APPENDIX I

Essential Fish Habitat Analysis

Appendix I

ESSENTIAL FISH HABITAT EVALUATION FOR TREMLEY POINT CONNECTOR ROAD

1.0 INTRODUCTION

Essential Fish Habitat (EFH) is defined in the Magnuson-Stevens Act as *"... those waters and substrate necessary to fish for spawning, breeding, feeding or growth to maturity."* As required by the Act, National Marine Fisheries Service (NMFS) has promulgated regulations to provide guidance to the regional fishery management councils for EFH designation. The regulations further clarify EFH by defining *"waters"* to include aquatic areas and their associated physical, chemical, and biological properties that are used by fish and may include aquatic areas historically used by fish where appropriate; *"substrate"* to include sediment, hard bottom, structures underlying the waters, and associated biological contribution to a healthy ecosystem; and *"spawning, breeding, feeding, or growth to maturity"* to cover a species' full life cycle.

The 1996 amendments to the Magnuson-Stevens Fishery Management and Conservation Act set forth a number of new mandates for NMFS, regional fishery management councils, and other federal agencies to identify and protect important marine and anadromous fish habitat. The councils, with assistance from NMFS, are required to delineate EFH for all managed species. Federal agencies that fund, permit, or carry out activities that may adversely impact EFH are required to consult with NMFS regarding the potential effects of their actions on EFH, and respond in writing to NMFS's recommendations. In addition, NMFS is required to comment on any state agency activities that would impact EFH.

2.0 PROJECT DESCRIPTION

The Tremley Point Connector Road (TPCR) will provide access between the New Jersey Turnpike's Interchange 12 via Industrial Road and the Tremley Point area of the City of Linden, Union County, New Jersey. Interchange 12 is located at milepost 95.9 of the New Jersey Turnpike in the Borough of Carteret, Middlesex County. The TPCR alignments that have been evaluated originate from Industrial Road in Carteret and traverse over the Rahway River and terminate at Tremley Point Road in Linden.

Tremley Point Road is a privately maintained roadway that originates at the point where it crosses over the Turnpike at MP 97.2. To the west of this location, the road is known as South Wood Avenue. Tremley Point Road is bounded by various petroleum bulk storage facilities and the Rahway River and its associated wetlands.

Industrial Road is bounded to the north by rail lines operated by Conrail and chemical storage facilities operated by Kinder Morgan Inc. To the south are petroleum storage tanks owned and operated by BP/Amoco (formerly the American Oil Company) and Roosevelt Avenue. To the east is the Arthur Kill and to the west is Interchange 12.

Several alternative alignments have been evaluated for the TPCR (see Section 3.0 of EA). All of the alternatives share a common goal of reducing existing traffic, and potential future traffic, primarily trucks, that originate on Tremley Point Road and have as the sole means of reaching major roadways, such as Route 1&9 and the Turnpike, to travel through a residential section of Linden on South Wood Avenue. The proposed redevelopment of Tremley Point brownfields sites will cause significant traffic and environmental impact in the absence of the Tremley Point Connector Road project. Without a means to address the increase in traffic that would occur with the redevelopment of several hundred acres of existing brownfields, the City of Linden has been reluctant to approve redevelopment of the brownfields at Tremley Point due to the additional traffic that would be generated and the subsequent adverse impact upon the existing residential areas. With the construction of the TPCR, the City of Linden would be able to approve the redevelopment of the Tremley Point brownfields, thus increasing the value of the land and tax base for Linden.

2.1 Tremley Point Connector Road (Alternate 10)

Of the numerous alternative alignments that have been evaluated for this project, Alternate 10 has been identified as the preferred alignment for the proposed TPCR as it has the least wetlands impacts (i.e., 4.3 acres) as compared to the other alternative alignments that are considered viable and meets the purpose and need of the project. Further details on the various other alternative alignments/designs that have been developed and evaluated to provide a direct link between Linden and Carteret are provided in the Environmental Assessment in Section 3.0, Alternatives to the Proposed Project.

Alternate 10 provides one of the most direct connections between Industrial Highway and Tremley Point Road (Figure No. 4). The TPCR will be constructed on a combination of retaining walls and elevated pile supported viaduct that will traverse predominantly tidally influenced wetlands and open water of the Rahway River. This approximately 5,700-foot long alignment intersects Industrial Highway at a point that utilizes the existing embankments of the Kinder Morgan Tract. This alignment bends slightly to the north with a 2,530 foot radius to travel through the western most lagoon of the former American Cyanamid site and crosses the Rahway River on a skewed alignment with a 2,530 foot radius to the northeast and a bridge length of approximately 1,200 feet. This alignment continues on a tangent for approximately 530 feet where it ties into Tremley Point Road.

In accordance with the 2001 AASHTO Manual entitled *"A Policy on Geometric Design of Highways and Streets"* this alignment satisfies a design speed of 50 mph with curve radii varying from a minimum of 2,530 feet. A maximum superelevation rate of 4% is utilized for the horizontal curvature with superelevation transition rates based on 2% per second for the design speed. Vertical grades vary from a minimum of 0.5% to a maximum of 3% with minimum vertical curve lengths based on three times the design speed. Both the horizontal and vertical geometry permit a posted speed of 45 mph along the TPCR.

The alignment for Alternate 10 traverses large tidally influenced wetland areas on both sides of the Rahway River with impacts to approximately 4.3 acres of wetlands through a combination of filling and shading impacts, the least wetlands impacts with the exception of Alternate 1, which is not considered a viable alternative (see Section 3.3). This alignment follows the western edge of the Rahway River on the Linden side of the project, more than the other alignments that were reviewed. This orientation maintains a large continuous wetland area to the west of the roadway. It is environmentally preferable to maintain the continuity of wetland areas as much a possible.

The route for Alternate 10 is located within the western-most portion of the American Cyanamid sludge lagoons and is intended to avoid, or at least minimize, impacts to current wetlands. The results of the soil borings data collected as part of the initial geotechnical boring program indicate that the lagoon area soils and groundwater have elevated concentrations of lead and zinc in excess of NJDEP guidance levels. This alignment can be slightly altered and the type of structure used through the area will be selected to minimize contamination impacts.

Construction of Alternate 10 will impact approximately 4.3 acres of wetlands. In order to mitigate/compensate for the unavoidable impacts to 4.3 acres of wetlands and night heron foraging areas, incorporated as an integral part of the proposed TPCR project is the commitment by the Authority to create replacement wetlands by enlarging the wetlands mitigation site located adjacent to Piles Creek on Tremley Point that was previously constructed by the Authority. This creation of wetlands from existing uplands will occur adjacent to the proposed brownfield redevelopment site and will be completed to the reasonable satisfaction of the USCG, in consultation with the USACE, NJDEP, USFWS, NMFS and USEPA prior to opening the TPCR to vehicular traffic.

Based upon a review of available files, there is a potential for soil and groundwater contamination along this alignment. Contaminated soils and a layer of free product on the groundwater were encountered during construction of the Industrial Highway in the vicinity of the BP/Amoco wetlands. Records of the soil sampling taken during construction indicate that petroleum hydrocarbons, cyanide, organic compounds and heavy metals were present in the soils. Contamination found at the BP/Amoco wetlands is related to the presence of coal ash, contaminated surface water and contaminated groundwater.

The estimated construction cost for Alternate 10 is $59,600,000. The property acquisitions (uplands, wetlands and riparian) necessary for the alternate are estimated to be approximately 8.1 acres. An order of magnitude combined cost for both the property acquisitions and mitigation needed for this alternate, based on local tax records and recent sales information, is estimated to be $3,055,500. The resulting total cost estimate for Alternate 10 (i.e., including construction, property acquisition and mitigation costs) is $62,655,500.

3.0 EFH SPECIES AND TREMLEY POINT CONNECTOR ROAD PROJECT SITE

The TPCR site, located between Carteret, Middlesex County and Linden, Union County with the Rahway River in between, has been designated as EFH for several species (see Table 1). The managed fish species and related life history stages of concern are red hake (*Urophycis chuss*), winter flounder (*Pleuronectes americanus*), windowpane flounder (*Scopthalmus aquosus*), Atlantic herring (*Clupea harengus*), bluefish (*Pomatomus saltatrix*), Atlantic butterfish (*Peprilus triacanthus*), Atlantic mackerel (*Scomber scombrus*), summer flounder (*Paralicthys dentatus*), scup (*Stenotomus chrysops*), black sea bass (*Centropristus striata*), king mackerel (*Scomberomorus cavalla*), Spanish mackerel (*Scomberomorus maculates*), sand tiger shark (*Odontaspis taurus*), sandbar shark (*Charcharinus plumbeus)* and cobia (*Rachycentron canadum*).

Table 1
Summary of NMFS Essential Fish Habitat (EFH) Designation for the Tremley Point Connector Road Project Site

Species	Scientific Name	Eggs	Larvae	Juveniles	Adults
Red hake	*Urophycis chuss*		X	X	X
Winter flounder	*Pleuronectes americanus*	X	X	X	X
Windowpane flounder	*Scopthalmus aquosus*	X	X	X	X
Atlantic sea herring	*Clupea harengus*		X	X	X
Bluefish	*Pomatomus saltatrix*			X	X
Atlantic butterfish	*Peprilus triacanthus*		X	X	X
Atlantic mackerel	*Scomber scombrus*			X	X
Summer flounder	*Paralicthys dentatus*		X	X	X
Scup	*Stenotomus chrysops*	X	X	X	
Black sea bass	*Centropristus striata*	n/a		X	X
King mackerel	*Scomberomorus cavalla*	X	X	X	X
Spanish mackerel	*Scomberomorus maculatus*	X	X	X	X
Cobia	*Rachycentron canadum*	X	X	X	X
Sand tiger shark	*Odontaspis taurus*		X		
Sandbar shark	*Charcharinus plumbeus*		X		X

Source: NMFS 2007

- Red Hake (*Urophycis chuss*) - Red hake have planktonic eggs with oil globules. According to the fisheries management EFH source documents, red hake juveniles are mainly found in salinities between 23 and 33 ppt. Furthermore, dissolved oxygen (DO) levels are 5-12 mg/L and depths ranged from 20-75 feet. Red hake adults are mainly found in DO levels of 6-11 mg/L, depths of 30-70 feet and salinities of 24-31 ppt.

- Summer Flounder (*Paralicthys dentatus*) - Summer flounder have planktonic eggs with oil globules. Juvenile summer flounder are primarily located in areas with DO levels at 6-11 mg/L, depths between 10 and 70 feet and salinities ranging from 22-32 ppt. Maximum growth rate and efficiency occurs at salinities greater than 10 ppt, corresponding with these salinities where the juveniles are most abundant in estuaries (Rogers and Van Den Avyle 1983). NMFS studies indicate that juveniles less than 29 cm were found in salinities greater than 16 ppt. Adult summer flounder are found mainly in

DO levels of 4-12 mg/L, depth of 15-50 feet and salinities of 20-32 ppt (Rogers and Van Den Avyle 1983).

- Winter Flounder (*Pleuronectes americanus*) - Winter flounder eggs are most abundant in water with salinities of 10 to 30 ppt. Eggs are demersal, sticky and are usually deposited on sandy bottoms in estuaries. Eggs hatch with abnormal larvae development at salinities less than 10 ppt with little survival (Rogers 1976). Embryos are uryhaline with best survival between salinities of 10 and 30 ppt. Winter flounder juveniles are benthic and seldom lose contact with the substrate. Most juveniles spend much of their first two years in or near shallow natal waters, where they move in response to extreme heat or cold. After metamorphosis, the juveniles prefer a substrate of sand or sand and silt. Older juveniles in estuaries gradually move seaward as they grow larger. Temperature is a less important factor in the distribution of juveniles, which tolerate higher temperatures than adults (Buckley, 1989). Adult winter flounder are found predominantly in 60-140 feet of water on muddy sand, clean sand, pebbly or gravelly bottom (Bigelow and Schroeder, 1953). The adults tolerate wide ranges of salinities, temperatures and DO.

- Atlantic butterfish (*Peprilus triacanthus*) - Atlantic butterfish eggs are planktonic with oil globules. Fisheries Management Program (FMP) (Wilk *et al*, 1998a) studies indicate juvenile populations to be most abundant in areas with a DO level of 5-12 mg/L, depths of 15-65 feet and salinities of 19-33 ppt. Adults in the same region were most abundant in DO levels of 6-12 mg/L, depths of 15-65 feet and salinities of 20-33 ppt.

- Windowpane flounder (*Scopthalmus aquosus*) - The windowpane flounder has eggs that are usually found in seawater salinities of 25 ppt or greater and are planktonic with oil globules. Juveniles are most abundantly found in DO levels of 5-12 ppt, depths of 15-50 feet and salinities of 18-33 ppt. Adults desire DO levels of 6-12 mg/L, depths of 15-45 feet and salinities of 20-33 ppt as sampled by the NMFS.

- Black sea bass (*Centropristus striata*) - Black sea bass eggs are planktonic with oil globules. According to FMP EFH source documents (Mercer, 1989; Wilk *et al*, 1998) for black sea bass, juveniles are found mostly in DO levels of 5-11 mg/L, depths of 15-50 feet and salinities of 20-33 ppt. Adults are found in 5-8 mg/L DO levels, depths of 15-65 feet and salinities of 20-30 ppt. Black sea bass are migratory in the northern part of their range, which includes the New York Bight. Black sea bass move inshore and northward in the spring and offshore and south in the fall due to changes in temperature.

- Bluefish (*Pomatomus saltatrix*) - Bluefish eggs are planktonic with oil globules. These eggs are more buoyant than most planktonic eggs because of a larger oil globule. Larva development takes place in outer continental shelf waters, primarily within 18 feet of the surface, at temperature of 18-26^{o}C and salinities of 30-32 ppt. (Kendall and Walford, 1979). Juveniles occur in outer continental shelf waters of the Middle Atlantic Region from April through June. As inshore waters warm, the juveniles move shoreward across the continental shelf into estuaries between Cape May and Long Island (Wilk 1977). Juveniles require temperatures higher than 10^{o}C for survival (Lund and Maltezos, 1970). Juveniles and adults occupy near shore habitats as shallow as 0.05 feet (DeSylva, 1976).

In fall and winter, most adult bluefish from Atlantic Coast stocks migrate southward and overwinter along the east coast of Florida.

- Atlantic sea herring *(Clupea harengus)* - Atlantic sea herring spawn in the vicinity of bays, estuarine and oceanic banks over rock, pebble, or gravel bottoms, but never over soft mud (Bigelow, H.B. and Schroeder, 1953). They do not spawn in salinities below 31.99 ppt or above 33.0 ppt (Bigelow, H.B. and Schroeder, 1953). Adults are found typically in salinities of 35 ppt (Holliday and Blaxter, 1961).

- Scup *(Stenotomus chrysops)* - Spawning takes place from May to August, with a concentration in June. Eggs are planktonic with oil globules. Annual migrations are made to the offshore winter grounds and the inshore summer grounds. Scup prefer smooth to rock bottom, and temperatures of at least 10°C.

- King mackerel *(Scomberomorus cavalla)* - Adults are a highly migratory species that range from the South Atlantic to Mid-Atlantic Bights. King mackerel prefer sandy shoals of capes and offshore bars, high profile rock bottoms and barrier island ocean side waters from the surf zone to the shelf break, but from the Gulf Stream shoreward. King mackerel prefer water temperatures in excess of 20° C and salinities greater than 25 ppt. This species can also be found in high salinity bays, estuaries and seagrass habitats

- Spanish mackerel *(Scomberomorus maculatus)* - Adults are a highly migratory species that range from the South Atlantic to Mid-Atlantic Bights. Spanish mackerel prefer sandy shoals of capes and offshore bars, high profile rock bottoms and barrier island ocean side waters from the surf zone to the shelf break, but from the Gulf Stream shoreward. Spanish mackerel prefer water temperatures in excess of 20° C and salinities greater than 30 ppt.

- Cobia *(Rachycentron canadum)* - Adults are a highly migratory species that range from the South Atlantic to Mid-Atlantic Bights. Cobia is generally found on sandy shoals of capes and offshore bars, high profile rock bottoms and barrier island/ocean side waters from the surf zone to the shelf break, but from the Gulf Stream shoreward. Cobia prefers water temperatures in excess of 20° C and salinities greater than 25 ppt.

- Sandbar shark *(Charcharinus plumbeus)* - Adults of up to 180 cm are found on the east coast of the United States in shallow coastal areas from the coast to the 50 meter (m) isobath from Nantucket, MA, south to Miami, FL; also, shallow coastal areas from the coast to the 100 m isobath around peninsular Florida to the Florida panhandle. Neonates and early juveniles are found in the shallow coastal areas to the 25 m isobath from Montauk, Long Island, NY, south to Cape Canaveral, FL (all year) with nursery areas in shallow coastal waters from Great Bay, NJ to Cape Canaveral, Florida, especially Delaware and Chesapeake Bays (seasonal-summer). Sandbar sharks prefer salinities greater than 22 ppt and water temperatures greater than 21° C. Important nursery and pupping grounds have been identified in shallow areas and the mouth of Great Bay, NJ, lower and middle Delaware Bay, lower Chesapeake Bay, MD and near the Outer Banks, NC.

- Sand tiger shark *(Odontaspis taurus)* – The sand tiger shark is one species of shark that has been killed simply because of its menacing appearance. This shark species can grow up to a length of more than 300 cm. Juvenile sharks are born alive and measure approximately 100 cm in length at birth. Neonate/early juveniles are found in shallow coastal waters from Barnegat Inlet, NJ south to Cape Canaveral, FL to the 25 m isobath. Adults are found in shallow coastal waters to the 25 m isobath from Barnegat Inlet, NJ to Cape Lookout, NC and from St. Augustine to Cape Canaveral, FL. Adults feed on herring, snappers, eels, mackerels or other fish.

3.1 EFH Prey Species

Prey species are defined as being a forage source for one or more fish and avian species. Prey species are normally found at the bottom of the food web in a healthy environment. The most numerous EFH prey species found in the Rahway River include killifish, silversides and bay anchovy.

- Killifish - Killifish include the mummichog *(Fundulus heteroclitus)* and the striped killifish *(Fundulus majalis)*. Both are resident species which are common throughout the Rahway River, as they tolerate the broad fluctuations in salinity, low levels of DO and high levels of pollution. Mummichogs found in high numbers compared to the total amount of fish are generally indicators of high stress environments.

  Various age groups of both species, from newly hatched larvae to adults, live in schools at the edge of tidal marshes. At low tides, killifish lie near the bottom of creeks, while at high tide they move into marshes to feed opportunistically. Killifish are permanent residents of the Rahway River and have a small home range along the banks of tidal creeks of approximately 30 meters in length. Killifish spawn in the spring and summer months during periods of increasing water temperatures. Spawning sites are diverse and eggs have been observed within silt at the bottom of creeks, within empty shells and other debris, and within tidal marshes on vegetation (such as on the primary leaves of cord grass).

- Atlantic Silverside *(Menidia menidia)* - The Atlantic silverside is an important component of the eastern shore surf zone. Beach seine studies from Georgia to Maine confirm this species as one of the most frequently occurring and abundant fish in shallow coastal waters. It is also a major constituent in the diet of bluefish, striped bass, summer flounder and weakfish. It is known to perform a winter migration from the surf zone to marsh channels, deep areas of bays or off-shore Atlantic waters. Prespawning schools move back and forth along the shoreline as the time of high tide approaches. Spawning runs take place in the upper intertidal zone at high tide. Spawning fish deposit their eggs on three types of substrates: the lower stems of saltmarsh cordgrass *(Spartina alterniflora)*; detrital mats; and exposed cordgrass roots along erosional scarps. Eggs are deposited at mean intertidal elevations of four to five feet above mean low water; exposing the eggs to the atmosphere for approximately ten hours between successive high tides. Tidal marshes serve as the major nursery grounds for these species. Juveniles are found in peak abundance in tidal marshes where they feed on small invertebrates.

- Bay anchovy (*Anchoa mitchilli*) - The bay anchovy is a small, pelagic, schooling forage fish inhabiting marine, estuarine and inshore waters of the Atlantic and Gulf Coasts from the Gulf of Maine to the Yucatan Peninsula of Mexico. Juveniles and adults can be found in shallow waters in a variety of habitats including muddy coves, grassy areas, bayous, off sandy beaches and in deep offshore waters.

  Anchovies are schooling spawners in coastal and estuarine waters. Breeding in the New York Bight occurs between June and late September. The adults move to deep water to spawn in the Hudson River (TI, 1976). The newly spawned eggs are pelagic and buoyant, but apparently become demersal as development progresses. After hatching, bay anchovy larva move upstream into lower salinity nursery areas, and continue this upstream and shoreward movement as juveniles (Dovel, 1971, TI, 1976).

  The bay anchovy is a planktivorous species feeding mostly on copopods, mysids and other small crustaceans or insects (Hildebrand, 1963). It is an important forage species for summer flounder, striped bass, weakfish and bluefish. There is no commercial or recreational fishery for the bay anchovy.

3.2 Fish Studies within Project Area

PS&S has studied the managed fish species environmental requirements and extensive 316(b) fish studies conducted by PSE&G in the Arthur Kill, which is in the immediate vicinity of the project site. There are no known studies of this magnitude for the Rahway River itself. Previous PSE&G studies of the Arthur Kill indicate that a total of 57 fish species were collected in the Arthur Kill and its tributaries over the last 20 years. Within bottom trawls that were conducted on the Arthur Kill, the winter flounder represents 23 percent of all species caught, with the killifish and silverside representing approximately 0.1 percent of the species. When seines were used in the shallow coastal waters, the silverside was the most numerous at 60 percent of the species, and the winter flounder and killifish representing 0.2 percent. The mummichog, striped killifish and silverside are present year round and comprise an important link in the food chain by providing finfish with an important food source. The winter flounder is also found year round in the waters of the Arthur Kill. The bay anchovy, weakfish and Atlantic menhaden were the most numerous fish species collected in the Arthur Kill. The bay anchovy was found in the mid-level trawls at a 73 percent level for adults and 96 percent for eggs. The weakfish was encountered in the bottom trawls at a rate of 38 percent. The Atlantic menhaden was found predominantly in the mid-level trawls at a rate of 20 percent.

3.3 Tremley Point Connector Road Assessment

In evaluating EFH impacts it is necessary to address fish life cycles by using the four stages of life that include: egg; larval; juvenile; and adult. Juvenile and adult life stages are usually highly mobile and able to retreat during disturbances. This also allows for a quick repopulation of the project site once dredging activities are complete as fish are likely to return when disturbances cease. Egg and larval stages are the most often impacted life stages due to their lack of mobility.

3.3.1 Impacts to Local Fish Species

Spawning strategies are important to identifying potential impacts to the reproductive success of the local fish and shellfish species managed under the EFH program. Spawning strategies are characterized by the type of eggs produced (i.e., demersal, pelagic) and the time periods during which spawning occurs. Environmental conditions influence the number of eggs that hatch and the success of larvae that mature into adults. The predominant environmental condition in this regard is seasonal water temperature.

Most fish species spawn either demersal or planktonic eggs that hatch into larvae in one day to six weeks, depending on the species, time of year, and water temperature (W. Morse, pers. comm., 1996). Demersal eggs are laid on or buried in the bottom sediments and remain on the bottom until the larvae hatch. Very often, demersal eggs are sticky and adhere to surfaces (e.g., rocks) until larvae have hatched. As these surfaces may be located on the ocean floor, the reproductive success rate of fish that produce demersal eggs may be lower, due to burial of eggs, than fish that produce planktonic eggs.

Most of the fish species listed in this EFH study spawn planktonic eggs. Planktonic eggs float in the water column and are often referred to as buoyant. Buoyancy of eggs varies among different species and the eggs may or may not contain an oil globule. Oil globules cause eggs to be more buoyant. Neutrally buoyant eggs have a specific gravity close to that of seawater, thus, they are more readily mixed deeper into the water column by waves and other turbulence. Most planktonic eggs are found in the upper 120 to 150 feet of the water column. Eggs with oil globules are usually located in the upper 45 feet of the water column, closer to the surface than other planktonic eggs (EPA, 1997).

3.3.2 Tremley Point Connector Road Project Site

PS&S has conducted research on the managed fish species' environmental requirements in the vicinity of the site. The sole activity within the waters of the Rahway River will be the construction of a pile supported bridge that will shade certain portions of the Rahway River during daylight hours. Loss of habitat from minor shading impacts may adversely affect the EFH species, however, it is anticipated that this site-specific adverse effect will not be substantial. Further consultation with NMFS regarding EFH impacts and conservation recommendations will be concluded during the public review period and prior to the final decision by the USCG, USACE and NJDEP. Pile construction activities that may cause short-term direct effects to the egg, larval, juvenile and adult life stages are discussed below.

Egg and Larval Stages - The project site is not suitable for demersal egg laying fish such as the winter flounder. Winter flounder typically deposit eggs over a sandy substrate at depths of 6 to 240 feet (Buckley, J. 1989). The predominant time frame for winter flounder to lay their eggs starts in January. The bottom of the area is very soft mud predominantly composed of silts and clays with little sand. This results in covering of any demersal eggs and ultimately the non-recruitment of the winter flounder. Due to the silty/clay substrate and shallow waters, the project site is generally not deemed as preferred habitat for larvae and egg life stages of winter flounder. Further, with an anticipated start date of June 2010, the pile-driving construction activities will not adversely impact the winter flounder breeding period.

Bluefish, scup, butterfish, summer flounder and windowpane flounder produce planktonic eggs with oil globules. These eggs are freeloading and disperse quickly when released. In addition, these species reproduce primarily in the spring, summer and fall months. The proposed pile-driving construction activities will take place in the late spring to early summer months, resulting in minimal impacts to the eggs and larvae of these species, as they are free floating and will not likely congregate at the project site.

Juveniles and Adults - Juvenile and adult stages of the EFH species found on or in close proximity to the pile-driving construction site are highly mobile. Fish species in the immediate pile-driving area will relocate unharmed to surrounding areas. Therefore, juvenile and adult fish will not be negatively impacted as result of the pile-driving construction activities.

Benthic Species, Prey Species and Shellfish - Prey species on the TPCR site are mainly comprised of benthic organisms such as polychaetes, oligocheates and amphipods. Benthic species in the footprint of the pile-driving construction area will be removed from the site as a result of pile-driving activities. After the initial pile-driving, colonization by epibenthic prey species on the piles is anticipated to occur quickly. The epibenthic community that will be established on the perimeter of the piles (i.e., barnacles, tunicates and mussels) will in turn provide habitat and enhanced food resources for EFH species. EFH fish prey species include grass shrimp *(Palaemonetes spp.)*, silversides, mummichogs and bay anchovies. These fish prey species are capable of avoiding any impacts from the pile-driving activities.

3.3.3 Impacts to Regional Fish Species

The proposed pile-driving construction activities will be local in scope. Therefore, no direct regional impacts will occur to regional EFH or other species.

3.3.4 Impacts to Future Fish Species

Pile-driving construction activities will no impact to EFH species. The piles themselves will provide an environment for the recruitment of epibenthic species such as barnacles, tunicates, and mussels, thus providing an enhanced habitat for juvenile EFH species and prey species such as grass shrimp that in turn will provide an increased food source for many EFH species.

4.0 CONCLUSION

To facilitate the project, pile-driving construction activities at the Tremley Point Connector Road project site are not planned to occur during the NJDEP window for seasonal restrictions that protect breeding winter flounder and migrating fish resources. The seasonal restrictions generally run from January 1 to May 31 of any year. It is foreseen that the once the pile-driving construction activities are completed, there will be no further habitat disturbance. The piles themselves will provide an environment for the recruitment of epibenthic species such as barnacles, tunicates, and mussels, thus providing an enhanced habitat for juvenile EFH species and prey species, such as grass shrimp, that in turn will provide an increased food resource for many EFH species. The project site is not generally considered suitable for demersal egg laying fish such as the winter flounder. Winter flounder typically deposit eggs over a sandy substrate at depths of 6 to 240 feet. The bottom of the Rahway River in the project area is very soft mud predominantly composed of silts and clays with very little sand and is not deemed as preferred habitat for the larvae and egg life stages of winter flounder. This sediment is easily resuspended due to wind, waves or currents. The continued resuspension of these fine-grained materials results in the sediments covering any demersal eggs and ultimately the non-recruitment of the winter flounder. The proposed pile-driving construction activities will be local and will not adversely impact the breeding period of winter flounder. Juvenile, adult fish and fish prey species in the immediate construction area are capable of avoiding any impact from the pile-driving activities by relocating unharmed to surrounding areas. Therefore, juvenile and adult fish, as well as prey species, will not be adversely impacted as result of the pile-driving construction activities.