these items are typically used as directed by the project engineer to maintain State Water Quality Standards. Pile jackets typically include cathodic protection, cathodic protection with structural protection, and structural support jackets, as described below. Since this activity is limited to a pile jacket attached to an existing pile and does not extend to the sea floor, it does not increase the size of impact for in-water work.

1. Cathodic Protection Pile Jackets - Cathodic protection is a technique used to control the corrosion of a metal surface by making it the cathode of an electrochemical cell. This pile jacket type provides galvanic cathodic protection to a pile to control corrosion but does not

provide any additional structural strength to the pile. The jackets are a fiberglass form with pre-installed zinc mesh. The bottom of the pile jacket is always placed in the water, typically -6 in MLW with an anode installed below the jacket on a galvanized steel strap. The jacket contains negative and positive connection wires that are connected to the existing pile, the anode, zinc mesh and then to a terminal box. The jacket is then filled with an epoxy grout.

2. Structural Cathodic-Protection Pile Jackets - This is the same type of system as the cathodic jacket but it also provides structural strengthening. The jacket is made wider to accommodate the new reinforcing steel and is filled with concrete.
3. Structural-Only Jackets - These are purely for structural strengthening and do not provide cathodic protection. The jackets are not used in an environment where corrosion related damage can occur.

Project Type #4 - Culvert Installation, Replacement, Repair, Maintenance, and Cleaning

Culvert projects primarily occur in areas where sturgeon and sea turtles do not occur, such as storm drains/ditches and small streams/channels/tidal creeks. Sturgeon primarily occur in large, main-stem rivers, estuaries and primary tidal creeks, while sea turtles occur primarily in estuaries and primary tidal creeks. As it relates to road crossings and conveying water, these areas are typically crossed using bridges. However, some large, secondary tidal creeks where culverts are located may be used by juvenile sturgeon.

Culvert projects consist of replacing undersized, broken, or damaged culverts with new structures to sustain adequate flows, or placing (installing or constructing) new culverts in areas where they did not previously occur. Culvert maintenance projects include making repairs to the structural integrity of the culvert or protecting an existing culvert with bank stabilization. Cleaning involves removing sediments or debris from within or near the opening of a culvert

Culverts are drains, pipes, or other conduits that convey water through or around a structure or obstruction. For highway projects, culverts typically pass water under roads and embankments. Culverts may differ in type (shape) and include closed and open-bottom culverts. Closed culverts are mainly rectangular structures (box culverts) or circular, elliptical, or arched pipes. Commonly used open-bottom culvert shapes include arched, high and low profile arched, and rectangular (open-bottom box culverts). Culverts may be composed of plastic, corrugated metal, concrete, or reinforced concrete, and may include features, such as baffles, steps, or ledges, to aid fish passage and/or control flows. Culverts may be precast (prefabricated) or cast-in-place at the project location and may have various inlet configurations, such as sloped inlets or wing walls. Factors affecting selection of inlet configuration include performance (e.g., flow dynamics and erosion control) and aesthetics.

Culvert installation may occur independently or as part of a larger roadway projects. Proper culvert sizing is determined by consulting hydraulics manuals and fish passage guidance. Average culvert lengths range between 18 and 200 ft. Culvert installation and replacements typically require less than 3 months to complete, while repair, maintenance and cleaning projects range in time from hours to less than 3 weeks. Typical culvert replacements involve removing vegetation at the outlet and inlet area, removing existing pavement and roadbed to extract the existing culvert, placing the new culvert, backfilling and replacing the pavement, installing armoring and headwalls, re-vegetating if necessary, and if flow is

present, dewatering the work area and establishing a flow bypass prior to initiating work. In-water construction typically occurs during low-flow months or during dry periods. Cofferdams are often used to facilitate culvert construction, repair, and maintenance.

Project Type #5 - Installation, Maintenance, and Removal of Shoreline Stabilization

Shoreline stabilization involves the direct protection of embankments at bridges, culverts, and roadway sections from erosive forces of flowing water. A variety of structures or materials can be built or placed parallel to shore on an existing, restored, or modified shoreline. Revetments, bulkheads, seawalls, and gabions protect the area immediately behind them, but afford no protection to adjacent areas or areas in front. These structures stabilize shorelines by enclosing and protecting areas, preventing the shoreline from functioning normally.

Rock riprap is the most common shoreline stabilization material used in transportation projects. Rock riprap is used as a general term to describe a variety of stone, rubble, concrete or other rock armoring used for shoreline protection and stabilization. Riprap is typically defined within the construction specifications of a project. Installing rock riprap consists of placing rock, typically in the form of hard quarry stone or fieldstone, on a shaped and graded slope. A transitional layer of gravel, small stone, or fabric can be placed between the underlying soil and the riprap to prevent material migration. Riprap is typically placed from the toe of the fill to the top of the fill. Various other structures, such as metal sheet piling, can be installed in conjunction with riprap for shoreline stabilization projects. Riprap is used in a variety of scenarios due to its versatility and cost. Riprap placement varies and may extend to the top of the bank or extend up the mean annual peak flow line, but can be placed up to one foot above the 100-year flood level. Woody and herbaceous plantings are used above this level. Riprap is not suitable for banks with grades steeper than 2:1. Bank grading may be required prior to stabilizing the bank. If necessary, a rock or earthen berm may be constructed to catch rocks dumped (end-dumped) from trucks before they enter the stream.

Stone revetments are filter-type structures that reduce wave energy while preventing migration of the soil beneath. Stone revetments are constructed by placing progressively larger stones atop a graded shoreline covered in geotextile fabric. Stone revetments typically include a layer of armoring (typically large stone riprap) that reduces the energy of waves and flowing water. Beneath the armoring are various sizes of smaller stones, fine gravel, and other materials that are placed on geotextile fabric (filter cloth). The geotextile fabric is placed on backfill, which is typically graded to a 2:1 slope. Other structures, such as toe protection and a splash apron may also be installed with stone revetments. Stone revetments are typically used when groundwater influx is part of the erosional process (e.g., ground water penetrates from the underlying soil while incoming waves strike the shoreline).

Retaining walls, bulkheads, and seawalls are all vertical wall structures that separate the natural shoreline from the water. These vertical walls are typically constructed of vinyl, metal sheet pile, or prefabricated concrete slabs, but timber may also be used. These structures are typically installed from land or from a willow-draft barge with land-based equipment by trenching, grading, or shaping the shoreline and installing vertical pieces. Vertical wall structures may be supported by piles installed by vibratory or impact hammer and/or deadmen anchors that hook underground behind the wall stabilizing them to the uplands. Footers can also be used, which are typically short/low level walls placed directly in front of a vertical wall to protect the bottom from erosion and scouring. Riprap footers are also used and are typically placed by trenching the location (i.e., dredging), placing filter fabric, and then placing riprap on

top of the fabric.

Gabions are enclosures or cages filled with material. These cages can be various shapes (e.g. cylindrical or rectangular) and sizes, can be filled with a variety of materials, and can be used in a number of scenarios. For shoreline stabilization in transportation projects, gabions are typically rectangular structures made of wire mesh or galvanized steel chain link fabric filled with rock riprap. Gabions are modular, so they can be moved and placed easily, and typically contain rock riprap, which can be an advantage to loose riprap that may become dislodged and removed by hydrodynamic forces.

Shore-connected structures are those structures used for shoreline stabilization, erosion control, and sediment accretion that are connected to the shore and extend out into the water. Groins are the most common shore-connected structure used for shoreline stabilization. Groins are typically made of large rock riprap (armor stone) and are built perpendicular to the shore, extending from the backshore out into the water. Although groins are typically straight perpendicular structures, groins can be hooked or curved or have a shore-parallel T-head at their seaward end. Groins are regularly used to disrupt the natural processes and currents along shorelines, including the longshore drift system on beaches of barrier islands. The purpose of a groin is to block the downstream flow (in rivers or streams) or longshore current so that sediment accumulates on the updrift/upstream side of the groin, accreting sediment and widening the shoreline. However, this further depletes the sediment supply to the shoreline on the downdrift/downstream side, which may lead to severe erosion. A common solution to this problem is to build a series of groins, often extending the entire length of a shoreline (USACE 1992).

Living shoreline is a broad term that encompasses a range of shoreline stabilization techniques along estuarine coasts, bays, sheltered coastlines, and tributaries. A living shoreline has a footprint that is made up mostly of native material, often incorporating vegetation or other living, natural elements. Many living shoreline projects combine “soft” elements with some type of harder shoreline structure, such as oyster reefs or rock sills, for added stability. Living shoreline projects typically use natural (e.g. oyster shell) and nature-based (e.g. rocks where they do not naturally occur) materials for added stability rather than metal, concrete or synthetic materials. Living shorelines maintain continuity of the natural land-water interface and reduce erosion while providing habitat value and enhancing coastal resilience.

Installation methods vary on a site-specific basis. In navigable waters, access from shore or a nearby structure is common; however, barges may be utilized. Whenever possible, equipment, such as excavators, will operate from banks, bridges, or temporary work platforms to avoid in-channel operation. Sometimes, materials can be placed directly on the streambed with little to no excavation; in other instances, excavation is necessary to key in materials. Often stream flow and anticipated erosion will determine specific aspects of design such as anchoring. Anchoring may be required for structures that include large woody debris. Several techniques exist including wood or steel piling, earth anchors, or rock overburden.

Project Type #6 - Pavement Preservation

Pavement preservation consists of patching, repairing, and replacing roadway surfaces and pavement. These include three types of pavement: (1) asphalt, (2) chip seal, and (3) concrete. If the existing pavement is in good condition, it may be covered over with a new layer of asphalt. Repair of badly deteriorated pavement could require grinding of existing pavement or replacement of the road foundation material prior to repaving. This typically involves grinding off and replacing the existing asphalt pavement.

Most paving occurs during March through November, though can occur throughout the year depending on weather. Activities may occur seven days a week, taking place either during the daylight hours, night hours, or both, depending on traffic volumes. Project duration depends on the size of the area being paved and could take from 1 to 120 working days to complete. Pavement preservation through chip sealing (alternately termed bituminous surface treatment or BST) involves the application of hot liquid asphalt and a layer of crushed rock on an existing asphalt surface. The application of BST is a temperature- and weather-sensitive activity. These projects may include a rock crushing operation to produce the necessary aggregate.

Hotmix Asphalt (HMA) paving is also a temperature- and weather-sensitive activity. Typically, the existing pavement is ground down (cold-milling) and replaced, or simply overlaid with new asphalt. Cold milling creates dry pavement grounds that are hauled to a dumpsite, spread along the road shoulders, or recycled into new pavement. Profile grinding is another optional method of removing the pavement surface. All asphalt paving projects involve the use of an asphalt plant area where asphalt is mixed with crushed rock to produce the new HMA, as well as occasionally crushing of rock for the pavement materials.

Preservation of existing Portland Cement Concrete Pavement (PCCP) is typically accomplished by removal and replacement of the existing PCCP, the placement of additional dowel bars into the existing pavement, or grinding of the existing surface. The removal results in concrete rubble that is typically hauled to a dumpsite. This is often accompanied by profile grinding as is the placement of additional dowel bars. Profile-grinding employs a series of diamond saws cooled by water that cut away the pavement. This creates pavement slurry that requires disposal at a dumpsite. Since paving may result in a slightly higher road surface, manholes, inlets, and guardrail may need to be raised or replaced. Guardrail raising involves the removal of existing guardrail, installation of taller posts, and reinstallation or replacement (depending on condition) of the rail.

Installation of roadside signs, guide posts, and raised pavement markers; guardrail improvements, fence installation and repair; and paint striping may also be included in a paving project. For most projects, installation of road signs, guideposts, and fencing involves minor amounts of excavation and vegetation removal. However, installation of very large signs, including concrete footings and steel supports, can potentially disturb substantial areas. Trenching may also be required to run utilities from existing sources to lighted signs. Paint striping may be completed with oil-based or latex-based paints, self- adhesive strips, or inset durable lane strips. Painting must be conducted in dry weather.

Activity #1 – Installation, Maintenance, and Removal of Temporary Erosion, Turbidity, and Sediment Control Devices

The installation of temporary erosion, turbidity, and sediment control measures is a necessary component of active construction sites. Prior to major construction activities, erosion and sediment control measures are typically installed on the perimeter of active construction sites (including off-site and staging areas) to prevent erosion and water pollution. Siltation control fence (SCF) is commonly used on the perimeter of sites, but typically requires small amounts of clearing and grubbing for installation. Construction work, typically beginning with site preparation, usually proceeds following the installation of perimeter SCF. Additional erosion and sediment control measures are routinely installed on the interior of active construction sites and may be used on the perimeter of sites in addition to, or to reinforce, SCF. Numerous measures are commonly used in NC, SC, and GA, and include berms, silt basins, dams, and

ditches, rock filter dams, hay bales, fiber logs and mats, inlet filters, slope drains, temporary seeding, stabilization control entrances/exits, brush barriers, and sediment tubes.

Activity #2 - Staging Areas

Staging areas are used for delivery and storage of construction materials and equipment, contractor office and storage trailers, and employee parking. These areas are typically contractor-selected and permitted, and are often fenced and located in close proximity to project construction. Temporary fencing prevents machinery and equipment, materials storage, and construction activity from intruding into adjacent properties, wetland and stream buffers, and shoreline areas. Office trailers, placed on temporary foundations, are often connected to available utilities including power, telephone, water, and sewer as needed. Connecting to these utilities may include installing poles for power lines and excavating trenches to place water and sewer pipelines. After construction is complete, staging areas are restored, if appropriate, and disconnected from any utilities.

Depending on site conditions, construction staging areas vary in size and may require vegetation clearing, grubbing, and grading or excavation to level the site and install drainage improvements. Extensive alterations to establish a staging area, such as blasting, are extremely unlikely. Cleared vegetation is often hauled offsite, mulched and redistributed, or less commonly piled and burned onsite. Excess material (e.g., soil, rock, debris) is disposed of at offsite facilities or reused as appropriate in construction. Conveyance systems for the movement of stormwater from a collection point to an outfall can consist of drainage pipes and stormwater facilities (such as ponds, vaults, and catch basins), using gravity or pumps to move the stormwater. Temporary driveways and access roads may be established from staging areas to the existing roadway network. Some staging areas may also be equipped with wheel washes that clean truck tires to reduce tracking dirt and dust offsite. Additional dust control is provided via water trucks and street sweepers.

Staging, fueling, and storage areas are typically located in areas that minimize potential effects to sensitive areas. Specialized best management practices (BMPs) are employed around concrete-handling areas to prevent water contamination from uncured cement entering water bodies or stormwater facilities. Temporary erosion and sediment control measures are implemented prior to, or immediately following, ground disturbance on these sites. Examples include marking clearing limits, establishing construction access, controlling runoff flow rates (sediment ponds, check dams, etc.), installing sediment controls and soil stabilization (silt fence, coir blankets, temporary seeding), protecting slopes, protecting drain inlets, and preventing/containing contaminant spills.

Activity #3 - Site Preparation

Site preparation begins with vegetation removal, which may be permanent or temporary. Permanent conversion of a vegetated area into a developed area includes clearing vegetation then grubbing out the roots, stumps, and other debris. Together, these are typically referred to as “clearing and grubbing” and are a sub-activity of earthwork. Temporary vegetative clearing includes cutting vegetation but maintaining the root mass to allow for regrowth. Removed vegetation is disposed of similarly to staging area vegetation clearing. Preliminary earthwork consists of stripping topsoil from an area and either removing earth or placing and compacting earth for roadway prism construction or slope construction. The earth may be moved from or to another section on the same project, or it may come from or be disposed off-site. Completed cut or fill prisms may then be covered by any number of treatments, such as rock base and pavement, rock stabilization and rip-rap, or mulch and seeding. Drainage and utility work

often accompany excavation and embankment. Impacts to wetlands and other sensitive areas are first avoided and minimized as much as possible, then mitigated when unavoidable. Utility work includes excavation to install new utility poles or trench excavation to install underground utilities. This work can be completed in forested areas.

Temporary road construction is often necessary for equipment access and involves similar site preparation activities as conducted for permanent roads. However, these roads are often unpaved, either constructed by grading, laying fabric and quarry spalls, construction mats, or rock rip-rap. Compaction is minimized so the materials can be removed and the site restored and replanted following construction. A variety of temporary construction BMPs are used for site preparation, including silt fences, berms, fiber wattles, storm drain inlet protection, straw bale barriers, check dams, and detention or siltation ponds. Erosion control measures are installed and operational before commencement of ground- disturbing activities. Areas where vegetation should be preserved are clearly marked or fenced. If work is conducted at night, temporary lighting is utilized.

Activity #4 - Geotechnical Drilling and Hazardous Waste Sampling

Subsurface sampling and testing to determine soil characteristics is often an important step in the engineering design process. Such sampling and testing may be associated with all projects/activities described. Subsurface sampling is accomplished by drilling test holes up to 300 ft. deep or digging soil pits up to 8 ft. deep. A drill rig can be mounted on a variety of transportation vehicles including trucks, tractors, skids, drill rigs, and barges. The drill is typically 5 to 10 inches in diameter. The drill shaft is lubricated using a mixture of bentonite (a natural, inert clay material) and water. The fluid is filtered and recycled back through the drilling operation.

When drilling is done off the roadway, impacts are minimized as much as possible through the selection of an appropriate sized and mounted drill rig, and limited vegetation removal. Normally, herbaceous and woody vegetation is cut back as necessary for drill access and not grubbed, and trees are rarely removed. Subsurface sampling for hazardous materials may also be necessary for each program/category. It is very similar to subsurface sampling for geotechnical purposes. Durations will vary for these activities depending on number of bore holes and substrate composition. Typically, one to several bore holes can be drilled in a day and most sampling is accomplished within a week.

Activity #5 – Installation, Maintenance, and Removal of Scientific Survey Devices

Numerous scientific survey devices are installed in or near project sites to collect data on environmental conditions, processes, and impacts. These types of devices are typically removed in less than 24 months. Many survey devices are installed with anchored buoys, vinyl poles, or single piles installed by hand or jetted in place from a barge. The amount of impact from this category of activity typically varies from $1ft^2$ to 50 ft^2. This type of installation can typically be completed in 1-2 days. These types of projects can include:

- Temporary buoys that contain current profilers to measure and record water temperatures and currents.
- Surface Elevation Tables (SETs)
- Time-laps cameras and passive data recorders affixed to PVC poles.
- Water quality monitoring buoys.

Activity #6 - Temporary Platforms, Access Fills, and Cofferdams

Temporary work platforms and fills may be required for new construction and to support maintenance activities (typically for bridges and causeways). Equipment typically includes the use of barges, cranes, pumps, boats, front-end loaders, and track hoes. Examples of temporary platforms and fills includes:

- Space-frame structures (i.e., truss-like, lightweight rigid structure constructed from interlocking struts in a geometric pattern) that provide high capacity working platforms which are capable of spanning large decks, including traversing along the length of a bridge; underslung girders and trusses
- Pontoons
- Work trestles (i.e., a rigid frame used as a support, especially referring to a bridge composed of a number of short spans supported by such frames)
- Temporary haul road fill (i.e., temporary roads of fill created in or adjacent to the waterbody to transport equipment and materials).
- Fill platforms (i.e., temporary islands or access roads of fill created to support equipment).

Cofferdams are temporary steel or concrete boxes used to keep water out of work areas and are common to in-water work operations. Cofferdams can also include inflatable (typically made of geotextile) devices, where the walls are filled with water and the interior areas is pumped out; these types of cofferdams are typically used in areas where sheet piles cannot penetrate the bottom substrate. Cofferdams enclose work areas and reduce turbidity, sedimentation, and hydroacoustic impacts, while excluding organisms from areas where construction work is occurring. Cofferdams composed of steel sheet piles installed with vibratory hammers in a generally rectangular configuration are included in this evaluation. Cofferdams may also consist of large casings (hollow cylinders), known as isolation casings, installed with vibratory hammers. Cofferdam installation includes driving sheet piling into the substrate to a sufficient depth to cut off water flow. The proper penetration depth will vary based on soil conditions. The sheet piling must also be tall enough to isolate the work area. Once the cofferdam is established, the inside of the cofferdam is dewatered using pumps to create “dry” conditions. Once work within the cofferdam is completed, all sheet piling is removed with a vibratory hammer.

Activity #7 - Pile Installation and Removal

Substructures: Piles and Footings

Substructures include all parts of a bridge or pier supporting the superstructures (i.e., beams and deck) and include abutments, interior bents, end-bents, footings, and piles/columns. Bents support a vertical load and are placed transverse to the length of the structure. The vertical elements of a bent are columns or piles. Horizontal bent elements on top of piles are bent caps, while elements below the piles are foundations, which are categorized as willow or deep. Willow foundations, known as footings, are used when surface soils are sufficiently strong enough to support loads and are typically rectangular reinforced concrete structures near the surface. The bearing capacity of the soil largely determines the size of the footing.

Piles are typically made of steel, concrete, or wood (timber). Various types (e.g., pre-cast and pre-stressed, cast-in-place), shapes (e.g., cylindrical, H-piles, sheet piles), sizes and configurations of piles are

used for transportation projects depending on need, site-specific conditions, and other factors. Piles are typically penetrated into the ground and are categorized as deep foundations. Piles provide support by transferring loads to deeper soil strata with higher bearing capacities. Some piles, such as metal sheet piles used for cofferdams and retaining walls, do not support a vertical load.

Pile Installation

Pile installation methods can be categorized as displacement or replacement. Displacement piles are driven or vibrated into the ground, displacing the surrounding soil. Replacement piles are placed or constructed within previously drilled boreholes, replacing the excavated soil. Various methods exist for displacement and replacement pile installation and a combination of methods are typically used.

Pile driving is a type of displacement method using mechanical force to drive piles into substrates. Impact hammers and vibratory hammers are the most common type of pile drivers. Impact hammers use a heavy ram weight raised hydraulically or mechanically above a pile, which is then dropped or propelled onto the head of a pile to move the pile into the substrate. Cushions are typically used between the ram and the pile in order to avoid physical breakdown. Numerous types of impact hammers exist, including simple drop/gravity hammers, single and double acting compressed air, steam, or hydraulic hammers, and diesel hammers (single or double acting). Impact pile hammers produce high-intensity impulsive sounds.

Vibratory hammers vibrate piles at frequencies, which move soil particles, significantly reducing friction around the pile shaft. Electrically or hydraulically produced vibrations are transmitted from the pile to the soil, allowing for penetration. Vibratory hammers are most effective in granular soils, but can also be effective in cohesive soils. Vibratory hammers produce non-impulsive sounds. For all pile drivers, pile diameter and hammer energy are correlated; with increased pile diameters, requiring increased hammer energy.

Jetting, or water jetting, is another type of displacement pile driving method. Jetting uses high-pressure water pumps to force a hole in the bottom substrate for the placement of piles. Jetting is typically used in association with impact and vibratory hammers; jetting is typically used to begin pile installation, then a hammer is used to complete the installation.

Cast-in-place (CIP) piles are the primary type of replacement pile installation method. CIP piles are reinforced concrete piles cast on-site in holes drilled to predetermined depths. CIP piles are commonly referred to as “drilled shafts.” For CIP piles in aquatic environments, steel casings are typically installed using a vibratory hammer, after which drilling takes place inside of the casing with an auger or other type of drilling equipment (e.g., drilling buckets) to the desired depth. After drilling is complete, a rebar cage is placed inside of the casing and concrete is poured into the casing; the casing is later removed. CIP piles generally produce less vibration and lower sound levels than driven piles.

Footings

Footings are constructed to support piles or columns, both of which are composed of reinforced concrete. In aquatic environments, cofferdams facilitate construction of footings (and below-water sections of piles or columns). Cofferdams are typically rectangular structures composed of steel sheet piles installed with a vibratory hammer. Once a cofferdam is in place, it is dewatered to create dry conditions and work proceeds as if on land: the soil is excavated and foundation is constructed with reinforced concrete. Piles/columns may also be constructed within the cofferdam, which is later removed

Pile and Footing Removal

Pile and footing removal takes place for various reasons, such as piles or footings are structurally deficient or functionally obsolete or piles are part of temporary structures. There are four general types of pile and footing removal:

Direct pull or clamshell method: Piles are typically grasped or held with an excavator bucket or clamshell bucket and are repeatedly moved or shaken until they are pulled directly out of the substrate. Piles may also break below the mudline using this method.

Pile hammer: Vibratory hammers are used to vibrate the pile in order to break the bonds between the pile and sediment and reduce friction of soil particles against the pile shaft. Piles are slowly pulled out of the substrate while being vibrated; soil will typically slough off during removal.

Cutting: Piles are cut off at, or just below, the mudline while the pile is supported from above the cut line. The portion of the pile below the mudline typically remains in the substrate.

Mechanical demolition: Piles are mechanically broken down with a bucket or other machinery (e.g., hammer) and pieces are removed from the water.

Blasting: Described in the next section.

Activity #8 - Blasting

Blasting involves using explosive charges to break-up or remove rock, reinforced concrete, or other structures for excavation, construction, or demolition purposes. Blasting charges use various explosive weights and time delays that generate high-energy impulsive sounds and pressure waves. For transportation projects, underwater blasting is typically employed to remove sub-structure components of old/existing bridges or excavate bottom sediments (e.g., rock) for the placement of new sub-structures. The most common type of blasting (above- or underwater) used in transportation projects is confined blasting, which consists of placing explosive charges into pre-drilled holes (blast holes) within a structure prior to detonation. Stemming is typically used with confined blasts and involves placing inert material into blast holes (to cover the charge) prior to detonation. Stemming material typically includes angular crushed stone or gravel. Confined blasts typically produce lower peak sound pressure levels than unconfined blasts, but surface and bottom boundaries can reflect pressure waves and create a complex series of positive and negative pressure peaks in willow water conditions.

Blasting may also be required when expanding the transportation footprint or as part of the stabilization efforts to remove unstable material. The scale of blasting operations can vary from breaking up a boulder or trimming an unstable overhang, to large-scale removal operations that involve thousands of cubic yards of material. There are two general types of blasting: production and controlled. Production blasting uses widely-spaced, large explosive charges that are designed to fragment a large amount of burden (the rock that lies between the existing slope face and blasthole). Controlled blasting uses more tightly spaced and smaller explosive charges to remove smaller amounts of burden. This technique can remove material along the final slope face or it can be used prior to production blasting to create an artificial fracture along the final cut slope.

Blasting mats may be required to contain flying rock, especially when blasting occurs adjacent to sensitive areas such as aquatic systems. Containment can also include installing anchored wire mesh.

Activity #9 - Dredging

Dredging is defined as underwater excavation and involves removing bottom sediments from the aquatic environment. Dredging is typically done to create or maintain waterways to support navigation, vessel access to channels, ports, and marinas. Dredging can also consist of removing debris, sediments, or other obstructions from the aquatic environment. For transportation projects, dredging is typically used to gain access to project sites and remove sediments to place piles.

Mechanical Dredging

Mechanical dredges remove bottom sediments by direct application of mechanical force to dislodge and scoop the sediments from the bottom. Mechanical dredges are primarily used for smaller sites; clamshell dredges (buckets) and excavators are the most common mechanical dredges. Clamshell dredges employ a vertical loading grabber connected to wire rope, which is lowered in the open position into the sediment, closes around the sediment load, and is raised above the water to be deposited into a barge. Clamshell dredges operate from atop barges, which are moved or positioned using spuds. Barges are typically equipped with three spuds: two forward and one aft.

Excavator dredging involves a backhoe excavator that uses its bucket to remove sediments from beneath the water line, bring the sediments to the surface in the open bucket, and deposit the sediments, typically on the shoreline or in a barge or truck. This is a common method of dredging associated with transportation projects. Excavator dredging can occur from the shoreline or from atop barges. Barges used for excavator dredging are typically configured with spuds in the same way as clamshell dredges.

Hydraulic Dredging

Hydraulic dredges remove bottom sediments by suction force and the sediments are pumped away from the site in liquid slurry form. Hydraulic dredges are typically used for larger sites; cutterhead/pipeline and hopper (suction) are the two common hydraulic dredges. Cutterhead dredges are equipped with rotating cutter apparatuses that surround the intake end of a suction pipe. The rotation of the cutterhead breaks up bottom sediments and facilitates the pumping of the sediment water slurry through the pipe. The pipeline discharges dredged material directly to a disposal site, which enables continuous work. Cutterhead dredges are the most common dredge in the U.S. Cutterhead dredges are typically held in position and advanced with spuds.

Suction or hopper dredges suck dredged material from the bottom through long intake pipes, called drag arms, and store it in hoppers. Hopper dredges are self-propelled ships with large hopper bins (“hoppers”; containment areas) that are fitted with powerful pumps to facilitate the suction process. Dredging stops when the hoppers are full and ships must dispose (in-water) of the dredged material. Hopper dredges are typically viewed as the dredging method with the highest potential to adversely affect species, including ESA-listed species. As a result of high rates of listed-species takes in the 1990s resulting from hopper dredging projects, NMFS developed a regional biological opinion concerning the use of hopper dredges in channels and borrow areas along the Southeast U.S. Atlantic coast (referred to as SARBO, 1997). The biological opinion includes a number of conservation recommendations to protect species. SARBO is currently used (applicable/precedent) for hopper dredging projects in the Southeast region.

Knockdown/Bed-leveling

Knockdowns employ an I-beam or similar equipment to redistribute shoaled sediment into deeper areas

within dredging sites. This method is typically employed for smoothing the bottom after conventional dredging, and for managing localized mounds of sediment. Knockdowns are commonly used for shoaling in ports and marinas.

Disposal

Sediments that are removed from below the water surface during the dredging process must be transported and disposed of. Dredged material may be deposited in several location types, depending on purpose, need, permitting, and other factors. On-site disposal is typically used if dredged material is intended to be used as fill material; the use of off-site dredge disposal sites is also common. Beneficial use of dredged material is encouraged, provided the sediments meet certain physical, chemical and biological criteria.

Activity #10 - Equipment

General equipment associated with roadway construction includes, but is not limited to, pick-up trucks, dump trucks, front-end loaders, cranes, asphalt grinders, paving machines, compaction rollers, bulldozers, chainsaws, vibratory and impact pile drivers, barges, vessels (boats), explosives, excavators, hoe rams, rock crusher (if blasting is used for on-site fill) track or pneumatic drills, graders, jack hammers, stingers, wire saws, air compressors, traffic control devices, generators, and other heavy equipment.