Draft
ENVIRONMENTAL ASSESSMENT
NEW JERSEY INTRACOASTAL WATERWAY
BENEFICIAL USE OF DREDGED MATERIAL AT EAST POOL- EDWIN B FORSYTHE NATIONAL WILDLIFE REFUGE

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1.1 New Jersey Intracoastal Waterway

The New Jersey Intracoastal Waterway (NJIWW) project was adopted in 1939 (HD 76-133, 1st session). This sea-level inland waterway extends along the New Jersey Coast from the Atlantic Ocean at Manasquan Inlet, about 26 miles south of Sandy Hook, New Jersey to Delaware Bay about three miles north of Cape May Point (Figure 1). The waterway extends through the inlet and up the Manasquan River about two miles and thence through the Point Pleasant Canal about two miles to the head of Barnegat Bay. It then passes through a series of bays, lagoons and thoroughfares along the New Jersey Coast to Cape May Harbor and thence across Cape May County to Delaware Bay (Cape May Canal). This project is normally maintained to a depth of six feet Mean Low Water (MLW), except in the southern portion in the vicinity of the Cape May Canal where it is maintained to a depth of up to 12 feet MLW. The total NJIWW project length is 117 miles.

The NJIWW provides a safe, reliable, and operational navigation channel for the East Coast's largest and 5th most valuable commercial fishing fleet in the U.S. (Cape May/Wildwood) and nine U.S. Coast Guard (USCG) Stations including the USCG Training Center Cape May. The USCG requires a reliable channel to fulfill their Homeland Security requirements and conduct search and rescue operations. Other commercial users include head-boats and tour-boats that operate over various portions of the waterway. The Delaware River and Bay Authority operates a ferry service between Cape May, New Jersey and Lewes, Delaware and the ferries dock in the Cape May Canal. Almost 1.5 million passengers are dependent on maintenance dredging to keep their four vessels operating. The southern New Jersey economy is heavily dependent on recreational and commercial fishing and tourism, and these industries rely on the maintained channels of the NJIWW.

1.2 Edwin B. Forsythe National Wildlife Refuge

1.2.1 Establishing and Acquisition Authorities

Edwin B. Forsythe National Wildlife Refuge (EBFNWR) was created on May 22, 1984, by combining the former Brigantine and Barnegat NWRs (98 Stat. 207) and is managed by the U.S. Fish and Wildlife Service (Service).

The Brigantine NWR was established on January 24, 1939, by the Migratory Bird Conservation Commission, under the authority of the Migratory Bird Conservation Act of 1929 (16 U.S.C. § 715d) as amended, to preserve estuarine habitats important to the

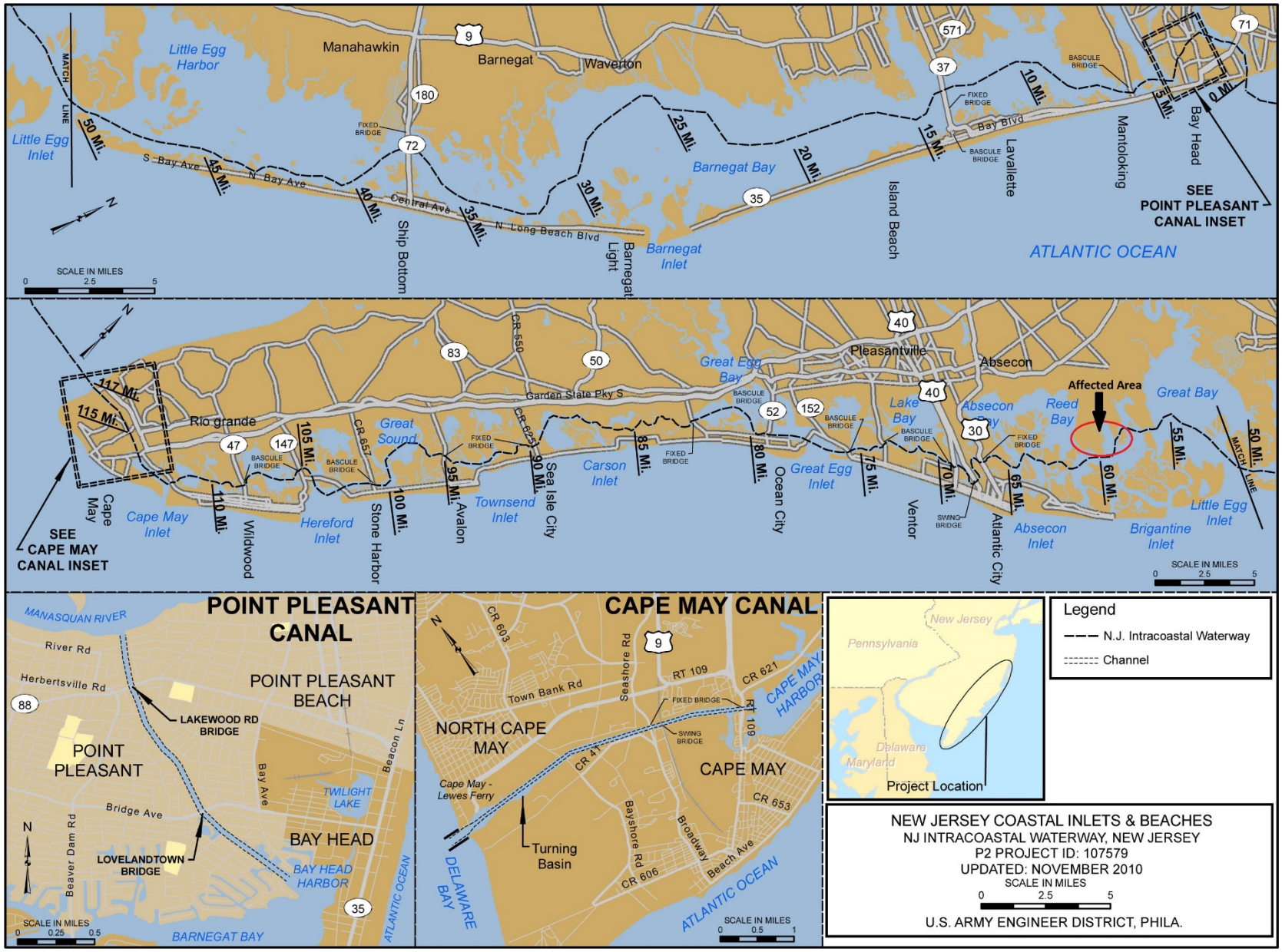

Figure 1. New Jersey Intracoastal Waterway

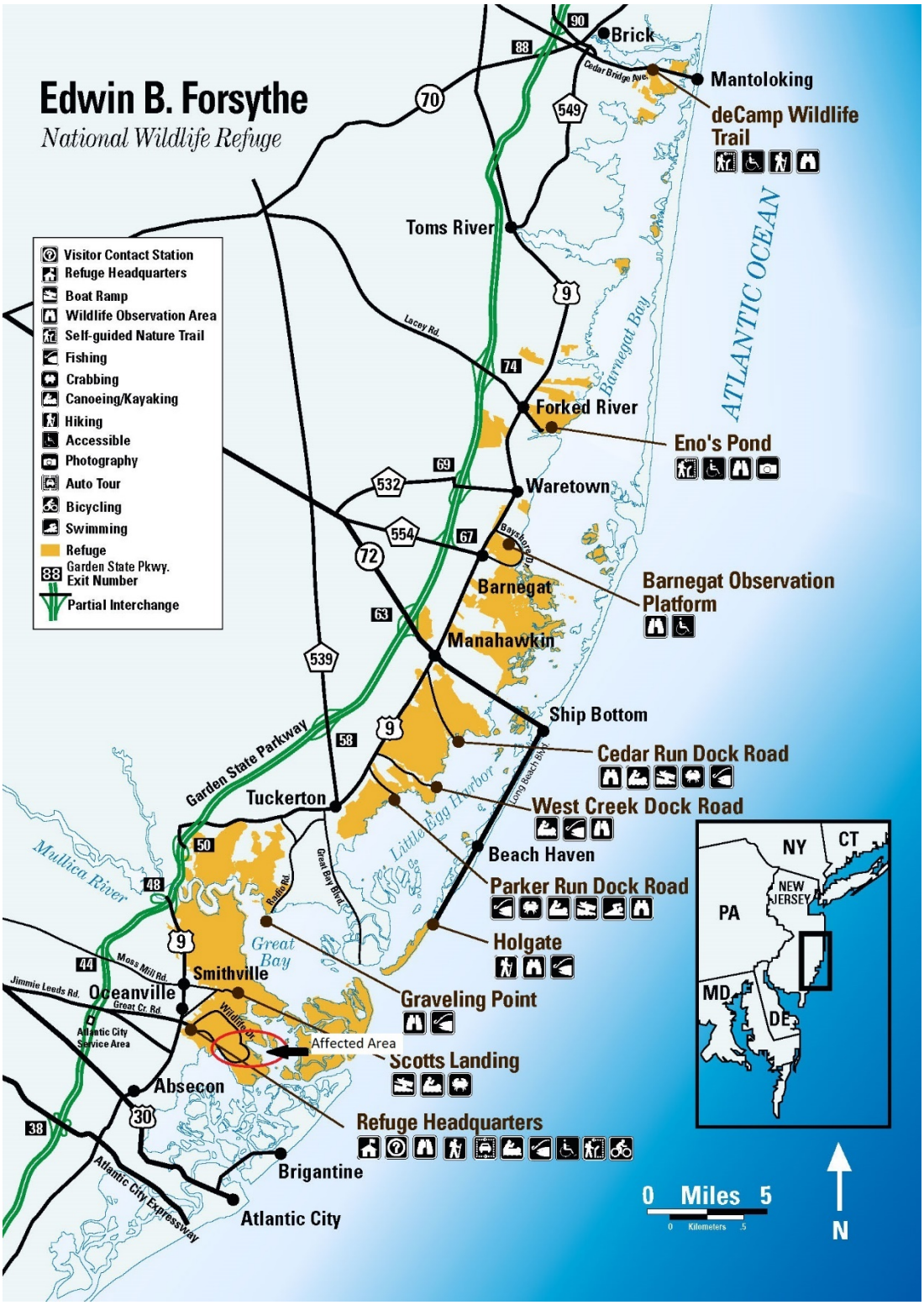

Figure 2. Edwin B. Forsythe National Wildlife Refuge Vicinity Map (Source USFWS Brochure accessed at https://www.fws.gov/uploadedFiles/Region_5/NWRS/North_Zone/Edwin_B_Forsythe/ForsytheBrochure.pdf on 10/25/2020.)

Atlantic brant (*Branta bernicla*) and to provide habitat for the American black duck (*Anas rubripes*) and rails (*Rallidae*).

The Barnegat NWR was established on June 21, 1967, under the authority of the Migratory Bird Conservation Act (16 U.S.C. § 715d) to preserve estuarine feeding and resting habitat for ducks and brant.

The Reedy Creek Unit of refuge was established in 1991, under authority of the Emergency Wetlands Resources Act of 1968 (16 U.S.C. 3901 (b) 100 Stat.3583).

1.2.2 Refuge Purposes

The refuge spans almost 50 miles of the New Jersey coastal estuaries, from the Metedeconk River in Ocean County to Reeds Bay in Atlantic County (Figure 2). Over 48,000 acres of coastal beach/dune, salt marsh, freshwater wetlands, wetland forest, upland forest, pitch pine barrens, early successional habitats, and managed wetland impoundments comprise the refuge. The refuge is listed as a Wetlands of International Significance under the Ramsar Convention on Wetlands. The refuge's approved acquisition boundary encompasses 60,082 acres. The refuge receives approximately 250,000 visitors each year.

For lands acquired under the Migratory Bird Conservation Act as amended, "...for use as an inviolate sanctuary, or for any other management purpose, for migratory birds." (16 U.S.C. § 715d).

For lands acquired under the Fish and Wildlife Act of 1956 (16 U.S.C. § 742(a)-754) as amended, "...for the development, advancement, management, conservation, and protection of fish and wildlife resources..." (16 U.S.C. § 742 (a)(4)) "...for the benefit of the United States Fish and Wildlife Service, in performing its activities and services. Such acceptance may be subject to the terms of any restrictive or affirmative covenant, or condition of servitude..." (16 U.S.C. § 742f(b)(1)).

For lands acquired under the Emergency Wetlands Resources Act of 1986 (16 U.S.C. § 3901(b)) as amended, "...the conservation of the wetlands of the Nation in order to maintain the public benefits they provide and to help fulfill international obligations contained in various migratory bird treaties and conventions..." (16 U.S.C. § 3901(b)).

For lands designated as parts of the National Wilderness Preservation System under Public Law 93-632 (88 Stat. 2154) in accordance with the Wilderness Act of 1964 (16 U.S.C. § 1131) as amended, "...to secure for the American people of the present and future generations the benefits of an enduring resource of wilderness." (16 U.S.C. § 1131(a)).

1.2.3 National Wildlife Refuge System Mission

The mission of the National Wildlife Refuge System is "…to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans." — National Wildlife Refuge System Improvement Act of 1997, as amended (Public Law 105-57 (111 Stat. 1254).

2.0 Purpose and Need for Action

The proposed action addresses two main critical needs: 1) Maintain safe navigation within the NJIWW Federal Navigation Channel; and 2) Restore critical salt marsh habitats within the East Pool of EBFNWR.

The NJIWW Federal Navigation Project experiences frequent shoaling between channel markers 152 (Hammock Cove/Shad Island) and 160 (Perch Cove/Little Bay) (Figure 3). This reach of the navigation channel occurs within a larger reach (markers 145 to 163) that was designated in 2019 as a "Priority 1" (for maintenance) by the USCG, and is described by the USCG as "narrowing and impassable to all but the smallest vessels at any tide." The reach between markers 152 and 160 requires maintenance dredging every 3 to 4 years to maintain the authorized channel dimensions of 100 ft. wide and -6.0 ft. mean lower low water (MLLW) deep. However, this channel reach has not been maintained since 2010 due to the lack of a placement area for dredged materials. Based on the most recent channel surveys, maintenance of the channel would require dredging to remove approximately 10,000 cubic yards of sands, silts, and clays. Disposal of dredged material within this stretch has historically occurred at the Shad Island Confined Disposal Facility (CDF). Because this CDF occurs within the bounds of the EBFNWR, a special use permit (SUP) from USFWS is required. The most recent use of this area was in 2010 under a SUP that expired in 2012. Subsequently, the USFWS has informed the USACE that a new SUP would not likely be issued due to the incompatibility of this activity with the mission of a National Wildlife Refuge. Therefore, a critical need for a new method and location of dredged material placement has arisen to accomplish the need for maintaining the NJIWW within this reach. Beneficial use of the NJIWW material to prevent further loss of eroding habitats is an optimum regional sediment management solution for the issues in the NJIWW.

Saltwater marshes on the New Jersey coastline have been disappearing over the past hundred years due to factors such as sea level rise, low accretion rates, and high rates of anthropogenic erosion. As sea levels continue to rise and storms become more frequent and intense, salt marshes that cannot keep pace with sea level rise will ultimately be lost along with the ecosystem services they provide to coastal communities and the coastal economy. Furthermore, salt marshes provide habitat for economically and ecologically important fish, crabs, and shellfish; nesting and foraging

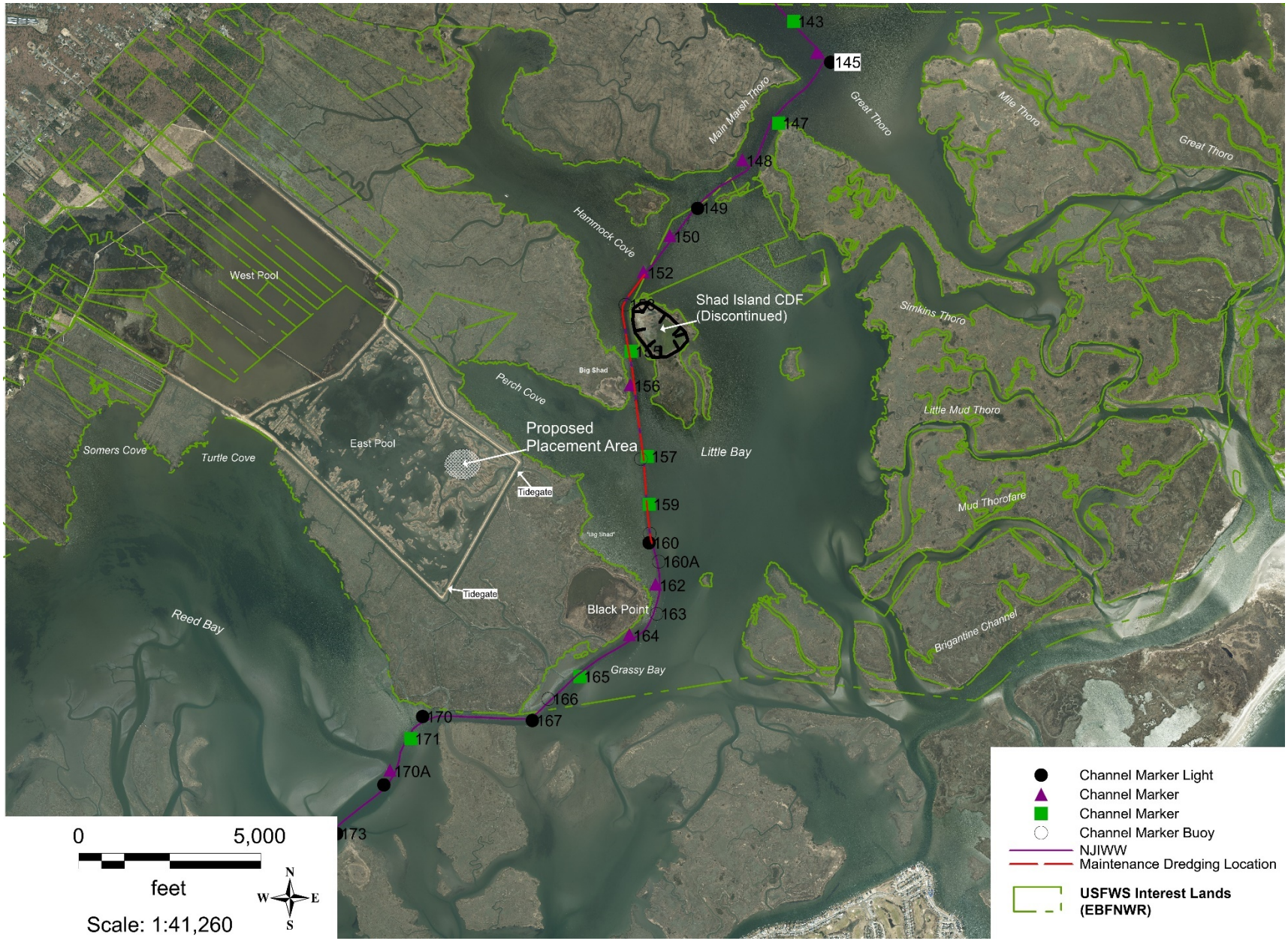

Figure 3. Project Location and Vicinity Map.

habitat for migratory and resident birds; and improve water quality through de-nitrification and sediment removal. Beneficial reuse projects can create a regional uplift in ecosystem functions, services and resiliency—including increased buffering capacity against storm and flood damage, significant regional uplift in water quality, and the enhancement and creation of fish, shellfish, wading bird, and waterfowl habitat. The uplift in ecosystem services will have a significant, positive impact on dependent local and regional economies including tourism, hunting, fishing, recreation, and avoided storm damage costs.

The establishment of the Headquarters (HQ) Impoundment System at Edwin B. Forsythe National Wildlife Refuge in the 1950s and 60s converted more than 1,500 acres of salt marsh to freshwater habitats to benefit American black ducks and rails. The impoundments remain an important wildlife resource and are the central focus of refuge use, with over 125,000 visitors per year. Despite the benefits to wildlife and visitors, long-term resilience of the site is of concern due to sea level rise and storms as elevations within impounded areas have become significantly lower than the surrounding tidal marshes. This is due to oxidation of organic matter in the soil and a lack of sedimentation and accretion. Sea level rise and storm activity may eventually overwhelm impoundment infrastructure and at that time the impoundments could convert to permanent tidal open water because elevations are too low to support the establishment of vegetation. The long-term goal of the refuge is to avoid this outcome by leveraging refuge infrastructure to pursue the restoration of salt marsh habitats in the impoundment interior so that a fully functional marsh will be present when the impoundments cease to function in future decades.

At one time, as many as 12 water control structures were in place within the constructed dikes to move water between impoundment pools and in and out of the System. The East Pool could not historically be effectively managed as a freshwater habitat due to the lack of capacity to deliver freshwater throughout the pool due to poor slope. In addition, the site was overtaken with the invasive plant *Phragmites australis* and became poor wildlife habitat. In the mid-2000s, the East Pool was converted from a freshwater habitat to saltmarsh by the introduction of tidal salt water. That water enters and exits the pool twice daily, and dramatically reduced the amount of *Phragmites* present. However, because the water control structures were not originally designed to manage such regular tidal flows, the resultant tidal range is restricted and is much less than that of the surrounding marshes. The majority of the East Pool is open water at all tide stages. The vegetated area is salt marsh habitat predominately comprised of infrequently flooded *Spartina patens*. The elevation of the marsh inside the impoundment is less than +1.0 ft. NAVD88, whereas similar habitat occurs at +2.3 - 3.0 ft. outside of the impoundment.

3.0 Project Locations and Objectives

3.1 Maintenance Dredge NJIWW from Markers 152 to 160

This range of the Federal navigation channel is surrounded by saltmarshes that are part

of the Edwin B. Forsythe National Wildlife Refuge (Figure 3). To the east of the channel, lies Shad Island, which is part saltmarsh and part previously used Confined Disposal Facility (CDF) for dredged material. The use of the site is now discontinued. To the west of the channel lies a salt marsh peninsula with a point known as “Big Shad”. This segment of the navigation channel experiences frequent shoaling that requires maintenance dredging every 3 to 4 years. The last time this segment was maintained was in 2010 requiring the disposal of approximately 10,000 cubic yards at the Shad Island CDF. It is estimated that shoaling that has developed subsequently requires the dredging and placement of approximately 6,000 to 10,000 cubic yards. The USACE is seeking a suitable location for beneficial use of dredged material.

3.2 Restore Saltmarsh Habitat in Edwin B. Forsythe National Wildlife Refuge East Pool

The East Pool is a part of the refuge’s Headquarters (HQ) complex located in Oceanville, Atlantic County, NJ (Figures 2 and 3). The East Pool is a diked area that lies on a marshy peninsula surrounded by Reeds Bay, Grassy Bay, Little Bay and Perch Cove. “Black Point” is the easternmost portion of this peninsula. To the west lies the “West Pool”, which is a non-tidal freshwater pool and marsh complex. Both impoundments are ringed by Wildlife Drive, a popular recreation destination.

As a first phase of marsh restoration, the EBFNWR seeks to initiate a small-scale project to place material dredged from the nearby NJIWW to learn about sediment behavior as the refuge seeks to increase elevation of the 500-acre East Pool in the future. Over time, large quantities of sediment will be needed to restore tidal marsh over multiple phases. In this first phase of work, the EBFNWR goals are to (1) test methodology for efficient placement of sediment in open water that meets precise elevation targets and minimizes loss of material from the placement area, and (2) test methodology to promote the rapid establishment of vegetation.

The long-term goal for management is to increase tidal range in the impoundment by redesigning the water control structure network and increasing marsh elevation and extent through addition of sediment. In this first phase of work, EBFNWR does not intend to change the tidal range because hydrological modeling has demonstrated a need to redesign the water control structure system, which is pending. Here, the refuge intends to expand the extent of marsh within the impoundment at its current elevation as a means to begin accumulating the knowledge that will be needed to inform the larger scale and longer-term impoundment restoration effort.

With the ability to manage water levels, the refuge believes it can incrementally restore full tidal flow in the East Pool over time while gradually building elevation and salt marsh vegetation extent using a range of restoration strategies. During this process, the impoundments can be used as a public and easily accessible proving ground for developing new techniques for the management of salt marsh habitat, with particular focus on high marsh. High marsh is an essential breeding habitat for both saltmarsh sparrow (*Ammodramus caudacutus*) and Eastern black rail (*Laterallus jamaicencis*

jamaicencis) and both species occur in the surrounding salt marshes of the Great Bay estuary. Future habitat is expected to be comprised of both low and high saltmarsh (predominately *Spartina alterniflora* and *S. patens*, respectively) with ponds and natural channels intermixed.

4.0 Alternatives

4.1 No Action

No action assumes that there would be no Federal involvement in maintaining portions of the NJIWW project, and the proposed benefits to the environment through beneficial use of dredged material would not occur. A plan of no action does not meet the current project objectives. The no action alternative is retained in the analysis pursuant to National Environmental Policy Act regulations.

Several dredged material placement alternatives were considered for the shoal locations in this portion of the NJIWW. Alternatives included other restoration sites, previously used confined disposal facilities, and placement of sand on an ocean beach. Alternatives were eliminated for various reasons including cost, institutional constraints and technical feasibility. The following describes the reviewed plans.

4.2 Past and Current Practices

The NJIWW channel in the vicinity of Shad Island and Black Point is dredged, as needed, when shoals develop that impede navigation, and when funding becomes available to maintain the channel. Over a period of 47 years from 1973 to 2020, records indicate that this portion of the NJIWW channel has been dredged 11 times. The dredged material has historically been placed nearby in the Shad Island CDF (Figure 3), which is entirely within the bounds of EBFNWR. Prior to use as a CDF, Shad Island was entirely saltmarsh. Over time, these placement actions resulted in increases in elevation. The area is mapped as predominantly palustrine emergent wetlands (NWI Mapping) and/or disturbed tidal wetlands and a *Phragmites*-dominated stand (NJDEP 2012).

Historically, it was common practice for New Jersey's coastal marshes to be used as placement sites for dredged material from a hydraulic dredge. It was convenient and cost effective. The Service worked with the Corps for decades to accommodate the creation of the Shad Island CDF, which fundamentally destroyed about 40 acres of prime saltmarsh habitat. The passage of the National Wildlife Refuge System Improvement Act of 1997 (Public Law 105-57) codified the need to ensure all uses occurring in national wildlife refuges are compatible for the purposes for which the refuge was established. In 2003, the refuge agreed to allow the Corps to place material in the Shad Island CDF but worked towards making the use compatible by proposing a habitat project that would improve nesting waterbird habitat in the CDF. That project failed because the invasive plant *Phragmites australis* invaded the site, no trees grew, and maintenance of the island was unmanageable with existing refuge resources. The Special Use Permit (SUP) for this work expired in 2012 and was not renewed by the

Service as there is no remaining appropriate use of fill material on the site. The refuge now only seeks dredged material for placement that can enhance habitat and provide opportunity to fulfill the refuge mission, and no longer will create CDF's for non-habitat related purposes.

4.3 East Pool Edwin B. Forsythe National Wildlife Refuge (Preferred Alternative)

Approximately 6,000 to 10,000 cubic yards of silts, fine sands, and clays would be hydraulically dredged to remove shoals between USCG markers 152 and 160 along the NJIWW for a one-time dredge and fill placement project for a period of 2 – 3 weeks in December 2020. The dredged material placement site within the East Pool was developed in coordination with the Service. Tidal range within the East Pool is very narrow where mudflat occurs approximately 0.75 ft. off of the base impoundment elevation of +0.2 ft. NAVD and marsh ranges occur at 0.75 -1.0 ft. Elevations higher than 1.0 ft NAVD are inhabited by *Phragmites* (personal communication with Dr. Joseph Smith, EBFNWR). The selected plan includes placement of a thin layer (approximately 1 ft.) of dredged material to raise the substrate elevations of open-water habitat to an intertidal mudflat and/or marsh elevation. Monitoring of material behavior (settlement placement) and marsh vegetation recruitment will occur. Ultimately, and with the ability to manage water levels, the refuge hopes to incrementally restore full tidal flow in the East Pool over time while gradually building elevation and salt marsh vegetation extent using a range of restoration strategies. High marsh is an essential breeding habitat for both saltmarsh sparrow and Eastern black rail and both species occur in the surrounding salt marshes of the Great Bay (Figure 4). Approximately 10 to 15 acres of subtidal open water in the impoundment are anticipated to become intertidal mudflat and saltmarsh and a surrounding approximately 50 acres of subtidal open water may receive a thin layer deposition of sediment from the placement operations. The fill material would be dredged from the adjacent channel and brought to the impoundment via a floating pipeline. The material would be piped through a “Y” distributor directly into the pool for infilling to the surrounding marsh elevation. Containment of the fill will be employed utilizing several techniques that will be evaluated including hay bales, coir logs/wattles, and open (unconfined) placement. The project is expected to take approximately 2- 3 weeks during the month of December 2020.

4.4 Alternate Dredged Material Disposal Methods/Locations

At this time, there are no alternative dredged material disposal locations. Aerial photography dating back to the 1930’s shows that dredge/fill activities likely occurred at “Big Shad” (a disturbed area on the marshy peninsula west of Shad Island) and at Black Point (east of the East Pool), which are at slightly higher elevations than surrounding saltmarsh. However, records demonstrating the use of these areas for dredged material disposal are not available. Additionally, these areas are entirely within EBFNWR, and would not be eligible for Special Use Permits from the Service. A preliminary search has shown that there are no suitable upland locations for development as a CDF and/or areas outside of the refuge within 3 miles of the channel dredging. In addition, no other

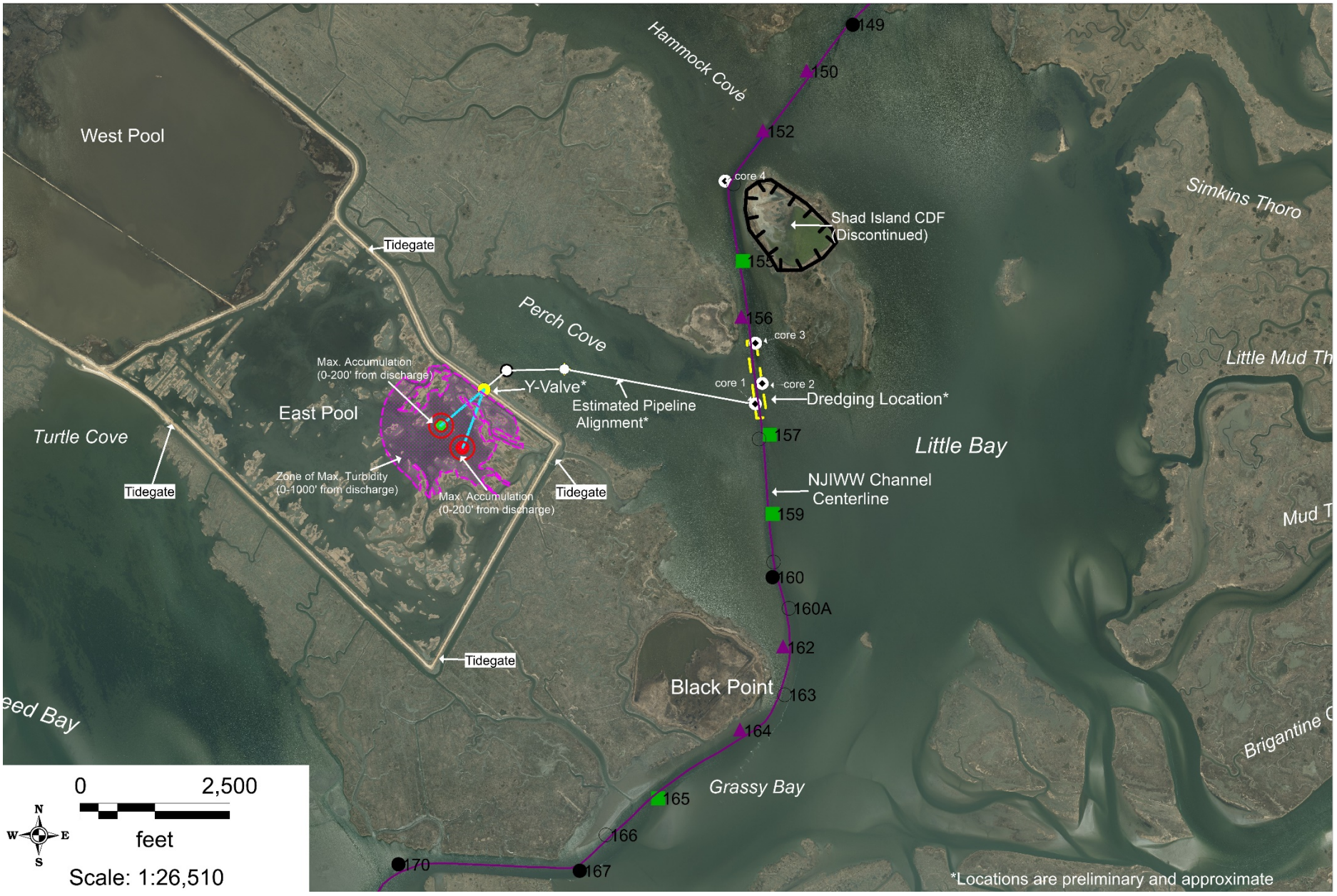

Figure 4. Beneficial Use in East Pool - Preferred Alternative: NJIWW Maintenance Dredging Locations and East Pool Placement Project Features Locations

potential beneficial use sites have been identified within this area; however, that status could change based on changing conditions and Service priorities within the EBFNWR.

5.0 Existing Environment

5.1 Land Use

The affected portion of the NJIWW and the East Pool areas lie entirely within the Edwin B. Forsythe National Wildlife Refuge (EBFNWR). Predominant land uses in the vicinity of the refuge are residential and upland commercial development. The EBFNWR encompasses over 48,000 acres that are distributed along more than 50 miles of the coast in Atlantic, Burlington, and Ocean Counties. Approximately 82 percent of the refuge consists of wetlands, of which 78 percent is saltmarsh interspersed with shallow coves and bays. The wetlands include three large impoundments of freshwater and brackish marsh habitat totaling approximately 1,490 acres. The impoundments allow intensive water level management to enhance the habitat value for waterfowl, shorebirds, and wading birds. The remaining 18 percent of the refuge is upland, of which approximately 5,000 acres are forested, and 2,000 acres are a mix of grasslands, beaches and dunes. The refuge includes two undeveloped barrier island beaches, the Holgate Unit, which consists of the lower 3.5-mile end of Long Beach Island, and Little Beach Island. Both areas are important nesting habitat for the federally threatened piping plover with 10 nesting pairs using Little Beach and 29 using Holgate in the 2020 nesting season.

The proposed action would occur in the approximately 500-acre East Pool in the HQ Impoundment System, in Galloway Township, Atlantic County. It is an impounded site with dikes on all sides, which are used to manage water levels. Those dikes are used as a viewing area for the public called Wildlife Drive. Four water control structures deliver tidal water to the East Pool twice daily.

Vegetation within the impoundment is comprised of mostly saltmeadow cordgrass (*Spartina patens*) and some smooth cordgrass (*Spartina alterniflora*). Higher elevations contain shrubs such as eastern baccharis (*Baccharis halimifolia*) and common reed (*Phragmites australis*).

5.1.1 Wilderness Areas

The approximately 6,600-acre Brigantine National Wilderness Area occurs in the refuge. The area is comprised of Holgate; Little Beach Island (south of Little Egg Inlet); and the Mullica-Motts area (south of the Mullica River). The affected area is not within the refuge's wilderness area.

5.1.2 NJIWW Affected Area

Surrounding land cover of the affected area of the NJIWW are salt marshes and open water shallow lagoonal bay systems composed of Hammock Cove, Perch Cove, and Grassy Bay within the overall Little Bay. The NJIWW channel occurs west of Shad

Island, and east of a marshy peninsula identified as “Big Shad” in the USGS 7.5’ Topographic Map along the western side of EBFNWR. The tip of Big Shad appears to have been disturbed as far back as the 1930’s, but could not be verified if it was used as a CDF (personal communication with Dr. Joseph Smith, EBFNWR). The NJIWW also passes “Black Point”, which occurs east of the East Pool. Based on historical aerial photography, Black Point may have been used as a dredged material disposal area as far back as the 1930’s; however, dredging records going back to 1973 do not show that this area has been used as a disposal area since 1973. Black Point was also historically used as a military practice bombing range (Virginia Rettig – EBFNWR – Personal Communication).

5.2 Climate and Climate Change

EBFNWR is within the New Jersey coastal weather station zone (Sandy Hook, Long Branch, Atlantic City, and Cape May weather stations). The ocean moderates the State's continental climate within the coastal weather zone. The average monthly temperature is 35°F in January, the coldest month of the year, and 75°F in July, the hottest month of the year. The growing season for the Refuge is 245 days. The growing season is the period of the year in which the average temperature is 43°F or more. The average annual precipitation in the coastal zone is 42.6 inches. Precipitation is distributed fairly evenly through the year, with slightly more in July and August, and less in February (USFWS, 2004).

Despite the historic moderate climate experienced within the Coastal Zone of New Jersey, the Earth’s surface temperature has risen by 1.3^{o}F over the last century, which is attributed to the anthropogenic introduction of carbon dioxide and other greenhouse gases (NJDEP, 2013). In New Jersey, the State Climatologist reports a statistically significant rise in average statewide temperature over the last 118 years. Also during this period, New Jersey has experienced a significant increase of the departure from normal indicating that average annual temperatures are consistently greater than the longer term average. This temperature trend coincides with an increase in precipitation due to more moisture in the atmosphere. However, despite a trend toward more precipitation, the northeastern portion of the United States is seeing longer periods without rainfall and longer growing seasons (NJDEP, 2013 and O’Neill, 2009).

Climate change has a profound effect on sea level rise locally and globally where sea levels are rising at a rate of 3.5 millimeters per year (NJDEP, 2013; Cooper *et al.* 2005), and this rate is projected to increase into the 21st Century (Climate Institute 2010, UCS 2013). It’s estimated that the global average of sea level rise is approximately 8 inches since the Industrial Revolution, but the East and Gulf Coasts of the United States have been experiencing some of the highest rates of sea level rise (UCS 2013). Small increases in sea level can have major effects on the world’s coastlines physically, biogeochemically, and economically through impacts such as erosion, flooding, salinization, and habitat transformation for wildlife and plants (Climate Institute 2010, UCS 2013).

Other impacts of climate change may include increased intensity of hurricanes; however, climate science projections for intensity and intense hurricane numbers

suggest relatively large uncertainty at present (NOAA 2012). High magnitude storm events such as hurricanes and Nor'easters could have extensive direct and indirect impacts to habitat, ranging from erosion from wave attack, saltwater intrusion from inundation, as well as water quality impacts from developed areas experiencing inundation from floodwaters. Additionally, temporary and permanent impacts to habitat could occur across a broad temporal reference along the North Atlantic Coast. Some habitat areas could be exposed to different impacts based on the time of the year the storm occurs. Combined with sea level rise, extreme water levels may exacerbate coastal storm impacts to habitats over the long-term planning horizon (USACE 2014).

5.3 Geology, Topography and Soils

The NJIWW and EBFNWR are within the Outer Coastal Plain within the Atlantic Coastal Plain Province, which consists of sedimentary deposits dating from the Tertiary period. Elevations on the refuge range up to 50 feet above mean sea level. Topography is nearly level to gently sloping. Uplands slope gradually to a wide band of salt marsh to shallow bays. These bays are separated from the ocean by barrier islands or spits. Major soil series in EBFNWR are Tidal Marsh-Coastal Beach association and Downer-Hammonton-Sassafras association (USFWS, 1994).

Underlying the Outer Coastal Plain region is the shallow, unconfined Kirkwood-Cohansey aquifer system, which is a surficial aquifer system. The Kirkwood-Cohansey aquifer system includes the Cohansey Formation, which is characterized primarily by medium- to coarse-grained sand, with local lenses of silt and clay, and some gravel; the Kirkwood Formation, which is characterized by fine-to-medium-grained sand with clay beds; the Cape May Formation, which consists mostly of fine-to-medium sand with a clay and silt unit at its base; the Bridgeton Formation which is primarily sand and gravel; and localized areas of other recently deposited sands (Wieben and Chepiga, 2018; Canace and Sugarman, 2009, Martin, 1998; Newell et al., 2000; Fiore et al., 2018). These formations contain mixtures of layers of highly permeable sands and gravels and clay layers that act as local confining units that produce wide variation in hydrology. Because this aquifer is shallow and unconfined, the aquifer system generally is well-connected hydraulically to surface-water bodies, and groundwater is the primary source of freshwater to streams and wetlands within the Coastal Plain (Wieben and Chepiga, 2018; Watt, 2000). However, significant portions of the marsh areas of the refuge are underlain by heterogeneous deposits that can consist of relatively high fractions of fine-grained sediment. These high fractions of fines indicate that the deposits may be areas of low permeability (Wieben and Chepiga, 2018; Stanford, 2013, 2014).

5.4 Air and Water Quality

5.4.1 Air Quality

As stated in USFWS (2004) "New Jersey is the most densely populated State in the country. The State also has the highest densities of roads and traffic. These factors impact air quality. The greatest adverse impact seems to be elevated levels of low-

altitude ozone in the State. The ozone levels exceed Environmental Protection Agency (EPA) thresholds set for the State. Investigations at the Brigantine Division of Forsythe Refuge indicate that the low-altitude ozone levels at that site are high, with resultant damage to vegetation (Davis, 1995). In 1978, Congress designated the Brigantine Wilderness Area (Wilderness Area) as a Class I air quality area, giving it special protection under the Clean Air Act. Congress charged the Service with the responsibility of protecting the air quality and air quality related values (AQRVs) of the area from manmade pollution. AQRVs include vegetation, wildlife, soils, water quality, visibility, odors, and cultural and archaeological resources. Despite this protection, air pollution is impacting the Wilderness Area. The area lies in a highly industrialized airshed, with air pollution coming from many sources, including industry, automobiles, and power plants. Surveys conducted from 1993 to 1996 indicated that certain plant species exhibited typical symptoms of ozone injury (e.g., stippling and chlorosis). In addition to these documented effects, there is concern that other effects may be occurring. Rainfall throughout the area is acidic; rainfall pH at sampling locations in New Jersey is often less than 5.0. As is the case in most of the eastern US, visibility in the Wilderness Area is affected by pollution-caused haze. Also, inshore waters of the Wilderness Area may be at risk from atmospheric nitrogen pollution. Research along the Atlantic Coast has demonstrated that atmospheric nitrogen (primarily from power plant and automobile emissions) has contributed to nutrient level increases of inshore waters, with subsequent algae blooms, loss of seagrass beds, and deterioration of fish and wildlife habitat."

USFWS (2004) further states: "The New Jersey Department of Environmental Protection (NJDEP) operates continuous sulfur dioxide and ozone monitors at the Nacote Creek Station at the west side of EBFNWR. The ozone monitor has recorded various violations of the National Air Quality Standards for ozone (the entire State of New Jersey is a "non-attainment area" for ozone). In addition, the Service monitors air quality at the Wilderness Area through two national programs. The Service monitors atmospheric pollutants in rain as part of the National Atmospheric Deposition Program (NADP; the "acid rain" program). The Service monitors fine particles as part of the Interagency Monitoring of Protected Visual Environments (IMPROVE) Program."

General Conformity is a process to implement Section 176(c) of the Clean Air Act to ensure actions conducted or sponsored by federal agencies in nonattainment or maintenance areas are consistent with the regulating authority's (NJDEP) air quality State Implementation Plan (SIP). General Conformity requires that reasonably foreseeable emissions from federal actions will not cause or contribute to new violations of a NAAQS, increase the frequency or severity of existing NAAQS violations, or delay timely attainment of the National Ambinent Air Quality Standards (NAAQS) or any interim milestone towards achieving attainment.

Atlantic County, New Jersey within which the Federal actions will take place is classified as marginal nonattainment for 8-hour ozone (oxides of nitrogen [NOx] and volatile organic compounds [VOCs]). The project site is within the Philadelphia-Wilmington-Atlantic City, PA-NJ-MD-DE nonattainment area. A nonattainment area is an area that

does not meet (or that contributes to ambient air quality in a nearby area that does not meet) the NAAQS for the pollutant.

The Marginal designation determines the *de minimis* emission threshold, below which a General Conformity determination is not required, and the project can be approved. The *de minimis* emission threshold for a marginal ozone nonattainment area is 100 tons/year of NOx or 100 tons/year VOC.

5.4.2 Water Quality

According to New Jersey regulations (N.J.A.C. 7:9B-1.12), the majority of surface waters in the vicinity of the NJIWW have an NJDEP classification of SE-1 (estuarine). Tidal water bodies classified as SE-1 are estuarine waters with the designated uses of:

- Shellfish harvesting in accordance with N.J.A.C. 7:12;
- maintenance, migration and propagation of natural and established biota;
- primary and secondary contact recreation; and any other reasonable uses.

Water quality within the coastal waters of New Jersey is comparable to that of similar coastal water bodies along the New York Bight and is indicative of similar coastal tidal river and estuary complexes along the Mid-Atlantic Coast (USFWS, 1997). The quality of water in this region is dependent largely on the influence of the major freshwater rivers that flow into the bays including the Mullica River, Absecon Creek, Patcong Creek and the Great Egg Harbor River. Other factors that influence water quality over time include tides, season, ocean current fluctuations, nutrient enrichment, water depth, biotic communities, and other temporal and spatial variables.

Studies conducted on the bays and estuaries in the vicinity of the NJIWW indicate that water quality has historically been impacted by pollutants such as nutrients, pathogens, heavy metals and fecal coliform bacteria. As a result, habitat for fish and wildlife has been degraded in many areas relative to historical pre-developed conditions. Barnegat Bay-Little Egg Harbor and New Jersey's more southerly inland bays from south of Great Bay south to Cape May are considered by the National Oceanic and Atmospheric Administration (NOAA) to be highly eutrophic – meaning that they are susceptible to nutrient-fueled algae blooms that harm aquatic ecosystems and have the potential to deprive waterways of oxygen. NOAA projects that nutrient related symptoms in the southern coastal bays are likely to worsen in the years to come.

The impounded area of the East Pool receives tidal flow twice each day. Water quality at the site is generally positive and water is clear, other than natural sediments carried in the estuary.

5.4.3 Contaminants

NJIWW Sediments

Sediment cores were collected from four locations in this reach of the NJIWW in February of 2020 (Tetra Tech, 2020). All four cores were analyzed for grain size. The cores ranged from 38.8% to 77.7% fine-grained sediments. Chapter II-Section C Case 1 of the New Jersey Department of Environmental Protection dredging guidance manual (NJDEP, 1997) indicates that no further testing is required if the material to be dredged is greater than 90% sand. Based on this criteria the four cores do not meet this case for no testing. Therefore, testing was performed in accordance with the NJDEP dredging guidance manual NJDEP (1997). The samples were analyzed for grain size; Total Organic Carbon (TOC); Target Compound List (TCL) volatile organics (VOCs) and semi-volatile organics (SVOCs); Target Compound List (TCL) pesticides; Target Analyte List (TAL) inorganics, including total cyanide and total mercury; polychlorinated biphenyl (PCB) arochlors and PCB congeners/dioxins and furans.

Sediment samples were also used to prepare unfiltered (total) and filtered (dissolved) modified elutriate samples. In addition, one surface water sample (unfiltered) was collected from this reach. The modified elutriate samples were analyzed for total and dissolved TCL SVOCs; total and dissolved TCL pesticides; total and dissolved TAL inorganics, including total cyanide and total mercury; total and dissolved PCB arochlors and total PCB congeners/dioxins and furans; and total suspended solids (TSS). The surface water samples used to prepare the elutriates were analyzed for total (unfiltered) concentrations of these parameters. TCL VOCs were also evaluated. Dissolved (filtered) concentrations were not evaluated for any parameter.

Based on these analyses, the following conclusions were made with respect to the chemical analysis of samples:

- All New Jersey residential and non-residential soil cleanup criteria were met;

- there were few exceedances of Effects Range- Low (ERL) (Long et al. 1995) ecological screening criteria for Arsenic (ERL= 8.3 mg/kg), Mercury (ERL= 150 ug/kg), Dieldrin (ERL=0.02 ug/kg), and Total PCBs (ERL=22.7 ug/kg).

- for most parameters exceeding ERL levels, sample concentrations were only slightly above the ERL and well below the Effects Range – Median (ER-M). This suggests that the potential for the sediment to have an adverse effect on ecological resources is small;

- the sediment elutriate samples had one exceedance of New Jersey for acute protection of aquatic life surface water quality criteria. This exceedance was for copper,

- and the elutriate data is conservative because it does not consider dilution within a mixing zone as provided by New Jersey surface water quality regulations.

A review of the sediment quality for suitability for placement in the East Pool is being conducted by the Service. Additionally, the NJDEP will be reviewing the sediment quality data for beneficial use suitability in accordance with their Section 401 Water Quality Certification review.

5.5 Biological Resources

5.5.1 Terrestrial and Aquatic Habitats

A variety of terrestrial/aquatic habitat types are present within the NJIWW and EBFNWR project area. However, the majority of the affected habitats are aquatic. The refuge is a critical area for breeding, wintering and migrating birds. The East Pool is used by more than 200 migratory bird species year-round. They benefit from the tidal marsh habitat as it is managed by the refuge. Although some wildlife species may use several different habitats, others are specialized and use only one or two types. According to the National Wetlands Inventory (NWI) and NJDEP wetland mapping, the terrestrial and wetland habitat types (Figure 5) within the project area include the following:

- bay and mudflats;
- low saltmarsh;
- high saltmarsh;
- common reed (tidal/upland);
- palustrine forested and scrub/shrub wetlands (west of impoundments);
- intertidal impoundment (East Pool);
- Lacustrine open water and emergent wetlands (West Pool); and
- dredged material placement sites.

<u>Bays and Mudflats</u>

Bay and mudflat habitats support an ecological community adapted to daily tidal fluctuations. At the base of this food chain is detritus and biota washed in from the adjacent tidal marsh and open bay areas, as well as benthic invertebrates that live on microscopic algae, plants and animals within the mud. Shorebirds (*e.g.*, sandpipers)

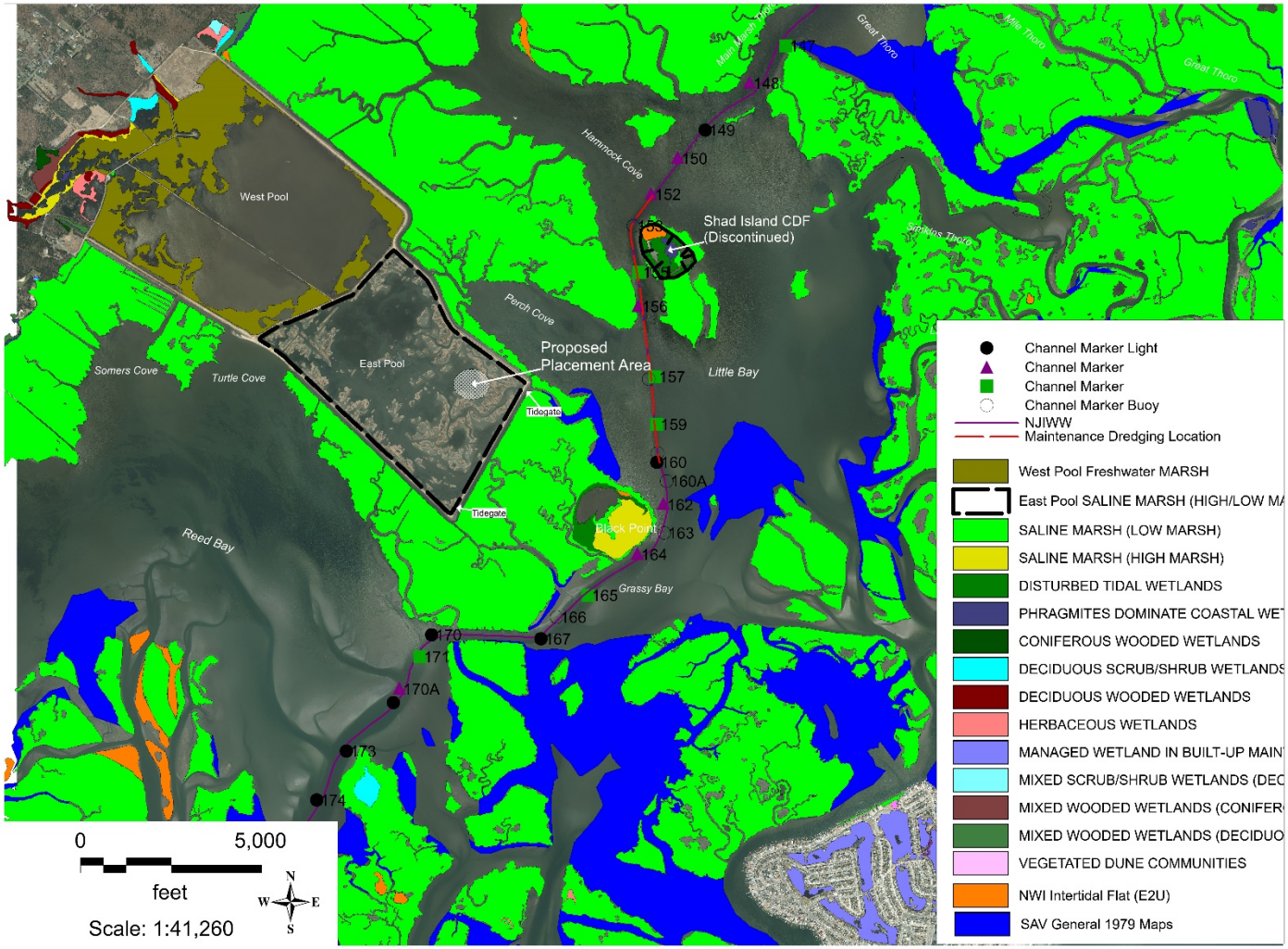

Figure 5. Wetland and Aquatic Habitats within the Affected Areas

and waterfowl feed on these invertebrates, which include minute crustaceans and mollusks, as do juvenile fish that enter the shallows with the tide. In some areas where tidal flow has been restricted due to dikes and tidal gates, these mudflat habitats exist along creeks and ditches without daily tidal inundation. Although the East Pool is controlled by dikes and tidegates, this area contains restricted tidal open water and intertidal mudflats.

Low Saltmarsh

Low saltmarsh habitats adjacent to the NJIWW are dominated by saltmarsh cordgrass (*Spartina alterniflora*), the dominant saltmarsh plant species in the northeastern United States (Mitsch and Gosselink, 1993). This species occurs in the intertidal zone between mean low water and mean high water levels where, it is subject to daily tidal inundation. Wildlife species utilizing low saltmarsh habitats include birds such as clapper rails (*Rallus longirostris*), common moorhen (*Gallinula chloropus*), waterfowl, and other species that feed on insects, crabs and other invertebrates that this community supports. The low marsh and tidal channel complex provides significant habitat for numerous fish species that depend on estuaries for nursery and spawning grounds, as well as smaller resident fish such as mummichog (*Fundulus heteroclitus*), killifish (*Fundulus* sp.) and Atlantic silversides (*Menidia menidia*) (Mitsch and Gosselink, 1993; Tiner, 1985). Approximately 23 acres of low saltmarsh occur within the East Pool, but to a lesser extent due to the abundant open water areas. The majority of the remaining saltmarsh is classified as a high marsh.

High Saltmarsh

High saltmarsh habitats are generally found near the mean high tide level and are generally dominated by saltmeadow cordgrass (*Spartina patens*) and seashore saltgrass (*Distichlis spicata*). High saltmarsh provides habitat for many of the same species found in the low tidal marsh areas. However, since high saltmarsh is inundated far less regularly than the low saltmarsh, waterfowl such as American black ducks and mallards (*Anas platyrhynchos*) may breed within this habitat. White-footed mice (*Peromyscus leucopus*) and meadow voles (*Microtus pennsylvanicus*) use this habitat, as well as raptors (hawks and owls) that feed on rodents throughout the year.

Within the East Pool, the tidal range is restricted and is much less than that of the surrounding marshes. The majority of the East Pool is open water at all tide stages. However, the vegetated area is salt marsh habitat predominately comprised of infrequently flooded *S. patens*. The elevation of the marsh inside the impoundment is less than 1.0 ft. NAVD88 whereas similar habitat occurs at 2.3 - 3.0 ft. outside of the impoundment. The 500-acre East Pool contains approximately 144 acres of high marsh.

Common Reed

The invasive common reed dominates much of the remaining high tidal marsh areas within the NJIWW project area. Since this species invades areas and excludes other native species, it can reduce the diversity of habitats and species within an area (Roman et al. 1984). This has happened historically within the project area, especially in areas that have been subject to diking and ditching for mosquito control purposes. Due to the tenacious nature of this species, control efforts are not always successful without repeated herbicide application (Marks et al. 1993). Common reed marshes are common throughout the area but are generally present at higher elevations than other tidal marsh communities. Common reed communities also tend to gradually encroach and fill in or restrict tidal channel flows. As a result, this habitat often provides marginal fish habitat except in mosquito ditches and other channels that are sufficiently inundated to support fish. However, if left unmanaged, the species quickly spreads creating a monoculture, which limits habitat diversity and productivity. The root mat and thick biomass of common reed communities also presents an impenetrable barrier to nesting terrapins and competing native vegetation.

Common reed was once abundant in the East Pool prior to it being converted to an intertidal saltmarsh impoundment. This species may be found along the upper edges of the marsh along the dike edges and is more common in the freshwater West Pool and along upland forest/marsh interfaces (Dr. Joseph Smith, EBFNWR, personal communication).

Scrub/Shrub

Scrub/shrub habitats are common at the transition from high marsh to uplands. Common vegetation includes switchgrass (*Panicum virgatum*), groundsel tree (*Baccharis halimifolia*), bayberry (*Myrica spp*.), eastern red cedar (*Juniperus virginiana*), hightide bush (*Iva frutescens*), seaside rose (*Rosa rugosa*) and poison ivy (*Toxicodendron radicans*). Common reed competes with these species for dominance in these areas. Scrub/shrub communities are an important component of the open water/tidal marsh/upland transition, providing habitat for numerous species of birds and mammals that utilize these areas. Remnant scrub shrub wetlands occur within the East Pool.

East Pool Impoundment

The East Pool is over 500 acres of impounded wetland area surrounded by dikes and gravel road (Wildlife Drive) that receives tidal flows through four gates located along the eastern dike. The impoundment is about 30% vegetated and 70% open water/mud. The site is comprised of a patchwork of marsh vegetation and saltmarsh shrubs. Table 1. provides the major habitat types within the East Pool and their corresponding National Wetlands Inventory Code.

Table 1. Wetland and Deepwater Habitats within the East Pool (NWI Mapping and Cowardin et al. 1979).			
Type	NWI Code	Acreage	Description
Tidal Channel (open water)	E1UBL	12.3	Tidal open water soft bottom channel that connects impoundment with tide gates
Tidal Impoundment (open water)	E1UBLx	365.7	Tidal open water soft bottom area modified as an impoundment.
Low Saltmarsh	E2EM1N	22.7	Intertidal saltmarsh dominated by *Spartina alterniflora*.
High Saltmarsh	E2EM1P	26.3	Upper intertidal saltmarsh dominated by *Spartina patens*.
High Saltmarsh w/ ditching	E2EM1Pd	117.6	Upper Intertidal saltmarsh dominated by *Spartina patens* modified by mosquito ditching.

5.5.3 Wildlife

5.5.3.1 Mammals

Mammals that occur within upland habitats near the NJIWW project area include raccoon (*Procyon lotor*), red fox (*Vulpes vulpes*), gray squirrel (*Sciurus carolinensis*), striped skunk (*Mephitis mephitis*), meadow vole (*Microtus pennsylvanicus*), eastern cottontail (*Sylvilagus floridanus*), Virginia opossum (*Didelphis virginiana*), red bat (*Lasiurus borealis*), little brown bat (*Myotis lucifugus*) and white-tailed deer (*Odocoileus virginianus*). Mammals that would likely inhabit freshwater and brackish wetlands, rivers, and saltmarshes along the back bays of the area include common muskrat (*Ondatra zibethicus*), raccoon, Virginia opossum, white-tailed deer, and river otter (*Lutra canadensis*) (USFWS, 1999). Small mammals that could utilize the upper saltmarsh and marsh transition areas include the meadow vole (*Microtus pennsylvanicus*), meadow jumping mouse (*Zapus hudsonius*), and white-footed mouse (*Peromyscus leucopus*) (Daiber, 1982).

5.5.3.2 Reptiles

Several species of turtles and snakes occur in upland areas of the barrier island complex within the NJIWW project area including the snapping turtle (*Chelydra serpentina*), eastern mud turtle (*Kinosternon subrubrum*), stinkpot (*Sternotherus odoratus*), northern watersnake (*Natrix sipedon*), northern black racer (*Coluber constrictor*), and eastern garter snake (*Thamnophis sirtalis*). The distribution of these species is limited by the availability of fresh water, as they are intolerant of higher salinity. The northern diamondback terrapin (*Malaclemys terrapin terrapin*) inhabits salt marshes, tidal flats, and beaches within the project area. Northern diamondback terrapins occur primarily in emergent wetlands and shallow water habitats and feed on

crustaceans, mollusks and other invertebrates (Palmer and Cordes, 1988, as cited in USFWS, 1988). During the winter, terrapins burrow into the mud of tidal creeks and ponds to hibernate either individually or in groups (USFWS, 1999).

5.5.3.3 Birds

Raptors that occur in the area include the red-shouldered hawk (*Buteo lineatus*), red-tailed hawk (*B. jamaicensis*), peregrine falcon (*Falco peregrinus*), osprey (*Pandion haliaetus*), Cooper's hawk (*Accipiter cooperii*), barred owl (*Strix varia*), and short-eared owl (*Asio flammeus*) (New Jersey Division of Fish, Game and Wildlife, 1994, as cited in USFWS 1999). These species utilize tidal marshes for nesting and foraging throughout the year. Ospreys nest on platforms in numerous locations throughout the project area and “feed primarily on fish within the back bays” (USFWS, 1999). The short-eared owl is a temporary resident of high marsh areas, feeding primarily on small mammals and birds (USFWS, 1999). Northern harriers are also known to “nest and feed in the salt and brackish marshes” along the Intracoastal Waterway. The red-shouldered hawk and Cooper’s hawk migrate over the area in spring and fall (USFWS, 1999). Other raptors that could occur in the project area during migration include American kestrel (*Falco sparverius*), merlin (*E. columbarius*), sharp-shinned hawk (*Accipiter striatus*), and broad-winged hawk (*Buteo platypterus*). Bald eagles are known to frequent the impoundment (*Haliaeetus leucacephalus*).

The New Jersey barrier beach/back barrier lagoon system provides important habitat for shorebirds during spring and fall migrations. Wetlands in the area also provide high quality habitats for a variety of migratory shorebirds. Birds using beach areas and associated estuarine wetlands at the project area include the Eastern black rail (*Laterallus jamaicensis jamaicensis*), American oystercatcher (*Haematopus palliates*), semi-palmated plover (*Charadrius semipalmatus*), piping plover (*C. melodus*), lesser golden plover (*Pluvialis dominica*), black-bellied plover (*P. squatarola*), hudsonian godwit (*Limosa haemastica*), marbled godwit (*Limosa fedoa*), whimbrel (*Numenius phaeopus*), sanderling (*Calidris alba*), semi-palmated sandpiper (*C. pusilla*), purple sandpiper (*C. maritima*), western sandpiper (*C. mauri*), least sandpiper (*C. minutilla*), white-rumped sandpiper (*C. fuscicollis*), pectoral sandpiper (*C. melanotos*), red knot (*C. canutus*), dunlin (*C. alpina*), greater yellowlegs (*Tringa melanoleuca*), eastern willet (*Catoptrophorus semipalmatus*), spotted sandpiper (*Actitis macularia*), ruddy turnstone (*Arenaria interpres*), and short-billed dowitcher (*Limnodromus griseus*) (New Jersey Division of Fish, Game and Wildlife 1994, as cited in USFWS, 1999).

Nesting wading birds that occur within the area include the great blue heron (*Ardea herodias*), little blue heron (*Egretta caerulea*), tricolored heron (*E. tricolor*), snowy egret (*E. thula*), black-crowned night heron (*Nycticorax nycticorax*), yellow-crowned night-heron (*Nyctanassa violaceus*), great egret (*Casmerodius albus*), glossy ibis (*Plegadis falcinellus*), great black-backed gull (*Larus marinus*), herring gull (*L. argentatus*), laughing gull (*L. atricilla*), glossy ibis (*Plegadis falcinellus*), Forster's tem (*Sterna forsteri*), common tern (*S. hirundo*), least tern (*S. antillarum*), black skimmer (*Rynchops niger*), common loon (*Gavia immer*), red-throated loon (*G. stellata*), great connorant

(*Phalacrocorax carbo*), and doublecrested cormorant (*P. auritus*) (New Jersey Division of Fish, Game and Wildlife, 1994, as cited in USFWS, 1999).

Estuarine marshes, bays, and channels within the area are important resting and feeding areas for migratory waterfowl on the Atlantic Flyway. The bays and associated coves within the area provided habitat for tundra swan (*Cygnus columbianus*), Atlantic brant (*Branta bernicla*), American black duck (*Anas rubripes*), gadwall (*Anas strepera*), American wigeon, northern pintail (*Anas acuta*), blue-winged teal (*A. discors*), green-winged teal (*A. crecca*), northern shoveler (*A. clypeata*), redhead (*A. Americans*), lesser scaup (*Aythya affinis*), mallard, bufflehead, greater scaup, canvasback, long-tailed duck (*Clangula hyemalis*), wood duck (*Aix sponsa*), ruddy duck (*Oxyura jamaicensis*), red-breasted merganser (*Mergus serrator*), and hooded merganser (*Lophodytes cucullatus*) (New Jersey Division of Fish, Game and Wildlife, 1994, as cited in USFWS 1999).

Inlet waterways are an important concentration area for many waterfowl species during harsh winters when other area water surfaces freeze. Breeding waterfowl in estuaries include American black duck, gadwall, mallard, and Canada goose. Salt marshes provide an important larval insect food source for newly hatched ducklings (USFWS, 1997).

The EBFNWR is a critical area for breeding, wintering and migrating birds. The East Pool is used by over 200 migratory bird species year-round. They benefit from the tidal marsh habitat as it is managed by the refuge.

5.5.4 Aquatic Invertebrates

The coastal habitats along the New Jersey Coast including the back bays are home to a wide variety of both benthic and free swimming and floating invertebrates. Invertebrate groups found in various coastal habitats include Cnidaria (hydra, corals, anemones, jellyfish), Platyhelminthes (flatworms), *Nemertinea* (ribbon worms), Nematoda (roundworms), Polychaetes (bristle worms), Oligochaetes, *Bryozoa*, Mollusca (chitons, bivalves, snails, squids, etc.), Crustaceans (crabs, shrimp, amphipods), insects (Dipterans), Echinodermata (sea urchins, sea cucumbers, sand dollars, starfish), Urochordata (tunicates), and zooplankton, which may represent a number of different phyla at various life stages.

Benthic macroinvertebrate communities are commonly used as indicators of overall quality of water and benthic habitats. Indices measuring such parameters as abundance and species composition are well developed and often used in describing quality of habitats and also the potential food sources for higher consumers. In particular, benthic invertebrates make up the primary food source for both juvenile and adult fish species in shallow water environments found in estuarine habitats. Benthic invertebrate communities vary spatially and temporally (NOAA, 1994) as a result of factors such as sediment type, water quality, depth, temperature, predation, competition, and season. Thus, benthic invertebrate communities differ between habitat types. For example, the community within fine grain sediment found in a deep water, low energy environment is

likely to be dominated by a higher percentage of sessile organisms, while a shallow, high energy environment consisting of larger grain sediment may contain a higher percentage of mobile filter feeding invertebrates. The New Jersey Back Bays are rich in benthic taxa. A recent benthic survey of the Barnegat Bay and Little Egg Harbor estuaries by Taghon *et* al. (2016) demonstrated a fairly diverse benthic community where they collected a total of 276 taxa of which 220 were infaunal taxa. However, five of these taxa made up 50% of the total abundance, which include polychaetes: *Mediomastus ambiseta and Streblospio benedicti;* amphipods*: Ampelisca abdita and A. verrilli*; and Oligochaeta*.*

Shallow water intertidal areas consisting of habitats such as high salt marshes, low salt marshes, mudflats, and common reed dominated estuarine wetlands provide habitat for benthic invertebrate groups that are tolerant of a continuously changing environment such as *oligochaetes*, *polychaetes*, and nematodes. These habitats are frequently inhabited by fiddler crab (*Uca spp*.), salt marsh snail (*Melampus bidentatus*), and ribbed mussels (*Geukensia demissus*). Other groups of benthic invertebrates that inhabit these habitats include ceratopogonids, nematodes, chironomids (mosquitos), tabanids (green head flies), mites, ostracods, isopods, and gastropods. High marsh habitats that are rarely affected by tidal influence generally contain lower abundances of aquatic invertebrates and a higher proportion of terrestrial taxa as a result. By comparison, habitats such as low saltmarsh and mosquito ditches are inundated most of the time and are home to a higher abundance of aquatic organisms. Similarly, the benthic macro invertebrate community may differ between vegetation types, such as within high marsh habitats dominated by common reed (*Phragmites*) vegetation versus low marsh habitat dominated by *Spartina alterniflora*. For example, low marshes dominated by *Spartina alterniflora* were shown to have greater abundance and species composition than high marshes dominated by *Phragmites* (Able, 2000; Angradi et. al., 2001).

Other benthic invertebrates common to estuarine and marine habitats within the New Jersey coast include mollusks such as bay scallop, hard clam, common blue mussel, and Eastern oyster; crustaceans such as common rock crab (*Cancer irroratus*), blue crab, snapping shrimp (*Crangon septemspinosa*), and grass shrimp (*Palaemontes spp*.); and an echinoderm: sea stars (*Asterias forbesi*).

5.5.5 Fisheries

The coastal waters of New Jersey are reported to support up to 107 species of fish during part or all of their life cycle (BBEP, 2001; Tatham et al., 1984). Of these, 61 species have been studied extensively regarding their role and presence in estuarine habitats (Able and Fahey, 1998). The great diversity of fish fauna found in estuarine habitats includes both resident and transient species. Species habitat use is best understood in terms of life history, as many fish species occupy estuarine habitats only during certain life stages. Several fish species are continuously present in coastal habitats, while others are present only during certain periods (e.g. during spring many fish species use specific habitats for spawning). Thus, the distribution and abundance

of important indicator fish species vary both temporally and spatially. Because most of the project area consists of estuarine waters, the focus of this assessment is on estuarine species that could be affected by different management alternatives. Estuarine environments are extremely important to a wide number of fish species because of the multitude of niche environments available to fish. Certain fish species utilize shallow water vegetated habitats for spawning while others migrate out to open water to distribute their eggs as planktonic forms. Similarly, some larval fish species migrate from open water as they develop and enter highly productive estuarine environments to grow and develop into juvenile stages. In this respect, estuaries provide ample amounts of both food and protection for larval and juvenile stages of fish (Able and Fahey, 1998).

High marsh and tidal mud flat areas provide important year-round habitat for many groups of fishes including killifishes (*Fundulidae*), needlefishes (*Belonidae*), and silversides (*Atherinidae*) (Talbot and Able, 1984). In addition, larval and juvenile stages of numerous fish species such as herring (*Clupeidae*), white perch (*Morone americana*), striped bass (*Morone saxatilis*), menhaden (*Brevoortia tyrannus*), and winter flounder (*Pseudopleuronectes americanus*) utilize high marsh and tidal mud flat environments during spring, summer, and fall. The variable microhabitats found throughout these environments provide both protection and cover as well as food sources for early life stages of fish found throughout estuarine habitats and are important to the success of these species as nurseries, foraging areas and cover habitat.

Habitats with restricted tidal flows such as marsh potholes and closed ponds often have associated fish assemblages that consist of low diversity and high abundance. For example, killifish are highly tolerant of wide variations in salinity and temperature and are known to dominate these types of habitats. High marsh habitat dominated by common reed has been shown to negatively affect the success and survival of larval and juvenile fish. Common reed habitats offer few niche habitats and associated biomass available as food sources. Conversely, low marsh areas dominated by *Spartina alterniflora* have been shown to provide high quality habitat for many fish species (Able and Hagan, 2000). Other vegetation types present in submerged aquatic vegetation beds such as water celery provide spawning habitats as well as nursery and feeding habitat for juvenile fish.

Connecting expanses of high and low marsh, marsh channels and tidal creeks provide highly utilized habitat for all life stages of fishes such as Atlantic silversides and killifish as well as important larval and juvenile habitat for fishes such as herring, white perch, weakfish (*Cynoscion regalis*), flounder and bluefish (Able et al., 2001; Roundtree and Able, 1992). Tidal stages strongly influence juvenile fish species such as summer flounder that utilize flood and ebb tides to gain access to habitats for foraging as they move between habitat types.

Impoundments that restrict tidal flow between marshes and estuaries inhibit fish migration and hence nutrient exchange between high and low intertidal habitats (Talbot et al.., 1986). The reduction or elimination of the tidal regime of a marsh due to diking

or ditching may lower salinity, reduce dissolved oxygen, and increase temperature fluctuations. These changes in water quality can result in alterations of habitats, vegetation type, or benthic invertebrates and consequently shifts fish species composition. Marshes altered for mosquito control by open marsh water management techniques have been shown to affect fish assemblages primarily due to resulting changes in salinity and habitat preference (Talbot and Able, 1986).

Certain fish such as striped bass travel through numerous habitat types along with diel tidal fluctuations (Tupper and Able, 2000). They may utilize low and high marsh channels during flood tides to areas where food is available in higher abundance and then move back into deeper water and channels with the ebb tide. Adult migratory fish species exhibit this behavior throughout estuarine habitats and utilize numerous types of intertidal habitat types.

5.5.5.1 Essential Fish Habitat

Essential Fish Habitat (EFH) is defined in the Magnuson-Stevens Fishery Conservation and Management Act, (PL 94-265 as amended through October 11, 1996 and 1998) as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." Regulations further clarify EFH by defining "waters" to include aquatic areas that are used by fish and may include aquatic areas that were historically used by fish where appropriate. A purpose of the act is to "promote the protection of essential fish habitat in the review of projects conducted under federal permits, licenses, or other authorities that affect, or have the potential to affect such habitat." An EFH assessment is required for a federal action that could potentially adversely impact essential fish habitat.

Managed fish species are those species that are managed under a federal fishery management plan. Managed fish species for New Jersey are listed in the Guide to Essential Fish Habitat Designations in the Northeastern United States Volume IV prepared by the National Oceanographic and Atmospheric Administration (NOAA, 1999). This guide is often used to evaluate the fish species that might be adversely affected by proposed developments within a project area. The coastal estuarine habitats of the project area have been designated as habitat for a number of managed species and their specific life history stages of concern. Some specific species and life stages that are designated for EFH in the New Jersey Inland Bays include summer flounder (larvae through adult), scup (juvenile), black sea bass (juvenile and adult), bluefish (juvenile and adult), and juvenile butterfish (NOAA, 1999).

EFH assessments also examine the potential effects on prey species for the managed fish species potentially occurring within the area. Prey species are defined as being a forage source for one or more designated fish species. They are normally found at the bottom of the food web in a healthy environment. Prey species found in the project area estuary (NJIWW and East Pool) include killifish, mummichogs, silversides and herrings.

The affected area is within the boundaries identified in Table 2. Federally managed fish

species that occur within these boundaries are listed in Table 3. Sixteen of these species primarily inhabit marine nearshore and offshore habitats throughout their lives and are not of major concern since they are largely outside of the affected area. The remaining fish species can be found within inshore habitats during at least part of their life cycle (Table 4).

Table 2. NJBB EFH 10 Minute X 10 Minute Squares

SQUARE COORDINATES (LAT/LONG-DM) SE CORNER	SQUARE DESCRIPTION
3920/7420	Atlantic Ocean waters within the square within the New Jersey Inland Bays estuary affecting the following: Great Bay, Little Bay, Reeds Bay, Absecon Bay, and the Atlantic Ocean. These waters affect Brigantine, NJ, Atlantic City, NJ, Absecon Inlet, Egg Island, Great Thorofare, Main Marsh Thorofare, Hammock Cove, Doughty Creek, Perch Cove, Simkins Thorofare, Little Mud Thorofare, Mud Thorofare, Brigantine Channel, Black Pt., Grassy Bay, Turtle Cove, Somers Cove, Obes Thorofare, Wading Thorofare, Broad Cove, Newfound Thorofare, Beach Thorofare, Great I., Inside Thorofare, Ventnor City, NJ, Smithville, NJ, Leeds Pt., Conovertown, NJ, Oceanville, NJ, Absecon Creek, and surrounding marsh. ****EFH for winter flounder does not occur south of Lat 39°22' N in this square. The southernmost portion of the affected area is north of Lat 39°26' N. Therefore, EFH for winter flounder applies.**

Table 3. NJBB EFH Life Stages Identified in EFH Mapper. (Within 10 Minute X 10 Minute Squares in Table 2

Managed Species	Eggs	Larvae	Juveniles	Adults
Mid-Atlantic Species				
Atlantic butterfish *(Peprilus tricanthus)*			Pelagic waters 10-360 m depth	Pelagic waters
Black sea bass *(Centropristus striata)*			Dermersal waters over rough bottom, shellfish and eelgrass beds, man-made structures in sandy-shelly areas	Dermersal waters over structured habitats (natural and man-made), and sand and shell areas.
Bluefish *(Pomatomus saltatrix)*			Pelagic waters	Pelagic waters
Long finned inshore squid *(Loligo pealei)*			Pre-recruits are pelagic, and inhabit upper 10 m at depths of 50-100 m on continental shelf. Found in coastal inshore waters in spring/fall, offshore in winter.	Demersal during the day, and pelagic at night, and inhabit the continental shelf and upper continental slope in seasonally variable depths to depths of 400 m. Adults may occur in depths of 110-200 m in the spring, but may migrate to inshore waters as shallow as 6 m in the summer and autumn. In the winter, adults migrate offshore to depths of 365 m.
Scup *(Stenotomus chrysops)*			Demersal waters	
Spiny dogfish *(Squalus*			Sub Female:	Widespread in

Table 3. NJBB EFH Life Stages Identified in EFH Mapper. (Within 10 Minute X 10 Minute Squares in Table 2				
Managed Species	Eggs	Larvae	Juveniles	Adults
acanthias)			Widespread in coastal waters. Demersal by day, but may vertically migrate at night to feed. Prefer muddy/silty and sandy bottoms in polyhaline baymouths and contenintal slope waters in depths of 1-500 m.	coastal waters. Demersal by day, but may vertically migrate at night to feed. Prefer muddy/silty and sandy bottoms in polyhaline baymouths and contenintal slope waters in depths of 1-500 m.
Summer flounder *(Paralicthys dentatus)*		Pelagic waters, near shore at depths of 10-70 m from Nov.-May	Demersal waters (mud and sandy substrates)	Demersal waters (mud and sandy substrates). Shallow coastal areas in warm months, offshore in cold months.
New England Species*				
White hake (Urophycis tenuis)	Occur near the surface in pelagic habitats in the Gulf of Maine, including Massachusetts and Cape Cod bays, and the outer continental shelf and slope.			
Windowpane flounder *(Scopthalmus aquosus)*	Surface waters, peaks in May and Oct.	Pelagic waters, peaks in May and Oct.	Bottom (mud or fine sands)	Bottom (mud or fine sands) peak spawning in May
Winter flounder (*Pleuronectes americanus*)** ****EFH for winter flounder does not occur south of Lat 39°22' N in the squares 8,9,10.**	Bottom habitats Temps <10°C, 10 - 30‰ salinity depths <6m	Pelagic and bottom waters <15°C, 4 - 30‰ salinity depths <6m	Bottom habits Mud, sand Temp <28°C, 0.1-10 m depth 5-33‰ salinity	Bottom habits Mud, sand, gravel Temps <25°C, 1-100 m depth 15-33‰ salinity
Silver hake/whiting (*Merluccius bilinearis*)	Surface waters year round, peaks Jul-Sep Temps below 20°C. Depths of 50-150m	Surface waters year round Peaks Jul-Sep Temps below 20°C. Depths of 15-150m	Bottom habitats Temps below 22°C. Depths of 30-325m	
Red hake *(Urophycis chuss)*	Surface waters <10°C, <25‰ salinity	Surface waters <10°C, <25‰ salinity	Bottom habitats shell fragment substrates <16°C, 31 – 33‰ salinity	Bottom habits Mud, sand, gravel Temps <25°C, 1-100 m depth 15-33‰ salinity
Monkfish *(Lophius americanus)*	Surface waters, in temps of 15°C and depths of 25-1000m	Pelagic waters with temps of 15°C and depths of 25-1000 m		
Little skate (*Raja erinacea*)			Intertidal and sub-tidal sand, gravel, and	

Table 3. NJBB EFH Life Stages Identified in EFH Mapper. (Within 10 Minute X 10 Minute Squares in Table 2				
Managed Species	Eggs	Larvae	Juveniles	Adults
			muddy benthic habitats in coastal waters of the Gulf of Maine and in the Mid-Atlantic region as far south as Delaware Bay, and on Georges Bank, extending to a maximum depth of 80 meters, and including high salinity zones in the bays and estuaries.	
Winter skate (*Raja ocellata*)			Intertidal and sub-tidal sand, gravel, and muddy benthic habitats in coastal waters of the Gulf of Maine and in the Mid-Atlantic region as far south as Delaware Bay, and on Georges Bank, extending to a maximum depth of 80 meters, and including high salinity zones in the bays and estuaries.	
Clearnose skate (*Raja eglanteria*)			Sub-tidal benthic habitats in coastal and inner continental shelf waters from NJ to the St. Johns River in FL, including high salinity zones of Chesapeake Bay, Delaware Bay, and the NJ inland bays from the shoreline to 30 meters, primarily on mud and sand, but also on gravelly and rocky bottom.	Sub-tidal benthic habitats in coastal and inner continental shelf waters from NJ to the St. Johns River in FL, including high salinity zones of Chesapeake Bay, Delaware Bay, and the NJ inland bays from the shoreline to 30 meters, primarily on mud and sand, but also on gravelly and rocky bottom.
Atlantic sea herring *(*Clupea harengus*)*			Pelagic and bottom waters <10° C and depths of 15-130 m	Pelagic waters and bottom habitats
Coastal Migratory Pelagic Species				
King mackerel *(Scomberomorus cavalla)*	Pelagic waters with sandy shoals of capes and offshore bars, high profile rocky bottom and barrier island ocean-side waters from the surf to the shelf break zone	Pelagic waters with sandy shoals of capes and offshore bars, high profile rocky bottom and barrier island ocean-side waters from the surf to the shelf break zone	Pelagic waters with sandy shoals of capes and offshore bars, high profile rocky bottom and barrier island ocean-side waters from the surf to the shelf break zone	Pelagic waters with sandy shoals of capes and offshore bars, high profiles rocky bottom and barrier island ocean-side waters from the surf to the shelf break zone
Spanish mackerel *(Scomberomorus maculatus)*	Pelagic waters with sandy shoals of capes and offshore bars, high profile rocky bottom and barrier	Pelagic waters with sandy shoals of capes and offshore bars, high profile rocky bottom and barrier island	Pelagic waters with sandy shoals of capes and offshore bars, high profile rocky bottom and barrier island ocean-side waters from	Pelagic waters with sandy shoals of capes and offshore bars, high profile rocky bottom and barrier island

Table 3. NJBB EFH Life Stages Identified in EFH Mapper. (Within 10 Minute X 10 Minute Squares in Table 2				
Managed Species	Eggs	Larvae	Juveniles	Adults
	island ocean-side waters from the surf to the shelf break zone. Migratory	ocean-side waters from the surf to the shelf break zone. Migratory	the surf to the shelf break zone. Migratory	ocean-side waters from the surf to the shelf break zone. Migratory
Cobia *(Rachycentron canadum)*	Pelagic waters with sandy shoals of capes and offshore bars, high profile rocky bottom and barrier island ocean-side waters from the surf to the shelf break zone. Migratory	Pelagic waters with sandy shoals of capes and offshore bars, high profile rocky bottom and barrier island ocean-side waters from the surf to the shelf break zone. Migratory	Pelagic waters with sandy shoals of capes and offshore bars, high profile rocky bottom and barrier island ocean-side waters from the surf to the shelf break zone. Migratory	Pelagic waters with sandy shoals of capes and offshore bars, high profile rocky bottom and barrier island ocean-side waters from the surf to the shelf break zone. Migratory
Highly Migratory Species				
Skipjack Tuna (*Katsuwonus pelamis)*				Circumglobal, epipelagic, oceanic
Yellowfin Tuna (*Thunnus albacares*)			Epipelagic and Oceanic	
Shark Species				
Managed Species	Neonates		Juveniles	Adults
Sand tiger shark *(Odontaspis taurus)*	Shallow coastal waters		Shallow coastal Waters to the 25m isobath	
Common thresher shark (*Alopias vulpinus)*	Coastal and oceanic waters		Coastal and oceanic waters	Coastal and oceanic waters
Dusky shark *(Charcharinus obscurus)*	Shallow coastal waters			
Sandbar shark *(Charcharinus plumbeus)*	Shallow coastal waters		Coastal and pelagic waters	Coastal and pelagic waters
Sandbar shark *(Charcharinus plumbeus)* ***HAPC***	Shallow coastal waters		Coastal and pelagic waters	Coastal and pelagic waters
Smoothhound shark (Mustelus mustelus)	Atlantic coastal areas from Cape Cod Bay, Massachusetts to South Carolina, inclusive of inshore bays and estuaries and continental shelf habitats between southern NJ and Cape Hatteras		Atlantic coastal areas from Cape Cod Bay, Massachusetts to South Carolina, inclusive of inshore bays and estuaries and continental shelf habitats between southern NJ and Cape Hatteras	Atlantic coastal areas from Cape Cod Bay, Massachusetts to South Carolina, inclusive of inshore bays and estuaries and continental shelf habitats between southern NJ and Cape Hatteras
Tiger shark *(Galeocerdo cuvieri)*			Coastal areas between the 25 and 100 m isobaths	Offshore waters south of Chesapeake Bay, MD
White shark *(Carcharodon carcharias)*	Mid- and southern west coast of Florida in the Gulf of Mexico, and mid- and NE coast of FL, SC, and NC in the Atlantic.			

Table 3. NJBB EFH Life Stages Identified in EFH Mapper. (Within 10 Minute X 10 Minute Squares in Table 2				
Managed Species	Eggs	Larvae	Juveniles	Adults
	Maryland to Cape Cod.			
***Digital mapping and location queries were unavailable, maps in NEFMC (2017) were utilized for life stage mapping of New England Fishery Management Species that occur in NJBB Study Area Waters**				

Table 4. Fish Species Early Life Stages in Great Bay	
SPECIES	LIFE STAGE
Smooth dogfish *(Mustelus canis)*	J
American eel *(Anguilla rostrata)*	J
Conger eel *(Conger oceanicus)*	J
Blueback herring *(Alosa aestivalis)*	
Alewife *(A. pseudoharengus)*	
American shad *(A. sapidissima)*	
Atlantic menhaden *(Brevoortia tyrannus)*	ELJ
Atlantic herring *(Clupea harengus)*	LJ
Striped anchovy *(Anchoa hepsetus)*	ELJ
Bay anchovy *(A. mitchilli)*	ELJ
Inshore lizardfish *(Synodus foetens)*	LJ
Pollack *(Pollachius virens)*	J
Red hake *(Urophycis chuss)*	EJ
Spotted hake *(U. regia)*	J
White hake *(U. tenuis)*	J
Striped cusk-eel *(Ophidion marginatum)*	J
Oyster toadfish *(Opsanus tau)*	ELJ
Atlantic needlefish *(Strongylura marina)*	LJ
Sheepshead minnow *(Cyprinodon varigatus)*	ELJ
Mummichog *(Fundulus heteroclitus)*	ELJ
Spotfin killifish *(F. luciae)*	ELJ
Striped killifish *(F. majalis)*	ELJ
Rainwater killifish *(Lucania parva)*	ELJ
Rough silverside *(Membras martinica)*	ELJ
Inland silverside *(Menidia beryllina)*	ELJ
Atlantic silverside *(M. menidia)*	ELJ
Fourspine stickleback *(Apeltes quadracus)*	ELJ
Threespine stickleback *(Gasterosteus aculeatus)*	ELJ
Lined seahorse *(Hippocampus erectus)*	LJ

Table 4. Fish Species Early Life Stages in Great Bay	
SPECIES	LIFE STAGE
Northern pipefish *(Syngnathus fuscus)*	LJ
Striped searobin *(Prionotus evolans)*	LJ
Northern searobin *(P. carolinus)*	LJ
Grubby *(Myoxocephalus aenaeus)*	LJ
White perch *(Morone americana)*	L
Striped bass *(M. saxatilis)*	J
Black sea bass *(Centropristis striata)*	LJ
Bluefish *(Pomatomus saltatrix)*	LJ
Crevalle jack *(Carnax hippos)*	J
Gray snapper *(Lutjanus griseus)*	J
Scup *(Stenotomus chrysops)*	LJ
Silver perch *(Bairdiella chrysoura)*	LJ
Weakfish *(Cynoscion regalis)*	LJ
Spot *(Leiostomus xanthurus)*	LJ
Northern kingfish *(Menticirrhus saxatilis)*	J
Atlantic croaker *(Micropogonias undulates)*	LJ
Black drum *(Pogonias cromis)*	
Foureye butterflyfish *(Chaetodon ocellatus)*	J
Striped mullet *(Mugil cephalus)*	J
White mullet *(M. curema)*	J
Northern sennet *(Sphyraena borealis)*	J
Tautog *(Tautoga onitis)*	ELJ
Cunner *(Tautogolabrus adspersus)*	ELJ
Rock gunnel *(Pholis gunnellus)*	LJ
Northern stargazer *(Astroscopus guttatus)*	LJ
Feather blenny *(Hypsoblennius hentz)*	LJ
American sand lance *(Ammodytes americanus)*	ELJ
Darter goby *(Gobionellus boleosoma)*	LJ
Naked goby *(Gobiosoma bosci)*	ELJ
Seaboard goby *(G. ginsburgi)*	LJ
Butterfish *(Peprilus triacanthus)*	LJ
Windopane *(Scophthalmus aquosus)*	ELJ
Smallmouth flounder *(Etropus microstomus)*	LJ
Summer flounder *(Paralichtys dentatus)*	LJ
Winter flounder *(Pseudopleuronectes americanus)*	ELJ

Table 4. Fish Species Early Life Stages in Great Bay	
SPECIES	LIFE STAGE
Hogchoker *(Trinectes maculates)*	ELJ
Northern puffer *(Sphoeroides maculates)*	LJ

E = eggs; L = larvae;
J = juveniles

Source: Able, Kenneth W. and Fahay, Michael P. The First Year in the Life of Estuarine Fishes in the Middle Atlantic Bight. 1998.

5.5.5.2 Shellfish

N.J.A.C. 7:7-9.2 defines shellfish habitat "as an estuarine bay or river bottom which currently supports or has a history of production for hard clams (*Mercenaria mercenaria*), soft clams (*Mya arenaria*), eastern oysters (*Crassostrea virginica*), bay scallops (*Argopecten irradians*), or blue mussels (*Mytilus edulis*)."

In order to be considered regulated shellfish habitat, a site must meet the following parameters:

Habitat Quality

A shellfish habitat area is defined as an area which meets one or more of the following criteria:

- The area has a current shellfish density equal to or greater than 0.20 shellfish per square foot;
- The area has a history of natural shellfish production or is depicted as having high or moderate commercial value in the Distribution of Shellfish Resources in Relation to the New Jersey Intracoastal Waterway (U.S. Department of the Interior, 1963), "Inventory of New Jersey's Estuarine Shellfish Resources" (Division of Fish, Game and Wildlife, Bureau of Shellfisheries, 1983-present); and/or the "Inventory of Delaware Bays Estuarine Shellfish Resources" (Division of Fish, Game and Wildlife, Bureau of Shellfisheries, 1993);
- The area is designated by the State of New Jersey as a shellfish culture area; or
- The area is designated as productive at N.J.A.C. 7:25-24, Leasing of Atlantic and Delaware Bay bottom for Aquaculture.

Extensive shellfish beds, which fluctuate in quality and productivity, are found in the back bays and shallow marine waters of the study area. Atlantic surfclams, hard clams, blue mussels (*Mytilus edulis*) and blue crabs are common commercial and recreational shellfish within the coastal waters of the study area. Additionally, the soft clam (*Mya arenaria*), bay scallop, (*Aequipecten iradians concentricus*) and Eastern oyster (*Crassostrea virginica*) are also found at certain locations within the general project area. The affected area of the NJIWW in the vicinity of Shad Island is mapped in the

USFWS 1963 Shellfish Maps as historic shellfish beds designated as “hard clam high value – commercial.” The blue crab (*Callinectes sapidus*) and the hard clam are two of the most important invertebrates of recreational and commercial value along the New Jersey Atlantic coastal estuaries (USACE, 1999).

N.J.A.C. 7:12 provides rules for NJDEP to implement procedures to classify shellfish waters and their boundaries in order to protect the health, safety, and welfare from the risks associated with the consumption of shellfish. Classifications of shellfish waters were developed in accordance with the National Shellfish Sanitation Program (NSSP), a Federal/State cooperative program, guidelines. A number of factors determine the classification of shellfish waters that include ambient bacteriological water quality and point and non-point pollution sources. The classifications are: Approved, Conditionally Approved, Conditionally Restricted, Restricted, Prohibited, and Suspended. A review of the NJDEP Shellfish Classifications at https://www.state.nj.us/dep/bmw/nssphome.html demonstrates that the waters in and around the affected area (including the NJIWW) are all classified as “Approved”, and meet the water quality standards of the NSSP. The East Pool waters are not included in this classification system.

5.5.6 Endangered Species

Endangered species are those whose prospects for survival are in immediate danger because of a loss or change of habitat, over-exploitation, predation, competition or disease. Threatened species are those that may become endangered if conditions surrounding the species begin or continue to deteriorate. Species may be classified on a Federal or State basis. There are several listed or notable species of special concern that can be found along the New Jersey Coast; most of these are transient in the area. A list of Federal and/or State listed threatened or endangered species that occur within the New Jersey Back Bays and their general habitats is presented in Table 5.

Table 5. Federal and State Special Status Species

Species	**Status**	**General Habitat**	**Probability of Occurrence in Affected Areas**
American Bittern (*Botaurus lentiginosos*) BR	SE	Freshwater and brackish marshes for breeding season. Salt marshes rest of year.	High
Bald Eagle (*Haliaeetus leucocephalus*) BR/NB	SE/ ST	Forest edges, open water	High
Northern Harrier (*Circus cyaneus*) BR	SE	Tidal marshes	High
Red knot* (*Calidris canutus rufa*) NB	**FT***, SE	Sandy beaches, spits, marsh islands, tidal flats	High
Short-Eared Owl (*Asio flammeus*) BR	SE	Coastal marshes	High

Table 5. Federal and State Special Status Species			
Species	**Status**	**General Habitat**	**Probability of Occurrence in Affected Areas**
Black-Crowned Night-Heron (*Nycticorax nycticorax*) BR	ST	Maritime forests, scrub-shrub, mixed *Phragmites* marshes	High
Yellow-Crowned Night-Heron (Nyctanassa violacea)	ST	Maritime forests, scrub-shrub on barrier and bay islands	High
Osprey (*Pandion haliaetus*) BR	ST	Coastal rivers, marshes, bays & inlets. Nest on dead trees, platforms, poles	High
Piping plover (*Charadrius melodus*)	**FT**/ SE	Ocean beaches, inlets, washover areas, tidal flats	Very low
Black Rail* (*Laterallus jamaicensis*) BR/NB	**FT***, SE/ST	High marshes	High
Black Skimmer (*Rynchops niger*)	SE	Sandy beaches, inlets, sandbars, offshore islands	Moderate
Least Tern (*Sternula antillarum*)	SE	Sandy beaches, bay islands	Moderate
Roseate Tern (*Sterna dougallii*)	**FE**/SE	Beaches w/ vegetated dunes	Moderate
Sedge Wren (*Cistothorus platensis*)	SE	High marshes	Moderate
American oystercatcher (*Haematopus palliates*)	SOC	Breed in coastal beaches, inlet spits, and backbay marshes.	Moderate
Common Tern (*Sterna hirundo*)	SOC	Nest on islands, barrier beaches, coastal promontories, dredged material islands, and some other artificial structures.	Moderate
Saltmarsh sparrow *(Ammodramus caudacutus)*	SOC	Nesting in saltmarsh habitats.	High
Atlantic Loggerhead (*Caretta caretta*)	**FT**/SE	Marine/Estuarine Pelagic	Very Low
Kemp's Ridley (*Lepidochelys kempii*)	**FE**/SE	Marine/Estuarine Pelagic	Very Low
Atlantic Green Sea Turtle *(Chelonia mydas*)	**FT**/ST	Marine/Estuarine Pelagic	Very Low
North Atlantic Right Whale (*Eubalaena glacialis*)	**FE**/SE	Marine pelagic	None
Blue Whale	**FE**/SE	Marine pelagic	None

Table 5. Federal and State Special Status Species			
Species	**Status**	**General Habitat**	**Probability of Occurrence in Affected Areas**
(*Balaenoptera musculus*)			
Fin Whale (*Balaenoptera physalus*)	**FE**/SE	Marine pelagic	None
Humpback Whale (*Megaptera novaeangliae*)	**FE**/SE	Marine pelagic	None
Sei Whale (*Balaenoptera borealis*)	**FE**/SE	Marine pelagic	None
Sperm Whale (*Physeter microcephalus*)	**FE**/SE	Marine pelagic	None
Northern Long-Eared Bat (*Myotis septentrionalis*)	FT	Summertime roosts beneath the bark of live and dead trees.	Low
Atlantic Sturgeon* (*Acipenser oxyrinchus oxyrinchus*)	**FE***/SE	Marine/estuarine Demersal/pelagic	Low
Shortnose Sturgeon (*Acipenser brevirostrum*)	**FE**/SE	River mouths, tidal rivers, estuaries, and bays serve as prime habitat for the shortnose sturgeon. Mainly found in tidal Delaware River.	Very Low
Northeastern Beach Tiger Beetle (*Cincindela d. dorsalis*)	SE	Atlantic coast sandy beaches	None
Bronze Copper (butterfly) (*Lycaena hyllus*)	SE	Fresh and brackish marshes	Low
Seabeach amaranth* (*Amaranthus pumilus*)	**FT**/SE	Upper sandy beaches, accreting ends of inlets	None
American chaffseed (*Schwalbea americana*)	**FE**/SE	Early successional open, moist pine flatwoods, fire-maintained savannas, ecotonal areas between peaty wetlands and xeric (dry) sandy soils, bog borders, and other open grass-sedge systems.	None
Knieskern's beaked-rush (*Rhynchospora knieskernii*)	**FT**/SE	Early successional wetland habitats, often on bog-iron substrates adjacent to slow-moving streams in the Pinelands region.	None
Swamp pink (*Helonias bullata*)	**FT**/SE	Palustrine forested wetlands including swampy forested wetlands bordering meandering streamlets, headwater wetlands, sphagnous Atlantic white-cedar swamps, and spring seepage areas	None
FT= Federally Threatened FE= Federally Endangered			

Table 5. Federal and State Special Status Species			
Species	**Status**	**General Habitat**	**Probability of Occurrence in Affected Areas**
ST=State Threatened	*Informal or formal Section 7 Endangered Species Act consultation anticipated		
SE= State Endangered			
SOC=Species of Concern			
BR= Breeding Population Only			
NB= Non-Breeding Population Only			

A Section 7 Endangered Species Act review is being conducted in coordination with the Service's New Jersey Field Office for federally listed species. Species being reviewed include eastern black rail (*Laterallus jamaicensis* ssp. *jamaicensis*), red knot (*Calidris canutus rufa*), American chaffseed (*Schwalbea americana*), Knieskern's beaked-rush (*Rhynchospora knieskernii*), and swamp pink (*Helonias bullata*). Red knot and eastern black rail are the only species that occur in the project area.

The red knot (*Calidris canutus rufa*) is listed as federally-threatened (2015) and state-listed as endangered (2007). The species is a large shorebird with a short straight black bill. During the breeding season, the breast and belly are a characteristic russet color (salmon to brick red). When not breeding, the bird is gray above with dirty white below with faint dark streaking. Small numbers of red knots may occur in New Jersey year-round, while large numbers of birds rely on New Jersey's coastal stopover habitats during the spring (mid-May through early June) and fall (late July through November) migration periods. The primary wintering areas for the *rufa* red knot include the southern tip of South America, northern Brazil, the Caribbean, and the southeastern and Gulf coasts of the U.S. Large flocks begin arriving at stopover areas along the Delaware Bay and New Jersey's Atlantic Ocean coast each spring. The birds feed on invertebrates, especially horseshoe crab eggs as well as clams, mussels, snails, small crustaceans, and marine worms. Horseshoe crab eggs, unlike any other food resource, are quickly metabolized into fat that is critical for red knots to double their body weight to reach their Arctic summer breeding grounds and successfully reproduce. With a decline in horseshoe crab populations during the 90's due to harvesting produced a commensurate decline in red knot populations. Although primarily found within the Delaware Bay shoreline, red knots may be found anywhere along New Jersey's ocean coasts and backbays, large numbers of migrating birds are known to use stopover habitats in Cumberland, Cape May, and Atlantic Counties.

The eastern black rail (*Laterallus jamaicensis jamaicensis*) is State endangered, and will be listed November 9, 2020 as a Federally threatened species under the Section 4(d) provisions of the Endangered Species Act. The eastern black rail is a marsh bird with a broad nesting range including the northeast, southeast and interior portions of the United States. In the northeastern United States, the eastern black rail can typically be found in salt and brackish marshes with dense cover but can also be found in upland areas of these marshes. Further south along the Atlantic coast, eastern black rail habitat

includes impounded and unimpounded salt and brackish marshes. The eastern black rail has a high potential to occur within the affected East Pool and marshes adjacent to the NJIWW.

The roseate tern (*Sterna dougallii*) is a medium-sized tern and primarily tropical but breeds in scattered coastal localities in the northern Atlantic temperate zone. It is Federally listed as endangered in the northeast region, including New Jersey. The roseate tern is not likely to be encountered within the affected areas.

There are five federally-listed threatened or endangered sea turtles that can occur off the coast of New Jersey, but are also known to venture into the inland bays to feed. The endangered Kemp's ridley turtle (*Lepidochelys kempii*), leatherback turtle (*Dermochelys coriacea*) and hawksbill turtle (*Eretmochelys imbricata*), and the threatened green turtle (*Chelonia mydas*) and loggerhead turtle *(Caretta caretta*). With the exception of the loggerhead, these species breed from Florida through the Caribbean and the Gulf of Mexico. The loggerhead may have historically nested on coastal barrier beaches. No known nesting sites are within the project area. All five species of sea turtles are listed in the State of New Jersey.

There are six federally listed species of endangered whales that have been observed along the New Jersey Atlantic Coast. The North Atlantic right (*Eubalaena* glacialis), fin whale (*Balaenoptera physalus*), and humpback whale (*Megapter novaeangliae*) are found seasonally in waters off New Jersey. The sperm whale (*Physeter catodon*), Sei (*Balaenoptera borealis),* and blue whale *(Balaenoptera musculus*) may be present in deeper offshore waters. These are migratory animals that travel north and south along the Atlantic coast. All six species of whales are listed in the State of New Jersey. These species are not expected to occur within the affected areas.

The Atlantic sturgeon is a federally and state-listed endangered anadromous fish. Adult and subadults can use the nearshore waters as a migratory corridor. Atlantic sturgeon spawn in the freshwater regions of the Delaware River. By the end of their first summer the majority of young-of-the-year Atlantic sturgeon remain in their natal river while older subadults begin to migrate to the lower Delaware Bay or nearshore Atlantic Ocean. The species is not known to occur in the project area, but could potentially be present.

The shortnose sturgeon (*Acipenser brevirostrum*) is also a federally- and state-listed endangered anadromous fish. The shortnose sturgeon generally lives in the freshwater reaches of rivers but make short trips into saltwater. Shortnose sturgeon conduct freshwater spawning migrations and are typically found in fresh and estuarine waters. Shortnose sturgeon rarely migrate between river systems or inhabit marine waters (Brundage and Meadows, 1982) and are not expected to occur in the project area.

The bald eagle (*Haliaeetus leucocephalus*) was listed as a federally endangered species throughout the United States in 1978. Most bald eagle nests are located in large wooded areas associated with marshes and other water bodies. Based on improvements in bald eagle population figures for the contiguous United States, the

U.S. Fish and Wildlife Service removed the bald eagle from the Endangered Species list in June 2007. The New Jersey Department of Environmental Protection reported that there were 211 pairs of bald eagles within the state in 2019 (Conserve Wildlife Foundation NJ http://www.conservewildlifenj.org/protecting/projects/baldeagle/ accessed on 116/2020). Although the bald eagle has been removed from the Endangered Species list, the bird is still protected by the Migratory Bird Treaty Act and the Bald and Golden Eagle Protection Act. These laws prohibit killing, selling or otherwise harming eagles, their nests, or eggs. The bald eagle has remained a state-listed species in New Jersey.

Peregrine falcons (*Falco peregrinus*) were placed on the Endangered Species list as endangered in 1984, however, like the bald eagle, their numbers in the Northeast region have been steadily increasing (Steidl *et al*., 1991). The peregrine falcon was removed from the Endangered Species list in August 1999. The bird continues to be protected by the Migratory Bird Treaty Act, which prohibits the taking, killing, possession, transportation, and importation of migratory birds, their eggs, parts, and nests except when specifically authorized by the Interior Department. The peregrine falcon remains a state-listed species in New Jersey.

There are currently 34 bird species state-listed as endangered or threatened in New Jersey. A few of these, such as the black skimmer, the least tern, and the roseate tern occur along Atlantic ocean beaches. Several raptors occur in the area including the state-listed endangered northern harrier (*Circus cyaneus*), short eared owl (*Asio flammeus*), osprey (*Pandion haliaetus*), and barred owl (*Strix varia*).

The harbor porpoise (*Phocoena phocoena*) and the bottlenose dolphin (*Tursiops truncatus*) are New Jersey species of special concern. These species, as are all marine mammals, are protected under the Marine Mammal Protection Act. While mid-Atlantic waters are the southern extreme of their distribution, stranding data indicate a strong presence of harbor porpoise off the coast of New Jersey, predominately during spring.

The northern diamondback terrapin (*Malaclemys terrapin terrapin*), considered a species of special concern, is known to occur in in the affected area. The diamondback terrapin occupies brackish tidal marshes and nests on sandy bay beaches.

5.6 Cultural Resources

The NJIWW was conceived in 1808 and constructed in sections during the late 1800s and 1900s, and serves as a protected navigation route for private, commercial and military vessels. The section of the NJIWW within the Area of Potential Effect is not listed on the National Register of Historic Places.

Some EBFNWR lands were formerly occupied by the Lenni Lenape. Some artifacts have been found when conducting Section 106 investigations in various refuge locations, primarily in the vicinity of the refuge Headquarters in Galloway, Township. These artifacts were largely remnants of pre-Industrial homesteads. No sites eligible for

listing on the National Register of Historic Places (NRHP) are within the project Area of Potential Effect (APE); therefore, no historic properties eligible for or listed on the NRHP would be affected by the proposed project.

5.7 Socioeconomics

The affected area is located in Atlantic County whose largest industry is the accommodation and food services industry that comprise an estimated 42,750 workers in 2014. About 32% of the workforce in Atlantic County is employed in this industry. The high concentration of the leisure and hospitality industry is attributed to the area's casino resorts (Atlantic City), hotels, and other resorts located along the barrier island beaches. Other major industries in Atlantic County are Health Care and Social Assistance, and in Retail Trade, which account for 13% and 12% of the workforce, respectively (Heyer, Gruel & Associates, 2018).

The EBFNWR is located 6 miles from Atlantic City, New Jersey, but located in Ocean, Burlington and Atlantic counties (1.3 million residents) (US Places.com 2019). Predominant land uses in the vicinity of the refuge are residential and commercial development. The refuge averages about 250,000 visitors per year. Total expenditures from refuge visitors were $4.1 million with non-residents accounting for $2.6 million or 62 percent of that total in 2017 (Caudill and Carver 2019).

5.8 Environmental Justice

Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, requires all Federal agencies to incorporate environmental justice into their missions by identifying and addressing disproportionately high or adverse human health or environmental effects of their programs and policies on minorities and low-income populations and communities.

5.9 Recreation

Recreation and ecotourism services provided by the inland bays of Great Bay and Little Bay, adjacent resort communities of Brigantine and Atlantic City, and recreational services provided by EBFNWR are a significant economic driver for tourism for the State of New Jersey. Anglers in the inland bay's waters and tidal creeks typically target summer flounder (fluke), winter flounder, weakfish, bluefish, striped bass, kingfish, white perch, and tautog. Other popular recreational activities include beach combing, swimming, sunbathing, boating, water skiing, jet skiing, paddling (canoes, kayaks, stand-up paddle boards), windsurfing, and bird watching.

5.9.1 Visitor and Use Experience

The EBFNWR is open to all six of the Refuge System's priority public uses (hunting, fishing, wildlife observation, wildlife photography, environmental education and

environmental interpretation). About 250,000 people visit the refuge each year with about 125,00 of those visitors accessing the Wildlife Drive, which surround the project area.

5.10 Visual and Aesthetics

Aesthetics refer to the sensory quality of the resources (sight, sound, smell, taste, and touch) and especially with respect to judgment about their pleasurable qualities (Canter 1993; Smardon *et al*. 1986). The aesthetic quality of the study area is influenced by the natural and developed environment. Visual resources include the natural and man-made features that comprise the visual qualities of a given area, or "viewshed." These features form the overall impression that an observer receives of an area or its landscape character. Topography, water, vegetation, man-made features, and the degree of panoramic views available are examples of visual characteristics of an area. The project area, situated in a National Wildlife Refuge, possesses exceptional natural aesthetics due to its predominant coastal water environment surrounded by natural undeveloped green marshes, wildlife, and bayscapes.

6.0 Environmental Impacts

The No Action alternative would allow the continuation of the significant public safety hazard to boaters that utilize the shoaled portions of the NJIWW. The existing degraded ecological conditions identified within the East Pool would also continue to worsen. Habitat quality will diminish in the East Pool as vegetation is lost and converted to open water over time which will favor species that prefer open water habitats. However, most species that use the site require some vegetation, primarily for cover so a long-term negative effect is anticipated. Target species (*e.g.,* saltmarsh sparrow and Eastern black rail) will be adversely affected as marsh habitat continues to degrade and eventually disappear. The preferred alternative entails maintenance dredging activities to remove critical shoals from the authorized NJIWW Federal navigation project. Also, this action utilizes dredged material for beneficial purposes that would raise the base elevation of a portion of open water within the East Pool of EBFNWR to restore degraded high marsh that is being converted to open water due to subsidence. Environmental impacts considered in this Environmental Assessment are those associated with maintenance dredging, placement of material in open water, and placement of material on existing marsh habitats.

A summary of the long-term and short-term impacts associated with implementation of the No Action and preferred alternative (Maintenance Dredging with Beneficial Use Placement in East Pool) is provided below.

6.1 Land Use

No Action: No action would result in continued shoaling of the channel resulting in increases in navigation hazards. Ultimately, this may result in reduced usage of the

NJIWW in this location, create life safety issues, and negatively impact operations and responsibilities of the USCG.

Current levels of use of refuge infrastructure would be maintained under this alternative and have little impact to the environment.

Preferred Alternative: Maintenance dredging of the NJIWW would continue to allow for safe navigation through this area and existing uses of the channel would be continued, as required by the USCG and the federal channel authorization.

No changes to existing infrastructure would occur as a part of this project and it is needed to maintain integrity of the project.

6.2 Climate and Climate Change

No Action: No action would not produce any significant differences in greenhouse gas emissions although the lack of maintenance of the NJIWW could produce a reduction of motorized boat usage, and thus a small reduction in greenhouse gases. The backbay region of New Jersey is a dynamic environment that is densely populated. Hurricane Sandy emphasized the vulnerability of the area to coastal storms that are expected to become more frequent and devastating in the future with climate change and rising sea levels. In the absence of channel dredging and placement operations, no dredged material placement will occur in areas where it could potentially provide additional resilience and these areas would continue to be exposed to the cumulative damages of inundation. The study area that is currently at risk will likely see an increase in future damage with the expected sea level rise in the future without project condition. Valuable foraging and nesting habitats will be impacted as sea level rises.

Preferred Alternative: Maintenance dredging of the NJIWW would produce minimal amounts of greenhouse gases during construction and current motorized boat usage is expected to be maintained. However, this is not expected to have significant effects on climate and climate change.

The placement of dredged sediments into the East Pool is expected to contribute to greater resiliency of the East Pool to changes in sea level rise, which are stressors created by changing climate.

6.3 Geology, Topography and Soils

No Action: No action would allow the continuation of shoaling and infilling of the NJIWW with sandy/silty sediments which would raise the bathymetry by decreasing the depths of the channel.

Subsidence of the East Pool Impoundment is expected to continue resulting in changes in bathymetry, open water increases and marsh losses. No changes to groundwater within the Cohansey-Kirkwood Aquifer are expected.

Preferred Alternative: Maintenance dredging of the NJIWW would deepen shoaled- in areas by 1-4 feet to maintain the channel at the authorized depth of -6 ft. MLLW. No significant changes in sediment substrate composition are anticipated.

Subsidence of the East Pool Impoundment is expected to continue. However, the placement of dredged material into the East Pool would increase the elevation by as much as a foot with sandy/silty material within the affected areas. It is expected that sandy material would drop out immediately near the dredge slurry discharge locations and the silty material could drop out and settle up to 1,000 feet away, if unimpeded, from the discharge locations. The sandy material is not expected to consolidate much, but the mass of the sand could compress the underlying soft sediments and cause some minor subsidence. The silty material is expected to undergo consolidation where the finished elevation after a few months may be less than the initial placement elevation. The preferred plan is not expected to introduce contaminants into the groundwater system. Therefore, no changes to groundwater within the Cohansey-Kirkwood Aquifer are expected.

6.4 Air and Surface Water Quality

6.4.1 Air Quality

No Action: No additional inputs to the air will occur as a result of no action. No action would not affect air quality in the vicinity of the NJIWW or East Pool or contribute to air quality degradation in the region.

Preferred Alternative: A negligible, short-term adverse impact would be associated with construction as sediment is added to the East Pool. Generators, pumps, and dredges would increase emissions to complete the project. That impact would cease upon project completion and no other emissions would occur thereafter. There would be some minor, short-term impacts (approximately 3 weeks) on noise and air quality. The dredging and beneficial use site are not immediately adjacent to residential areas, and no long-term impacts are anticipated from the selected alternative. Based upon the quantity of material to be dredged and the small magnitude and duration of construction, it is estimated that air emissions for this action would be below the *de minimis* threshold for a marginal ozone nonattainment area (100 tons/year of NOx and 100 tons/year VOC). Therefore, this project would result in the maintenance of existing regional conditions. Additionally, this action is exempt from CAA requirements in accordance with 40 CFR 93.153 c.2.ix where it states “Maintenance dredging and debris disposal where no new depths are required, applicable permits are secured, and disposal will be at an approved disposal site” shall not apply under § 93.153. Therefore, a General Conformity determination is not required.

6.4.2 Surface Water Quality

No Action: No action would not affect water quality in the vicinity of the NJIWW or East

Pool or contribute to water quality degradation in the region.

Preferred Alternative: Significant impacts to water quality are not anticipated from implementation of any of the components to the selected plan. Short-term, temporary and localized impacts to water quality in the form of turbidity are anticipated to occur from maintenance dredging and depositing fine-grained and sandy sediment within the East Pool. Any potential effects would be short-lived and localized and would be limited to the immediate vicinity of the dredging sites and the area that receives dredged material. In this case, the effects would primarily be experienced within the East Pool, which, although is tidally connected, it is not open to all tidal currents and bay circulation due to the relatively confined nature of the impoundment. During construction, the water slurry brought into the East Pool will be full of suspended sediment, and it is expected that turbidity may remain for a few weeks within the impoundment as the fine particles settle. It is anticipated that at the discharge points, sandy material would settle out first especially within the confinement structures. In this zone, elevation building would be most rapid. Suspended fine-grained sediments would travel further from the discharge point within approximately 1,000 feet of the discharge point before settling out. Existing salt marsh surfaces within the impoundment may act as natural baffles to promote settlement of suspended sediments. However, it is expected that suspended fine-grained materials containing clay particles and flocculants may exit the impoundment during ebb flows, which may produce a visible turbidity plume exiting the impoundment. Ebb flows from the impoundment would readily mix with the receiving waters.

Best Management Practices (such as the use of various confinement techniques) would be used and may be mandated by conditions contained in State approvals (i.e., 401 Water Quality and Coastal Zone Management Certifications) and would minimize water quality impacts during project implementation. Therefore, no long-term adverse impacts are anticipated. As discussed, a review of the sediment quality for suitability for placement in the East Pool is being conducted by the Service. Additionally, the NJDEP will be reviewing the sediment quality data for beneficial use suitability in accordance with their Section 401 Water Quality Certification review. No sediment placement would occur prior to the satisfactory conclusions of these reviews.

6.5 Biological Resources

6.5.1 Terrestrial Habitats

No Action: No action within the NJIWW channel is not expected to have any effects on terrestrial habitats. However, the No Action alternative would result in the continued loss of habitat within the region due to erosion and subsidence within the East Pool.

Preferred Alternative: Maintenance dredging operations of the NJIWW would occur entirely within subtidal areas, therefore, no terrestrial habitats would be affected within the channel.

There would be temporary adverse impacts to existing terrestrial habitats during construction from construction equipment and access. Temporary minor effects would disturb saltmarsh on the outside of the impoundment dike as it makes landfall to install the “Y” valve into the impoundment. In recently completed projects in New Jersey and outside of New Jersey, dredged material has been used to restore eroded marsh along the Atlantic and Gulf Coasts with great success. Applications of dredged material have shown improved marsh health, function and resiliency with very short recovery times. This action would result in positive ecological benefits to the salt marsh complex within the East Pool of EBFNWR, which provides important resting, feeding and nesting habitat to many migratory and resident species of birds. This project is intended to demonstrate the benefits that can be achieved with dredged material in this back-bay, coastal environment.

6.5.2 Aquatic Habitats

No Action: No action would continue shoaling of the channel, however, this shoaling is not expected to change the existing habitat (E1UBL).

Continued subsidence within the East Pool is expected to result in increased losses of saltmarsh habitats and conversions to open water habitats within the impoundment.

Preferred Alternative: Maintenance dredging within the existing NJIWW channel would impact approximately 3 acres of subtidal (E1UBL) existing benthic habitats, but similar habitat would remain after dredging. The benthic community within the navigation channel should recover to pre-dredge conditions within 1-2 years after disturbance.

Approximately 10 to 15 acres of soft bottom open water subtidal (E1UBLx) habitat would be converted to intertidal mudflat (E2UB) and saltmarsh (E2EM) due to the placement of dredged material within the East Pool.

6.5.3 Wildlife

No Action: No action (no maintenance dredging) is not expected to have any effects within the NJIWW channel and surrounding marshes.

Habitat quality will diminish in the East Pool as vegetation is lost and converted to open water over time which will favor species that prefer open water habitats. However, most species that use the site require some vegetation, primarily for cover; therefore, a long-term negative effect is anticipated. Target species (*e.g.,* saltmarsh sparrow and Eastern black rail) will be adversely affected as marsh habitat continues to degrade and eventually disappear.

Preferred Alternative: The marshes along the NJIWW provide breeding, foraging, nesting and resting areas for many species of migratory birds, including shorebirds, wading birds, raptors and waterfowl. Species will benefit from the addition of sediment and the subsequent vegetation as we seek to re-build lost marsh. The action will result

in a long-term positive impact. The proposed project is intended to improve ecosystem functions, services and resiliency—including improvement in water quality, and the enhancement and creation of fish, migratory bird, wading bird, and waterfowl habitat. No long-term adverse impacts to wildlife resources utilizing the selected restoration sites are anticipated as a result of this project. Ultimately, these improvements would benefit trust species of EBFNWR such as the Eastern black rail and saltmarsh sparrow. It is likely that construction activities would result in mortality of some burrowing animals such as crustaceans, mollusks, and some worms. Motile animals would be displaced during the construction period but would likely repopulate the site after construction and revegetation is completed. Disturbance to wildlife is also minimized by the timing of this action, which would occur during the winter when biological activities are less, and nesting is not disrupted by noise and physical disturbance.

During the construction window (about 2 – 3 weeks), migratory birds will likely be flushed away from the work zone(s). Due to the size of the pool and the availability of an expanse of habitat in the adjacent pools and marsh, there are alternatives sites for birds to move to during construction and impacts will be short-term and negligible. After construction, sediment will settle in the placement zones and be of varying elevations. While there may be a short-term loss of usable habitat due to changes on-site, it is expected that over a few months and moving into the spring, the site will recover, vegetation will grow to some extent, and birds will use the site. In the long-term, as the site potentially converts from open space to vegetated areas, a shift of bird use by species is expected (*e.g.*, shorebirds use mudflats and saltmarsh sparrows use vegetation). That change is the goal of the project and is a long-term positive impact.

6.5.4 Aquatic Invertebrates

No Action: No action is not expected to have any effects on the benthic community within the NJIWW.

Continued subsidence of marshes within the East Pool may convert/shift benthic invertebrate communities from generally a marsh assemblage to a subtidal open water assemblage**.**

Preferred Alternative: Short-term adverse impacts to benthic organisms would occur as a result of construction activities associated with dredging and placement activities. Dredging would result in the complete removal of the benthic community within portions of the NJIWW channel dredged (approximately 3 acres of bottom). Placement of dredged material in the East Pool may result in a layer of up to 1-foot in thickness over existing bottom, which may smother some less mobile benthic organism, while others may migrate vertically through thinner layers of dredged material placed. Recolonization is anticipated within one to two years for the dredging and placement sites. It is expected that these species, after construction, would repopulate the restored areas from nearby aquatic and marsh habitats. Conversion of subtidal open water to intertidal mudflat and marsh habitat may displace existing benthic invertebrates or result in a shift in the benthic community that would more favor intertidal habitats.

6.5.5 Fisheries

No Action: No action is not expected to have any significant changes on fisheries within the NJIWW channel from existing conditions.

Continued subsidence of the marshes within the East Pool would likely increase shallow open water habitats where some species may benefit while other species that depend on marsh habitats may be adversely affected. No action is not expected to have any significant changes on fisheries within the East Pool from existing conditions.

Preferred Alternative: The project will have limited and short-term impacts on finfish. With the exception of some small finfish, most bottom dwelling and pelagic fishes are highly mobile and should be capable of avoiding entrainment into the dredge and turbidity impacts due to dredging and placement operations. The primary impact to fisheries will be felt from the disturbance of benthic and epibenthic communities. The loss of benthos and epibenthos smothered as a result of dredged material discharges, and removal during maintenance dredging activities will temporarily disrupt the food chain in the impacted areas.

6.5.5.1 Essential Fish Habitat

No Action: No action is not expected to have any significant changes on essential fish habitat within the NJIWW channel from existing conditions.

Continued subsidence of the marshes within the East Pool would likely increase shallow open water essential fish habitat where some species may benefit while other species that depend on marsh habitats may be adversely affected. No action is not expected to have any significant changes (beneficial or adverse) on essential fish habitat within the East Pool from existing conditions.

Preferred Alternative: Two EFH worksheets submitted to the National Marine Fisheries Service (NMFS) are presented in Appendix B. Based on the above listed habitat utilization by the designated EFH species, it appears that most of the species will not be found in the immediate project areas, due to a depth requirement or the fact that they are migratory in nature (i.e., the sharks). There is the potential for a few species to be found in the NJIWW project area and these include: winter flounder, windowpane flounder, summer flounder, scup, and black sea bass. Maintenance dredging of the NJIWW would affect approximately 3 acres of subtidal open-water (E1UBL) within the channel. This effect is not expected to have significant adverse effects on EFH because it is not significantly changing the existing habitat (conversions) or resulting in any loss of habitat. A temporary loss of benthic prey items is expected to occur, but recolonization and recovery are expected within a few months to 2 years. It should be noted that the NJIWW channel is periodically disturbed from maintenance dredging activities. Most of the fish species listed are not estuarine resident species and therefore only utilize this area on a seasonal basis, primarily in the warmer summer

months (Dredging would occur in December, a time of lowered biological activity). During the summer months, the estuary is typically utilized as a forage area for juveniles and adults and as a nursery area for larvae and juveniles. Since adults and juveniles of the above-listed species are mobile, it is expected that they will avoid the areas of disturbance regardless of season, and therefore, will not be impacted. In addition, the actual footprint of the in-water construction work is relatively small, so any impacts to demersal eggs and larvae of various species will be minor. Discharges of dredged material into the East Pool may temporarily affect EFH for common prey species such as Atlantic silverside, mummichog, and sheepshead minnow.

Cumulative effects associated with these types of projects on EFH and managed species are not anticipated. The projects would have temporary minor impacts to the bottom habitat and demersal eggs/larvae of some species. However, once the construction is completed it is likely that the bottom areas would quickly recolonize. There would be small habitat conversions within the East Pool from open water (E1UBLx) to intertidal mudflat (E2UB) and saltmarsh (E2EM), which would have some adverse effects on EFH for some species and beneficial impacts on EFH for others. It is concluded that the projects would have a minimal direct effect on EFH and not result in cumulative impacts to EFH. The following measures are proposed to minimize adverse effects on EFH:

1. All in-water work would be avoided from January I to May 31 to minimize impacts to the EFH for the early life stages of winter flounder.

2. Confinement structures such as hay bales, wattles or other containment structures will be evaluated for their efficacy in minimizing the release of suspended sediment during material placement and their ability to effectively build elevation within the placement areas. However, these techniques may also be compared to unconfined placement.

6.5.5.2 Shellfish

No Action: Shellfish resources would remain unaffected with the no maintenance dredging of the NJIWW and no beneficial use placement of material within the East Pool.

Preferred Alternative: The NJIWW in the vicinity of Shad Island is historically mapped as “hard clam high commercial value” in the 1963 USFWS mapping. Maintenance dredging would affect approximately 3 acres of bottom potentially inhabited with hard clams. Other shellfish species affected may include blue crabs.

No recreational or commercial shellfish beds occur within the East Pool. However, turbidity generated from the placement of dredged material within the East Pool may have minor, temporary effects on hardclams within the receiving waterways.

6.5.6 Threatened and Endangered Species

No Action: With no action, no significant direct, indirect and cumulative changes to Federal and State listed threatened and endangered species are expected as described in the Affected Environment section. It is expected that current trends of populations and distribution of these species would continue unless significant new interventions or impacts are implemented. However, climate change and sea level rise may exacerbate conditions for some of these species. SLR may contribute to loss of intertidal foraging habitats critical for red knots.

Red knots use beach habitats and marsh mudflats and prefer the open, unvegetated sites located in the East Pool. Generally, they are not observed using the area so they do not significantly benefit from the site.

Eastern black rails require densely vegetated emergent wetlands. A moist to saturated substrate (occasionally dry) interspersed with or adjacent to very shallow water (between 1 and 6 centimeters), with elevated refugia to escape high water events is important. In the long term, the habitat in the East Pool will deteriorate and less of this type of habitat will be available.

Preferred Alternative: Due to the location of the proposed project along the NJIWW, the Federally listed Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus*), shortnose sturgeon (*Acipenser* brevirostrum), and several sea turtles have been considered for the maintenance dredging. The dredging component is not likely to adversely affect these species for the following reasons:

1. Shortnose sturgeon, although they could potentially occur in the affected area, are not known to occur in the project area.
2. Atlantic sturgeon could potentially occur within the NJIWW, but are not likely to become entrained into a small cutter-suction dredge.
3. Several species of sea turtles could potentially venture into the affected area; however, the work would occur in mid-late December when these species have migrated south to warmer waters. Additionally, these species are not likely to be entrained into a small cutter-suction dredge.

Maintenance dredging of the NJIWW would occur approximately 400 to 500 feet from the nearest saltmarsh shorelines and mudflats, and could be within sight of red knot and Eastern black rail habitat. Although the maintenance dredging is occurring in December, red knots could potentially be in the area feeding and affected by the noise and visual disturbance of a dredge operation. However, it is likely that red knots could relocate to a number of alternate locations nearby with suitable feeding/resting habitat. This disturbance would be temporary since work would only occur for approximately 2-3 weeks. Because of the time of year of dredging (December), there will be no black rail nesting activity or presence as they would have migrated to the south. Based on the available information, it has been determined that the maintenance dredging of the NJIWW is not likely to adversely affect the above listed threatened and endangered

species. This determination is being coordinated with the National Marine Fisheries Service and the U.S. Fish and Wildlife Service.

Within the East Pool, the addition of sediment during construction could have a short-term impact on red knots and black rails as they will be flushed – if they are present. However, construction in the winter for a two to three-week period reduces the likelihood of interaction, and while small numbers of red knots could potentially overwinter in New Jersey, black rails should not be present as they winter farther south.

In the long term, red knots will likely not benefit by the development of marsh vegetation to the East Pool, but they are not known to use the site in large numbers. Black rails will benefit significantly as the project is intended to create more vegetated habitat that meets their needs.

No adverse impacts are expected for American chaffseed, Knieskern's beaked-rush, and swamp pink as those species do not occur at the project site.

The project would have no adverse impact on State-listed species of birds. The projects are intended to restore important resting, feeding and nesting habitat for these species. Therefore, the dredged material placement within the East Pool is not likely to adversely affect these species.

6.6 Cultural Resources

No Action: No adverse effects on cultural resources would result from taking no action.

Preferred Alternative: Since the NJIWW will only be dredged to its previously authorized depth, and since the placement of dredged material will serve to stabilize and restore marshes in the East Pool, it has been determined that the proposed action will have *No Effect* on historic properties eligible for or listed on the National Register of Historic Places pursuant to 36CFR800.4(d)(1). The New Jersey State Historic Preservation Office (SHPO) has been requested to review the proposed project and provide their concurrence with this determination prior to construction.

6.7 Socioeconomics

No Action: No action would continue shoaling of the NJIWW, which would result in increased navigation hazards and less recreational boat usage, which would have adverse socioeconomic effects.

For placement into East Pool, no changes in local expenditures are expected by the public.

Preferred Alternative: Maintenance dredging of the NJIWW would provide a safer navigation channel for recreational boaters, which would have net positive economic benefits.

For dredged material placement into East Pool, no changes in local expenditures are expected by the public.

6.8 Environmental Justice

No Action: No action is not expected to result in any disproportionately high and adverse human health and environmental effects on minority populations and low-income populations.

Preferred Alternative: None expected; no affected populations. Maintenance of the NJIWW is expected to comply with Executive Order 12898, which requires that "each Federal agency make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health and environmental effects of its programs, policies, and activities on minority populations and low-income populations."

For the placement of dredged material in the East Pool, the Corps has not identified any potential high and adverse environmental or human health impacts from this proposed action or any of the alternatives. The Corps has identified no minority or low-income communities within the impact area. Minority or low-income communities will not be disproportionately affected by any impacts from this proposed action or any of the alternatives.

6.9 Recreation

No Action: Under the No Action Alternative, the NJIWW navigation channel would continue to shoal, which would result in a negative effect on navigation, recreational boating, and safety. The No Action Alternative would not meet the objective of the project, which is to beneficially use maintenance dredged material for habitat creation. For the East Pool, no impact to visitor use would occur if the project is not implemented.

Preferred Alternative: Maintenance dredging of the NJIWW would result in indirect beneficial effects on recreational resources. Dredging is necessary for maintaining the safety of the navigation channel which would benefit recreational boating, which supports fishing and other watercraft-related recreational activities.

For the East Pool, short term impacts to visitor use would occur during the few weeks of the construction window. The EBFNWR would likely close a portion of the Wildlife Drive so the public would not interfere with the project. Once the sediment placement is complete, the Drive would re-open and full use would continue. Change in the habitat, especially post-construction, could reduce the quality of some wildlife viewing sites, but that would be expected to recover as time passes.

6.10 Visual and Aesthetics

No Action: Under the No Action alternative, there would be no effects on visual and aesthetics of the project area.

Preferred Alternative: Maintenance dredging the NJIWW channel with associated equipment and floating pipeline may have a temporary minor adverse impact on the visual aesthetics of the natural setting situated within a wildlife refuge during construction. The noise and exhaust generated from diesel engines would also produce temporary minor adverse effects on aesthetics. These effects are short-term and would be conducted during a time of minimal usage by the public.

For the East Pool, short-term minor effects on aesthetics are expected during the pumping of the dredged material slurry into the impoundment. Pipelines and construction equipment may affect sights and sounds along Wildlife Drive. In addition, temporary odors composed of hydrogen sulfide may be present as previously anaerobic channel sediments are pumped in the area. This should quickly dissipate upon cessation of dredging. These effects are short-term. Once pumping is complete, the dredged sediments will blend in with the surrounding landscape as a mudflat and eventually become vegetated with native marsh plants.

6.11 Cumulative Impacts

The National Environmental Policy Act (NEPA) defines cumulative effects as: “the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or Non-Federal) or person undertakes such other actions” (40 CFR 1508.7).

No Action: No cumulative impacts resulting from dredging or placement would occur in the absence of these operations.

Preferred Alternative: Past actions that have occurred in back bays not associated with navigation channel dredging include bulkheading, piling driving, the filling of saltmarshes, and the destruction of maritime forest for development. These actions have degraded the habitat quality within the region. Development in turn attracts more recreational users to the bay. Boaters impact bay habitats with water pollution and disturbance to saltmarshes and SAV beds with boat wakes. Future activities in the back bays are anticipated to remain similar to those present actions.

Cumulative impacts associated with the proposed action (*i.e*. beneficial use of dredged material) are positive effects. Use of the dredged material to reduce depths within the East Pool to promote the development of saltmarsh in areas currently subsiding and converting to open water. This will benefit the overall bay ecosystem in the area and help in combatting adverse effects due to sea level rise. For dredging the NJIWW, no adverse cumulative effects would occur to benthic invertebrate resources or fish as

benthic organisms are known to recolonize disturbed bottom and fish are mobile and can leave the area temporarily while turbidity is elevated.

6.12 Short-term Uses of the Environment and Long-term Productivity

No Action: No short-term uses of the environment or long-term productivity would result.

Preferred Alternative: The proposed action will ensure that a valuable resource of clean channel sediments will remain in the bay system and be put to productive use. Placements within the East Pool will potentially increase/restore habitat suitable for intertidal mudflat and saltmarsh development within an impoundment experiencing subsidence and consequential marsh losses and increasing open water. The Service will conduct monitoring of this placement, which will provide valuable information for potential future beneficial use that use Regional Sediment Management (RSM) and Engineering with Nature (EWN)-based applications in the project area, but also in other parts of coastal NJ. Adverse impacts to the placement area are short-term and minimal as marsh vegetation and benthic fauna will re-establish.

6.13 Irreversible and Irretrievable Commitments of Resources

No Action: No commitment of resources. For Service staff administration, no commitment of funds beyond current spending levels would be needed to implement this alternative. Staff would continue to monitor water levels and marsh vegetation over time.

Preferred Alternative: The maintenance dredging of the NJIWW channel and beneficial use placement within the East Pool utilizes time and fossil fuels, which are irreversible and irretrievable. Impacts to the benthic community would not be irreversible, as benthic communities recolonize through recruitment from neighboring areas with cessation of dredging/placement activities. For Service administration, estimated staff costs to implement this alternative are $16,716.15. This is largely due to project planning and post-construction monitoring. The Service anticipates about 365 days of refuge staff time that includes biologists and managers. These funds are available from the refuge's annual operating budget.

7.0 Relationship of Selected Plan to Environmental Requirements, Protection Statutes, and Other Requirements

Compliance with environmental quality protection statutes and other environmental review requirements is ongoing. Table 6 provides a listing of compliance with environmental statutes. The project requires State approval pursuant to Section 401 of the Clean Water Act, Section 307 of the Coastal Zone Management Act and Section 106 of the National Historic Preservation Act. The Corps has applied for these approvals. All approvals will be obtained prior to initiation of construction. A Federal consistency evaluation is presented in Appendix C.

The project discussed in this EA is being coordinated with the U.S. Fish and Wildlife Service and the National Marine Fisheries Service regarding issues related to Section 7 of the Endangered Species Act of 1977 (16 U.S. C. 1531 et seq.). For marine fisheries, a “NOAA Fisheries Greater Atlantic Regional Fisheries Office ESA Section 7: NLAA Program Verification Form” is presented in Appendix D.

This project is also being coordinated with NMFS regarding Essential Fish Habitat pursuant to Section 305(b)(2) of the Magnuson-Stevens Fishery Conservation and Management Act (1996 amendments). A “NOAA Fisheries Greater Atlantic Regional Fisheries Office Essential Fish Habitat (EFH) Assessment & Fish and Wildlife Coordination Act (FWCA) Worksheet” has been prepared and is presented in Appendix E.

This EA concludes that the proposed maintenance of the NJIWW and beneficial use placement of dredged material within the East Pool of the Edwin B. Forsythe National Wildlife Refuge is not a major Federal action significantly affecting the human environment. Therefore, it has been determined that preparation of an Environmental Impact Statement is not warranted for the project as identified herein, and a Finding of No Significant Impact (FONSI) for the proposed project is appropriate.

Table 6. Compliance of the Proposed Action with Environmental Protection Statutes and other Environmental Requirements

STATUTES	**COMPLIANCE STATUS**
Clean Air Act	Complete
Clean Water Act	In progress
Coastal Zone Management Act	In progress
Endangered Species Act	In progress
Fish and Wildlife Coordination Act	In progress
National Historic Preservation Act	In progress
National Environmental Policy Act	In progress
Environmental Justice (E.O. 12898)	Complete
Marine Mammals Protection Act of 1972	Complete
Magnuson-Stevens Fishery Conservation and Management Act of 1976	In progress
Submerged Lands Act of 1953	Complete

STATUTES	COMPLIANCE STATUS
Rivers and Harbors Act of 1899	Complete
Coastal Barrier Resources Act and Coastal Barrier Improvement Act of 1990	NA
Anadromous Fish Conservation Act	Complete
Migratory Bird Treaty Act and Migratory Bird Conservation Act	Complete
Marine Protection, Research and Sanctuaries Act (Ocean Dumping Act)	NA
Executive Order 11988, Floodplain Management	Complete
Executive Order 12898, Environmental Justice	Complete
Executive Order 13045, Disparate Risks Involving Children	Complete

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APPENDIX A

Section 404(B)(1) Analysis

Section 404(b)(1) Analysis

A review of the impacts associated with discharges to waters of the United States for Channel Maintenance & Beneficial Use of Dredged Material Project at East Pool- Edwin B. Forsythe National Wildlife Refuge - New Jersey Intracoastal Waterway Atlantic County, New Jersey is required by Section 404(b)(1) of the Clean Water Act, as amended (Public Law 92-500).

I. PROJECT DESCRIPTION

A. Location. The project area is located in Atlantic County, New Jersey.

B. General Description. Project descriptions and objectives are provided in Sections 3.0 and 4.0 of this EA.

C. Purpose. The purpose of this project is to remove critical shoals from the NJIWW that pose a hazard to navigation and public safety. A secondary purpose is to utilize the dredged material for restoration of degraded and eroding coastal habitats.

D. General Description of Dredged or Fill Material.

1. General Characteristics of Material: sand/silt

2. Quantity of Discharge: The estimated quantity of dredged material is 6,000 to 10,000 cubic yards.

3. Source of Material: All material would be obtained from the existing NJIWW Federal navigation project. For the East Pool, project material would be removed between channel markers 152 and 160.

E. Description of Discharge Sites.

1. Location: See Figures 2 through 5 in the EA for the East Pool location.

2. Size (acres): East Pool Impoundment is approximately 500 acres in size. Discharge is expected to impact approximately 60 acres from confined and unconfined placement within the impoundment.

3. Type of Sites: The East Pool is an intertidal saltwater impoundment confined by dikes. Tidal flows are regulated by 4 water control structures. Fill placement would occur in near the northeast corner of the East Pool in shallow (< 2 ft.) open water.

4. Type of Habitat: estuarine.

5. Timing and Duration of Discharge: 2-3 weeks commencing mid-December 2020.

F. Description of Discharge Method. Hydraulic pipeline dredging with a Y valve discharge.

II. FACTUAL DETERMINATIONS

A. Physical Substrate Determinations.

1. Substrate Elevation and Slope: +0.2 Ft. NAVD flat soft bottom.

2. Sediment Type: sand/silt.

3. Fill Material Movement: Fill movement will affect approximately 1,000 ft. radius from pipe discharge and would predominantly occur within the impoundment with minimal transport through northeast tide gate. Sandy material would drop out at location of discharge points, but fine-grained materials may transport and settle up to 1,000 feet from discharge.

4. Physical Effects on Benthos: Temporary, loss of existing benthos during dredging and placement actions. The areas should reach a stabilized equilibrium subsequent to construction. A permanent conversion of open water to intertidal mudflat, low marsh, and high marsh habitat would occur at discharge locations.

5. Actions taken to Minimize Impacts: Construction best management practices will be used during construction including the testing and evaluation of confinement techniques such as hay bales, vegetation wattles and unconfined placement.

B. Water Circulation, Fluctuation and Salinity Determinations.

1. Water:

a. Salinity – No effect

b. Water Chemistry – Temporary, minor effect.

c. Clarity – Temporary, minor effect.

d. Color - No effect.

e. Odor – Temporary, minor effect.

f. Taste - No effect.

g. Dissolved Gas Levels – No effect.

h. Nutrients – No effect.

i. Eutrophication - No effect.

j. Temperature- No effect.

2. Current Patterns and Circulation:

a. Current Patterns and Flow – No significant effect.

b. Velocity – No significant effect on tidal velocity.

c. Stratification – Normal stratification patterns would continue.

d. Hydrologic Regime – The regime would remain estuarine, but bottom would be converted from subtidal open water to intertidal regimes.

3. Normal Water Level Fluctuations – No effect on tidal regime. Water control would be maintained through existing tide gates.

4. Salinity Gradients – No effect on existing salinity gradients.

5. Actions That Will Be Taken to Minimize Impacts: N/A

C. Suspended Particulate/Turbidity Determinations.

1. Expected Changes in Suspended Particulates and Turbidity Levels in Vicinity of Fill Site: Temporary effects when the dredged material is being placed. The areas should reach a stabilized equilibrium in a relatively short time period.

2. Effects on Chemical and Physical Properties of the Water Column:

a. Light Penetration: Short-term, limited reductions during dredging and placement activities. No long-term effects.

b. Dissolved Oxygen: There is a potential for decreased

dissolved oxygen levels during dredging and placement activities. No long- term effects.

c. Toxic Metals and Organics: No effect.

d. Pathogens: No effect.

e. Aesthetics: Minor, temporary effects limited to the construction period.

f. Temperature: No effect.

3. Effects on Biota:

a. Primary Production, Photosynthesis: Temporary, minor effect during dredging and placement activities. The areas should reach a stabilized equilibrium in a relatively short time period.

b. Suspension/Filter Feeders: Temporary, minor effect on suspension feeders during dredging and placement activities. The area should reach a stabilized equilibrium in a relatively short time period.

c. Sight feeders: Temporary, minor effect on sight feeders during dredging and placement activities. The area should reach a stabilized equilibrium in a relatively short time period.

4. Actions Taken to Minimize Impacts: Best management practices will be used to minimize turbidity.

D. Contaminant Determinations:

No significant contaminants were found at the project sites that would impact the project area. See Appendix A of the EA for recent sediment data (Tetra Tech, 2020).

E. Aquatic Ecosystem and Organism Determinations:

1. Effects on Plankton: Temporary, minor effect on plankton during dredging and placement activities. The area should reach a stabilized equilibrium in a relatively short time period.

2. Effects on Benthos: Temporary, minor effect on benthos during

dredging and placement activities. The area should reach a stabilized equilibrium in a relatively short time period.

3. Effects on Nekton: No effect.

4. Effects on Aquatic Food Web: Temporary, minor effect on the aquatic food web during dredging and placement activities. The area should reach a stabilized equilibrium in a relatively short time period.

5. Effects on Special Aquatic Sites:

   (a) Sanctuaries and Refuges: The East Pool is located on E.B. Forsythe National Wildlife Refuge. Discharge of dredged material into the East Pool is desired to build up a subsiding marsh platform to restore marsh bottom. This practice was found to be consistent with Refuge mission by USFWS.

   (b) Wetlands: Restoration of eroding and subsiding habitats.

   (c) Tidal flats: None.

   (d) Vegetated Shallows: None.

6. Threatened and Endangered Species: Not likely to adversely effect. Discharge would occur in winter when T&E species are either not present or are present in low numbers and would provide overall habitat improvement for T&E species.

7. Other Wildlife: Temporary, minor effects during construction.

8. Actions to Minimize Impacts: Best management construction practices will be used to minimize any disturbance.

F. Proposed Disposal Site Determinations.

1. Mixing Zone Determinations: The following factors have been considered in evaluating the placement sites.

   a. Depth of water.
   b. Current velocity.
   c. Degree of turbulence.
   d. Stratification.
   e. Discharge vessel speed and direction.
   f. Rate of discharge.
   g. Dredged material characteristics.

2. Determination of Compliance with Applicable Water Quality Standards: A section 401 Water Quality Certificate will be obtained from the NJDEP prior to construction.

3. Potential Effects on Human Use Characteristics:

a. Municipal and Private Water Supply: No anticipated effect.

b. Recreational and Commercial Fisheries: Temporary, minor effect during construction.

c. Water Related Recreation: Temporary, minor effect.

d. Aesthetics: Temporary, minor effect.

e. Parks, National and Historical Monuments, National Seashore, Wilderness Areas, Research Sites, and Similar Preserves: Temporary adverse effects on human use of East Pool during construction (approximately 2-3 weeks).

G. Determination of Cumulative Effects on the Aquatic Ecosystem. No significant adverse effects are anticipated.

H. Determination of Secondary Effects on the Aquatic Ecosystem. No significant secondary effects are anticipated.

III. FINDINGS OF COMPLIANCE OR NON-COMPLIANCE WITH THE RESTRICTIONS ON DISCHARGE

A. Adaptation of the Section 404(b)(1) Guidelines to this evaluation - No significant adaptation of the guidelines was made relative to this evaluation.

B. Evaluation of Availability of Practicable Alternatives to the Proposed Discharge Site Which Would Have Less Adverse Impact on the Aquatic Ecosystem - The selected plan was determined to be the best alternative for restoring the habitat at the placement site.

C. Compliance with Applicable State Water Quality Standards - The selected plan is not expected to violate any applicable state water quality standards in New Jersey.

D. Compliance with Applicable Toxic Effluent Standards or Prohibition Under Section 307 of the Clean Water Act - The proposed discharge is not

anticipated to violate the Toxic Effluent Standards of Section 307 of the Clean Water Act.

E. Compliance with Endangered Species Act of 1973 -The selected plan will comply with the Endangered Species Act of 1973. Informal Section 7 consultation will be completed with the U.S. Fish and Wildlife Service and National Marine Fisheries Service prior to initiation of construction.

F. Compliance with Specified Protection Measures for Marine Sanctuaries Designated by the Marine Protection, Research, and Sanctuaries Act of 1972 - No Marine Sanctuaries, as designated in the Marine Protection, Research, and Sanctuaries Act of 1972, are located within the project area.

G. Evaluation of Extent of Degradation of Waters of the United States - The proposed project will not result in significant adverse effects on human health and welfare, including municipal and private water supplies, and recreational and commercial fishing, plankton, fish and shellfish, wildlife, and special aquatic sites. The life stages of aquatic life and wildlife will not be adversely affected. Significant adverse impacts on aquatic ecosystem diversity, productivity and stability, and recreation, aesthetics and economic values will not occur as a result of the project.

H. Appropriate and Practicable Steps Taken to Minimize Potential Adverse Impacts of the Discharge on the Aquatic Ecosystem – Timing of discharge (winter – low biological activity) and best management construction methods will be employed to minimize potential adverse impacts of discharging material in the aquatic ecosystem.

APPENDIX B

Pre-dredge Sediment Analyses

TABLE 1. NJIWW FORSYTHE SEDIMENT CORE LOCATIONS COORDINATES				
Name	Northing (Y) NJ State Plane (NAD 83 Ft)	Easting (X) NJ State Plane (NAD 83 Ft)	Latitude	Longitude
FSYTH-2019-1	226726.8	522327.0	39 27.349479 N	074 23.581899 W
FSYTH-2019-2	227063.2	522438.1	39 27.404881 N	074 23.558224 W
FSYTH-2019-3	227729.2	522330.6	39 27.514625 N	074 23.580921 W
FSYTH-2019-4	230415.8	521824.9	39 27.957306 N	074 23.687715 W

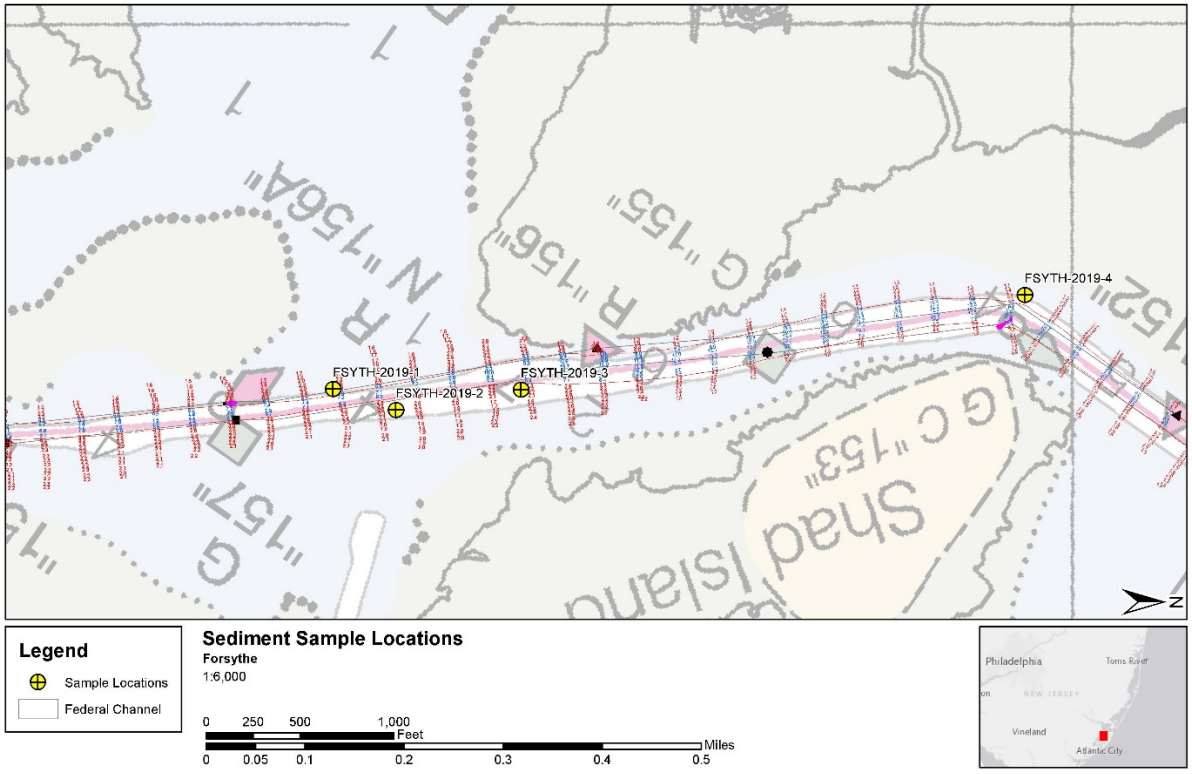


TABLE 2. Grain Size Distribution for sediment cores collected, NJIWW Pre-dredge samples, Forsythe					
		FSYTH-2019-1	FSYTH-2019-2	FSYTH-2019-3	FSYTH-2019-4
SOIL CLASSIFICATION		%	%	%	%
Coarse Sand		0.2	0.1	0	0.1
Fine Sand		20.7	60	30.4	33.5
Fines		77.1	38.8	67.6	64.3
Gravel		0.2	0.5	0	0.4
Medium Sand		1.8	0.6	2	1.7
Sand		22.7	60.7	32.4	35.3
GRAIN SIZE	Grain Size (mm)	% Passing	% Passing	% Passing	% Passing
Sieve Size 3 inch - Percent Finer	76.2	100	100	100	100
Sieve Size 2 inch - Percent Finer	50.8	100	100	100	100
Sieve Size 1.5 inch - Percent Finer	38.1	100	100	100	100
Sieve Size 1 inch - Percent Finer	25.4	100	100	100	100
Sieve Size 0.75 inch - Percent Finer	19.05	100	100	100	100
Sieve Size 0.375 inch - Percent Finer	9.525	100	100	100	100
Sieve Size #4 - Percent Finer	4.76	99.8	99.5	100	99.6
Sieve Size #10 - Percent Finer	2	99.6	99.4	100	99.5
Sieve Size #20 - Percent Finer	0.841	98.2	99	98.5	98
Sieve Size #40 - Percent Finer	0.4	97.8	98.8	98	97.8
Sieve Size #60 - Percent Finer	0.25	97.4	98.2	97.6	97.3
Sieve Size #80 - Percent Finer	0.177	96.8	97.2	97	96.7
Sieve Size #100 - Percent Finer	0.149	96	92.1	95	93.4
Sieve Size #200 - Percent Finer	0.074	77.1	38.8	67.6	64.3

TABLE 1: DATA SUMMARY OF BULK SEDIMENT INORGANIC ANALYTICAL RESULTS -USACE Philadelphia, NJIWW (Forsythe) Federal navigation channels, New Jersey

Sample ID:	NJ	NJ			FSYTH-2019-1		FSYTH-2019-2		FSYTH-2019-3		FSYTH-2019-4	
Sample Date:	Residential Soil	Non-Residential Soil	ERL	ERM	2/19/20		2/19/20		2/19/20		2/19/20	
MISCELLANEOUS PARAMETERS												
	mg/kg	mg/kg			mg/kg		mg/kg		mg/kg		mg/kg	
Cyanide, Total	4.7E+01	6.8E+02			ND		ND		ND		ND	
Total Organic Carbon	---	---			19000		11000		17000		20000	
INORGANICS	mg/kg	mg/kg			mg/kg		mg/kg		mg/kg		mg/kg	
Aluminum	7.8E+04	---			13000	^	8800	^	13000	^	13000	^
Antimony	3.1E+01	4.5E+02			0.11	J	0.058	J	ND		0.13	J
Arsenic	1.9E+01	1.9E+01	8.3	70	10		6.5		8.6		11	
Barium	1.6E+04	5.9E+04			39		25		34		38	
Beryllium	1.6E+01	1.4E+02			0.53		0.35		0.46		0.49	
Cadmium	7.8E+01	7.8E+01	1.2	9.6	0.34		0.18		0.15		0.39	
Calcium	---	---			4100		2900		3500		3900	
Chromium	---	---	81	370	40		24		32		40	
Cobalt	1.6E+03	5.9E+02			7.6		5		6.7		7.1	
Copper	3.1E+03	4.5E+04	34	270	19		10		9.1		21	
Iron	---	---			22000	^ B	14000	^ B	21000	^ B	21000	^ B
Lead	4.0E+02	8.0E+02	46.7	218	25		12		7.3		32	
Magnesium	---	---			6900		4500		6300		6300	
Manganese	1.1E+04	5.9E+03			200		130		190		240	
Mercury (ug/kg)	2.3E+04	5.9E+06	150	710	200		100		19		280	
Nickel	1.6E+03	2.3E+04	20.9	51.6	20		13		18		20	
Potassium	---	---			3100		2000		2900		2800	
Selenium	3.9E+02	5.7E+03			0.47	J	0.24	J	0.32	J	0.46	
Silver	3.9E+02	5.7E+03	1	3.7	0.34		0.13		0.046	J	0.48	
Sodium	---	---			7700		4500		6100		7000	
Thallium	---	---			0.22		0.15		0.19		0.19	
Vanadium	7.8E+01	1.1E+03			37		24		34		37	
Zinc	2.3E+04	1.1E+05	124	410	83		50		46		90	

TABLE 2: DATA SUMMARY OF BULK SEDIMENT DIOXIN/FURAN ANALYTICAL RESULTS -USACE Philadelphia, NJIWW (Forsythe) Federal navigation channels, New Jersey

Sample ID:	NJ	NJ			FSYTH-2019-1		FSYTH-2019-2		FSYTH-2019-3		FSYTH-2019-4	
Sample Date:	Residential Soil	Non-Residential Soil	ERL	ERM	2/19/20		2/19/20		2/19/20		2/19/20	
DIOXINS/FURANS	**pg/g**	**pg/g**			**pg/g**		**pg/g**		**pg/g**		**pg/g**	
1,2,3,4,6,7,8-HpCDD	---	---			48	B	26	B	32	B	73	B
1,2,3,4,6,7,8-HpCDF	---	---			12	B	4.1	J B	0.52	J B	19	B
1,2,3,4,7,8,9-HpCDF	---	---			0.52	J	0.22	J	0.04	J q	1.1	J
1,2,3,4,7,8-HxCDD	---	---			1.3	J	0.75	J	0.97	J	1.7	J
1,2,3,4,7,8-HxCDF	---	---			2.4	J	1.1	J	0.15	J q	4.4	J
1,2,3,6,7,8-HxCDD	---	---			3	J	1.5	J	1.6	J	4.9	
1,2,3,6,7,8-HxCDF	---	---			1.2	J	0.54	J	0.1	J	2	J
1,2,3,7,8,9-HxCDD	---	---			4	J	2.4	J	3.2	J	6.1	
1,2,3,7,8,9-HxCDF	---	---			0.11	J	ND		ND		0.21	J
1,2,3,7,8-PeCDD	---	---			0.99	J q	0.57	J	0.59	J q	1.5	J
1,2,3,7,8-PeCDF	---	---			1.2	J	0.47	J	0.11	J	2.1	J
2,3,4,6,7,8-HxCDF	---	---			0.93	J	0.47	J	0.07	J q	1.5	J
2,3,4,7,8-PeCDF	---	---			1.4	J	0.65	J	0.076	J q	2.5	J l
2,3,7,8-TCDD	---	---			1.1	q	0.34	J q	0.15	J	2.9	
2,3,7,8-TCDF	---	---			3.2		1.2		0.16	J q	6	
OCDD	---	---			480	B	290	B	370	B	680	B
OCDF	---	---			11	B	3.2	J B	0.43	J q B	23	B
Total Dioxins/Furans	---	---			572.4		333.5		410.2		831.9	
TEQ (WHO)	1000 (1)	5000 (1)			4.9		2.3		1.8		9.0	

TABLE 3: DATA SUMMARY OF BULK SEDIMENT SEMIVOLATILE ORGANICS, VOLATILE ORGANICS, AND PESTICIDES ANALYTICAL RESULTS -USACE Philadelphia, NJIWW (Forsythe) Federal navigation channels, New Jersey

Sample ID:	NJ	NJ			FSYTH-2019-1		FSYTH-2019-2		FSYTH-2019-3		FSYTH-2019-4	
Sample Date:	Residential Soil	Non-Residential Soil	ERL	ERM	2/19/20		2/19/20		2/19/20		2/19/20	
SEMIVOLATILES	ug/kg	ug/kg			ug/kg		ug/kg		ug/kg		ug/kg	
1,1'-Biphenyl	6.1E+04	2.4E+05			3.8	J F1	8.9	J	6	J	3.3	J
2,2'-oxybis[1-chloropropane]	2.3E+04	6.7E+04			ND	F1	ND		ND		ND	
2,4,5-Trichlorophenol	6.1E+06	6.8E+07			ND	F1	ND		ND		ND	
2,4,6-Trichlorophenol	1.9E+04	7.4E+04			ND	F1	ND		ND		ND	
2,4-Dichlorophenol	1.8E+05	2.1E+06			ND	F1	ND		ND		ND	
2,4-Dimethylphenol	1.2E+06	1.4E+07			ND		ND		ND		ND	
2,4-Dinitrophenol	1.2E+05	1.4E+06			ND	F1	ND		ND		ND	
2,4-Dinitrotoluene	7.0E+02	3.0E+03			ND	F1	ND		ND		ND	
2,6-Dinitrotoluene	7.0E+02	3.0E+03			ND	F1	ND		ND		ND	
2-Chloronaphthalene	---	---			ND	F1	ND		ND		ND	
2-Chlorophenol	3.1E+05	2.2E+06			ND	F1	ND		ND		ND	
2-Methylnaphthalene	2.3E+05	2.4E+06	70	670	94	F1	220		170		61	
2-Methylphenol	3.1E+05	3.4E+06			ND	F1	ND		ND		ND	
2-Nitroaniline	3.9E+04	2.3E+07			ND	F1	ND		ND		ND	
2-Nitrophenol	---	---			ND	F1	ND		ND		ND	
3,3'-Dichlorobenzidine	1.0E+03	4.0E+03			ND	F1	ND		ND		ND	
3-Nitroaniline	---	---			ND	F1	ND		ND		ND	
4,6-Dinitro-2-methylphenol	6.0E+03	6.8E+04			ND	F1	ND		ND		ND	
4-Bromophenyl phenyl ether	---	---			ND	F1	ND		ND		ND	
4-Chloro-3-methylphenol	---	---			ND		ND		ND		ND	
4-Chloroaniline	---	---			ND	F1	ND		ND		ND	
4-Chlorophenyl phenyl ether	---	---			ND	F1	ND		ND		ND	
4-Nitroaniline	---	---			ND	F1	ND		ND		ND	
4-Nitrophenol	---	---			ND		ND		ND		ND	
Acenaphthene	3.4E+06	3.7E+07	16	500	3.5	J F1	2.5	J	1.8	J	5.1	J
Acenaphthylene	---	3.0E+08	44	640	6.5	F1	3.9	J	1.2	J	6.6	
Acetophenone	2.0E+03	5.0E+03			ND		ND		ND		ND	
Anthracene	1.7E+07	3.0E+07	85.3	1100	7.7	F1	4.5	J	ND		8.8	
Atrazine	2.1E+05	2.4E+06			ND		ND		ND		ND	
Benzaldehyde	6.1E+06	6.8E+07			24	J F1	ND		ND		ND	
Benzo[a]anthracene	5.0E+03	1.7E+04	261	1600	22	F1	15		3.5	J	23	
Benzo[a]pyrene	5.0E+02	2.0E+03	430	1600	25	F1	16		3.2	J	25	

TABLE 3: DATA SUMMARY OF BULK SEDIMENT SEMIVOLATILE ORGANICS, VOLATILE ORGANICS, AND PESTICIDES ANALYTICAL RESULTS -USACE Philadelphia, NJIWW (Forsythe) Federal navigation channels, New Jersey

Sample ID:	NJ	NJ			FSYTH-2019-1		FSYTH-2019-2		FSYTH-2019-3		FSYTH-2019-4	
Sample Date:	Residential Soil	Non-Residential Soil	ERL	ERM	2/19/20		2/19/20		2/19/20		2/19/20	
Benzo[b]fluoranthene	1.7E+04	5.0E+03			28	F1	18		4.3	J	30	
Benzo[g,h,i]perylene	3.8E+08	3.0E+07			19	F1	13		2.7	J	21	
Benzo[k]fluoranthene	4.5E+04	1.7E+05			10	F1	6.6		ND		10	
Bis(2-chloroethoxy)methane	---	---			ND	F1	ND		ND		ND	
Bis(2-chloroethyl)ether	4.0E+02	2.0E+03			ND	F1	ND		ND		ND	
Bis(2-ethylhexyl) phthalate	3.5E+04	1.4E+05			37	J F1	ND		ND		36	J
Butyl benzyl phthalate	1.2E+06	1.4E+07			25	J F1	ND		21	J	26	J
Caprolactam	3.1E+07	3.4E+08			ND	F1	ND		ND		ND	
Carbazole	2.4E+04	9.6E+04			ND	F1	ND		ND		1.9	J
Chrysene	4.5E+05	1.7E+06	384	2800	23	F1	14		3.6	J	25	
Dibenz(a,h)anthracene	5.0E+02	2.0E+03	63.4	260	4.8	J F1	2.9	J	ND		5.6	J
Dibenzofuran	---	---			2.1	J F1	2	J	ND		3	J
Diethyl phthalate	4.9E+07	5.5E+08			ND	F1	ND		11	J	ND	
Dimethyl phthalate	---	---			ND	F1	ND		ND		ND	
Di-n-butyl phthalate	---	---			ND	F1	ND		ND		ND	
Di-n-octyl phthalate	2.4E+06	2.7E+07			ND	F1	ND		ND		ND	
Fluoranthene	2.3E+06	2.4E+07	600	5100	32	F1	20		5.5	J	32	
Fluorene	2.3E+06	2.4E+07	19	540	4.2	J F1	2.8	J	1.3	J	5.7	J
Hexachlorobenzene	3.0E+02	1.0E+03			ND	F1	ND		ND		ND	
Hexachlorobutadiene	6.0E+03	2.5E+04			ND		ND		ND		ND	
Hexachlorocyclopentadiene	4.5E+04	1.1E+05			ND	F1 F2	ND		ND		ND	
Hexachloroethane	1.2E+04	4.8E+04			ND	F1	ND		ND		ND	
Indeno[1,2,3-cd]pyrene	1.2E+04	1.7E+04			15	F1	11		2.5	J	17	
Isophorone	5.1E+05	2.0E+06			ND		ND		ND		ND	
Methylphenol, 3 & 4	3.1E+04	3.4E+05			ND	F1	ND		ND		ND	
Naphthalene	6.0E+03	1.7E+04	160	2100	65	F1	100		98		48	
Nitrobenzene	5.0E+03	1.4E+04			ND	F1	ND		ND		ND	
N-Nitrosodi-n-propylamine	2.0E+02	3.0E+02			ND	F1	ND		ND		ND	
N-Nitrosodiphenylamine	9.9E+04	3.9E+05			ND	F1	ND		ND		ND	
Pentachlorophenol	9.0E+02	3.0E+03			ND	F1	ND		ND		ND	
Phenanthrene	---	3.0E+08			16	F1	9.1		3.4	J	19	
Phenol	1.8E+07	2.1E+08			ND	F1	ND		ND		ND	
Pyrene	1.7E+06	1.8E+07			33	F1	23		5.1	J	39	

TABLE 3: DATA SUMMARY OF BULK SEDIMENT SEMIVOLATILE ORGANICS, VOLATILE ORGANICS, AND PESTICIDES ANALYTICAL RESULTS -USACE Philadelphia, NJIWW (Forsythe) Federal navigation channels, New Jersey

Sample ID:	NJ	NJ			FSYTH-2019-1		FSYTH-2019-2		FSYTH-2019-3		FSYTH-2019-4	
Sample Date:	Residential Soil	Non-Residential Soil	ERL	ERM	2/19/20		2/19/20		2/19/20		2/19/20	
VOLATILES	ug/kg	ug/kg			ug/kg		ug/kg		ug/kg		ug/kg	
1,1,1-Trichloroethane	1.6E+08	---			ND		ND		ND		ND	
1,1,2,2-Tetrachloroethane	1.0E+03	3.0E+03			ND		ND		ND		ND	
1,1,2-Trichloro-1,2,2-trifluoroethane	---	---			ND		ND		ND		ND	
1,1,2-Trichloroethane	2.0E+03	6.0E+03			ND		ND		ND		ND	
1,1-Dichloroethane	8.0E+03	2.4E+04			ND		ND		ND		ND	
1,1-Dichloroethene	1.1E+04	1.5E+05			ND		ND		ND		ND	
1,2,4-Trichlorobenzene	7.3E+04	8.2E+05			ND		ND		ND		ND	
1,2-Dibromo-3-Chloropropane	8.0E+01	2.0E+02			ND		ND		ND		ND	
1,2-Dibromoethane	8.0E+00	4.0E+01			ND		ND		ND		ND	
1,2-Dichlorobenzene	5.3E+06	5.9E+07			ND		ND		ND		ND	
1,2-Dichloroethane	9.0E+02	3.0E+03			ND		ND		ND		ND	
1,2-Dichloroethene, Total	2.0E+03	5.0E+03			ND		ND		ND		ND	
1,2-Dichloropropane	5.3E+06	5.9E+07			ND		ND		ND		ND	
1,3-Dichlorobenzene	5.0E+03	1.3E+04			ND		ND		ND		ND	
1,4-Dichlorobenzene	3.1E+06	4.4E+07			ND		ND		ND		ND	
2-Butanone (MEK)	---	---			ND		ND		ND		ND	
2-Hexanone	---	---			ND		ND		ND		ND	
4-Methyl-2-pentanone (MIBK)	7.0E+07	---			ND		ND		ND		ND	
Acetone	2.0E+03	5.0E+03			14	J	ND		ND		7.1	J
Benzene	1.0E+03	3.0E+03			ND		ND		ND		ND	
Bromoform	8.1E+04	2.8E+05			ND		ND		ND		ND	
Bromomethane	2.5E+04	5.9E+04			ND		ND		ND		ND	
Carbon disulfide	7.8E+06	1.1E+08			ND		ND		ND		ND	
Carbon tetrachloride	2.0E+03	4.0E+03			ND		ND		ND		ND	
Chlorobenzene	5.1E+05	7.4E+06			ND		ND		ND		ND	
Chlorodibromomethane	3.00E+03	8.00E+03			ND		ND		ND		ND	
Chloroethane	2.20E+05	1.10E+06			ND	*	ND	*	ND	*	ND	*
Chloroform	6.00E+02	2.00E+03			ND		ND		ND		ND	
Chloromethane	4.00E+03	1.20E+04			ND		ND		ND		ND	
cis-1,2-Dichloroethene	2.30E+05	5.60E+05			ND		ND		ND		ND	
cis-1,3-Dichloropropene	---	---			ND		ND		ND		ND	
Cyclohexane	---	---			ND		ND		ND		ND	
Dichlorobromomethane	1.00E+03	3.00E+03			ND		ND		ND		ND	

TABLE 3: DATA SUMMARY OF BULK SEDIMENT SEMIVOLATILE ORGANICS, VOLATILE ORGANICS, AND PESTICIDES ANALYTICAL RESULTS -USACE Philadelphia, NJIWW (Forsythe) Federal navigation channels, New Jersey

Sample ID:	NJ	NJ			FSYTH-2019-1		FSYTH-2019-2		FSYTH-2019-3		FSYTH-2019-4	
Sample Date:	Residential Soil	Non-Residential Soil	ERL	ERM	2/19/20		2/19/20		2/19/20		2/19/20	
Dichlorodifluoromethane	4.90E+05	2.30E+08			ND		ND		ND		ND	
Ethylbenzene	7.80E+06	1.10E+08			ND		ND		ND		ND	
Isopropylbenzene	---	---			ND		ND		ND		ND	
Methyl acetate	7.80E+07	---			ND		ND		ND		ND	
Methyl tert-butyl ether	1.10E+05	3.20E+05			ND		ND		ND		ND	
Methylcyclohexane	---	---			ND		ND		ND		ND	
Methylene Chloride	4.60E+04	2.30E+05			17		8.2	B	8.9	B	9.6	B
m-Xylene & p-Xylene	---	---			ND		ND		ND		ND	
o-Xylene	---	---			ND		ND		ND		ND	
Styrene	9.00E+04	2.60E+05			ND	*	ND		ND		ND	
Tetrachloroethene	4.30E+04	1.50E+06			ND		ND		ND		ND	
Toluene	6.30E+06	9.10E+07			ND		ND		ND		ND	
trans-1,2-Dichloroethene	3.00E+05	7.20E+05			ND		ND		ND		ND	
trans-1,3-Dichloropropene	---	---			ND		ND		ND		ND	
Trichloroethene	3.00E+03	1.00E+04			ND		ND		ND		ND	
Trichlorofluoromethane	2.30E+07	3.40E+08			ND		ND		ND		ND	
Vinyl chloride	7.00E+02	2.00E+03			ND		ND		ND		ND	
Xylenes, Total	1.20E+07	1.70E+08			ND		ND		ND		ND	
PESTICIDES	**ug/kg**	**ug/kg**			**ug/kg**		**ug/kg**		**ug/kg**		**ug/kg**	
4,4'-DDD	3.0E+03	1.3E+04	2	20	0.27	p	0.086	p	0.04	J p	0.44	p
4,4'-DDE	2.0E+03	9.0E+03	2.2	27	0.72		0.24		0.078		1.5	
4,4'-DDT	2.0E+03	8.0E+03	1	7	ND		ND		ND		ND	
Aldrin	4.0E+01	2.0E+02			ND		ND		ND		ND	
alpha-BHC	1.0E+02	5.0E+02			ND		ND		ND		ND	
beta-BHC	400	2000			ND		ND		ND		ND	
cis-Chlordane	---	---	0.5	6	0.032	J p	ND		ND		0.13	
delta-BHC	---	---			ND		ND		ND		ND	
Dieldrin	4.0E+01	2.0E+02	0.02	8	0.046	J p	0.022	J p	ND		0.049	J p
Endosulfan I	---	---			ND		ND		ND		ND	
Endosulfan II	---	---			0.049	J p	0.016	J p	ND		0.086	p
Endosulfan sulfate	4.7E+05	6.8E+06			ND		ND		ND		ND	
Endrin	2.3E+04	3.4E+05			0.5		0.077	p	0.029	J p	0.59	p
Endrin aldehyde	---	---			ND		ND		ND		ND	

TABLE 3: DATA SUMMARY OF BULK SEDIMENT SEMIVOLATILE ORGANICS, VOLATILE ORGANICS, AND PESTICIDES ANALYTICAL RESULTS -USACE Philadelphia, NJIWW (Forsythe) Federal navigation channels, New Jersey

Sample ID:	NJ	NJ			FSYTH-2019-1		FSYTH-2019-2		FSYTH-2019-3		FSYTH-2019-4	
Sample Date:	Residential Soil	Non-Residential Soil	ERL	ERM	2/19/20		2/19/20		2/19/20		2/19/20	
Endrin ketone	---	---			ND		ND		ND		ND	
gamma-BHC (Lindane)	4.0E+02	2.0E+03			ND		ND		ND		ND	
Heptachlor	100	700			ND		ND		ND		ND	
Heptachlor epoxide	7.0E+01	3.0E+02			0.058	J p	ND		ND		0.14	p
Methoxychlor	7.0E+01	3.9E+05			ND		ND		ND		ND	
Toxaphene	6.0E+02	3.0E+03			ND		ND		ND		ND	
trans-Chlordane	---	---	0.5	6	0.2		0.051	J p	ND		ND	

TABLE 4: DATA SUMMARY OF BULK SEDIMENT ANALYTICAL PCB RESULTS -USACE Philadelphia, NJIWW (Forsythe) Federal navigation channels, New Jersey

Sample ID:	NJ	NJ			FSYTH-2019-1		FSYTH-2019-2		FSYTH-2019-3		FSYTH-2019-4	
Sample Date:	Residential Soil	Non-Residential Soil	ERL	ERM	2/19/20		2/19/20		2/19/20		2/19/20	
PCB Congeners	ng/g	ng/g			ng/g		ng/g		ng/g		ng/g	
PCB-1	---	---			0.036		0.007	J	0.0039	J	0.038	
PCB-10	---	---			0.0089	J q	0.002	J q	0.0016	J q	0.01	q
PCB-100	---	---			0.011	J q C93	0.0021	J C93 q	0.0012	J q C93	0.053	C93
PCB-101	---	---			0.54	C90 B	0.099	B C90	0.049	C90 B	0.94	B C90
PCB-102	---	---			0.022	C98	0.0053	J C98	0.0021	J C98	0.056	C98
PCB-103	---	---			0.012		0.002	J	ND		0.043	
PCB-104	---	---			ND		ND		ND		ND	
PCB-105	---	---			0.24		0.045		0.023		0.27	
PCB-106	---	---			ND		ND		ND		0.0013	J q
PCB-107	---	---			0.082	B	0.015	B	0.0065	J B	0.11	B
PCB-108	---	---			0.016	J C B	0.0023	J C B q	0.0012	J q C B	0.019	J C B
PCB-109	---	---			0.3	C86 B	0.056	J B C86	0.028	J C86 B	0.42	B C86
PCB-11	---	---			0.67		0.11		0.058		1.1	
PCB-110	---	---			0.57	C B	0.11	C B	0.05	C B	0.84	C B
PCB-111	---	---			0.0044	J	0.0018	J	0.00049	J	0.0071	J

TABLE 4: DATA SUMMARY OF BULK SEDIMENT ANALYTICAL PCB RESULTS -USACE Philadelphia, NJIWW (Forsythe) Federal navigation channels, New Jersey

Sample ID:	NJ	NJ			FSYTH-2019-1		FSYTH-2019-2		FSYTH-2019-3		FSYTH-2019-4	
Sample Date:	Residential Soil	Non-Residential Soil	ERL	ERM	2/19/20		2/19/20		2/19/20		2/19/20	
PCB-112	---	---			0.0066	J	0.0014	J	0.00042	J q	0.01	
PCB-113	---	---			0.54	C90 B	0.099	B C90	0.049	C90 B	0.94	B C90
PCB-114	---	---			0.01		0.0018	J q	0.0008	J q	0.012	q
PCB-115	---	---			0.57	C110 B	0.11	B C110	0.05	C110 B	0.84	B C110
PCB-116	---	---			0.1	C85 B	0.018	J C85 B	0.0088	J C85 B	0.1	C85 B
PCB-117	---	---			0.1	C85 B	0.018	J C85 B	0.0088	J C85 B	0.1	C85 B
PCB-118	---	---			0.76		0.13		0.062		1.1	
PCB-119	---	---			0.3	C86 B	0.056	J B C86	0.028	J C86 B	0.42	B C86
PCB-12	---	---			0.12	C	0.021	C	0.011	J q C	0.16	C
PCB-120	---	---			0.014	q	0.0019	J q	0.00076	J q	0.03	
PCB-121	---	---			ND		ND		ND		ND	
PCB-122	---	---			0.0098	J	0.0021	J q	0.00099	J	0.016	q
PCB-123	---	---			0.01	B	0.0016	J B q	0.0015	J B	0.013	B q
PCB-124	---	---			0.016	J C108 B	0.0023	J B q C108	0.0012	J q C108 B	0.019	J B C108
PCB-125	---	---			0.3	C86 B	0.056	J B C86	0.028	J C86 B	0.42	B C86
PCB-126	---	---			0.007	J B	0.00099	J B	ND		0.0066	J B q
PCB-127	---	---			ND		ND		ND		ND	
PCB-128	---	---			0.13	C	0.025	C	0.012	J C	0.15	C
PCB-129	---	---			0.88	C B	0.17	C B	0.076	C B	1.1	C B
PCB-13	---	---			0.12	C12	0.021	C12	0.011	J q C12	0.16	C12
PCB-130	---	---			0.069		0.011		0.0041	J q	0.076	
PCB-131	---	---			ND		ND		ND		0.0051	J q
PCB-132	---	---			0.16		0.028		0.012		0.19	
PCB-133	---	---			0.022		0.0046	J	0.0012	J q	0.033	
PCB-134	---	---			0.037	C	0.0055	J C q	0.0037	J C	0.046	C q
PCB-135	---	---			0.2	C B	0.044	C B	0.018	J C B	0.31	C B
PCB-136	---	---			0.057		0.012		0.0057	J	0.16	
PCB-137	---	---			0.017		0.0039	J	0.0013	J q	0.018	
PCB-138	---	---			0.88	C129 B	0.17	B C129	0.076	C129 B	1.1	B C129
PCB-139	---	---			0.018	J C	0.0025	J C q	0.0012	J q C	0.023	C
PCB-14	---	---			0.0038	J q	ND		ND		0.0055	J
PCB-140	---	---			0.018	J C139	0.0025	J C139 q	0.0012	J q C139	0.023	C139
PCB-141	---	---			0.051	q	0.01		0.0041	J q	0.079	

TABLE 4: DATA SUMMARY OF BULK SEDIMENT ANALYTICAL PCB RESULTS -USACE Philadelphia, NJIWW (Forsythe) Federal navigation channels, New Jersey

Sample ID:	NJ	NJ			FSYTH-2019-1		FSYTH-2019-2		FSYTH-2019-3		FSYTH-2019-4	
Sample Date:	Residential Soil	Non-Residential Soil	ERL	ERM	2/19/20		2/19/20		2/19/20		2/19/20	
PCB-142	---	---			ND		ND		ND		ND	
PCB-143	---	---			0.037	C134	0.0055	J C134 q	0.0037	J C134	0.046	C134 q
PCB-144	---	---			0.014		0.0027	J	0.0014	J q	0.017	
PCB-145	---	---			ND		ND		ND		0.0016	J q
PCB-146	---	---			0.23		0.046		0.018		0.39	
PCB-147	---	---			0.68	C	0.13	C	0.055	C	1.6	C
PCB-148	---	---			0.0058	J q	0.0019	J q	0.00047	J	0.013	
PCB-149	---	---			0.68	C147	0.13	C147	0.055	C147	1.6	C147
PCB-15	---	---			0.7		0.11		0.056		0.87	
PCB-150	---	---			0.0061	J	0.0015	J	0.00025	J q	0.028	
PCB-151	---	---			0.2	C135 B	0.044	C135 B	0.018	J C135 B	0.31	C135 B
PCB-152	---	---			0.0018	J	0.00041	J q	ND		0.0066	J
PCB-153	---	---			0.87	C	0.17	C	0.075	C	1.6	C
PCB-154	---	---			0.032		0.0069	J	0.0034	J	0.11	
PCB-155	---	---			0.0017	J	0.00058	J	ND		0.0058	J
PCB-156	---	---			0.064	C B	0.015	J C B	0.0047	J q C B	0.079	C B
PCB-157	---	---			0.064	C156 B	0.015	J C156 B	0.0047	J q C156 B	0.079	C156 B
PCB-158	---	---			0.057		0.0085	J	0.0036	J	0.061	
PCB-159	---	---			ND		ND		ND		0.0044	J q
PCB-16	---	---			0.082		0.012	q	0.0074	J q	0.12	
PCB-160	---	---			0.88	C129 B	0.17	B C129	0.076	C129 B	1.1	B C129
PCB-161	---	---			ND		ND		ND		ND	
PCB-162	---	---			ND		ND		ND		0.0041	J q
PCB-163	---	---			0.88	C129 B	0.17	B C129	0.076	C129 B	1.1	B C129
PCB-164	---	---			0.04		0.0042	J q	0.0029	J	0.052	
PCB-165	---	---			ND		ND		ND		ND	
PCB-166	---	---			0.13	C128	0.025	C128	0.012	J C128	0.15	C128
PCB-167	---	---			0.029		0.0052	J q	0.0027	J q	0.037	q
PCB-168	---	---			0.87	C153	0.17	C153	0.075	C153	1.6	C153
PCB-169	---	---			ND		ND		ND		0.005	J B q
PCB-17	---	---			0.18		0.029	q	0.015		0.25	
PCB-170	---	---			0.15	B	0.03	B	0.011	B	0.23	B
PCB-171	---	---			0.051	C B	0.012	J C B q	0.0045	J q C B	0.084	C B
PCB-172	---	---			0.029		0.0084	J	0.0026	J	0.039	

TABLE 4: DATA SUMMARY OF BULK SEDIMENT ANALYTICAL PCB RESULTS -USACE Philadelphia, NJIWW (Forsythe) Federal navigation channels, New Jersey

Sample ID:	NJ	NJ			FSYTH-2019-1		FSYTH-2019-2		FSYTH-2019-3		FSYTH-2019-4	
Sample Date:	Residential Soil	Non-Residential Soil	ERL	ERM	2/19/20		2/19/20		2/19/20		2/19/20	
PCB-173	---	---			0.051	C171 B	0.012	J C171 B q	0.0045	J q C171 B	0.084	C171 B
PCB-174	---	---			0.093		0.022		0.0077	J	0.13	
PCB-175	---	---			0.0086	J	0.0031	J	0.00076	J q	0.012	q
PCB-176	---	---			0.018	B	0.0048	J B	0.0014	J B	0.029	B
PCB-177	---	---			0.14		0.029		0.012		0.19	
PCB-178	---	---			0.07		0.021		0.0063	J	0.1	
PCB-179	---	---			0.1	B	0.027	B	0.0088	J B	0.16	B
PCB-18	---	---			0.24	C	0.041	C	0.022	C	0.36	C
PCB-180	---	---			0.28	C B	0.072	C B	0.028	C B	0.48	C B
PCB-181	---	---			ND		ND		ND		0.0034	J B
PCB-182	---	---			0.0041	J q	0.0022	J q	0.0007	J	0.011	
PCB-183	---	---			0.13	C	0.035	C	0.011	J C	0.19	C
PCB-184	---	---			0.0028	J	ND		ND		0.0058	J
PCB-185	---	---			0.13	C183	0.035	C183	0.011	J C183	0.19	C183
PCB-186	---	---			ND		ND		ND		ND	
PCB-187	---	---			0.42	B	0.12	B	0.04	B	0.67	B
PCB-188	---	---			0.0091	J	0.0058	J	0.00067	J	0.021	
PCB-189	---	---			0.0081	J B	0.0021	J B	ND		0.011	B
PCB-19	---	---			0.021	q	0.0035	J	0.0019	J	0.031	q
PCB-190	---	---			0.02	B	0.0014	J B q	0.0021	J B	0.03	B
PCB-191	---	---			0.0067	J B	0.0012	J B q	ND		0.0092	J B
PCB-192	---	---			ND		ND		ND		ND	
PCB-193	---	---			0.28	C180 B	0.072	C180 B	0.028	C180 B	0.48	C180 B
PCB-194	---	---			0.12	B	0.039	B	0.011	B	0.21	B
PCB-195	---	---			0.039	B	0.0095	J B	0.0036	J q B	0.057	B
PCB-196	---	---			0.057		0.024		0.0059	J	0.094	
PCB-197	---	---			0.0098	J B	0.0034	J B q	0.0014	J B	0.015	B
PCB-198	---	---			0.15	C B	0.075	C B	0.014	J C B	0.21	C B
PCB-199	---	---			0.15	C198 B	0.075	C198 B	0.014	J C198 B	0.21	C198 B
PCB-2	---	---			0.087		0.022		0.016		0.14	
PCB-20	---	---			1.3	C B	0.22	C B	0.11	C B	1.7	C B
PCB-200	---	---			0.0083	J B	0.0027	J B q	0.00065	J q B	0.013	B
PCB-201	---	---			0.029		0.012	q	0.0032	J	0.035	
PCB-202	---	---			0.088		0.055		0.01		0.11	

TABLE 4: DATA SUMMARY OF BULK SEDIMENT ANALYTICAL PCB RESULTS -USACE Philadelphia, NJIWW (Forsythe) Federal navigation channels, New Jersey

Sample ID:	NJ	NJ			FSYTH-2019-1		FSYTH-2019-2		FSYTH-2019-3		FSYTH-2019-4	
Sample Date:	Residential Soil	Non-Residential Soil	ERL	ERM	2/19/20		2/19/20		2/19/20		2/19/20	
PCB-203	---	---			0.062	B	0.023	B	0.0047	J q B	0.11	B
PCB-204	---	---			ND		ND		ND		0.0014	J B q
PCB-205	---	---			0.0045	J B	ND		ND		0.0068	J B q
PCB-206	---	---			0.15		0.064		0.013		0.27	
PCB-207	---	---			0.023	q	0.0078	J	0.0016	J q	0.035	
PCB-208	---	---			0.077		0.039		0.0057	J q	0.11	
PCB-209	---	---			0.16	B	0.048	B	0.012	q B	0.24	B
PCB-21	---	---			0.23	C B	0.041	C B	0.021	C B	0.29	C B
PCB-22	---	---			0.22		0.04		0.02		0.28	
PCB-23	---	---			ND		ND		ND		ND	
PCB-24	---	---			0.0057	J	0.00088	J	ND		0.0057	J q
PCB-25	---	---			0.16		0.026		0.013		0.25	
PCB-26	---	---			0.24	C	0.038	C	0.02	C	0.36	C
PCB-27	---	---			0.04		0.0049	J q	0.0032	J	0.061	
PCB-28	---	---			1.3	C20 B	0.22	B C20	0.11	C20 B	1.7	B C20
PCB-29	---	---			0.24	C26	0.038	C26	0.02	C26	0.36	C26
PCB-3	---	---			0.039		0.0075	J	0.0038	J q	0.046	
PCB-30	---	---			0.24	C18	0.041	C18	0.022	C18	0.36	C18
PCB-31	---	---			0.81	B	0.13	B	0.068	B	1.1	B
PCB-32	---	---			0.13		0.024		0.013	q	0.18	
PCB-33	---	---			0.23	C21 B	0.041	B C21	0.021	C21 B	0.29	B C21
PCB-34	---	---			ND		ND		ND		0.0086	J
PCB-35	---	---			0.043		0.0083	J	0.0034	J	0.075	
PCB-36	---	---			0.014	q	0.0026	J	0.002	J	0.032	
PCB-37	---	---			0.52	B	0.076	B q	0.043	B	0.68	B
PCB-38	---	---			ND		ND		ND		ND	
PCB-39	---	---			0.0059	J	ND		ND		0.0075	J q
PCB-4	---	---			0.11		0.022		0.01	J q	0.14	
PCB-40	---	---			0.22	C	0.035	C	0.02	J C	0.48	C
PCB-41	---	---			0.22	C40	0.035	C40	0.02	J C40	0.48	C40
PCB-42	---	---			0.13		0.022		0.012		0.26	
PCB-43	---	---			0.018	J q C	0.0035	J C	ND	C	0.018	J C q
PCB-44	---	---			0.46	C B	0.074	C B	0.039	C B	0.88	C B
PCB-45	---	---			0.044	C	0.0071	J C	0.0033	J q C	0.086	C

TABLE 4: DATA SUMMARY OF BULK SEDIMENT ANALYTICAL PCB RESULTS -USACE Philadelphia, NJIWW (Forsythe) Federal navigation channels, New Jersey

Sample ID:	NJ	NJ			FSYTH-2019-1		FSYTH-2019-2		FSYTH-2019-3		FSYTH-2019-4	
Sample Date:	Residential Soil	Non-Residential Soil	ERL	ERM	2/19/20		2/19/20		2/19/20		2/19/20	
PCB-46	---	---			0.013		0.0022	J q	0.0018	J q	0.041	
PCB-47	---	---			0.46	C44 B	0.074	B C44	0.039	C44 B	0.88	B C44
PCB-48	---	---			0.061		0.01		0.0058	J	0.1	
PCB-49	---	---			0.34	C	0.059	C	0.031	C	0.71	C
PCB-5	---	---			ND		ND		ND		0.0037	J
PCB-50	---	---			0.036	C	0.0056	J C q	0.0041	J C	0.068	C
PCB-51	---	---			0.044	C45	0.0071	J C45	0.0033	J q C45	0.086	C45
PCB-52	---	---			0.44		0.072		0.038		0.83	
PCB-53	---	---			0.036	C50	0.0056	J C50 q	0.0041	J C50	0.068	C50
PCB-54	---	---			ND		ND		ND		0.0006	J q
PCB-55	---	---			0.021	q	0.0043	J	0.0033	J	0.036	q
PCB-56	---	---			0.27		0.046		0.025		0.42	
PCB-57	---	---			0.0081	J	0.0014	J	ND		0.011	
PCB-58	---	---			0.0055	J	ND		ND		0.0093	J q
PCB-59	---	---			0.044	C	0.0072	J C q	0.0036	J C	0.086	C
PCB-6	---	---			0.082		0.016		0.0084	J q	0.096	
PCB-60	---	---			0.12		0.019		0.012		0.14	
PCB-61	---	---			1	C B	0.17	C B	0.089	C B	1.6	C B
PCB-62	---	---			0.044	C59	0.0072	J C59 q	0.0036	J C59	0.086	C59
PCB-63	---	---			0.0093	J q	0.0038	J q	0.0013	J q	0.044	
PCB-64	---	---			0.15		0.026		0.014		0.27	
PCB-65	---	---			0.46	C44 B	0.074	B C44	0.039	C44 B	0.88	B C44
PCB-66	---	---			0.87		0.14		0.074		1.4	
PCB-67	---	---			0.036		0.0054	J	0.0022	J q	0.06	
PCB-68	---	---			0.016	q B	0.0018	J B	0.0013	J q B	0.029	B
PCB-69	---	---			0.34	C49	0.059	C49	0.031	C49	0.71	C49
PCB-7	---	---			0.01	q	0.0025	J q	0.0016	J q	0.012	q
PCB-70	---	---			1	C61 B	0.17	C61 B	0.089	C61 B	1.6	C61 B
PCB-71	---	---			0.22	C40	0.035	C40	0.02	J C40	0.48	C40
PCB-72	---	---			0.016		0.0014	J q	0.0015	J	0.037	
PCB-73	---	---			0.018	J q C43	0.0035	J C43	ND	C43	0.018	J C43 q
PCB-74	---	---			1	C61 B	0.17	C61 B	0.089	C61 B	1.6	C61 B
PCB-75	---	---			0.044	C59	0.0072	J C59 q	0.0036	J C59	0.086	C59
PCB-76	---	---			1	C61 B	0.17	C61 B	0.089	C61 B	1.6	C61 B

TABLE 4: DATA SUMMARY OF BULK SEDIMENT ANALYTICAL PCB RESULTS -USACE Philadelphia, NJIWW (Forsythe) Federal navigation channels, New Jersey

Sample ID:	NJ	NJ			FSYTH-2019-1		FSYTH-2019-2		FSYTH-2019-3		FSYTH-2019-4	
Sample Date:	Residential Soil	Non-Residential Soil	ERL	ERM	2/19/20		2/19/20		2/19/20		2/19/20	
PCB-77	---	---			0.17	B	0.031	B	0.016	B	0.28	B
PCB-78	---	---			ND		ND		ND		ND	
PCB-79	---	---			0.0087	J	0.0012	J q	ND		0.014	
PCB-8	---	---			0.24		0.042		0.023		0.29	
PCB-80	---	---			ND		ND		ND		0.0031	J
PCB-81	---	---			ND		ND		ND		0.0043	J B q
PCB-82	---	---			0.044	q	0.0083	J q	0.004	J q	0.054	
PCB-83	---	---			0.56	C	0.1	C	0.054	C	1.2	C
PCB-84	---	---			0.1		0.018		0.0061	J q	0.16	
PCB-85	---	---			0.1	C B	0.018	J C B	0.0088	J C B	0.1	C B
PCB-86	---	---			0.3	C B	0.056	J C B	0.028	J C B	0.42	C B
PCB-87	---	---			0.3	C86 B	0.056	J B C86	0.028	J C86 B	0.42	B C86
PCB-88	---	---			0.088	C	0.019	J C	0.0084	J C	0.32	C
PCB-89	---	---			0.0044	J	ND		0.00048	J q	0.0042	J q
PCB-9	---	---			0.0096	J	0.0016	J q	0.0016	J q	0.012	q
PCB-90	---	---			0.54	C B	0.099	C B	0.049	C B	0.94	C B
PCB-91	---	---			0.088	C88	0.019	J C88	0.0084	J C88	0.32	C88
PCB-92	---	---			0.1		0.02		0.0084	J	0.16	
PCB-93	---	---			0.011	J q C	0.0021	J C q	0.0012	J q C	0.053	C
PCB-94	---	---			ND		0.00077	J q	ND		0.014	
PCB-95	---	---			0.3		0.055		0.024		0.61	
PCB-96	---	---			ND		ND		ND		0.011	
PCB-97	---	---			0.3	C86 B	0.056	J B C86	0.028	J C86 B	0.42	B C86
PCB-98	---	---			0.022	C	0.0053	J C	0.0021	J C	0.056	C
PCB-99	---	---			0.56	C83	0.1	C83	0.054	C83	1.2	C83
Total PCBS (ng/g)	200	1000	22.7	180	37.28		7.06		3.27		59.52	
TEQ (WHO)	1[(1)]	5[(1)]			7.53E-04		1.09E-04		4.58E-06		8.87E-04	

Notes:
FSYTh=Forsythe
Results compared to NJ DEP Soil Remediation Residential and Non-Residential Standards
ERL=Effects Range- Low (Long et al., 1995)
ERM=Effects Range- Median (Long et al., 1995)
ND -- Not Detected

yellow shaded--Exceeds NJ DEP Soil Remediation Standard
--- No standard available
EB--Equipment Blank
TEQ -- Toxic equivalence in terms of the dioxin 2,3,7,8-TCDD using WHO 2005 TEFs.
(1) US EPA residential or non-residential soil objective
Data Qualifiers:
B -- Analyte was found in the blank and sample.
C--The compound co-eluted with other compounds
C108--The compound co-eluted with PCB-108
E -- Results exceeded calibration range
F1--MS and/or MSD Recovery is outside acceptance limits.
F2--MS/MSD RPD exceeds control limits
J -- Result is less than the reporting limit but greater than or equal to the method detection limit and the concentration is an approximate value.
I -- Value is Estimated maximum possible concentration (EMPC)
q -- Estimated maximum possible concentration (EMPC).
p -- The % Relative Percent Difference between the primary and confirmation column/detector is > 40%. The lower value has been reported.
* -- LCS or LCSD is outside acceptance limits.
^ -- ICV,CCV,ICB,CCB, ISA, ISB, CRI, CRA, DLCK or MRL standard: Instrument related QC is outside acceptance limits.

TABLE 5: DATA SUMMARY OF UNFILTERED ELUTRIATE ANALYTICAL RESULTS - USACE Philadephia, NJIWW (Forsythe) Federal navigation channels, New Jersey

Sample ID:	**New Jersey**	**FSYTH-2019-1**		**FSYTH-2019-2**		**FSYTH-2019-3**		**FSYTH-2019-4**	
Sample Date:	**Saline, Aquatic Life, Acute** [(1)]	2/19/2020		2/19/2020		2/19/2020		2/19/2020	
MISCELLANEOUS PARAMETERS									
Cyanide, Total (ug/L)	---	4.7	J	5.5	J	4.6	J	ND	
Total Suspended Solids (mg/L)	---	23		60		53		39	
INORGANICS	**ug/L**	**ug/L**		**ug/L**		**ug/L**		**ug/L**	
Aluminum	---	1800		1600		1500		1300	
Antimony	---	ND		ND		ND		ND	

TABLE 5: DATA SUMMARY OF UNFILTERED ELUTRIATE ANALYTICAL RESULTS - USACE Philadephia, NJIWW (Forsythe) Federal navigation channels, New Jersey

Sample ID:	**New Jersey**	**FSYTH-2019-1**		**FSYTH-2019-2**		**FSYTH-2019-3**		**FSYTH-2019-4**	
Sample Date:	**Saline, Aquatic Life, Acute** [(1)]	2/19/2020		2/19/2020		2/19/2020		2/19/2020	
Arsenic	---	4	J	9.4	J	26		3.6	J
Barium	---	ND		24	J	23	J	25	J
Beryllium	---	ND		ND		ND		ND	
Cadmium	---	ND		ND		ND		ND	
Calcium	---	320000		340000		350000		350000	
Chromium	---	ND		ND		ND		ND	
Cobalt	---	ND		ND		ND		ND	
Copper	---	ND		ND		ND		ND	
Iron	---	730		1700		1500		1900	
Lead	---	ND		1.7	J	ND		3.9	J
Magnesium	---	1000000		1100000		1100000		1100000	
Manganese	---	66	B	66	B	56	B	590	B
Mercury (ng/L)	---	3.5		5.1		1.3		15	
Nickel	---	ND		3.5	J	ND		ND	
Potassium	---	290000		300000		300000		310000	
Selenium	--	ND		ND		ND		ND	
Silver	---	ND		ND		ND		ND	
Sodium	---	8300000		8800000		8900000		9000000	
Thallium	---	ND		ND		ND		ND	
Vanadium	---	ND		29		47		ND	
Zinc	---	ND		ND		ND		ND	
DIOXIN/FURANS		**pg/L**		**pg/L**		**pg/L**		**pg/L**	
1,2,3,4,6,7,8-HpCDD	**---**	6.7	J B	5.6	J B	2.8	J B	3.4	J q B
1,2,3,4,6,7,8-HpCDF	**---**	1.2	J q B	0.76	J q B	0.33	J l q B	130	I B

TABLE 5: DATA SUMMARY OF UNFILTERED ELUTRIATE ANALYTICAL RESULTS - USACE Philadephia, NJIWW (Forsythe) Federal navigation channels, New Jersey

Sample ID:	**New Jersey**	**FSYTH-2019-1**		**FSYTH-2019-2**		**FSYTH-2019-3**		**FSYTH-2019-4**	
Sample Date:	**Saline, Aquatic Life, Acute** [(1)]	2/19/2020		2/19/2020		2/19/2020		2/19/2020	
1,2,3,4,7,8,9-HpCDF	---	ND		ND		ND		3.5	J B
1,2,3,4,7,8-HxCDD	---	ND		0.2	J q B	ND		ND	
1,2,3,4,7,8-HxCDF	---	ND		ND		ND		8.1	J
1,2,3,6,7,8-HxCDD	---	0.55	J q B	0.27	J q B	ND		ND	
1,2,3,6,7,8-HxCDF	---	ND		ND		ND		5.9	J I
1,2,3,7,8,9-HxCDD	---	0.62	J q B	0.63	J q B	0.38	J q B	0.43	J q B
1,2,3,7,8,9-HxCDF	---	ND		ND		ND		ND	
1,2,3,7,8-PeCDD	---	ND		ND		ND		ND	
1,2,3,7,8-PeCDF	---	ND		ND		ND		ND	
2,3,4,6,7,8-HxCDF	---	ND		ND		ND		1.5	J B
2,3,4,7,8-PeCDF	---	ND		ND		ND		ND	
2,3,7,8-TCDD	---	ND		ND		ND		ND	
2,3,7,8-TCDF	---	ND		ND		ND		0.39	J
OCDD	---	120	B	97	B	110	B	34	J B
OCDF	---	2.2	J B	1.3	J B	0.62	J q B	260	B
Total Dioxin/Furans	---	131.27		105.76		114.13		447.22	
TEQ (WHO)	---	0.23		0.20		0.10		3.09	
SEMIVOLATILES		**ug/L**		**ug/L**		**ug/L**		**ug/L**	
1,1'-Biphenyl	---	ND		ND		ND		ND	
2,2'-oxybis[1-chloropropane]	---	ND		ND		ND		ND	
2,4,5-Trichlorophenol	---	ND		ND		ND		ND	
2,4,6-Trichlorophenol	---	ND		ND		ND		ND	
2,4-Dichlorophenol	---	ND		ND		ND		ND	
2,4-Dimethylphenol	---	ND		ND		ND		ND	
2,4-Dinitrophenol	---	ND		ND		ND		ND	
2,4-Dinitrotoluene	---	ND		ND		ND		ND	
2,6-Dinitrotoluene	---	ND		ND		ND		ND	

TABLE 5: DATA SUMMARY OF UNFILTERED ELUTRIATE ANALYTICAL RESULTS - USACE Philadephia, NJIWW (Forsythe) Federal navigation channels, New Jersey

Sample ID:	**New Jersey**	**FSYTH-2019-1**		**FSYTH-2019-2**		**FSYTH-2019-3**		**FSYTH-2019-4**	
Sample Date:	**Saline, Aquatic Life, Acute** [(1)]	2/19/2020		2/19/2020		2/19/2020		2/19/2020	
2-Chloronaphthalene	---	ND		ND		ND		ND	
2-Chlorophenol	---	ND		ND		ND		ND	
2-Methylnaphthalene	---	ND		ND		ND		ND	
2-Methylphenol	---	ND		ND		ND		ND	
2-Nitroaniline	---	ND		ND		ND		ND	
2-Nitrophenol	---	ND		ND		ND		ND	
3,3'-Dichlorobenzidine	---	ND		ND		ND		ND	
3-Nitroaniline	---	ND		ND		ND		ND	
4,6-Dinitro-2-methylphenol	---	ND		ND		ND		ND	
4-Bromophenyl phenyl ether	---	ND		ND		ND		ND	
4-Chloro-3-methylphenol	---	ND		ND		ND		ND	
4-Chloroaniline	---	ND		ND		ND		ND	
4-Chlorophenyl phenyl ether	---	ND		ND		ND		ND	
4-Nitroaniline	---	ND		ND		ND		ND	
4-Nitrophenol	---	ND		ND		ND		ND	
Acenaphthene	---	ND		ND		ND		ND	
Acenaphthylene	---	ND		ND		ND		ND	
Acetophenone	---	ND		ND		ND		0.065	J
Anthracene	---	ND		ND		ND		ND	
Atrazine	---	ND		ND		ND		ND	
Benzaldehyde	---	ND		ND		ND		ND	
Benzo[a]anthracene	---	ND		ND		ND		ND	
Benzo[a]pyrene	---	ND		ND		ND		ND	
Benzo[b]fluoranthene	---	ND		ND		ND		ND	
Benzo[g,h,i]perylene	---	ND		ND		ND		ND	
Benzo[k]fluoranthene	---	ND		ND		ND		ND	
Bis(2-chloroethoxy)methane	---	ND		ND		ND		ND	
Bis(2-chloroethyl)ether	---	ND		ND		ND		ND	

TABLE 5: DATA SUMMARY OF UNFILTERED ELUTRIATE ANALYTICAL RESULTS - USACE Philadephia, NJIWW (Forsythe) Federal navigation channels, New Jersey

Sample ID:	**New Jersey**	**FSYTH-2019-1**		**FSYTH-2019-2**		**FSYTH-2019-3**		**FSYTH-2019-4**	
Sample Date:	**Saline, Aquatic Life, Acute** [(1)]	2/19/2020		2/19/2020		2/19/2020		2/19/2020	
Bis(2-ethylhexyl) phthalate	---	ND		ND		ND		ND	
Butyl benzyl phthalate	---	ND		ND		ND		ND	
Caprolactam	---	ND		ND		ND		ND	
Carbazole	---	ND		ND		ND		ND	
Chrysene	---	ND		ND		ND		ND	
Dibenz(a,h)anthracene	---	ND		ND		ND		ND	
Dibenzofuran	---	ND		ND		ND		ND	
Diethyl phthalate	---	ND		ND		ND		ND	
Dimethyl phthalate	---	ND		ND		ND		ND	
Di-n-butyl phthalate	---	1.1		1.2		1.4		1.4	
Di-n-octyl phthalate	---	ND		ND		ND		ND	
Fluoranthene	---	ND		ND		ND		ND	
Fluorene	---	ND		ND		ND		ND	
Hexachlorobenzene	---	ND		ND		ND		ND	
Hexachlorobutadiene	---	ND		ND		ND		ND	
Hexachlorocyclopentadiene	---	ND		ND		ND		ND	
Hexachloroethane	---	ND		ND		ND		ND	
Indeno[1,2,3-cd]pyrene	---	ND		ND		ND		ND	
Isophorone	---	ND		ND		ND		ND	
Methylphenol, 3 & 4	---	ND		ND		ND		ND	
Naphthalene	---	ND		ND		ND		ND	
Nitrobenzene	---	ND		ND		ND		ND	
N-Nitrosodi-n-propylamine	---	ND		ND		ND		ND	
N-Nitrosodiphenylamine	---	ND		ND		ND		ND	
Pentachlorophenol	13	ND		ND		ND		ND	
Phenanthrene	---	0.078		0.089	J	0.08	J	0.089	J
Phenol	---	ND		ND		ND		ND	
Pyrene	---	ND		ND		ND		ND	

TABLE 5: DATA SUMMARY OF UNFILTERED ELUTRIATE ANALYTICAL RESULTS - USACE Philadephia, NJIWW (Forsythe) Federal navigation channels, New Jersey

Sample ID:	**New Jersey**	**FSYTH-2019-1**		**FSYTH-2019-2**		**FSYTH-2019-3**		**FSYTH-2019-4**	
Sample Date:	**Saline, Aquatic Life, Acute** [(1)]	2/19/2020		2/19/2020		2/19/2020		2/19/2020	
PESTICIDES	**ug/L**	**ug/L**		**ug/L**		**ug/L**		**ug/L**	
4,4'-DDD	---	0.00082	J	0.0012		0.00072	J p	ND	
4,4'-DDE	---	ND		ND		ND		ND	
4,4'-DDT	---	ND		ND		ND		ND	
Aldrin	1.3	ND		ND		ND		ND	
alpha-BHC	---	ND		ND		ND		ND	
beta-BHC	--	ND		ND		ND		ND	
cis-Chlordane	---	ND		ND		ND		ND	
delta-BHC	---	ND		ND		ND		ND	
Dieldrin	0.71	0.00033	J p	0.00027	J p	0.00059	J	ND	
Endosulfan I	---	ND		ND		ND		ND	
Endosulfan II	---	ND		ND		ND		ND	
Endosulfan sulfate	---	ND		ND		ND		ND	
Endrin	0.037	ND		ND		ND		ND	
Endrin aldehyde	---	0.0012	p	0.00064	J p	0.0013	p	ND	
Endrin ketone	---	ND		ND		ND		ND	
gamma-BHC (Lindane)	0.16	ND		ND		ND		ND	
Heptachlor	0.053	ND		ND		ND		ND	
Heptachlor epoxide	0.053	ND		ND		ND		ND	
Methoxychlor	---	ND		ND		ND		ND	
Toxaphene	0.21	ND		ND		ND		ND	
trans-Chlordane	---	ND		ND		ND		ND	
PCB CONGENERS		**ng/L**		**ng/L**		**ng/L**		**ng/L**	
PCB-1	---	0.0085	J B	0.0063	J B	0.0038	J B	0.011	J B
PCB-10	---	ND		ND		ND		ND	
PCB-100	---	0.00048	J q C93	ND	C93	ND	C93	0.0048	J q C93

TABLE 5: DATA SUMMARY OF UNFILTERED ELUTRIATE ANALYTICAL RESULTS - USACE Philadephia, NJIWW (Forsythe) Federal navigation channels, New Jersey

Sample ID:	**New Jersey**	**FSYTH-2019-1**		**FSYTH-2019-2**		**FSYTH-2019-3**		**FSYTH-2019-4**	
Sample Date:	**Saline, Aquatic Life, Acute** [(1)]	2/19/2020		2/19/2020		2/19/2020		2/19/2020	
PCB-101	---	0.029	J C90 B	0.014	J C90 B	0.0061	J C90 B	0.092	J C90 B
PCB-102	---	0.001	J q C98	ND	C98	ND	C98	0.0084	J C98
PCB-103	---	0.00076	J q	ND		ND		0.006	J
PCB-104	---	ND		ND		ND		ND	
PCB-105	---	0.012	J B	0.0049	J B	0.002	J B	0.015	J B
PCB-106	---	ND		ND		ND		ND	
PCB-107	---	0.0035	J q	0.0011	J q	0.00089	J q	0.005	J q
PCB-108	---	0.0011	J q C B	ND	C	ND	C	ND	C
PCB-109	---	0.019	J q C86 B	0.0065	J q C86 B	0.0038	J C86 B	0.041	J C86 B
PCB-11	---	0.056	B	0.041	J B	0.025	J B	0.08	B
PCB-110	---	0.034	J C B	0.012	J q C B	0.0063	J C B	0.078	C B
PCB-111	---	ND		ND		ND		ND	
PCB-112	---	ND		ND		ND		ND	
PCB-113	---	0.029	J C90 B	0.014	J C90 B	0.0061	J C90 B	0.092	J C90 B
PCB-114	---	ND		ND		ND		ND	
PCB-115	---	0.034	J C110 B	0.012	J q C110 B	0.0063	J C110 B	0.078	C110 B
PCB-116	---	0.006	J C85 B	0.002	J q C85 B	0.0011	J C85 B	0.0074	J q C85 B
PCB-117	---	0.006	J C85 B	0.002	J q C85 B	0.0011	J C85 B	0.0074	J q C85 B
PCB-118	---	0.037	J B	0.017	J B	0.0063	J B	0.072	B
PCB-119	---	0.019	J q C86 B	0.0065	J q C86 B	0.0038	J C86 B	0.041	J C86 B
PCB-12	---	ND	C	0.003	J q C	ND	C	0.012	J C
PCB-120	---	0.0007	J q	ND		ND		0.0019	J q
PCB-121	---	ND		ND		ND		ND	
PCB-122	---	ND		ND		ND		ND	
PCB-123	---	0.0013	J q	ND		ND		0.0014	J q
PCB-124	---	0.0011	J q C108 B	ND	C108	ND	C108	ND	C108

TABLE 5: DATA SUMMARY OF UNFILTERED ELUTRIATE ANALYTICAL RESULTS - USACE Philadephia, NJIWW (Forsythe) Federal navigation channels, New Jersey

Sample ID:	**New Jersey**	**FSYTH-2019-1**		**FSYTH-2019-2**		**FSYTH-2019-3**		**FSYTH-2019-4**	
Sample Date:	**Saline, Aquatic Life, Acute** [(1)]	2/19/2020		2/19/2020		2/19/2020		2/19/2020	
PCB-125	---	0.019	J q C86 B	0.0065	J q C86 B	0.0038	J C86 B	0.041	J C86 B
PCB-126	---	0.0011	J q B	ND		0.0005	J q B	0.0011	J B
PCB-127	---	ND		ND		ND		ND	
PCB-128	---	0.0069	J C B	0.0024	J q C B	0.0012	J q C B	0.0083	J C B
PCB-129	---	0.049	J C B	0.019	J C B	0.007	J q C B	0.068	J C B
PCB-13	---	ND	C12	0.003	J q C12	ND	C12	0.012	J C12
PCB-130	---	0.0033	J	ND		ND		0.005	J
PCB-131	---	ND		ND		ND		ND	
PCB-132	---	0.0055	J q	0.004	J	0.0024	J	0.011	J
PCB-133	---	ND		ND		ND		0.0022	J
PCB-134	---	ND	C	ND	C	ND	C	0.0025	J C
PCB-135	---	0.013	J C B	0.0059	J q C B	0.0024	J C B	0.034	J C B
PCB-136	---	0.003	J q	0.0022	J	0.00055	J q	0.019	J
PCB-137	---	0.0016	J q	ND		ND		ND	
PCB-138	---	0.049	J C129 B	0.019	J C129 B	0.007	J q C129 B	0.068	J C129 B
PCB-139	---	ND	C	ND	C	ND	C	ND	C
PCB-14	---	ND		ND		ND		ND	
PCB-140	---	ND	C139	ND	C139	ND	C139	ND	C139
PCB-141	---	0.0028	J q B	0.0027	J B	0.00093	J q B	0.0039	J q B
PCB-142	---	ND		ND		ND		ND	
PCB-143	---	ND	C134	ND	C134	ND	C134	0.0025	J C134
PCB-144	---	0.00052	J q	0.00041	J q	ND		0.002	J q
PCB-145	---	ND		ND		ND		ND	
PCB-146	---	0.012	J	0.0048	J	0.0015	J q	0.025	J q
PCB-147	---	0.032	J q C B	0.017	J C B	0.0076	J C B	0.14	C B
PCB-148	---	ND		ND		ND		ND	

TABLE 5: DATA SUMMARY OF UNFILTERED ELUTRIATE ANALYTICAL RESULTS - USACE Philadephia, NJIWW (Forsythe) Federal navigation channels, New Jersey

Sample ID:	**New Jersey**	**FSYTH-2019-1**		**FSYTH-2019-2**		**FSYTH-2019-3**		**FSYTH-2019-4**	
Sample Date:	**Saline, Aquatic Life, Acute** [(1)]	2/19/2020		2/19/2020		2/19/2020		2/19/2020	
PCB-149	---	0.032	J q C147 B	0.017	J C147 B	0.0076	J C147 B	0.14	C147 B
PCB-15	---	0.019	J q	0.01	J q	0.0037	J	0.032	J
PCB-150	---	ND		ND		ND		0.0033	J
PCB-151	---	0.013	J C135 B	0.0059	J q C135 B	0.0024	J C135 B	0.034	J C135 B
PCB-152	---	ND		ND		ND		0.00061	J q
PCB-153	---	0.049	J C B	0.022	J C B	0.0066	J q C B	0.12	C B
PCB-154	---	0.0019	J q	0.0004	J q	0.00021	J q	0.013	J
PCB-155	---	0.00029	J q B	ND		ND		0.00078	J B
PCB-156	---	0.0031	J C B	0.0021	J q C B	0.00082	J q C B	0.0038	J q C B
PCB-157	---	0.0031	J C156 B	0.0021	J q C156 B	0.00082	J q C156 B	0.0038	J q C156 B
PCB-158	---	0.0035	J B	0.0012	J q B	0.00064	J B	0.0029	J q B
PCB-159	---	ND		ND		ND		ND	
PCB-16	---	0.0066	J	0.0034	J	0.002	J q	0.015	J
PCB-160	---	0.049	J C129 B	0.019	J C129 B	0.007	J q C129 B	0.068	J C129 B
PCB-161	---	ND		ND		ND		ND	
PCB-162	---	ND		ND		ND		ND	
PCB-163	---	0.049	J C129 B	0.019	J C129 B	0.007	J q C129 B	0.068	J C129 B
PCB-164	---	0.0021	J B	ND		ND		0.0044	J B
PCB-165	---	ND		ND		ND		ND	
PCB-166	---	0.0069	J C128 B	0.0024	J q C128 B	0.0012	J q C128 B	0.0083	J C128 B
PCB-167	---	0.0015	J q B	ND		0.00043	J B	0.002	J B
PCB-168	---	0.049	J C153 B	0.022	J C153 B	0.0066	J q C153 B	0.12	C153 B

TABLE 5: DATA SUMMARY OF UNFILTERED ELUTRIATE ANALYTICAL RESULTS - USACE Philadephia, NJIWW (Forsythe) Federal navigation channels, New Jersey

Sample ID:	**New Jersey**	**FSYTH-2019-1**		**FSYTH-2019-2**		**FSYTH-2019-3**		**FSYTH-2019-4**	
Sample Date:	**Saline, Aquatic Life, Acute** [(1)]	2/19/2020		2/19/2020		2/19/2020		2/19/2020	
PCB-169	---	ND		0.0014	J B	ND		ND	
PCB-17	---	0.011	J q	0.0047	J q	0.0023	J q	0.026	J
PCB-170	---	0.0091	J B	0.0044	J B	0.0012	J q B	0.016	J B
PCB-171	---	0.0051	J q C B	0.0017	J q C B	0.0018	J q C B	0.0071	J q C B
PCB-172	---	0.0014	J q B	ND		ND		0.0029	J B
PCB-173	---	0.0051	J q C171 B	0.0017	J q C171 B	0.0018	J q C171 B	0.0071	J q C171 B
PCB-174	---	0.0076	J q B	0.0032	J B	0.0013	J q B	0.011	J B
PCB-175	---	0.00037	J q	ND		ND		0.00089	J q
PCB-176	---	0.0011	J B	ND		ND		0.0022	J q B
PCB-177	---	0.009	J B	0.0026	J q B	0.0012	J q B	0.011	J q B
PCB-178	---	0.0048	J	0.0044	J	0.00042	J q	0.0069	J
PCB-179	---	0.0073	J q	0.0024	J q	0.00066	J q	0.013	J
PCB-18	---	0.016	J C	0.0079	J C	0.0039	J q C	0.037	J C
PCB-180	---	0.018	J C B	0.0091	J C B	0.0037	J C B	0.038	J C B
PCB-181	---	ND		ND		ND		ND	
PCB-182	---	0.0006	J	ND		ND		ND	
PCB-183	---	0.0067	J q C B	0.0027	J q C B	0.0023	J C B	0.016	J C B
PCB-184	---	ND		ND		ND		ND	
PCB-185	---	0.0067	J q C183 B	0.0027	J q C183 B	0.0023	J C183 B	0.016	J C183 B
PCB-186	---	ND		ND		ND		ND	
PCB-187	---	0.026	J q B	0.014	J B	0.0027	J q B	0.052	B
PCB-188	---	0.00062	J q	0.00056	J q	0.00021	J q	0.0014	J q
PCB-189	---	ND		0.00069	J B	ND		0.00089	J q B
PCB-19	---	0.0022	J q	0.0013	J q	0.0016	J	0.0029	J q
PCB-190	---	0.0013	J q B	ND		ND		0.003	J q B
PCB-191	---	ND		ND		ND		0.00069	J

TABLE 5: DATA SUMMARY OF UNFILTERED ELUTRIATE ANALYTICAL RESULTS - USACE Philadephia, NJIWW (Forsythe) Federal navigation channels, New Jersey

Sample ID:	**New Jersey**	**FSYTH-2019-1**		**FSYTH-2019-2**		**FSYTH-2019-3**		**FSYTH-2019-4**	
Sample Date:	**Saline, Aquatic Life, Acute** [(1)]	2/19/2020		2/19/2020		2/19/2020		2/19/2020	
PCB-192	---	ND		ND		ND		ND	
PCB-193	---	0.018	J C180 B	0.0091	J C180 B	0.0037	J C180 B	0.038	J C180 B
PCB-194	---	0.0069	J q B	0.0044	J q B	0.001	J B	0.013	J q B
PCB-195	---	0.0015	J q B	0.0012	J B	0.00033	J B	0.0028	J q B
PCB-196	---	0.0035	J q	0.0025	J q	ND		0.0069	J
PCB-197	---	ND		ND		ND		0.00078	J
PCB-198	---	0.0099	J C	0.0075	J C	0.00086	J q C	0.014	J q C
PCB-199	---	0.0099	J C198	0.0075	J C198	0.00086	J q C198	0.014	J q C198
PCB-2	---	0.01	J B	0.0033	J q B	0.0021	J B	0.016	J B
PCB-20	---	0.051	J C B	0.023	J C B	0.01	J C B	0.1	C B
PCB-200	---	0.00077	J	ND		ND		0.00085	J q
PCB-201	---	0.0023	J q	0.0014	J q	ND		0.0027	J
PCB-202	---	0.0059	J q	0.0063	J q	0.001	J	0.0076	J
PCB-203	---	0.0045	J	0.001	J q	0.00039	J q	0.0076	J
PCB-204	---	ND		ND		ND		ND	
PCB-205	---	ND		ND		ND		0.0013	J q B
PCB-206	---	0.013	J	0.012	J	ND		0.0097	J q
PCB-207	---	0.0023	J q	ND		ND		ND	
PCB-208	---	0.0041	J q	0.0064	J	ND		0.0046	J q
PCB-209	---	0.014	J B	0.023	J B	0.003	J B	0.011	J q B
PCB-21	---	0.0088	J q C B	0.0075	J C B	0.0045	J C B	0.02	J q C B
PCB-22	---	0.01	J B	0.0053	J B	0.0031	J B	0.021	J B
PCB-23	---	ND		ND		ND		ND	
PCB-24	---	0.00052	J q	ND		ND		0.00086	J q
PCB-25	---	0.0067	J	0.0027	J	0.0013	J q	0.022	J
PCB-26	---	0.009	J q C B	0.0052	J C B	0.0016	J q C B	0.03	J C B
PCB-27	---	0.0033	J	0.001	J q	ND		0.006	J q
PCB-28	---	0.051	J C20 B	0.023	J C20 B	0.01	J C20 B	0.1	C20 B

TABLE 5: DATA SUMMARY OF UNFILTERED ELUTRIATE ANALYTICAL RESULTS - USACE Philadephia, NJIWW (Forsythe) Federal navigation channels, New Jersey

Sample ID:	**New Jersey**	**FSYTH-2019-1**		**FSYTH-2019-2**		**FSYTH-2019-3**		**FSYTH-2019-4**	
Sample Date:	**Saline, Aquatic Life, Acute** [(1)]	2/19/2020		2/19/2020		2/19/2020		2/19/2020	
PCB-29	---	0.009	J q C26 B	0.0052	J C26 B	0.0016	J q C26 B	0.03	J C26 B
PCB-3	---	0.0027	J q B	0.002	J q B	0.0014	J B	0.0035	J q B
PCB-30	---	0.016	J C18	0.0079	J C18	0.0039	J q C18	0.037	J C18
PCB-31	---	0.035	J B	0.016	J B	0.0084	J B	0.071	B
PCB-32	---	0.0076	J q B	0.0047	J B	0.0026	J B	0.018	J B
PCB-33	---	0.0088	J q C21 B	0.0075	J C21 B	0.0045	J C21 B	0.02	J q C21 B
PCB-34	---	ND		ND		ND		ND	
PCB-35	---	0.0018	J q B	0.00084	J B	ND		0.0034	J B
PCB-36	---	ND		ND		ND		0.002	J
PCB-37	---	0.014	J B	0.0073	J B	0.003	J B	0.024	J B
PCB-38	---	ND		ND		ND		ND	
PCB-39	---	ND		ND		ND		ND	
PCB-4	---	0.016	J q	0.0096	J q	0.0054	J q	0.03	J
PCB-40	---	0.012	J C	0.0041	J q C	0.0034	J C	0.043	J C
PCB-41	---	0.012	J C40	0.0041	J q C40	0.0034	J C40	0.043	J C40
PCB-42	---	0.0076	J	0.0041	J	0.0011	J	0.023	J
PCB-43	---	ND	C	ND	C	ND	C	0.0029	J q C
PCB-44	---	0.06	J C B	0.071	J C B	0.043	J C B	0.11	C B
PCB-45	---	0.0082	J q C B	0.01	J q C B	0.0089	J C B	0.014	J q C B
PCB-46	---	ND		ND		ND		0.007	J
PCB-47	---	0.06	J C44 B	0.071	J C44 B	0.043	J C44 B	0.11	C44 B
PCB-48	---	0.0034	J	ND		0.00071	J q	0.0072	J q
PCB-49	---	0.021	J C B	0.0083	J C B	0.0033	J q C B	0.069	J C B
PCB-5	---	ND		ND		0.0024	J q	ND	
PCB-50	---	0.0023	J q C	ND	C	0.00096	J C	0.009	J C
PCB-51	---	0.0082	J q C45 B	0.01	J q C45 B	0.0089	J C45 B	0.014	J q C45 B
PCB-52	---	0.028	J B	0.013	J B	0.0068	J B	0.081	B
PCB-53	---	0.0023	J q C50	ND	C50	0.00096	J C50	0.009	J C50

TABLE 5: DATA SUMMARY OF UNFILTERED ELUTRIATE ANALYTICAL RESULTS - USACE Philadephia, NJIWW (Forsythe) Federal navigation channels, New Jersey

Sample ID:	**New Jersey**	**FSYTH-2019-1**		**FSYTH-2019-2**		**FSYTH-2019-3**		**FSYTH-2019-4**	
Sample Date:	**Saline, Aquatic Life, Acute** [(1)]	2/19/2020		2/19/2020		2/19/2020		2/19/2020	
PCB-54	---	ND		ND		ND		ND	
PCB-55	---	0.0016	J	0.0012	J	ND		ND	
PCB-56	---	0.0088	J q	0.0048	J q	0.0017	J q	0.02	J q
PCB-57	---	ND		ND		ND		ND	
PCB-58	---	ND		ND		ND		ND	
PCB-59	---	0.0025	J q C	0.0018	J C	ND	C	0.0069	J C
PCB-6	---	0.0055	J q	0.0039	J q	0.002	J q	0.014	J q
PCB-60	---	0.0045	J	0.0022	J	0.0014	J	0.0079	J
PCB-61	---	0.04	J C B	0.017	J C B	0.0072	J q C B	0.087	J C B
PCB-62	---	0.0025	J q C59	0.0018	J C59	ND	C59	0.0069	J C59
PCB-63	---	0.0022	J	ND		ND		0.0028	J
PCB-64	---	0.0069	J	0.0033	J q	0.0011	J q	0.021	J
PCB-65	---	0.06	J C44 B	0.071	J C44 B	0.043	J C44 B	0.11	C44 B
PCB-66	---	0.034	J B	0.012	J q B	0.0056	J B	0.082	B
PCB-67	---	ND		ND		ND		0.0054	J
PCB-68	---	0.0048	J B	0.0083	J B	0.0046	J B	0.004	J q B
PCB-69	---	0.021	J C49 B	0.0083	J C49 B	0.0033	J q C49 B	0.069	J C49 B
PCB-7	---	ND		ND		ND		ND	
PCB-70	---	0.04	J C61 B	0.017	J C61 B	0.0072	J q C61 B	0.087	J C61 B
PCB-71	---	0.012	J C40	0.0041	J q C40	0.0034	J C40	0.043	J C40
PCB-72	---	ND		ND		ND		0.0031	J
PCB-73	---	ND	C43	ND	C43	ND	C43	0.0029	J q C43
PCB-74	---	0.04	J C61 B	0.017	J C61 B	0.0072	J q C61 B	0.087	J C61 B
PCB-75	---	0.0025	J q C59	0.0018	J C59	ND	C59	0.0069	J C59
PCB-76	---	0.04	J C61 B	0.017	J C61 B	0.0072	J q C61 B	0.087	J C61 B
PCB-77	---	0.0056	J B	ND		0.0011	J q B	0.0088	J q B
PCB-78	---	ND		ND		ND		ND	
PCB-79	---	ND		ND		ND		ND	

TABLE 5: DATA SUMMARY OF UNFILTERED ELUTRIATE ANALYTICAL RESULTS - USACE Philadephia, NJIWW (Forsythe) Federal navigation channels, New Jersey

Sample ID:	**New Jersey**	**FSYTH-2019-1**		**FSYTH-2019-2**		**FSYTH-2019-3**		**FSYTH-2019-4**	
Sample Date:	**Saline, Aquatic Life, Acute** [(1)]	2/19/2020		2/19/2020		2/19/2020		2/19/2020	
PCB-8	---	0.021	J B	0.012	J q B	0.0069	J B	0.029	J B
PCB-80	---	ND		ND		ND		ND	
PCB-81	---	ND		ND		ND		ND	
PCB-82	---	0.0039	J q B	0.0021	J q B	0.0006	J q B	0.0034	J q B
PCB-83	---	0.032	J C	0.013	J C	0.0044	J q C	0.13	C
PCB-84	---	0.0037	J q	0.0022	J q	0.0013	J	0.015	J q
PCB-85	---	0.006	J C B	0.002	J q C B	0.0011	J C B	0.0074	J q C B
PCB-86	---	0.019	J q C B	0.0065	J q C B	0.0038	J C B	0.041	J C B
PCB-87	---	0.019	J q C86 B	0.0065	J q C86 B	0.0038	J C86 B	0.041	J C86 B
PCB-88	---	0.0046	J q C	0.0016	J q C	0.00088	J C	0.037	J C
PCB-89	---	ND		ND		ND		ND	
PCB-9	---	ND		ND		ND		0.0031	J q
PCB-90	---	0.029	J C B	0.014	J C B	0.0061	J C B	0.092	J C B
PCB-91	---	0.0046	J q C88	0.0016	J q C88	0.00088	J C88	0.037	J C88
PCB-92	---	0.0056	J q B	0.0023	J B	0.00078	J q B	0.012	J B
PCB-93	---	0.00048	J q C	ND	C	ND	C	0.0048	J q C
PCB-94	---	ND		ND		ND		0.0012	J q
PCB-95	---	0.02	J B	0.0079	J q B	0.005	J q B	0.072	B
PCB-96	---	ND		ND		ND		0.0015	J q
PCB-97	---	0.019	J q C86 B	0.0065	J q C86 B	0.0038	J C86 B	0.041	J C86 B
PCB-98	---	0.001	J q C	ND	C	ND	C	0.0084	J C
PCB-99	---	0.032	J C83	0.013	J C83	0.0044	J q C83	0.13	C83
Total PCBs	---	2.1		1.1		0.5		4.7	
TEQ (WHO)	---	1.12E-04		4.28E-05		5.04E-05		1.14E-04	

Notes
AV= FSYTh=Forsythe

TABLE 5: DATA SUMMARY OF UNFILTERED ELUTRIATE ANALYTICAL RESULTS - USACE Philadephia, NJIWW (Forsythe) Federal navigation channels, New Jersey

Sample ID:	**New Jersey**	**FSYTH-2019-1**		**FSYTH-2019-2**		**FSYTH-2019-3**		**FSYTH-2019-4**	
Sample Date:	**Saline, Aquatic Life, Acute** [(1)]	2/19/2020		2/19/2020		2/19/2020		2/19/2020	

ND -- Not Detected

[(1)] -- NJ Surface Water Quality Acute Criteria for the protection of aquatic life in saline water (N.J.A.C. 7:9B-1.14 (f))

yellow highlight -- exceedance of NJ Surface Water Quality Acute Criteria for the protection of aquatic life in saline water (N.J.A.C. 7:9B-1.14 (f))

NA -- No result is available/applicable for this parameter in this sample.

TEQ -- Toxic equivalence in terms of the dioxin 2,3,7,8-TCDD using WHO 2005 TEFs.

Data Qualifiers:

B -- Compound was found in the blank and sample.

C -- The compound co-eluted with other compounds

C108 -- The compound co-eluted with PCB-108

F1 -- MS and/or MSD recovery exceeds control limits.

I -- Value is EMPC (estimated maximum possible concentration).

J -- Result is less than the reporting limit but greater than or equal to the method detection limit and the concentration is an approximate value.

q -- Estimated maximum possible concentration (EMPC).

p -- The % Relative Percent Difference between the primary and confirmation column/detector is > 40%. The lower value has been reported.

* -- Isotope Dilution analyte is outside acceptance limits (Dioxin) or LCS or LCSD is outside acceptance limits (SVOCs).

TABLE 6: DATA SUMMARY OF FILTERED ELUTRIATE ANALYTICAL RESULTS - USACE Philadephia, NJIWW (Forsythe), Federal navigation channels, New Jersey

Sample ID:	**NJ**	**FSYTH-2019-1**		**FSYTH-2019-2**		**FSYTH-2019-3**		**FSYTH-2019-4**	
Sample Date:	**Saline, Aquatic Life, Acute** [(1)]	2/19/2020		2/19/2020		2/19/2020		2/19/2020	
MISCELLANEOUS PARAMETERS									
Cyanide, Total (ug/L)	---	4.6	J	ND		ND		ND	
DISSOLVED INORGANICS	**ug/L**	**ug/L**		**ug/L**		**ug/L**		**ug/L**	
Aluminum	---	ND		ND		ND		ND	
Antimony	---	ND		ND		ND		ND	
Arsenic	69	ND		7.4	J	26		ND	
Barium	---	ND		23	J	26	J	27	J
Beryllium	---	ND		ND		ND		ND	
Cadmium	40	ND		ND		ND		ND	
Calcium	---	320000		340000		350000		330000	
Chromium	---	ND		ND		ND		ND	
Cobalt	---	ND		ND		ND		ND	
Copper	4.8	18	J	ND		ND		ND	
Iron	---	ND		ND		ND		ND	
Lead	210	ND		ND		ND		ND	
Magnesium	---	1000000		1100000		1100000		1100000	
Manganese	---	58	B	52	B	44	J B	550	B
Mercury (ng/L)	1800 (ng/L)	0.72		0.67		0.62		0.96	
Nickel	64	ND		ND		ND		ND	
Potassium	---	290000		300000		300000		300000	
Selenium	290	ND		ND		ND		ND	
Silver	1.9	ND		ND		ND		ND	
Sodium	---	8300000		8500000		8900000		8800000	
Thallium	---	ND		ND		ND		ND	
Vanadium	---	ND		24		46		ND	
Zinc	90	ND		ND		ND		ND	

TABLE 6: DATA SUMMARY OF FILTERED ELUTRIATE ANALYTICAL RESULTS - USACE Philadephia, NJIWW (Forsythe), Federal navigation channels, New Jersey

Sample ID:	**NJ**	**FSYTH-2019-1**		**FSYTH-2019-2**		**FSYTH-2019-3**		**FSYTH-2019-4**	
Sample Date:	**Saline, Aquatic Life, Acute [(1)]**	2/19/2020		2/19/2020		2/19/2020		2/19/2020	
SEMIVOLATILES	**ug/L**	**ug/L**		**ug/L**		**ug/L**		**ug/L**	
1,1'-Biphenyl	---	ND		ND		ND		ND	
2,2'-oxybis[1-chloropropane]	---	ND		ND		ND		ND	
2,4,5-Trichlorophenol	---	ND		ND		ND		ND	
2,4,6-Trichlorophenol	---	ND		ND		ND		ND	
2,4-Dichlorophenol	---	ND		ND		ND		ND	
2,4-Dimethylphenol	---	ND		ND		ND		ND	
2,4-Dinitrophenol	---	ND		ND		ND		ND	
2,4-Dinitrotoluene	---	ND		ND		ND		ND	
2,6-Dinitrotoluene	---	ND		ND		ND		ND	
2-Chloronaphthalene	---	ND		ND		ND		ND	
2-Chlorophenol	---	ND		ND		ND		ND	
2-Methylnaphthalene	---	ND		ND		ND		ND	
2-Methylphenol	---	ND		ND		ND		ND	
2-Nitroaniline	---	ND		ND		ND		ND	
2-Nitrophenol	---	ND		ND		ND		ND	
3,3'-Dichlorobenzidine	---	ND		ND		ND		ND	
3-Nitroaniline	---	ND		ND		ND		ND	
4,6-Dinitro-2-methylphenol	---	ND		ND		ND		ND	
4-Bromophenyl phenyl ether	---	ND		ND		ND		ND	
4-Chloro-3-methylphenol	---	ND		ND		ND		ND	
4-Chloroaniline	---	ND		ND		ND		ND	
4-Chlorophenyl phenyl ether	---	ND		ND		ND		ND	
4-Nitroaniline	---	ND		ND		ND		ND	
4-Nitrophenol	---	ND		ND		ND		ND	
Acenaphthene	---	ND		ND		ND		ND	
Acenaphthylene	---	ND		ND		ND		ND	
Acetophenone	---	ND		ND		ND		0.063	J
Anthracene	---	ND		ND		ND		ND	
Atrazine	---	ND		ND		ND		ND	

TABLE 6: DATA SUMMARY OF FILTERED ELUTRIATE ANALYTICAL RESULTS - USACE Philadephia, NJIWW (Forsythe), Federal navigation channels, New Jersey

Sample ID:	**NJ**	**FSYTH-2019-1**		**FSYTH-2019-2**		**FSYTH-2019-3**		**FSYTH-2019-4**	
Sample Date:	**Saline, Aquatic Life, Acute [(1)]**	2/19/2020		2/19/2020		2/19/2020		2/19/2020	
Benzaldehyde	---	ND		ND		ND		ND	
Benzo[a]anthracene	---	ND		ND		ND		ND	
Benzo[a]pyrene	---	ND		ND		ND		ND	
Benzo[b]fluoranthene	---	ND		ND		ND		ND	
Benzo[g,h,i]perylene	---	ND		ND		ND		ND	
Benzo[k]fluoranthene	---	ND		ND		ND		ND	
Bis(2-chloroethoxy)methane	---	ND		ND		ND		ND	
Bis(2-chloroethyl)ether	---	ND		ND		ND		ND	
Bis(2-ethylhexyl) phthalate	---	ND		ND		ND		ND	
Butyl benzyl phthalate	---	ND		ND		ND		ND	
Caprolactam	---	ND		0.56	J	ND		ND	
Carbazole	---	ND		ND		ND		ND	
Chrysene	---	ND		ND		ND		ND	
Dibenz(a,h)anthracene	---	ND		ND		ND		ND	
Dibenzofuran	---	ND		ND		ND		ND	
Diethyl phthalate	---	ND		ND		ND		ND	
Dimethyl phthalate	---	ND		ND		ND		ND	
Di-n-butyl phthalate	---	1.4		2.2		1		1.5	
Di-n-octyl phthalate	---	ND		ND		ND		ND	
Fluoranthene	---	ND		ND		ND		ND	
Fluorene	---	ND		ND		ND		ND	
Hexachlorobenzene	---	ND		ND		ND		ND	
Hexachlorobutadiene	---	ND		ND		ND		ND	
Hexachlorocyclopentadiene	---	ND		ND		ND		ND	
Hexachloroethane	---	ND		ND		ND		ND	
Indeno[1,2,3-cd]pyrene	---	ND		ND		ND		ND	
Isophorone	---	ND		ND		ND		ND	
Methylphenol, 3 & 4	---	ND		ND		ND		ND	
Naphthalene	---	ND		ND		ND		ND	
Nitrobenzene	---	ND		ND		ND		ND	

TABLE 6: DATA SUMMARY OF FILTERED ELUTRIATE ANALYTICAL RESULTS - USACE Philadephia, NJIWW (Forsythe), Federal navigation channels, New Jersey

Sample ID:	**NJ**	**FSYTH-2019-1**		**FSYTH-2019-2**		**FSYTH-2019-3**		**FSYTH-2019-4**	
Sample Date:	**Saline, Aquatic Life, Acute [(1)]**	2/19/2020		2/19/2020		2/19/2020		2/19/2020	
N-Nitrosodi-n-propylamine	---	ND		ND		ND		ND	
N-Nitrosodiphenylamine	---	ND		ND		ND		ND	
Pentachlorophenol	13	ND		ND		ND		ND	
Phenanthrene	---	0.089	J	0.066	J	0.098	J	0.11	J
Phenol	---	ND		ND		ND		ND	
Pyrene	---	ND		ND		ND		ND	
PESTICIDES	**ug/L**	**ug/L**		**ug/L**		**ug/L**		**ug/L**	
4,4'-DDD	---	0.0013		0.0015	p	0.00061	J p	ND	
4,4'-DDE	---	ND		ND		ND		ND	
4,4'-DDT	---	ND		ND		ND		ND	
Aldrin	1.3	ND		ND		ND		ND	
alpha-BHC	---	ND		ND		ND		ND	
beta-BHC	--	ND		ND		ND		ND	
cis-Chlordane	---	ND		ND		ND		ND	
delta-BHC	---	ND		ND		ND		ND	
Dieldrin	0.71	0.00043	J p	0.0005	J p	0.00085	J	0.00048	J p
Endosulfan I	---	ND		ND		ND		ND	
Endosulfan II	---	ND		ND		ND		ND	
Endosulfan sulfate	---	ND		ND		ND		ND	
Endrin	0.037	ND		ND		ND		ND	
Endrin aldehyde	---	0.0018		ND		ND		ND	
Endrin ketone	---	ND		ND		ND		ND	
gamma-BHC (Lindane)	0.16	ND		ND		ND		ND	
Heptachlor	0.053	ND		0.00066	J	ND		ND	
Heptachlor epoxide	0.053	ND		ND		ND		0.00069	J
Methoxychlor	---	ND		ND		ND		ND	
Toxaphene	0.21	ND		ND		ND		ND	
trans-Chlordane	---	ND		ND		ND		ND	

TABLE 6: DATA SUMMARY OF FILTERED ELUTRIATE ANALYTICAL RESULTS - USACE Philadephia, NJIWW (Forsythe), Federal navigation channels, New Jersey

Sample ID:	**NJ**	**FSYTH-2019-1**		**FSYTH-2019-2**		**FSYTH-2019-3**		**FSYTH-2019-4**	
Sample Date:	**Saline, Aquatic Life, Acute [(1)]**	2/19/2020		2/19/2020		2/19/2020		2/19/2020	

Notes:

FSYTh=Forsythe

ND -- Not Detected

[(1)] -- NJ Surface Water Quality Acute Criteria for the protection of aquatic life in saline water (N.J.A.C. 7:9B-1.14 (f))

yellow highlight -- exceedance of NJ Surface Water Quality Acute Criteria for the protection of aquatic life in saline water (N.J.A.C. 7:9B-1.14 (f))

NA -- No result is available/applicable for this parameter in this sample.

Data Qualifiers:

B -- Compound was found in the blank and sample.

J -- Result is less than the reporting limit but greater than or equal to the method detection limit and the concentration is an approximate value.

q -- Estimated maximum possible concentration (EMPC).

p -- The % Relative Percent Difference between the primary and confirmation column/detector is > 40%. The lower value has been reported.

TABLE 7: DATA SUMMARY OF WATER ANALYTICAL RESULTS - USACE Philadephia, NJIWW (Avalon, Forsythe, Oyster Creek), Pre-dredge samples

Sample ID:	**New Jersey**	**SW-1D**		**SW-1T**		**EB-1**	
Sample Date:	**Saline, Aquatic Life, Acute [(1)]**	**2/20/2020**		**2/20/2020**		**2/19/2020**	
MISCELLANEOUS PARAMETERS							
Cyanide, Total (ug/L)	---	ND		ND		ND	
Total Suspended Solids (mg/L)	---	NA		7.2		NA	

TABLE 7: DATA SUMMARY OF WATER ANALYTICAL RESULTS - USACE Philadephia, NJIWW (Avalon, Forsythe, Oyster Creek), Pre-dredge samples

Sample ID:	New Jersey	SW-1D		SW-1T		EB-1	
Sample Date:	Saline, Aquatic Life, Acute [(1)]	2/20/2020		2/20/2020		2/19/2020	
INORGANICS	**ug/L**	**ug/L**		**ug/L**		**ug/L**	
Aluminum	---	NA		ND		ND	
Antimony	---	NA		ND		ND	
Arsenic	---	NA		ND		ND	
Barium	---	NA		ND		ND	
Beryllium	---	NA		ND		ND	
Cadmium	---	NA		ND		ND	
Calcium	---	NA		350000		ND	
Chromium	---	NA		ND		ND	
Cobalt	---	NA		ND		ND	
Copper	---	NA		ND		ND	
Iron	---	NA		ND		ND	
Lead	---	NA		ND		ND	
Magnesium	---	NA		1100000		ND	
Manganese	---	NA		ND		0.89	J B
Mercury (ng\L)	---	NA		1.2		0.44	J
Nickel	---	NA		ND		ND	
Potassium	---	NA		310000		ND	
Selenium	--	NA		ND		ND	
Silver	---	NA		ND		ND	
Sodium	---	NA		8700000		390	J
Thallium	---	NA		ND		ND	
Vanadium	---	NA		ND		ND	
Zinc	---	NA		ND		3.3	J
DISSOLVED INORGANICS	**ug/L**	**ug/L**		**ug/L**		**ug/L**	
Aluminum	---	ND		NA		NA	
Antimony	---	ND		NA		NA	
Arsenic	69	ND		NA		NA	
Barium	---	ND		NA		NA	

TABLE 7: DATA SUMMARY OF WATER ANALYTICAL RESULTS - USACE Philadephia, NJIWW (Avalon, Forsythe, Oyster Creek), Pre-dredge samples

Sample ID:	New Jersey	SW-1D		SW-1T		EB-1	
Sample Date:	Saline, Aquatic Life, Acute [(1)]	2/20/2020		2/20/2020		2/19/2020	
Beryllium	---	ND		NA		NA	
Cadmium	40	ND		NA		NA	
Calcium	---	370000		NA		NA	
Chromium	---	ND		NA		NA	
Cobalt	---	ND		NA		NA	
Copper	4.8	ND		NA		NA	
Iron	---	ND		NA		NA	
Lead	210	ND		NA		NA	
Magnesium	---	1100000		NA		NA	
Manganese	---	ND		NA		NA	
Mercury (ng\L)	1800 (ng/L)	0.64	H	NA		NA	
Nickel	64	ND		NA		NA	
Potassium	---	310000		NA		NA	
Selenium	290	ND		NA		NA	
Silver	1.9	ND		NA		NA	
Sodium	---	9000000		NA		NA	
Thallium	---	ND		NA		NA	
Vanadium	---	ND		NA		NA	
Zinc	90	ND		NA		NA	
DIOXIN/FURANS		pg/L		pg/L		pg/L	
1,2,3,4,6,7,8-HpCDD	---	NA		7.3	J	1.5	J q
1,2,3,4,6,7,8-HpCDF	---	NA		1.2	J	ND	
1,2,3,4,7,8,9-HpCDF	---	NA		ND		ND	
1,2,3,4,7,8-HxCDD	---	NA		ND		ND	
1,2,3,4,7,8-HxCDF	---	NA		0.3	J q	ND	
1,2,3,6,7,8-HxCDD	---	NA		ND		ND	
1,2,3,6,7,8-HxCDF	---	NA		ND		ND	
1,2,3,7,8,9-HxCDD	---	NA		ND		ND	
1,2,3,7,8,9-HxCDF	---	NA		ND		ND	

TABLE 7: DATA SUMMARY OF WATER ANALYTICAL RESULTS - USACE Philadephia, NJIWW (Avalon, Forsythe, Oyster Creek), Pre-dredge samples

Sample ID:	New Jersey	SW-1D		SW-1T		EB-1	
Sample Date:	Saline, Aquatic Life, Acute [(1)]	2/20/2020		2/20/2020		2/19/2020	
1,2,3,7,8-PeCDD	---	NA		ND		ND	
1,2,3,7,8-PeCDF	---	NA		ND		ND	
2,3,4,6,7,8-HxCDF	---	NA		ND		ND	
2,3,4,7,8-PeCDF	---	NA		ND		ND	
2,3,7,8-TCDD	---	NA		ND		0.12	J q
2,3,7,8-TCDF	---	NA		ND		ND	
OCDD	---	NA		230	B	11	J B
OCDF	---	NA		6.5	J B	ND	
Total Dioxin/Furans	---	NA		245.3		12.62	
TEQ (WHO)	---	NA		0.19		0.14	
SEMIVOLATILES		ug/L		ug/L		ug/L	
1,1'-Biphenyl	---	ND		ND		ND	
2,2'-oxybis[1-chloropropane]	---	ND		ND		ND	
2,4,5-Trichlorophenol	---	ND		ND		ND	
2,4,6-Trichlorophenol	---	ND		ND		ND	
2,4-Dichlorophenol	---	ND		ND		ND	
2,4-Dimethylphenol	---	ND		ND		ND	
2,4-Dinitrophenol	---	ND		ND		ND	
2,4-Dinitrotoluene	---	ND		ND		ND	
2,6-Dinitrotoluene	---	ND		ND		ND	
2-Chloronaphthalene	---	ND		ND		ND	
2-Chlorophenol	---	ND		ND		ND	
2-Methylnaphthalene	---	ND		ND		ND	
2-Methylphenol	---	ND		ND		ND	
2-Nitroaniline	---	ND		ND		ND	
2-Nitrophenol	---	ND		ND		ND	
3,3'-Dichlorobenzidine	---	ND		ND		ND	
3-Nitroaniline	---	ND		ND		ND	
4,6-Dinitro-2-methylphenol	---	ND		ND		ND	

TABLE 7: DATA SUMMARY OF WATER ANALYTICAL RESULTS - USACE Philadephia, NJIWW (Avalon, Forsythe, Oyster Creek), Pre-dredge samples

Sample ID:	New Jersey	SW-1D		SW-1T		EB-1	
Sample Date:	Saline, Aquatic Life, Acute [(1)]	2/20/2020		2/20/2020		2/19/2020	
4-Bromophenyl phenyl ether	---	ND		ND		ND	
4-Chloro-3-methylphenol	---	ND		ND		ND	
4-Chloroaniline	---	ND		ND		ND	
4-Chlorophenyl phenyl ether	---	ND		ND		ND	
4-Nitroaniline	---	ND		ND		ND	
4-Nitrophenol	---	ND		ND		ND	
Acenaphthene	---	ND		ND		ND	
Acenaphthylene	---	ND		ND		ND	
Acetophenone	---	0.12	J	ND		ND	
Anthracene	---	ND		ND		ND	
Atrazine	---	ND		ND		ND	
Benzaldehyde	---	0.15	J	ND		0.16	J
Benzo[a]anthracene	---	ND		ND		ND	
Benzo[a]pyrene	---	ND		ND		ND	
Benzo[b]fluoranthene	---	ND		ND		ND	
Benzo[g,h,i]perylene	---	ND		ND		ND	
Benzo[k]fluoranthene	---	ND		ND		ND	
Bis(2-chloroethoxy)methane	---	ND		ND		ND	
Bis(2-chloroethyl)ether	---	ND		ND		ND	
Bis(2-ethylhexyl) phthalate	---	ND		ND		ND	
Butyl benzyl phthalate	---	ND		ND		ND	
Caprolactam	---	ND		ND		ND	
Carbazole	---	ND		ND		ND	
Chrysene	---	ND		ND		ND	
Dibenz(a,h)anthracene	---	ND		ND		ND	
Dibenzofuran	---	ND		ND		ND	
Diethyl phthalate	---	ND		ND		0.63	J
Dimethyl phthalate	---	ND		ND		ND	
Di-n-butyl phthalate	---	0.85	J	ND		ND	
Di-n-octyl phthalate	---	ND		ND		ND	

TABLE 7: DATA SUMMARY OF WATER ANALYTICAL RESULTS - USACE Philadephia, NJIWW (Avalon, Forsythe, Oyster Creek), Pre-dredge samples

Sample ID:	New Jersey	SW-1D		SW-1T		EB-1	
Sample Date:	Saline, Aquatic Life, Acute [(1)]	2/20/2020		2/20/2020		2/19/2020	
Fluoranthene	---	ND		ND		ND	
Fluorene	---	ND		ND		ND	
Hexachlorobenzene	---	ND		ND		ND	
Hexachlorobutadiene	---	ND		ND		ND	*
Hexachlorocyclopentadiene	---	ND		ND		ND	
Hexachloroethane	---	ND		ND		ND	
Indeno[1,2,3-cd]pyrene	---	ND		ND		ND	
Isophorone	---	ND		ND		ND	
Methylphenol, 3 & 4	---	ND		ND		ND	
Naphthalene	---	ND		ND		ND	
Nitrobenzene	---	ND		ND		ND	
N-Nitrosodi-n-propylamine	---	ND		ND		ND	
N-Nitrosodiphenylamine	---	ND		ND		ND	
Pentachlorophenol	13	ND		ND		ND	
Phenanthrene	---	0.1	J	ND		0.081	J
Phenol	---	ND		ND		ND	
Pyrene	---	ND		ND		ND	
VOLATILES		ug/L		ug/L		ug/L	
1,1,1-Trichloroethane		NA		NA		ND	
1,1,2,2-Tetrachloroethane		NA		NA		ND	
1,1,2-Trichloro-1,2,2-trifluoroethane		NA		NA		ND	
1,1,2-Trichloroethane		NA		NA		ND	
1,1-Dichloroethane		NA		NA		ND	
1,1-Dichloroethene		NA		NA		ND	
1,2,4-Trichlorobenzene		NA		NA		ND	
1,2-Dibromo-3-Chloropropane		NA		NA		ND	
1,2-Dibromoethane (EDB)		NA		NA		ND	
1,2-Dichlorobenzene		NA		NA		ND	
1,2-Dichloroethane		NA		NA		ND	

TABLE 7: DATA SUMMARY OF WATER ANALYTICAL RESULTS - USACE Philadephia, NJIWW (Avalon, Forsythe, Oyster Creek), Pre-dredge samples

Sample ID:	New Jersey	SW-1D		SW-1T		EB-1	
Sample Date:	Saline, Aquatic Life, Acute [(1)]	2/20/2020		2/20/2020		2/19/2020	
1,2-Dichloropropane		NA		NA		ND	
1,3-Dichlorobenzene		NA		NA		ND	
1,4-Dichlorobenzene		NA		NA		ND	
2-Butanone (MEK)		NA		NA		ND	
2-Hexanone		NA		NA		ND	
4-Methyl-2-pentanone (MIBK)		NA		NA		ND	
Acetone		NA		NA		ND	
Benzene		NA		NA		ND	
Bromodichloromethane		NA		NA		ND	*
Bromoform		NA		NA		ND	
Bromomethane		NA		NA		ND	
Carbon disulfide		NA		NA		ND	
Carbon tetrachloride		NA		NA		ND	
Chlorobenzene		NA		NA		ND	
Chloroethane		NA		NA		ND	
Chloroform		NA		NA		ND	*
Chloromethane		NA		NA		ND	
cis-1,2-Dichloroethene		NA		NA		ND	
cis-1,3-Dichloropropene		NA		NA		ND	
Cyclohexane		NA		NA		ND	
Dibromochloromethane		NA		NA		ND	
Dichlorodifluoromethane		NA		NA		ND	
Ethylbenzene		NA		NA		ND	
Isopropylbenzene		NA		NA		ND	
Methyl acetate		NA		NA		ND	
Methyl tert-butyl ether		NA		NA		ND	
Methylcyclohexane		NA		NA		ND	
Methylene Chloride		NA		NA		ND	
Styrene		NA		NA		ND	
Tetrachloroethene		NA		NA		ND	

TABLE 7: DATA SUMMARY OF WATER ANALYTICAL RESULTS - USACE Philadephia, NJIWW (Avalon, Forsythe, Oyster Creek), Pre-dredge samples

Sample ID:	New Jersey	SW-1D		SW-1T		EB-1	
Sample Date:	Saline, Aquatic Life, Acute [(1)]	2/20/2020		2/20/2020		2/19/2020	
Toluene		NA		NA		ND	
trans-1,2-Dichloroethene		NA		NA		ND	
trans-1,3-Dichloropropene		NA		NA		ND	
Trichloroethene		NA		NA		ND	
Trichlorofluoromethane		NA		NA		ND	
Vinyl chloride		NA		NA		ND	
Xylenes, Total		NA		NA		ND	
PESTICIDEs	**ug/L**	**ug/L**		**ug/L**		**ug/L**	
4,4'-DDD	---	ND		ND		ND	
4,4'-DDE	---	ND		ND		ND	
4,4'-DDT	---	0.00035	J p	ND		ND	
Aldrin	1.3	0.00082	J	ND		ND	
alpha-BHC	---	ND		ND		ND	
beta-BHC	--	ND		ND		ND	
cis-Chlordane	---	ND		ND		ND	
delta-BHC	---	ND		ND		ND	
Dieldrin	0.71	ND		ND		ND	
Endosulfan I	---	ND		ND		ND	
Endosulfan II	---	ND		ND		ND	
Endosulfan sulfate	---	ND		ND		ND	
Endrin	0.037	ND		ND		ND	
Endrin aldehyde	---	0.0014	p	ND		ND	
Endrin ketone	---	ND		ND		ND	
gamma-BHC (Lindane)	0.16	ND		ND		ND	
Heptachlor	0.053	ND		ND		ND	
Heptachlor epoxide	0.053	ND		ND		ND	
Methoxychlor	---	ND		ND		ND	
Toxaphene	0.21	ND		ND		ND	

TABLE 7: DATA SUMMARY OF WATER ANALYTICAL RESULTS - USACE Philadephia, NJIWW (Avalon, Forsythe, Oyster Creek), Pre-dredge samples

Sample ID:	New Jersey	SW-1D		SW-1T		EB-1	
Sample Date:	Saline, Aquatic Life, Acute [(1)]	2/20/2020		2/20/2020		2/19/2020	
trans-Chlordane	---	ND		ND		ND	
PCB CONGENERS	**ng/L**	**ng/L**		**ng/L**		**ng/L**	
PCB-1	---	NA		0.0015	J q B	ND	
PCB-10	---	NA		ND		ND	
PCB-100	---	NA		0.00053	J C93	ND	C93
PCB-101	---	NA		0.008	J C90 B	0.0011	J B C90
PCB-102	---	NA		0.00055	J q C98	ND	C98
PCB-103	---	NA		ND		ND	
PCB-104	---	NA		ND		ND	
PCB-105	---	NA		0.0021	J q B	0.00085	J B
PCB-106	---	NA		ND		ND	
PCB-107	---	NA		0.0011	J q	ND	
PCB-108	---	NA		0.00048	J q C B	ND	C
PCB-109	---	NA		0.005	J C86 B	0.0013	J B C86 q
PCB-11	---	NA		0.038	J B	0.012	J B q
PCB-110	---	NA		0.0077	J C B	0.0014	J C B q
PCB-111	---	NA		ND		ND	
PCB-112	---	NA		ND		ND	
PCB-113	---	NA		0.008	J C90 B	0.0011	J B C90
PCB-114	---	NA		ND		ND	
PCB-115	---	NA		0.0077	J C110 B	0.0014	J B C110 q
PCB-116	---	NA		0.00085	J q C85 B	ND	C85
PCB-117	---	NA		0.00085	J q C85 B	ND	C85
PCB-118	---	NA		0.0054	J B	0.0013	J B q
PCB-119	---	NA		0.005	J C86 B	0.0013	J B C86 q
PCB-12	---	NA		ND	C	ND	C
PCB-120	---	NA		ND		ND	
PCB-121	---	NA		ND		ND	
PCB-122	---	NA		ND		ND	

TABLE 7: DATA SUMMARY OF WATER ANALYTICAL RESULTS - USACE Philadephia, NJIWW (Avalon, Forsythe, Oyster Creek), Pre-dredge samples

Sample ID:	New Jersey	SW-1D		SW-1T		EB-1	
Sample Date:	Saline, Aquatic Life, Acute [(1)]	2/20/2020		2/20/2020		2/19/2020	
PCB-123	---	NA		ND		ND	
PCB-124	---	NA		0.00048	J q C108 B	ND	C108
PCB-125	---	NA		0.005	J C86 B	0.0013	J B C86 q
PCB-126	---	NA		ND		ND	
PCB-127	---	NA		ND		ND	
PCB-128	---	NA		0.00063	J C B	0.00085	J C B
PCB-129	---	NA		0.0068	J C B	0.0024	J C B q
PCB-13	---	NA		ND	C12	ND	C12
PCB-130	---	NA		ND		ND	
PCB-131	---	NA		ND		ND	
PCB-132	---	NA		0.0013	J q	0.00089	J q
PCB-133	---	NA		ND		ND	
PCB-134	---	NA		ND	C	ND	C
PCB-135	---	NA		0.0015	J q C B	ND	C
PCB-136	---	NA		0.00084	J	ND	
PCB-137	---	NA		ND		ND	
PCB-138	---	NA		0.0068	J C129 B	0.0024	J B C129 q
PCB-139	---	NA		ND	C	ND	C
PCB-14	---	NA		ND		ND	
PCB-140	---	NA		ND	C139	ND	C139
PCB-141	---	NA		0.0012	J q B	ND	
PCB-142	---	NA		ND		ND	
PCB-143	---	NA		ND	C134	ND	C134
PCB-144	---	NA		ND		ND	
PCB-145	---	NA		ND		ND	
PCB-146	---	NA		0.0013	J	ND	
PCB-147	---	NA		0.0069	J C B	0.0017	J C B q
PCB-148	---	NA		ND		ND	
PCB-149	---	NA		0.0069	J C147 B	0.0017	J B C147 q
PCB-15	---	NA		0.0049	J	ND	

TABLE 7: DATA SUMMARY OF WATER ANALYTICAL RESULTS - USACE Philadephia, NJIWW (Avalon, Forsythe, Oyster Creek), Pre-dredge samples

Sample ID:	New Jersey	SW-1D		SW-1T		EB-1	
Sample Date:	Saline, Aquatic Life, Acute [(1)]	2/20/2020		2/20/2020		2/19/2020	
PCB-150	---	NA		ND		ND	
PCB-151	---	NA		0.0015	J q C135 B	ND	C135
PCB-152	---	NA		ND		ND	
PCB-153	---	NA		0.0074	J C B	0.0011	J C B q
PCB-154	---	NA		ND		ND	
PCB-155	---	NA		ND		ND	
PCB-156	---	NA		0.00055	J q C B	ND	C
PCB-157	---	NA		0.00055	J q C156 B	ND	C156
PCB-158	---	NA		0.00058	J B	ND	
PCB-159	---	NA		ND		ND	
PCB-16	---	NA		0.0013	J q	ND	
PCB-160	---	NA		0.0068	J C129 B	0.0024	J B C129 q
PCB-161	---	NA		ND		ND	
PCB-162	---	NA		ND		ND	
PCB-163	---	NA		0.0068	J C129 B	0.0024	J B C129 q
PCB-164	---	NA		ND		ND	
PCB-165	---	NA		ND		ND	
PCB-166	---	NA		0.00063	J C128 B	0.00085	J C128 B
PCB-167	---	NA		0.00046	J B	ND	
PCB-168	---	NA		0.0074	J C153 B	0.0011	J B C153 q
PCB-169	---	NA		ND		ND	
PCB-17	---	NA		0.0045	J	ND	
PCB-170	---	NA		0.0011	J B	0.0012	J B q
PCB-171	---	NA		0.00096	J q C B	0.001	J C B q
PCB-172	---	NA		ND		ND	
PCB-173	---	NA		0.00096	J q C171 B	0.001	J C171 B q
PCB-174	---	NA		0.0013	J q B	ND	
PCB-175	---	NA		ND		ND	
PCB-176	---	NA		ND		ND	
PCB-177	---	NA		0.0007	J q B	ND	

TABLE 7: DATA SUMMARY OF WATER ANALYTICAL RESULTS - USACE Philadephia, NJIWW (Avalon, Forsythe, Oyster Creek), Pre-dredge samples

Sample ID:	New Jersey	SW-1D		SW-1T		EB-1	
Sample Date:	Saline, Aquatic Life, Acute [(1)]	2/20/2020		2/20/2020		2/19/2020	
PCB-178	---	NA		0.00045	J q	ND	
PCB-179	---	NA		0.00048	J q	ND	
PCB-18	---	NA		0.0051	J q C	ND	C
PCB-180	---	NA		0.0025	J C B	0.0022	J C B
PCB-181	---	NA		ND		ND	
PCB-182	---	NA		ND		ND	
PCB-183	---	NA		0.0018	J q C B	0.0012	J C B q
PCB-184	---	NA		ND		ND	
PCB-185	---	NA		0.0018	J q C183 B	0.0012	J B C183 q
PCB-186	---	NA		ND		ND	
PCB-187	---	NA		0.0026	J q B	ND	
PCB-188	---	NA		ND		ND	
PCB-189	---	NA		ND		ND	
PCB-19	---	NA		0.0019	J q	ND	
PCB-190	---	NA		ND		ND	
PCB-191	---	NA		ND		ND	
PCB-192	---	NA		ND		ND	
PCB-193	---	NA		0.0025	J C180 B	0.0022	J C180 B
PCB-194	---	NA		ND		ND	
PCB-195	---	NA		ND		ND	
PCB-196	---	NA		ND		ND	
PCB-197	---	NA		ND		ND	
PCB-198	---	NA		0.0015	J C	ND	C
PCB-199	---	NA		0.0015	J C198	ND	C198
PCB-2	---	NA		0.0015	J B	ND	
PCB-20	---	NA		0.01	J C B	0.0025	J C B q
PCB-200	---	NA		ND		ND	
PCB-201	---	NA		ND		ND	
PCB-202	---	NA		ND		ND	
PCB-203	---	NA		ND		ND	

TABLE 7: DATA SUMMARY OF WATER ANALYTICAL RESULTS - USACE Philadephia, NJIWW (Avalon, Forsythe, Oyster Creek), Pre-dredge samples

Sample ID:	New Jersey	SW-1D		SW-1T		EB-1	
Sample Date:	Saline, Aquatic Life, Acute [(1)]	2/20/2020		2/20/2020		2/19/2020	
PCB-204	---	NA		ND		ND	
PCB-205	---	NA		ND		ND	
PCB-206	---	NA		ND		ND	
PCB-207	---	NA		ND		ND	
PCB-208	---	NA		ND		ND	
PCB-209	---	NA		0.0013	J q B	0.00074	J B q
PCB-21	---	NA		0.0031	J C B	0.0021	J C B q
PCB-22	---	NA		0.0023	J B	ND	
PCB-23	---	NA		ND		ND	
PCB-24	---	NA		ND		ND	
PCB-25	---	NA		0.0013	J	ND	
PCB-26	---	NA		0.0024	J q C B	ND	C
PCB-27	---	NA		0.00087	J q	ND	
PCB-28	---	NA		0.01	J C20 B	0.0025	J B C20 q
PCB-29	---	NA		0.0024	J q C26 B	ND	C26
PCB-3	---	NA		0.0014	J q B	ND	
PCB-30	---	NA		0.0051	J q C18	ND	C18
PCB-31	---	NA		0.0075	J B	0.0031	J B
PCB-32	---	NA		0.0028	J q B	0.00088	J B
PCB-33	---	NA		0.0031	J C21 B	0.0021	J B C21 q
PCB-34	---	NA		ND		ND	
PCB-35	---	NA		ND		ND	
PCB-36	---	NA		ND		ND	
PCB-37	---	NA		0.0021	J B	0.0011	J B q
PCB-38	---	NA		ND		ND	
PCB-39	---	NA		ND		ND	
PCB-4	---	NA		0.0097	J q	ND	
PCB-40	---	NA		0.0035	J C	ND	C
PCB-41	---	NA		0.0035	J C40	ND	C40
PCB-42	---	NA		0.0023	J	ND	

TABLE 7: DATA SUMMARY OF WATER ANALYTICAL RESULTS - USACE Philadephia, NJIWW (Avalon, Forsythe, Oyster Creek), Pre-dredge samples

Sample ID:	New Jersey	SW-1D		SW-1T		EB-1	
Sample Date:	Saline, Aquatic Life, Acute [(1)]	2/20/2020		2/20/2020		2/19/2020	
PCB-43	---	NA		ND	C	ND	C
PCB-44	---	NA		0.043	J C B	0.027	J C B q
PCB-45	---	NA		0.0078	J C B	0.005	J C B
PCB-46	---	NA		ND		ND	
PCB-47	---	NA		0.043	J C44 B	0.027	J B C44 q
PCB-48	---	NA		ND		ND	
PCB-49	---	NA		0.0053	J q C B	ND	C
PCB-5	---	NA		ND		ND	
PCB-50	---	NA		0.0012	J q C	ND	C
PCB-51	---	NA		0.0078	J C45 B	0.005	J C45 B
PCB-52	---	NA		0.0077	J B	0.0025	J B
PCB-53	---	NA		0.0012	J q C50	ND	C50
PCB-54	---	NA		ND		ND	
PCB-55	---	NA		ND		ND	
PCB-56	---	NA		0.0018	J	ND	
PCB-57	---	NA		ND		ND	
PCB-58	---	NA		ND		ND	
PCB-59	---	NA		ND	C	ND	C
PCB-6	---	NA		0.0022	J q	ND	
PCB-60	---	NA		ND		ND	
PCB-61	---	NA		0.0075	J C B	0.0022	J C B
PCB-62	---	NA		ND	C59	ND	C59
PCB-63	---	NA		ND		ND	
PCB-64	---	NA		0.0018	J	ND	
PCB-65	---	NA		0.043	J C44 B	0.027	J B C44 q
PCB-66	---	NA		0.0046	J q B	ND	
PCB-67	---	NA		ND		ND	
PCB-68	---	NA		0.0054	J B	0.0027	J B q
PCB-69	---	NA		0.0053	J q C49 B	ND	C49
PCB-7	---	NA		ND		ND	

TABLE 7: DATA SUMMARY OF WATER ANALYTICAL RESULTS - USACE Philadephia, NJIWW (Avalon, Forsythe, Oyster Creek), Pre-dredge samples

Sample ID:	New Jersey	SW-1D		SW-1T		EB-1	
Sample Date:	Saline, Aquatic Life, Acute [(1)]	2/20/2020		2/20/2020		2/19/2020	
PCB-70	---	NA		0.0075	J C61 B	0.0022	J C61 B
PCB-71	---	NA		0.0035	J C40	ND	C40
PCB-72	---	NA		ND		ND	
PCB-73	---	NA		ND	C43	ND	C43
PCB-74	---	NA		0.0075	J C61 B	0.0022	J C61 B
PCB-75	---	NA		ND	C59	ND	C59
PCB-76	---	NA		0.0075	J C61 B	0.0022	J C61 B
PCB-77	---	NA		0.001	J q B	ND	
PCB-78	---	NA		ND		ND	
PCB-79	---	NA		ND		ND	
PCB-8	---	NA		0.0055	J q B	0.0034	J B q
PCB-80	---	NA		ND		ND	
PCB-81	---	NA		ND		ND	
PCB-82	---	NA		ND		ND	
PCB-83	---	NA		0.005	J C	ND	C
PCB-84	---	NA		0.0015	J q	ND	
PCB-85	---	NA		0.00085	J q C B	ND	C
PCB-86	---	NA		0.005	J C B	0.0013	J C B q
PCB-87	---	NA		0.005	J C86 B	0.0013	J B C86 q
PCB-88	---	NA		0.00077	J C	ND	C
PCB-89	---	NA		ND		ND	
PCB-9	---	NA		ND		ND	
PCB-90	---	NA		0.008	J C B	0.0011	J C B
PCB-91	---	NA		0.00077	J C88	ND	C88
PCB-92	---	NA		0.0016	J q B	ND	
PCB-93	---	NA		0.00053	J C	ND	C
PCB-94	---	NA		ND		ND	
PCB-95	---	NA		0.0058	J B	ND	
PCB-96	---	NA		ND		ND	
PCB-97	---	NA		0.005	J C86 B	0.0013	J B C86 q

TABLE 7: DATA SUMMARY OF WATER ANALYTICAL RESULTS - USACE Philadephia, NJIWW (Avalon, Forsythe, Oyster Creek), Pre-dredge samples

Sample ID:	New Jersey	SW-1D		SW-1T		EB-1	
Sample Date:	Saline, Aquatic Life, Acute [(1)]	2/20/2020		2/20/2020		2/19/2020	
PCB-98	---	NA		0.00055	J q C	ND	C
PCB-99	---	NA		0.005	J C83	ND	C83
Total PCBs	---	NA		0.55		0.18	
TEQ (WHO)	---	NA		3.72E-07		6.45E-08	

Notes:

ND -- Not Detected

NA -- Not Analyzed

[(1)] -- NJ Surface Water Quality Acute Criteria for the protection of aquatic life in saline water (N.J.A.C. 7:9B-1.14 (f))

SW-1D (dissolved); SW-1T (total), surface water samples collected near sample location OC-2019-9

EB--Equipment Blank

yellow highlight -- exceedance of NJ Surface Water Quality Acute Criteria for the protection of aquatic life in saline water (N.J.A.C. 7:9B-1.14 (f))

TEQ -- Toxic equivalence in terms of 2,3,7,8-TCDD

Data Qualifiers:

B -- Compound was found in the blank and sample.

C -- The compound co-eluted with other compounds.

C93 --The compound co-eluted with PCB-93

H -- Sample was prepped or analyzed beyond the specified holding time

J -- Result is less than the reporting limit but greater than or equal to the method detection limit and the concentration is an approximate value.

p -- The % Relative Percent Difference between the primary and confirmation column/detector is > 40%. The lower value has been reported.

* -- The LCS or LCSD exceeds the control limits.

q -- The reported result is the estimated maximum possible concentration of this analyte

APPENDIX C

New Jersey Coastal Zone Federal Consistency Evaluation

ENCLOSURE 1

NJIWW CHANNEL MAINTENANCE AND BENEFICIAL USE OF DREDGED MATERIAL AT EAST POOL-EDWIN B. FORSYTHE NATIONAL WILDLIFE REFUGE ATLANTIC COUNTY, NJ

HABITAT BENEFIT OBJECTIVES

The proposed action addresses two main critical needs: 1) Maintain safe navigation within the NJIWW Federal Navigation Channel; and 2) Restore critical salt marsh habitats within the East Pool of EBFNWR.

The NJIWW Federal Navigation Project experiences frequent shoaling between channel markers 152 (Hammock Cove/Shad Island) and 160 (Perch Cove/Little Bay). This reach of the navigation channel occurs within a larger reach (markers 145 to 163) that was designated in 2019 as a “Priority 1” (for maintenance) by the U.S. Coast Guard, and is described by the USCG as “narrowing and impassable to all but the smallest vessels at any tide.” The reach between markers 152 and 160 requires maintenance dredging every 3 to 4 years to maintain the authorized channel dimensions of 100 ft. wide and -6 ft. (mean low water). However, this channel reach has not been maintained since 2010 due to funding limitations. Based on the most current channel surveys, maintenance of the channel would require dredging to remove approximately 6,000 to 10,000 cubic yards of sands, silts, and clays. Disposal of dredged material within this stretch has historically occurred at the Shad Island Confined Disposal Facility (CDF). Because this CDF occurs within the bounds of the EBFNWR, a special use permit (SUP) from USFWS is required. The most recent use of this area was in 2010 under a SUP that expired in 2012. Subsequently, the USFWS has informed the USACE that a new SUP would not likely be issued due to the incompatibility of this activity with the mission of a National Wildlife Refuge. Therefore, a critical need for a new method and location of dredged material placement has arisen to accomplish the need for maintaining the NJIWW within this reach. Beneficial use of the NJIWW material to prevent further loss of eroding habitats is an optimum regional sediment management solution for the issues in the NJIWW.

Saltwater marshes on the New Jersey coastline have been disappearing over the past hundred years due to factors such as sea level rise, lower accretion rates, and higher rates of anthropogenic erosion. As sea levels continue to rise and storms become more frequent and intense, salt marshes that cannot keep pace with sea level rise will ultimately be lost along with the ecosystem services they provide to coastal communities and the coastal economy. Furthermore, salt marshes provide habitat for economically and ecologically important fish, crabs, and shellfish; nesting and foraging habitat for migratory and resident birds; and improve water quality through de-

nitrification and sediment removal. Beneficial reuse projects like these will create a regional uplift in ecosystem functions, services and resiliency—including increased buffering capacity against storm and flood damage, significant regional uplift in water quality, and the enhancement and creation of fish, shellfish, wading bird, and waterfowl habitat. The uplift in ecosystem services will have a significant, positive impact on dependent local and regional economies including tourism, hunting, fishing, recreation, and avoided storm damage costs.

The establishment of the Headquarters (HQ) Impoundment System at Edwin B. Forsythe National Wildlife Refuge in the 1950's and 60's converted more than 1,500 acres of salt marsh to freshwater habitats to benefit American black ducks and rails. The impoundments remain an important wildlife resource and are the central focus of refuge use, with over 125,000 visitors per year. Despite the benefits to wildlife and visitors, long-term resilience of the site is of concern due to sea level rise and storms as elevations within impounded areas have become significantly lower than the surrounding tidal marshes. This is due to oxidation of organic matter in the soil and a lack of sedimentation and accretion. Sea level rise and storm activity will eventually overwhelm impoundment infrastructure and at that time the impoundments will convert to permanent tidal open water because elevations are too low to support the establishment of vegetation. The long-term goal of the refuge is to avoid this outcome by leveraging refuge infrastructure to pursue the restoration of salt marsh habitats in the impoundment interior so that a fully functional marsh will be present when the impoundments cease to function in future decades.

At one time, as many as 12 water control structures were in place within the constructed dikes to move water between impoundment pools and in and out of the System. The East Pool could not be effectively managed as a freshwater habitat due to the lack of capacity to deliver freshwater throughout the pool due to poor slope. In addition, the site was overtaken with the invasive *Phragmites australis* and became poor wildlife habitat. In the mid-2000s, the East Pool was converted from a fresh habitat to saltmarsh by the introduction of tidal salt water. That water enters and exits the pool twice daily, and dramatically reduced the amount of *Phragmites* present. However, because the water control structures were not originally designed to manage such regular tidal flows, the resultant tidal range is restricted and is much less than that of the surrounding marshes. The majority of the East Pool is open water at all tide stages. The vegetated area is salt marsh habitat predominately comprised of infrequently-flooded *Spartina patens*. The elevation of the marsh inside the impoundment is less than +1.0 ft. NAVD88, whereas similar habitat occurs at +2.3-3.0 ft. outside of the impoundment.

ENCLOSURE 2

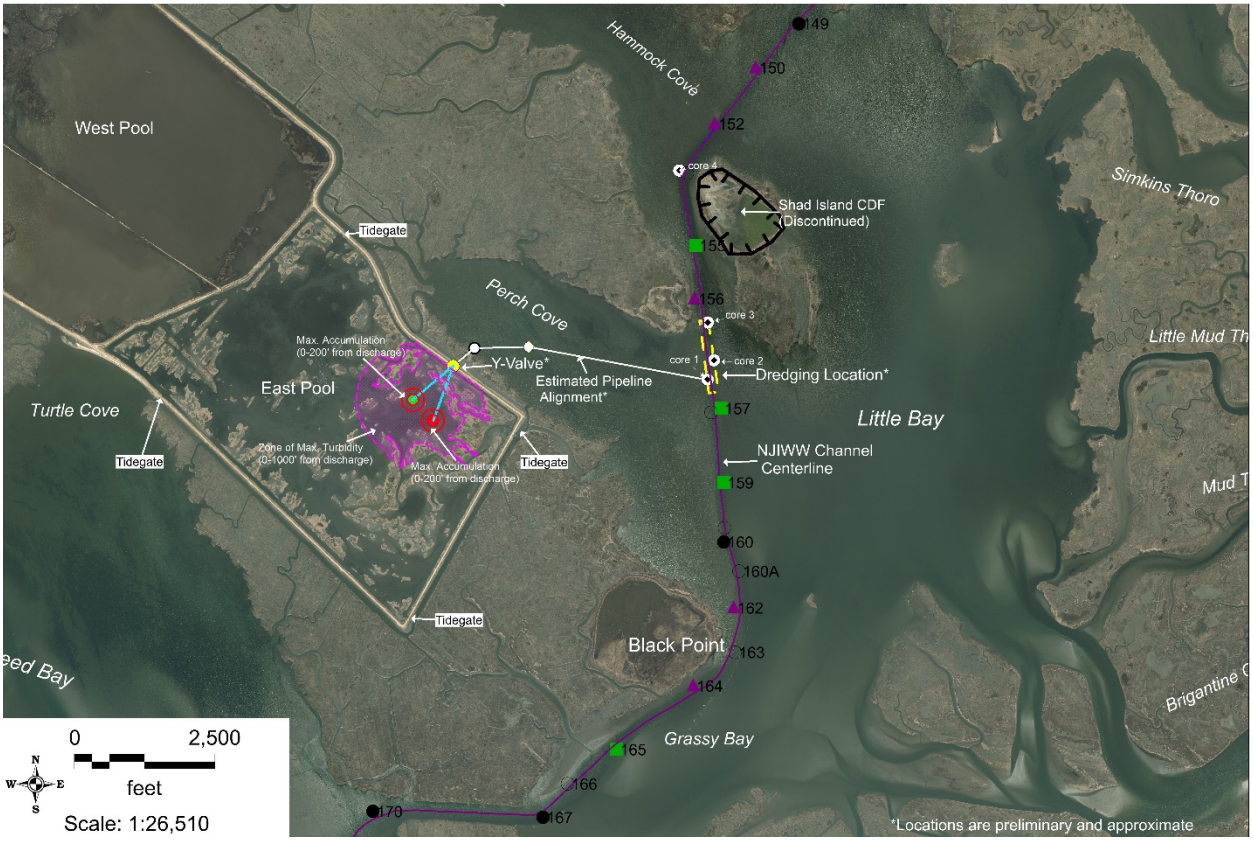
NJIWW CHANNEL MAINTENANCE AND BENEFICIAL USE OF DREDGED MATERIAL AT EAST POOL-EDWIN B. FORSYTHE NATIONAL WILDLIFE REFUGE ATLANTIC COUNTY, NJ

EAST POOL CONSTRUCTION CONCEPT
DECEMBER 2020

The following provides the construction plan for a beneficial use placement of dredged material within the East Pool of the Edwin B. Forsythe National Wildlife Refuge – Brigantine Division. This project is scheduled to occur in December of 2020.

Approximately 6,000 to 10,000 cubic yards of silts, fine sands, and clays would be hydraulically dredged to remove shoals between USCG markers 152 and 160 along the NJIWW for a one-time dredge and fill placement project for a period of 2 – 3 weeks in December 2020. The dredged material placement site within the East Pool was developed in coordination with the Service. Tidal range within the East Pool is very narrow where mudflat occurs approximately 0.75 ft. off of the base impoundment elevation of +0.2 ft. NAVD and marsh ranges occur at 0.75 -1.0 ft. Elevations higher than 1.0 ft NAVD are inhabited by *Phragmites*. The selected plan includes placement of a thin layer (approximately 1 ft.) of dredged material to raise the substrate elevations of open-water habitat to an intertidal mudflat and/or marsh elevation. Monitoring of material behavior (settlement placement) and marsh vegetation recruitment will occur. Ultimately, and with the ability to manage water levels, the refuge hopes to incrementally restore full tidal flow in the East Pool over time while gradually building elevation and salt marsh vegetation extent using a range of restoration strategies. High marsh is an essential breeding habitat for both saltmarsh sparrow and Eastern black rail and both species occur in the surrounding salt marshes of the Great Bay (Figure 4). Approximately 10 to 15 acres of subtidal open water in the impoundment are anticipated to become intertidal mudflat and saltmarsh and a surrounding approximately 50 acres of subtidal open water may receive a thin layer deposition of sediment from the placement operations. The fill material would be dredged from the adjacent channel and brought to the impoundment via a floating pipeline. The material would be piped through a “Y” distributor directly into the pool for infilling to the surrounding marsh elevation. Containment of the fill will be employed utilizing several techniques that will be evaluated including hay bales, coir logs/wattles, and open (unconfined) placement. The project is expected to take approximately 2- 3 weeks during the month of December 2020.

Figure 1 – East Pool Beneficial Use Plan



ENCLOSURE 3

CONSISTENCY REVIEW OF APPLICABLE NEW JERSEY COASTAL ZONE MANAGEMENT POLICIES
(N.J.A.C. 7:7 as amended 15 July 2019)
NJIWW CHANNEL MAINTENANCE AND BENEFICIAL USE OF DREDGED MATERIAL AT GULL ISLAND, CAPE MAY COUNTY NEW JERSEY

Coastal General Permit 24 (N.J.A.C. 7:7- 6.24)

(Please note that the N.J.A.C. 7:7 rule language is shown in italics)

(a) This general permit authorizes habitat creation, restoration, enhancement, and living shoreline activities necessary to implement a plan for the restoration, creation, enhancement, or protection of the habitat, water quality functions, and values of wetlands, wetland buffers, and open water areas, which is sponsored by a Federal or State agency or other entity described in (b) below. For the purposes of this general permit, a "sponsor" shall endorse the activities in writing.

(b) The following habitat creation, restoration, enhancement, and living shoreline plans are acceptable provided they demonstrate compliance with (c) through (g) below:

1. A fish and/or wildlife management plan created or approved by the Department's Division of Fish and Wildlife;

2. A project plan approved under the Partners for Fish and Wildlife program, Coastal Program, or a similar program administered by the USFWS;

3. A project plan created by the U.S. Department of Agriculture's Natural Resources Conservation Service under the Wetlands Reserve program, the Conservation Reserve program, the Conservation Reserve Enhancement program, the Wildlife Habitat Incentive program (WHIP), or a similar program, and approved by the local Soil Conservation District;

4. A plan approved by the Department's Office of Natural Resource Damages for the restoration, creation or enhancement of natural resources injured as the result of an oil spill or release of a hazardous substance;

5. A mitigation project required or approved by a government agency, such as the USACE;

6. A habitat creation, restoration or enhancement plan carried out by one of the Federal or State agencies at (b) 1 through 5 above or by a government resource protection agency such as a parks commission;

7. A habitat creation, restoration, or enhancement plan carried out by a charitable conservancy provided that the plan is part of a program listed at (b)2 through 5 above;

8. A living shoreline plan designed and/or sponsored by the Department, the USFWS, the Natural Resource Conservation Services, the USACE, the USEPA, or NOAA's Restoration Center; or

9. A living shoreline plan implemented by a college or university for the purpose of research.

The project is in compliance with (b) above as it is a project plan approved and administered by the USFWS at the Edwin B. Forsythe National Wildlife Refuge, and carried out by USACE. The placement site located at East Poll (managed by USFWS) will restore elevation to tidal wetlands that have degraded into open water, and will provide sediment to nourish and expand intertidal mud flats and saltmarsh. This project qualifies as a habitat creation, restoration or enhancement plan carried out by one of the Federal or State agencies at (b) 1 through 5 above or by a government resource protection agency such as a parks commission.

(c) Habitat creation, restoration, enhancement, and living shoreline activities that are authorized by this general permit include, but are not limited to, the following:

1. Altering hydrology to restore or create wetlands conditions, such as by blocking, removing, or disabling a human-made drainage ditch or other drainage structure such as a tile, culvert or pipe;

2. Breaching a structure such as a dike or berm in order to allow water into an area;

3. Placing habitat improvement structures such as:

i. Nesting islands;

ii. Fencing to contain, or to prevent intrusion by, livestock or other animals; and

iii. Fish habitat enhancement devices or fish habitat improvement structures such as placed boulders, stream deflectors, or brush piles;

4. Regrading to provide proper elevation or topography for wetlands restoration, creation, or enhancement;

5. Cutting, burning or otherwise managing vegetation in order to increase habitat diversity or control nuisance flora; or

6. Establishing a living shoreline to protect, restore, or enhance a habitat.

The project at East Pool, while not specifically referenced in (c), is consistent with the rule.

(d) To be eligible for authorization under this general permit, an applicant shall demonstrate that the proposed project:

1. Is part of a plan for the restoration, creation or enhancement of the habitat and water quality functions and values of wetlands, wetland buffers, and/or State open waters;

2. Is consistent with the requirements of the Wetlands Act of 1970, the Waterfront Development Law, the Coastal Area Facility Review Act and this chapter;

3. Will improve or maintain the values and functions of the ecosystem; and

4. Will have a reasonable likelihood of success, or, if performed by a college or university, in accordance with (b)9 above, will advance the level of knowledge regarding living shorelines in the State.

The project plans, which have been developed in conjunction with the USFWS Edwin B. Forsythe National Wildlife Refuge are being implemented to enhance and restore intertidal saltmarsh wetlands within the East Pool impoundment, which serves as valuable habitat within the refuge. The goal for work at Gull Island is to raise the height of certain areas of wetland that have degraded into open water, and to create inter-tidal mudflats and saltmarsh within the impoundment. The goal is to create a matrix of

habitats as a result of this work. The project involves a research component and is intended to be adaptively managed and monitored so that the experience can inform future restoration objectives of the Refuge, and other habitat restoration and regional sediment management projects.

(e) Activities under this general permit, except for living shoreline activities, which are subject to the requirements of (f) below, shall comply with the following:

1. If the proposed habitat creation, restoration, or enhancement activity is to take place in special areas, as defined at N.J.A.C 7:7-9, the general permit authorization shall be issued only if the Department finds that there are no practicable alternatives that would involve less or no disturbance or destruction of special areas;

2. The activities shall disturb the minimum amount of special areas as defined at N.J.A.C. 7:7-9 necessary to successfully implement the project plan;

3. The activities shall not decrease the total combined area of special areas on a site. However, the Department may approve a decrease if the Department determines that the activities causing the decrease are sufficiently environmentally beneficial to outweigh the negative environmental effects of the decrease. In addition, the Department may approve conversion of one special area to another special area if the Department determines that such conversion is environmentally beneficial; and

4. If the activities involve the removal of a dam, the activities shall be conducted in accordance with a permit issued pursuant to N.J.A.C. 7:20 by the Department's Dam Safety Section in the Division of Engineering and Construction.

The objective of the project at Gull Island is to replenish sediment where the marsh is degrading in order to provide resilience and to restore and expand available marsh habitat for avian species that utilize the impoundment. The placement sites within the East Pool have been selected based on their low elevation. As the entire area of the East Pool is considered one type of special area or another pursuant to the N.J.A.C. 7:7, there are no alternatives that would avoid special areas. The constructed sites would be limited to a size that is considered optimal from both engineering practicability and habitat suitability perspectives. While there may be a potential net reduction in open-water habitat because of this project, the project will provide resilience for the refuge, and in turn provide protection to valuable habitat for multiple NJ Species of Special Concern. Furthermore, the project will also seek to create new intertidal mudflat and saltmarsh habitat within the East Pool. Threatened and Endangered species habitat is also considered a special area pursuant to N.J.A.C. 7:7-9.36. As a result, there will be no net loss of special areas. Furthermore, due to the lack of suitable habitat for these Species of Special Concern elsewhere in the region, the small conversion of open-water to intertidal mudflat and marsh habitat is environmentally beneficial and outweighs any potential loss of open-water habitat.

(f) Living shoreline activities shall comply with the following:

1. The project area below the mean high water line is one acre in size or less, unless the applicant is a county, State or Federal agency that demonstrates that a larger project size is necessary to satisfy the goals of the project;

2. The project shall disturb the minimum amount of special areas as defined at N.J.A.C. 7:7- 9, necessary to successfully implement the project plan. The Department may approve a reduction in the size of a particular special area in order to allow an increase in a different special area if the Department determines that the activities causing the reduction are sufficiently environmentally beneficial to outweigh the negative environmental effects of the reduction; and
3. Where the living shoreline is intended to restore an existing shoreline to a previous location, the living shoreline, including all associated fill, shall not exceed the footprint of the shoreline as it appeared on the applicable Tidelands Map, except for a structural component of the project intended to reduce wave energy.

Item (f) is not applicable to this project.

(g) Public access shall be provided in accordance with the lands and waters subject to public trust rights rule, N.J.A.C. 7:7-9.48, and the public access rule, N.J.A.C. 7:7-16.9.

This project is in compliance with g above. Public access will only be restricted to this portion of the National Wildlife Refuge during the period of construction. Public access would be maintained in accordance with and be consistent with existing USFWS management procedures of the refuge.

(h) This general permit does not authorize an activity unless the sole purpose of the activity is habitat creation, restoration, enhancement, or a living shoreline. For example, this general permit does not authorize construction of a detention basin in wetlands for stormwater management, even if the detention basin or the project of which the basin is a part will also result in habitat creation or enhancement.

The sole purpose of the activity is to create, restore, and enhance habitat, with the added purpose of learning how we can better achieve habitat goals with other beneficial use projects in the future.

7:7-9.2 SHELLFISH HABITAT

The East Pool, itself, is not mapped as shellfish habitat. However, the receiving waters, which include Little Bay, Grassy Bay, and Reeds Bay are mapped as “hard clam high value commercial” on the 1963 shellfish maps created by USFWS. Additionally, the maintenance dredging portion of the NJIWW is located in the same designated waters.

Items *7:7-9.2 (b)* through *(e)* are not relevant to this project because it is not a dock or pier, the area has not been designated by the Department as being contaminated by toxins, and the project does not entail any new dredging.
(f) This project entails maintenance dredging and will minimize disturbance to shellfish habitat to the greatest extent possible. The project has been intentionally located away from active shellfish leases in order to avoid impacting their activities.

(h) While this project is not a living shoreline, section 7:7-9.2(h) of the rule is the most relevant section for this project and makes for the most meaningful analysis of the project as it relates to shellfish. Living shorelines are a shoreline management practice that addresses the loss of vegetated shorelines by providing protection, restoration, or enhancement of these habitats. The establishment of living shorelines is conditionally acceptable provided the living shoreline activities disturb the minimum amount of special areas necessary to successfully implement the restoration, creation, enhancement, or protection of habitat, water quality functions, and values of wetlands, wetland buffers, and open water areas. This may include a decrease in the existing special area or the conversion of one special area to another where it is determined that such changes are environmentally beneficial.

The project activities will disturb the minimum amount of special areas necessary to successfully implement the restoration, creation, enhancement, and protection of marsh habitat, and will ultimately inform future efforts of this kind in the area. Any impacts to shellfish habitat would be temporary in nature due to turbidity and smothering during construction (initial sediment deposition). Ultimately, the project will likely create new shallower habitat favorable to shellfish once sediment settles.

Items *7:7-9.2 (i)* through *(l)* are not relevant to this project because it is not a dock, bulkhead, or pier, does not entail any development required for national security.

7:7-9.3 SURF CLAM AREAS

The project area does not contain surf clam coastal waters which can be demonstrated to support significant commercially harvestable quantities of surf clams (Spisula solidissima), or areas important for recruitment of surf clam stocks.

(b) This project would not result in the destruction, condemnation, or contamination of surf clam areas.

7:7-9.4 PRIME FISHING AREAS

(a-b) This project does not entail sand or gravel submarine mining which would alter existing bathymetry to a significant degree so as to reduce the high fishery productivity of these areas. Furthermore, this project does not entail disposal of domestic or industrial wastes.

7:7-9.5 FINFISH MIGRATORY PATHWAYS

(a-c) The project would not create a physical barrier to the movement of fish. There would also be no permanent adverse impact to water quality. Turbidity will increase during construction (deposition of dredged material) however this will be temporary.

Item (d) is not applicable to this project because it does not entail water's edge development.

7:7-9.6 SUBMERGED VEGETATION HABITAT

(a) There are no existing Submerged Aquatic Vegetation (SAV) beds in the footprint of the proposed placement areas within the East Pool. However, SAV in the form of macro algae and algal flats are present in the project area outside of the impoundment and will be avoided to the maximum extent practicable.
(b) Maintenance dredging of the existing, authorized Federal NJIWW navigation channel is acceptable. There are no SAV beds within the footprint of the channel.

7:7-9.7 NAVIGATION CHANNELS

(a-b) The NJIWW is a federally maintained navigation channel. The proposed dredging would improve navigation and is acceptable. The dredging is in compliance with 7:7-12.6 Maintenance Dredging and Appendix G.

7:7-9.15 INTERTIDAL AND SUBTIDAL SHALLOWS

(a) The project area contains areas considered to be intertidal and subtidal shallows. The proposed project is acceptable in accordance with policy (c) and policy (g) because it entails maintenance dredging and is intended to address the loss of vegetated shallows and habitat in the littoral zone of the East Pool.
(c) Maintenance dredging of subtidal shallows is acceptable to maintain the authorized depth of the existing NJIWW Federal navigation channel. The dredging is in compliance with 7:7-12.6 Maintenance Dredging and Appendix G.
(g) The establishment of a living shoreline in intertidal and subtidal shallows to address the loss of vegetated shorelines and habitat in the littoral zone is conditionally acceptable provided the living shoreline complies with N.J.A.C. 7:7-12.23. While not intended to be a living shoreline, the beneficial reuse of dredged material that is planned for the East Pool will function similarly and have similar impacts to a living shoreline. As stated in the rule, living shorelines are a shoreline management practice that addresses erosion by providing protection, restoration or enhancement of vegetated shoreline habitats. Furthermore, the sediment placement within the East Pool is intended to

address the loss of vegetated shorelines and habitat in the littoral zone.

7:7-9.21 BAY ISLANDS

(a) The project area is not located on a ”bay island,” which, as defined by the rule, is an island or filled area surrounded by tidal waters, wetlands, beaches, or dunes, lying between the mainland and barrier island, which may be connected to the mainland or barrier island by elevated or fill supported roads.
(b-d) These are not applicable to this project because the project is not adjacent to any development and does not propose any development.

7:7-9.27 WETLANDS

(a) The placement of the dredged material to create habitat for Federal and State listed species endangered and trust species is addressed at N.J.A.C. 7:7-6.24 and this project is in compliance. Furthermore, as a wetland and mudflat enhancement project, this project requires water access and is water oriented as a central purpose of the basic function of the activity, and as such is water dependent. This project has no prudent or feasible alternative on a non-wetland site because it is specially designed to improve and expand the function and resilience of habitat within the East Pool. The project will result in minimum feasible alteration or impairment of natural tidal circulation, and is designed to work with the existing tidal circulation. The project will result in minimum feasible alteration of the natural contours or the natural vegetation of the wetlands. Areas that will be receiving sediment are primarily devoid of vegetation because they have degraded to interior mudflats. This project aims to raise the surface of the degraded areas to a height sufficient to support high-marsh wetland plants, as well as create inter-tidal mudflats along the shoreline.

7:7-9.28 WETLAND BUFFERS

(a, c) The project will entail placement of dredged material in wetland buffers. This work is intended to benefit the ecosystem and will not have a significant adverse impact on the existing resources.

7:7-9.34 HISTORIC AND ARCHAEOLOGICAL RESOURCES

(a-b) Since the NJIWW will only be dredged to its previously authorized depth, and since the placement of dredged material will serve to restore habitat in the East Pool impoundment, a preliminary determination has been made that the proposed action will have *No Effect* on historic properties eligible for or listed on the National Register of Historic Places pursuant to 36CFR800.4(d)(1). The project is being coordinated with the

New Jersey State Historic Preservation Office.

7:7-9.36 ENDANGERED OR THREATENED WILDLIFE OR PLANT SPECIES HABITATS

(a-b) The project plans, which have been developed in conjunction with the USFWS, are being implemented to protect and create habitat for Federal and state threatened and endangered birds within the refuge. The project is being coordinated with the U.S. Fish and Wildlife Service and the National Marine Fisheries Service pursuant to the Federal Endangered Species Act. The project will not result in any adverse impact to Federal or state listed endangered or threatened wildlife or plant species or their habitats. The intent of the project is to utilize sediment nourishment in order to create, enhance, and protect habitat for sensitive species.

7:7-9.37 CRITICAL WILDLIFE HABITATS

(a-b) The project area provides important habitat for migratory birds. The project has been designed and timed with great sensitivity to wildlife movement and habitat. Maintenance dredging in the NJIWW navigation channel and placement of material to create habitat would not adversely impact migratory birds.

7:7-9.48 LANDS AND WATERS SUBJECT TO PUBLIC TRUST RIGHTS

(a-b) Lands and waters subject to public trust rights include tidal waterways and their shores. Development that adversely affects lands and waters subject to public trust rights is discouraged. The project does not include development that would adversely affect the waterway. The project is in compliance with 7:7-16.9 Public Access, and would not restrict public access.

7:7-12.1 GENERAL WATER AREAS PURPOSE AND SCOPE

(a-b) General Water Areas include all water areas located below the spring high water line. General Water Areas are divided into eight categories. The NJIWW project area is included in 7:7E-4.1(b) 8 “tidal guts.” Tidal guts are the waterway connections between two estuarine bodies of water. Also known as thorofares or canals, tidal guts control the mix of salt and freshwater. The East Pool is located in a semi-enclosed or back bay (Little Bay).

7:7-12.23 LIVING SHORELINES

(a-c) In addition to gaining practical insight into using dredge material to create and enhance habitat, this project addresses the loss of habitat, including vegetated shorelines and habitat in the littoral zone by providing for the restoration and enhancement of these habitats. This project will experiment with strategic placement of sediment in order to learn how to achieve this aim. This project is consistent with 7:7-12.23 (b-c) and complies with Appendix G.

7:7-12.6 MAINTENANCE DREDGING

(a-b) The dredging location is a portion of the NJIWW Federal navigation channel, which is maintained to an authorized depth and width. Recent analysis of channel sediment indicates that the dredged material is primarily fine sand and silts. While a temporary increase in turbidity will occur during construction, there would be no adverse impact to water quality during dredging and placement operations.

7:7-12.9 DREDGED MATERIAL DISPOSAL

Pursuant to 7:7-12.9 (a), dredged material disposal does not include the beneficial use of dredged material and therefore this rule is not applicable as the placement of the dredged material will be used to create habitat and is consistent with 7:7-6.24.

7:7-12.11 FILLING

(a, g, h) The purpose of dredged material placement for this project is to enhance and protect wetland habitat and to create mudflat habitat. Areas within the East Pool that will receive sediment are previous marsh areas that have degraded to open-water. This project aims to raise the surface of the degraded areas to a height sufficient to support intertidal mudflats, wetland plants and provide habitat for Federal and state threatened and endangered and trust birds. The project complies with policies g and h.

7:7-14.2 BASIC LOCATION RULE

(a-b) This project does not pose a threat to the public, natural resources, property, or the environment. This project is designed to benefit the environment and to advance practice and improve techniques to implement habitat enhancement projects more effectively.

7:7-14.3 SECONDARY IMPACTS

(a-b) Dredging for maintenance of the NJIWW Federal navigation channel, and placement of the dredged material to create bird nesting habitat, will not result in any additional development. The proposed project will not result in any secondary impacts.

7:7-15.11 COASTAL ENGINEERING

(a-b) Placement of dredged material to create habitat is considered a hybrid shore protection measure.

7:7-16.2 MARINE FISH AND FISHERIES

(a-c) Dredging for maintenance of the NJIWW Federal navigation channel, and placement of the dredged material to create habitat will not result in any adverse impacts to marine fish or fisheries.

7:7-16.3 WATER QUALITY

(a-b) Proper precautions will be taken to ensure that the proposed project will not violate any applicable Federal or state water quality requirements in New Jersey. To ensure compliance with N.J.A.C. 7:7 Coastal Zone Management Rules Appendix G, the sediment to be removed from the NJIWW has been tested. Grain size and chemical analyses were conducted in February of 2020 (*Tetra Tech, Inc. 2020. Biological and Environmental Services Related to Marine and Navigable Waterways Civil Works Activities in the Philadelphia District, Contract: W912BU-19-D-0010, May 12, 2020 Avalon, Forsythe, and Oyster Creek, NJIWW, Pre-Dredge Sediment Chemical Analysis, Draft Report*).

7:7-16.8 AIR QUALITY

(a-b) Based on the small magnitude and short duration of project construction (2-3 weeks), the project is expected to produce emissions at the *de minimis level*, and will not exceed the thresholds established for NOx and VOC's in Atlantic County. Additionally, this action is exempt from CAA requirements in accordance with 40 CFR 93.153 c.2.ix where it states "Maintenance dredging and debris disposal where no new depths are required, applicable permits are secured, and disposal will be at an approved disposal site" shall not apply under § 93.153. Therefore, the selected plan complies with Section 176 (c)(1) of the Clean Air Act Amendments of 1990.

APPENDIX D

NOAA Fisheries Greater Atlantic Regional Fisheries Office ESA Section 7: NLAA Program Verification Form

NOAA FISHERIES
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
Greater Atlantic Region

US Army Corps of Engineers ®

GARFO ESA Section 7: NLAA Program Verification Form

(Please submit a signed version of this form, together with any project plans, maps, supporting analyses, etc., to nmfs.gar.esa.section7@noaa.gov with "**USACE NLAA Program: [Application Number]**" in the subject line)

Section 1: General Project Details

Application Number:	NJ Intracoastal Waterway Maintenance Dredging and Beneficial Use at E.B. Forsythe Refuge East Pool
Reinitiation:	No
Applicant(s):	U.S. Army Corps Of Engineers - Philadelphia District
Permit Type:	Civil Works/Federal Navigation
Anticipated project start date (e.g., 10/1/2020)	12/10/2020
Anticipated project end date (e.g., 12/31/2022 – if there is no permit expiration date, write "N/A")	12/31/2030

Project Type/Category (check all that apply to entire action):

☐	Aquaculture (shellfish) and artificial reef creation	☐	Mitigation (fish/wildlife enhancement or restoration)
☑	Dredging and disposal/beach nourishment	☐	Bank stabilization
☐	Piers, ramps, floats, and other structures	☑	If other, describe project type category: Dredging and sediment placement w/in East Pool

Town/City:	Oceanville	Zip:	08231
State:	New Jersey	Water body:	Little Bay/Hammock Cove/Perch Cove

Project/Action Description **and** Purpose (*include relevant permit conditions that are not captured elsewhere on form*):
To maintenance dredge approximately 6,000 to 10,000 cubic yards of predominantly fine-grained materials within the Federal navigation channel (between channel markers 152-160) to a depth of -6.0 ft. MLLW in December 2020; Dredged material disposal placement would occur within the East Pool impoundment located at Edwin B. Forsythe National Wildlife Refuge. Dredged material placement shall be conducted as thin-layer placement (< or = to 1.0 ft.) on muddy subtidal and intertidal areas with lifts at a time at locations determined by the U.S. Fish and Wildlife Service to maintain or rebuild intertidal vegetated wetlands and mudflat habitats. The East Pool impoundment is experiencing significant subsidence and is converting to open water and resulting intertidal habitat losses. Tidal flows are currently maintained through 4 tidegates installed near each corner of the impoundment. Currently, the East Pool impoundment is flooded at +1.0 ft MHW, while outside of the impoundment, MHW is +1.7 ft. The utltimate goal of USFWS is to raise the bottom of the impoundment for the

Type of Bottom Habitat Modified:	Permanent/Temporary:	Area (acres):
Silt/Mud/Clay (saline)	Temporary	23.00
Silt/Mud/Clay (saline)	Permanent	6.00
Silt/Mud/Clay (saline)	Permanent	12.00
Project Latitude (e.g., 42.625884)	39.346315	
Project Longitude (e.g., -70.646114)	-74.394371	
Mean Low Water (MLW)(m)		
Mean High Water (MHW)(m)		

Width (m) of water body in action area:	Stressor Category (stressor that extends furthest distance into water body – e.g., turbidity plume; sound pressure wave):	Max extent (m) of stressor into the water body:
210.00	Bottom disturbance/turbidity plume	305.00

Section 2: ESA-listed species and/or critical habitat in the action area:

☑	Atlantic sturgeon (all DPSs)	☑	Kemp's ridley sea turtle
☐	Atlantic sturgeon critical habitat Indicate which DPS : Select DPS	☑	Loggerhead sea turtle (NW Atlantic DPS)
☑	Shortnose sturgeon	☑	Leatherback sea turtle
☐	Atlantic salmon (GOM DPS)	☐	North Atlantic right whale
☐	Atlantic salmon critical habitat (GOM DPS)	☐	North Atlantic right whale critical habitat
☑	Green sea turtle (N. Atlantic DPS)	☐	Fin whale

* Please consult GARFO PRD's ESA Section 7 Mapper for ESA-listed species and critical habitat information for your action area at: https://www.fisheries.noaa.gov/new-england-mid-atlantic/consultations/section-7-species-critical-habitat-information-maps-greater.

Section 3: NLAA Determination (check all applicable fields):
If the Project Design Criteria (PDC) is met, select Yes. If the PDC is not applicable (N/A) for your project (e.g., the stressor category is not included for your project activity, or for PDC 2, your project does not occur within the range of the GOM DPS of Atlantic salmon), select N/A. If the PDC is applicable, but is not met, leave both boxes blank and provide a justification for that PDC in Section 4.

a) GENERAL PDC			
Yes	N/A	PDC #	PDC Description
☐	☐	1.	No portion of the proposed action will individually or cumulatively have an adverse effect on ESA-listed species or designated critical habitat.
☑	☐	2.	No portion of the proposed action will occur in the tidally influenced portion of rivers/streams where Atlantic salmon presence is possible from April 10–November 7. **Note**: If the project will occur within the geographic range of the GOM DPS Atlantic salmon but their presence is not expected following the best available commercial scientific data, the work window does not need to be applied (include reference in project description).
☐	☐	3.	No portion of the proposed action that may affect shortnose or Atlantic sturgeon will occur in areas identified as spawning grounds as follows: i. Gulf of Maine: April 1–Aug. 31 ii. Southern New England/New York Bight: Mar. 15–Aug. 31 iii. Chesapeake Bay: March 15–July 1 and Sept. 15–Nov. 1 **Note**: If river specific information exists that provides better or more refined time of year information, those dates may be substituted with NMFS approval (include reference in project description).
☐	☐	4.	No portion of the proposed action that may affect shortnose or Atlantic sturgeon will occur in areas identified as overwintering grounds, where dense aggregations are known to occur, as follows: i. Gulf of Maine: Oct. 15–April 30 ii. Southern New England/ New York Bight: Nov. 1–Mar. 15 iii. Chesapeake Bay: Nov. 1–Mar. 15 **Note**: If river specific information exists that provides better or more refined time of year information, those dates may be substituted with NMFS approval (include reference in project description).
☐	☑	5.	Within designated Atlantic salmon critical habitat, no portion of the proposed action will affect spawning and rearing areas (PBFs 1-7).
☑	☐	6.	Within designated Atlantic sturgeon critical habitat, no work will affect hard bottom substrate (e.g., rock, cobble, gravel, limestone, boulder, etc.) in low salinity waters (i.e., 0.0-0.5 parts per thousand) (PBF 1).

Yes	N/A	PDC #	PDC Description
☑	☐	7.	Work will result in no or only temporary/short-term changes in water temperature, water flow, salinity, or dissolved oxygen levels.
☑	☐	8.	If ESA-listed species are (a) likely to pass through the action area at the time of year when project activities occur; and/or (b) the project will create an obstruction to passage when in-water work is completed, then a zone of passage (~50% of water body) with appropriate habitat for ESA-listed species (e.g., depth, water velocity, etc.) must be maintained (i.e., physical or biological stressors such as turbidity and sound pressure must not create barrier to passage).
☐	☑	9.	Any work in designated North Atlantic right whale critical habitat must have no effect on the physical and biological features (PBFs).
☑	☐	10.	The project will not adversely impact any submerged aquatic vegetation (SAV).
☑	☐	11.	No blasting or use of explosives will occur.

b) The following stressors are applicable to the action (check all that apply – use Stressor Category Table for guidance):

☐	Sound Pressure
☑	Impingement/Entrapment/Capture
☑	Turbidity/Water Quality
☐	Entanglement (Aquaculture)
☐	Habitat Modification
☑	Vessel Traffic

	Stressor Category					
Activity Category	Sound Pressure	Impingement/ Entrapment/ Capture	Turbidity/ Water Quality	Entanglement	Habitat Mod.	Vessel Traffic
Aquaculture (shellfish) and artificial reef creation	N	N	Y	Y	Y	Y
Dredging and disposal/beach nourishment	N	Y	Y	N	Y	Y

	Stressor Category					
Activity Category	Sound Pressure	Impingement/ Entrapment/ Capture	Turbidity/ Water Quality	Entanglement	Habitat Mod.	Vessel Traffic
Piers, ramps, floats, and other structures	Y	N	Y	N	Y	Y
Transportation and development (e.g., culvert construction, bridge repair)	Y	N	Y	N	Y	Y
Mitigation (fish/wildlife enhancement or restoration)	N	N	Y	N	Y	Y
Bank stabilization and dam maintenance	Y	N	Y	N	Y	Y

c) SOUND PRESSURE PDC

Information for Pile Driving:
If your project includes non-timber piles*, please attach your calculation to this verification form showing that the noise is below the injury thresholds of ESA-listed species in the action area. The GARFO Acoustic Tool is available as one source, should you not have other information:

https://www.fisheries.noaa.gov/new-england-mid-atlantic/consultations/section-7-consultation-technical-guidance-greater-atlantic

*Sound pressure effects from timber and steel sheet piles were analyzed in the NLAA programmatic consultation, so no additional acoustic information is necessary.

	Pile material	Pile diameter/width (inches)	Number of piles	Installation method
a)	Select pile material			Select installation method
b)	Select pile material			Select installation method
c)	Select pile material			Select installation method
d)	Select pile material			Select installation method

Yes	N/A	PDC #	PDC Description
☐	☑	12.	If pile driving is occurring during a time of year when ESA-listed species may be present, and the anticipated noise is above the behavioral noise threshold, a "soft start" is required to allow animals an opportunity to leave the project vicinity before sound pressure levels increase. *In addition to using a soft start at the beginning of the work day for pile driving, one must also be used at any time following cessation of pile driving for a period of 30 minutes or longer.* <u>For impact pile driving</u>: pile driving will commence with an initial set of three strikes by the hammer at 40% energy, followed by a one minute wait period, then two subsequent 3-strike sets at 40% energy, with one-minute waiting periods, before initiating continuous impact driving. <u>For vibratory pile installation</u>: pile driving will be initiated for 15 seconds at reduced energy followed by a one-minute waiting period. This sequence of 15 seconds of reduced energy driving, one-minute waiting period will be repeated two additional times, followed immediately by pile-driving at full rate and energy.
☐	☑	13.	Any new pile supported structure must involve the installation of ≤ 50 piles (below MHW).
☐	☑	14.	All underwater noise (pressure) is below (<) the physiological/injury noise threshold for ESA-species in the action area.

d) IMPINGEMENT/ENTRAINMENT/CAPTURE PDC

Information for Dredging/Disposal:			
Type of dredge:	Hydraulic/Cutterhead		
Maintenance dredging?:	Yes	If "Yes", how many acres?	3.00
If maintenance, when was the last dredge cycle?	2010		
New dredging:	No	If "Yes", how many acres?	
Estimated number of dredging events covered by permit:	0		
ESA-species exclusion measures required (e.g., cofferdam, turbidity curtain):	No		
If no exclusion measures required, explain why:	Presence of ESA-listed species limited to rare, transient individuals		
Information for Intake Structures:			
Mesh screen size (mm) for temporary intake:			

Yes	N/A	PDC #	PDC Description
☑	☐	15.	Only mechanical, cutterhead, and low volume hopper (e.g., CURRITUCK, ~300 cubic yard maximum bin capacity) dredges may be used.
☑	☐	16.	No new dredging in Atlantic sturgeon or Atlantic salmon critical habitat (maintenance dredging still must meet all other PDCs). New dredging outside Atlantic sturgeon or salmon critical habitat is limited to one time dredge events (e.g., burying a utility line) and minor (≤ 2 acres) expansions of areas already subject to maintenance dredging (e.g., marina/harbor expansion).
☑	☐	17.	Work behind cofferdams, turbidity curtains, or other methods to block access of animals to dredge footprint is required when operationally feasible or beneficial and ESA-listed species are likely to be present (if presence is limited to rare, transient individuals, exclusion methods are not necessary).
☐	☑	18.	Temporary intakes related to construction must be equipped with appropriate sized mesh screening (as determined by GARFO section 7 biologist and/or according to Chapter 11 of the NOAA Fisheries Anadromous Salmonid Passage Facility Design) and must not have greater than 0.5 fps intake velocities, to prevent impingement or entrainment of any ESA-listed species life stage.
☑	☐	19.	No new permanent intake structures related to cooling water, or any other inflow at facilities (e.g. water treatment plants, power plants, etc.).

e) TURBIDITY/WATER QUALITY PDC

Information for Turbidity Producing Activity (excluding disposal):	
ESA-species turbidity control measures required (e.g., turbidity curtain):	No
If no turbidity control measures required, explain why:	Presence of ESA-listed species limited to rare, transient individuals
Information for Dredged Material Disposal:	
Disposal site:	Nearshore placement/nourishment
Estimated number of trips to disposal site:	1
Relevant disposal site permit/special conditions required (NAE: for offshore disposal, include Group A, B, C, or relevant Long Island Sound consultation):	Disposal is for benefical use within a 500-acre semi-confined intertidal "East Pool" impoundment of the Edwin B. Forsythe National Wildlife Refuge. Goal is to build elevation to counteract subsidence to build to intertidal mudflat/saltmarsh elevation for for fish and wildlife management purposes.

Yes	N/A	PDC #	PDC Description
☑	☐	20.	Work behind cofferdams, turbidity curtains, or other methods to control turbidity is required when operationally feasible or beneficial and ESA-listed species are likely to be present (if presence is limited to rare, transient individuals, turbidity control methods are not necessary).
☐	☑	21.	In-water offshore disposal may only occur at designated disposal sites that have been the subject of ESA section 7 consultation with NMFS, where a valid consultation is in place and appropriate permit/special conditions are included.

Yes	N/A	PDC #	PDC Description
☑	☐	22.	Any temporary discharges must meet state water quality standards (e.g., no discharges of substances in concentrations that may cause acute or chronic adverse reactions, as defined by EPA water quality standards criteria).
☑	☐	23.	Only repair, upgrades, relocations and improvements of existing discharge pipes or replacement in-kind are allowed; no new construction of untreated discharges.
	f) ENTANGLEMENT PDC		

Information for Aquaculture Projects:

Approximate distance from shore (MHW)(m):	
Grow season begins (approximate):	
Grow season ends (approximate):	
Total number of vertical lines:	
Total number of horizontal lines:	
Is any gear seasonally removed from the water? If yes, which parts and when?	

	Aquaculture Gear	Acreage (total permit footprint)	Type of Shellfish Cultivated
a)	Select aquaculture gear		Select type of shellfish cultivated
b)	Select aquaculture gear		Select type of shellfish cultivated
c)	Select aquaculture gear		Select type of shellfish cultivated

Yes	N/A	PDC #	PDC Description
☐	☑	24.	Shell on bottom <50 acres with maximum of 4 corner marker buoys;
☐	☑	25.	Cage on bottom with no loose floating lines <5 acres and minimal vertical lines (1 per string of cages, 4 corner marker buoys);
☐	☑	26.	Floating cages in <3 acres in waters and shallower than -10 feet MLLW with no loose lines and minimal vertical lines (1 per string of cages, 4 corner marker buoys);
☐	☑	27.	Floating upweller docks in >10 feet MLLW.
☐	☑	28.	Any in-water lines, ropes, or chains must be made of materials and installed in a manner to minimize or avoid the risk of entanglement by using thick, heavy, and taut lines that do not loop or entangle. Lines can be enclosed in a rigid sleeve.
	g) HABITAT MODIFICATION PDC		
Yes	N/A	PDC #	PDC Description
☑	☐	29.	No conversion of habitat type (soft bottom to hard, or vice versa) for aquaculture or reef creation.

	h) VESSEL TRAFFIC PDC

Information for Vessel Traffic:

	Temporary Project Vessel Type	Number of Vessels
a)	Dredge vessel	1
b)	Tug	1
c)	Crew support vessel	2
	Type of Non-Commercial or Aquaculture Vessels Added *– only include if there is a net increase directly/indirectly resulting from project*)	Number of Vessels (*if sum > 2, PDC 33 is not met and justification required in Section 4*)
a)	Select type of non-commercial or aquaculture vessels	
b)	Select type of non-commercial or aquaculture vessels	
	Type of Commercial Vessels Added (*only include if there is a net increase directly/indirectly resulting from project*)	Number of Vessels (*if > 0, PDC 33 is not met and justification required in Section 4*)
a)		
b)		

If no temporary/permanent vessel traffic, briefly explain (e.g., all land-based work, no net increase in vessel traffic)	

Yes	N/A	PDC #	PDC Description
☑	☐	30.	Maintain project vessels operating within the action area to speed limits below 10 knots and dredge vessel speeds of 4 knots maximum, while dredging.
☐	☑	31.	Maintain a 1,500-foot buffer between project vessels and ESA-listed whales and a 150-foot buffer between project vessels and sea turtles unless the vessel is navigating to an in-water disposal site/activity. If the vessel is navigating to an in-water disposal site/activity, refer to and include the conditions contained in the appropriate GARFO-USACE/EPA consultation for the disposal site.
☑	☐	32.	The number of project vessels must be limited to the greatest extent possible, as appropriate to size and scale of project.
☐	☑	33.	The permanent net increase in vessels resulting from a project (e.g., dock/float/pier/boating facility) must not exceed two non-commercial vessels. A project must not result in the permanent net increase of any commercial vessels (e.g., a ferry terminal).

Section 4: Justification for Review under the NLAA Program

If the action is not in compliance with all of the General PDC and appropriate stressor PDC, but you can provide justification and/or special conditions to demonstrate why the project still meets the NLAA determination and is consistent with the aggregate effects considered in the programmatic consultation, you may still certify your project through the NLAA program using

this verification form. Please identify which PDC your project does not meet (e.g., PDC 9, PDC 15, PDC 22, etc.) and provide your rationale and justification for why the project is still eligible for the verification form.

To demonstrate that the project is still NLAA, you must explain why the effects on ESA-listed species or critical habitat are **insignificant** (i.e., too small to be meaningfully measured or detected) or **discountable** (i.e., extremely unlikely to occur). **Please use this language in your justification.**

PDC#	Justification
1	Maintenance dredging activity and disposal (beneficial use within East Pool impoundment) are within the range of shortnose sturgeon and Atlantic sturgeon. However, insufficient information exists to determine presence/absence. These species are not known to inhabit the affected area in any significant concentrations.
3	Maintenance dredging activity and disposal (beneficial use within East Pool impoundment) are within the range of shortnose sturgeon and Atlantic sturgeon. However, insufficient information exists if any spawning activity occurs for shortnose sturgeon or Atlantic sturgeon upstream of proposed action.
4	Maintenance dredging activity and disposal (beneficial use within East Pool impoundment) are within the range of shortnose sturgeon and Atlantic sturgeon. However, insufficient information exists if these species overwinter within the affected area. These species are not known to inhabit the affected area in any significant concentrations.

PDC #	

Section 5: USACE Verification of Determination

☑	In accordance with the NLAA Program, USACE has determined that the action complies with all applicable PDC and is not likely to adversely affect listed species.
☐	In accordance with the NLAA Program, the USACE has determined that the action is not likely to adversely affect listed species per the justification and/or special conditions provided in Section 4.

USACE Signature:	Date:
	11/05/2020

Section 6: GARFO Concurrence

☐	In accordance with the NLAA Program, GARFO PRD concurs with USACE's determination that the action complies with all applicable PDC and is not likely to adversely affect listed species or critical habitat.
☐	In accordance with the NLAA Program, GARFO PRD concurs with USACE's determination that the action is not likely to adversely affect listed species or critical habitat per the justification and/or special conditions provided in Section 4.
☐	GARFO PRD does not concur with USACE's determination that the action complies with the applicable PDC (with or without justification), and recommends an individual Section 7 consultation to be completed independent from the NLAA Program.

GARFO Signature:	Date:

APPENDIX E

NOAA Fisheries Greater Atlantic Regional Fisheries Office Essential Fish Habitat (EFH) Assessment & Fish and Wildlife Coordination Act (FWCA) Worksheet

1. Maintenance Dredging of NJIWW
2. Beneficial Use Placement in East Pool

NOAA Fisheries Greater Atlantic Regional Fisheries Office
Essential Fish Habitat (EFH) Assessment & Fish and Wildlife Coordination Act (FWCA) Worksheet

This worksheet is your essential fish habitat (EFH) assessment. It provides us with the information necessary to assess the effects of your action on EFH under the Magnuson Stevens Fishery Conservation and Management Act and on NOAA trust resources under the Fish and Wildlife Coordination Act (FWCA). Consultation is not required if:

1. there is no adverse effect on EFH or NOAA trust resources (see page 10 for more info).
2. no EFH is designated and no trust resources may be present at the project site.

Instructions

Federal agencies or their non-federal designated lead agency should email the completed worksheet and necessary attachments to nmfs.gar.efh.consultation@noaa.gov. Include the public notice (if applicable) or project application and project plans showing:

- location map of the project site with area of impact.
- existing and proposed conditions.
- all waters of the U.S. on the project site with mean low water (MLW), mean high water (MHW), high tide line (HTL), and water depths clearly marked.
- sensitive habitats mapped, including special aquatic sites (submerged aquatic vegetation, saltmarsh, mudflats, riffles and pools, coral reefs, and sanctuaries and refuges), hard bottom or natural rocky habitat areas, and shellfish beds.
- site photographs, if available.

We will provide our EFH conservation recommendations and recommendations under the FWCA, as appropriate, within 30 days of receipt of a complete EFH assessment (60 days if an expanded consultation is necessary). Please submit complete information to minimize delays in completing the consultation.

This worksheet provides us with the information required[1] in an EFH assessment:

1. A description of the proposed action.
2. An analysis of the potential adverse effects on EFH and the federally managed species.
3. The federal agency's conclusions regarding the effects of the action on EFH.
4. Proposed mitigation, if applicable.

Your analysis **should focus on impacts that reduce the quality and/or quantity of the habitat or result in conversion to a different habitat type** for all life stages of species with designated EFH within the action area.

Use the information on the HCD website and NOAA's EFH Mapper to complete this worksheet. If you have questions, please contact the appropriate HCD staff member to assist you.

[1] The EFH consultation process is guided by the requirements of our EFH regulation at 50 CFR 600.905.

EFH ASSESSMENT WORKSHEET

General Project Information

Date Submitted: November 6, 2020

Project/Application Number: N/A

Project Name: NJIWW Maintenance Dredging Between USCG Markers 152 & 160

Project Sponsor/Applicant: U.S. Army Corps of Engineers

Federal Action Agency (if state agency acting as delegated): U.S. Army Corps of Engineers

Fast-41 or One Federal Decision Project: ☐ Yes ☑ No

Action Agency Contact Name: Steven D. Allen

Contact Phone: 215-656-6559 Contact Email: Steven.D.Allen@usace.army.mil

Latitude: 39.456765° Longitude: -74.392624°

Address, City/Town, State:

New Jersey Intracoastal Waterway (NJIWW) near Oceanville, NJ

Body of Water: Perch Cove/Little Bay (Atlantic County)

Project Purpose:

Maintain NJIWW Federal navigation channel between U.S. Coast Guard Markers 152 and 160 to authorized depth of -6.0 ft. MLLW and width of 100 ft. for safe navigation.

Project Description:

Several shoal locations have developed between USCG Markers 152 and 160 that require maintenance dredging of approximately 6,000 to 10,000 cubic yards of silty/sandy material. Dredging will be accomplished with a hydraulic cutter-suction dredge for an estimated period of 2 to 3 weeks in December of 2020. Based on recent channel surveys, subtidal shoal areas would be dredged to maintain the authorized depth to -6.0 ft. MLLW within the channel boundaries. Dredged material would be transported (pumped) via floating pipeline extending 0.75 miles to 1.1 miles to the proposed beneficial use site, East Pool, at the Edwin B. Forsythe National Wildlife Refuge (EBFNWR) (see EFH Worksheet titled "Beneficial Use of Dredged Material at East Pool - EBFNWR for details on dredged material placement).

Anticipated Duration of In-Water Work or Start/End Dates:

December 10 to December 31, 2020.

Habitat Description

EFH includes the biological, chemical, and physical components of the habitat. This includes the substrate and associated biological resources (e.g., benthic organisms, submerged aquatic vegetation, shellfish beds, salt marsh wetlands), the water column, and prey species.

Is the project in designated EFH[2]? ☑ Yes ☐ No

Is the project in designated HAPC[2]? ☑ Yes ☐ No

Is this coordination under FWCA only? ☐ Yes ☑ No

Total area of impact to EFH (indicate sq ft or acres): ~3.0 acres

Total area of impact to HAPC (indicate sq ft or acres): ~3.0 acres

Current water depths: -1.2' to -6.0' Salinity: 19-30ppt Water temperature range: 29.5-82 F

Sediment characteristics[3]: Sand/Gravel: 22.9% - 61.2%; Fines: 38.8%-77.1%

What habitat types are in or adjacent to the project area and will they be permanently impacted? Select all that apply. Indicate if impacts will be temporary, if site will be restored, or if permanent conversion of habitat will occur. A project may occur in overlapping habitat types.

	Habitat Type	**Total impact (sq ft/acres)**	**Impacts are temporary**	**Restored to pre-existing conditions**	**Permanent conversion of all or part of habitat**
☐	Marine				
☑	Estuarine	~3 acres	Yes	Yes	No
☐	Riverine (tidal)				
☐	Riverine (non-tidal)				
☐	Intertidal				
☑	Subtidal	~3 acres	Yes	Yes	No
☑	Water column	~3 acres	Yes	Yes	No
☐	Salt marsh/ Wetland (tidal)				
☐	Wetland (non-tidal)				

[2] Use the tables on pages 7-9 to list species with designated EFH or the type of designated HAPC present.
[3] The level of detail is dependent on your project – e.g., a grain size analysis may be necessary for dredging.

	Habitat Type	Total impact (sq ft/acres)	Impacts are temporary	Restored to pre-existing conditions	Permanent conversion of all or part of habitat
☐	Rocky/hard bottom[4]:				
☐	Sand				
☐	Shellfish beds or oyster reefs				
☐	Mudflats				
☐	Submerged aquatic vegetation (SAV)[5], macroalgae, epifauna				
☑	Diadromous fish (migratory or spawning habitat)	~3 acres	Yes	Yes	No

Indicate type(s) of rocky/hard bottom habitat (pebble, cobble, boulder, bedrock outcrop/ledge) and species of SAV:

Project Effects

Select all that apply	Project Type/Category
☐	Hatchery or Aquaculture
☐	Agriculture
☐	Forestry
☐	Military (e.g., acoustic testing, training exercises)
☐	Mining (e.g., sand, gravel)
☐	Restoration or fish/wildlife enhancement (e.g., fish passage, wetlands, beach renourishment, mitigation bank/ILF creation)

[4] Indicate type(s). The type(s) of rocky habitat will help you determine if the area is cod HAPC.
[5] Indicate species. Provide a copy of the SAV report and survey conducted at the site, if applicable.

Select all that apply	Project Type/Category
☐	Infrastructure/transportation (e.g., culvert construction, bridge repair, highway, port)
☐	Energy development/use
☐	Water quality (e.g., TMDL, wastewater, sediment remediation)
☑	Dredging/excavation and disposal
☐	Piers, ramps, floats, and other structures
☐	Bank/shoreline stabilization (e.g., living shoreline, groin, breakwater, bulkhead)
☐	Survey (e.g., geotechnical, geophysical, habitat, fisheries)
☐	Other

Select all that apply	Potential Stressors Caused by the Activity	Select all that apply and if temporary or permanent		Habitat alterations caused by the activity
☑	Underwater noise	Temp	Perm	
☑	Water quality/turbidity/ contaminant release	☐	☑	Water depth change
☑	Vessel traffic/barge grounding	☐	☐	Tidal flow change
☑	Impingement/entrainment[6]	☐	☐	Fill
☑	Prevent fish passage/spawning	☐	☐	Habitat type conversion
☑	Benthic community disturbance			Other:
☑	Impacts to prey species			Other:

[6] Entrainment is the voluntary or involuntary movement of aquatic organisms from a water body into a surface diversion or through, under, or around screens and results in the loss of the organisms from the population. Impingement is the involuntary contact and entrapment of aquatic organisms on the surface of intake screens caused when the approach velocity exceeds the swimming capability of the organism.

Details: project impacts and mitigation

The level of detail that you provide should be commensurate with the magnitude of impacts associated with the proposed project. Attach supplemental information if necessary.

Describe how the project would impact each of the habitat types selected above. Include temporary and permanent impact descriptions and direct and indirect impacts.

Dredging would occur to maintain the authorized channel depth of -6.0 ft MLLW by the removal of shoals at -1.2 ft. MLLW to -6.0 ft. MLLW in depth. Approximately 3.0 acres of estuarine subtidal soft bottom (E1UBL, Cowardin et al. 1979) would be affected. The dredging would increase the depth in the shoaled areas, but will not change the tidal regime. Dredging depths to -6.0 ft. MLLW would not be isolated, and would tie into existing navigation channel depths at -6.0 ft. MLLW or deeper to allow for flushing. Underlying substrate (sands/silts) would remain similar to pre-existing substrates and adjacent substrates. Dredging would generate temporary and localized turbidity at point of dredge. Dredged areas may shoal-in at a frequency of every 3-4 years.

What specific measures will be used to avoid impacts, including project design, turbidity controls, acoustic controls, and time of year restrictions? If impacts cannot be avoided, why not?

Impacts to bottom habitat are unavoidable to maintain safe navigation. Turbidity would be

What specific measures will be used to minimize impacts?

Employing practicable BMP's such as a pipeline delivery system and completing work by

Is compensatory mitigation proposed? ☐ Yes ☑ No

If no, why not? If yes, describe plans for mitigation and how this will offset impacts to EFH. Include a conceptual compensatory mitigation and monitoring plan, if applicable.

The purpose is to maintain an existing authorized Federal navigation channel that is perio

Federal Action Agency's EFH determination (select one)	
☐	There is no adverse effect[7] on EFH or EFH is not designated at the project site. EFH Consultation is not required. This is a FWCA-only request.
☑	The adverse effect[7] on EFH is not substantial. This means that the adverse effects are no more than minimal, temporary, or can be alleviated with minor project modifications or conservation recommendations. This is a request for an abbreviated EFH consultation.
☐	The adverse effect[7] on EFH is substantial. This is a request for an expanded EFH consultation. We will provide more detailed information, including an alternatives analysis and NEPA document, if applicable.

EFH and HAPC designations[8]

Use the EFH mapper to determine if EFH may be present in the project area and enter all species and lifestages that have designated EFH. Optionally, you may review the EFH text descriptions linked to each species in the EFH mapper and use them to determine if the described habitat is present. We recommend this for larger projects to help you determine what your impacts are.

Species	**EFH is designated/mapped for:**				**Habitat present based on text description (optional)**
	EFH: eggs	**EFH: larvae**	**EFH: juvenile**	**EFH: adults/ spawning adults**	
Atlantic butterfish (Peprilus tricanthus)	☐	☐	☑	☑	☑
Black sea bass (Centropristus striata)	☐	☐	☑	☑	☐
Bluefish (Pomatomus saltatrix)	☐	☐	☑	☑	☑
Long finned inshore squid (Loligo pealei)	☐	☐	☑	☑	☐

[7] An **adverse effect** is any impact that reduces the quality and/or quantity of EFH. 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. 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.

[8] Within the Greater Atlantic Region, EFH has been designated by the New England, Mid-Atlantic, and South Atlantic Fisheries Management Councils and NOAA Fisheries.

Species	EFH is designated/mapped for:				Habitat present based on text description (optional)
	EFH: eggs	EFH: larvae	EFH: juvenile	EFH: adults/ spawning adults	
Scup (Stenotomus chrysops)	☐	☐	✔	☐	✔
Spiny dogfish (Squalus acanthias)	☐	☐	✔	✔	✔
Summer flounder (Paralicthys dentatus)	☐	✔	✔	✔	✔
White hake (Urophycis tenuis)	✔	☐	☐	☐	☐
Windowpane flounder (Scopthalmus aquosus)	✔	✔	✔	✔	✔
Winter flounder (Pleuronectes americanus)	✔	✔	✔	✔	✔
Silver hake/whiting (Merluccius bilinearis)	✔	✔	✔	☐	✔
Red hake (Urophycis chuss)	✔	✔	✔	✔	✔
Monkfish (Lophius americanus)	✔	✔	☐	☐	☐
Little skate (Raja erinacea)	☐	☐	✔	☐	✔
Winter skate (Raja ocellata)	☐	☐	✔	☐	✔
Clearnose skate (Raja eglanteria)	☐	☐	✔	✔	✔
Atlantic sea herring (Clupea harengus)	☐	☐	✔	✔	✔
King mackerel (Scomberomorus cavalla)	✔	✔	✔	✔	☐
Spanish mackerel (Scomberomorus maculatus)	✔	✔	✔	✔	☐
Cobia (Rachycentron canadum)	✔	✔	✔	✔	☐
Skipjack Tuna (Katsuwonus pelamis)	☐	☐	☐	✔	☐
Yellowfin Tuna (Thunnus albacares)	☐	☐	✔	☐	☐
Sand tiger shark (Odontaspis taurus)	☐	✔	✔	☐	☐
Common thresher shark (Alopias vulpinus)	☐	✔	✔	✔	☐
Dusky shark (Charcharinus obscurus)	☐	✔	☐	☐	☐
Sandbar shark (Charcharinus plumbeus)	☐	✔	✔	✔	✔

HAPCs

Select all that are in your action area.

☐	Summer flounder: SAV[9]	☐	Alvin & Atlantis Canyons
☑	Sandbar shark	☐	Baltimore Canyon
☐	Sand Tiger Shark (Delaware Bay)	☐	Bear Seamount
☐	Sand Tiger Shark (Plymouth-Duxbury-Kingston Bay)	☐	Heezen Canyon
☐	Inshore 20m Juvenile Cod	☐	Hudson Canyon
☐	Great South Channel Juvenile Cod	☐	Hydrographer Canyon
☐	Northern Edge Juvenile Cod	☐	Jeffreys & Stellwagen
☐	Lydonia Canyon	☐	Lydonia, Gilbert & Oceanographer Canyons
☐	Norfolk Canyon (Mid-Atlantic)	☐	Norfolk Canyon (New England)
☐	Oceanographer Canyon	☐	Retriever Seamount
☐	Veatch Canyon (Mid-Atlantic)	☐	Toms, Middle Toms & Hendrickson Canyons
☐	Veatch Canyon (New England)	☐	Washington Canyon
☐	Cashes Ledge	☐	Wilmington Canyon

[9] Summer flounder HAPC is defined as all native species of macroalgae, seagrasses, and freshwater and tidal macrophytes in any size bed, as well as loose aggregations, within adult and juvenile summer flounder EFH. In locations where native species have been eliminated from an area, then exotic species are included. Use local information to determine the locations of HAPC.

More information

The Magnuson-Stevens Fishery Conservation and Management Act (MSA) mandates that federal agencies conduct an essential fish habitat (EFH) consultation with NOAA Fisheries on any actions they authorize, fund, or undertake that may adversely affect EFH. An **adverse effect** is any impact that reduces the quality and/or quantity of EFH. 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. 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.

We designed this worksheet to help you to prepare EFH assessments. It is important to remember that an adverse effect determination is a trigger to consult with us. It does not mean that a project cannot proceed as proposed, or that project modifications are necessary. It means that the effects of the proposed action on EFH must be evaluated to determine if there are ways to avoid, minimize, or offset adverse effects.

This worksheet should be used as your EFH assessment or as a guide to develop your EFH assessment. At a minimum, you should include all the information required to complete this worksheet in your EFH assessment. The level of detail that you provide should be commensurate with the magnitude of impacts associated with the proposed project. If your answers in the worksheet and supplemental information you attach do not fully evaluate the adverse effects to EFH, we may request additional information to complete the consultation.

You may need to prepare an expanded EFH assessment for more complex projects to fully characterize the effects of the project and the avoidance and minimization of impacts to EFH. While the EFH assessment worksheet may be used for larger projects, the format may not be sufficient to incorporate the extent of detail required, and a separate EFH assessment may be developed. However, regardless of format, you should include an analysis as outlined in this worksheet for an expanded EFH assessment, along with any additional necessary information. This additional information includes:

- the results of on-site inspections to evaluate the habitat and site-specific effects.
- the views of recognized experts on the habitat or the species that may be affected.
- a review of pertinent literature and related information.
- an analysis of alternatives that could avoid or minimize the adverse effects on EFH.

Please contact our Greater Atlantic Regional Fisheries Office, Protected Resources Division regarding potential impacts to marine mammals or threatened and endangered species.

Useful Links

National Wetland Inventory Maps
https://www.fws.gov/wetlands/
EPA's National Estuary Program (NEP)
https://www.epa.gov/nep/local-estuary-programs
Northeast Regional Ocean Council (NROC) Data Portal
https://www.northeastoceandata.org/
Mid-Atlantic Regional Council on the Ocean (MARCO) Data Portal
http://portal.midatlanticocean.org/

Resources by State

Maine
Maine Office of GIS Data Catalog
https://geolibrary-maine.opendata.arcgis.com/datasets#data
Town shellfish information including shellfish conservation area maps
https://www.maine.gov/dmr/shellfish-sanitation-management/programs/municipal/ordinances/towninfo.html
State of Maine Shellfish Sanitation and Management
https://www.maine.gov/dmr/shellfish-sanitation-management/index.html
Eelgrass maps
https://www.maine.gov/dmr/science-research/species/eelgrass/index.html
Casco Bay Estuary Partnership
https://www.cascobayestuary.org/
Maine GIS Stream Habitat Viewer
https://www.arcgis.com/home/item.html?id=5869c2d20f0b4c3a9742bdd8abef42cb

New Hampshire
NH's Statewide GIS Clearinghouse, NH GRANIT
http://www.granit.unh.edu/
NH Coastal Viewer
http://www.granit.unh.edu/nhcoastalviewer/
State of NH Shellfish Program
https://www.des.nh.gov/organization/divisions/water/wmb/shellfish/

Massachusetts
MA Shellfish Sanitation and Management Program
https://www.mass.gov/shellfish-sanitation-and-management
MassGIS Data, Including Eelgrass Maps
http://maps.massgis.state.ma.us/map_ol/oliver.php
MA DMF Recommended TOY Restrictions Document
https://www.mass.gov/files/documents/2016/08/ry/tr-47.pdf
Massachusetts Bays National Estuary Program
https://www.mass.gov/orgs/massachusetts-bays-national-estuary-program
Buzzards Bay National Estuary Program
http://buzzardsbay.org/
Massachusetts Division of Marine Fisheries

https://www.mass.gov/orgs/division-of-marine-fisheries
Massachusetts Office of Coastal Zone Management
https://www.mass.gov/orgs/massachusetts-office-of-coastal-zone-management

Rhode Island
RI Shellfish and Aquaculture
http://www.dem.ri.gov/programs/fish-wildlife/marine-fisheries/shellfish-aquaculture.php
RI Shellfish Management Plan
http://www.shellfishri.com/
Eelgrass Maps
http://edc.maps.arcgis.com/apps/View/index.html?appid=db52bb689c1e44259c06e11fd24895f8
RI GIS Data
http://ridemgis.maps.arcgis.com/apps/webappviewer/index.html?id=87e104c8adb449eb9f905e5f18020de5
Narragansett Bay Estuary Program
http://nbep.org/
Rhode Island Division of Marine Fisheries
http://www.dem.ri.gov/programs/fish-wildlife/marine-fisheries/index.php
Rhode Island Coastal Resources Management Council
http://www.crmc.ri.gov/

Connecticut
CT Bureau of Aquaculture
https://www.ct.gov/doag/cwp/view.asp?a=3768&q=451508&doagNav=
CT GIS Resources
https://www.ct.gov/deep/cwp/view.asp?a=2698&q=323342&deepNav_GID=1707
Natural Shellfish Beds in CT
https://cteco.uconn.edu/viewer/index.html?viewer=aquaculture
Eelgrass Maps
https://www.fws.gov/northeast/ecologicalservices/pdf/wetlands/2012_CT_Eelgrass_Final_Report_11_26_2013.pdf
Long Island Sound Study
http://longislandsoundstudy.net/
CT GIS Resources
http://cteco.maps.arcgis.com/home/index.html
CT DEEP Office of Long Island Sound Programs and Fisheries
https://www.ct.gov/deep/site/default.asp
CT River Watershed Council
https://www.ctriver.org/

New York
Eelgrass Report
http://www.dec.ny.gov/docs/fish_marine_pdf/finalseagrassreport.pdf
Peconic Estuary Program
https://www.peconicestuary.org/
NY/NJ Harbor Estuary
https://www.hudsonriver.org/estuary-program

New York GIS Clearinghouse
https://gis.ny.gov/

New Jersey
Submerged Aquatic Vegetation Mapping
http://www.crssa.rutgers.edu/projects/sav/
Barnegat Bay Partnership
https://www.barnegatbaypartnership.org/
NJ GeoWeb
https://www.nj.gov/dep/gis/geowebsplash.htm
NJ DEP Shellfish Maps
https://www.nj.gov/dep/landuse/shellfish.html

Pennsylvania
Delaware River Management Plan
https://www.fishandboat.com/Fish/Fisheries/DelawareRiver/Documents/delaware_river_plan_exec_draft.pdf
PA DEP Coastal Resources Management Program
https://www.dep.pa.gov/Business/Water/Compacts%20and%20Commissions/Coastal%20Resources%20Management%20Program/Pages/default.aspx
PA DEP GIS Mapping Tools
https://www.dep.pa.gov/DataandTools/Pages/GIS.aspx

Delaware
Partnership for the Delaware Estuary
http://www.delawareestuary.org/
Center for Delaware Inland Bays
http://www.inlandbays.org/
Delaware FirstMap
http://delaware.maps.arcgis.com/home/index.html

Maryland
Submerged Aquatic Vegetation Mapping
http://web.vims.edu/bio/sav/
MERLIN
http://dnrweb.dnr.state.md.us/MERLIN/
Maryland Coastal Bays Program
https://mdcoastalbays.org/

Virginia
Submerged Aquatic Vegetation mapping
http://www.mrc.virginia.gov/regulations/Guidance_for_SAV_beds_and_restoration_final_approved_by_Commission_7-22-17.pdf
VDGIF Time of Year Restrictions (TOYR) and Other Guidance
https://www.dgif.virginia.gov/wp-content/uploads/VDGIF-Time-of-Year-Restrictions-Table.pdf

NOAA Fisheries Greater Atlantic Regional Fisheries Office
Essential Fish Habitat (EFH) Assessment & Fish and Wildlife Coordination Act (FWCA) Worksheet

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1. there is no adverse effect on EFH or NOAA trust resources (see page 10 for more info).
2. no EFH is designated and no trust resources may be present at the project site.

Instructions

Federal agencies or their non-federal designated lead agency should email the completed worksheet and necessary attachments to nmfs.gar.efh.consultation@noaa.gov. Include the public notice (if applicable) or project application and project plans showing:

- location map of the project site with area of impact.
- existing and proposed conditions.
- all waters of the U.S. on the project site with mean low water (MLW), mean high water (MHW), high tide line (HTL), and water depths clearly marked.
- sensitive habitats mapped, including special aquatic sites (submerged aquatic vegetation, saltmarsh, mudflats, riffles and pools, coral reefs, and sanctuaries and refuges), hard bottom or natural rocky habitat areas, and shellfish beds.
- site photographs, if available.

We will provide our EFH conservation recommendations and recommendations under the FWCA, as appropriate, within 30 days of receipt of a complete EFH assessment (60 days if an expanded consultation is necessary). Please submit complete information to minimize delays in completing the consultation.

This worksheet provides us with the information required[1] in an EFH assessment:

1. A description of the proposed action.
2. An analysis of the potential adverse effects on EFH and the federally managed species.
3. The federal agency's conclusions regarding the effects of the action on EFH.
4. Proposed mitigation, if applicable.

Your analysis **should focus on impacts that reduce the quality and/or quantity of the habitat or result in conversion to a different habitat type** for all life stages of species with designated EFH within the action area.

Use the information on the HCD website and NOAA's EFH Mapper to complete this worksheet. If you have questions, please contact the appropriate HCD staff member to assist you.

[1] The EFH consultation process is guided by the requirements of our EFH regulation at 50 CFR 600.905.

EFH ASSESSMENT WORKSHEET

General Project Information

Date Submitted: November 6, 2020

Project/Application Number: N/A

Project Name: Beneficial Use of Dredged Material at East Pool - EBFNWR

Project Sponsor/Applicant: U.S. Army Corps of Engineers

Federal Action Agency (if state agency acting as delegated): U.S. Army Corps of Engineers

Fast-41 or One Federal Decision Project: ☐ Yes ☑ No

Action Agency Contact Name: Steven D. Allen

Contact Phone: 215-656-6559 Contact Email: Steven.D.Allen@usace.army.mil

Latitude: 39.454404° Longitude: -74.411290°

Address, City/Town, State:

800 Great Creek Road Galloway, NJ 08205

Body of Water: East Pool/Perch Cove/Little Bay/Grassy Bay/Reeds Bay

Project Purpose:

Beneficial Use of Dredged Material to restore degraded/subsiding intertidal marshes within East Pool of the Edwin B. Forsythe National Wildlife Refuge (EBFNWR)

Project Description:

East Pool to receive 6,000 to 10,000 cubic yards of maintenance dredged material (sands/silts) from the NJIWW between USCG Markers 152 and 160 (see EFH Worksheet titled "NJIWW Maintenance Dredging Between USCG Markers 152 & 160" for details). Material would be pumped into the impoundment from a "Y" valve system utilizing 200' diameter confinement systems and no confinement for comparison of efficacy of building marsh surface. The discharge would occur in a shallow subtidal muddy bottom open water area (E1UBLx)near the northeast corner of the impoundment. Impoundment bottom would gain a maximum of 0.7 feet to raise the subtidal bottom at +0.2' NAVD to the target high marsh elevation at +0.9' NAVD nearest the discharge confinement area. It is expected that intertidal mudflat would form at elev. +0.6' NAVD nearby. Fines are expected to be transported about 1,000' from the discharge point and deposited as a very thin layer and remain open water.

Anticipated Duration of In-Water Work or Start/End Dates:

December 10 to December 31, 2020.

Habitat Description

EFH includes the biological, chemical, and physical components of the habitat. This includes the substrate and associated biological resources (e.g., benthic organisms, submerged aquatic vegetation, shellfish beds, salt marsh wetlands), the water column, and prey species.

Is the project in designated EFH[2]? ☑ Yes ☐ No

Is the project in designated HAPC[2]? ☑ Yes ☐ No

Is this coordination under FWCA only? ☐ Yes ☑ No

Total area of impact to EFH (indicate sq ft or acres): 64 acres

Total area of impact to HAPC (indicate sq ft or acres): 0

Current water depths: -1.2' to-6.0' Salinity: 19-30ppt Water temperature range: 29.5-82 F

Sediment characteristics[3]: Sand/Gravel: 22.9% - 61.2%; Fines: 38.8%-77.1%

What habitat types are in or adjacent to the project area and will they be permanently impacted? Select all that apply. Indicate if impacts will be temporary, if site will be restored, or if permanent conversion of habitat will occur. A project may occur in overlapping habitat types.

	Habitat Type	**Total impact (sq ft/acres)**	**Impacts are temporary**	**Restored to pre-existing conditions**	**Permanent conversion of all or part of habitat**
☐	Marine				
☑	Estuarine	~60 acres	Yes	Yes	No
☐	Riverine (tidal)				
☐	Riverine (non-tidal)				
☐	Intertidal				
☑	Subtidal	~60 acres	Yes	Yes	Yes
☑	Water column	~60acres+	Yes	Yes	No
☑	Salt marsh/ Wetland (tidal)	~5 acres	Yes	Yes	No
☐	Wetland (non-tidal)				

[2] Use the tables on pages 7-9 to list species with designated EFH or the type of designated HAPC present.
[3] The level of detail is dependent on your project – e.g., a grain size analysis may be necessary for dredging.

	Habitat Type	Total impact (sq ft/acres)	Impacts are temporary	Restored to pre-existing conditions	Permanent conversion of all or part of habitat
☐	Rocky/hard bottom[4]:				
☐	Sand				
☐	Shellfish beds or oyster reefs				
☐	Mudflats				
☐	Submerged aquatic vegetation (SAV)[5], macroalgae, epifauna				
☐	Diadromous fish (migratory or spawning habitat)				

Indicate type(s) of rocky/hard bottom habitat (pebble, cobble, boulder, bedrock outcrop/ledge) and species of SAV:

Project Effects

Select all that apply	Project Type/Category
☐	Hatchery or Aquaculture
☐	Agriculture
☐	Forestry
☐	Military (e.g., acoustic testing, training exercises)
☐	Mining (e.g., sand, gravel)
☑	Restoration or fish/wildlife enhancement (e.g., fish passage, wetlands, beach renourishment, mitigation bank/ILF creation)

[4] Indicate type(s). The type(s) of rocky habitat will help you determine if the area is cod HAPC.
[5] Indicate species. Provide a copy of the SAV report and survey conducted at the site, if applicable.

Select all that apply	Project Type/Category
☐	Infrastructure/transportation (e.g., culvert construction, bridge repair, highway, port)
☐	Energy development/use
☐	Water quality (e.g., TMDL, wastewater, sediment remediation)
☑	Dredging/excavation and disposal
☐	Piers, ramps, floats, and other structures
☐	Bank/shoreline stabilization (e.g., living shoreline, groin, breakwater, bulkhead)
☐	Survey (e.g., geotechnical, geophysical, habitat, fisheries)
☐	Other

Select all that apply	Potential Stressors Caused by the Activity	Select all that apply and if temporary or permanent		Habitat alterations caused by the activity
☐	Underwater noise	Temp	Perm	
☑	Water quality/turbidity/ contaminant release	☐	☑	Water depth change
☐	Vessel traffic/barge grounding	☐	☐	Tidal flow change
☐	Impingement/entrainment[6]	☐	☑	Fill
☐	Prevent fish passage/spawning	☐	☑	Habitat type conversion
☑	Benthic community disturbance			Other:
☑	Impacts to prey species			Other:

[6] Entrainment is the voluntary or involuntary movement of aquatic organisms from a water body into a surface diversion or through, under, or around screens and results in the loss of the organisms from the population. Impingement is the involuntary contact and entrapment of aquatic organisms on the surface of intake screens caused when the approach velocity exceeds the swimming capability of the organism.

Details: project impacts and mitigation

The level of detail that you provide should be commensurate with the magnitude of impacts associated with the proposed project. Attach supplemental information if necessary.

Describe how the project would impact each of the habitat types selected above. Include temporary and permanent impact descriptions and direct and indirect impacts.

Approximately 64 acres of E1UBLx (Cowardin et al. 1979) bottom in a tidally connected impoundment would be affected by pumping a dredged material (sands/silts) slurry and deposition of sediments to raise the bottom elevation. This would convert 10 to 15 acres of shallow open water to intertidal mudflat (E2UBLx) and saltmarsh (E2EM1P). Closest to the discharge point, sands are expected to settle out and build elevation rapidly, which could deposit up to a foot of sediments over the bottom. Suspended fine-grained sediments could transport and settle as far as 1,000' from discharge points. Turbidity may exit pool. Approximately 5 acres of existing intertidal saltmarsh (E2EM1Pd) may receive a very thin layer of fines deposited from receding high tides during the operation.

What specific measures will be used to avoid impacts, including project design, turbidity controls, acoustic controls, and time of year restrictions? If impacts cannot be avoided, why not?

Impacts to bottom habitat are unavoidable because the purpose is to raise bottom elevati

What specific measures will be used to minimize impacts?

Employing practicable BMP's such as a pipeline delivery system and completing work by

Is compensatory mitigation proposed? ☐ Yes ☑ No

If no, why not? If yes, describe plans for mitigation and how this will offset impacts to EFH. Include a conceptual compensatory mitigation and monitoring plan, if applicable.

The purpose of the dredged material fill placement is to restore intertidal habitats in an ar

Federal Action Agency's EFH determination (select one)	
☐	There is no adverse effect[7] on EFH or EFH is not designated at the project site. EFH Consultation is not required. This is a FWCA-only request.
☑	The adverse effect[7] on EFH is not substantial. This means that the adverse effects are no more than minimal, temporary, or can be alleviated with minor project modifications or conservation recommendations. This is a request for an abbreviated EFH consultation.
☐	The adverse effect[7] on EFH is substantial. This is a request for an expanded EFH consultation. We will provide more detailed information, including an alternatives analysis and NEPA document, if applicable.

EFH and HAPC designations[8]

Use the EFH mapper to determine if EFH may be present in the project area and enter all species and lifestages that have designated EFH. Optionally, you may review the EFH text descriptions linked to each species in the EFH mapper and use them to determine if the described habitat is present. We recommend this for larger projects to help you determine what your impacts are.

Species	**EFH is designated/mapped for:**				**Habitat present based on text description (optional)**
	EFH: eggs	**EFH: larvae**	**EFH: juvenile**	**EFH: adults/ spawning adults**	
Atlantic butterfish (Peprilus tricanthus)	☐	☐	☑	☑	☑
Black sea bass (Centropristus striata)	☐	☐	☑	☑	☐
Bluefish (Pomatomus saltatrix)	☐	☐	☑	☑	☑
Long finned inshore squid (Loligo pealei)	☐	☐	☑	☑	☐

[7] An **adverse effect** is any impact that reduces the quality and/or quantity of EFH. 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. 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.

[8] Within the Greater Atlantic Region, EFH has been designated by the New England, Mid-Atlantic, and South Atlantic Fisheries Management Councils and NOAA Fisheries.

Species	EFH is designated/mapped for:				Habitat present based on text description (optional)
	EFH: eggs	EFH: larvae	EFH: juvenile	EFH: adults/ spawning adults	
Scup (Stenotomus chrysops)	☐	☐	✔	☐	✔
Spiny dogfish (Squalus acanthias)	☐	☐	✔	✔	☐
Summer flounder (Paralicthys dentatus)	☐	✔	✔	✔	✔
White hake (Urophycis tenuis)	✔	☐	☐	☐	☐
Windowpane flounder (Scopthalmus aquosus)	✔	✔	✔	✔	✔
Winter flounder (Pleuronectes americanus)	✔	✔	✔	✔	✔
Silver hake/whiting (Merluccius bilinearis)	✔	✔	✔	☐	✔
Red hake (Urophycis chuss)	✔	✔	✔	✔	✔
Monkfish (Lophius americanus)	✔	✔	☐	☐	☐
Little skate (Raja erinacea)	☐	☐	✔	☐	✔
Winter skate (Raja ocellata)	☐	☐	✔	☐	✔
Clearnose skate (Raja eglanteria)	☐	☐	✔	✔	✔
Atlantic sea herring (Clupea harengus)	☐	☐	✔	✔	✔
King mackerel (Scomberomorus cavalla)	✔	✔	✔	✔	☐
Spanish mackerel (Scomberomorus maculatus)	✔	✔	✔	✔	☐
Cobia (Rachycentron canadum)	✔	✔	✔	✔	☐
Skipjack Tuna (Katsuwonus pelamis)	☐	☐	☐	✔	☐
Yellowfin Tuna (Thunnus albacares)	☐	☐	✔	☐	☐
Sand tiger shark (Odontaspis taurus)	☐	✔	✔	☐	☐
Common thresher shark (Alopias vulpinus)	☐	✔	✔	✔	☐
Dusky shark (Charcharinus obscurus)	☐	✔	☐	☐	☐
Sandbar shark (Charcharinus plumbeus)	☐	✔	✔	✔	☐

HAPCs

Select all that are in your action area.

☐	Summer flounder: SAV[9]	☐	Alvin & Atlantis Canyons
☑	Sandbar shark	☐	Baltimore Canyon
☐	Sand Tiger Shark (Delaware Bay)	☐	Bear Seamount
☐	Sand Tiger Shark (Plymouth-Duxbury-Kingston Bay)	☐	Heezen Canyon
☐	Inshore 20m Juvenile Cod	☐	Hudson Canyon
☐	Great South Channel Juvenile Cod	☐	Hydrographer Canyon
☐	Northern Edge Juvenile Cod	☐	Jeffreys & Stellwagen
☐	Lydonia Canyon	☐	Lydonia, Gilbert & Oceanographer Canyons
☐	Norfolk Canyon (Mid-Atlantic)	☐	Norfolk Canyon (New England)
☐	Oceanographer Canyon	☐	Retriever Seamount
☐	Veatch Canyon (Mid-Atlantic)	☐	Toms, Middle Toms & Hendrickson Canyons
☐	Veatch Canyon (New England)	☐	Washington Canyon
☐	Cashes Ledge	☐	Wilmington Canyon

[9] Summer flounder HAPC is defined as all native species of macroalgae, seagrasses, and freshwater and tidal macrophytes in any size bed, as well as loose aggregations, within adult and juvenile summer flounder EFH. In locations where native species have been eliminated from an area, then exotic species are included. Use local information to determine the locations of HAPC.

More information

The Magnuson-Stevens Fishery Conservation and Management Act (MSA) mandates that federal agencies conduct an essential fish habitat (EFH) consultation with NOAA Fisheries on any actions they authorize, fund, or undertake that may adversely affect EFH. An **adverse effect** is any impact that reduces the quality and/or quantity of EFH. 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. 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.

We designed this worksheet to help you to prepare EFH assessments. It is important to remember that an adverse effect determination is a trigger to consult with us. It does not mean that a project cannot proceed as proposed, or that project modifications are necessary. It means that the effects of the proposed action on EFH must be evaluated to determine if there are ways to avoid, minimize, or offset adverse effects.

This worksheet should be used as your EFH assessment or as a guide to develop your EFH assessment. At a minimum, you should include all the information required to complete this worksheet in your EFH assessment. The level of detail that you provide should be commensurate with the magnitude of impacts associated with the proposed project. If your answers in the worksheet and supplemental information you attach do not fully evaluate the adverse effects to EFH, we may request additional information to complete the consultation.

You may need to prepare an expanded EFH assessment for more complex projects to fully characterize the effects of the project and the avoidance and minimization of impacts to EFH. While the EFH assessment worksheet may be used for larger projects, the format may not be sufficient to incorporate the extent of detail required, and a separate EFH assessment may be developed. However, regardless of format, you should include an analysis as outlined in this worksheet for an expanded EFH assessment, along with any additional necessary information. This additional information includes:

- the results of on-site inspections to evaluate the habitat and site-specific effects.
- the views of recognized experts on the habitat or the species that may be affected.
- a review of pertinent literature and related information.
- an analysis of alternatives that could avoid or minimize the adverse effects on EFH.

Please contact our Greater Atlantic Regional Fisheries Office, Protected Resources Division regarding potential impacts to marine mammals or threatened and endangered species.

Useful Links

National Wetland Inventory Maps
https://www.fws.gov/wetlands/
EPA's National Estuary Program (NEP)
https://www.epa.gov/nep/local-estuary-programs
Northeast Regional Ocean Council (NROC) Data Portal
https://www.northeastoceandata.org/
Mid-Atlantic Regional Council on the Ocean (MARCO) Data Portal
http://portal.midatlanticocean.org/

Resources by State

Maine
Maine Office of GIS Data Catalog
https://geolibrary-maine.opendata.arcgis.com/datasets#data
Town shellfish information including shellfish conservation area maps
https://www.maine.gov/dmr/shellfish-sanitation-management/programs/municipal/ordinances/towninfo.html
State of Maine Shellfish Sanitation and Management
https://www.maine.gov/dmr/shellfish-sanitation-management/index.html
Eelgrass maps
https://www.maine.gov/dmr/science-research/species/eelgrass/index.html
Casco Bay Estuary Partnership
https://www.cascobayestuary.org/
Maine GIS Stream Habitat Viewer
https://www.arcgis.com/home/item.html?id=5869c2d20f0b4c3a9742bdd8abef42cb

New Hampshire
NH's Statewide GIS Clearinghouse, NH GRANIT
http://www.granit.unh.edu/
NH Coastal Viewer
http://www.granit.unh.edu/nhcoastalviewer/
State of NH Shellfish Program
https://www.des.nh.gov/organization/divisions/water/wmb/shellfish/

Massachusetts
MA Shellfish Sanitation and Management Program
https://www.mass.gov/shellfish-sanitation-and-management
MassGIS Data, Including Eelgrass Maps
http://maps.massgis.state.ma.us/map_ol/oliver.php
MA DMF Recommended TOY Restrictions Document
https://www.mass.gov/files/documents/2016/08/ry/tr-47.pdf
Massachusetts Bays National Estuary Program
https://www.mass.gov/orgs/massachusetts-bays-national-estuary-program
Buzzards Bay National Estuary Program
http://buzzardsbay.org/
Massachusetts Division of Marine Fisheries

https://www.mass.gov/orgs/division-of-marine-fisheries
Massachusetts Office of Coastal Zone Management
https://www.mass.gov/orgs/massachusetts-office-of-coastal-zone-management

Rhode Island
RI Shellfish and Aquaculture
http://www.dem.ri.gov/programs/fish-wildlife/marine-fisheries/shellfish-aquaculture.php
RI Shellfish Management Plan
http://www.shellfishri.com/
Eelgrass Maps
http://edc.maps.arcgis.com/apps/View/index.html?appid=db52bb689c1e44259c06e11fd24895f8
RI GIS Data
http://ridemgis.maps.arcgis.com/apps/webappviewer/index.html?id=87e104c8adb449eb9f905e5f18020de5
Narragansett Bay Estuary Program
http://nbep.org/
Rhode Island Division of Marine Fisheries
http://www.dem.ri.gov/programs/fish-wildlife/marine-fisheries/index.php
Rhode Island Coastal Resources Management Council
http://www.crmc.ri.gov/

Connecticut
CT Bureau of Aquaculture
https://www.ct.gov/doag/cwp/view.asp?a=3768&q=451508&doagNav=
CT GIS Resources
https://www.ct.gov/deep/cwp/view.asp?a=2698&q=323342&deepNav_GID=1707
Natural Shellfish Beds in CT
https://cteco.uconn.edu/viewer/index.html?viewer=aquaculture
Eelgrass Maps
https://www.fws.gov/northeast/ecologicalservices/pdf/wetlands/2012_CT_Eelgrass_Final_Report_11_26_2013.pdf
Long Island Sound Study
http://longislandsoundstudy.net/
CT GIS Resources
http://cteco.maps.arcgis.com/home/index.html
CT DEEP Office of Long Island Sound Programs and Fisheries
https://www.ct.gov/deep/site/default.asp
CT River Watershed Council
https://www.ctriver.org/

New York
Eelgrass Report
http://www.dec.ny.gov/docs/fish_marine_pdf/finalseagrassreport.pdf
Peconic Estuary Program
https://www.peconicestuary.org/
NY/NJ Harbor Estuary
https://www.hudsonriver.org/estuary-program

New York GIS Clearinghouse
https://gis.ny.gov/

New Jersey
Submerged Aquatic Vegetation Mapping
http://www.crssa.rutgers.edu/projects/sav/
Barnegat Bay Partnership
https://www.barnegatbaypartnership.org/
NJ GeoWeb
https://www.nj.gov/dep/gis/geowebsplash.htm
NJ DEP Shellfish Maps
https://www.nj.gov/dep/landuse/shellfish.html

Pennsylvania
Delaware River Management Plan
https://www.fishandboat.com/Fish/Fisheries/DelawareRiver/Documents/delaware_river_plan_exec_draft.pdf
PA DEP Coastal Resources Management Program
https://www.dep.pa.gov/Business/Water/Compacts%20and%20Commissions/Coastal%20Resources%20Management%20Program/Pages/default.aspx
PA DEP GIS Mapping Tools
https://www.dep.pa.gov/DataandTools/Pages/GIS.aspx

Delaware
Partnership for the Delaware Estuary
http://www.delawareestuary.org/
Center for Delaware Inland Bays
http://www.inlandbays.org/
Delaware FirstMap
http://delaware.maps.arcgis.com/home/index.html

Maryland
Submerged Aquatic Vegetation Mapping
http://web.vims.edu/bio/sav/
MERLIN
http://dnrweb.dnr.state.md.us/MERLIN/
Maryland Coastal Bays Program
https://mdcoastalbays.org/

Virginia
Submerged Aquatic Vegetation mapping
http://www.mrc.virginia.gov/regulations/Guidance_for_SAV_beds_and_restoration_final_approved_by_Commission_7-22-17.pdf
VDGIF Time of Year Restrictions (TOYR) and Other Guidance
https://www.dgif.virginia.gov/wp-content/uploads/VDGIF-Time-of-Year-Restrictions-Table.pdf