Docket No. CP02-   -000

Application of Iroquois Gas Transmission System, L.P. for a Certificate of Public Convenience and Necessity

Volume III
Biological Assessment

Iroquois

GAS TRANSMISSION SYSTEM

IROQUOIS PIPELINE OPERATING COMPANY, OPERATOR

BIOLOGICAL ASSESSMENT

of the

EASTERN LONG ISLAND EXTENSION PROJECT: PIPELINE SECTION

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3.2 Biological Environment

3.2. Essential Fish Habitat

Amendment 1 to the Fishery Management Plan (FMP), prepared by the Mid-Atlantic Fishery Management Council (Council) and the Atlantic States Marine Fisheries Commission (Commission), is intended to manage various fisheries pursuant to both the Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA) of 1976, as amended by the Sustainable Fisheries Act (SFA), and the Atlantic Coastal Fisheries Cooperative Management Act (ACFCMA). The goal of the management plan is to conserve fisheries resources. The Council and Commission have adopted different objectives to achieve this goal for each species under consideration.

The National Marine Fisheries Service (NMFS) coordinates with other State and Federal agencies to conserve and enhance Essential Fish Habitat (EFH). Congress defined EFH as "those waters and substrate necessary to fish for spawning, breeding, feeding or growth to maturity." Parties interested in constructing within Long Island Sound must consult with NMFS and present an environmental assessment that states the effects of construction and potential risks to commercial and recreational fisheries and fish habitat. Long Island Sound was divided into 10-minute x 10-minute blocks and the life stages of each species occurring within each block were identified (NOAA 1999). The proposed ELI Project pipeline route traverses a portion of three blocks numbered 20, 21, and 34 (Figure 3.2.1-1). Managed species with their specific lifestages known to occur in these blocks are identified in Tables 3.2.1-1 through 3.2.1-3.

Not all economically and commercially important species currently have fisheries management plans (FMPs). The FMPs that are available were developed to protect EFH and have management objectives as defined by the Council and Commission. These management objectives are:

> Describe and identify the essential habitat for the managed species;
> Minimize to the extent practicable adverse effects on EFH caused by fishing ; and
> Identify other actions to encourage the conservation and enhancement of EFH.

The MSFCMA, as amended by the SFA, also establishes measures to protect EFH. NMFS must coordinate with other federal agencies to conserve and enhance EFH, and federal agencies must consult with NMFS on all activities, or proposed activities, authorized, funded or undertaken by the agency that may adversely affect EFH. In turn, NMFS must provide recommendations to federal and state agencies on such activities to conserve EFH. Such recommendations may include measures to avoid, minimize, mitigate, or otherwise offset adverse effects on EFH resulting from actions or proposed actions authorized, funded or undertaken by that agency.

It is important to note that several species do not have any life stages in the three NMFS blocks, and therefore would not be affected by the placement of the proposed pipeline (NOAA 1999). This assessment therefore focuses on fish species that have greater than 45% of their life stages located within the three designated blocks of concern. Species that have less than 25% but greater than 0% are discussed but are treated as incidental.

This page involves pipeline location information and is not available at this Internet site due to homeland security-related considerations. This portion of the Islander East consistency appeal administrative record may be reviewed at NOAA's Office of General Counsel for Ocean Services, 1305 East-West Highway, Silver Spring, Maryland.

Table 3.2.1-1. Species found in Block 20, Essential Fish Habitat, in Long Island Sound.

Block 20 Coordinates				
Boundary	North	East	South	West
Coordinate	41° 10.0'N	73°00.0'W	41°00.0'N	73°10.0'W

Species	Eggs	Larvae	Juveniles	Adults
American plaice *(Hippoglossoides platessoides)*			X	X
Atlantic butterfish *(Peprilus triacanthus)*				
Atlantic cod *(Gadus morhua)*				
Atlantic halibut *(Hippoglossus hippoglossus)*				
Atlantic mackerel *(Scomber scombrus)*	X	X	X	X
Atlantic salmon *(Salmo salar)*			X	X
Atlantic sea herring *(Clupea horengus)*			X	X
Atlantic sea scallop *(Placopecten magellanicus)*				
Black sea bass *(Centropristus striata)*	n/a		X	
Bluefish *(Pomatomus saltatrix)*			X	X
Cobia *(Rachycentron canadum)*	X	X	X	X
Haddock *(Melanogrammus aeglefinus)*				
King mackerel *(Scomberomorus cavalla)*	X	X	X	X
Long-finned squid *(Loligo pealei)*	n/a	n/a		
Monkfish *(Lophius americanus)*				
Ocean pout *(Macrozoarces americanus)*				
Ocean quahog (*Artica islandica)*	n/a	n/a		
Offshore hake *(Merluccius albidus)*				
Pollock *(Pollachius virens)*			X	X
Red hake *(Urophycis chuss)*	X	X	X	X
Redfish *(Sebastes fasciatus)*	n/a			
Sand tiger shark *(Odontaspis taurus)*		X		
Scup *(Stenotomus chrysops)*	X	X	X	X
Short-finned squid *(Illex illecebrosus)*	n/a	n/a		
Spanish mackerel *(Scomberomorus maculatus)*	X	X	X	X
Spiny dogfish *(Squalus acanthias)*	n/a	n/a		
Summer flounder *(Paralicthys dentatus)*			X	
Surf clam *(Spisula solidissima)*	n/a	n/a		
Tilefish *(Lopholatilus chamaeleonticeps)*				
White hake *(Urophycis tenuis)*				
Whiting *(Merluccius bilinearis)*				X
Windowpane flounder *(Scopthalmus aquosus)*	X	X	X	X
Winter flounder *(Pleuronectes americanus)*	X	X	X	X
Witch flounder *(Glyptocephalus cynoglossus)*				
Yellowtail flounder *(Pleuronectes ferruginea)*				

Table 3.2.1-2. Species found in Block 21, Essential Fish Habitat, in Long Island Sound.

Block 21 Coordinates				
Boundary	North	East	South	West
Coordinate	41°10.0' N	72°50.0 W	41°00.0' N	73°00.0 W

Species	Eggs	Larvae	Juveniles	Adults
American plaice *(Hippoglossoides platessoides)*			X	X
Atlantic butterfish *(Peprilus triacanthus)*				
Atlantic cod *(Gadus morhua)*				
Atlantic halibut *(Hippoglossus hippoglossus)*				
Atlantic mackerel *(Scomber scombrus)*	X	X	X	X
Atlantic salmon *(Salmo salar)*			X	X
Atlantic sea herring *(Clupea harengus)*			X	X
Atlantic sea scallop *(Placopecten magellanicus)*				
Black sea bass *(Centropristus striata)*	n/a			
Bluefish *(Pomatomus saltatrix)*			X	X
Cobia *(Rachycentron canadum)*	X	X	X	X
Haddock *(Melanogrammus aeglefinus)*				
King mackerel *(Scomberomorus cavalla)*	X	X	X	X
Long-finned squid *(Loligo pealei)*	n/a	n/a		
Monkfish *(Lophius americanus)*				
Ocean pout *(Macrozoarces americanus)*				
Ocean quahog (*Artica islandica)*	n/a	n/a		
Offshore hake *(Merluccius albidus)*				
Pollock *(Pollachius virens)*			X	X
Red hake *(Urophycis chuss)*	X	X	X	X
Redfish *(Sebastes fasciatus)*	n/a			
Sand tiger shark *(Odontaspis taurus)*		X		
Scup *(Stenotomus chrysops)*	X	X	X	X
Short-finned squid *(Illex illecebrosus)*	n/a	n/a		
Spanish mackerel *(Scomberomorus maculatus)*	X	X	X	X
Spiny dogfish *(Squalus acanthias)*	n/a	n/a		
Summer flounder *(Paralicthys dentatus)*			X	
Surf clam *(Spisula solidissima)*	n/a	n/a		
Tilefish *(Lopholatilus chamaeleonticeps)*				
White hake *(Urophycis tenuis)*				
Whiting *(Merluccius bilinearis)*				X
Windowpane flounder *(Scopthalmus aquosus)*	X	X	X	X
Winter flounder *(Pleuronectes americanus)*	X	X	X	X
Witch flounder *(Glyptocephalus cynoglossus)*				
Yellowtail flounder *(Pleuronectes ferruginea)*				

Table 3.2.1-3. Species found in Block 34, Essential Fish Habitat, in Long Island Sound.

Block 34 Coordinates				
Boundary	North	East	South	West
Coordinate	41° 10.0'N	72°50.0'W	40°50.0'N	73°00.0'W

Species	Eggs	Larvae	Juveniles	Adults
American plaice *(Hippoglossoides platessoides)*				
Atlantic butterfish *(Peprilus triacanthus)*				
Atlantic cod *(Gadus morhua)*				
Atlantic halibut *(Hippoglossus hippoglossus)*				
Atlantic mackerel *(Scomber scombrus)*	X	X	X	X
Atlantic salmon *(Salmo salar)*			X	X
Atlantic sea herring *(Clupea horengus)*			X	X
Atlantic sea scallop *(Placopecten magellanicus)*				
Black sea bass *(Centropristus striata)*	n/a		X	
Bluefish *(Pomatomus saltatrix)*			X	X
Blue shark *(Prionace glauca)*				X
Cobia *(Rachycentron canadum)*	X	X	X	X
Haddock *(Melanogrammus aeglefinus)*				
King mackerel *(Scomberomorus cavalla)*	X	X	X	X
Long-finned squid *(Loligo pealei)*	n/a	n/a		
Monkfish *(Lophius americanus)*				
Ocean pout *(Macrozoarces americanus)*				
Ocean quahog (*Artica islandica)*	n/a	n/a		
Offshore hake *(Merluccius albidus)*				
Pollock *(Pollachius virens)*			X	X
Red hake *(Urophycis chuss)*	X	X	X	X
Redfish *(Sebastes fasciatus)*	n/a			
Sandbar shark *(Charcharinus plumbeus)*		X		X
Sand tiger shark *(Odontaspis taurus)*		X		
Scup *(Stenotomus chrysops)*	X	X	X	X
Short-finned squid *(Illex illecebrosus)*	n/a	n/a		
Spanish mackerel *(Scomberomorus maculatus)*	X	X	X	X
Spiny dogfish *(Squalus acanthias)*	n/a	n/a		
Summer flounder *(Paralicthys dentatus)*			X	
Surf clam *(Spisula solidissima)*	n/a	n/a		
Tilefish *(Lopholatilus chamaeleonticeps)*				
White hake *(Urophycis tenuis)*				
Whiting *(Merluccius bilinearis)*				X
Windowpane flounder *(Scopthalmus aquosus)*	X	X	X	X
Winter flounder *(Pleuronectes americanus)*	X	X	X	X
Witch flounder *(Glyptocephalus cynoglossus)*				
Yellowtail flounder *(Pleuronectes ferruginea)*				

Fishery Management Plans for Fish Species in LIS

Specific FMP objectives for fish species that occur in the three designated blocks traversed by the proposed ELI Project is provided below. Most species that are listed as having life stages that occur in the three designated blocks that would be traversed by the pipeline do not have FMPs developed and may not be important for recreational and/or commercial fisheries.

1. Summer Flounder, Scup and Black Sea Bass (NOAA 1998a)

Reduce fishing mortality in the summer flounder, scup, and black sea bass fisheries to assure that overfishing does not occur.

Reduce fishing mortality on immature summer flounder, scup and black sea bass to increase spawning stock biomass.

Improve the yield from these fisheries.

Promote compatible management regulations between state and federal jurisdictions.

- Promote uniform and effective enforcement of regulations.
- Minimize regulations to achieve the management objectives stated above.

2. Bluefish (NOAA 1998b)

Increase understanding of the stock and of the fishery.

Provide the highest availability of bluefish to U.S. fishermen while maintaining, within limits, traditional uses of bluefish.

- Provide for cooperation among the coastal states, the various regional marine fishery management councils, and federal agencies involved along the coast to enhance the management of bluefish throughout its range.

Prevent recruitment overfishing.

Reduce the waste in both the commercial and recreational fisheries.

3. Atlantic Mackerel and Butterfish (NOAA 1998c)

- Enhance the probability of successful (i.e., the historical average) recruitment to the fisheries.
- Promote the growth of the US commercial fishery, including the fishery for export.
- Provide the greatest degree of freedom and flexibility to all harvesters of these resources consistent with the attainment of the other objectives of this FMP.
- Provide marine recreational fishing opportunities, recognizing the contribution of recreational fishing to the national economy.
- Increase understanding of the conditions of the stocks and fisheries.
- Minimize harvesting conflicts among US commercial, US recreational, and foreign fishermen.
- These are year round fisheries.

Information on the life stages of each fish species (with or without a FMP) that was listed as present in Long Island Sound (NOAA 1999) is provided for compliance with Amendment 1 to the Fishery Management Plan (FMP) and with the requirements of the Essential Fisheries Habitat Management Program.

Fish with 100% of All Life Stages in the Three Designated Blocks of Concern to this Project

1. Winter Flounder - *Pseudopleuronectes americanus* (Walbaum 1792)

All life stages of winter flounder occur and are commonly found in the three blocks that may be traversed by the proposed ELI Project. These fish are demersal and prefer to settle into the sediment for protection from predators. Eggs are typically found in coastal estuarine environments, but not in the central portion of Long Island Sound. Larvae and spawning adults are found with very low abundances from September through January (NOAA 1994). Adults are commonly found in Long Island Sound during April through July. Juveniles are abundant year round but are most abundant from January through May. Adults spawn in coastal ponds and marshes during late February through March. These spawning adults are not found in the central part of Long Island Sound and would not be affected by the placement of the proposed ELI pipeline. The current fishing season for winter flounder in NY waters is from the third Saturday in March to June 30 and September 15 to November 30 (http://www.seagrant.sunysb.edu).

2. Windowpane Flounder - *Scophthalmus aquosus* (Mitchill 1815)

Windowpane flounder are abundant in Long Island Sound, with all life stages being found in all three of the designated blocks traversed by the proposed pipeline. This species occurs from shore to 45-m depth and occasionally deeper. Approximately 769,000 pounds of winter flounder and 121,000 pounds of windowpane flounder were caught in the New York waters (this includes Long Island Sound and the Atlantic Ocean side of Long Island) in 1999. Spawning adults of windowpane flounder are rarely found from August through December and are absent during January and February. Larvae are absent January through March. Juveniles and adults are present year round, however, their lowest abundances occur from January to March and June to October. Abundance data are not available for juvenile flounders in the nearshore environment off Milford or Shoreham. Since both these habitats lack eelgrass, it is likely that the juvenile flounder are not common in these areas but are living in protected areas such as coastal pond and salt marsh habitats. Windowpane flounder are more abundant east of the proposed pipeline, south of Clinton, Connecticut. Adults have their greatest abundances during the months of April through June.

3. Scup - *Stenotomus chrysops* (Linnaeus 1766)

Juvenile and adult scup are highly abundant in Long Island Sound (NOAA 1994). However, spawning adults, larvae, and eggs are only moderately abundant. All life stages of scup are found in the three designated blocks traversed by the proposed pipeline route (NOAA 1999). This species is rarely found in the fresh/saltwater mixing areas and tends to be limited to the deeper seawater zones (NOAA 1994). Scup usually occur in schools inshore in summer and offshore in winter. This species feeds on amphipods, worms, sand dollar, and young squid (Leim and Scott 1966). Adults, spawning adults, juveniles, larvae, or eggs are not found in Long Island Sound during the months of December through March. All life stages for this fish are most abundant from April to October. Scup young-of-the-year are not present in the Long Island Sound during April through June. From October through March, Scup move offshore and are not commonly found in Long Island Sound.

4. King Mackerel - *Scomberomorus cavalla* (Cuvier 1829)

King mackerel is an offshore species of fish and is rarely found in Long Island Sound. This species feeds primarily on other species of fish and to a lesser degree on penaeid shrimp as well as squid. Large schools have been found to migrate over considerable distances along the Atlantic coast, water temperature permitting. Eggs are pelagic, hatching from May to July. Although all life stages of King mackerel occur in the three designated blocks along the pipeline route (NMFS 1999). data (www.st.nmfs.gov/ows-commercial/gc_runc_cgi.sh) indicates that. combined. king and cero mackerel netted only $273 from January to October 1999. This suggests that king mackerel is not an important fishery in Long Island Sound.

5. Spanish Mackerel - *Scomberomorus maculatus* (Mitchill 1815)

Spanish mackerel are migratory pelagic species that are rarely found in Long Island Sound. but all life stages. in low abundances. have been reported from all three blocks where the ELI Project is proposed to be placed (NOAA 1999). These fish migrate in large schools over great distances along the shore and move offshore to deep water during the winter. This species feeds mainly on small fishes (clupeids and anchovies), penaeid shrimps. and cephalopods. Spanish mackerel spawn in the warmest months when the water temperature is highest (August and September). The Connecticut Fisheries Bottom Trawl Survey (1984–1994) reported that the greatest numbers of Spanish mackerel were caught close to shore: that the species was absent from the Long Island Sound from the months of April through August; and only 30 individuals were caught during September through October, the time period when this species is most abundant in the Long Island Sound (Gottschall et al. 2000).

6. Cobia - *Rachycentron canadum* (Linnaeus 1766)

Although it is a predominantly offshore species and is rarely found in Long Island Sound, all life stages of cobia have been reported to be present in the three blocks traversed by the proposed ELI pipeline route (NMFS 1998). It is so rare that the Connecticut bottom trawl surveys that took place from 1984–1994 did not report any data for this species. This species can occur in a variety of habitats: mud, sand and gravel bottoms, coral reefs, rocky shores (Collette 1997a), mangrove sloughs, around pilings and buoys, around drifting and stationary objects, and occasionally in estuaries (Vaught Shaffer and Nakamura 1989). Cobia feed on crabs, fishes, and squids (Fischer et al. 1990), and is caught in small quantities due to its solitary behavior. The annual landings by species for New York as of October 18, 1999 report only 60 pounds of cobia caught, with a net worth of $59.00. This species spawns during the warm months in the offshore western Atlantic Ocean; eggs and larvae are planktic (Vaught Shaffer and Nakamura 1989). Cobia is not an important fishery for Long Island Sound and is not anticipated to be affected by the proposed pipeline route.

7. Red Hake - *Urophycis chuss* (Walbaum 1792)

All life stages of red hake occur in the three blocks that would be transversed by the proposed ELI Project. This species of fish is found on soft muddy and sandy bottoms, but never on rocks, gravel, or shells. Juveniles live along the coasts at shallow depth (4–6 m); adults migrate to deeper waters, generally to between 110 and 130 m, and in some instances, to over 550 m. Juveniles live in scallop *Placopecten magellanicus* and remain close to scallop beds until they mature (Frimodt 1995). Because *P. magellanicus* are reported as not being found in Long Island Sound (NOAA 1999), the likelihood of finding significant numbers of eggs or juveniles of *U. chuss* in the three blocks along the pipeline route is minimal. NOAA (1994) reports that juveniles, eggs, and spawning adults are not found in Long Island Sound. However, adults are highly abundant in the central portion of Long Island Sound. This species has its greatest adult abundance during the months of April through June: very few individuals are present during the months from September through the winter months (Gottschall et al. 2000).

8. Atlantic Mackerel - *Scomber scombrus* (Linnaeus 1758)

All life stages of Atlantic mackerel have been reported to occur in the three blocks that are traversed by the proposed ELI Project (NMFS 1998a): however, it is considered to be a migratory pelagic species in Long Island Sound. Between 1984 and 1994, only 635 individuals of Atlantic mackerel were caught in Long Island Sound. This species has its greatest abundance in the Long Island Sound from August to October (Gottschall et al. 2000). The highest numbers of eggs of this species are found during May. Atlantic mackerel are not found in Long Island Sound during the months of December, January, February, and March as it migrates to deeper, offshore waters.

Fish with 50% of all life stages in the three designated blocks of concern to this project. There are no species found in the three blocks potentially transversed by the ELI proposed pipeline route that have >50% but <100% of their life stages found in Long Island Sound.

1. Atlantic Salmon - *Salmo salar* (Linnaeus 1758) and Atlantic Cod *Gadus morhua* (Linnaeus 1758)

Atlantic salmon has 50% of their life stages in all three blocks traversed by the proposed pipeline. These life stages include juveniles and adults only; these species are anadromous and spawn up-river in fresh water. These species are considered rare in Long Island Sound (NOAA 1994). Twenty-six rivers have been designated as "habitat areas of particular concern" for Atlantic salmon eggs and juveniles. Of these 26 rivers, 23 are located in Maine, one is located in New Hampshire and one in Massachusetts. The last is the Connecticut River, which empties into Long Island Sound east of Milford, where the proposed pipeline is to have one of two terminal ends. The NOAA Estuarine Living Marine Resources (ELMR) program designates those bays and estuaries supporting Atlantic salmon adults at the "abundant," "common," or "rare" level as being essential fish habitat. Atlantic salmon adults are rarely found in Long Island Sound; juveniles, spawning adults, and eggs are not present, at any time of year, in Long Island Sound. Objectives of the NOAA ELMR program are to ensure that all rivers currently capable of supporting Atlantic salmon are included in the EFH designation. The EFH for this species in Long Island Sound is the freshwater rivers and the brackish mixing zone associated with these rivers. The proposed pipeline placement for the ELI Project is not anticipated to be affected Atlantic salmon population in any way because this species is rarely found in Long Island Sound.

2. Pollock - *Pollachius virens* (Linnaeus 1758)

Pollock have 50% their life stages in the three blocks traversed by the proposed pipeline. These life stages include juveniles and adults. The eggs and larvae are not found in Long Island Sound and, therefore, are not expected to be affected by the placement of the proposed pipeline. Juveniles and adults are gregarious, usually entering coastal waters in spring, and returning to deeper waters in winter. Pollock are considered to be rare in Long Island Sound waters (NOAA 1994).

3. Bluefish - *Pomatomus saltator* (Linnaeus 1766)

Only adults and juveniles of bluefish are found in the three blocks traversed by the proposed ELI Project; eggs and larvae are absent from all three blocks. This species occurs in oceanic and coastal waters (Claro 1994). They are most common along surf beaches and rock headlands in clean, high-energy waters, although adults can also be found in estuaries and brackish water (Grant 1982). Small fish may be found in shallow coastal waters in at least 2-m depth (May and Maxwell 1986). Adults are in loose groups often found attacking shoals of mullets or other fishes, destroying numbers apparently far in excess of feeding requirements (Collette 1997). They are associated with sharks and billfishes (Claro 1994) and are a voracious and aggressive species (Cervigón 1993). Bluefish migrate to warmer water during winter and to cooler water in summer (Frimodt 1995). Bluefish young-of-the-year are most abundant during the months of September through October. From November through June, the young-of-the-year are rare or absent from central Long Island Sound. The one-year old bluefish follow the same temporal pattern as the young-of-the-year, having their greatest abundance in September through October.

Adults can be found from July through October. Over the winter, this species migrates to offshore waters. The proposed pipeline construction is not expected to affect migratory bluefish population, especially if it is placed during the winter months.

4. Atlantic Sea Herring - *Clupea harengus* (Linnaeus 1758)

These fish form large schools and migrate along the coast of North America. They have been reported from waters ranging from –1.0 to 18°C and are considered a resident pelagic species. Only the juveniles and adults of this species have been reported to be present in central Long Island Sound. This species has its greatest abundance from April through June, with a second peak from November to December. Atlantic sea herring have 50% of their life history stages located among the three designated blocks of concern for this project. Larvae, in general, are considered to be rarely found in Long Island Sound (NOAA 1994). Eggs and spawning adults are absent (NOAA 1994). Pipeline placement during the winter months is not expected to affect this species, mostly because they are pelagic, move in schools, and are able to avoid pipeline construction.

Fish with <50% but >30% of all life stages in the three designated blocks of concern to this project.

1. American Plaice - *Hippoglossoides platessoides* (Fabricius 1780)

This species is described by NMFS (1998a) as having only juvenile and adult life stages found in blocks 20 and 21. This species is commonly found offshore and is rarely found in Long Island Sound. However, neither the NEFMC EFH amendment description for American plaice includes any portion of Long Island Sound, nor do the maps show the Long Island Sound as a viable habitat for this species. Therefore, the proposed pipeline is not expected to affect this fish population.

Fish with <30% but >20% of all life stages in the three designated blocks of concern to this project.

1. Whiting (Silver Hake) - *Merluccius bilnearis* (Mitchell 1814)

The greatest abundances of these fish are found around central Long Island Sound from April through August. From September through February, this species of fish is not nearly as abundant. Eggs, larvae, and juveniles are not found in the Long Island Sound (NMFS 1998a) and Long Island Sound is not considered to be EFH for this species (NMFS 1998a).

2. Summer Flounder - *Paralichthys dentatus* (Linnaeus 1766)

Summer Flounder are very rarely found in Long Island Sound (NOAA 1994; NOAA 1999). However, 25% of the life stages for this species are reported as found within the three blocks that would be traversed by the ELI proposed pipeline. Eggs, larvae, juveniles, and/or spawning adults are not known to occur in any of the three blocks and only the adults have been reported from Long Island Sound (NMFS 1998a). Adults usually inhabit hard sandy substrate where they can burrow; most of the pipeline would be placed in soft, muddy sediment. This species occurs in bays, lagoons, and shallow coastal waters. The proposed pipeline is not expected to affect the status of this fish population.

3. Black Sea Bass - *Centropristis striata* (Linnaeus 1758)

This species is important only as a game fish in Long Island Sound. Eggs, larvae, and spawning adults are not present in Long Island Sound (NOAA 1994). NMFS (1998a) states that the juveniles and adults of this species of fish are present in central Long Island Sound. The greatest abundances of this species occur in the eastern portion of Long Island Sound from April through October; however, the abundances are quite low. The Connecticut bottom trawl survey from 1984–1994 caught only 158 Black Sea Bass in Long Island Sound over the course of the 10 years (Gottschall et al. 2000). With a winter pipeline placement, this species of fish is not expected to be affected by the proposed project.

4. Sand Tiger Shark - *Carcharias taurus* (Rafinesque 1810)

Only larvae of the sand tiger shark are found in the three blocks traversed by the proposed pipeline route, and these are rare. This species of shark produces live young at birth and thus does not produce externally fertilized eggs. Neither adults nor spawning adults have been reported (NOAA 1999) from these areas. The pipeline construction is not expected to have affect any of the life stages of this species.

Fish with <20% but >0% of all life stages in the three designated blocks of concern to this project.

1. Blue Shark - *Prionace glauca* (Linnaeus 1758)

This species is predominantly oceanic but can occasionally be found in continental shelf waters of 150 m depth. The adults of this species are the only life stage that has been reported from block 34, one of the three blocks that may be traversed by the proposed ELI Project. It is highly unlikely that this species would be found in Long Island Sound. The pipeline, if placed, would have no affect on this population.

2. Sandbar Shark - *Carcharhinus plumbeus* (Nardo 1827)

Larvae and adults of this species are reported to be present only from block 34 (NMFS 1998a). This species bears live young and is rarely found in Long Island Sound (NOAA 1994). There is no active fishery for this species in Long Island Sound because the status of this species is vulnerable. This species is predatory by nature and highly motile. Juveniles are born viviparously and range in size from 45 to 75 cm at birth. The pipeline will not extend into either block 20 or 21 and since the pipeline will only cross a small portion of block 34, this proposed project should have no affect on this species.

3.2.2 Significant Coastal Fish and Wildlife Habitats

The NYSDEC evaluates the significance of coastal fish and wildlife habitats, and, following a recommendation from the NYSDEC, the New York State Department of State (NYSDOS) designates and maps these significant habitats. As part of the policies established in New York State's Coastal Management Program (CMP), proposed activities in the coastal zone must demonstrate that significant coastal fish and wildlife habitats would be protected. The ELI Project does not cross any state-designated habitats in Long Island Sound. Refer to Resource Report 3 in Volume II for onshore habitats in the near the ELI project area.

3.2.3 USFWS Northeast Coastal Areas Study

In 1990, the USFWS received funding from the U.S. Congress to conduct the Northeast Coastal Areas Study (NECAS). This study involved identifying those areas in southern New England and Long Island Sound in need of protection for fish and wildlife habitat and the preservation of natural diversity. To identify significant habitats of special emphasis, the USFWS analyzed individual occurrences of coastal species of special concern. In its final report to Congress, the USFWS identified 40 significant coastal habitat sites and recommended protective measures that should be facilitated to restore, maintain, enhance, and protect these unique habitats. The ELI Project does not cross any NECAS habitats in the

Long Island Sound. Refer to Resource Report 3 in Volume II for USFWS management areas in the near the ELI project area.

Plankton

3.2.4.1 Phytoplankton

The phytoplankton community of Long Island Sound includes 150 identified temperate and boreal species from neritic and littoral origin. Diatoms and dinoflagellates are dominant, but *Chlorella*-type micro flagellates are abundant and may be of substantial trophic importance. The dominant species are uniformly distributed across Long Island Sound, and no significant vertical gradients have been reported. Phytoplankton exhibit seasonal abundance patterns in the form of blooms, with diatom blooms occurring in the late winter and early fall, and dinoflagellate blooms occurring in early summer. The lowest phytoplankton densities occur during the period October through April, as day length shortens and the water temperature drops.

In general, estuaries are more turbid than costal zone areas (Okubo 1971). As a result, light penetrates only to shallow depths and phytoplankton production in winter months can be light-limited rather than nutrient-limited (Valiella 1984). In areas of Long Island Sound where there is anthropogenic input, nutrient-limited conditions would probably occur only during strong thermocline conditions; therefore there is the potential for increased turbidity to influence the rate of primary production.

3.2.4.2 Zooplankton

The zooplankton community in Long Island Sound is diverse, but the estuarine salinities in the western and central areas limit neritic species to the eastern area, including the entrance to Block Island Sound. Holoplankton (organisms that exist only as plankton) are dominated by copepods (*Acartia clausi*) during the cold months and *A. tonsa* during warm months; larvacean tunicates, cnidarians, and chaetognaths, *Sagitta elegans*, are also present. Seasonal cycles of new plankton (laryae of benthic organisms) are evident, with crustacean larval forms more abundant in cold months and molluscan and polychaete larvae more abundant during warm months. The highest abundances of zooplankton are seen in late spring and late summer (Deevey 1956).

3.2.5 Benthos

Benthic communities are those biological assemblages associated with the sediments of aquatic systems. Such assemblages are an integral component of the estuarine food web (Day et al. 1989) and also play an important role in geochemical and physical processes, such as sediment reworking and flux of chemicals (Aller 1978 and 1982; Aller and Yingst 1978; Rhoads and Boyer 1982; Waslenchuk et al. 1983; Yingst and Rhoads 1978).

The benthos includes both infauna, which live within the bottom sediments, either burrowing into the sediment or building tubes that extend above the surface, and epifauna, which live on the surface of the sediment or rocky substrates. Epifaunal organisms are usually larger than the infauna, and may be mobile, such as crabs or lobster, or sessile, such as mussels, which attach by byssal threads to a hard substrate. Richards and Riley (1967) reviewed the epifauna of Long Island Sound. The focus of this section is on the infaunal benthos of soft sediments, which comprise the greatest area in Long Island Sound (Zajac 1998).

3.2.5.1 Previous Studies

Beginning in 1953 with the seminal work of Sanders (1956), Long Island Sound has been the location of several studies on benthic community structure. These studies were conducted primarily in the 1970s and 1980s, and were either Sound-wide (Reid et al. 1979; Pelligrino and Hubbard 1983) or focused on one particular area (central basin: McCall 1977 and 1978; Rhoads et al. 1977, Rhoads and Germano 1982; Fishers Island Sound: Franz 1976; Swanson 1977; Biernbaum 1979). A significant number of studies have been conducted with reference to the impacts of dredging and the disposal of dredged material at several sites in the Long Island Sound (Fredette et al. 1993). The USEPA sampled Long Island Sound as part of their Environmental Monitoring and Assessment Program-Estuaries Virginian Province (EMAP-E VP) (Weisberg et al. 1993; Gallagher and Grassle 1997).

In addition to studies conducted in offshore waters, additional work has been done on inshore areas (Welsh et al. 1977; Zajac and Whitlatch 1982a, b; Northeast Utilities 1999). The Northeast Utilities work has continued for over 20 years in an effort to document any potential impacts of the nuclear power plant on the intertidal and shallow subtidal benthos in a localized area of northern Long Island Sound (NUSCO 1999).

Zajac (1998) reviewed several studies conducted offshore in water generally deeper than 5 m and identified two limitations to most of these studies, particularly the earlier ones: (1) sampling was usually conducted only one to three times per study, resulting in a lack of detail on temporal variability; and (2) most benthic samples were screened through coarse-mesh sieves (1.0-mm mesh), resulting in a severe undersampling of the small organisms that have been shown to comprise soft-sediment communities. Many of the studies conducted in the late 1980s and throughout the 1990s, including those done to monitor effects of the disposal of dredged material at the four active disposal sites in Long Island Sound, have used finer, usually 0.5-mm, mesh screens. Retention of the small-bodied organisms generally results in higher recorded densities for particular species and higher overall species diversity at particular stations.

Reid et al. (1979) conducted the first area-wide survey of the Long Island Sound benthos, sampling 142 stations located every 3-5 km on north/south transects spaced 8.7 km apart along the entire length of Long Island Sound. Annelids, molluscs, and arthropods accounted for 46%, 21%, and 33%, respectively, of the 248 species identified from this survey. Species diversity, a measure of the distribution of the individuals among the species collected, was lowest at the deep-water stations with high silt-clay content, although some shallow water stations also had low diversities (Figure 3.2.5.1-1). Highest diversities (>3.0 H') were found in the eastern end of Long Island Sound near Fishers Island and south of Niantic Bay. Moderate to high H' values (between 2.0 and 3.0) were found throughout much of the eastern portion of Long Island Sound as well as along several transects in the central portion of the Long Island Sound and at nearshore sites in the western Long Island Sound. Values between 1.0 and 2.0 were prevalent throughout much of the western portion of Long Island Sound, with patches of both higher and lower diversities occurring in nearshore and offshore areas, respectively. A later study by Pelligrino and Hubbard (1983), although confined to Connecticut waters along the northern portion of Long Island Sound, confirmed several of the trends seen in the study by Reid et al., including the increase from west to east in species richness and mean density (individuals per sample). Lower species richness in the western part of Long Island Sound may be due to a reduced species pool, lower habitat heterogeneity, and perhaps long-term environmental deterioration (Zajac 1998).

Sanders (1956) sampled muddy areas in central Long Island Sound and was the first to describe the infaunal community dominated by the polychaete *Nephthys incisa* and the bivalves *Yoldia limatula* and *Nucula proxima* (later shown by Hampson (1971) to be *N. annulata*). Sanders noted the correspondence of community structure with sediment type, since this community was found in sediments of >25% silt-clay content, in depths of 4–30 m, where temperature and salinity ranged between 5 and 22 °C and 24.7–29.2 ppt, respectively. Pelligrino and Hubbard (1983) observed this same community in their survey.

Similarity analysis of Reid et al.'s data revealed three faunal groups in the central and western portions of Long Island Sound: a muddy, deep-water group, a sandy, shallow-water group, and a transitional shallow-water assemblage. Bivalves dominated both the muddy deep water and sandy shallow groups, with *Nucula annulata* and *Yoldia limatula* dominant in muddy sediments and *Tellina agilis* dominant in sandy sediments (Table 3.2.5.1-1). Polychaetes, especially *Mediomastus ambiseta*, *Polydora cornuta*, and *Tharyx acutus*, dominated the transitional stations. Amphipod crustaceans were also important, with *Ampelisca abdita* dominant at the muddy stations in 1972–1973 and *A. vadorum* common at the sandy stations. No consistent groups were identified for the eastern portion of Long Island Sound, where dominant organisms tended to be more variable, as confirmed by Pellegrino and Hubbard (1983) (Table 3.2.5.1-2).

Zajac's (1998) reanalysis of Pelligrino and Hubbard's (1983) data suggests only low levels of similarity among the species assemblages sampled at their 413 stations. Zajac's reanalysis was based on the 35 most abundant species, including 19 polychaetes, 8 bivalves, and 8 arthropods, and indicated that community structure is quite variable throughout Long Island Sound, and while general trends do exist, such trends should not be interpreted as smooth transitions in community structure from west to east or shallow to deep water. However, spatial variation in community structure was low for large areas of the western and central areas of Long Island Sound and relatively higher in both the Narrows in the west and in the eastern basin.

Although the majority of studies did not include a temporal component, those that did (McCall 1977; Reid et al. 1979; Zajac and Whitlatch 1988, 1989) showed that the benthos in Long Island Sound exhibit the seasonal changes in composition and abundance generally expected for this geographic area. Such changes are correlated with reproductive cycles, with higher abundances generally seen during the warmer summer months. A drastic unexplained decline in the populations of a number of species dominant in the mud communities, such as the polychaete *Polydora* and the bivalves *Mulinia*, *Yoldia*, and *Pitar*, was seen between 1972 and 1973 (Reid et al. 1979). Mean numbers of individuals and number of species remained low through 1978; however, during the same time period, diversity (H') increased from 1.07 to 1.69 and remained at the higher level through 1978.

Table 3.2.5.1-1. Characteristics of the three faunal groups in Long Island Sound as recognized by Reid et al. (1979) via cluster analysis of 1972 samples.
(Numbers are mean densities per m^2)

***Muddy, Deep-Water Group* (>69% silt+clay, depth > 15 m)**

Taxon Year	**1972**	**1973**	**1975**	**1976**	**1977**	**1978**
Nephthys incisa (P)	60	100	71	79	147	181
Pherusa affinis (P)	50	45	13	19	22	21
Polydora cornuta (P)	157	2	0	1	44	22
Mediomastus ambiseta (P)	11	288	0	5	48	35
	483	324	264	791	262	444
	191	51	34	42	106	175
Pitar morrhuana (B)	357	4	60	18	25	114
	8,217	11	144	232	673	1,074
	53	26	0	1	0	0
Total Density	10,400	1,263	861	1,314	1,457	2,310
Total Species	21.2	10.1	9.8	8.9	11.2	14.2

***Shallow Sandy Group* (<3.7% silt+clay, depth <15 m)**			***Shallow Transitional Group* (% silt+clay: mixed; depth <20 m)**		
Taxon Year	**1972**	**1973**	**Taxon Year**	**1972**	**1973**
Nephthys picta (P)	75	48	*Mediomastus ambiseta* (P)	175	143
Spiophanes bombyx (P)	25	207	*Polydora cornuta* (P)	7,131	1
Aricidea catherinae (P)	45	6	*Streblospio benedicti* (P)	1,549	14
Tellina agilis (B)	445	1,910	*Tharyx acutus* (P)	533	4
Ensis directus (B)	122	74	*Ampharete arctica* (P)	415	43
Spisula solidissima (B)	795	29	*Tellina agilis* (B)	418	222
Ampelisca vadorum (A)	98	49	*Ensis directus* (B)	281	104
Paraphoxus epistonus (A)	52	89	*Ampelisca abdita* (A)	96	44
			Ampelisca vadorum (A)	81	508
Total Density	6,938	3,703	Total Density	14,037	2,362
Total Species	23.1	22.9	Total Species	34.3	23.8

A= amphipod, B=bivalve; P = polychaete.
Source: Zajac 1998, based on data from Reid 1979 and Reid et al. 1979.

Table 3.2.5.1-2. Characterization of Benthic Communities in Each of the Geographical Regions of Long Island Sound Surveyed by Pelligrino and Hubbard (1983).

Region of Long Island Sound	Sediment Type	Dominant Species
I: Greenwich–Stamford	mud (77.8%)	*Mulinia lateralis* (B) *Nucula annulata* (B) *Pectinaria gouldii* (P)
II: Stamford–Norwalk	mud (69.2%)	*Nucula annulata* *Mulinia lateralis* *Pectinaria goudii*
III: Norwalk–Bridgeport	mud (42.2%)	*Mulinia lateralis*
	sandy-mud (25%)	*Nucula annulata* *Pitar morhuanna* (B)
IV: Bridgeport–Milford	mud (70.7%)	*Mulinia lateralis* *Nucula annulata* *Nephthys incisa* (P)
V: Milford–New Haven	mud (65.5%) sandy-gravel (13.8%)	*Mulinia lateralis* *Nucula annulata* *Nephthys incisa*
VI: New Haven–Guilford	mud (70.0%) sandy-mud (12.5%)	*Nucula annulata* *Mulinia lateralis* *Nephthys incisa*
VII: Guilford–Madison	sand & muddy sand (62.2%)	*Clymenella zonalis* (P) *Asabellides oculatus* (P) *Spiophanes bombyx* (P)
VIII: Madison–Old Saybrook	sand, sandy-shell (66.7%)	*Protohaustorius wigleyi* (A) *Tellina agilis* (B) *Acanthohaustorius millsi* (A)
IX: Old Saybrook–New London	sandy gravel sandy shell (58.6%)	*Aeginina longicornis* (A) *Cirratulis grandis* (P) *Ampharete artica* (P)
X: New London–Stonington	mud, sandy mud sand	*Ampelisca abdita* (A) *Aricidia jefferysii* (P) *Clymenella zonalis* (P)

A = amphipod: B = bivalve: P = polychaete

3.2.5.2 Sampling Results

A series of benthic samples was taken in June 2001 along several alternate options for the proposed ELI Project route (see Appendix A for details of the sampling procedures and Appendix D for the benthic data). Eight stations were located in Connecticut waters and eight stations were located in New York waters. Samples were analyzed for sediment grain-size parameters and constituents of the benthic infauna.

Connecticut Stations

Of the total of 67 distinct taxa that were identified from the 16 benthic samples, 52 occurred at stations in Connecticut waters (Appendix D). Species composition at these stations was generally very similar to that reported in earlier studies, including Pelligrino and Hubbard (1983) and earlier collections made along the proposed Eastchester Extension pipeline route (see Table 3.2.5.2-1).

Dominant species included the bivalve *Nucula annulata*, and the polychaetes *Levinsenia gracilis*, *Mediomastus ambiseta*, *Nephtys incisa*, and *Ampharete finmarchica* (Table 3.2.5.2-1). These five species accounted for 76% of all individuals collected at stations in Connecticut waters. *Nucula annulata* was the top dominant at three of the CT stations (AM-CT1, HTAP-A-CT3, and HTAP-B-CT6). The paraonid polychaete, *Levinsenia gracilis*, dominated four stations: A1-CT4, A2-CT5, A6-CT2, and B1-CT8. The remaining CT station was dominated by the capitellid polychaete *Mediomastus ambiseta*, with three other species, *N. annulata*, *L. gracilis*, and *A. finmarchica*, contributing nearly equal numbers to the community.

Table 3.2.5.2-1. Dominant Infaunal Taxa at Connecticut Stations (numbers of individuals per grab sample).

Station	AM-CT1	HTAP-A-CT3	A1-CT4	A2-CT5	A6-CT2	BT-CT7	HTAP-B-CT6	B1-CT8
Taxon								
Ampharete finmarchica	0	0	2	18	26	52	2	12
Levinsenia gracilis	0	18	144	116	113	51	24	62
Mediomastus ambiseta	30	75	30	4	10	74	1	13
Nephtys incisa	29	45	14	24	5	27	11	9
Nucula annulata	101	303	0	3	10	57	279	8

Community parameters for each station are given in Table 3.2.5.2-2. Infaunal densities, extrapolated from the total density in a single grab sample and adjusted for removal of the sediment grain-size core, ranged from a high of 12,430 individuals/m^2 at Station HTAP-A-CT3 to a low of 4,051 individuals/m^2 at Station B1-CT8. Species diversity, as measured by the Shannon index H' (base ln), ranged from a high of 2.32 at Stations A6-CT2 and B1-CT8 to a low of 0.90 at Station HTAP-B-CT6. Relative diversities among stations are also shown in Figure 3.2.5.2-1, the family of rarefaction curves generated for these stations.

Table 3.2.5.2-2. Benthic Community Parameters for CT Stations Sampled in June 2001 along the Proposed Eastern Long Island Pipeline Route.

Station	Density per m^2	No. Taxa for Diversity	H' base ln	H' base 2	J'	Hurlbert-Sanders Rarefaction ESN 2	ESN 12	ESN 50	ESN 100	ESN 200
AM-CT1	5949	15	1.83	2.64	0.68	1.77	5.40	9.08	11.11	14.08
HTAP-A-CT3	12,430	15	1.35	1.95	0.50	1.59	4.02	7.33	9.40	11.76
A1-CT4	6506	17	1.65	2.38	0.58	1.66	4.90	9.71	12.39	15.74
A2-CT5	6051	28	2.09	3.01	0.63	1.74	5.91	13.72	19.37	26.24
A6-CT2	7114	28	2.32	3.35	0.70	1.81	6.61	14.85	19.82	25.23
BT-CT7	8456	22	2.27	3.27	0.73	1.86	6.52	11.97	15.41	19.26
HTAP-B-CT6	8911	13	0.90	1.30	0.35	1.36	3.03	6.09	7.96	10.39
B1-CT8	4051	21	2.32	3.35	0.76	1.82	6.86	14.88	18.79	–

New York Stations

Of the total of 67 distinct taxa that were identified from the 16 benthic samples, 56 occurred at stations in New York waters. Dominant species included the polychaetes *Ampharete finmarchica, Levinsenia gracilis*, *Sigambra tentaculata*, and *Nephtys incisa*, which together accounted for 62% of all individuals collected at the New York stations (Table 3.2.5.2-3). The bivalve *Nucula annulata* was not common at these stations, being absent from three of the eight stations and occurring only in low numbers at the other five. The large burrowing anemone, *Ceriantheopsis americanus*, was dominant at Station A3-NY1, and common at five additional stations (Table 3.2.5.2-3).

Table 3.2.5.2-3. Dominant Infaunal Taxa at New York Stations (numbers of individuals per grab sample).

Station	A3-NY1	A4-NY2	A5-NY3	P1A3-NY4	S-NY5	B2-NY6	B3-NY7	B4-NY8
Taxon								
Ampharete finmarchica	9	127	6	14	2	20	108	47
Ceriantheopsis americanus	13	8	5	0	0	13	7	5
Levinsenia gracilis	2	40	25	73	86	8	25	45
Nephtys incisa	5	2	6	10	36	5	9	5
Nucula annulata	0	0	5	27	24	1	4	1
Sigambra tentaculata	5	19	8	23	32	5	0	6

Community parameters for each station are given in Table 3.2.5.2-4. Infaunal densities, extrapolated from the total density in a single grab sample and adjusted for removal of the sediment grain-size core, ranged from a high of 8,000 individuals/m^2 at Station S-NY5 to a low of 2,000 individuals/m^2 at Station A3-NY1. Species diversity, as measured by the Shannon index H' (base ln), ranged from a high of 2.87 at Station A3-NY1 to a low of 1.74 at Station B3-NY7. Relative diversities are also shown in Figure 3.2.5.2-2, in the family of rarefaction curves generated for these stations.

Table 3.2.5.2-4. Benthic Community Parameters for NY Stations Sampled in June 2001 along the Proposed Eastern Long Island Pipeline Route.

	Density per m^2	No. Taxa for Diversity	H' base ln	H' base 2	J'	Hurlbert-Sanders Rarefaction				
						ESN 2	ESN 12	ESN 50	ESN 100	ESN 200
New York Stations										
A3-NY1	2025	25	2.87	4.15	0.89	1.94	8.89	20.50	–	–
A4-NY2	6684	25	1.94	2.80	0.60	1.73	5.51	11.72	16.14	22.09
A5-NY3	2101	17	2.40	3.46	0.85	1.88	7.40	14.78	–	–
P1A3-NY4	6987	27	2.53	3.65	0.77	1.88	7.41	14.75	18.62	23.66
S-NY5	8101	25	2.37	3.42	0.74	1.87	6.88	12.84	16.57	21.38
B2-NY6	2203	18	2.48	3.58	0.86	1.90	7.66	15.09	–	–
B3-NY7	5646	15	1.74	2.51	0.64	1.72	5.06	9.63	12.37	14.79
B4-NY8	3899	24	2.24	3.24	0.71	1.82	6.29	14.97	20.81	–

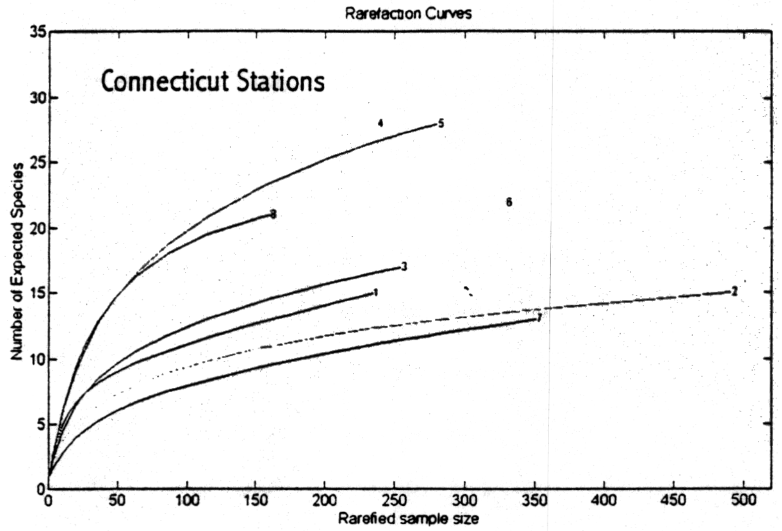

Figure 3.2.5.2-1 Rarefaction curves for benthic infaunal communities sampled in Connecticut waters along proposed ELI pipeline route, June 2001.

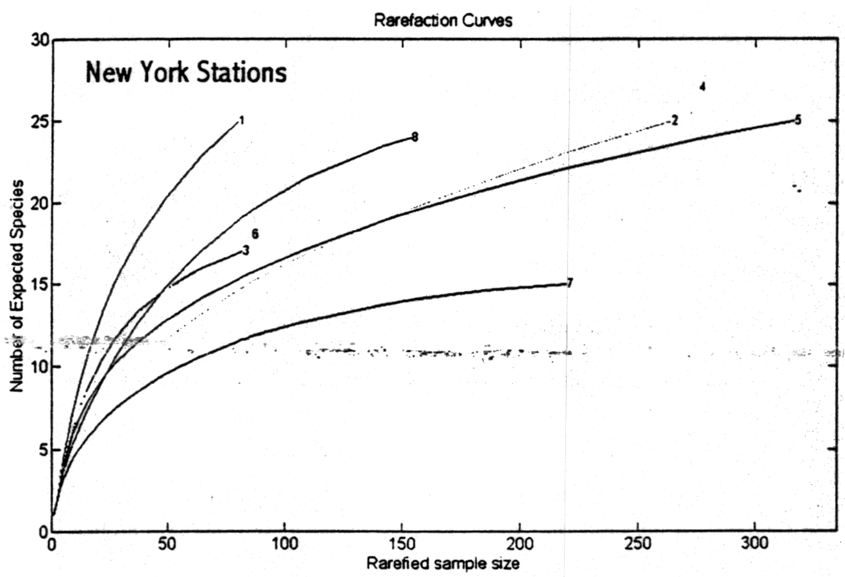

Figure 3.2.5.2-2 Rarefaction curves for benthic infaunal communities sampled in New York waters along proposed ELI pipeline route, June 2001.

3.2.6 Fish and Shellfish

Long Island Sound is home to many commercial and recreational fisheries. The following species are commonly found in large numbers in Long Island Sound, but are not necessarily found along the proposed pipeline route (see section 3.2.1, Essential Fish Habitat, for more detail).

3.2.6.1 Demersal Fish

In addition to red hake, windowpane, winter and summer flounder, and scup, which are demersal fish that were described in Section 3.2.1 (Essential Fish Habitat), the following species are found in Long Island Sound. Information, unless otherwise noted, is applicable to the entire area of Long Island Sound, not just the proposed pipeline route.

Silver Hake - *Merluccius bilinearis* (Mitchell 1814)

The essential habitat of the silver hake is concentrated in the center of Long Island Sound (NEFMC 1998) and thus potentially along the route of the proposed ELI Project.

Long-finned Squid - *Loligo pealei*

Long-finned squid are common throughout the Long Island Sound from May through November. The percentage of juveniles increases throughout the summer and peaks in September. Abundance is highest over mud bottoms, with transitional and sand bottoms ranking second and third (Gottschall et al. 2000).

3.2.6.2 Coastal Pelagic Species

The following species have been identified as coastal pelagic species that inhabit Long Island Sound: Atlantic herring, Atlantic salmon, bluefish, butterfish, striped bass, and tautog. Atlantic salmon, bluefish, and butterfish were described in Section 3.2.1 Essential Fish Habitat. Information, unless otherwise noted, is applicable to the entire area of Long Island Sound, not just the area of the proposed pipeline route.

Atlantic Herring - *Clupea harengus* (Linnaeus 1758)

Atlantic sea herring form large schools, move rapidly together, and migrate along the coast of North America. They have been reported from water ranging from -1.0 to 18°C. Adults of this species are abundant in Long Island Sound during the winter months; but eggs and spawning adults are absent and larvae are generally considered to be rare (NOAA 1994).

Striped Bass - *Morone saxatilis* (Walbaum 1792)

Along with black sea bass (*Centropristus striata*), the striped bass is an important game fish in Long Island Sound. Both species are present in the Long Island Sound only as juveniles and adults, with highest abundances in the summer.

Tautog - *Tautoga onitis* (Linnaeus 1758)

Tautog is a slow-growing resident species of Long Island Sound, frequently inhabiting rocky reefs and outcrops. All life stages are present in Long Island Sound; however, spawning adults, juveniles, larvae, and eggs are either rare or absent during the fall, winter, and early spring. Tautogs migrate to shallower waters within the Long Island Sound during the spring, and return to deeper, offshore waters in the fall. Spawning takes place during the spring and summer, peaking in the period May through June. They are caught by anglers from April to December, with peak fishing times in Long Island Sound occurring from May to June and again from October to November.

3.2.6.3 Shellfish

. Shellfisheries are common within Long Island Sound. More than 60,000 acres of shellfish grounds are cultivated in Connecticut coastal waters by the aquaculture industry. Additional waters in New York open to shellfish occur west of Matinocock Point, particularly Oyster Bay and Northport Bay. Oysters (*Crassostrea virginica*) are the dominant commercial fishery resource in the Long Island Sound, although commercial and recreational shellfishers also harvest quahogs (*Mercenaria mercenaria*), soft-shell clams (*Mya arenaria*), sea scallops (*Placopecten magellanicus*), blue mussels (*Mytilus edulis*), surf clams (*Spisula solidissima*), and razor clams (*Ensis directus*).

3.2.6.4 Lobsters

Long Island Sound lobster population supports the second most valuable commercial fishery within Long Island Sound, second only to oysters. Lobsters *(Homarus americanus)* are found throughout the Long Island Sound during all seasons. Percent occurrence ranges from 67% in April to 79% in July with highest abundances occurring on mud bottoms (Gottschall et al. 2000). Coastal lobsters are concentrated in rocky areas where shelter is readily available, although occasional high densities occur in mud substrates suitable for burrowing. It has been reported that lobsters are attracted to a disturbed bottom because it allows them to burrow into the mud (K. Chytalo, NYSDEC pers. comm.). Distribution maps prepared by the CTDEP (1998) from data collected from 1984 through 1994 show a high density of lobster east of Batons Neck in the fall. Lobster abundances are highest in eastern and central Long Island Sound.

Range of the American Lobster

The American lobster *(Homarus americanus)* is found in a wide range of habitats along the continental shelf and upper slope of the northwestern Atlantic, from Cape Hatteras, North Carolina, to the Straits of Belle Isle, Newfoundland, and Labrador. The principal depth range is from the sublittoral fringe to 50 m, but lobsters are fished to depths of 700 m on the edge of the continental shelf (Cooper and Uzmann 1971; Lawton and Lavalli 1995).

The habitat most commonly occupied by inshore lobsters is a highly textured "sand base with rock" (Cooper and Uzmann 1980) in which they can excavate burrows for shelter. Muddy areas are not preferred, but may be used if suitable substrate is not available.

Fishery

The major inshore fisheries for American lobster are found between Rhode Island and Newfoundland, but a significant fishery exists in Long Island Sound, where lobsters are fished year round in all parts of Long Island Sound (Holst, NYSDEC, pers comm.). The American lobster is considered the mainstay of commercial fishing in the Long Island Sound, and landings climbed steadily during the 1980s and 1990s. However, an unexplained die-off occurred in the fall of 1998 and continued throughout the 1999 season. Late in 1999, a parasite was identified as having infected a large percentage of the lobster population in Long Island Sound (and perhaps as far north as Maine as well) and is apparently causing the loss of a large percentage of the population.

Life Cycle of the Lobster

Larvae

The lobster has a complex life cycle that includes both planktonic (in the water column) and benthic (on the bottom) stages (Table 3.2.6.3-1). The female carries fertilized eggs for 9-12 months, then released into the water column, where the pre-larvae undergo several molts over a period of 6-8 weeks before settling to the bottom. Release of larvae typically occurs in the summer when water temperatures are highest. Release may occur as early as May, but the majority of larvae are found in the water column in late June and July. The late-stage larvae are selective in choosing the type of substrate on which they settle, and can delay settling for a short period of time if suitable substrate is not found (Ennis 1995). The larvae prefer complex substrates that would provide shelter from predators such as fish and crabs. Highly textured substrates such as rocks or cobble or *Spartina alterniflora* peat reefs are preferred (Hudon 1987, Able et al. 1988, Wahle and Steneck 1991).

Juveniles

A series of juvenile stages, separated by successive molts, begins once the lobster has settled to the bottom. The first stage, the shelter-restricted juvenile, remains confined to its burrow and feeds on plankton or items found within its shelter. The next stage, the emergent juvenile, makes limited excursions from the shelter, while the later or vagile juvenile stage makes increasingly longer, more wide-ranging excursions in search of food. These juvenile stages are sometimes referred to collectively as "early benthic phase" or EBP lobsters.

Laboratory studies on shelter usage suggest that while the earliest juvenile stage may stay in the shelter 100% of the time, emergent juveniles reduce shelter usage to 50–80% of the time, and vagile juveniles use the shelter 30–50% of the time (Lavalli et al. 1995). Close-fitting shelters are preferred, where the height is less than the width (Cobb 1971). Shelters are more important for juvenile lobsters than for adult lobsters, except during times of molting and mating (Lawton and Lavalli 1995).

Adults

Adolescent lobsters are defined as having achieved physiological but not functional sexual maturity; the adult phase begins with the onset of functional sexual maturity. Lobsters can live 30 years or more, with anecdotal information suggesting the possibility of a long life of 100 years.

Lobsters are nocturnal in nature, generally emerging from their shelters about one hour after sunset and remaining very active for the next two hours, after which they return to their own or a nearby shelter (Karnofsky et al. 1989, inter alia). Field and laboratory observations suggest that lobsters know their environment, as evidenced by their ability to immediately locate alternate shelters in the event of direct predator threat. Karnofsky et al. (1989) suggest that information gained about the environment during the foraging period is as important, if not more so, than food.

Generally, only one shelter is used at a time, but during the time period directly preceding molting, individual lobsters may occupy as many as three shelters, perhaps to enlarge territory and enhance survival during the vulnerable post-molt period (Karnofsky et al. 1989; Atema and Voigt 1995). Lobsters may occupy one shelter for as long as 9 months, including overwintering; others may move from shelter to shelter within the same general area (Karnofsky et al. 1989; Ennis 1980, 1984). Although large male lobsters can and do evict all others from their shelters, nonmating lobsters may share shelters, for example, when one animal is much larger than the other, when one or both animals have missing claws, when shelter is rare. or when water temperature is low (Atema and Voigt 1995; Lawton and Lavalli 1995).

Table 3.2.6.3-1. Life History Phases of *Homarus americanus*. (modified from Lawton and Lavalli 1995)			
Phase	**Size (mm CL)**	**Foraging Mode**	**Activity Pattern**
Larval Stages I-III	-2 -4	Raptorial	Pelagic. migrates vertically
Postlarval Stage IV	-4- 5	Raptorial/ Suspension	Settles to bottom
Shelter-restricted juvenile	-4 -14	Suspension; Browser within shelter; ambusher at shelter entrance	Recently settled, remains under cover, may have entrance spatially complex shelters
Emergent juvenile	-15- 25	Browser, ambusher	Mostly confined to shelter; limited movement outside shelter; 1-several shelters
Vagile juvenile	-25- -40 (physiological maturity)	Ambusher, pursuer, searcher	Uses 1-several shelters; more extensive movements outside
Adolescent	Physiological, not functional maturity (-50)	Pursuer, searcher	Active, Nocturnal
Adult	Functional maturity (>50)	Pursuer, searcher	Active, Nocturnal; direct fishing mortality

Feeding

Prior to settlement, postlarval lobsters feed on a wide range of planktonic organisms, including copepods, diatoms, bacteria, crustacean remains, decapod larvae, amphipods, algae, fish eggs, gastropod larvae, echinoderms, polychaetes, molluscan larvae, and insects (or insect pieces) (Herrick 1895, 1909; Wouldiams 1907; Templeman and Tibbo 1945; Harding et al. 1983; Gunn 1987; Juinio and Cobb 1992).

Information on the feeding behavior and choices of newly settled lobsters is available only from laboratory studies; no field data have been developed (Lawton and Lavalli 1995). In the laboratory, postlarval lobsters survived on plankton derived from unfiltered seawater (Emmel 1908) and on brine shrimp (D' Agostino 1980). Other studies have shown that barnacle larvae, copepods, mysids, crab zoeae and unidentified planktonic organisms up to 1 mm in size are sufficient nutrition for both post larvae and shelter-restricted juveniles (Daniel et al. 1985; Barshaw 1989; Lavalli 1991). The small size of the claws of newly settled lobsters imposes a constraint on their feeding behavior and choices; the small claws are not capable of capturing and crushing the same molluscan prey that the adult lobster pursues. The combination of relatively ineffective small claws and vulnerability to predators when outside the shelter makes it likely that newly settled postlarvae feed on particles suspended in the water column and benthic items found within the shelters (Lawton and Lavalli 1995).

The natural diet of emergent and vagile phase lobsters is better known than that of shelter-restricted juveniles. Plankton continue to be an important component of the diet, supplemented by the benthic polychaetes and amphipods found within the burrow. Juvenile lobster retain the capacity for suspension and raptorial feeding as seen in postlarvae (Lawton and Lavalli 1995), but at some point, the nutritional requirements for growth and further development are no longer being met and the lobster begins foraging outside the shelter. The diet is fairly consistent for shelter-restricted, emergent and vagile phases, being dominated by mussels, lobsters, Atlantic rock crab, gastropods and ectoprocts (Hudon and Lamarche 1989; Lawton and Lavalli 1995). Lobsters begin feeding shortly after molting and mostly eat items high in calcium for remineralization of skeleton (Weiss 1970; Scarratt 1980). Seasonal variations in the diet may reflect availability of prey, lobster size, or nutritional need related to the molt cycle (Weiss 1970; Scarratt 1980; Leavitt et al. 1979).

Stomach content analyses suggest that although the types of prey may be similar for lobsters in different stages from juvenile through adult, the relative proportions of these prey items is dependent on the size of the lobster. For example, smaller lobsters consume more hydroids, gastropods, polychaetes and brittle stars than do larger lobsters (Weiss 1970). Plant material, including eelgrass and algae, is also a consistent component of the natural diet, suggesting that it is actively selected rather than incidental in the diet (Elner and Campbell 1987). Earlier suggestions that lobsters are scavengers (Herrick 1895, 1909), unspecialized feeders (Scarratt 1980), or opportunistic carnivores (Squires 1970; Miller et al. 1971) apparently are not correct.

Mating Behavior

Mating behavior of lobsters is better known from laboratory studies than from observation of wild populations (Lawton and Lavalli 1995). In laboratory settings, adult females usually initiate and form pair bonds with dominant males, which can be recognized as those possessing especially large chelae. Females would approach the shelter of a male, and, following a sometimes elaborate courtship ritual, would occupy the shelter with the male (Atema and Voight 1995). The female molts during cohabitation; almost all mating is post-molt (Atema et al. 1979) and females may stagger their molts in order to mate with dominant males. Females can be inseminated by more than one male; conversely, a single male may mate with more than one female (Talbot and Helluy 1995).

In Long Island Sound, where warm-water conditions may last longer than in other parts of the lobster's range, growth is accelerated and sexual maturity occurs at smaller sizes, often at a size smaller than the legal harvestable size (Briggs and Mushacke 1979; Lawton and Lavalli 1995). Fertilized eggs are carried on the abdomen of the female for 9–12 months, with prelarvae are released as early as May.

Movement and Migration Behavior

Three patterns of movement have been described for lobsters. These movements include homing, defined as periodic, often daily, excursions from the shelter followed by a return to the same or nearby shelter; nomadism (or transient), defined as wandering over a large area without a defined start or end point; and migration, defined as the movement of individuals or populations over considerable distances, followed by a return to the original area (Hernnkind 1980; Lawton and Lavalli 1995).

Little information is available on the movement of emergent and vagile juvenile lobsters (Lawton and Lavalli 1995). The vagile juveniles are probably restricted to homing behavior, perhaps with a tendency towards transient behavior when seeking new shelters in response to physical or feeding requirements. Younger lobsters may move on a scale of several meters or less, while adolescent lobsters (>40-mm carapace length) may range up to 300 m (Cooper and Uzmann 1977).

In some areas of the lobster's range (Nova Scotia to the mid-Atlantic), the females migrate offshore during the colder winter months and shallow water in the summer when the eggs are ready to hatch. Such behavior has been demonstrated with tagging studies for populations in the Massachusetts bay/Georges Bank area; however, the lobsters of Long Island Sound, which belong to a different stock population, do not exhibit this migratory pattern, but remain in one area throughout their life (Briggs and Mushacke 1979, 1980).

3.2.7 Migratory Birds

Migratory birds are protected pursuant to the Migratory Bird Treaty Act of 1918 and implementing conventions with Canada, Japan, Mexico, and Russia. This act decrees that all migratory birds and their parts (including eggs, nests, and feathers) be fully protected.

There are 31 birds protected by the treaty that potentially occur in or near the project area. These protected birds include those wintering and migrating waterfowl that utilize bays along the north shore of Long island, including Greater Scaup (*Aythya marila*), American Black Duck (*Anas rubripes*), American Wigeon (*Anas americana*), Canvasback (*Aytha valisineria*), Red-Breasted Merganser (*Mergus serrator*), Mallard (*Anas platyrhynchos*), Canada Goose (*Branta canadensis*), and Bufflehead (*Bucephala albeola*).

3.2.8 Threatened and Endangered Species

The Federal government protects threatened and endangered species under the Endangered Species Act of 1973 (ESA, 16 USCA 1531-1543, P.L. 93-205), while the State of New York protects endangered species under Environmental Protection law (ECL) of New York, Section 11-0535 and 6 NYCRR Part 182 (effective 12/4/99). The Connecticut Endangered Species Act protects endangered species after the Connecticut Legislature passed Public Act 89-224 in 1989 "Establishing a Program for the Protection of Endangered and Threatened Species." Marine mammals are protected under the Marine Mammal Protection Act of 1972 (MMPA, 16 USC), as re-authorized in 1994.

Section 7 of the ESA requires a federal agency to ensure that any action authorized, funded, or carried out by the agency does not jeopardize the continued existence of a federally listed endangered or threatened species, or result in the destruction or adverse modification of the designated critical habitat of a federally listed species. The proposed ELI Project (installation of a natural gas pipeline within Long Island Sound) qualifies as such an action. Under ESA Section 7(c), the lead federal agency, in this case FERC, must prepare BA of the potential influences of its action (permitting installation of the natural gas pipeline) on listed species or their critical habitat. Depending on the conclusion of the BA, the FERC may be required to confer formally with the NMFS or the United States Fish and Wildlife Service (USFWS) regarding the project.

Critical habitat is defined in section 3(5)(A) of the ESA as "(i) the specific areas within the geographic area occupied by the species…on which are found those physical or biological features (I) essential to the conservation of the species, and (II) which may require special management considerations or protection; and (ii) specific areas outside the geographical area occupied by the species…upon a determination by the Secretary that such areas are essential for the conservation of the species." In designating critical habitat, the USFWS or NMFS must consider the requirements of the species, including: (1) space for individual and population growth, and normal behavior; (2) food, water, air, light, minerals, or other nutritional or physiological requirements; (3) cover or shelter; (4) sites for breeding, reproduction, or rearing of offspring; and generally, (5) habitats that are protected from disturbance or are representative of the historic geographical and ecological distribution of the species.

The National Marine Fisheries Service (NMFS) has the primary Federal responsibility for the conservation, management, and development of living marine resources and for the protection of certain marine mammals and endangered species under numerous federal laws. To date, Iroquois has not received a response from the NMFS regarding potential protected marine species that may occur in the Long Island Sound. This information has been derived from the Draft Environmental Impact Statement (DEIS) for the Eastchester Extension Project (FERC Docket No. CP00-232-000 and -001), which also covers the Long Island Sound. The DEIS identifies five Federally threatened or endangered marine species occurring in the Long Island Sound: the Atlantic green turtle, Kemp's Ridley turtle, leatherback turtle, loggerhead turtle, and the shortnose sturgeon. These species, their designated protective status, and areas where they occur along the pipeline route are listed below in Table 3.2.8-1.

Table 3.2.8-1. Federal and State Listed Threatened and Endangered Species Potentially Occurring Within Long Island Sound.

Species	Federal Status	State Status	Habitat and location
Federally Listed Species			
Atlantic Green Turtle (*Chelonia mydas*)	T	T	Marine-Long Island Sound
Kemp's Ridley Turtle (*Lepidochelys kempii*)	E	E	Marine-Long Island Sound
Leatherback Turtle (*Dermochelys coriacea*)	E	E	Marine-Long Island Sound
Loggerhead Turtle (*Caretta caretta*)	T	T	Marine-Long Island Sound
Shortnose Sturgeon (*Acipenser brevirostrum*)	E	E	Marine-Long Island Sound
State Listed Species			
Harbor Seal (*Phoca vitulina*)[1]	NL	SC	Marine-Long Island Sound
Harbor Porpoise (*Phocoena phocoena*)[2]	NL	SC	Marine-Long Island Sound
Protected Species[3]			
Gray Seal (*Halichoerus grypus*)	NL	NL	Marine-Long Island Sound
Harbor Seal (*Phoca vitulina*)	NL	NL	Marine-Long Island Sound
Harbor Porpoise (*Phocoena phocoena*)	NL	NL	Marine-Long Island Sound

Notes:
1 = Harbor seal protected under the ECL of New York.
2 = Harbor porpoise is a New York State species of concern
3 = Species protected under the Marine Mammal Protection Act.
Keys:
T = Threatened
E = Endangered
SC = State Species of Concern
NL = Not listed as Threatened or Endangered

3.2.8.1 Federally Listed Species

Marine Turtles

Four species of federally endangered or threatened species of marine turtles have been documented as occurring within Long Island Sound on occasion (Rusanowski 2000: CTDEP 1998). The leatherback and Kemp's ridley turtles are listed as endangered and the loggerhead and Atlantic green are listed as threatened. Historic records demonstrate the occurrence of all four species in Long Island Sound. although most data are from reports of deceased turtles washed ashore. The marine turtles found in Long Island Sound do not maintain breeding populations and their occurrence in Long Island Sound is limited to the warmer months (June through November) and their primary activity is feeding (Klemens 1993: USFWS 1997). Over the past 12-15 years. nine turtles have been stranded and recovered along the Connecticut shore of Long Island Sound. All nine of these specimens were either leatherback or loggerhead turtles (Nowojchik 1999).

Green Turtle

The green sea turtle was listed as threatened on July 28, 1978. The breeding populations off Florida and the Pacific coast of Mexico are listed as endangered while all other populations are designated as threatened. This species is distributed throughout the world's oceans between 35 degrees north and south latitude. They are found in the eastern and western hemispheres and nest on beaches throughout the Atlantic, Pacific, and Indian Oceans (Oceanic Resource Foundation 2000). This thoroughly aquatic turtle rarely comes to land except to bask, sleep, or lay eggs. Green sea turtles are primarily herbivorous, congregating near food sources – primarily sea grasses and seaweeds found just below the surface of the water, or submerged aquatic vegetation, and are found in waters of the northeast United States from June through October (USFWS 2001a). Typically, the best foraging grounds are located great distances from preferred nesting beaches, thus green sea turtles have evolved complex migratory habits (Evergreen Project 1999).

Adult green sea turtles may reach 60 in long and a mass of 482 pounds while attaining sexual maturity between 20 and 50 years (NMFS 2001a). Every second or third year, sexually mature adults migrate for great distances to their natal beaches to mate and lay eggs (Evergreen Project 1999). Total population estimates for the green sea turtle are unavailable, and trends are particularly difficult to assess because of wide year-to-year fluctuations in numbers of nesting females, difficulties of conducting research on early life stages, and long generation time. Present estimates range from 200 to 1,100 females nesting on United States beaches. The species status has not improved appreciably since its listing date in 1978 (NMFS 2001). No designated critical habitat occurs in the vicinity of the proposed project nor are any nesting beaches of the green sea turtle known to exist in Long Island Sound.

Kemp's Ridley Turtle

The Kemp's ridley turtle was listed as endangered throughout its range on December 2 1970, and its status has remained unchanged to this date often being considered the most at-risk of all sea turtles (USFWS 1992). This species is the smallest of all sea turtles with mature adults generally weighing less than 100 pounds with the straight carapace length measuring 25.5 in (NMFS 2001b). This species inhabits tropical and subtropical waters of the western North Atlantic, with adults almost exclusively restricted to the Gulf of Mexico (Marquez-M 1994). Adult Kemp's ridley turtles inhabit shallow coastal and estuarine waters feeding chiefly on portunid crabs (USFWS 1992). Neonatal individuals feed on the available sargassum and associated infauna or other epipelagic species found in the Gulf of Mexico. This species is most often found within several miles of the shore in water depths less than 165 ft (Fritts et al. 1983). Adults migrate along the coast from the Atlantic seaboard and western coast of Florida to their nesting grounds in Mexico.

Nesting occurs from April to July and is essentially limited to a single stretch of beach (Rancho Nuevo) on the northeastern coast of Mexico (USFWS 1992). Age at sexual maturity is not known, but it is believed to be approximately seven to 15 years, although other estimates of age at maturity range as high as 35 years (NMFS 2001a).

Individuals, usually two- to five-year old juveniles, are commonly found in the eastern part of New York Bight from June to October feeding on spider and green crabs. A large portion of the surviving population of this species uses the Bight annually in its development cycle, and the region is of considerable importance to the survival and recovery of the Kemp's ridley turtle. It appears that this species uses this area as a one-time juvenile development/feeding area, not returning as adults. Favorite areas include the Peconic Estuary, Gardiners Bay, and Block Island Sound (USFWS 2001b). The eastern portion of Long Island Sound is foraging habitat of considerable importance for juveniles of this species who feed on green crab (USFWS 1997). Critical habitat has not been designated nor have any known nesting beaches for this species been identified within Long Island Sound.

Leatherback Turtle

The leatherback turtle was listed as endangered throughout its range on June 2, 1970. The leatherback turtle is the largest living sea turtle, with the average adult carapace length of 61 in and weighing from 970 to 3,402 pounds (NMFS 1999). This species is distributed throughout temperate and tropical waters of the northern and southern hemispheres. This species is highly pelagic, generally approaching shores only during the reproductive season.

The leatherback turtle is well adapted to temperate climates because of its ability to thermo-regulate; thus it is one of the most widely distributed of all marine turtles. Their breeding grounds are located in the tropical and subtropical latitudes, although they are regularly seen in more temperate areas (Poland 1996). Nesting on the east coast of the United States occurs from February to July as far north as Georgia (NMFS 1999). Leatherbacks nest only on high-energy, steep shelving beaches immediately adjacent to deep water and where there are no fringing reefs. Nests are located on or just above the high-water mark.

Nesting populations of leatherback turtles are especially difficult to discern because the females frequently change nesting beaches. However, current estimates are that 20,000 to 30,0000 female leatherback turtles exist worldwide (NMFS 1999). The recovery plan for this species concluded that the nesting trends in the United States appear to be stable, but the population faces significant threats from incidental take in commercial fisheries and marine pollution.

Very little is known about the life history of the leatherback turtle from emergence to reaching sexual maturity. The leatherback turtle feeds mainly on pelagic invertebrates, such a jellyfish, tunicates, crustaceans, and juvenile fish. The feeding behavior of juveniles is unknown, but it is thought that they are pelagic and follow warm currents and eddies offshore in search of food (Poland 1996).

The leatherback turtle is a common marine species in the waters of the northeastern United States from May through November. Adult and juveniles are both found feeding in the near coastal areas, but rarely in bays, estuaries, and lagoons. This species travels to areas in the north Atlantic to feed on various soft-bodied invertebrates such as Ctenophores and jellyfish. Leatherbacks are also found at this time in the cold water areas off of Cape Cod, Massachusetts feeding on the large jellyfish, lion's mane (*Cyanea capillata*) (USFWS 2001c).

Critical habitat has been designated for this species in the Caribbean Sea. However, no such critically designated habitat or any known nesting beach of this species is known to occur in Long Island Sound or in the vicinity of the proposed pipeline.

Loggerhead Turtle

The loggerhead turtle was listed as threatened throughout its entire range on July 28, 1978, and its status has not changed since the time of its listing. This species is distributed circumglobally throughout temperate, subtropical, and tropical waters of the northern and southern hemispheres inhabiting continental shelves, bays, estuaries, and lagoons. Adults of the species inhabit the continental shelf and estuarine environments while hatchlings are pelagic, often being associated with sargassum and/or debris in pelagic drift lines (Carr 1986). Adult average size is 36 in straight carapace length, with an average weight of 300 pounds.

In the Atlantic, the loggerhead turtle's range extends from Newfoundland to as far south as Argentina. During the summer months, nesting occurs in the lower latitudes of this range. Approximately 50,000 to 70,000 nests are deposited annually on the beaches of the southeastern United States accounting for approximately 35 to 40% of the worldwide nesting population (NMFS and USFWS 1991). The primary Atlantic nesting sites of the loggerhead occurs along the southeastern coast of Florida and to a lesser degree on the high-energy beaches of barrier islands in the Gulf of Mexico, Florida's west coast, Georgia, and the Carolinas. Courtship and mating occur offshore of nesting beaches between late March and early June with nesting occurring between late May and mid September (Fritts et al. 1983).

In the spring and fall, loggerheads are concentrated south of New Jersey in the continental shelf waters, arriving in the New York Bight and Long Island Sound as early as May. Juveniles are found in coastal bays of Long Island Sound. In coastal waters, spider crabs are their dominant food item, however, they will feed on horseshoe, green, blue, and lady crabs (USFWS 2001d). Loggerheads are capable of inhabiting a variety of environments including brackish waters of coastal lagoons and the mouths of rivers. No critical habitat has been designated in Long Island Sound for this species, and similarly, no known nesting beaches of the loggerhead turtle are known to occur in Long Island Sound or in the vicinity of the proposed pipeline.

Shortnose Sturgeon

The shortnose sturgeon (*Acipensar brevirostrum*) was listed as endangered throughout its range on March 11, 1967, and its management is guided by a recovery plan under the ESA (McDaniel 2001b). This species is anadromous fish that spawns in coastal rivers along the east coast of North America from the St. John River in Canada to the St. John's River in Florida. Its preferred habitats include the nearshore marine, estuarine, and riverine habitats of large river systems. Shortnose sturgeon do not appear to make long-distance offshore migrations similar to other anadromous species the region such as shad or salmon (NMFS 2001c).

This species is found in two water bodies adjacent to Long Island Sound: the Hudson River and the Connecticut River (NYSDEC 2001; McDaniel 2001a; Thalhauser 2001). Shortnose sturgeon may be found in rivers, estuaries, and in marine waters, but populations are confined mostly to natal rivers and estuaries (NMFS 1998b). The use of saline habitat varies greatly among the northern populations of this species. In the Hudson River, adults occur both in freshwater and upper tidal saline areas throughout the year (NMFS 1998b). In the Connecticut River, adults remain in freshwater all year round, but some adults may briefly enter low salinity reaches of the river in May through June, then return upriver. Some adults have been captured in nearshore marine habitats, but this has not been well documented. Many tagging and telemetry studies in rivers throughout the species' range indicate that these fish remain in their natal river or within the river's estuary (NMFS 1998b).

Juveniles and adults are benthic (bottom) feeders, consuming a wide variety of crustaceans, bivalves, and worms. This species of sturgeon is the smallest of the three sturgeon species that may be found in eastern North America, having a maximum known total length of 56 in and a weight of 61 pounds. The maximum known age for females is 67 years, but males seldom exceed 30 years of age (NMFS 2001).

Males and females mature at the same fork length (17 to 21 in) throughout their range. However, age of maturation varies from north to south due to slower growth rates in the north. Males mature around two to three years of age in Georgia, while those in the northern population (Canada) do not reach maturity until 10 or 11 years of age. Age at first spawning in males occurs approximately one to two years after maturity, but in females is delayed for up to five years after maturity. Generally, females spawn every three years, while males spawn every year (NMFS 2001). Spawning migrations begin during the late winter to early summer, occurring later in the year at higher latitudes. Juvenile sturgeons remain in fresh water during the first summer of life and then migrate to deeper, more brackish water in the winter months. Juveniles migrate to and from freshwater for a number of years before entering the marine environment and joining the adult migration pattern.

No surveys for the shortnose sturgeon have been conducted for this project nor have any survey studies been identified within the project area. The proposed project is not located in the vicinity of the two major rivers mentioned above, so the likelihood of impacting sturgeon is unlikely and anticipated effects are expected to be minimal to none.

3.2.8.2 State Listed Species and Protected Species

Marine mammals do not regularly occur in Long Island Sound (CTDEP 1998; Iroquois 2000). However, harbor porpoises (*Phocoena phocoena*), gray seals (*Halichoerus grypus*), and harbor seals (*Phoca vitulina*) are occasionally observed within Long Island Sound during the winter months (Gilbert 2001). None of these marine mammals are currently listed and protected under the ESA, although the harbor porpoise is a federal candidate species and a New York State species of special concern. The gray seal, harbor seal, and harbor porpoise are afforded protection under the MMPA and the harbor seal is also protected under the ECL of the State of New York.

Anecdotal reports from the Mystic Aquarium in Mystic, Connecticut indicate five records of unidentified seals near the Western Long Island Sound Disposal Site, an area that is historically used for receiving dredged material (Nowojchik 1999). There have been no reports of seal strandings along the coast of Long Island Sound. In the last 12 years, only three harbor porpoises strandings have been reported along the Connecticut shore (Iroquois 2000).

3.3 Socioeconomic Conditions

3.3.1 Pipeline Infrastructure

A hazard survey was conducted from May 29, 2001 to June 15, 2001 by Thales GeoSolutions, Inc. along the entire offshore pipeline corridor and the route alternatives. This marine survey included a magnetometer survey capable of detecting any object causing a change in the local magnetic field on or below the seabed. This included ferro-magnetic objects such as pipelines, cables, debris, magnetic fields induced by electric current, and changes in the natural magnetism of the underlying rocks. In addition, sidescan sonar was used to obtain high-resolution images of the seabed surface. This instrument was able to detect foreign lines on or above the seabed. The magnetometer and sidescan surveys were correlated with the known positions of foreign lines, as reported on the NOAA charts and other sources.

The marine surveys did not detect any pipelines along the proposed pipeline route. Several communications cables were identified. The hazard survey report is provided as Volume IV.

3.3.2 Shipping and Navigation

Long Island Sound receives a high volume of vessel traffic from various sources such as commercial shipping, ferry services, sightseeing tours, and recreational boating.

3.3.2.1 Commercial Shipping

Commercial shipping vessel traffic in the vicinity of the proposed pipeline is mainly from vessels departing and arriving from the deep-water ports of New Haven and Bridgeport, Connecticut. An official vessel traffic scheme has not been developed by the U.S. Coast Guard (USCS) or any of the area Port Authorities, so in the absence of such a vessel traffic scheme, federal navigation aides and the use of standard marine safety procedures have led to the development of established traffic patterns and generalized shipping lanes within Long Island Sound (Rossiter 2001). The main shipping lane within Long Island Sound generally runs through the center of the Long Island Sound and branches off to enter the deeper-water ports (Rossiter 2001).

3.3.2.2 Ferry Service

Two year-round ferry lines operate in the vicinity of the proposed pipeline project. One ferry service operates from Bridgeport, Connecticut to Port Jefferson, New York, and the other ferry service operates from Orient Point, New York to New London, Connecticut. Neither of these ferry routes cross, or are within 10 miles of the proposed pipeline route. The Port Jefferson to Bridgeport ferry operates approximately 25 miles to the west of the proposed route while the Point Orient to New London ferry operates approximately 35 miles to the east of the proposed route.

3.3.2.3 Sightseeing Tours

Several tour companies offer sightseeing excursions in and around Long Island Sound. One popular area for sightseeing tours is the Thimble Islands, which are located in the vicinity of the proposed pipeline route. The Thimble Islands are made up of hundreds of rock outcrops in a three-mile radius of the shoreline of Stony Creek, Connecticut. Guided boat tours operate from mid-May through Columbus Day in October and depart from the Stoney Creek town docks.

3.3.2.4 Mooring Areas, Anchorage Areas, Lightering Areas, and Sub-sea Cables

National Oceanic and Atmospheric Administration (NOAA) charts (Charts 12354, 12363) were reviewed to identify any charted features that may occur in, or be impacted by, the proposed construction and operation of the ELI Project (NOAA 1984). Information was also obtained from the Connecticut Department of Transportation, Marine Division (Rossiter 2001).

A mooring area is a pile or cluster of secured piles to which a vessel may be moored to when in open water. NOAA navigation charts were reviewed to identify any mooring areas within one mile of the proposed pipeline. No mooring areas are charted within one mile of the proposed pipeline route within Long Island Sound (NOAA 1984). No impacts to mooring areas are expected to occur because of their significant distance from the centerline of the proposed route. Vessel traffic contained within the construction spread will be at a sufficient distance from this mooring area that no interference with its operations are expected before, during, or after construction is completed.

The proposed pipeline will not cross any area identified on NOAA navigational charts as designated anchorage areas (NOAA 1984, Rossiter 2001). Anchorage areas are those locations where vessels anchor or may anchor. The nearest designated anchorage area is located approximately six miles to the east of the proposed centerline (NOAA 1984, Rossiter 2001), corresponding with approximate MP 0.0. At this distance, no impacts to the anchorage area are expected and normal operations of this anchorage area are expected to occur during the construction and operation of the proposed project.

The ELI Project has been designed so as to avoid all lightering areas located within Long Island Sound. A lightering area is described as a location where an at-sea ship-to-ship transfer of petroleum products, materials, or other materials occurs (NOAA 1998e). The nearest designated lightering zone to the proposed pipeline route is the Port Jefferson lightering zone, located approximately 4.1 miles to the southeast of the proposed alignment (NOAA 1984 and 1998e). This rectangle-shaped zone is approximately three miles north of Port Jefferson, New York and corresponds to approximate MP 13.0 of the proposed route (NOAA 1984, Rossiter 2001). The USCG monitors proposed cable and pipeline projects within Long Island Sound to prevent facilities from being constructed within lightering zones.

3.3.3 Commercial and Recreational Fisheries Resources

Fishery resources contribute to the food supply, economy, welfare, health, and recreational opportunities of Long Island Sound. The Long Island Sound supports commercial and recreational fisheries values of over one billion dollars annually to the economies of Connecticut and New York. Over one million recreational fishing trips are made each year in Connecticut, while commercial fisheries harvest more than three million pounds of finfish, lobster, and squid annually from Long Island Sound (Gottschall et al. 2000).

In general, the Long Island Sound provides important habitat for a variety of fish and shellfish species. The fish assemblage in the spring is dominated numerically by winter flounder and windowpane flounder, whereas primarily warm-water pelagic migrants such as bluefish, butterfish, weakfish and warm-water demersal scup (ENSR 1999) represent the fish community in the fall. A total of 59 species of finfish were caught in 1997. The 59 species comprised 141,000 individual fish weighing a combined total of 13,000 kg.

The socioeconomic data for Long Island Sound is primarily available from the eastern and central portions of the Long Island Sound and the most complete data are compiled by the CTDEP. These data are based on Connecticut Fisheries Division Bottom Trawl Surveys, which are taken in the fall and spring. The sampling area includes all waters deeper than 5 m between New London, Connecticut, in the eastern Long Island Sound to Hempstead Harbor, New York, in the west. Unless otherwise noted, information presented here is applicable to the entire of Long Island Sound, not just the area of the proposed pipeline route.

3.3.3.1 Important Species

Winter flounder, along with the lobster, are the two most economically important resident species that utilize Long Island Sound throughout their life (Gottschall et al. 2000, NOAA 1999).