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POLICIES FOR THE PROTECTION AND RESTORATION OF ESSENTIAL FISH HABITATS FROM ALTERATIONS TO RIVERINE, ESTUARINE AND NEARSHORE FLOWS

(Redraft October 2013)

Policy Context

This document establishes the policies of the South Atlantic Fishery Management Council (SAFMC) regarding protection of the essential fish habitats (EFH) and habitat areas of particular concern (EFH-HAPCs) associated with alterations of riverine, estuarine and nearshore flows. Such hydrologic alterations occur through activities such as dam operations, water supply and irrigation withdrawals, deepening of navigational channels and inlets, and other modifications to the normative hydrograph. The policies are designed to be consistent with the overall habitat protection policies of the SAFMC as formulated and adopted in the Habitat Plan (October 1998) and the Comprehensive EFH Amendment (October 1998).

The findings presented below assess the threats to EFH potentially posed by activities related to the alteration of flows in southeast rivers, estuaries and nearshore ocean habitats, and the processes whereby those resources are placed at risk. The policies established in this document are designed to avoid, minimize and offset damage caused by these activities, in accordance with the general habitat policies of the SAFMC as mandated by law.

EFH At Risk from Flow-Altering Activities

The SAFMC finds:

1) In general, the array of existing and proposed flow-altering projects being considered for the Southeastern United States for states with river systems that drain into the SAFMC area of jurisdiction together constitutes a real and significant threat to EFH under the jurisdiction of the SAFMC.

2) The cumulative effects of these projects have not been adequately assessed, including impacts on public trust marine and estuarine resources (especially diadromous

species), use of public trust waters, public access, state and federally protected species, state critical habitat, SAFMC-designated EFH and EFH-HAPCs.

3) Individual proposals resulting in hydrologic alterations rarely provide adequate assessments or consideration of potential damage to fishery resources under state and federal management. Historically, emphasis has been placed on the need for human water supply, hydropower generation, agricultural irrigation, flood control and other human uses. Environmental considerations are dominated by compliance with limitations imparted by the Endangered Species Act for shortnose and Atlantic sturgeon, and/or through provisions of Section 18 of the Federal Power Act, as administered by the Federal Energy Regulatory Commission, which applies to the provision of passage for diadromous species, as well as the provisions of the Fish and Wildlife CoordinationAct.

4) .

5) Hydrologic alterations have caused impacts to a variety of habitats including:

   a) waters, wetlands and benthic habitats near the discharge and withdrawal points, especially where such waters are used for spawning by anadromous species
   b) waters, wetlands and benthic habitats in the area downstream of discharge or withdrawal points
   c) waters, wetlands and benthic habitats in receiving estuaries of southeast rivers and
   d) waters and benthic habitats of nearshore ocean habitats receiving estuarine discharge.

6) Certain riverine, estuarine and nearshore habitats are particularly important to the long-term viability of commercial and recreational fisheries under SAFMC management, and threatened by large-scale, long-term or frequent hydrologic alterations:

   a) freshwater riverine reaches and/or wetlands used for anadromous spawning and foraging
   b) downstream freshwater, brackish and mid-salinity portions of rivers and estuaries serving as nursery areas for anadromous and estuarine-dependent species and
   c) nearshore oceanic habitats off estuary mouths.

7) Large sections of South Atlantic waters potentially affected by these projects, both individually and collectively, have been identified as EFH or EFH-HAPC by the SAFMC**,** as well as the Mid-Atlantic Fishery Management Council (MAFMC) in the case of North Carolina. Potentially affected species and their EFH under federal management include, but are not limited to (SAFMC, 1998):

   a) summer flounder (various nearshore waters, including the surf zone and inlets; certain offshore waters)
   b) bluefish (various nearshore waters, including the surf zone and inlets)

d) many snapper and grouper species (live hardbottom from shore to 600 feet, and – for estuarine-dependent species [e.g., gag grouper and gray snapper] – unconsolidated bottoms and live hardbottoms to the 100 foot contour).
e) black sea bass (various nearshore waters, including unconsolidated bottom and live hardbottom to 100 feet, and hardbottoms to 600 feet)
f) penaeid shrimp (offshore habitats used for spawning and growth to maturity, and waters connecting to inshore nursery areas, including the surf zone and inlets)
g) coastal migratory pelagics (e.g., king mackerel, Spanish mackerel) (sandy shoals of capes and bars, barrier island ocean-side waters from the surf zone to the shelf break inshore of the Gulf Stream; all coastal inlets)
h) corals of various types (hard substrates and muddy, silt bottoms from the subtidal to the shelf break)
i) areas identified as EFH for Highly Migratory Species managed by the Secretary of Commerce (inlets and nearshore waters are importantpupping and nursery grounds for sharks)

8) Projects which entail hydrologic alterations also threaten important fish habitats for diadromous species under federal, interstate and state management (in particular, riverine spawning habitats, riverine and estuarine habitats, including state designated areas - e.g. Primary and Secondary Nursery Areas of North Carolina), as well as essential overwintering grounds in nearshore and offshore waters. All diadromous species are under management by the Atlantic States Marine Fisheries Commission and the states. The SAFMC also identified essential habitats of anadromous and catadromous species in the region (inlets and nearshore waters).

9) Numerous habitats that have been impacted by these projects causing hydrologic alterations have been identified as EFH-HAPCs by the SAFMC. The specific fishery management plan is provided in parentheses:

a) all nearshore hardbottom areas (SAFMC, snapper grouper).
b) all coastal inlets (SAFMC, penaeid shrimps, and snapper grouper).
c) nearshore spawning sites (SAFMC and penaeid shrimps).
d) benthic *Sargassum* (SAFMC, snapper grouper).
e) from shore to the ends of the sandy shoals of Cape Lookout, Cape Fear, and Cape Hatteras, North Carolina; Hurl Rocks, South Carolina; *Phragmatopora* (worm reefs) reefs off the central coast of Florida and nearshore hardbottom south of Cape Canaveral (SAFMC, coastal migratory pelagics).
f) Atlantic coast estuaries with high numbers of Spanish mackerel and cobia from ELMR, to include Bogue Sound, New River, North Carolina; Broad River, South Carolina (SAFMC, coastal migratory pelagics).
g) Florida Bay, Biscayne Bay, Card Sound, and coral hardbottom habitat from Jupiter Inlet through the Dry Tortugas, Florida (SAFMC, Spiny Lobster)
h) Hurl Rocks (South Carolina), The *Phragmatopoma* (worm reefs) off central east coast of Florida, nearshore (0-4 meters; 0-12 feet) hardbottom off the east coast of Florida from Cape Canaveral top Broward County); offshore (5-30 meters; 15-90 feet) hardbottom off the east coast of Florida from Palm Beach County to Fowey

Rocks; Biscayne Bay, Florida; Biscayne National Park, Florida; and the Florida Keys National Marine Sanctuary (SAFMC, Coral, Coral Reefs and Live Hardbottom Habitat).

i) EFH-HAPCs designated for HMS species (e.g., sharks) in the South Atlantic region (NMFS, Highly Migratory Species).

10) Habitats likely to be affected by projects which alter hydrologic regimes include many recognized in state level fishery management plans. Examples of these habitats include Critical Habitat Areas (CHAs) established by the North Carolina Marine Fisheries Commission, either in FMPs or in Coastal Habitat Protection Plans.

Threats to Riverine, Marine and Estuarine Resources from Hydrologically-Altering Activities

The SAFMC finds that activities which alter normative hydrologic regimes of rivers, estuaries, inlets and nearshore oceanic habitats may include projects such as dam operations, water withdrawals, and dredging. These actions may pose a threat to EFH, EFH-HAPCs, diadromous fishes, state and federally-listed species, Federal critical habitat, and CHAs through the following mechanisms:

Dredging:

Methods:
Agitation dredging- dredge material is hydraulically or mechanically lifted into the water column and then tidal or river currents are used to carry the suspended sediments elsewhere.

Hopper dredging- dredge material is loaded onto a vessel via a suction pipe, distributed into one or more hoppers in the vessel, and carried to an offshore disposal site.

Hydraulic pipeline dredge– dredge material is moved via intake pipe directly through a discharge pipe into a disposal area, either an open-water disposal site or an upland confined disposal facility (CDF). If the disposal site is a CDF, there may or may not be an effluent from the settled dredged material into the adjacent waterbody.

Mechanical dredge- dredge material is scooped from the bottom and then placed into a waiting vessel or disposal area. The two main types of scooping buckets used are clamshell and dipper buckets

Impacts to aquatic species from the act of dredging could result from suspended sediments and any associated contaminants, lowered dissolved oxygen (DO), impingement and entrainment, as well as vessel collisions. Dredging channels can also result in long-term salinity impacts, potentially compressing the area of fresh and brackish waters and driving the higher salinity ocean water farther inland. Stronger salinity stratification can reduce mixing and result in lower DO in the deeper part of the water column. Higher salinity levels can reduce habitat suitability for anadromous fishes and can convert tidal freshwater marsh to brackish marsh.

Disposal:

Confined disposal- material is placed behind dikes, which contain and isolate it from the surrounding environment. A mixture of dredged material and water is pumped into an area, may be divided into several smaller areas called cells. As the water moves through the cells, the sediments settle out and water may be discharged from the site as effluent.

Ocean disposal- material is delivered via a hopper dredge or towed barge, which travels to a designated Ocean Dredged Material Disposal Site (ODMDS), where the material is released and deposited on the ocean floor.

Open-water disposal- material is placed in an open waterbody (e.g., river, lake, estuary, or nearshore ocean area). The selected disposal site may be in a high-energy dispersive area or a low-energy depositional area, depending on the project goals.

Capped disposal- material is placed on a level bottom or in deep pits or depressions and clean material is placed on top to isolate the dredged material and any associated contaminants.

Impacts to aquatic species and habitats from disposal activities could include vessel collisions with certain sensitive species, alterations to existing habitat due to the disposal of disposed materials, and potential exposure to any associated contaminants.

Flow alterations:

Water withdrawals:

Impacts to aquatic species and habitats from water withdrawals for municipal, industrial, and agricultural purposes could potentially include impingement, entrainment, temporary and permanent alterations to habitat from construction activities, decreased downstream flows, and degradation of downstream water quality due to decreased downstream flows. Minimizing impingement and entrainment requires knowledge of the life history and behavioral traits of sensitive species in the project area, their sustained swimming speeds, and the sizes of their vulnerable life stages. In addition, projected approach and sweeping velocities at multiple flow scenarios need to be calculated during the project design phase. Approach velocity is the vector component perpendicular to the screen face as water passes through the screen mesh, measured approximately 3 inches from the screen surface. Sweeping velocity is the vector component parallel and adjacent to the screen face.

The most vulnerable life stages to water withdrawals are typically eggs, larvae, and juveniles. Protection devices need to prevent entrainment, prevent impingement, and guide sensitive species away from the facility. The first consideration is to separate the fish spatially and temporally from the intake. If intakes cannot be located away from habitats supporting sensitive species, reducing or eliminating withdrawals during the period these species are present can be an effective protection strategy.

Providing fish egress from the intake is important because without it they can eventually fatigue and become impinged. The preferred configuration is for the intake to be placed in open water, especially with a suitable sweeping velocity, because a bypass is therefore not required. However, when intakes are set into the bank, a bypass system with an entrance at the downstream end of the screen becomes necessary. Velocities at the bypass entrance should be high enough to provide efficient guidance for outmigrating fish.

Keeping the screen surface clean of debris is critically important for maintaining proper approach velocities because clogged screens tend to develop hot spots composed of higher velocities, significantly increasing rates of impingement.

Dam operations: Impacts to aquatic species and habitats caused by flow alterations from dam operations include temporary and permanent alterations to habitat from construction activities, saltwater intrusion, degradation of downstream water quality, and altered downstream flows. Saltwater intrusion occurs when reduced riverine freshwater flows allow more saline water to intrude farther inland. Increased salinities can alter emergent vegetation, reduce habitat suitability and growth rates of sensitive species, and increase the colonization of predators. Degraded downstream water quality associated with dam operations may include reduced dissolved oxygen, altered water temperature, increases in algal blooms, and reduced wastewater assimilation.

Flow modifications of natural hydrologic regimes caused by dams can greatly alter aquatic systems. The current environmental flows paradigm emphasizes the importance of the natural variability of flows and the concept that biota have evolved in response to critical components of variable flows. Components of natural river flows provide ecological functions and include baseflows, high pulse flows, and floods. For example, seasonal and annual variability in baseflows creates habitat diversity that results in diverse aquatic communities. Higher baseflows provide adequate habitat for aquatic organisms, maintain suitable water quality, keep fish eggs suspended, and enable fishes to move to feeding and spawning areas. Periodic naturally low baseflows can purge invasive species and concentrate prey into limited areas to benefit predators. High pulse flows shape physical habitat of river channels, determine the size of substrate, prevent riparian vegetation from encroaching into the channel, restore normal water quality conditions after prolonged low flows and flush away waste products and pollutants, aerate eggs, prevent siltation, and maintain suitable salinity in estuaries. Floods provide migration and spawning cues for fishes, enable fishes to access the floodplain for spawning and feeding and provide a nursery area for juvenile fishes, maintain the balance of species in aquatic communities, deposit gravel and cobbles in spawning areas, flush organic materials that serve as food and habitat structures into the channel, and purge invasive species.

Five critical components of flow regimes that regulate ecological processes in river ecosystems are recognized: magnitude, frequency, duration, timing, and rate of change. Alterations to each of these components of the natural flow regime can cause a wide range of detrimental ecological responses. As an example, the magnitude and frequency of high and low flows are common flow alterations as a result of dam operations. The extreme daily variations below peaking power hydroelectric dams represent an extremely harsh environment of frequent, unpredictable flow disturbance. Aquatic species living in these environments can suffer physiological stress, washout during high flows, and stranding during rapid dewatering. Frequent exposure can result in mortality of bottom-dwelling organisms and reductions in biological productivity. Many small fishes and early life stages are found in shallow shoreline or backwater areas, which can be impaired by frequent flow fluctuations. These flow modifications can lead to reductions in diversity and abundance of many fishes and invertebrates. Conversely, flow stabilization can also occur below dams, such as water supply reservoirs, that can result in artificially constant environments that lack natural extremes, decreased diversity, and reduced floodplain connectivity. Therefore, mimicking or ensuring the natural magnitude, frequency, duration, timing, and rate of change of baseflows, high pulse flows, and floods is preferable.

Methods of Instream Flow Protection:

Three types of approaches have been typically employed for setting environmental flow standards: minimum flow thresholds, statistically-based standards, and per cent of flow approaches. The most commonly applied approach has been to set a minimum flow to be maintained or minimum flows that vary seasonally. More recently, statistically-based standards have been used to maintain select characteristics of flow regimes. Increasingly, per cent of flow approaches are being used. Expanding upon the per cent of flow approach, bands of allowable alteration called sustainability boundaries can be placed around natural flow conditions as a means of expressing environmental flow needs. To do this, natural flow conditions are estimated on a daily basis at the points of interest, representing flows that would have existed in the absence of current flow alterations. Sustainable boundary limits can be set on the basis of allowable perturbations from the natural condition. Richter et al. (2011), citing well-supported case studies and regional analyses, suggest a high level of ecological protection will be provided when daily flow alterations are no greater than 10%, a moderate level of protection when daily flows are altered 11-20%, and alterations greater than 20% will likely result in moderate to major changes in natural structure and ecosystem functions, with greater risk associated with greater levels of daily flow alteration. It is recommended that when a single threshold value or standard is needed, a presumptive standard of protecting 80% of daily flows will maintain ecological integrity in most rivers and 90% may be needed to protect rivers with at-risk species and exceptional biodiversity. When local ecological knowledge indicates that more protective standards may be needed, adjustments to values should be considered. In addition, when applying this standard to hydropower-regulated rivers, the standard applied to daily flow averages may be insufficient to protect ecological integrity because of peaking power operations, which cause considerable fluctuation within a day.

Current State Policies:

North Carolina: Surface and groundwater withdrawers who meet conditions established by the General Assembly register and annually report their water withdrawals and surface water transfers with the State. Registrations are updated at least every five years. Water withdrawal permits contain conditions to meet site-specific instream flow requirements. Specifics of each project are used by the Division of Water Resources of

North Carolina Department of Environment and Natural Resources to determine the appropriate instream flow recommendation. Some of these specifics include if the project is proposed or existing, presence or absence of a dam, purpose of the withdrawal, etc. Some flow recommendations may be a percentage of a low flow value while others may be variable, seasonally dependent flows based on fieldwork and consensus among numerous stakeholders.

South Carolina: Surface water withdrawals are regulated by the South Carolina Department of Health and Environmental Control (SCDHEC) under the Surface Water Permitting, Withdrawal, and Reporting Act, which was signed into law in June, 2010. Most facilities that have a dam and withdraw surface waters must abide by the regulations provided in this Act. However, hydropower is exempted from the permitting requirements, including the minimum flow requirements, identified in this Act. Minimum flows released from hydroprojects are permitted through the 401 Water Quality Certification Permitting process administered by SCDEHC. In the development of 401 permits, SCDHEC will consider recommendations from other State Agencies, such as the South Carolina Department of Natural Resources (SCDNR). SCDNR established an instream flow policy for protection of fish and wildlife habitats in 1989. In the absence of a site-specific instream flow study, recommended minimum flows are as follows:

Piedmont Streams:
July-November = 20% of mean annual daily streamflow
January-April = 40% of mean annual daily streamflow
May, June, December = 30% of mean annual daily streamflow

Coastal Plain Streams:
July-November = 20% of mean annual daily streamflow
January-April = 60% of mean annual daily streamflow
May, June, December = 40% of mean annual daily streamflow

Georgia: A centralized permitting process is in place under the Georgia Department of Natural Resources- Environmental Protection Division (GDNR-EPD), which issues surface and groundwater withdrawal permits for any use greater than 100,000 gallons per day. GDNR-EPD implements its 2001 Interim Instream Flow Protection Strategy through provisions in surface water withdrawal permits. It is applicable to new, post-2001, non-farm surface water allocations of water and is applicable to any non-federal impoundment. Therefore exceptions to this policy are agricultural projects, Federal reservoirs, and withdrawals from highly regulated streams, such as the Savannah River, in which flows are significantly determined by the operation of Federal reservoirs. GDNR will work to identify a consensus approach to address minimum flow requirements for those seeking to withdraw water from highly regulated streams.

Pre-2001 withdrawal permit holders seeking increases in permit quantities are required to comply with the policy for the increased allocation only, not for the previously permitted withdrawal amount. Low flow protection for those projects using previous withdrawal amounts are governed by an annual 7Q10 or, if using pre-1977 withdrawal amounts, no minimum flow requirements. Under the 2001 Interim Instream Flow Protection Strategy, the permit applicant is able to select from one of three minimum stream flow options, outlined below:

1) Monthly 7Q10 Minimum Flow Option: The applicant is required to release the lesser of the monthly 7Q10 or inflow. The monthly 7Q10 is a statistical figure that reflects the lowest seven-day running average of a stream's flow for each calendar month with a recurrence frequency of once in ten years.

2) Site-Specific Instream Flow Study Option: A site-specific instream flow study may be performed to determine what minimum flow conditions must be maintained for protection of aquatic habitat.

3) Mean Annual Flow Options:
    a) 30% Mean Average Annual Flow for direct withdrawals, or inflow, whichever is less.
    b) 30/60/40% Mean Annual Flow for water supply reservoirs, or inflow, whichever is less. This translates to the lesser of 30% of the mean annual flow or inflow during July through November, 60% of the mean annual flow or inflow during January through April, and 40% of the mean annual flow or inflow during May, June, and December.

Florida: The five state Water Management Districts or the Florida Department of Environmental Protection (FDEP) are required to establish minimum flows and levels (MFLs) for aquifers, surface watercourses, and other surface waterbodies to identify the limit at which further withdrawals would be significantly harmful to the water resources or ecology of the area (Chapter 373.042, Florida Statutes). FDEP is given general supervisory authority over the districts and delegates water resources programs to the districts where possible. Minimum levels are developed for lakes, wetlands and aquifers, whereas minimum flows are developed for rivers, streams, estuaries and springs. MFLs are adopted into Water Management District rules (Chapter 40D-8, Florida Administrative Code) and used in each District's water use permitting program to ensure that withdrawals do not cause significant harm to water resources or the environment. Each District identifies waterbodies with adopted MFLs and those that they are currently targeting or planning to work on in the future.

The Districts collect and analyze a variety of data for each waterbody for application of methods that are used to develop specific MFL recommendations and to help define significant harm. If actual flows or levels are below established MFLs, or are expected to be below established MFLs within the next twenty years, the Districts develop and implement a recovery or prevention strategy (Chapter 40D-80, F.A.C.), in accordance with state law (Chapter 373.0421, Florida Statutes). The St. Johns River Water Management District and South Florida Water Management District are the two districts in Florida that drain into the South Atlantic region. These Districts often express MFLs as statistics of long-term hydrology incorporating return interval (years), duration (days), and magnitude (flow or level).

SAFMC Policies for Flow-altering Projects

The SAFMC establishes the following general policies related to projects resulting in hydrologic alterations, to clarify and augment the general policies already adopted in the Habitat Plan and Comprehensive Habitat Amendment (SAFMC 1998a; SAFMC 1998b):

1) Projects should avoid, minimize and where possible offset damage to EFH and EFH-HAPCs, diadromous fishes, state and federally-listed species, Federal critical habitat, and State Critical Habitat Areas (CHAs).

2) Projects should provide detailed analyses of possible impacts to EFH, EFH-HAPCs, diadromous fishes, state and federally-listed species, Federal critical habitat, and CHAs..This should include careful and detailed analyses of possible impacts , including short-term, long-term, population, and ecosystem-scale effects. Agencies with oversight authority should require expanded EFH consultation.

3) Projects should provide a full range of alternatives, along with assessments of the relative impacts of each on each type of EFH, EFH-HAPC, diadromous fishes, state and federally-listed species, Federal critical habitat, and CHAs.

4) Projects should avoid impacts on EFH, EFH-HAPCs, diadromous fishes, state and federally-listed species, Federal critical habitat, and CHAs that are shown to be avoidable through the alternatives analysis, and minimize impacts that are not.

5) Projects should include assessments of potential unavoidable damage to EFH and other marine resources.

6) Projects should be conditioned on the avoidance of impacts, and the minimization of unavoidable impacts. Compensatory mitigation should be required for all unavoidable impacts to EFH, EFH-HAPCs, diadromous fishes, state and federally-listed species, Federal critical habitat, and CHAs, taking into account uncertainty about these effects. Mitigation should be local, up-front and in-kind, and should be adequately monitored.

7) Projects should include baseline and project-related monitoring adequate to document pre-project conditions and impacts of the projects on EFH, EFH-HAPCs, diadromous fishes, state and federally-listed species, Federal critical habitat, and CHAs.

8) All assessments should be based upon the best available science.

9) All assessments should take into account the cumulative impacts associated with other projects in the same southeast watershed.

10) Projects should meet state and Federal water quality standards. For instance operational or structural modifications may be employed, if necessary, to improve downstream dissolved oxygen and/or water temperature.

11) To the extent that it is reasonably practicable, construction activities (e.g., dredging, construction of intake structures) should not be scheduled to coincide with the spawning migrations or early development of sensitive species that are present in the proposed project areas.
12) Sediments to be dredged should be tested for contaminant levels prior to dredging to ensure they will not pose an unacceptable toxicological risk to fish, wildlife species, or their prey. Dredged material should not be placed in areas that would negatively affect EFH's, EFH-HAPCs, CHAs, Federal critical habitat, diadromous fishes, or state and federally-listed species. Effluent from upland CDFs should be monitored to ensure state and Federal water quality standards are not violated.

13) To minimize the potential for impacts to certain sensitive species during dredging and disposal activities, vessel speed restrictions, observers, timing restrictions, and other avoidance techniques may be employed.
14) Impingement and entrainment of sensitive species at water intakes should be avoided. Water intakes should not be placed in areas that would negatively affect EFH's, EFH-HAPCs, CHAs, Federal critical habitat, diadromous fishes, and state and federally-listed species.

15) When developing the intake design, intake screens in rivers and streams should be constructed away from the banks and within the flowing stream. If on the bank, the face should be continuous with the adjacent bank line to ensure a smooth transition to prevent eddies around the screen and a fish bypass system that returns fish to the main channel should be incorporated. Screens should be oriented so the angle between the face of the screen and the approaching flow is not more than 45 degrees off parallel. Anticipated sweeping and approach velocities of proposed projects should be compared to the known swimming speeds of sensitive species in the project area, egg size of sensitive species should be considered when deciding on mesh size, and the vertical distribution of sensitive species should be considered when deciding on the elevation of the intake. Approach velocities must be set lower than the sustained swimming speed of sensitive species. Sweeping velocities should be greater than the approach velocities. Using a non-withdrawal period or installing removable screens with reduced mesh size during the spawning and early development periods may also be options to avoid impingement and entrainment. Where possible, locate intakes where sufficient sweeping velocity exists to minimize sediment accumulation, facilitate debris removal, and encourage fish movement away from the screen face.

16) An on-going maintenance and repair program is necessary to ensure water intake facilities are kept free from debris and that screen mesh and other components are functioning correctly. Adequate facilities need to be in place for handling floating and submerged debris large enough to damage the screen.

17) Multiple years of post-construction monitoring should be used to study impingement and entrainment rates of sensitive species, and if a bypass system is included, for monitoring mortality through the bypass. Monitoring results need to confirm that the

design criteria were met and that unexpectedly high mortality rates are not occurring. Monitoring results can then be used to improve the water intake structure, if needed.

18) Components of the natural flow regime should be altered as little as possible. Although achieving a natural hydrograph in its entirety may not be possible, restoration of some of the natural flow regime components can restore ecosystem elements that would be lost or reduced as a consequence of flow regulation.

19) For hydropower peaking projects, consider the implementation of ramping rate restrictions before and after the peaking operation and a non-peaking window during the critical reproductive and rearing periods of sensitive species.

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November 15, 2012: Flow/Energy Policies Work Group discusses updates for these policies at the November 14-15, 2012 Habitat and Environmental Protection AP Meeting (Wilson Laney, John Ellis, Alice Lawrence, Jenks Michael, Tom Jones, Emily Greene).

May 7, 2013: Flow Policy Work Group discusses updates for this policy at the May 7-8, 2013 Habitat and Environmental Protection AP Meeting (Alice Lawrence, Anne Deaton, Jenks Michael, Mark Caldwell, Tom Jones, Steve Trowell).

June 25, 2013: Correspondence related to the Savannah Harbor Expansion Project (SHEP) forwarded to Alice Lawrence for background information pertaining to dredging activities by Bill Wikoff, USFWS contact for SHEP.

June 27, 2013: Draft dredging section sent out to the SAFMC Habitat and Environmental Protection AP work group participants listed above. Comments received from Priscilla Wendt on July 2, 2013.

July 3, 2013: Correspondence related to Plant Washington, Washington County, Georgia forwarded to Alice Lawrence for background information pertaining to water withdrawal activities by Jimmy Evans, GDNR-WRD.

July 10, 2013: Draft water withdrawal section sent out to the SAFMC Habitat and Environmental Protection AP work group participants listed above. Priscilla Wendt responded that she had no further comments on July 11, 2013.

July 10, 2013: Correspondence related to current instream flow policies in FL and SC forwarded to Alice Lawrence for background information pertaining to flow alteration by Jerry Ziewitz (USFWS) and Thomas McCoy (USFWS).

July 23, 2013: Conversation with Mary Davis (SARP) regarding instream flow recommendations. Correspondence forwarded to Alice Lawrence for background information pertaining to instream flows.

July 24, 2013: Draft dam operations, methods for flow protection, and current state flow policies sent out to the SAFMC Habitat and Environmental Protection AP work group participants listed above. Priscilla Wendt provided edits (Dick Christie, SCDNR) on July 26, 2013.