August 3, 2016

NOAA National Marine Fisheries Service
Protected Resources Division
55 Great Republic Drive
Gloucester, MA 01930

Attn: Mrs. Kimberly Damon-Randall

Re: Maintenance Dredging of the Housatonic River Federal Navigation Project, Stratford and Milford, Connecticut

Dear Mrs. Damon-Randall,

This letter is to request Endangered Species Act (ESA) concurrence from your office to perform maintenance dredging of the Housatonic River Federal Navigation Project (FNP) in Stratford and Milford, Connecticut. The U.S. Army Corps of Engineers (Corps) has made the determination that the proposed activity may affect, but is not likely to adversely affect, any species listed as threatened or endangered by NMFS under the ESA of 1973, as amended. We have made the determination that the proposed activity will not result in destruction or adverse modification of the proposed Atlantic sturgeon critical habitat. Our supporting analysis is provided below.

Proposed Project

The Housatonic River Federal Navigation Project (FNP) was authorized by the River and Harbor Act of 1871 and modified by enactments in 1888, 1892, and 1930 (H. Doc. 449, 70th Cong., 2nd Sess.). The existing Federal navigation project provides for an 18-foot deep, 200-foot wide main channel from the mouth of the river to the lower end of Culvers Bar (approximately five miles distance), a 7-foot deep, 100-foot wide channel to Derby and Shelton (a total length of about 13 miles), and three jetties. The project was last maintained in 2012 when the FNP was dredged to -14 feet mean lower low water (MLLW) from the entrance to just south of the Route 1 bridge. Some areas within the Federal channel are currently shoaled to depths as shallow as -5 feet MLLW. In order to provide safe navigation, the proposed project will return the lower portion of the Housatonic River FNP to authorized dimensions.

The U.S. Army Corps of Engineers proposes to dredge up to 300,000 cubic yards (cy) of sandy material from shoal areas of the lower Housatonic River FNP below the Route 1 bridge. These shoal areas will be dredged to authorized depth (-18 feet MLLW) plus 2 feet overdepth (see Figure 1).

The shoal material will be removed with a hopper dredge or a mechanical dredge and scows, and then transported to Hammonasset Beach State Park in Madison, CT approximately 33 miles away. The material will be pumped out of the scow or hopper and placed directly on the beach (Figure 2) above mean high water, but may be pushed into the water during the grading of the beach. The

proposed dredge work will be performed over a period of approximately three to four months within the work window of October 1 through January 31 for shoal material inside of Milford Point and October 1 through February 28 for shoal areas seaward of Milford Point, the beach grading may continue into March. It is assumed that a 2,500 cy hopper or scow will be used to transport the material to Hammonasset Beach. Therfore a conservative estimate of scow/hopper vessel traffic would involve approximately 80 to 120 trips to the placement site. The dredge and placement activities have the potential to impact up to 46.9 acres of bottom habitat.

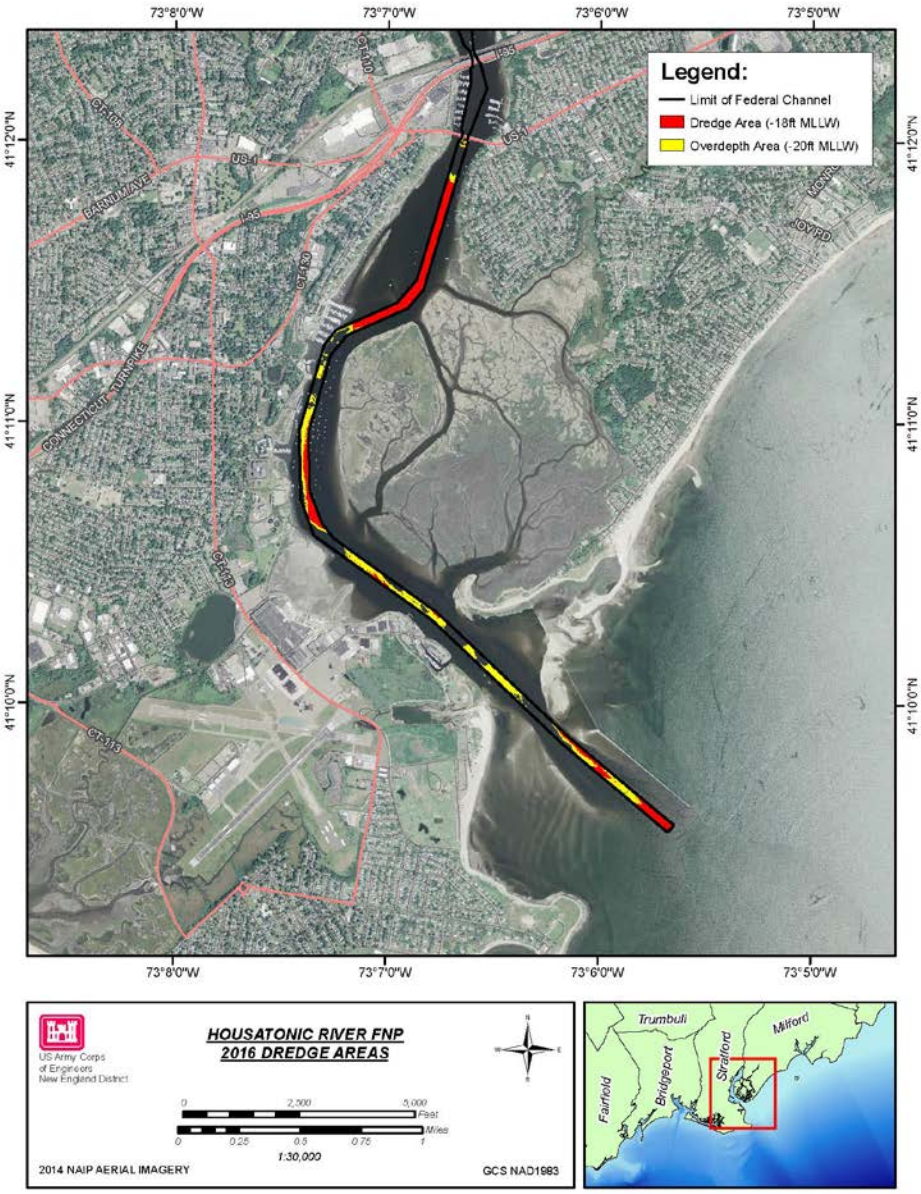

Figure 1. The lower Housatonic River Federal Navigation Project in Straford and Milford, CT showing the dredge areas.

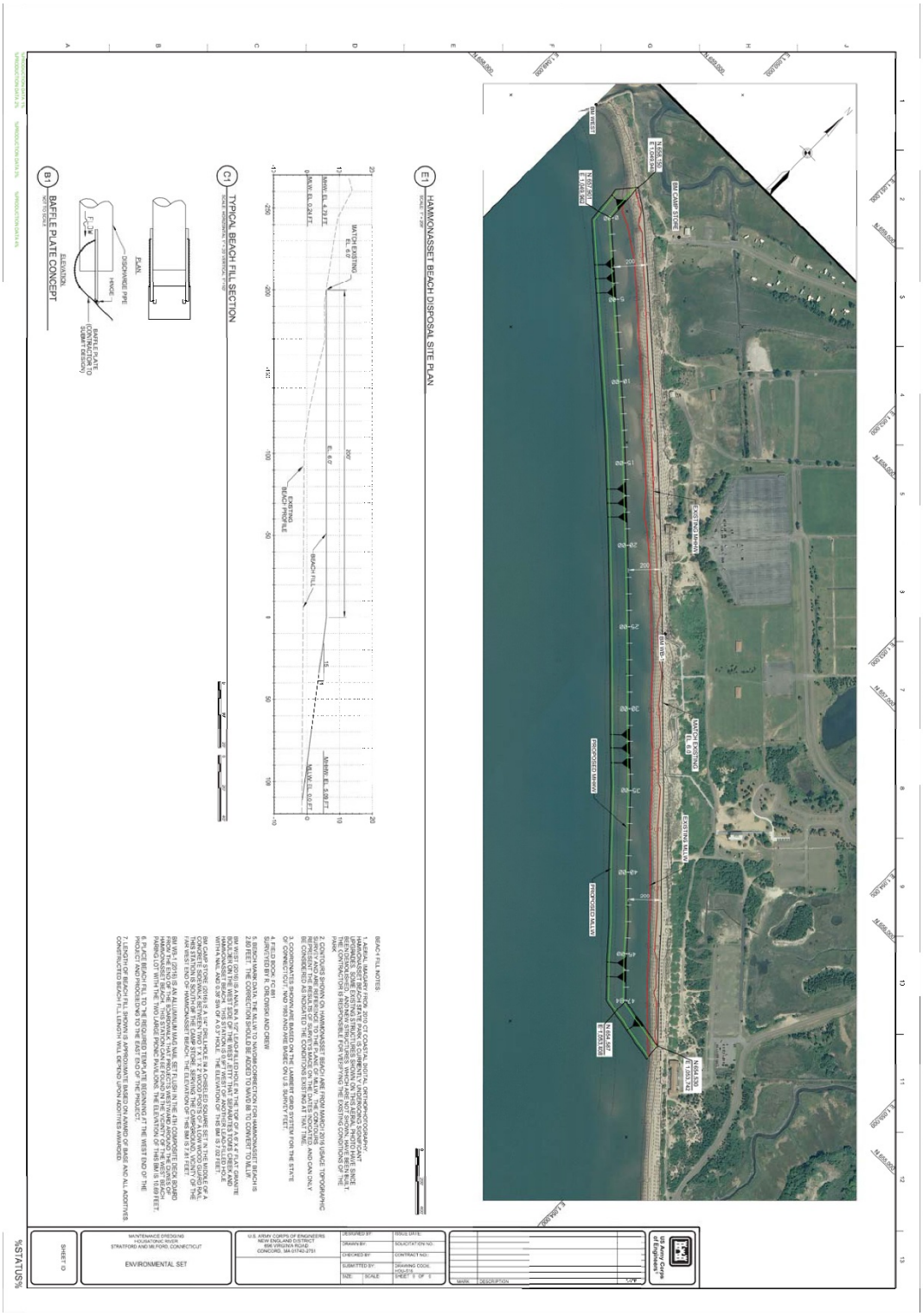

Figure 2. Dredged material placement site on Hammonasset Beach State Park.

Description of the Action Area

The action area is defined as "all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action" (50CFR§402.02). For this project, the action area consists of the proposed dredging areas within the Housatonic River FNP (approximately 3.67 miles of the lower river), the routes travelled by the hopper dredge/scows to the nearshore area adjacent to Hammonasset Beach so the material can be pumped onto the beach (approximately 33 miles away from the FNP), and all underwater areas where the effects of dredging and dredged material placement (e.g., increases in suspended sediment, loss of prey, and increased risk of vessel strikes) will be experienced.

Analyses of mechanical dredging activities using a clamshell style dredge bucket indicate that increased sediment levels at the near bottom will be fully dissipated at a distance of 2,300 feet from the dredge site if dredging silt (Bohlen *et al*., 1979). As the project sediments consist of sand the material would settle out of the water column more rapidly. We expect the sediment plume concentrations from hopper dredging operations to return to background levels within approximately 2,400 feet of the dredge (Corps, 2015). At the beach placement site elevated total suspended sediment level are expected to be limited to a narrow area of the swash zone up to 1640 feet down current from the discharge pipe (Burlas *et al*., 2001). Therefore, the action area consists of the dredge footprint, the 2,300-foot radius around each of the areas to be mechanically dredged, the 2,400-foot radius around the area to by dredged by a hopper dredge, the 1,640-foot area down current from the discharge pipe, and the routes travelled by the barges/scows from the dredge site to the placement site. These areas are expected to encompass all of the direct and indirect effects of the proposed actions.

The Housatonic River arises in northwestern Massachusetts, flows in a general southerly direction through Massachusetts and Connecticut for about 120 miles, and enters the north shore of Long Island Sound between Stratford and Milford, at about 60 miles east of New York City. The river is tidal for about 13 miles to the dam in the city of Shelton. The town of Stratford and the city of Milford respectively abuts the west and east side of the river's mouth. Farther upstream is the smaller community of Devon, a residential section of Milford. Much of Stratford's Housatonic shoreline has been developed. Historically industrial and commercial operations dominated the waterfront; several major industries remain. Newer development consists of residential and water-dependent commercial uses, including marinas. The shoreline of the river below Culvers Bar consists of either undeveloped wetlands or developed residential, boat and docking areas and a municipal airport on the lower west shore. There are marina and yacht clubs along both sides of the Housatonic River. In Stratford there are 7 marinas with a total of 714 slips available, Milford has 3 marinas and 246 slips and Shelton also has 3 marinas with 188 slips. There are 87 harbor moorings and 18 residential docks along the river. Additionally eleven commercial fishing vessels use these marinas. Commercial tugs and barges can be found on the river for repairs and marine construction. There are sand bars surrounding the channel and beaches on the shoreline as the entrance channel passes through the landcut. Although the NOAA Tides and Currents predict a velocity of 1.2 knots for the mouth of the Housatonic at 0.2 mile west of Milford Point, local knowledge describes the tidal currents at the mouth of the river as strong, averaging 2 to 4 knots (USCG BM2 West of USCG New Haven Station; and Stratford Harbormaster Ross

Hatfield), but can be as high as 6-8 knots under extreme high outgoing tides (Stratford Harbormaster Ross Hatfield). Salinity range for the lower Housatonic River (Derby Dam to the mouth of the river) has been recorded from 0 to 31 parts per thousand (Aarrestad and Jacobson, 1996). Estuarine fish such as striped bass, bluefish, flounder, tautog, black sea bass, and scup, as well as anadromous fish such as American shad, sea-run trout, alewife and blueback herring utilize the river. In general the benthic community consists of polychaetes, oligochaetes, mollusks, amphipods, isopods and nematods. *Streblasopio benedict*i an opportunistic surface deposit feeding polychaete was the most numerous species found in all samples collected by the Corps in 2004. Shellfish are plentiful within the Housatonic River estuary, especially oysters.

The proposed beach placement will be on Hammonasset Beach State Park, which consists of over 2 miles of eroding beach. Mean higher high water is at 5.0 ft. The currents are tidal and have an average velocity of less than one knot (1.85 km/hr). The beach experiences an easterly littoral drift, with erosion on the western side (average of -1.30 ft/yr from 1974-2007) and accretion on the eastern end (+0.57 ft/yr from 1974 to 2007) (Fuss & O'Neill, 2008). In the nearshore vicinity of Hammonasset Beach, the predominant current direction is toward the southeast or along the beach shoreline (Fuss & O'Neill, 2008). Benthic samples collected from the lower intertidal area contained oligochaetes, nematodes, and Opheliid polychaetes (lugworms). In the nearshore environment ostracods were the most abundant species present in all collected samples. In the sites closest to shore, amphipods and copepods were also found, while at the deeper sites gastropods were the most abundant organisms in the samples. Any fish species found in the shallows of Long Island Sound could be found off the beach area.

NMFS Listed Species and Critical Habitat in the Action Area

According to the NOAA Fisheries Section 7 website (http://www.greateratlantic.fisheries.noaa.gov/protected/section7/guidance/maps/index.html, there are three species of whales, four species of sea turtles, and two species of fish and one critical habitat area listed under the Endangered Species Act (ESA) that occur or have the potential to occur in the action area and may be adversely affected by the proposed action. ESA species and critical habitat include:

Whales – the most western limit of whales in Long Island Sound just east of the placement site.

Humpback Whale (*Megaptera novaeangliae*) - Endangered (35 FR 18319; Recovery plan: NMFS 1991)
North Atlantic Right Whale (*Eubalaena glacialis*) – Endangered (73 FR 12024; Recovery plan: NMFS 2005)
Fin Whale (*Balaenoptera physalus*) - Endangered (35 FR 18319; Recovery plan: NMFS 2010)

Sea Turtles
Kemp's Ridley Turtle (*Lepidochelys kempii*)-Endangered (35 FR 18319; Recovery plan: NMFS *et al*. 2011)

Leatherback Turtle (*Dermochelys coriacea*)-Endangered (35 FR 849; Recovery plan: NMFS & USFWS 1992)
Loggerhead Turtle (*Caretta caretta*)-Threatened (76 FR 58868; Recovery plan: NMFS & USFWS 2008)
Green Turtle (*Chelonia mydas*)-Threatened (81 FR 20057; Recovery plan: NMFS & USFWS 1991)

Fish
Atlantic Sturgeon (*Acipenser oxyrinchus oxyrinchus*)-Endangered except for GOM DPS-Threatened (77 FR 5880 and 77 FR 5914)
Shortnose Sturgeon (*Acipenser brevirostrum*) (32 FR 4001; Recovery plan: NMFS 1998)

Critical Habitat
North Atlantic Right Whale Critical Habitat – None
Proposed Atlantic Sturgeon Critical Habitat – (81 FR 35701) includes the Housatonic River below the Derby Dam.

Whales

Federally endangered North Atlantic right whales, humpback whales, and fin whales may be found seasonally in eastern Long Island Sound waters. North Atlantic right whales have been documented in the waters of this region from November – April as the whales migrate from northern foraging grounds to the southern calving grounds. Humpback whales feed during the spring, summer, and fall over a range that encompasses the entire eastern coast of the United States. Fin whales are common in waters of the United States Exclusive Economic Zone, principally offshore from Cape Hatteras northward. While these whale species are not considered residents of the Long Island Sound, it is possible that transients may be in the general area during seasonal migrations. Given the shallow water depths of the dredge and placement areas (20 ft MLLW or shallower), we do not expect whales to enter the dredging or placement areas; however, it is possible they could encounter turbidity plumes as the plumes move away from the project areas. If any whales are encountered during the project operations it would most likely be in Long Island Sound during the transit between the river and placement site.

Sea Turtles

Four species of federally listed threatened or endangered sea turtles may be seasonally found in coastal waters of New England including the action area. These species include the threatened Northwest Atlantic Ocean distinct population segment (DPS) of loggerhead and North Atlantic DPS of green, and the endangered Kemp's ridley and leatherback. Sea turtles are generally distributed in coastal Atlantic waters from Florida to New England. As water temperatures of coastal New England rise in the spring, turtles begin to migrate north from their overwintering waters in the south. Sea turtles are expected to be found in the action area during the summer and fall months (May-November) when the water temperatures are at least 59° F (Shoop and Kenney 1992) with the highest concentrations of turtles from June through October (Morreale 1999; Morreale 2003; Morreale and Standora 2005).

Atlantic Sturgeon

There are four DPSs of Atlantic sturgeon listed as endangered (New York Bight, Chesapeake Bay, Carolina, and South Atlantic) and one DPS listed as threatened (Gulf of Maine) under the ESA. The marine range for all five DPSs includes marine waters, coastal bays and estuaries from the Labrador Inlet in Labrador, Canada to Cape Canaveral, Florida. The presence of Atlantic sturgeon has been documented in the action area according to the NOAA Fisheries endangered species map. Available information on the distribution of Atlantic sturgeon indicates that a majority of the Atlantic sturgeon in the action area will be from the New York Bight (NYB) DPS with a small chance of other DPS individuals occurring in the action area (Damon-Randall *et al.* 2012).

Atlantic sturgeon are bottom feeders; diets of adult and migrant subadult Atlantic sturgeon include mollusks, gastropods, amphipods, annelids, decapods, isopods, and fish such as sand lance (Bigelow and Schroeder 1953; ASSRT 2007; Guilbard *et al.* 2007; Savoy 2007). The distribution of Atlantic sturgeon is strongly associated with prey availability. Therefore, Atlantic sturgeon may occur where suitable forage and appropriate habitat conditions are present (e.g., soft substrate with areas of submerged aquatic vegetation).

Eggs and larvae of Atlantic sturgeon are not expected in the lower estuary or marine portion of the action area, due to the high salinity, If any spawning were to occur in the the river, it will be well up-river (approximatley 9 miles) near the dam in areas of freshwater. Juvenile Atlantic sturgeon generally remain in their natal river and they would be found in the fresh-brackish waters further upstream than the project areas; therefore, no juveniles should be present in the action area as it is too saline. We do not have any estimates of the number of Atlantic sturgeon present in Long Island Sound, or the action area; however, Atlantic sturgeon have been reported as bycatch in commercial fisheries operating in adjacent waters (Damon-Randall *et al.* 2012). Minimal foraging by adult Atlantic sturgeon is expected to occur in the dredging area due to the river's frequent vessel traffic (Pers. comm., Zachary Jylkka, NMFS). Therefore, we anticipate the presence of Atlantic sturgeon in the action area to be limited to occasional transient subadults or adults.

During winter months, adult Atlantic sturgeon primarily occupy deeper water offshore; they occupy the deepest waters during winter and early spring (November–March) and shallower waters during late spring to early fall (May–September) (Dunton *et al*., 2010; Erickson *et al.* 2011). Because the species uses a variety of habitats for foraging throughout the year, we expect Atlantic sturgeon to occupy waters that are generally deeper than what is available in the action area during the winter months, but will most likely move back into shallower nearshore areas as the water temperature rises in the spring. Adult and subadult Atlantic sturgeon are known to overwinter outside of their natal rivers and a limited number of adult and subadult Atlantic sturgeon could be present foraging in the harbor during winter months. Based on habitat conditions in the action area, we do not anticipate Atlantic sturgeon to overwinter (November-March) in the project area. Therefore, we expect the presence of transient Atlantic sturgeon in the action area to be greater in April–November.

Shortnose Sturgeon

Shortnose sturgeon occur in rivers and estuaries along the east coast of the U.S. and Canada (SSSRT 2010). There are 19 documented populations of shortnose sturgeon, with the population closest to the Housatonic River occurring about 40 miles north in the Connecticut River or to south in the Hudson River. The Housatonic River itself is listed as historic habitat for shortnose sturgeon.

Little information is available about the current use of waters between the Connecticut and Hudson Rivers, including the action area, by shortnose sturgeon. Adults tagged in the Hudson River have migrated to the Connecticut River (SSSRT, 2010). At this time, the available tagging and tracking information is too limited to determine if Hudson and Connecticut River shortnose sturgeon are making regular movements outside of their natal rivers. The genetic differentiation between these populations is thought to be a reflection of the rarity of these types of movements. However, the movement of a shortnose sturgeon from the Hudson River to the Connecticut River, indicate that occasional transient adult shortnose sturgeon moving between the Hudson and Connecticut Rivers could pass through the action area from May through November. Spawning and early life stages of the shortnose sturgeon only occur in freshwater habitats. Therefore, no life stages besides salinity tolerant adults will occur in the action area.

Proposed Atlantic Sturgeon Critical Habitat

The proposed dredge area and its associated action area is located within proposed Atlantic sturgeon critical habitat. Critical habitat is defined by section 3 of the ESA as "(1) the specific areas within the geographical area occupied by the species, at the time it is listed, on which are found those physical or biological features (a) essential to the conservation of the species and (b) which may require special management considerations or protection; and (2) specific areas outside the geographical area occupied by the species at the time it is listed, upon a determination by the Secretary that such areas are essential for the conservation of the species (NOAA 2016)."

According to the proposed rule for Atlantic sturgeon critical habitat, there are four physical features essential for reproduction and recruitment. These include hard bottom substrate (*e.g.,* rock, cobble, gravel, limestone, boulder, etc.) in low salinity waters (*i.e.,* 0.0 to 0.5 parts per thousand range) for settlement of fertilized eggs, refuge, growth, and development of early life stages; aquatic habitat with a gradual downstream salinity gradient of 0.5 to 30 parts per thousand and soft substrate (*e.g.,* sand, mud) downstream of spawning sites for juvenile foraging and physiological development; water of appropriate depth and absent physical barriers to passage (*e.g.,* locks, dams, reservoirs, gear, etc.) between the river mouth and spawning sites necessary to support: (1) Unimpeded movement of adults to and from spawning sites; (2) seasonal and physiologically dependent movement of juvenile Atlantic sturgeon to appropriate salinity zones within the river estuary; and (3) staging, resting, or holding of subadults or spawning condition adults. Water depths in main river channels must also be deep enough (*e.g.,* ≥1.2 m) to ensure continuous flow in the main channel at all times when any sturgeon life stage would be in the river; and water, especially in the bottom meter of the water column, with the temperature, salinity, and oxygen values that, combined, support: (1) Spawning; (2) annual and

interannual adult, subadult, larval, and juvenile survival; and (3) larval, juvenile, and subadult growth, development, and recruitment (*e.g.*, 13 °C to 26 °C for spawning habitat and no more than 30° C for juvenile rearing habitat, and 6 mg/L dissolved oxygen for juvenile rearing habitat).

While the dredge area is within the proposed critical habitat, the dredging will occur in the lower three miles of the river near the mouth where the salinity of the bottom waters is at the upper end of the salinity range found within the river (0-31 ppt). The bottom sediments are sand and will remain sand upon completion of the dredging activities. Although the project extends over approximately 3 miles, there are three main areas where the dredging would occur. Forage items will be temporarily removed from the dredge areas, but similar prey would be available in adjacent areas. The proposed project will not adversely impact any of the physical features essential for reproductionas they are further upstream, beyond the action area, and access to these areas would not be blocked. At most there may be a temporary impact to foraging habitat for older juveniles and adults.

Effects Determination

Mechanical Dredging

Entrapment

Mechanical dredging entails lowering the open bucket or clamshell through the water column, closing the bucket after impact on the bottom, lifting the bucket up through the water column, and emptying the bucket into a barge. The bucket operates without suction or hydraulic intake, moves relatively slowly through the water column and impacts only a small area of the aquatic bottom at any time. In order to be captured in a dredge bucket, an animal must be on the bottom directly below the dredge bucket as it impacts the substrate and remain stationary as the bucket closes. Species captured in dredge buckets can be injured or killed if entrapped in the bucket or buried in sediment during dredging and/or when sediment is deposited into the dredge scow. Species captured and emptied out of the bucket can suffer stress or injury, which can lead to mortality. As a mechanical dredge is not typically present in the river, the analyses below all refer to effects when added to baseline conditions.

Whales

Due to the shallow depths, we do not expect whales to be in the area where dredging or placement will occur. Therefore, no impacts to whales are expected from a mechanical dredge.

Sea Turtles

Sea turtles are not known to be vulnerable to entrainment in mechanical dredges, presumably because they are able to avoid the dredge bucket. Thus, if a sea turtle were to be present at the dredge site, it would be extremely unlikely to be injured or killed as a result of dredging operations carried out by a mechanical dredge. Based on this information, effects to sea turtles from the mechanical dredge are discountable.

Sturgeon
In 2012, the Corps provided NMFS with a list of all documented interactions between dredges and sturgeon reported along the U.S. East Coast; reports dated as far back as 1990 (Corps, 2012). This list included four incidents of sturgeon captured in dredge buckets. These include the capture of a decomposed Atlantic sturgeon in Wilmington Harbor in 2001. The condition of this fish indicated it was not killed during the dredging operation and was likely dead on the bottom or in the water column and merely scooped up by the dredge bucket. Another record was of the capture of an Atlantic sturgeon in Wilmington Harbor in 1998; however, this record is not verified and not considered reliable. The report also listed the live capture of an Atlantic sturgeon at the Bath Iron Works (BIW) facility in the Kennebec River, Maine in 2001 as well as a shortnose sturgeon captured at BIW in 2003 that was observed to have suffered death recently at the time of capture. One report of a live shortnose sturgeon captured in a dredge bucket at BIW in 2009 was not included in the report. Observer coverage at dredging operations at the BIW facility has been 100% for approximately 15 years, with dredging occurring every one to two years. Hundreds of mechanical dredging projects occur along the U.S. Atlantic coast each year and we are not aware of any other captures of sturgeon in mechanical dredges anywhere in the U.S prior to or after 2012.

The risk of interactions between sturgeon and mechanical dredges is thought to be highest in areas where large numbers of sturgeon are known to aggregate. The risk of capture may also be related to the behavior of the sturgeon in the area. While foraging, sturgeon are at the bottom of the river interacting with the sediment. This behavior may increase the susceptibility of capture with a dredge bucket. We also expect the risk of capture to be higher in areas where sturgeon are overwintering in dense aggregations as overwintering sturgeon may be less responsive to stimuli which could reduce the potential for a sturgeon to avoid an oncoming dredge bucket.

Based on all available evidence, the risk of sturgeon being captured in a mechanical dredge is low. The risk is further reduced because the action area is not known to support high densities of sturgeon; the areas to be dredged are not used for overwintering; and, the lack of benthic resources suggest that foraging in the areas to be dredged will be limited to occasional opportunistic events. Based on these factors, it is extremely unlikely that any sturgeon will be captured, injured or killed during mechanical dredging activities. Therefore, any effects of entrapment from the proposed dredging activities on sturgeon are discountable.

Hopper Dredging

Impingement/Entrainment

With the use of a hopper dredge, dredged material is raised by dredge pumps through dragarms connected to dragheads in contact with the channel bottom and discharged into hoppers built in the vessel. Hopper dredges are equipped with large centrifugal pumps similar to those employed by other hydraulic dredges. Suction pipes (dragarms) are hinged on each side of the vessel with the intake (drag) extending downward toward the stern of the vessel. The draghead is moved along the bottom as the vessel moves forward at speeds up to three knots. The dredged material

is sucked up the pipe and deposited and stored in the hoppers of the vessel. As a hopper dredge is not typically present in the river the analyses below all refer to effects when added to baseline conditions.

Most sea turtles and sturgeon are able to escape from the oncoming draghead due to the slow speed that the draghead advances (up to 3 mph or 4.4 feet/second). Interactions with a hopper dredge result primarily from crushing when the draghead is placed on the bottom, or when an animal is unable to escape from the suction of the dredge and becomes stuck on the draghead (i.e., impingement). Entrainment occurs when organisms are sucked through the draghead into the hopper. Mortality most often occurs when animals are sucked into the dredge draghead, pumped through the intake pipe and then killed as they cycle through the centrifugal pump and into the hopper.

Interactions with the draghead can also occur if the suction is turned on while the draghead is in the water column (i.e., not seated on the bottom). The Corps implements procedures to minimize the operation of suction when the draghead is not properly seated on the bottom sediments which reduces the risk of these types of interactions.

Whales
Due to the shallow depths, we do not expect whales to be in the area where dredging will occur.

Sea Turtles
Sea turtles are vulnerable to impingement and entrainment in hopper dredges. Sea turtles are typically present from June through October in Long Island Sound and no dredging would occur during the summer months when the sea turtles are most likely to be present in the action area. Dredging may start when the sea turtles are beginning to leave the Long Island Sound (overlap during the month of October), but it is unlikely that any sea turtles will be foraging within the Housatoanic River navigational channel. Therefore, it is unlikely that any sea turtles will be impinged or entrained in the hopper dredge.

Sturgeon
Sturgeon are vulnerable to interactions with hopper dredges. The risk of interactions is related to both the amount of time sturgeon spend on the bottom and the behavior the fish are engaged in (i.e., whether the fish are overwintering, foraging, resting or migrating), as well as the intake velocity and swimming abilities of sturgeon in the area (Clarke, 2011). Intake velocities at a typical large self-propelled hopper dredge are 11 feet per second. Exposure to the suction of the draghead intake is minimized by not turning on the suction until the draghead is properly seated on the bottom sediments and by maintaining contact between the draghead and the bottom.

In general, entrainment of large mobile animals, such as the sturgeon, is relatively rare. Several factors are thought to contribute to the likelihood of entrainment. One factor influencing potential entrainment is the swimming stamina and size of the individual fish at risk (Boysen and Hoover 2009). Swimming stamina is positively correlated with total fish length. Entrainment of larger sturgeon, such as the subadults and adults that may occur in the action area, is less likely due to the increased swimming performance by the fish. The estimated minimum size for sturgeon that out-migrate from their natal river is approximately 30-36 inches (Murawski and

Pacheco, 1977; ASSRT, 2007); therefore, that is the minimum size of sturgeon anticipated in the action area.

In areas where animals are present in high density, the risk of an interaction is greater because more animals are exposed to the potential for entrainment. The hopper dredge draghead operates on the bottom and is typically at least partially buried in the sediment. Sturgeon are benthic feeders and are often found at or near the bottom while foraging or while moving within rivers. Sturgeon at or near the bottom could be vulnerable to entrainment if they were unable to swim away from the draghead. Information suggests that Atlantic sturgeon migrating in the marine environment do not move along the bottom, but move further up in the water column (Sarah Cameron, submission of comments on 75 FR 61872, 2011 in letter from NMFS for Duxbury Harbor September 9, 2011).

Furthermore, hydraulic pumps will only be turned on once the draghead is on the bottom and in contact with the sediments, thereby, directing and maintaining the suction velocity to the bottom, and thus, within an area where sturgeon are not expected to occur. We expect the occurrence of sturgeon in the area to be limited to rare transients. Given the precautionary measures ensuring that suction of the draghead is only on when in contact with the bottom, an interaction of a sturgeon with a hopper dredge in the action area is extremely unlikely. Therefore, effects of impingement or entrainment on sturgeon are unlikely.

Sediment Plume from Dredging and Placement Activities

In the vicinity of hopper dredge operations, a near-bottom turbidity plume of resuspended bottom material may extend 2,400 feet down current from the dredge (Corps, 2015). In the immediate vicinity of the dredge, a well-defined upper plume is generated when water overflows the hoppers. Approximately 1,000 feet behind the dredge, the two plumes merge into a single plume (Corps, 2015). Suspended solid concentrations may be as high as several tens of parts per thousand (ppt; grams per liter) near the discharge port and as high as a few parts per thousand near the draghead. In a study done by Anchor Environmental (2003), nearfield concentrations ranged from 80.0-475.0 mg/l. Turbidity levels in the near-surface plume appear to decrease exponentially with increasing distance from the dredge due to settling and dispersion, quickly reaching concentrations less than one ppt. Studies also indicate that in almost all cases, the vast majority of resuspended sediments resettle close to the dredge within one hour, and only a small fraction takes longer to resettle (Anchor Environmental 2003).

Mechanical dredging will disturb sediments and cause a temporary increase in suspended sediment within the action area. Resuspended sediment is expected to settle out of the water column within a few hours. Information on suspended sediment plumes associated with mechanical clamshell dredges indicate that the concentration of suspended sediments will be highest close to the bottom (445 mg/l) and will decrease rapidly higher in the water column (105 mg/l midwater) and further from the dredge site (ACOE, 2001. A study by Burton (1993) measured turbidity levels at 500, 1000, 2000, and 3300 feet from the dredge site. Based on these analyses, elevated suspended sediment levels of up to 445 mg/l may be present in the immediate vicinity of the clamshell bucket, and suspended sediment levels of up to 191 mg/l could be

present within a 2,000 foot radius from the location of the clamshell dredge. The material to be dredged is sand, therefore increased levels of suspended sediments are expected to be confined to the vicinity of the dredge and to rapidly settle out of the water column.

Wilber *et al*. (2006) reported that elevated total suspended sediment (TSS) concentrations associated with the active beach nourishment site were limited to within 1,312 feet of the discharge pipe in the swash zone (defined as the area of the nearshore that is intermittently covered and uncovered by waves), while other studies found that the turbidity plume and elevated total suspended sediment levels are expected to be limited to a narrow area of the swash zone up to 1312 feet down current from the discharge pipe (Wilber *et al*., 2006). Based on this and the best available information, turbidity levels created by the beach fill operations along the shoreline are expected to be between 34.0-64.0 mg/l; limited to an area approximately 1,312 feet down current from the discharge pipe; and are expected to be short term, only lasting several hours.

Overall, water quality impacts from dredging and placement are anticipated to be minor and temporary in nature. The total suspended solids (TSS) within the water column naturally vary based on season, winds, and storm events. Once dredging and placement operations are complete, the project area is expected to return to ambient conditions within an hour due to the large grain size of the dredged material (sand) (Clarke *et al*., draft).

Whales

No information is available on the effects of total suspended solids (TSS) on whales. TSS is most likely to affect whales if a plume causes a barrier to normal behaviors or displaces prey. The conditions conducive to concentrating whale prey species do not occur in LIS and therefore would not be affected by elevated turbidity; the effects are therefore discountable. Whales in the action area during project operations may avoid interacting with a sediment plume by swimming around it. However, if whales do interact with the plume, the TSS levels are below those shown to have an adverse effect on fish (Burton, 1993), so it is reasonable to assume that these levels would also be below those that would cause adverse effects to whales. Based on this information, the effects of suspended sediment resulting from dredging activities on whales are extremely unlikely; therefore, effects to whales from turbidity related to dredging activities are discountable.

Sea Turtles

No information is available on the effects of TSS on juvenile and adult sea turtles; however, elevated TSS levels could affect sea turtles if a plume causes a barrier to normal behaviors. As sea turtles are highly mobile, they will be able to avoid any sediment plume they encounter with minor movements to alter their course away from the sediment plume. Thus, any effect on sea turtle movements is likely to be immeasurable and therefore insignificant.

Sturgeon

The life stages of sturgeon most vulnerable to increased sediment are eggs and non-mobile larvae which are subject to burial and suffocation. As noted above, no sturgeon eggs and/or larvae will be present in the action area. Sturgeon in the action area during dredging may avoid a sediment plume by swimming around it. However, if sturgeon do interact with the plume, expected TSS

levels (up to 475.0 mg/l) are below those shown to have an adverse effect on fish (580.0 mgl for the most sensitive species, with 1,000.0 mg/l more typical (Burton 1993)).

Turbidity studies conducted during dredging projects provide values above baseline conditions; when these values are added to general baseline conditions (e.g., 2 to 15 mg/l, Boston Harbor (Battelle, 2009)) they are still within acceptable levels. Dredging related suspended sediments or turbidity plumes may differ in scope, timing, duration, and intensity from natural conditions (Clarke and Wilber, 2000). Major storms can displace larger amounts of sediments than dredging operations, and tend to occur one to three times a year. Natural disturbances are more frequent than most dredging operations at a particular area and dredging affects much smaller areas (i.e. a localization of impacts) than these major storms (Wilber and Clarke, 2001). Also, the proposed dredging will occur in fall/winter before the spring melt when there are increases in the amount of freshwater running downstream causing turbid conditions. Based on this information, the effects of suspended sediment resulting from dredging activities on sturgeon are not capable of being meaningfully measured, evaluated or detected; therefore, effects to sturgeon from turbidity related to dredging activities are insignficant.

Habitat modification

Effects to listed species can be caused by disturbance to the sea floor that reduces the availability of prey species or alters the composition of forage. Mechanical and hopper dredging, as well as beach placement, can affect future use of the action area by sea turtles and sturgeon by reducing prey species (such as worms, mollusks, and crustaceans) through the alteration of the existing biotic assemblages. The dredge and placement activities have the potential to impact up to 46.9 acres of bottom habitat. Any prey targeted by whales in the action area would be pelagic and highly mobile, and therefore would not be impacted by dredging interactions. Green sea turtles forage on sea grasses and no sea grasses will suffer adverse effects from dredging or placement. Leatherback sea turtles feed on jellyfish. As jellyfish are pelagic species and not vulnerable to interactions with the dredge, there is not likely to be a reduction in the forage base for leatherbacks. Kemp's ridley and loggerhead sea turtles typically feed on crabs, other crustaceans and mollusks. Some of the prey species targeted by turtles and sturgeon, including crabs, are mobile; therefore, some individuals are likely to avoid the dredge and sand placement, but sessile infauna would be impacted.

Studies reviewed by Wilbur and Clarke (2007) demonstrate that benthic communities in temperate regions occupying shallow waters with a combination of sand, silt, or clay substrate reported recovery times between 1-11 months after dredging. Thus, we expect the benthic community within the project area to recover in less than one year, and no permanent removal of potential forage organisms from the area. Some species of benthic invertebrates that sturgeon and turtles feed on have limited mobility and could be temporarily buried during disposal operations. Some buried animals will be able to migrate upward through the sediment and reestablish themselves. The surrounding areas where dredged material will be placed are expected to be recolonized by individuals from similar habitats nearby.

While there is likely to be some temporary reduction in the amount of prey in the dredge and placement areas, the action will result in the loss of only a small portion of the available forage

in Long Island Sound. Therefore, sturgeon and sea turtles opportunistically foraging in the action area will be able to forage in other areas of the Sound, where benthic communities have not been removed or buried. As a result, effects on habitat modification from dredging and placement when added to typical baseline conditions will be too small to be meaningfully measured or detected, and are therefore insignificant.

Vessel Traffic

Collision with vessels is a source of anthropogenic mortality for sea turtles, Atlantic sturgeon, and whales. The proposed project requires the use of a hopper dredge or tug and scow to transit to the placement site (80-120 trips), and will therefore lead to a temporary increase in vessel traffic.

Whales
Large whales, particularly right whales, are vulnerable to injury and mortality from ship strikes. Ship strike injuries to whales take two forms: (1) propeller wounds characterized by external gashes or severed tail stocks; and (2) blunt trauma injuries indicated by fractured skulls, jaws, and vertebrae, and massive bruises that sometimes lack external expression (Laist *et al.*, 2001). Collisions with smaller vessels may result in propeller wounds or no apparent injury, depending on the severity of the incident. Laist *et al.* (2001) reports that of 41 ship strike accounts that reported vessel speed, no lethal or severe injuries occurred at speeds below 10 knots, and no collisions have been reported for vessels traveling less than 6 knots. Most ship strikes, however, have occurred at vessel speeds of 13-15 knots or greater (Jensen and Silber 2004; Laist *et al.* 2001). An analysis by Vanderlaan and Taggart (2007) showed that at speeds greater than 15 knots, the probability of a ship strike resulting in death increases asymptotically to 100%. At speeds below 11.8 knots, the probability decreases to less than 50%, and at 10 knots or less, the probability is further reduced to approximately 30%. We do not expect the speed of the hopper dredge or tug and scows to exceed 10 knots while transiting to and from the placement site (3 knots while dredging), making vessel strikes unlikely. Based on this information, an interaction between the dredge or scow and a listed species of whale is extremely unlikely.

Sea Turtles
Interactions between vessels and sea turtles can result in injury or death. Most vessel interactions result from contact between sea turtles and boat propellers. Information is lacking on the type or speed of vessels involved in turtle vessel strikes. However, there does appear to be a correlation between the number of vessel struck turtles and the level of recreational boat traffic (NRC 1990). Dredge vessels and scows have relatively shallow drafts and travel at slow speeds (i.e., less than 3 knots while dredging, less than 10 knots at any other time). While sea turtles occur at the water's surface and are therefore susceptible to interactions with shallow-draft vessels, sea turtles are highly mobile and have ample space and time to avoid any interaction with a project vessel. Therefore, effects of vessel traffic on sea turtles are extremely unlikely.

Sturgeon
When this project is completed, it will not result in an increased number of vessels in the action area, and thus, there is no increased risk of vessel strike in the future. We have also considered

the likelihood that an increase in vessel traffic related to the activities associated with the proposed project would generally increase the risk of interactions between sturgeon and vessels in the action area**,** in addition to baseline conditions. The use of a dredge or scow and tug will cause a small, localized, temporary increase in vessel traffic. Given the extremely small increase in vessel traffic above existing levels in the Housatonic River and Long Island Sound, there will be no measurable or detectable increase in the risk of vessel strike, and effects to sturgeon are insignificant.

Based on this information, we believe the effects of vessel traffic on sea turtles, whales, and sturgeon from the proposed project are insignificant and discountable.

Proposed Atlantic Sturgeon Critical Habitat

As mentioned above the dredge area is within proposed critical habiat for atlantic sturgeons. Dredging will not affect potential spawning habitat, i.e., hard bottom substrate in low salinity waters that would be found further upstream outside the influence of any dredging related impacts. Also, dredging would not affect the salinity gradient found within the river or modify the type of bottom sediments (sand). Dredging could have potential environmental effects including increased turbidity and disturbance of benthic communities, specifically the removal of benthic habitat and communities that could provide forage for subadult and adult Atlantic sturgeon found in the higher salinity waters near the mouth of the river. Any reduction in benthic prey items would be temporary with recolonization from seasonal and local recruitment occurring within months. Also similar benthic habitat occurs in areas adjacent to the dredge areas, therefore, any impacts to proposed critical habitat due to the maintenance dredging of the lower Housatonic River FNP would be temporary, minor and insignificant.

Conclusions

Based on the analysis that all effects of the proposed action when added to baseline conditions will be insignificant and/or discountable, we have determined that the proposed project is not likely to adversely affect any listed species under NMFS' jurisdiction. We have made the determination that the proposed activity will not result in the destruction or adverse modification of proposed critical habitat for Atlantic sturgeon and therefore, no conference is necessary. The Corps used the best scientific and commercial data available to complete this analysis. We request your concurrence with this determination.

Please feel free to contact myself at (978) 318-8288 (jack.karalius@usace.army.mil) or Dr. Valerie Cappola, the Environmental Resources Team Member at (978) 318-8067 (valerie.a.cappola@usace.army.mil) if you have any questions or require additional information.

Sincerely,

KARALIUS.JACK.A.1228844930

Digitally signed by KARALIUS.JACK.A.1228844930
DN: c=US, o=U.S. Government, ou=DoD, ou=PKI, ou=USA, cn=KARALIUS.JACK.A.1228844930
Date: 2016.08.04 09:33:05 -04'00'

Jack Karalius
Project Manager

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