3 AFFECTED ENVIRONMENT

This chapter describes the environment that may potentially be affected by the implementation of the proposed vessel operational measures. The following areas are addressed: biological resources (including the right whale and other marine species); the physical environment; and the economic environment, with a focus on the shipping and other maritime industries. The geographical area considered spans the East Coast of the United States from Maine to northern Florida, and includes state waters (seaward from the shore to 3 nm [5.6 km]); US territorial waters (seaward from the shore to 12 nm [22.2 km]); and the US Exclusive Economic Zone (EEZ, out to 200 nm [370.4 km]). The effective distance of the proposed vessel operational measures varies. For the purposes of the proposed operational measures and this FEIS, the area under consideration is divided into the southeastern United States (SEUS), mid-Atlantic United States (MAUS), and the northeastern United States (NEUS) regions. The geographical extent of each region is described in Section 1.4 and illustrated in Figure 1-1.

3.1 The North Atlantic Right Whale

Right whales are baleen whales (also known as mysticetes) that mainly inhabit coastal and continental shelf waters. In the western North Atlantic Ocean, right whales have the following six main habitat areas, illustrated in Figure 3-1:

1. Coastal waters off the SEUS (mostly off Florida and Georgia)
2. Cape Cod Bay
3. Massachusetts Bay
4. Great South Channel (east of Cape Cod)
5. Bay of Fundy (Canada)
6. Scotian Shelf

Right whale seasonal migration patterns are relatively well documented, though some right whales, especially males and nonpregnant adult females, may not conform to the generalized model. Typically, pregnant females, females with young calves, and some juveniles (as well as a few atypical individuals) migrate seasonally, generally via near-shore waters along the eastern seaboard of the United States and Canada between calving areas located in waters off the SEUS and feeding areas located in waters off New England and the Canadian Maritime Provinces (see Figure 3-1). Peak migration periods are November/December and March/April. In waters along the US mid-Atlantic coast, right whales are generally found in waters less than 20 fathoms (36.6 m) deep (Knowlton *et al*., 2002); a large majority of sightings occur within 20 nm (37 km) of the coastline and almost all sightings occur within 30 nm (56 km) (see Section 2.3.6). Whales generally migrate alone or in mother-calf pairs. Males and nonpregnant females are sometimes observed in the calving grounds; however, where the bulk of the noncalving population spends the winter is not known. More studies are needed to fully understand right whale migration patterns and behaviors in each region.

3.1.1 Reproduction

3.1.1.1 Habitat

The SEUS region contains the only known calving and nursery area for the western stock of the North Atlantic right whale. Right whales give birth in the shallow coastal waters off the coasts of Georgia and Florida during winter. Mothers and calves are present in this area from November to April. Nearly all whales are gone from the area by mid-April, having migrated north. As many as 90 right whales have been seen in a given year in the SEUS region.

On June 3, 1994, NMFS designated waters along the Georgia and northeastern Florida coasts as right whale critical habitat (see Figure 2-1). The Northern right whale critical habitat in the Southeast includes the coastal waters between the latitudes of 31°15’ N and 30°15’ N from the coast out 15 nm (28 km) and the coastal waters between the latitudes of 30°15’ N and 28°00’ N from the coast out 5 nm (9.3 km) (50 CFR 226).

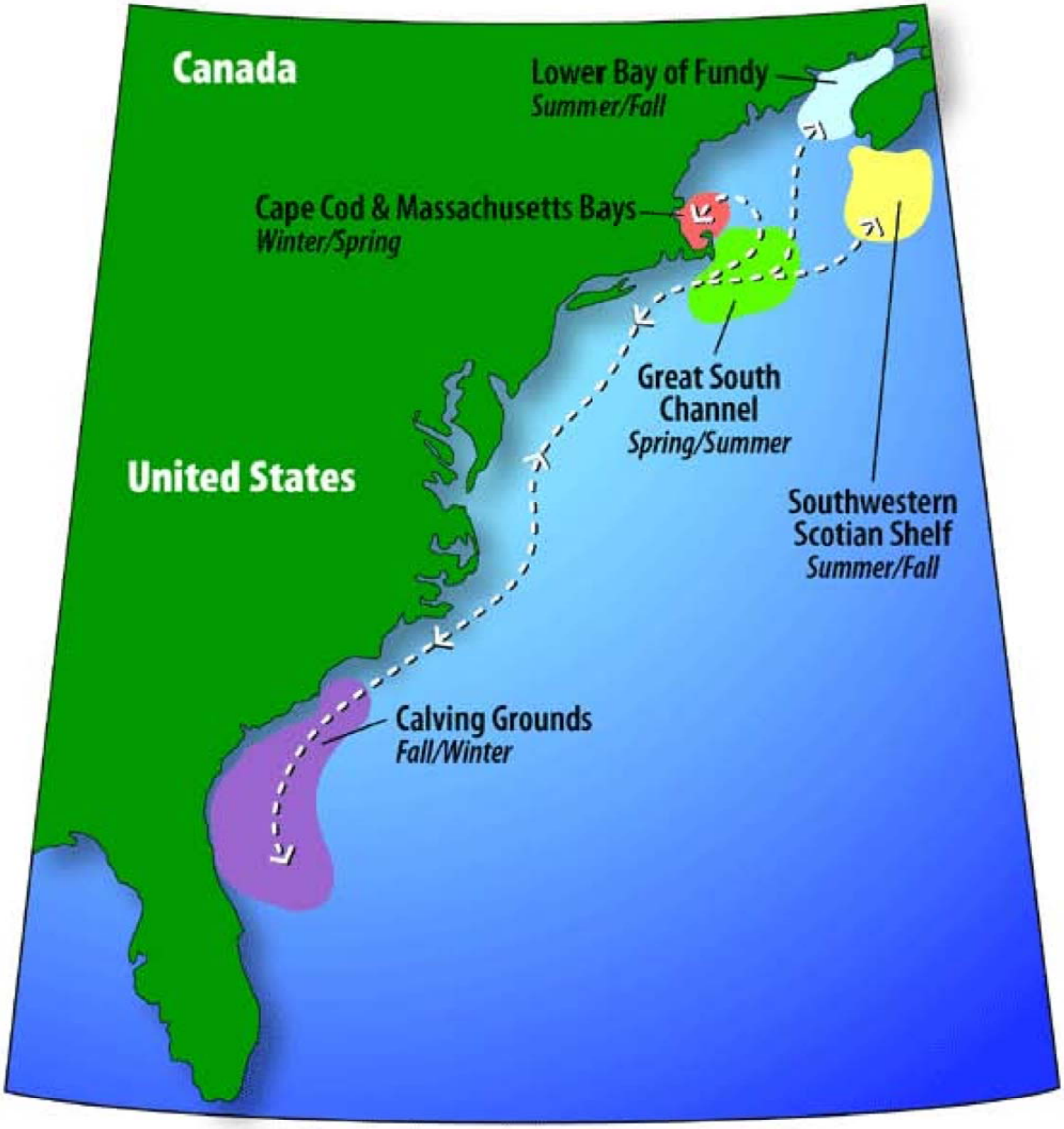
3.1.1.2 Behavior

Right whales engage in competitive mating behavior. They form mating aggregations and several males are thought to compete for a single female. The female produces vocalizations, probably to attract males, and males compete for a position adjacent to the female to gain the best chance of mating (Kraus and Hatch, 2001). It is probable that more than one male mates with a given female. Mating aggregations have been observed year-round and may serve other social purposes besides reproduction. Males have no role in raising the calf. Although mating behavior has been observed from time to time, exact breeding habitat areas are unknown.

Females usually reach sexual maturity between seven and ten years of age. About 60 percent of the current female population is estimated to be reproductively mature (Hamilton *et al.*, 1998; NMFS, 2005b). A recently-developed technique, which involves measuring estrogens, progestins, androgens, and other metabolites found in right whale fecal samples, now allows for a more accurate determination of age of sexual maturation than the traditional method, which relies on the mean age of first calving (Rolland *et al.,* 2005). Gestation lasts from 12 to 16 months. Mother and calf remain close until weaning, which generally occurs when the calf is 10 to 12 months old. Mother-calf pairs tend to remain separate from other pairs. The female then requires at least one or two years of reproductive rest to recoup the high energy investment necessary to give birth to and raise a calf (Kraus and Hatch, 2001).

The average calving interval for North Atlantic right whale females has been increasing, from 3.67 years in 1980 through 1992 (Knowlton *et al.,* 1994) to 5.8 years in 1990 through 1998 (Kraus *et al.,* 2001). In addition, calf production and recruitment (the number of calves born each year that survive and become part of the population) were low in the 1980s and 1990s. Continuation of such poor reproductive performance could present a significant obstacle to population recovery, although recent trends indicate the population may be recovering from the reproductive problems observed in the 1990s. Although the exact reasons for past poor reproductive performance are not known, an April 2000 workshop, *Cause of Reproductive Failure in North Atlantic Right Whales: New Avenues of Research*, identified factors that may contribute to it (Reeves *et al.,* 2001), including:

North Atlantic Right Whale Habitat and Migration Route



Source: E. Paul Oberlander, Woods Hole Oceanographic Institute Graphic Services

Figure 3-1

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- Environmental contaminants and endocrine disruptors
- Body condition/nutritional stress
- Genetics
- Infectious diseases
- Marine biotoxins

Right whales may be exposed to a variety of anthropogenic chemical contaminants throughout their range, which may lead to reproductive dysfunction. Theoretically, a loss of genetic diversity can lead to "inbreeding depression," whereby inbreeding adversely affects a population's reproduction and recruitment rates, although this has not been established. Genetic conditions (e.g. inbreeding, loss of biodiversity, and effective sex ratio) might be affected by external factors, including toxic chemicals and poor nutrition (Reeves *et al.,* 2001). Nutrition has an effect on the reproductive process in both sexes at many levels, including, but not limited to, sexual maturation age, sperm production, milk production, and calving intervals; therefore, poor nutrition reduces overall reproductive success (Reeves *et al.,* 2001).

Nutrition is directly related to the availability of food, which is in turn dependent on many oceanographic factors and, to a lesser extent, climate. Right whale calving rates and reproductive success are likely related to the regional abundance of the copepod (planktonic crustacean) species *Calanus finmarchicus* (hereinafter referred to as *C. finmarchicus*) (Greene and Pershing, 2004). Competition for food with other species and climate variability decrease food availability and reduce calf production (Kraus *et al.,* 2001).

The North Atlantic Oscillation (NAO) is a complex climatic phenomenon in the North Atlantic Ocean particularly associated with fluctuations of climate between Iceland and the Azores. It is characterized predominantly by cyclical fluctuations of air pressure and changes in storm tracks across the North Atlantic. The NAO index measures the difference in sea-level pressure between the subtropical high (Azores) and the subpolar low (Iceland). During a positive phase[1] in the NAO index during the 1980s, continental-slope water temperatures were warmer than average in the Gulf of Maine and *C. finmarchicus* was relatively abundant. Modeling studies indicate that the stable calving rates of right whales in the 1980's were related to the high abundance of *C. finmarchicus* during that time (Greene *et al*., 2003). A subsequent decrease in the NAO index in the mid-1990s resulted in low *C. finmarchicus* abundance and coincided with declining calving rates from 1993 to 2001 (Greene *et al*., 2003).

This declining calf production in the past has been observed only in the North Atlantic right whale, not other baleen whales (NMFS, 2005a). Even among right whales, it is variable, like the factors thought to influence it. Annual observed calf production was relatively low from 1993 to 2000, averaging around 12 calves (Greene *et al*., 2003). After 2001, calf production increased, although it remained variable: 31 in 2001, 21 in 2002, 19 in 2003, 16 in 2004, 28 in 2005 (Kraus *et al.,* 2005), and 19 in 2006 (Right Whale News, 2007). During this period, calf production averaged more than 22 calves per year, and the average calving interval for adult females declined to close to its lowest recorded level (Kraus *et al*., 2007).

[1] A positive phase occurs when subtropical pressures are higher than normal and subpolar pressures are lower than normal, resulting in above average temperatures in the eastern United States (http://www.cpc.ncep.noaa.gov/data/teledoc/nao.shtml).

The recent increase in births has been partially offset by the observed increase in the estimated rate of human-caused mortality and serious injuries: this rate was 3.8 per year for the period from 2002-2006 (Glass *et al*., 2008), a marked increase from previous estimates: for the five-year period 1999 to 2003, the average rate was 2.6 right whales per year; for the five-year period 2000 to 2004, the rate was 2.8; and from 2001 to 2005, the rate was 3.2 (NMFS, 2005f; NMFS, 2006; Waring *et al*., 2007; Nelson *et al.*, 2007). Since pregnant females and reproductively-mature adults account for several of the recent mortalities, this upward trend may have serious, long-term ramifications for the population of right whales.

3.1.2 Feeding

Like most mysticetes, right whales fast during the winter calving season and feed predominantly during spring, summer, and fall. They may also feed opportunistically while migrating (NMFS, 2003c).

3.1.2.1 Prey

Right whales primarily feed on *C. finmarchicus,* a type of copepod, one of the small-to-microscopic organisms that compose zooplankton. Right whales feed by filtering water through their baleen. Right whales target an older copepodite stage of *C. finmarchicus* – fifth copepodite (Baumgartner *et al*., 2003) – which at certain times of the year is generally resting (referred to as being in the diapause state) in deep waters (Sameoto and Herman, 1990; Miller *et al*., 1991). Although *C. finmarchicus* aggregate at particular depths, they can occur throughout the water column. Optimal right whale foraging is dependent on the location of dense prey patches.

3.1.2.2 Habitat

From late winter to early fall, North Atlantic right whale distribution tends to correspond to the location of *C. finmarchicus*, which is found mostly in temperate to subarctic waters. Major feeding areas are in waters off New England and the Canadian Maritime Provinces in spring and early summer, where particularly dense patches of prey occur, including:

- Cape Cod Bay (late winter)
- Great South Channel (spring and summer)
- Bay of Fundy (summer and early fall)

Because these feeding grounds are essential to right whale survival, NMFS designated the areas in US waters as right whale critical habitat on June 3, 1994 (50 CFR 226). Two critical habitat areas were defined, one including the Great South Channel and the other encompassing portions of Cape Cod Bay and Stellwagen Bank (see Figure 2-12). The Great South Channel critical habitat is bounded by the following coordinates:

41° 40’ N	069° 45’ W
41° 00’ N	069° 05’ W
41° 38’ N	068° 13’W
42° 10’ N	068° 31’W

The Cape Cod Bay critical habitat is bounded on the south and east by the interior shoreline of Cape Cod and on the north and west by the following coordinates:

42° 04.8’ N	070° 10’ W
42° 12’ N	070° 15’ W
42° 12’ N	070° 30’ W
41° 46.8’ N	070° 30’ W

While whales have been sighted year round in Cape Cod Bay, the peak period of feeding in that area is from January to May. Roughly one-fourth of the entire right whale population utilizes Cape Cod Bay during this time (Brown *et al*., 2002) and more individuals enter Cape Cod Bay as the season progresses. Mean individual residency in Cape Cod Bay was 32 days from 1998 to 2001, 18 days in 2002, 20 days in 2003, and 26 days in 2004 (Standard Error [SE] ± 18) (Mayo *et al*., 2004). While these numbers are representative of the general residency of right whales in Cape Cod Bay, gaps in sighting records of certain individuals indicate that some whales travel in and out of Cape Cod Bay during winter and spring (Mayo *et al*., 2004).

Whales primarily concentrate in the eastern part of Cape Cod Bay; as the season progresses, aggregations are seen in the central and southern portions and, to a lesser extent, in the western part as well. Distribution and residency within the bay are related to the presence and abundance of *C. finmarchicus*. Costa *et al*. (2006) studied environmental factors in Cape Cod Bay and how these factors affected zooplankton and right whale abundance in the bay from 2000 to 2003. The authors suggested that limited use and short residency time of whales in Cape Cod Bay in 2002 resulted from a change in wind and ocean circulation patterns that resulted in a low density of *C. finmarchicus.* Studies such as this are helpful in both determining past anomalies and predicting future distribution in an important feeding habitat. This type of research is especially pertinent in areas like the Cape Cod/Massachusetts Bay and the Gulf of Maine, where right whales spend about one-third of their feeding time at the surface, which may increase the risk of ship strikes and entanglements from buoy lines and surface-system lines.

From Cape Cod Bay, right whales tend to move to the feeding grounds in the Great South Channel, the northern Gulf of Maine, and other areas via the Off Race Point area. While in the Great South Channel (April to July, with occasional appearances year-round), right whales spend approximately 10 percent of their time feeding at the surface and 90 percent feeding at lower depths (Goodyear, 1996). Concentrations of whales feeding in the Great South Channel may extend into the northern edge area of Georges Bank as well. Feeding areas of sporadically-high or semi-regular use in the Gulf of Maine include areas near the entrance to Portland, Maine, such as Platts Bank, Jeffreys Ledge, and Cashes Ledge. In late summer and fall, adult males typically feed along the Scotian Shelf (Browns and Baccaro Banks) of Canada, while mother-calf pairs and juveniles are more likely to be found feeding in the Bay of Fundy (Figure 3-1) (Perry *et al.,* 1999). One-third of the females do not utilize the Bay of Fundy feeding grounds, which suggests that there are still unidentified feeding grounds (Schaef *et al.,* 1993). Right whales spend a significant amount of time feeding at depth in the Bay of Fundy, where most *C. finmarchicus* aggregate just above the bottom mixed layer (a temperature/salinity gradient) (Baumgartner and Mate, 2003).

While the majority of right whales feeding in the Northeast occur in areas with high abundance of *C. finmarchicus*, there is an exception in the deep basins of the Gulf of Maine. A study of satellite-tagged right whales in the lower Bay of Fundy during 1989 to 1991 and in 2000 found that the tagged animals did not frequent the deep basins of the Gulf of Maine and Scotian Shelf, even though copepods are thought to be abundant at these locations (Baumgartner and Mate, 2005). This is probably because the whales would have to feed at very great depths there (below 200 m [656 ft]), and deeper dives make for shorter feeding times and less energetic benefit per dive than dives in shallower waters (Baumgartner and Mate, 2005).

3.1.2.3 Feeding Behavior

Right whales use their baleen (long plates of keratin and hair attached to the upper jaw) to filter food from the mouthfuls of water and prey they collect and then expel. Whales obtain most of their food energy (91.1 percent) by feeding during long dives and the remainder (8.9 percent) through surface feeding (Goodyear, 1996). Surface-feeding right whales skim-feed by swimming slowly along the surface with their mouths open, collecting dense batches of prey. When right whales dive to feed, they go down to depths ranging from 10 m (32.8 ft) to more than 100 m (328 ft).

When prey is located, the whale typically meanders through the area to gather as much food as possible. Although the practice of foraging while submerged consumes more energy than skim-feeding, deeper-water copepods are more abundant, have higher caloric content, and are less active than surface ones (Baumgartner *et al.,* 2003). Longer intervals at the surface between foraging dives have been observed in reproductively active females and their calves, which makes them more susceptible to ship strikes (Baumgartner and Mate, 2003). Feeding at the surface may also increase exposure to toxins.

A study conducted in the Grand Manan Basin in the Lower Bay of Fundy, a late summer feeding ground, examined levels of paralytic shellfish poisoning (PSP) toxins in *C. finmarchicus* (Durbin *et al.,* 2002). During this study, the right whales were feeding at depth, and thus had a lower toxin intake than if they had been feeding on surface aggregations of *C. finmarchicus,* which have higher PSP toxin levels than those occurring at depth (Durbin *et al.,* 2002). Ingesting large amounts of prey that contain PSP toxins can cause neuropathology, respiratory difficulties, and impaired diving capabilities. Since copepods are more abundant at depth, diving limitations may affect their ability to ingest enough prey to meet their caloric requirements.

Right whales usually feed alone, although several individuals may feed simultaneously in the same general area of dense prey patches. Given that other species have similar diets, some competition for prey may exist with species such as the sei whale and some planktivorous fish species (NMFS, 2003b). In fact, this scenario may influence the departure of right whales from their feeding habitat in the southern Gulf of Maine for their summer feeding grounds in Canadian waters. Payne *et al*. (1990) hypothesized that the abundance of planktivorous fish, such as sandlance, which also feed on *C. finmarchicus,* is inversely related to the abundance of right whales. That is, when sandlance in Stellwagen Bank are sparse, copepods are more abundant, and more right whales are present to feed on them. Conversely, if sandlance are abundant, and right whales are competing for copepods, the whales may move to other feeding grounds (Payne *et al*., 1990).

3.1.3 Socializing

Right whale socializing behavior typically involves surface activities during which whales may be in physical contact with each other. The collection of individuals taking part in this type of behavior is known as a surface active group (SAG) and usually involves a single adult female (or focal female) surrounded by up to 34 (but typically fewer) males maneuvering to approach her. Vocalizations are common and may include calls by the focal female to attract males and increase competition for mating (Kraus and Hatch, 2001). Socializing behavior can include turning, rolling, and lifting flippers into the air.

Social activities may increase the risk of entanglement with fishing gear or of a ship strike. Being heavily engaged in, and intent on, a particular activity such as socializing or mating likely reduces whales' awareness of external threats, thereby increasing their vulnerability to oncoming ships. On the other hand, the size of the aggregation may also increase the probability that a mariner will spot the whales and take appropriate action to avoid a strike.

3.1.4 Diving Behavior

Because of their high lipid content and relatively large amounts of blubber, right whales are positively buoyant (Nowacek *et al.,* 2001). Combined with slow swimming, this buoyancy hinders rapid descents, which could be a factor in right whale vulnerability to ship strikes. On the other hand, the same buoyancy allows for ascents with little or no energy expenditure, since the animal naturally floats toward the surface. This may also contribute to ship strikes because a whale may have difficulty either aborting or modifying a free ascent (Nowacek *et al*., 2001).

3.1.5 Vocalization

Vocalizations by North Atlantic right whales (thought to be similar to those by southern right whales) differ in frequency depending on the type of call and the behavior associated with the call. Right whales are quite vocal during mating, foraging, and social activities. Vocalizations are typically moans and pulsed calls, with most signal energy under 400 hertz (Hz) (Watkins and Schevill, 1972 *in* Wartzok and Ketten, 1999). One of the more common sounds made by right whales is the "up call," a frequency-modulated upsweep in the 50–200 Hz range (Mellinger, 2004).

In a study on vocalization rates of North Atlantic right whales in Cape Cod, Great South Channel, and the Bay of Fundy, several types of right whale sounds were recorded using a towed hydrophone array and digital acoustic recording tags (DTAGs) (Matthews *et al*., 2001). "Moans" ranged from a frequency of 50 to 500 Hz, lasted 0.4–1.5 seconds, and varied in amplitude. "Gunshots" were broadband and impulsive (Parks *et al*., 2005) and similar to the southern right whale's "slaps" (Clark, 1982; 1983 *in* Matthews *et al*., 2001). Low-frequency calls had a constant frequency, around 60–80 Hz, and durations from 0.5 to 10 seconds. Moan rates (per aggregation per hour) were related to the size of aggregations: groups of 10 or more whales had the highest rates (~70–700/hr), followed by groups of less than 10 whales, with moan rates of < 60/hr; individuals rarely produced moans (<10/hr) (Matthews *et al*., 2001).

A 2005 study recorded six major call types within a SAG: scream, gunshot, blow, upcall, warble, and downcall (Parks and Tyack, 2005). When SAGs form, as described in Section 3.1.3, females call frequently and males have been observed to produce gunshot-like sounds (Parks, 2003). These sounds have also been recorded emanating from whales that are alone without appearing to attract other whales (Parks, 2003). The focal female in a social group produces calls at frequencies of 400 Hz and higher that last 0.5–2.8 seconds at an average rate of about 12 per minute (Kraus and Hatch, 2001). These vocalizations are thought to be a mating call from the females to males within an audible distance. Mothers and calves vocalize while the mother is feeding away from the calf; these calls are known as “contact calls” (Reeves, 2000).

Other research techniques, such as passive acoustic methods (i.e., listening/recording devices, as opposed to “active” methods, like sonar) are being employed to detect whale calls and establish long-term monitoring of a specific area. Passive acoustic technology may be a viable management tool to determine the presence of right whales through recording vocalizations; scientists at Cornell University are currently working with this type of technology. Ten autonomous recording devices or ‘pop ups’ were deployed throughout Stellwagen Bank National Marine Sanctuary in 2006 to record the presence or absence of right whales. The purpose of this study is to determine the occurrence and distribution of the whales, in support of the effort to modify the Boston Traffic Separation Scheme (TSS). While this method may eventually shape certain ship-strike policies, additional research is required before it can be effectively utilized to predict right whale distribution and gather real-time monitoring information that may aid in reducing ship strikes.

3.1.6 Hearing

3.1.6.1 Hearing Characteristics

Although it has not been tested by developing an audiogram, it is generally accepted that right whale hearing is in low frequencies, consistent with the ranges of other mysticetes (baleen whales), whereas odontocetes (toothed whales) vocalize and hear in high frequencies (Ketten, 1998). The assumption that right whales hear in low frequencies is based on ear structure and inferences from vocalization characteristics. A preliminary model based on inner ear anatomy indicates that right whale hearing may be in the range of 10 Hz – 22 kilohertz (kHz) (Parks *et al.*, 2007).

If there were no anthropogenic sources of noise in the ocean, then whales might be able to hear sounds from other whales and vocalize more effectively. However, many human activities (including the operation of large vessels) are sources of noise in the same low-frequency ranges mysticetes use, which may interfere with their hearing and communication (Koschinski, 2002).

Research has been conducted on the effects of vessel and industrial noise on certain species of large whales (NMFS, 2003b), but there are still unknowns about right whale hearing capacities. While right whales likely are able to hear some anthropogenic sounds, they may not hear high-frequency sounds, such as the noise made by propellers (Terhune and Verboom, 1999).

A right whale’s ability to detect an approaching vessel is related to a variety of factors, including bottom reflections, the frequency of the noise, the location of the whale with respect to the vessel, and its depth in the water column. Multipath propagation of vessel noise may confuse the whale as to the direction the ship is headed because low-frequency sounds can be difficult to localize. Ships generate higher noise levels toward the stern than near the bow, and even louder noises directly under the ship, so the chances of detection are greater behind the ship than in front. Ship noises are not as loud near the surface as they are 5 to 10 meters beneath it because the water surface reflects sound waves (Terhune and Verboom, 1999). This is known as the Lloyd mirror effect. The Lloyd mirror effect is stronger in the low-frequency range, in calm sea states, and when the source and/or receiver are near the surface (Richardson *et al*., 1995). Therefore, in certain conditions, a whale might be less likely to hear a vessel when the whale is at or near the surface, which is precisely the location where it is also at a high risk of being struck.

3.1.6.2 Masking and Habituation

Ambient noise, or underwater noise sources, including that produced by human activities (e.g., dredging, shipping, seismic exploration, and drilling for oil), may interfere with the ability of a marine mammal to detect sound signals, such as calls from other animals (Richardson *et al.,* 1995). This effect is known as masking. Some mysticetes may alter communication frequencies to reduce masking (Richardson *et al*., 1995).

Masking may reduce the likelihood of a right whale detecting and avoiding an approaching vessel because the animal may not be able to distinguish the sound of the approaching ship from surrounding ambient noise; however, this hypothesis has not been tested. Areas where there is continuous loud distant noise from shipping may mask the sound of individual ships until they are too close for the whale to avoid a strike (Terhune and Verboom, 1999), increasing right whales' susceptibility to such incidents. It may also be that initially, vessel noise was mostly a masking issue for whales, preventing them from locating the sound of an individual, approaching ship. Subsequently, the animals may have become habituated to the noise, to the point where they no longer react to it, a phenomenon known as habituation.

3.1.6.3 Behavioral Reactions

Aside from masking and habituation, other factors may interfere with a whale's ability to respond to approaching vessels. Although right whales should, in theory, be able to hear vessels, they do not always appear to avoid them. Yet Parks (2003) established that whales have the ability to locate a sound and even remember where it originated from, for around 20 minutes after the sound stops. However, a whale must perceive a ship as a threat to avoid it (Watkins, 1986), and unless a given individual has had a previous close encounter with a ship, survived, and learned the threat, the urge to avoid a ship may not be great.

One study utilized a DTAG to record whale behavioral reaction to an alert signal, vessel noise, other whale social sounds, and a silent control (Nowacek *et al.,* 2004). The whales did not have a significant response to any of the signals other than an alert signal broadcast ranging from 500 to 4,500 Hz. In response to the alert signal, whales abandoned foraging dives, began a high power ascent, remained at the surface for the duration of the exposure, or spent more time just below the surface, at depths of 3–33 ft (1–10 m) (Nowacek *et al.,* 2004), also the draft range of most large vessels. This increased time just below the surface could substantially increase the risk of a ship strike because whales at this depth are not visible, and, are therefore more susceptible to being struck. The consequences of the whales' response to the alert signal, aside from the increased risk of a ship strike, are reduced foraging time and an excess use of energy, which is a problem for an endangered species. The whales' lack of response to a vessel noise stimulus from a container ship and from passing vessels indicated that whales are unlikely to respond to the noise made by an approaching vessel even when they can hear it (Nowacek *et al.,* 2004). A second study (Johnson and Tyack, 2003) utilizing a DTAG yielded similar results. Playback of recordings of a tanker elicited no response from a tagged whale 1,970 ft (600 m) away. As previously noted, lack of response may indicate an inability to detect; habituation; failure to perceive the noise as a threat; or some unknown factor, since the reasons for the right whales' susceptibility to ship strikes has not been firmly established.

3.1.6.4 Effects of Ocean Noise on Cetacean Hearing

The potential effects of noise on cetacean ears range from tissue damage to a reduction in hearing sensitivity. Although neither effect would be expected to occur as a result of vessel noise, this section provides a brief description of hearing sensitivity so the reader is aware of the full range of the effects of loud noise on cetaceans.

Exposure to certain high-intensity underwater noises (e.g., SONAR) can cause a reduction in hearing sensitivity in cetaceans. This change in the hearing threshold can either be temporary, in which case it is referred to as temporary threshold shift (TTS), or permanent, referred to as permanent threshold shift (PTS) (ICES, 2005; Kastack *et al*., 2005). Neither TTS nor PTS has been recorded in mysticetes and is usually extrapolated. TTS generally results from high-intensity, acute noises and is unlikely to be caused by the low-frequency noise generated by vessels.

3.2 Other Marine Species

This section provides information on marine species whose ranges coincide with that of the right whale. Marine species and habitats that have no potential to be noticeably affected by the proposed vessel operational measures are not addressed. This includes several marine mammals that, although protected under the general provisions of the MMPA, are not considered depleted, such as:

- Atlantic spotted dolphin (*Stenella frontalis*)
- Pantropical spotted dolphin (*Stenella attenuata*)
- Spinner dolphin (*Stenella longirostris*)
- Harbor porpoise (*Phocoena phocoena*)
- Bryde's whale (*Balaenoptera edeni*)
- Short-beaked common dolphin (*Delphinus delphis*)
- Cuvier's beaked whale (*Ziphius cavirostris*)
- Minke whale (*Balaenoptera acutorostrata*)
- Killer whale (*Orcinus orca*)
- Short-finned pilot whale (*Globicephala macrorhyncus*)
- Long-finned pilot whale (*Globicephala melas*)
- Pygmy sperm whale (*Kogia breviceps*)
- Dwarf sperm whale (*Kogia sima*)
- Risso's dolphin (*Grampus griseus*)
- Harbor seal (*Phoca vitulina*)

Essential fish habitat (EFH) is another marine resource that has no potential to be affected by the proposed action. Most designated EFH is subsurface and beyond the range of any potential impacts from the proposed measures. Similarly, plankton, as well as benthic (bottom-dwelling), demersal (living near the bottom) and other species and habitats found beyond the range of any potential effects from the proposed measures are not addressed.

3.2.1 Protected Marine Mammals

Threatened, endangered, and depleted[2] species of marine mammals are protected under the ESA and MMPA. These species are listed in Table 3-1.

Like the right whale, a number of these marine mammal species are affected by ship strikes. The species known to be most commonly struck are the fin whale and the humpback whale, but there are also records of ship strikes to gray, minke, sperm, southern right, blue, Bryde's, sei, and killer whales. Most reported ship strikes involving large whales worldwide occur in the western North Atlantic and mid-Atlantic, but it is important to note that these conclusions are drawn from a database that does not constitute a random sample (Jensen and Silber, 2003). Most reported large-whale ship strikes result in death (Jensen and Silber, 2003).

Table 3-1
Domestic Depleted and ESA-listed Marine Mammal Stocks Occurring in or Near the Western Range of the North Atlantic Right Whale

Common Name	Scientific Name	Status*
Blue whale	*Balaenoptera musculus*	E
Fin whale	*Balaenoptera physalus*	E
Humpback whale	*Megaptera novaeangliae*	E
Sei whale	*Balaenoptera borealis*	E
Sperm whale	*Physeter macrocephalus*	E
West Indian manatee	*Trichechus manatus*	E
Bottlenose dolphin (US mid-Atlantic coastal migratory stock)	*Tursiops truncatus*	D

* E = endangered; D = depleted.
Sources: NMFS, 2004c; United States Fish and Wildlife Service (USFWS), 2004.

3.2.1.1 Blue Whale

The blue whale (*Balaenoptera musculus*) is the largest of the baleen whales. Blue whales are listed as endangered under the ESA and are protected under the MMPA. They are found worldwide and are separated into North Atlantic, North Pacific, and Southern Hemisphere populations. The blue whale has been subdivided into three subspecies: *B. musculus intermedia*, found in Antarctic waters; *B. musculus musculus* in the Northern Hemisphere; and *B. musculus brevicauda* (the "pygmy" blue whale) in the southern Indian Ocean and southwest Pacific Ocean.[3]

[2] A depleted species is defined in the MMPA as a species or population stock that is below Optimum Sustainable Population (OSP) or if the species or population stock is listed as an endangered or threatened species under the ESA (16 U.S.C. 1362).
[3] http://www.nmfs.noaa.gov/pr/species/mammals/cetaceans/blue_whale.doc

The pre-exploitation population size of the North Atlantic blue whale ranged from 1,100 to 1,500 individuals; estimates of current population range from 100 to 555 whales. The current minimum population estimate for the western North Atlantic stock is 308 whales. The distribution of blue whales in the western North Atlantic ranges from the Arctic to at least mid-latitude waters (NMFS, 2005c). This species primarily feeds north of the Gulf of St. Lawrence during spring and summer. Blue whales are pelagic, so they are primarily found in deep, offshore waters and are rare in shallow shelf waters. Blue whales have been killed or seriously injured by ship strikes; one occurrence was recorded in the North Atlantic in 1998 and several in California in the early 1990s.

3.2.1.2 Fin Whale

The MMPA stock assessment report (SAR) for the fin whale recognizes one stock in the US North Atlantic (western North Atlantic) and three stocks in the North Pacific (California, Oregon, and Washington) (NMFS, 2006). The species is listed as endangered under the ESA. Fin whales range from the Arctic to the Greater Antilles. The minimum population estimate for the western North Atlantic stock is 2,362; the best population estimate for this stock in is 2,814 individuals, based on a 1999 shipboard and aerial survey of waters from Georges Bank to the mouth of the Gulf of St. Lawrence (Waring *et al.,* 2001). Fin whales occur widely in the mid-Atlantic throughout the year, with concentrations from Cape Cod north in summer and from Cape Cod south in winter, and are typically associated with the continental shelf and continental shelf edge. The New England coast is a major feeding ground for fin whales from spring to fall. It is assumed that fin whales breed in the middle North Atlantic, with mating and calving occurring from November to March; however, the location of their wintering grounds is poorly known. Fin whales are one of the species most frequently involved in ship strikes; the average observed annual mortality due to ship strikes is 1.0 fin whale per year for the period 2000-2004 (NMFS, 2006).

3.2.1.3 Humpback Whale

The humpback whale (*Megaptera novaeangliae*) is a mid-sized baleen whale. Humpback whales were listed as endangered under the ESA throughout their range on June 2, 1970 and as such, are considered depleted under the MMPA. It is estimated that there are fewer than 7,000 humpbacks in US waters. The best population estimate for the Gulf of Maine stock is 902 individuals; the minimum estimate is 647 whales (NMFS, 2005c). The four recognized stocks of humpback whales in the United States (based on geographically-distinct winter ranges) are: the Gulf of Maine stock (previously known as the western North Atlantic stock); the eastern North Pacific stock (previously known as the California-Oregon-Washington stock); the central North Pacific stock; and the western North Pacific stock (NMFS, 2003b). The humpback whale is found worldwide in all ocean basins, though it is less common in Arctic waters. Humpback whales migrate seasonally. In the winter (the breeding season) most humpback whales are found in temperate and tropical waters of both hemispheres. In the summer (the feeding season) most are in waters of high biological productivity, usually in higher latitudes. There are 44 records of vessel collisions with humpback whales from 1975 to 2002 (Jensen and Silber, 2003), and many more in 2005 and 2006. From 2000 through 2004, the annual anthropogenic rate of mortality and serious injury was 3.0 (NMFS, 2006).

3.2.1.4 Sei Whale

For management purposes, there are two stocks of sei whales (*Balaenoptera borealis*): the Labrador stock and the Nova Scotia stock. Only the latter is considered here. The range of the Nova Scotia stock includes the continental shelf waters of the northeastern United States and extends northeastward to south of Newfoundland (NMFS, 2003b). The population size of sei whales in US North Atlantic waters is unknown. During the feeding season, sei whales are found at the northern limit of their range, in Nova Scotia. In the spring and summer, they occur in the southern end of their range, which includes the Gulf of Maine and Georges Bank (NMFS, 2003b). The sei whale typically occurs in deep waters characteristic of the continental shelf edge region (Hain *et al*., 1985 *in* NMFS, 2003b). They primarily feed on euphausiids and copepods, and have been known to travel to inshore feeding habitats in years of abundant copepods. These areas are late-summer feeding grounds for right whales as well. Sei whales in the western North Atlantic occasionally suffer from ship strikes, although records are fewer than for other large whale species such as humpback and fin whales, perhaps because of their offshore distribution. NMFS' stranding and entanglement records from 1997 through 2001 yield an average of 0.2 mortalities of sei whales per year as a result of recorded ship strikes in New York in 2001 and Boston in 1994. A similar review of records from 1999 to 2003 indicated an increase in the number of mortalities to 0.4 per year as a result of ship strikes. The second ship strike during this period occurred outside of Norfolk Naval Base in Virginia (NMFS, 2005f).

3.2.1.5 Sperm Whale

Sperm whales (*Physeter macrocephalus*) are the largest of the odontocetes (toothed whales). Sperm whales are found throughout the world's oceans in deep waters between about 60°N and 60°S latitudes. They are highly social animals. The basic social unit consists of a mixed group of adult females, calves, and some juveniles – usually 20 to 40 individuals in all. They prey on large mesopelagic (living at depths of 660 to 3,280 ft [200 to 1,000 m]) squid, other cephalopods (e.g., octopus), demersal (living near the bottom), and occasionally benthic (bottom-dwelling) fish. Sperm whales are capable of diving to depths of more than 3,280 ft (1,000 m) for durations of more than 60 minutes.

There are five stocks of sperm whales, the North Atlantic stock being the only one that overlaps geographically with the right whale. In winter, sperm whales from this stock tend to concentrate east and northeast of Cape Hatteras. In spring, the center of distribution shifts northward to areas east of Delaware and Virginia and the whales are found throughout the central portion of the mid-Atlantic and in the southern portion of Georges Bank. In summer, sperm whales occur east and north of Georges Bank, into the Northeast Channel region and the continental shelf (inshore of the 328-ft [100-m] isobath) south of New England, where they are most plentiful in the fall (NMFS, 2003b).

The minimum population estimate for the western North Atlantic sperm whale stock is 3,539 individuals; the best estimate is 4,804. The sperm whale was listed as endangered under the ESA throughout its range on June 2, 1970 and is also protected under the MMPA. There is a potential for sperm whales to be killed or seriously injured by ship strikes. In May 1994, a sperm whale was involved in a ship strike south of Nova Scotia and in May 2000, a merchant ship reported a ship strike in Block Canyon, New Jersey (NMFS, 2005c). From 1999 through 2003, the annual anthropogenic rate of serious injury and mortality was 0.4 (NMFS, 2005f).

3.2.1.6 West Indian Manatee

The West Indian manatee is divided into two subspecies: the Antillean manatee (*Trichechus manatus manatus*) and the Florida manatee (*Trichechus manatus latirostris*). Only the latter is considered here. The Florida manatee is listed as endangered under the ESA and thus is considered depleted under the MMPA. It occurs mainly in waters off the coasts of Florida but has been known to occur in southeastern Georgia and even Virginia to the north and Louisiana to the west. In winter, manatees are generally found in south Florida, though some have also been known to winter further north in naturally and artificially warm waters.

The exact population size of Florida manatees is unknown but the minimum population is estimated at 1,822 animals, based on intensive statewide winter aerial surveys at warm-water refuges coordinated by the Florida Department of Environmental Protection in early February of 1995 (United States Fish and Wildlife Service [USFWS], 2000). Anthropogenic causes of death include collisions with large and small boats; crushing by barges and flood gates/canal locks; entanglement in nets and lines; entrapment in culverts; poaching; and entanglement in, and ingestion of, marine debris. From 1974 through 1994, 2,456 manatee carcasses were recovered in the southeastern United States; one-third of the deaths were attributed to human-related causes (USFWS, 2000).

3.2.1.7 Bottlenose Dolphin

The bottlenose dolphin (*Tursiops truncatus*) is found worldwide in temperate and tropical inshore waters. Sighting data indicate that bottlenose dolphins are distributed along the coast, across the continental shelf, over the continental shelf edge, and in waters over the continental slope with a bottom depth greater than 3,280 ft (1,000 m). There are two genetically-distinct stocks of bottlenose dolphin off the Atlantic coast: the western North Atlantic coastal and western North Atlantic offshore stocks. The coastal morphotype[4] is smaller and generally not found in waters deeper than 82 ft (25 m). It is continuously distributed along the Atlantic Coast south of Long Island, around Florida and along the Gulf of Mexico coast (NMFS, 2003b). This morphotype is migratory and winters south of Cape Hatteras, North Carolina. This stock is defined as depleted under the MMPA because the stock is below its OSP.

The offshore morphotype can be found in waters deeper than 82 ft (25 m) and generally occurs along the continental shelf break and into slope waters. Aerial surveys of the offshore morphotype indicate that it extends along the entire continental shelf break from Georges Bank to Cape Hatteras during spring and summer (Cetacean and Turtle Assessment Program [CETAP] 1982; Kenney 1990 *in* NMFS, 2003b). In fall, more sightings were reported in the south than in other portions of the survey area; in the winter, there were few to no sightings in the central portion of the survey area (NMFS, 2003b). The offshore morphotype was found exclusively seaward of 18 nm (34 km) and in waters deeper than 112 ft (34 m). Within 4 nm (7.5 km) of shore, all animals were of the coastal morphotype (NMFS, 2003b).

Abundance estimates for each management unit of the coastal and offshore stocks are provided in the 2005 NMFS SAR (NMFS, 2005f). Anthropogenic threats to bottlenose dolphins are primarily from entanglement with fishing gear such as gillnets, seines, long-lines, shrimp trawls, and crab pots (Read, 1994; Wang *et al*., 1994). The total estimated average annual fishery-related

[4] A morphotype is term that describes local populations or subpopulations of a single species of animal that are phenotypically or behaviorally distinct from the larger population as a whole.

mortality in 1996-2000 was 233 (Coefficient of Variation [CV] = 0.16) in the mid-Atlantic coastal gillnet fishery. Other threats to bottlenose dolphins include pollution and habitat degradation.

3.2.2 Sea Turtles

All six species of sea turtles occurring in US waters are listed under the ESA and all species have recovery plans finalized between 1991 and 1998, several of which are currently being revised. These plans contain information on each species and are incorporated here by reference. One species, the olive Ridley turtle (*Lepidochelys olivacea*), is predominantly tropical and is not considered here. The other five species are listed in Table 3-2. Fishery bycatch, habitat loss, egg poaching, marine debris, beach nourishment, and artificial lighting are common threats to sea turtles. Sea turtles are highly susceptible to vessel collisions because they regularly surface to breathe and often rest at or near the surface.

Table 3-2
Sea Turtles Occurring in US East Coast Waters

Common Name	Scientific Name	Status*
Green turtle	*Chelonia mydas*	E, T**
Hawksbill turtle	*Eretmochelys imbricata*	E
Kemp's Ridley turtle	*Lepidochelys kempi*	E
Leatherback turtle	*Dermochelys coriacea*	E
Loggerhead turtle	*Caretta caretta*	T

* E = endangered; T = threatened.
** Status assigned according to population.
Source: NMFS, 2004a.

3.2.2.1 Green Turtle

The green turtle is a global species found in tropical and subtropical waters. In the United States, green turtles occur in inshore and nearshore waters from Texas to Massachusetts. Hatchlings are pelagic, i.e., they occur in the water column of the open ocean. Adults spend most of their time in tropical shallow, nearshore areas, but green turtles are known to undertake long oceanic migrations between nesting and foraging habitats.

All green turtle populations are threatened except the breeding populations off Florida and the Pacific Coast of Mexico, which are endangered. Since the 1978 listing, the populations have not significantly improved (NMFS, 2004a). There are a number of threats to green turtles, from capture in commercial fisheries, predation, and human activities on nesting beaches to systematic harvesting in certain countries. Boating activities may also cause injury or death to green turtles through collisions or propeller wounds.

A study on vessel speed and collisions with green turtles in Moreton Bay Australia analyzed behavioral responses of turtles to an approaching 20-ft (6-m) vessel at slow (2 knot), moderate (6 knot), and fast (10 knot) speeds (Hazel *et al*., 2007). The authors found that turtles fled frequently in encounters with slow vessels, infrequently with moderate vessels, and rarely in encounters with fast vessels. Further, the turtles that fled in encounters with a slow vessel did so at a greater distance than those that fled in encounters with moderate vessels. Although vessel noise is within a turtle's hearing range, there are several factors that impede their recognition of the noise as a threat (e.g. directionality of the noise in the ocean and habituation to background vessel noise). The results indicate that the only effective speed that would allow sufficient time for a turtle to avoid an approaching vessel would be a very slow speed of 2 knots. On this basis, the authors determined that vessel speed was a significant factor in the likelihood of a strike and concluded that mandatory vessel speed restrictions were necessary to reduce the risk of vessel strikes to sea turtles (Hazel *et al*., 2007).

3.2.2.2 Hawksbill Turtle

Hawksbill sea turtles are found in the tropical and subtropical waters of the Atlantic, Pacific, and Indian oceans. In the United States, they are found along the coastline from Massachusetts southward; however, sightings north of Florida are rare. Like the green turtle, post-hatchling hawksbills are pelagic; adults return to a variety of shallow coastal habitats, including rocky outcrops, coral reefs, lagoons on oceanic islands, and estuaries.

The hawksbill turtle was listed as endangered under the ESA in 1970 (NMFS, 2004a). In addition to other human-caused threats to hawksbills, they may incur propeller wounds or other injury from vessel collisions in areas with concentrated vessel traffic.

3.2.2.3 Kemp's Ridley Turtle

The Kemp's Ridley turtle has a more limited range than other sea turtles. Adult distribution is generally restricted to the coastal areas of the Gulf of Mexico and the northwestern Atlantic Ocean. In the US Atlantic, they occur in the coastal waters off Georgia north to New England. Nesting occurs primarily in one area near Rancho Nuevo in southern Tamaulipas, on the northeastern coast of Mexico. There are also a few scattered nests in Texas, Florida, South Carolina, and North Carolina.

The Kemp's Ridley turtle was listed as endangered in 1970. After long periods of decline, today the population appears to be in the early stages of recovery due to protective measures (NMFS, 2004a). The Kemp's Ridley turtle recovery plan contains additional information and is incorporated here by reference (NMFS and USFWS, 1992b). Kemp's Ridley turtles have the potential to be injured by propellers or collisions with vessels.

3.2.2.4 Leatherback Turtle

The leatherback is the largest extant turtle species (NMFS, 2004a). Leatherback turtles are found worldwide in tropical and temperate waters of the Atlantic, Pacific, and Indian oceans. In the United States, leatherbacks nest in southeastern Florida but have been sighted as far north as the Gulf of Maine. Adult leatherbacks are highly mobile and are believed to be the most pelagic of all sea turtles. Females are often observed near the edge of the continental shelf; they do not nest as frequently as other turtle species found in US waters.

Leatherbacks were listed as endangered in 1970. Boating activities may result in direct injury or death through collision impact or propeller wounds.

3.2.2.5 Loggerhead Turtle

Loggerhead sea turtles are found in tropical, subtropical, and temperate waters throughout the world. The loggerhead is the most abundant sea turtle in US coastal waters, occurring from Texas to Massachusetts. They frequent continental shelves, bays, estuaries, and lagoons.

Loggerheads were listed as threatened in 1978 and their status has not changed. It appears that the nesting populations in South Carolina and Georgia may be declining, while the Florida nesting population seems to be stable. Loggerheads face threats on both nesting beaches and in the marine environment. The greatest cause of decline and the continuing primary threat to loggerhead turtle populations worldwide is incidental capture in fishing gear, primarily in longlines and gillnets, but also in trawls, traps and pots, and dredges. In addition to entanglement in fishing gear, loggerheads have also been injured and killed by vessel strikes.

3.2.3 Seabirds

Seabirds are birds that normally live and forage in coastal, offshore, or pelagic (open- sea) waters (Harrison, 1983). Seabirds include loons (*Gaviiformes*), grebes (*Podicipediformes*), albatrosses, fulmars, prions, petrels, shearwaters, storm-petrels, diving petrels (*Procellariiformes*), pelicans, boobies, gannets, cormorants, shags, frigatebirds, tropicbirds, anhingas (*Pelecaniformes*), shorebirds, skuas, jaegers, gulls, terns, auks, and puffins (*Charadriiformes*). The main threats to seabirds include bycatch in commercial long-line fisheries, habitat degradation, development, pollution, and predation on eggs.

Table 3-3 lists the seabird species protected under the ESA. The *Environmental Assessment of Proposed Regulations to Govern Interactions between Marine Mammals and Commercial Fishing Operations, under Section 118 of the Marine Mammal Protection Act* (NMFS, 1995) contains more detailed data on seabirds and is incorporated here by reference.

Table 3-3
ESA-listed Seabirds Occurring Along the US East Coast

Common Name	Scientific Name	Status*
Piping plover	*Charadrius melodus*	T
Brown pelican	*Pelecanus occidentalis*	E, R**
Least tern	*Sterna antillarum*	E
Roseate tern	*Sterna dougallii dougallii*	E, T**

* E = endangered; T = threatened; R = recovered (delisted).
** Status assigned according to population.
Source: USFWS, 2004.

3.2.4 Protected Anadromous and Marine Fishes

Table 3-4 shows anadromous (living in salt water but reproducing in fresh water) and marine fish species found along the US East Coast that are endangered or threatened under the ESA, or are considered species of concern. No catadromous (living in fresh water but reproducing in salt water) fishes are listed or are candidates for listing under the ESA.

Table 3-4
Endangered and Species of Concern Anadromous and Marine Fishes Occurring Along the US East Coast

Common Name	Scientific Name	Status*
Alewife	*Alosa pseudoharengus*	SC
Atlantic halibut	*Hippoglossus hippoglossus*	SC
Atlantic salmon (†Gulf of Maine)	*Salmo salar*	E
Atlantic sturgeon	*Acipenser oxyrinchus oxyrinchus*	SC
Atlantic wolffish	*Anarhichas lupus*	SC
Barndoor skate	*Raja laevis*	SC
Blueback herring	*Alosa aestivalis*	SC
Cusk	*Brosme brosme*	SC
Dusky shark	*Carcharhinus obscurus*	SC
Goliath grouper	*Epinephelus itajara*	SC
Mangrove rivulus	*Rivulus marmoratus*	SC
Nassau grouper	*Epinephelus striatus*	SC
Night shark	*Carcharhinus signatus*	SC
Opossum pipefish	*Microphis brachyurus*	SC
Porbeagle shark	*Lamna nasus*	SC
Rainbow smelt	*Osmerus mordax*	SC
Sand tiger shark	*Carcharias taurus*	SC
Shortnose sturgeon	*Acipenser brevirostrum*	E
Smalltooth sawfish (†Portion of U.S. range)	*Pristis pectinata*	E
Thorny skate	*Amblyraja radiata*	SC
Speckled hind	*Epinephelus drummondhayi*	SC
Warsaw grouper	*Epinephelus nigritus*	SC
White Marlin	*Tetrapturus albidus*	SC

*E = endangered; SC = species of concern (those species for which uncertainties exist regarding status and threats, information is lacking, and listing is not currently being considered).
†DPS = distinct population segments.
Sources: www.nmfs.noaa.gov/pr/species/esa/fish and www.nmfs.noaa.gov/pr/species/concern.

A recovery plan exists for the shortnose sturgeon and is incorporated here by reference (NMFS, 1998).

3.3 Physical Environment

North Atlantic right whales range from maritime Canada south along the US East Coast to northern Florida. In the SEUS region, right whales generally occur in nearshore continental shelf waters (Garrison, 2005); right whales have been sighted in SEUS offshore waters, but with what frequency they occur there remains unknown (NMFS, 2005f). In the MAUS region, right whales are almost always found within 30 nm (56 km) of the coast: recent studies have shown that 90 percent of all sightings from the South Carolina/Georgia border to Connecticut are within that distance from the shore, with a large majority of the sightings (83 percent) within 20 nm (37 km) (NMFS, 2008, *unpublished*). In that region, right whales generally occur at depths of up to 60 ft (18.3 m) (71.5 percent of recorded sightings) and are rarely found at depths greater than 150 ft

(45.7 m); 93 percent of recorded sightings are at 150 ft or less (Knowlton *et al*., 2002). In contrast to what has been observed in the other two regions, right whales are frequently found in offshore waters in the NEUS region. The following section provides information on the physical environment, including water depth, sea floor topography, sediment types, water composition and quality, of those areas in which right whales are most commonly found.

3.3.1 Bathymetry and Substrate

A brief description of bathymetry (i.e., ocean depth and physical features) and bottom sediment types is provided in this FEIS because certain seafloor features and sediment types are particularly conducive to right whale foraging. Patches of the right whale's primary food source, *C. finmarchicus*, are found at specific depths in the water column. Right whales aggregate in areas where there is an abundance of prey.

3.3.1.1 General Features

Several geophysical features, including the continental shelf, the continental slope, the continental rise, and the abyssal plain, are common to all three regions considered. The operational measures proposed for the MAUS and SEUS are within the continental shelf; those proposed for the NEUS are within the continental shelf and slope areas.

The continental shelf is a broad, sea-floor platform that, although submerged, is in fact part of the continental mass. Along the Atlantic coast, the continental shelf extends from the shoreline to a depth of about 660 ft (200 m). It ends at the shelf break or shelf edge, usually marked by a noticeable increase in slope, as the continental shelf joins the steeper continental slope, leading to the continental rise. The continental rise is a zone approximately 54 to 540 nm (100 to 1,000 km) wide at the base of the continental slope, marked by a gentle seaward gradient ending in the abyssal plain. Figure 3-2 depicts these features. Submarine canyons are steep, v-shaped valleys that cut through the continental slope, continental rise, and, less commonly, the continental shelf. There are several submarine canyons in the mid-Atlantic Bight.

3.3.1.2 Gulf of Maine/Georges Bank (NEUS Region)

The Gulf of Maine/Georges Bank area includes important right whale habitat. In addition to the Cape Cod Bay and Great South Channel critical habitat, right whales are known to occur in Jeffreys Ledge, the Bay of Fundy, Platts Bank, and other physiographic areas in the Gulf of Maine. Figure 3-3 depicts the Gulf of Maine, which includes the waters between Nova Scotia and the Bay of Fundy as well as Cape Cod. Georges Bank extends to the southeast of the gulf. The continental shelf in this area is a relatively narrow band surrounding deeper basins. Two of the larger inner basins, Jordan Basin and Wilkinson Basin, are separated by a broad ridge that extends southeastward from the coast of Maine toward Georges Bank. Georges Bank is the third largest basin in this region and is connected to the continental slope through the Northeast Channel, which also separates Georges Bank from the Scotian Shelf (Milliman and Imamura, 1992). Jeffreys Ledge and Stellwagen Bank are two of several large bathymetric features in the southern Gulf of Maine. The majority of Stellwagen Bank and a small section of the southern end of Jeffreys Ledge are within Stellwagen Bank National Marine Sanctuary, which spans approximately 22 miles (35.4 km) in a southeast to northwest direction from Cape Cod to Cape Anne at the mouth of Massachusetts Bay, is about 6 miles (9.7 km) across at the widest point, and has waters depths from 65 to 600 feet (19.8 to 182.8 m) (National Ocean Service [NOS], 1993b).

Figure 3-4 depicts sediment types in this area. Jeffreys Ledge, located on the northern edge of the Stellwagen Bank National Marine Sanctuary at depths less than 197 ft (60 m) is composed primarily of gravel and a gravel-sand mixture, with a sandy boundary to the southeast (NOS, 1993b). Stellwagen Bank, with depths less than 164 ft (50 m), is mainly sand or pebbly-sand, bounded on the east by gravel or a gravel-sand mixture (NOS, 1993b). The Gulf of Maine basin mostly consists of silty-clay or clayey-silt sediments. The seafloors of Stellwagen Basin and Cape Cod Bay are covered by clayey silt. The outer rim of the Gulf of Maine (Nantucket Shoals, Georges Bank, and the Nova Scotian Shelf) consists of primarily sand and gravel. Sand is the principle sediment for the inner shelf off Cape Cod (NOS, 1993b).

Bottom-layer characteristics and other physical oceanographic conditions determine the location of high-density patches of copepods and, consequently, where right whales are most likely to be found foraging. Baumgartner and Mate (2005) report that right whales in the Gulf of Maine are more commonly found in areas characterized by specific bathymetric features. They observed that whales generally occurred in areas with low bottom water temperatures, high surface salinity, and high surface stratification. Such areas may support a higher abundance of *C. finmarchicus*, which would explain why the whales preferred them (Baumgartner and Mate, 2005). Baumgartner and Mate (2005) adduced a similar reason to explain that the whales preferred shallow basins (areas with depths of approximately 492 ft [150 m]) to the deep basins of the Gulf of Maine and Scotian Shelf, noting that "the structure, hydrography, and physical processes of these [shallow] basins may improve the availability, quality, and aggregation of *C. finmarchicus* for foraging right whales." Such correlations between bathymetry and prey abundance allow scientists to better predict the location of foraging whales.

Recent technology takes this relationship between oceanographic conditions and *C. finmarchicus* abundance one step further to predict right whale births. Data from Gulf of Maine Ocean Observing System (GoMOOS) Buoy N (in the Northeast Channel) can provide forecasts of right whale births based on water temperature at the Buoy. As mentioned in Section 3.1.1.2, the NAO affects water temperatures in the Atlantic Ocean and specifically the Gulf of Maine. Water temperatures in turn, influence right whale's food supply, which affects reproduction and the number of calves born. "After a positive NAO index, whale food becomes plentiful, and right whales produce many calves. After a negative NAO index, food becomes scarce, resulting in few calves being born" (GoMOOS, 2006). Based on these data, 13 births were predicted in 2006 and 16 in 2007.

3.3.1.3 Middle Atlantic Bight (MAUS Region)

Figure 3-5 depicts the bathymetry of the Middle Atlantic Bight, which extends from Cape Cod and Nantucket Shoals to Cape Hatteras, North Carolina (Milliman and Imamura, 1992). Right whales occur throughout the Middle Atlantic Bight during fall and spring. Compared to the bathymetry of the Gulf of Maine/Georges Bank area, the Middle Atlantic Bight bathymetry is relatively simple. Water depth usually increases regularly from the coast out to the shelf break. The depth of the break decreases from 492 ft (150 m) south of Georges Bank to 164 ft (50 m) off Cape Hatteras. The inner shelf is connected to Narragansett Bay, Long Island Sound, the Hudson River, Delaware Bay, and Chesapeake Bay, the largest estuaries on the US eastern seaboard (Milliman and Imamura, 1992). At the shelf's edge, it gives way abruptly to the continental

Bathymetry in the Gulf of Maine

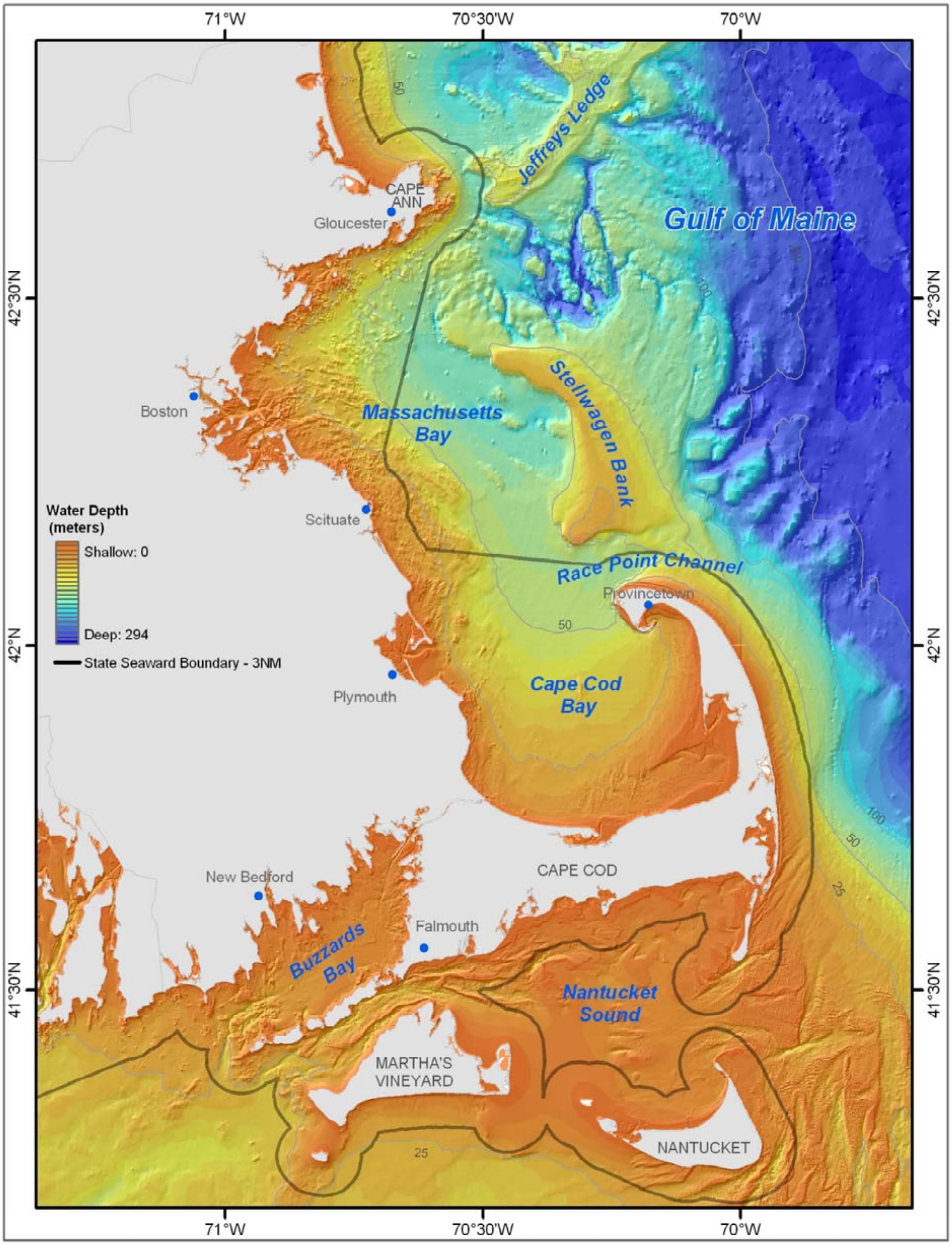

Figure 3-2

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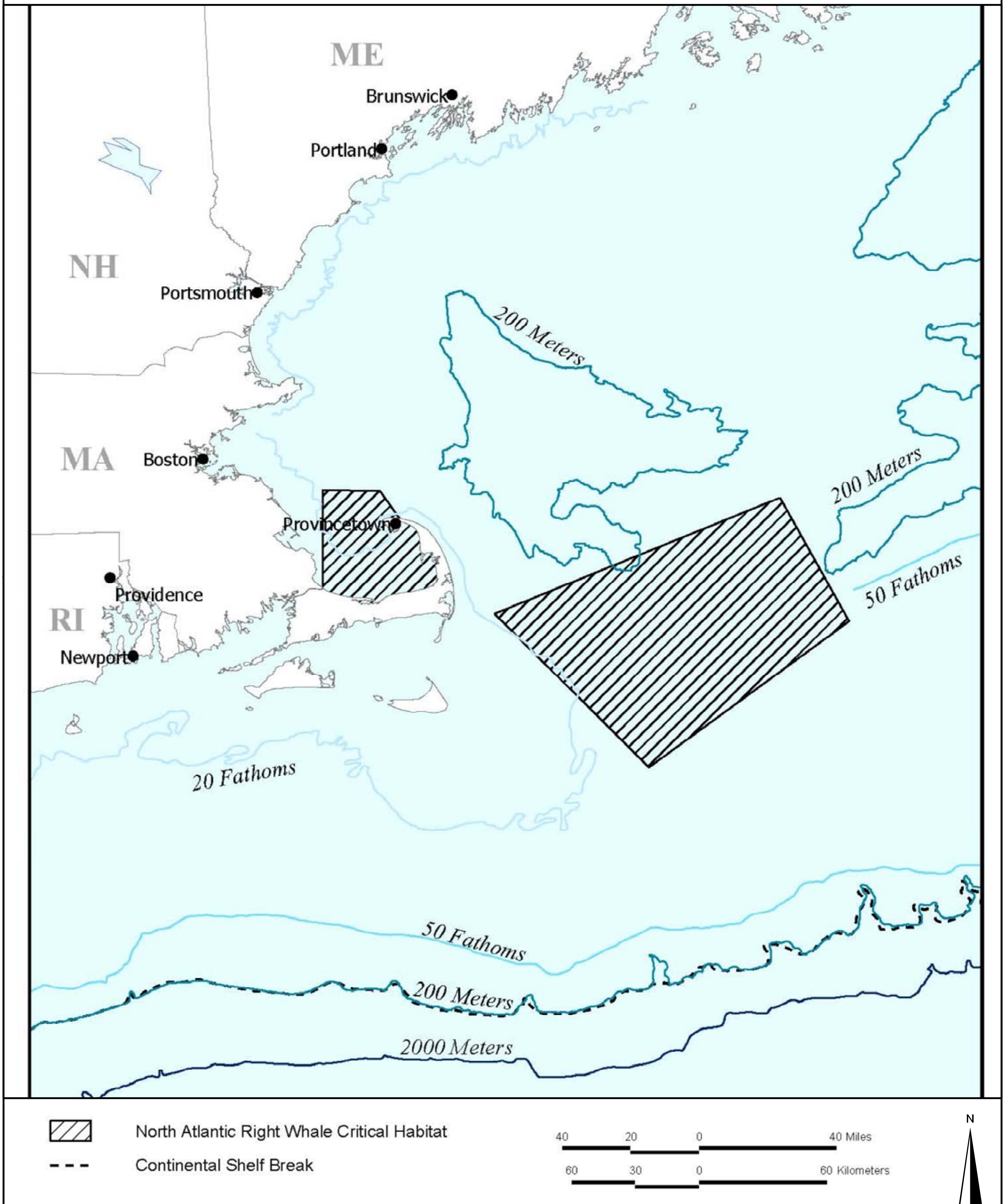
Bathymetry in the Northeastern United States



Note: Map data not projected.

Figure 3-3

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Sediment Classification in Georges Bank / Gulf of Maine

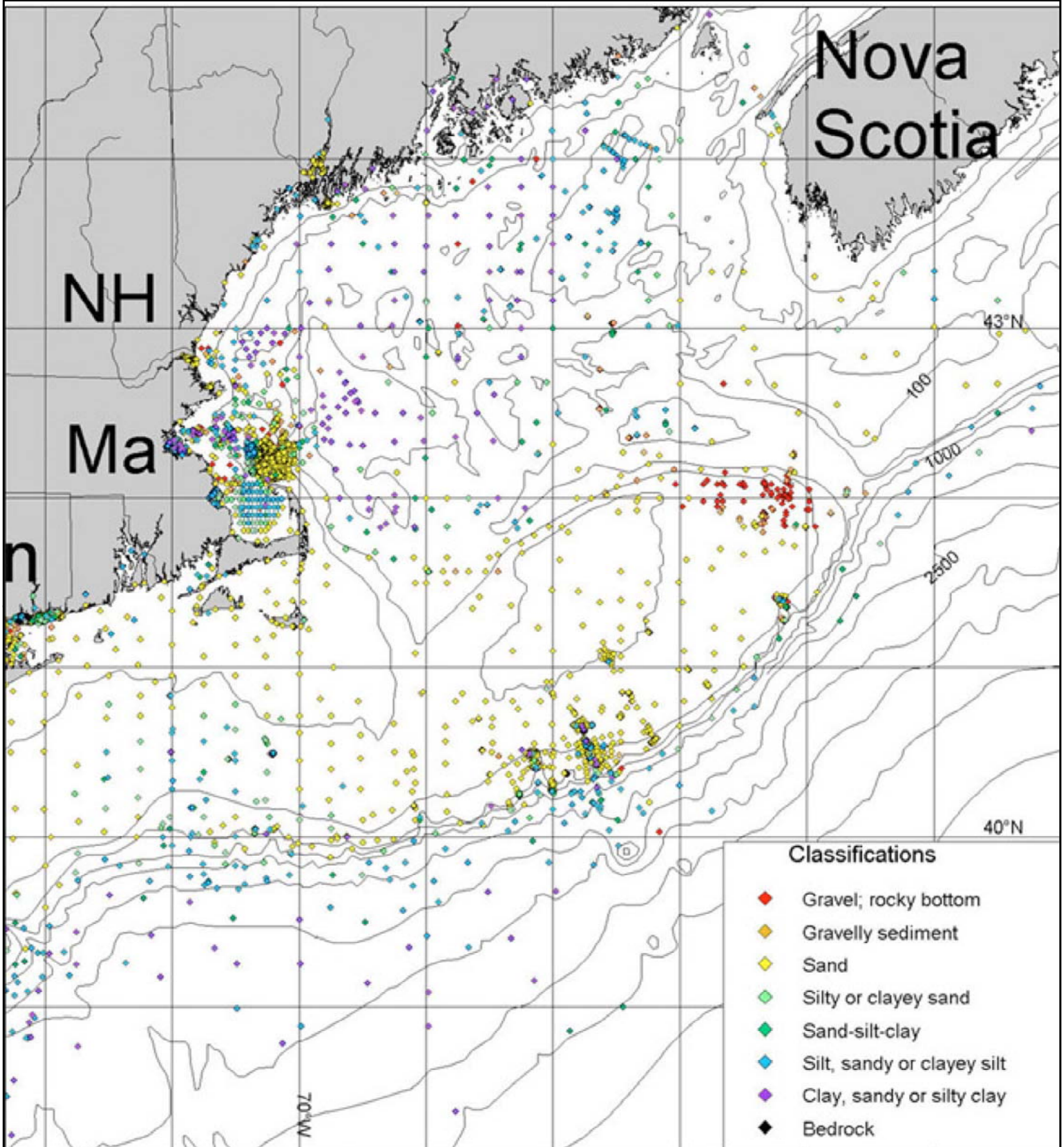

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Figure 3-4

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Bathymetry in the Mid-Atlantic United States

North Atlantic Right Whale Critical Habitat

Continental Shelf Break

140 70 0 140 Miles

190 95 0 190 Kilometers

N

Note: Map data not projected.

Figure 3-5

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slope. The continental slope extends to water depths ranging from 6,562 to 13,125 ft (2,000 to 4,000 m) (Department of the Navy [DoN], 2001). The upper slope area contains several submarine canyons, including Hudson Canyon, Hudson Shelf Valley, and Norfolk Canyon.

The continental shelf and continental slope of the Middle Atlantic Bight are covered with sand, silt, clay, and some gravel (DoN, 2001).

"Coastal areas of North Carolina have varying sedimentation rates, which results in diverse bottom composition. High sedimentation rates typify the area from Raleigh Bay northward, while the low sedimentation rates and scouring by currents in southern North Carolina, especially Onslow Bay, has led to the exposure of rock outcrops. Although sand dominates the sediments of the continental shelf, the concentration of sand typically declines with increasing water depth down the continental slope and rise, where clay and silt predominate. The sandy southern North Carolina continental slope is somewhat atypical, but north of Cape Hatteras silt and clay regain their dominance in continental slope sediments" (DoN, 2002a). Figure 3-6 and Figure 3-7 depict sediment types in the MAUS region.

3.3.1.4 South Atlantic Bight (SEUS Region)

Figure 3-8 depicts the bathymetry of the South Atlantic Bight. Right whales migrate through the northern portion of the South Atlantic Bight on their way to and from the calving grounds off the Georgia and Florida coast.

The South Atlantic Bight contains three large Bays: Raleigh Bay, Onslow Bay, and Long Bay (Milliman and Imamura, 1992). The dominant bathymetric features there are the continental shelf, the continental slope, and the Blake Plateau. The continental shelf slopes gently from the coast to approximately the 164-ft (50-m) isobath (line connecting all points having the same depth), where it drops off to the 656-ft (200-m) isobath. The continental slope spans from approximately the 656-ft (200-m) to the 2,297-ft (700-m) isobaths. The slope is widest off Jacksonville, FL (30°N).

The Blake Plateau (Figure 3-9) is a large physiographic feature 71,250 nm^2 (228,000 km^2) in area, between 2,297 and 3,281 ft (700 and 1,000 m) in depth. The Gulf Stream flows along the Florida-Hatteras Slope over the Blake Plateau's western flank (DoN, 2002b).

In the SEUS region, including the Blake Plateau Basin, the substrate composition ranges from mixed fine sand and gravel near the coast to an increasingly higher percentage of calcium carbonate material at greater depths (Figure 3-9). There are also traces of gravelly sand, sand and clay, and fine-grained sand and silt found in deeper waters. Continental slope sediments in the south Atlantic area are primarily composed of silt and clay. The inner part of the Blake Plateau contains a minimal amount of sediments due to the sweeping action of the Gulf Stream. The Plateau is also covered by a thick layer of phosphoritic sediments and a thin layer of carbonate sands (DoN, 2002b).

In the NEUS, prey abundance determines right whale distribution; however, in the SEUS, right whales have rarely been observed feeding (Kenney *et al*., 1986), so different oceanographic variables must be considered in order to predict distribution in this region. A recent analysis by Keller *et al*. (2006) studies right whale distribution in the southeastern calving grounds in relation to sea-surface temperatures (SST). The results support a nonrandom distribution of whales in relation to SST. Whales were sighted in waters with an overall mean SST of 14.3° C ± 2.1°. Sighting data in the early warning system (EWS) survey area, which mainly covers the

Southeastern critical habitat, were compared to SST data to determine whale location during resident months (January and February). A southward shift in whale distribution was observed to occur toward warmer SSTs in the EWS area, while further south, right whales were concentrated in the northern portion that had cooler waters (Keller *et al*., 2006). It also appears that warm Gulf Stream waters (generally to the south and east of the critical habitat) serve as a thermal limit for right whales and play a role in their distribution within the calving grounds.

3.3.2 Water Quality

This section is divided into three subsections: Section 3.3.2.1 describes pollutants and their possible implications for right whales; Section 3.3.2.2 provides a brief overview of water quality in the coastal waters of the US eastern coastal states; and Section 3.3.2.3 provides an overview of the regulatory framework for marine pollution.

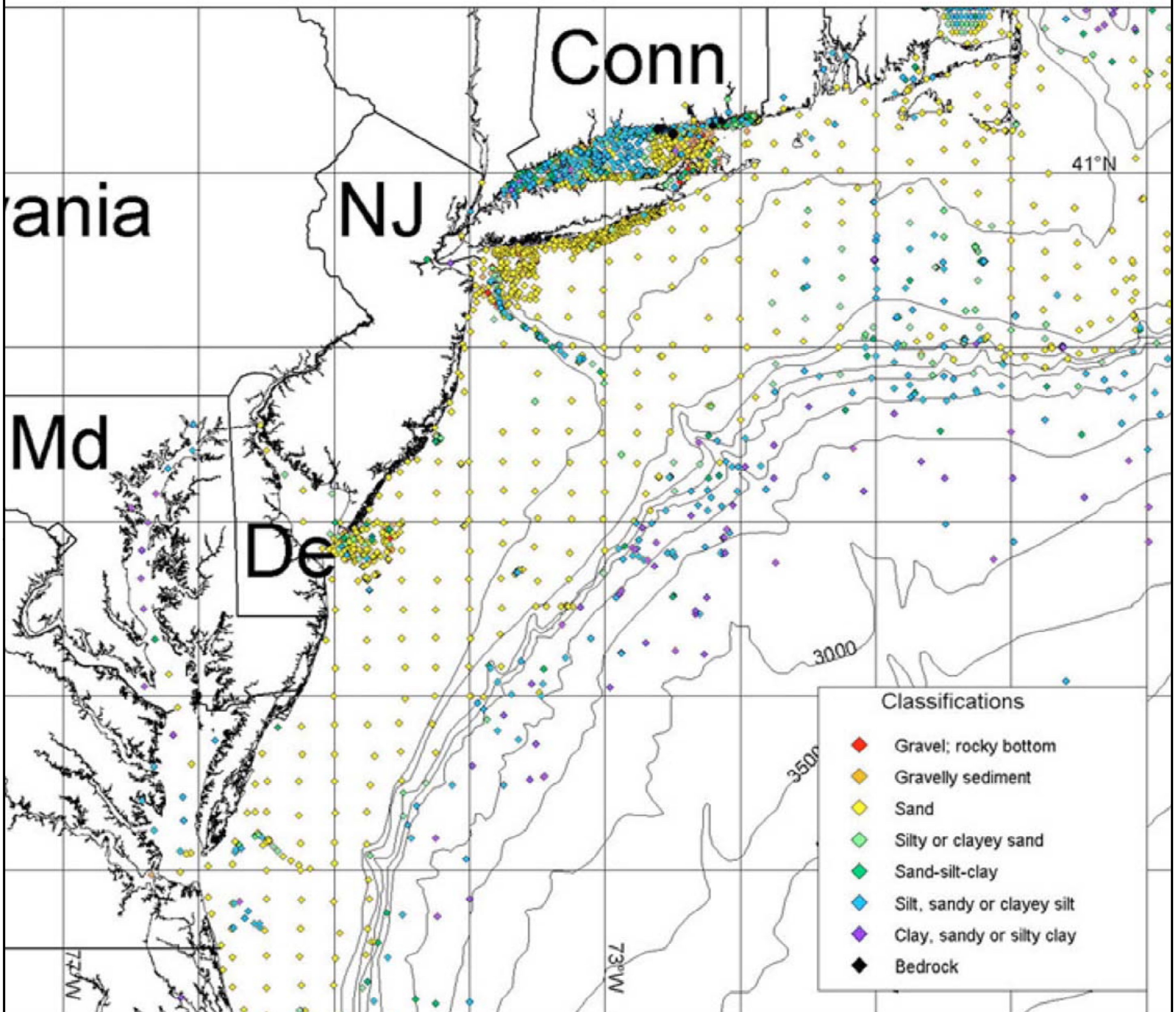
3.3.2.1 Implications of Water Pollution for Right Whale Health

Pollution and poor water quality may affect right whale health indirectly, by reducing the quantity and diversity of the zooplankton on which they feed, or more directly through ingestion and long-term storage in the blubber (fat layer). Pollutants can bioaccumulate – that is, increase in concentration as energy is transferred up the food chain. For this reason, chemical pollutant levels in mysticetes, such as the right whale, are generally several orders of magnitude lower than the levels found in seals or odontocetes (toothed cetaceans) because seals and odontocetes feed on fish at relatively high trophic levels, whereas most mysticetes feed on zooplankton, near the bottom of the chain (NMFS, 2005a).

Contaminants found in the coastal environment include suspended solids, organic debris, metals, synthetic organic compounds, nutrients, and pathogens. Chemical pollutants from oil spills, leaks, discharges, and organotins (leaching from hulls) may also enter the water as a side effect of shipping operations (Busbee *et al.*, 1999). The following contaminants are of particular concern with regard to right whale health (O' Shea *et al*., 1994; Reijnders *et al*., 1999).

- **Persistent organic pollutants:** Polychlorinated biphenyls (PCBs), polychlorinated dibenzo-p-dioxins (PCDDs), polychlorinated dibenzofurans (PCDF)s, dichloro-diphenyl-trichloroethane (DDT), chlordanes, hexachlorocyclohexane (HCH), and other pesticides.
- **Flame retardants:** Polybrominated diphenyl ethers (PBDEs) and other brominated flame retardants.
- **Plasticizers:** Phthalate esters.
- **Surfactants:** Alkyphenol ethoxylates (e.g., NPEO–nonylphenoletoxylates).
- **New-era pesticides and herbicides.**
- **Municipal and industrial effluents:** Endocrine-disrupting compounds (e.g., synthetic estrogens, natural hormones, pulp byproducts).
- **Anti-fouling agents:** Organotins and replacement compounds.
- **Dielectric fluids:** PCB replacements (e.g., PCNs – polychlorinated napthalenes, PBBs – polybrominated biphenyls).
- **Aquaculture-related chemicals:** Antibiotics, pesticides.
- **Metals:** Methyl mercury (MeHg).

Sediment Classification in the Mid-Atlantic
from Cape Cod to Albemarle Sound



USGS science for a changing world

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Figure 3-6

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Sediment Classification in the Carolina Trough

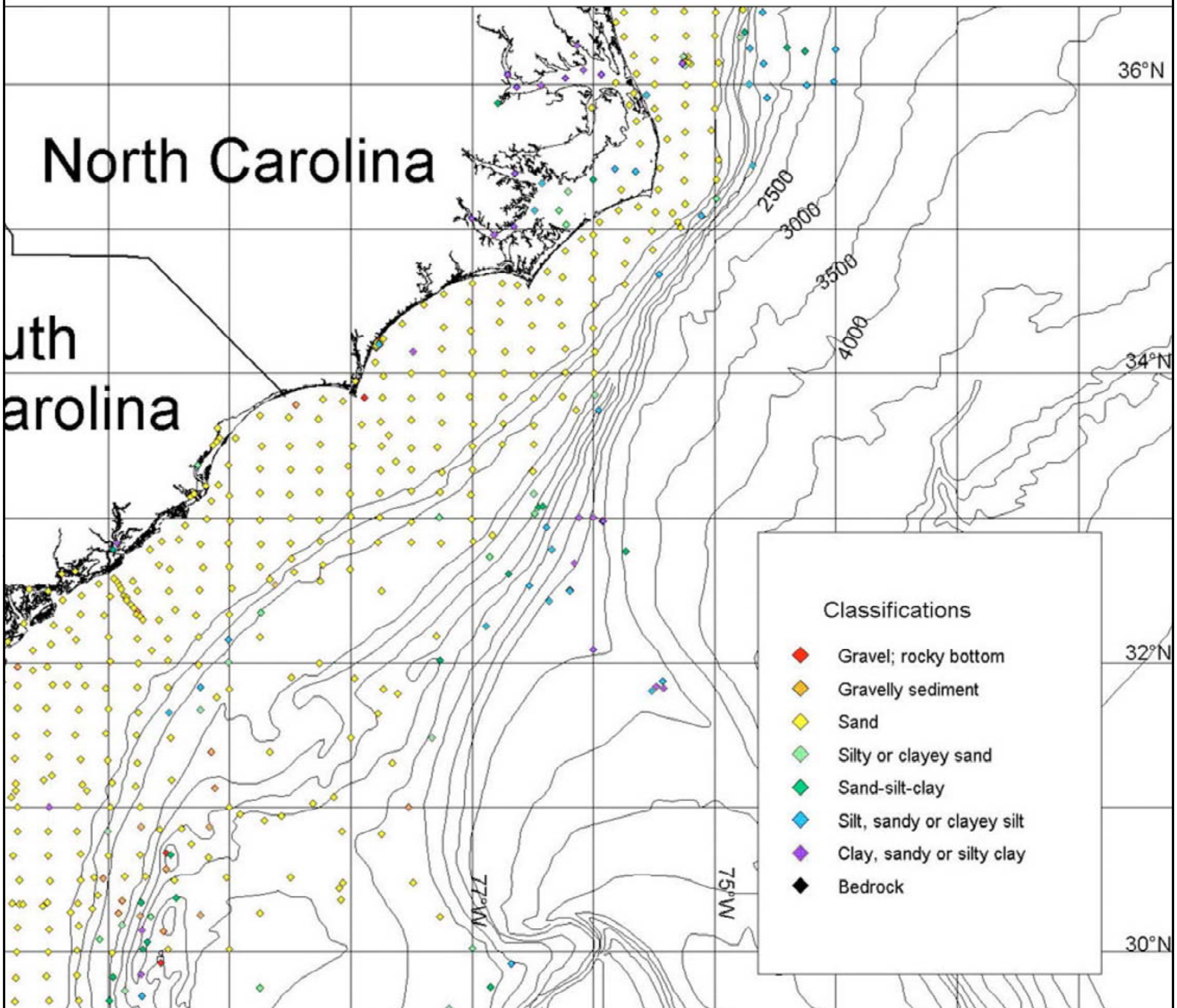

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Figure 3-7

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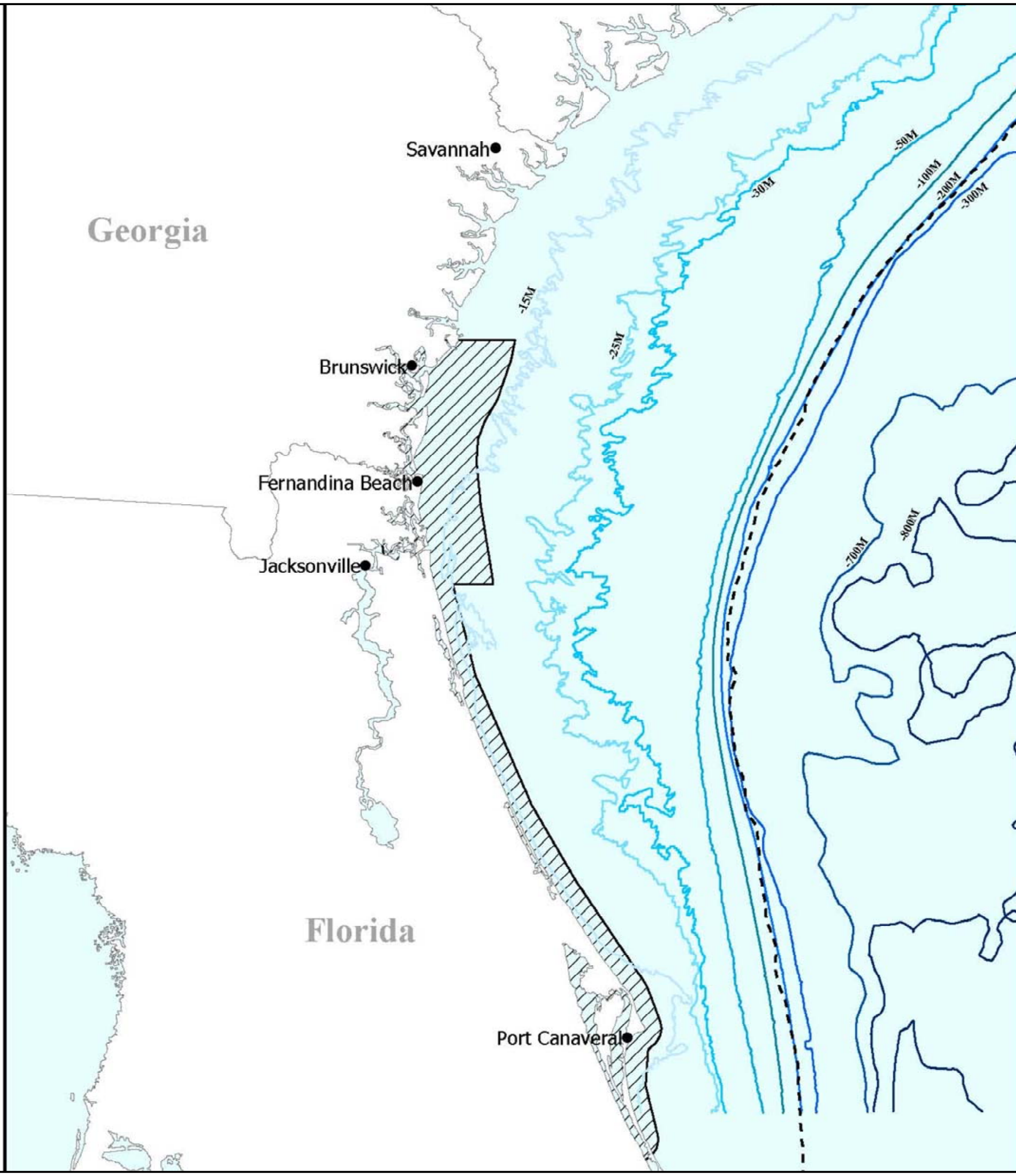
Bathymetry in the Southeastern United States



North Atlantic Right Whale Critical Habitat

Continental Shelf Break

40 20 0 40 Miles

60 30 0 60 Kilometers

N

Note: Map data not projected.

Figure 3-8

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Sediment Classification in the Blake Plateau Basin

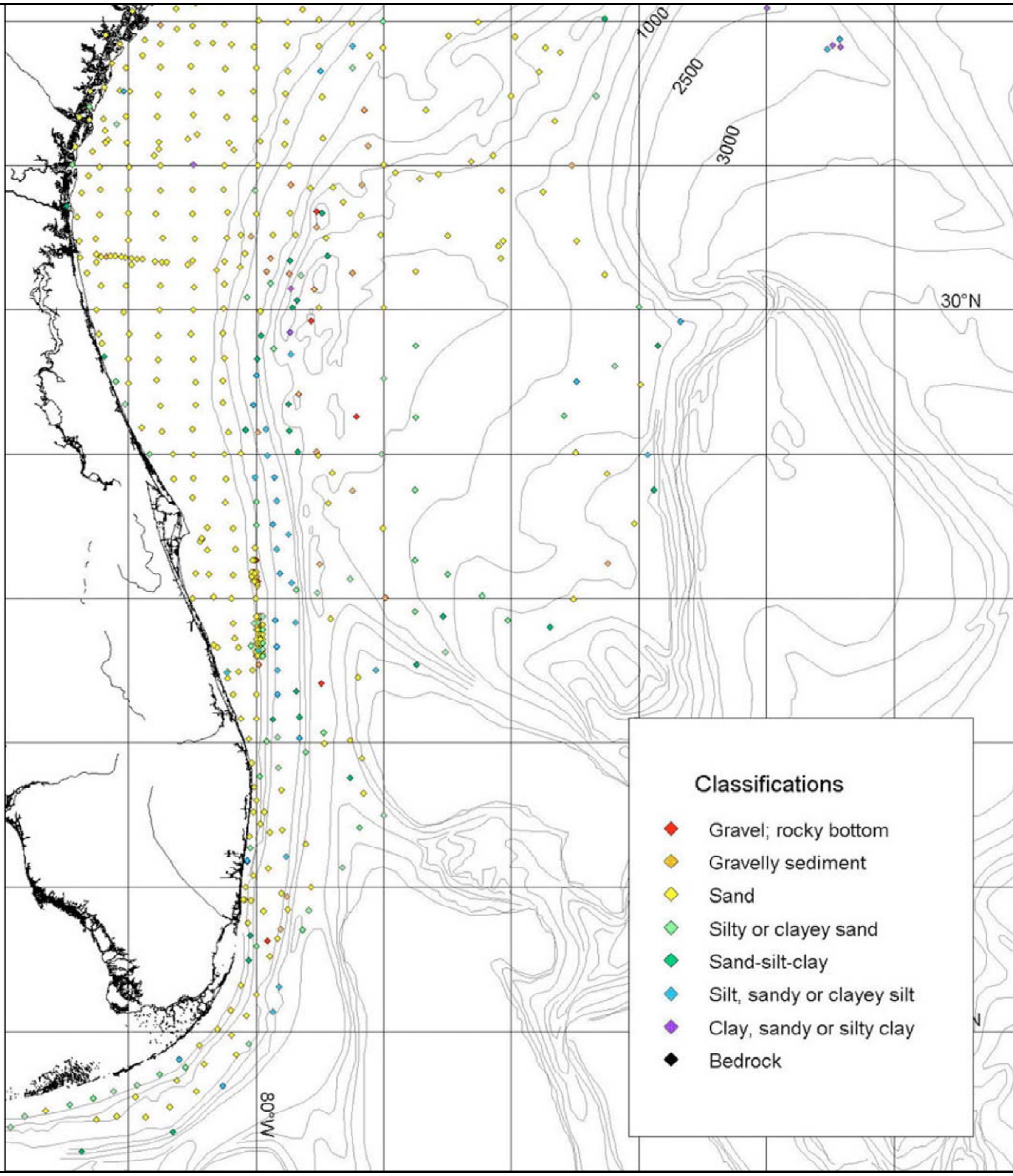

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Figure 3-9

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Concentrations of organochlorines, including DDT, PCBs, HCHs, aldrin, and dieldrin, have been observed in many species of marine mammals, including right whales. PCBs have been found in samples of right whale blubber (Weisbrod *et al*., 2000) and, at low levels, in zooplankton sampled from Cape Cod Bay (Reeves *et al*., 2001). PCBs, DDT, and other organochlorines have been detected in northern right whale samples from the Bay of Fundy, Browns, and Baccarro Banks (Woodley *et al.*, 1991 *in* NMFS, 2005a). However, it is not known whether the levels detected are sufficiently high to be detrimental.

Another source of pollutants that may have an effect on right whale health and reproduction are biotoxins. Biotoxins are transferred to right whales through ingestion of copepods, such as *C. finmarchicus*, which consume PSP toxin-producing dinoflagellates such as *Alexandrium* and similar organisms (Doucette *et al*., 2006). Biotoxins are highly toxic compounds produced by harmful algal blooms (HABs).[5] Five major classes of biotoxins are associated with HABs: saxitoxins (responsible for paralytic shellfish poisoning); brevatoxins (responsible for neurotoxic shellfish poisoning in the SEUS); domoic acid (amnesic shellfish poisoning); okasdaic acid and dinophysistoxins (diarrhetic shellfish poisoning); and ciguatoxins. The first three of these classes have been implicated in marine mammal mortality events (Reeves *et al*., 2001).

While there is minimal evidence to date that right whales have been adversely affected by these biotoxins, they are present in the whales' environment and have been known to cause loss of equilibrium and respiratory distress; they may also affect feeding (Reeves *et al*., 2001). In addition to the findings of Durbin *et al*. (2002; see Section 3.1.2.3), recent research has confirmed the presence of PSP toxins in right whales by sampling their feces and prey species in the Bay of Fundy (Doucette *et al*., 2006). Doucette *et al*. (2006) also compared the amount of *Alexandrium* in the water with right whale calving rates to further investigate the relationship suggested by Durbin *et al*. (2002) but found no correlation. However, the possible impact of PSP toxins on feeding and diving behavior could indirectly affect the ability to conceive or to maintain pregnancy (Doucette *et al*., 2006). Even though more research is required to understand the specific effects of PSP toxins, evidence suggests that they may be contributing to the slow population-recovery rate.

Other pollutants are generated by vessels at sea. Discharges are regulated in state and Federal waters out to the Contiguous Zone, which includes waters contiguous to the territorial sea out to 24 nm (44 km). "Graywater" and "blackwater" are two types of waste discharges from vessels at sea. Graywater contains nonsewage waste from showers, baths, sinks, and laundries. It may contain food waste, oil and grease, cleaning products, and detergents. Blackwater is sewage, which is discharged according to the regulations described in Section 3.3.2.3 (Table 3-5). Discharges of untreated sewage in unregulated waters may cause eutrophication, that is, a high level of nutrients in the water, which can in turn lead to excessive plant growth that can deplete the oxygen in the water. This limits the oxygen available to other species and, in extreme cases, can harm or kill other organisms in the water. However, eutrophication is generally limited to inshore estuaries or slow-moving streams, which are affected by land-based pollution more than water-based sources, and it is unlikely to occur in right whale habitat. Marine engines can

[5] Algae are photosynthetic plant-like organisms that live in water. Most species of algae or phytoplankton are not harmful and serve as the energy producers at the base of the food chain. Occasionally, the algae grow very fast or "bloom" and accumulate into dense, visible patches near the surface of the water. "Red Tide" is a common name for this situation, whereby certain phytoplankton species contain redish pigments and bloom such that the waters appear red (NMFS, 2005a).

discharge oils, lubricants, and fuel. Discharges of bilge and ballast water may include residual oil, lubricants, and fuel (as well as biological organisms).

Table 3-5
Regulatory Requirements for Marine Vessel Pollution

Waste	Law or Regulation	Requirements and Thresholds
Blackwater (Sewage)	US Clean Water Act	Discharges of untreated sewage or sewage with a fecal coliform bacterial count greater than 200 colonies per 100 milliliters, or total suspended solids exceeding 150 milligrams per 100 milliliters are not allowed within 3 nm of the shoreline. Requires a certified operable Marine Sanitation Device (MSD) on every vessel (US and foreign) with an installed toilet.
	MARPOL Annex IV	The discharge of sewage into the sea is prohibited, except when the ship is discharging ground-up and disinfected sewage using a system approved by the administration at a distance of more than 4 nm from the nearest land, or sewage that is not comminuted or disinfected at a distance of more than 12 nm from the nearest land; or the ship has in operation an approved sewage treatment plant which has been certified by the administration. The effluent shall not produce visible floating solids in, nor cause the discoloration of, the surrounding water.
Graywater	US Clean Water Act	No restrictions on discharging graywater.
Solid Wastes, Marine Debris	MARPOL Annex V	Dumping floatable dunnage, lining, and packing material is prohibited within 25 nm of shore. The disposal of plastics is prohibited. Dumping other un-ground garbage is prohibited within 12 nm. Incinerator ash is typically considered nonhazardous, and may be disposed of at sea in accordance with International Convention for the Prevention of Pollution from Ships annex V. Ash identified as being hazardous must be disposed of ashore in accordance with Resource Conservation and Recovery Act.
Toxic Wastes	Resource Conservation and Recovery Act	Dry-cleaning solvent (perchlorethylene [PERC]); batteries including lead acid, lithium, and nickel cadmium; some print-shop waste; and photo-processing waste containing silver in excess of 5 parts per million are classified as hazardous waste under the Resource Conservation and Recovery Act and must be handled accordingly.
Oil	US Oil Pollution Act	No visible sheen or oil content greater than 15 parts per million within 12 nm. Oily waste must be retained onboard and discharged at an appropriate reception facility.
	MARPOL Annex I	All vessels of any type more than 400 gross tons traveling over international waters are required to have an approved Shipboard Oil Pollution Emergency Plan (SOPEP). Vessels must be equipped as far as practicable and reasonable with installations to ensure the storage of oil residues onboard and their discharge to reception facilities, or into the sea providing the ship is more than 12 nm from the nearest land, the oil content of the effluent is less than 100 parts per million, and the ship has in operation an oil-discharge monitoring and control system, oil-water separating equipment, and oil-filtering system or other installation.
Source: National Park Service (NPS) 2003.		

3.3.2.2 State Water Quality

Each state has water-quality standards that are approved by the United States Environmental Protection Agency (EPA). The EPA compiles state water-quality reports (Clean Water Act [CWA] section 305[b]) into the National Assessment Database. All of the information in this section is from the 2002 National Assessment Database (EPA, 2002). In several cases, data were unavailable for coastal and ocean waters, in which case the category "bays and estuaries" was used, which encompasses some coastal waters. Water quality is fairly localized and, therefore, may vary within a particular region even though only one rating has been assigned. Also, near-coastal water quality may not be a good indicator of offshore water quality. The water-quality categories that the EPA utilizes are based on the designated uses assigned to the waters, activities such as swimming, propagation of aquatic life, etc. These nationally-developed water-quality standards are:

- **Good:** Waters fully support all of their designated uses.
- **Threatened:** Waters currently support all of their designated uses, but one or more of those uses may become impaired in the future if pollution-control actions are not taken.
- **Impaired:** Waters cannot support one or more of their designated uses.

If a state has threatened or impaired waters, the state description will also include causes of impairment and sources that generate these pollutants, or impairments.

NEUS Region

Maine

Maine's assessed[6] waters' overall water-quality attainment for ocean and near-coastal waters was rated 100 percent good for the state-designated use of fish, shellfish, and wildlife protection and propagation.

New Hampshire

New Hampshire's assessed measurements of near-coastal and ocean waters resulted in ratings of 98.9 percent good and 1.1 percent impaired for recreation. Waters designated for aquatic-life harvesting or areas that support coastal aquaculture were 100 percent impaired. The top three causes of impairments for these waters were dioxin, mercury, and PCBs. The major source of these contaminants was atmospheric deposition of toxic materials.

Massachusetts

Massachusetts' assessed waters' overall water-quality attainment for bays and estuaries was rated 65.83 percent good and 34.17 percent impaired for fish, shellfish, and wildlife protection and propagation. Recreational waters were 82.07 percent good and 17.93 percent impaired. Waters designated for aquatic-life harvesting (aquaculture) were 9.32 percent good and 90.68 percent impaired. Waters designated for aesthetic value were rated 89.75 percent good and 10.25 percent impaired. The top causes of impairment were pathogens, total toxics, priority organics, nutrients, and organic enrichment. Major sources of contaminants were unknown sources, municipal (urbanized high-density area), and combined sewer overflows.

Cape Cod Bay Monitoring Project

The Provincetown Center for Coast Studies (PCCS) organizes various research projects in Cape Cod Bay, including extensive habitat studies. These projects monitor water quality and the composition and distribution of planktonic species as indicators of the health of the bay and availability of food for right whales.

PCCS began a new project with the Massachusetts Water Resources Authority in response to the relocation of a municipal wastewater-discharge outfall tunnel 9 miles (mi) (15 km) into

[6] "Assessed" refers to the total square miles of water that were monitored and sampled in the state.

Massachusetts Bay and about 36 mi (58 km) from Cape Cod Bay. There were concerns that this nitrogen-rich sewage effluent would affect zooplankton diversity. The study concluded that nitrogen from the sewage is being assimilated by autotrophic organisms without affecting the diversity of the plankton community. Therefore, there have been no measurable changes to the dynamic food web in the short term. However, the short-term analysis of data at a limited number of sample sites raises the question of possible long-term effects that have not yet developed. Thus, in the future the project may shift focus to assess the potential cumulative or chronic effects to buffer the effluent over the long term (Moore *et al.,* 2005). Continued monitoring of Cape Cod Bay is vital to the recovery for right whales, as it is their major feeding ground, and this effluent is one of many possible factors that could change ecosystem parameters.

Rhode Island

Rhode Island's assessed waters for coastal shorelines were rated 100 percent good for the state-designated uses of recreation and aquatic-life harvesting.

MAUS Region

Connecticut

Connecticut's assessed waters for overall water-quality attainment are categorized as bays and estuaries, although this category includes offshore waters in Long Island Sound as well as coastal waters and beaches. For the designated use of recreation, the sampled waters were rated 87.34 percent good, 7.81 percent threatened, and 4.85 percent impaired. For fish, shellfish, and wildlife protection and propagation, waters were rated 61.25 percent good, 0.05 percent threatened, and 38.7 percent impaired. Waters designated for aquatic-life harvesting were rated 68.86 percent good and 31.14 percent impaired. The top five causes for impairment were nutrients, organic enrichment, pathogens, indicator bacteria, and nitrogen/ammonia. Major sources for contaminants were urbanized high-density areas, municipal point-source discharges, waterfowl, and combined sewer overflows.

New York

Water quality for New York's coastal shoreline-assessed waters was 100 percent good for the state-designated use of fish, shellfish, and wildlife protection and propagation.

New Jersey

Water quality for New Jersey's near-coastal and ocean-assessed waters was 21.2 percent good and 78.8 percent impaired for the use of fish, shellfish, and wildlife protection and propagation. No causes or sources for impairment were reported.

Delaware

Water quality for Delaware's coastal shoreline-assessed waters was 100 percent good for all three state-designated uses. These uses are fish, shellfish, and wildlife protection, recreation, and industrial.

Maryland

Water quality for Maryland's assessed waters in bays and estuaries was 9.8 percent good and 90.20 percent impaired. No causes or sources for impairment were reported.

Virginia

Water quality for Virginia's assessed waters for bays and estuaries was 5.83 percent good and 29.76 percent threatened, and 64.41 percent impaired for fish, shellfish, and wildlife protection and propagation. Waters designated for recreation were rated as 95.7 percent good, 0.03 percent threatened, and 4.27 percent impaired. Waters designated for aquatic-life harvesting were 79 percent good, 13.48 percent threatened, and 7.53 percent impaired. Some of the causes of impairment were nutrients, turbidity, organic enrichment and low dissolved oxygen. The major sources of contaminants were municipal point-source discharges, industrial point discharges, and nonpoint sources.

North Carolina

North Carolina's state water quality data were not reported on the EPA website. The "Water quality assessment and impaired waters list (2004 Integrated 305(b) and 303 (d) reports)" can be found at North Carolina's division of water quality website:
http://h2o.enr.state.nc.us/tmdl/General_303d.htm

South Carolina

South Carolina's assessed waters for bays and estuaries were rated as 81.36 percent good and 18.64 percent impaired for fish, shellfish, and wildlife protection and propagation. Waters designated for recreation were 93.35 percent good and 6.65 percent impaired. The top causes for impairment were organic enrichment, pathogens, turbidity, metals, and pH. The major sources for contaminants were natural sources, unknown sources, and industrial point-source discharge.

SEUS Region

Georgia

Georgia's assessed waters for overall water-quality attainment in bays and estuaries were rated as 100 percent impaired for fish, shellfish, wildlife propagation, and aquatic life harvesting. The top causes for impairment were dissolved oxygen, fish-consumption guidance, shellfishing ban, mercury, and polychlorinated biphenyls. The major sources of contaminants were industrial point-source discharge, municipal point-source discharges, and urban runoff/urban effects.

Florida

Florida's assessed waters for overall water quality attainment in bays and estuaries were rated 100 percent good for the state-designated use of recreation.

3.3.2.3 Marine Pollution Regulatory Framework

Relevant international and Federal laws and regulations pertaining to water quality along the eastern coast of the United States are listed below and summarized in Table 3-5. State laws and regulations are not identified because there would be no water-quality impacts on state waters (out to 3 nm [5.6 km]) from implementing the proposed measures.

The International Convention for the Prevention of Pollution from Ships, 1973, modified by the Protocol of 1978, also known as MARPOL 73/78, minimizes vessel pollution by regulating the disposal of wastes from vessel operations, including oil, chemicals, sewage, garbage, and other harmful substances, into the ocean. Annex I of MARPOL requires the storage of oil residues and their discharge to reception facilities unless the oil content of effluent is less than 100 parts per million (ppm) and discharge is more than 12 nm (22 km) from the nearest land. Annex IV prohibits the discharge of sewage into the sea, with several exceptions. Annex V of MARPOL regulates the dumping of marine debris within 12 nm (22 km) of land. Vessels flagged under a country that is party to MARPOL 73/78 must comply with the requirements of the convention.

MARPOL 73/78 is implemented in the United States by the Act to Prevent Pollution from Ships (33 U.S.C. § 1901), under the lead of the USCG. Under the act, dumping is regulated within the territorial sea (12 nm [22 km]) and in some cases in the contiguous zone (24 nm [44 km]). This legislation restricts the discharge of untreated sewage within 12 nm (22 km). It allows the discharge of treated effluent in coastal waters except in designated No Discharge Areas. Some vessels treat water prior to discharging it beyond 12 nm (22 km) or hold waste water and other solid waste until they reach a shoreside treatment facility.

Solid waste includes food waste, bottles, plastic containers, cardboard, and paper. Marine debris may include fishing gear, building materials, packing materials, and other items (National Park Service [NPS], 2003). Solid waste and marine debris must be disposed of in accordance with Annex V of MARPOL (see preceding text). Solid waste, except for plastics[7], may be disposed of outside of 12 nm (22 km), and should not have an adverse effect on water quality. There is, however, the potential that marine animals (including sea turtles and sea birds) may accidentally ingest these items, which would have a negative effect on their health and could even cause death. Marine species may also become entangled in marine debris, which may cause injury, starvation, or death. Annex V is implemented and enforced in part by Regulation 9, which requires all ships of 400 gross registered tons (GRT) and above and every ship certified to carry 15 persons or more to maintain a Garbage Record Book, to record all disposal and incineration operations (International Maritime Association [IMO], 2004a).

The Federal Water Pollution Control Act or CWA is the principal US law controlling pollution activities in the nation's streams, lakes, and estuaries. The USCG and EPA share responsibilities to implement the act. A number of the provisions included in the CWA contribute directly and indirectly to maintaining the water quality of the marine environment. Specifically, one of the goals of the Act is to provide for the protection and propagation of fish, shellfish, and wildlife (33 U.S.C. § 1251 (a)(2)) (NMFS, 2005a). Under Section 402, for any discharge of a pollutant from a point source to the navigable waters of the United States or beyond a National Pollutant Discharge Elimination System (NPDES) permit must be obtained (33 U.S.C. § 1342). Any discharge to the territorial sea or beyond must comply with the Ocean Discharge criteria established under Section 403 (33 U.S.C. § 1343), or a permit will not be issued. The CWA prohibits the discharge of untreated sewage within all navigable waters[8] of the United States. Section 312 of the Act requires vessels with installed toilet facilities to contain marine sanitation devices, and if these devices treat the sewage, then the treated effluent may be discharged into coastal waters. Section 312 also allows the establishment of a No Discharge Area, where discharge of sewage from vessels is completely prohibited. The CWA has no restrictions on discharging graywater. States may have more stringent regulations on discharging graywater within state waters than these Federal requirements. The CWA generally prohibits discharges of

[7] Annex V of MARPOL totally prohibits of the disposal of plastics anywhere into the sea, and severely restricts discharges of other garbage from ships into coastal waters and "Special Areas" (IMO, 2004a).

[8] The term "navigable waters" means the waters of the United States, including the territorial seas (33 U.S.C. § 1362).

oil and hazardous substances into coastal or ocean waters except when permitted under MARPOL 73/78.

The Oil Pollution Act of 1990 (33 U.S.C. § 2701 *et seq.*) establishes an extensive liability scheme designed to ensure that in the event of a spill or release of oil or other hazardous substances, the responsible parties are liable for the removal costs and damages resulting from the incident. Under the act, waste discharged in waters within 12 nm (22 km) of shore may not have a visible sheen or oil content greater than 15 ppm. Oily water must be retained onboard and discharged at an appropriate reception facility.

The Resource Conservation and Recovery Act of 1976, as amended (42 U.S.C. § 6901 *et seq.*) forbids the dumping at sea of the types of hazardous waste it regulates. If there is compliance with this law, then no hazardous wastes would be discharged in the ocean and there would be no impact on water quality.

The Marine Protection, Research, and Sanctuaries Act of 1972 (MPRSA, P.L. 92-532), in addition to other provisions, has two basic aims: (1) to regulate international disposal of materials, and (2) to authorize related research. Title I of the Act, often referred to as the Ocean Dumping Act, prohibits dumping of all municipal sewage, sewage sludge, and industrial waste, and regulates the disposal of dredged material under a US Army Corps of Engineers permit. The EPA also designates sites and imposes strict tests for the disposal of dredged material. Research provisions concerning general and ocean-disposal research are contained in Title II; Title III authorizes the establishment of marine sanctuaries; Title IV established a regional marine research program; and Title V addresses coastal water-quality monitoring.

3.3.3 Air Quality

This section presents information on air-quality standards; an overview of baseline domestic/international ship emissions; transport and dispersion of air pollutants within the context of regional vessel traffic; and the regulatory framework for marine pollution prevention. The FEIS does not attempt to describe local air quality stemming from marine emissions, as such information is not readily available; however, information on regional air quality at sea is provided where data are available (Section 3.3.3.4).

3.3.3.1 National Ambient Air Quality Standards

Criteria pollutants are those for which the EPA has established National Ambient Air Quality Standards (NAAQS) to protect public health and welfare (40 CFR 50). There are seven criteria pollutants with primary standards: ozone (O_3), carbon monoxide (CO), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), lead (Pb), particulate matter with aerodynamic diameter less than or equal to 10 micrometers (PM_{10}), and particulate matter with aerodynamic diameter less than or equal to 2.5 micrometers ($PM_{2.5}$).

3.3.3.2 Air Pollutants from Marine Vessels

Marine engines emit air pollutants, especially hydrocarbons (HC), nitrogen oxides (NO_x), and sulfur oxides (SO_x). Greenhouse gases such as carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_20) are also emitted during waterborne travel (EPA, 1999). The criteria pollutants from marine engines are shown below in Table 3-6.

Table 3-6
Criteria Pollutant Emissions from Marine Vessels, 1997

Pollutant	Quantity Emitted (Thousands of short tons)	Percent of Total Emissions of Pollutant
Carbon Monoxide (CO)	85	0.1
Nitrogen Oxides (NO_x)	235	1.0
Volatile Organic Compound (VOCs)	50	0.3
Sulfur Dioxide (SO_2)	245	1.2
Particulate Matter (PM_{10})	31	0.1
Particulate Matter ($PM_{2.5}$)	22	0.3
Lead (Pb)	NA	NA

Note: Percentage of emissions from traditionally inventoried sources (does not include agriculture and forestry, fugitive dust, or natural sources like windblown dust). The table does not include recreational marine vessels.
Source: US Environmental Protection Agency, National Air Pollutant Emission Trends, 1900-1997.

Many factors determine emission levels and air impacts, including:

- Number of vessel trips.
- Emissions per volume of fuel consumed, per trip, or per distance traveled, by chemical.
- Distance traveled.
- Engine type, age, and emissions-control technology.
- Fuel consumed (by type), which affects emissions per mile.
- Travel characteristics: speed, acceleration, etc., which affect emissions per mile.
- Climatic conditions (temperature, wind, rain, etc.), which affect dispersion/dilution of pollutants and formation of secondary pollutants.
- Population density, which determines the number of people exposed to pollution.
- Sensitivity of local ecosystems (EPA, 1999).

Engine make and type, size, speed and load are the most influential factors (Corbett and Koehler, 2003). Corbett and Koehler (2003) estimated that the world fleet fuel consumption, calculated for all main and auxiliary engines in the internationally-registered oceangoing fleet (including military vessels), is approximately 289 million metric tons annually. However, the pollutants NO_x, SO_x, and CO_2 estimated in this model were higher than the actual fuel usage reported. The IMO estimates that sulfur emissions from ships are about four percent of total global sulfur emissions at 4.5 to 6.5 million tons per year. These emissions are generally well-dispersed except for certain high-travel shipping routes (IMO, 2005). NO_x emissions are estimated to account for seven percent of global emissions at 5 million tons per year and have regional impacts on acid rain and local port areas (IMO, 2005). Table 3-7 lists emission levels and fuel consumption for various cargo and passenger vessels.

Table 3-7
Modeled Cargo and Passenger Fleet Fuel Consumption and Emissions in 1996 and 2000 from the Main and Auxiliary Engines[a] at Normal Cruising Speed

Ship Type	N_2O, kt		NOx, Mt		CO, kt		NMVOC, kt		PM, kt		SO_2, Mt		CO_2, Mt		Fuel Consumption, Mt	
	96	00	96	00	96	00	96	00	96	00	96	00	96	00	96	00
Liquefied gas tanker	0.3	0.4	0.3	0.3	27	31	9	10	24	29	0.2	0.2	13	16	4	5
Chemical tanker	0.4	0.5	0.3	0.4	30	39	10	13	25	34	0.2	0.3	14	19	5	6
Oil tanker	2.4	2.4	2.0	2.1	178	185	57	60	172	180	1.4	1.5	93	97	29	31
Bulk ships[b]	2.4	2.4	2.6	2.6	224	226	73	73	222	223	1.6	1.6	96	97	30	30
General cargo[c]	2.1	1.9	1.8	1.7	190	174	62	57	95	113	0.7	0.8	82	75	26	24
Container	1.6	2.3	1.6	2.3	150	214	49	69	124	166	0.9	1.2	64	91	20	29
Ro-Ro ships[d]	0.8	0.8	0.7	0.8	72	76	23	25	33	48	0.2	0.3	31	33	10	10
Passenger vessels	0.3	0.4	0.3	0.4	31	38	10	12	15	21	0.1	0.2	13	16	4	5
Refrigerated cargo	0.3	0.3	0.3	0.3	29	28	9	9	15	15	0.1	0.1	12	12	4	4
Total ME	10.6	11.5	9.8	10.8	931	1010	302	327	726	829	5.5	6.2	419	455	132	144
Total (ME + AUX)	11.7	12.7	10.8	11.9	1024	1111	332	360	799	912	6.1	6.8	461	501	145	158

[a]Main engines (ME); auxiliary engines (AUX). Values are in metric tons (Mt) (106 t) or kilotons (kt) (103 t).
[b] Bulk dry and bulk dry/oil vessels.
[c] Including passenger/general cargo vessels.
[d] Including passenger/roll-on roll-off (ro-ro) vessels.
Source: (Endresen *et al*., 2003)

3.3.3.3 Transport and Dispersion of Marine Air Pollutants

The transport and dispersion of air pollutants in the marine environment are influenced by many factors, including global and regional weather patterns. At the local level, wind speed and direction, vertical air-temperature gradients, air-water temperature differences, and the amount of solar heating are primary factors affecting transport and dispersion of air pollutants (EPA, 2005a). There are many factors that determine where air pollutants are transported and how well they are diluted. Without a complex model, it is difficult to determine the fate of vessel emissions that are transported landward or taken up by the ocean.

Oceangoing vessels are moving point sources that disperse emissions. These moving point sources result in transient, short-lived air quality impacts on receptors both on land and at sea. Elevated concentrations at receptor points resulting from ships will last only a few minutes before the ship either moves away or the effluent plume moves away from the receptors. The magnitude of transient emissions is also directly dependent on the closest passing distance between the ship and a receptor. An increase in overall ship emission levels would require an increase in the number of ships in a specific area or the amount of effluent from each ship. When ship-traffic densities act to decrease distances between ships, navigational safety provisions dictate that ships maintain certain spacing, thereby reducing emission concentrations in a specific area. These measures will generally act to reduce the probability that any two ships' plumes will intersect and lead to elevated pollutant concentrations at receptors near or between ships. Barring any increases in per-ship emissions, the only time when systematic increases in concentrations might be expected is when ships sail in a fixed formation, as in a naval formation, or if a shipping lane decreases in area, which could result in a decrease in ship-to-ship distance in the formation.

If shipping lanes bring the average ship passage closer to a receptor, it is possible that average concentrations might increase at the receptor because for peak transient concentrations a reduction in ship-receptor distance results in larger pollutant concentrations. However, the recommended routes neither lead to increased near-shore congestion, nor a shift in the average position of the channels.

3.3.3.4 Regional Vessel Traffic and Air Quality

The mid-Atlantic region has the heaviest vessel traffic of the three regions on the East Coast, with 21,657 vessel arrivals in 2004. The MAUS region includes the majority of the ports on the East Coast, and also includes the busiest port on the coast – New York/New Jersey (described in detail in Section 3.4.1.2). The SEUS has the second-highest volume of vessel traffic on the East Coast, with 4,440 vessel arrivals in 2004. The northeastern region ranks third in overall vessel traffic, with 2,570 arrivals in 2004.

Air quality at sea in the mid-Atlantic, a high vessel-traffic region, has been measured in the vicinity of Wallops Island, Virginia through the Tropospheric Aerosol Radiative Forcing Observational Experiment (TARFOX). This study found that aerosol conditions in the region varied from relatively clean to moderately polluted. The sources of pollution included land-based sources on the East Coast of the United States as well as mineral dust that has been transported from North Africa (Russell *et al*., 1999). Additional information on the TARFOX can be found at *www.geo.arc.nasa.gov/sgg/tarfox*.

Data are currently unavailable for air quality at sea in the SEUS.

Air quality over water in the Northeast, which has less vessel traffic than the other two regions, has been measured intensively during the New England Air Quality Study (NEAQS). This study confirmed via O_3 profiling light detection and rating (LIDAR) that ozone concentrations over water bodies such as the Gulf of Maine can be rather high within 1,000 meters of the atmosphere during the middle of the day. In some cases ozone concentrations are considerably larger than the old 125 parts per billion (ppb) 1 hour NAAQS.[9] Observations made from the research vessel (R/V) Ron Brown (Senff *et al*., 2003) suggest that these concentrations persist over relatively large areas and cannot be considered transient, short-lived air quality impacts like those associated with ship plumes. Furthermore, given the elevated nature of these ozone-enriched layers, back trajectories suggest that much of the ozone and ozone precursors had their origin in the New York City and Boston urban plumes. An observation relevant to shipping traffic is that over the ocean the near-surface air chemistry is NO_x-limited and NO_x injections by shipping plumes could further increase the already-elevated ozone concentrations.

In addition to ozone, the NEAQS offshore observations found layers of high particulate matter (PM) concentrations that also seemed to originate from southwest of New England (Senff *et al*., 2003). Furthermore, some of the layers of particulate matter are localized in origin and can be extremely thin due to the suppressed vertical mixing in the surface of the ocean. The PM off the coast of New England is rather rich in secondary organic species when compared to other

[9] The allowable concentration of criteria pollutants is measured in one-hour intervals, which should not exceed the standard, 125 ppb for ozone. If the standards are exceeded, the area is in non-attainment for that pollutant.

continental plumes like those off China. However, sulfate is still a major fraction of the aerosol mass and shipping emissions will act to increase the offshore concentrations of aerosols.

3.3.3.5 Regulatory Framework for Marine Vessel Pollution Prevention

The Clean Air Act Amendments of 1990 were the first statutes to provide the EPA with a regulatory mandate to control emissions from marine engines. Since then, a number of regulatory milestones have been reached regarding emissions from marine vessels. Of all of the marine boat/ship categories defined by the EPA and the USCG, large commercial (Category 1) ships contribute almost 85 percent of all open-water HC + NO_x emissions, according to an EPA document on control of emissions from marine diesel engines.[10] At present, there are two sources of marine regulation that are producing or will produce significant emissions reductions from commercial shipping.

International efforts exist to prevent marine emissions. Regulations for reducing air pollution from ships were adopted in the 1997 Protocol to MARPOL 73/78, and the new Annex VI entered into force on May 19, 2005. MARPOL Annex VI sets limits on sulfur oxide and nitrogen oxide emissions from marine vessels and prohibits deliberate emissions of ozone-depleting substances. It places a global cap of 4.5 percent mass per unit mass (m/m) on the sulfur content of fuel and includes a provision for IMO to monitor the worldwide average fuel sulfur content. Annex VI also has a provision to establish special SO_x Emission Control Areas, where the sulfur content of fuel must not exceed 1.5 percent m/m or ships must add an exhaust-gas cleaning system to the vessel (IMO, 2005). Other provisions include limits on NO_x emissions from diesel engines, prohibit onboard incineration of PCBs, and prohibit deliberate emissions of ozone- depleting substances such as halons and chlorofluorocarbons (CFCs) (IMO, 2005).

The EPA is proposing a program to introduce more stringent emission standards for large marine diesel engines. The agency published an advanced notice of proposed rulemaking in the *Federal Register* on June 29, 2004, to announce the scope of the program to reduce NO_x and PM emissions from new marine diesel engines. Impacts of emissions on ozone may be reduced by lowering NO_x emissions in the open ocean (Endresen *et al.,* 2003). The EPA has implemented an additional set of controls on the sulfur in marine engine fuels. By 2004 sulfur content in fuels is to be reduced by 99 percent, which will result in a reduction of PM sulfate from fuel containing sulfur. An EPA analysis found that a reduction of 26 percent for HC, 29 percent for NO_x, and 38 percent for PM would result from the regulations. A discussion of the regulatory particulars can be found in the EPA fact sheet, “Overview of EPA’s Emission Standards for Marine Engines” (EPA420-F-04-031).

3.3.4 Noise

Noise in the ocean originates from a myriad of natural and anthropogenic sources. Natural sources of sound in the marine environment, such as from earthquakes, wind, and biologics, can range in frequency from below 1 Hz to above 100 kHz (NRC, 2003). Anthropogenic sources of noise in the marine environment are quite diverse with many producing sound for a particular purpose (e.g., oil and gas exploration, military activities such as sonar or explosives and acoustic scientific research) or incidental to their normal operations (e.g., construction and shipping).

[10] EPA420-R-99-026

Commercial shipping has been identified as one of the primary sources contributing to the increase in ambient (background noise) sound levels of the marine environment. For example, recent studies off the California coast have demonstrated a 3 decibel (dB) increase in the ambient sound level (i.e., doubling of background sound) from commercial shipping per decade (Andrew *et al*., 2002; McDonald *et al*., 2006). A major source of noise, from these types of vessels, results from propeller cavitation (when air spaces created by the motion of the propeller collapse), as well as noise generated from onboard machinery (NMFS, 2005d). The amount of noise produced by large commercial vessels depends on vessel type, size, speed, and engine type. The low-frequency sounds produced by commercial vessels have the potential to overlap with sounds used by large whales for critical life functions (e.g., communication) and are of concern.

Foreign waterborne trade has been steadily increasing over the years, with the number of large vessels predicted to double over the next two to three decades (NMFS, 2005d). Due to this prediction, research on trends in shipping, marine ambient noise, effects of long-term exposure of noise on marine mammals, as well as potential vessel quieting technologies should be investigated. Some of these issues have recently been addressed by two NOAA symposia on shipping noise and marine mammals (2004) and on vessel-quieting technology (2007) and are predicted to be continually addressed nationally and internationally due to the global nature of this issue.

3.4 Socioeconomic Characteristics

3.4.1 Port Areas, Existing Regulations, Traffic Corridors, and Vessel Types

3.4.1.1 Port Areas

Twenty-six port areas along the East Coast of the United States are identified as having the highest potential to be affected by the proposed action. The term port area is used because the port may include smaller ports within the general vicinity of a larger port, although they are not formally included within the boundaries of a single port authority. These port areas are listed in Table 3-8 and shown on Figure 3-10. The port areas have been grouped into port regions, as shown in the table.

3.4.1.2 Summary Descriptions of Port Areas and Operations

The following are brief descriptions of the facilities and operations at each of the port areas considered in this FEIS. For some of the port areas, more detailed descriptions are available in Appendix D.

Socioeconomic Study Areas

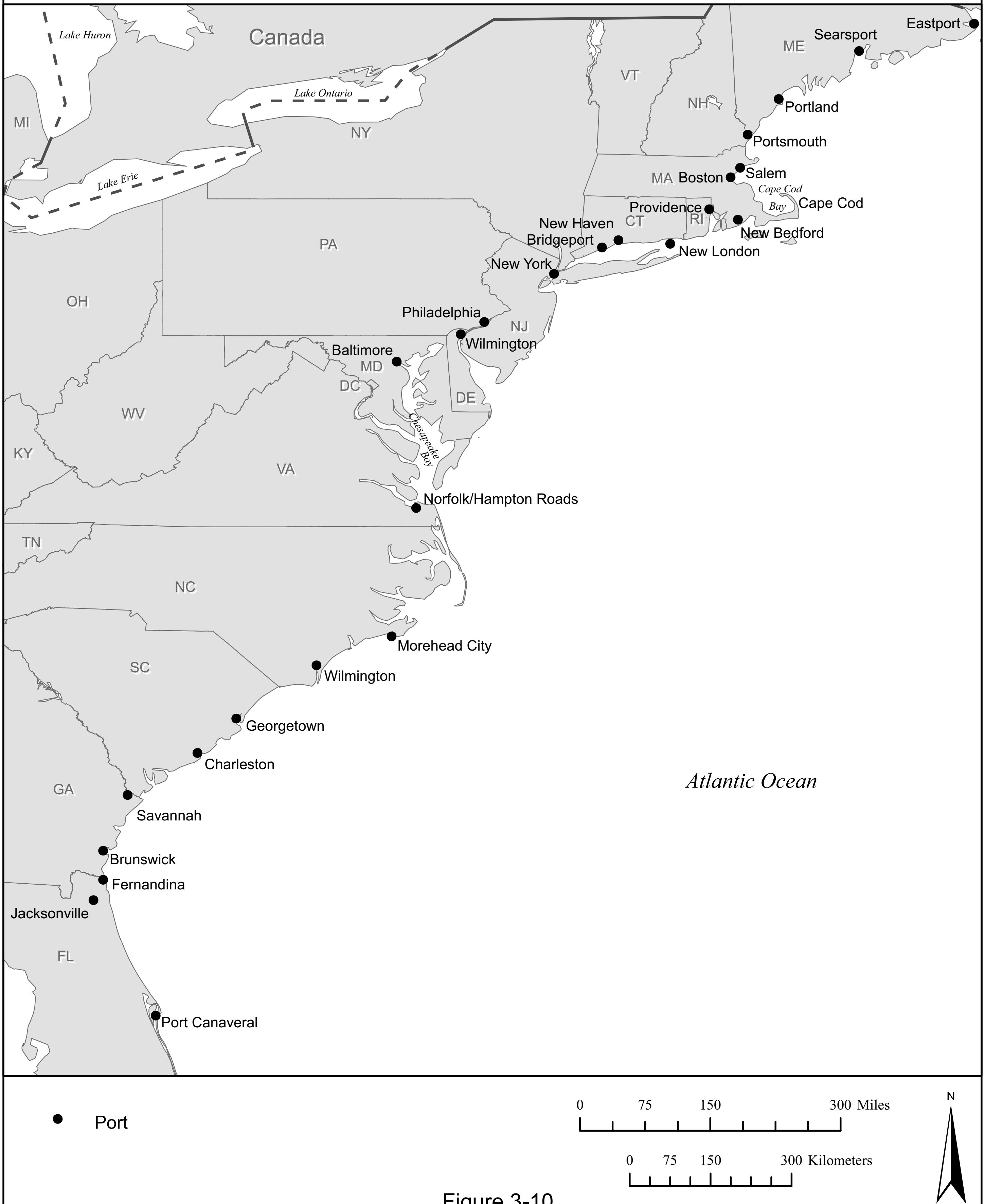

Figure 3-10

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Table 3-8
Socioeconomic Study Area

Port Region	Port Area
Northeastern United States – Gulf of Maine	Eastport, Maine Searsport, Maine Portland, Maine Portsmouth, New Hampshire
Northeastern United States – Off Race Point	Salem, Massachusetts Boston, Massachusetts
Northeastern United States – Cape Cod Bay	Cape Cod, Massachusetts
Mid-Atlantic – Block Island Sound	New Bedford, Massachusetts Providence, Rhode Island New London, Connecticut New Haven, Connecticut Bridgeport, Connecticut Long Island, New York
Mid-Atlantic – Ports of New York/New Jersey	New York City, New York
Mid-Atlantic – Delaware Bay	Philadelphia, Pennsylvania*
Mid-Atlantic – Chesapeake Bay	Baltimore, Maryland Hampton Roads, Virginia
Mid-Atlantic – Morehead City and Beaufort, North Carolina	Morehead City, North Carolina
Mid-Atlantic – Wilmington, North Carolina	Wilmington, North Carolina
Mid-Atlantic – Georgetown, South Carolina	Georgetown, South Carolina
Mid-Atlantic – Charleston, South Carolina	Charleston, South Carolina
Mid-Atlantic – Savannah, Georgia	Savannah, Georgia
Southeastern United States – Brunswick, Georgia	Brunswick, Georgia
Southeastern United States	Fernandina, Florida Jacksonville, Florida Port Canaveral, Florida
*Note: Wilmington, Delaware is also in Delaware Bay, but for the purposes of this analysis, is included with Philadelphia.	

Eastport, Maine

Eastport is the easternmost port in the United States. It is situated in a harbor behind Canada's Campobello Island. The waters of Passamaquoddy Bay and Cobscook Bay converge in Eastport, which, as a result, cause some of the highest tidal ranges in the United States. Due to this tidal action, the local waters are clean and productive. Eastport is home to one of the largest salmon aquaculture operations in the United States. Eastport is also centrally located to many of Maine's forest products industries, making transportation of these products economically efficient. [11]

Searsport, Maine

Searsport is located at the head of Penobscot Bay. The port has recently undergone a major reconstruction effort to better serve the needs of shippers moving products in and out of Maine, and through the onsite rail yard of the Montreal, Maine, and Atlantic Railway, to provide service to the heartlands of both the United States and Canada.[11]

[11] Maine Port Authority: http://www.maineports.com/

Portland, Maine

Portland Harbor, at the western end of Casco Bay, is the most important port on the coast of Maine. The ice-free harbor offers secure anchorage to deep-draft vessels in all weather. There is considerable domestic and foreign commerce in petroleum products, paper, wood pulp, scrap metal, coal, salt, and containerized goods. Portland is also the Atlantic terminus pipeline for shipments of crude oil to Montreal and Ontario. In 1998, Portland became the largest port in the Northeast based on throughput tonnages. A rail system connects the port to a national network that also reaches into Canada, and is one of the reasons shippers bypass the crowded and more costly port cities of southern New England and the mid-Atlantic.

The port has 11 terminals and piers, including several oil terminals, a passenger-vessel terminal, and a fish pier. Portland hosts a variety of international cruise lines, and frequent ferry services to maritime Canada operate from the ports of Portland and Bar Harbor (Port of Portland, 2005).

Portsmouth, New Hampshire

With a deep natural harbor and river, Portsmouth is one of the oldest working ports in the United States. Activity at the port includes pleasure boating and sport and commercial fishing in addition to bulk and general-cargo transport to and from points worldwide. In total, about five million tons of cargo enter or exit Portsmouth Harbor each year. Portsmouth's strategic location makes it ideal for import/export traffic with European trading partners and with businesses in the Middle East, Africa, and the Pacific Rim. The Port is ice-free year round – the closest such port to Europe. Rail service is available to the Port Authority and many other private facilities, while access to Interstate Highway 95 is only a half-mile away. Pease International Tradeport is 2 mi (3.2 km) away in Newington.[12]

Salem, Massachusetts

Salem, founded in 1626, has the second-largest and deepest natural harbor of the Commonwealth and is located on the northeastern coast of Massachusetts.[13] Salem's port facilities receive more than a million tons of coal and 3 million barrels of petroleum products each year. An ongoing major port expansion project will enlarge port capacity and allow for cruise-vessel and ferry service. These improvements are expected to reestablish the regional prominence of this historic seaport.

Boston, Massachusetts

Boston is the oldest continually-active major port in the Western Hemisphere, and is still growing. Since 1980, container traffic has tripled and Boston has become one of the most modern and efficient container ports in the country. Conley Terminal for containerized cargo shipments and Moran Terminal – currently leased to Boston Autoport for the import and distribution of automobiles – handle more than 1.3 million tons of general cargo, 1.5 million tons of nonfuel bulk cargos, and 12.8 million tons of bulk fuel cargos annually.

The passenger ship industry is also expanding in Boston. Numerous four- and five-star cruise lines such as Cunard, Norwegian Majesty, Hapag-Lloyd, and Silversea regularly call at the port. With 101 passenger ships scheduled to call in the 2005 season, Cruiseport Boston is considered one of the fastest-growing high-end cruise markets in the country. The Black Falcon Cruise

[12] Port of Portsmouth profile: http://www.seacoastnh.com/business/port.html
[13] Seaport Advisory Council webpage: http:www.mass.gov/seaports/salem.htm

Terminal, located in the Boston Marine Industrial Park, will serve over 210,000 cruise passengers in 2006. A full cruise season was planned for 2006 between April and October (MASSPORT, 2005). In 2007, from April through December 15, the cruise season expects 101 vessel calls.

Boston also hosts a large complex of privately-owned petroleum and liquefied natural gas terminals, which supply more than 90 percent of Massachusetts' petroleum-consumption needs. The port is home to two shipyards, numerous public and private ferry operations, world-renowned marine research institutions, marinas, and a major Coast Guard facility. It is also one of America's highest-value fishing ports.

The Boston Harbor Navigation Improvement Project currently underway will deepen portions of Boston's Inner Harbor and surrounding areas in order to allow a larger class of vessels to call in the Port. Upon completion of the dredging, the enhanced accessibility of Boston's channels will improve the Port of Boston's competitive position and provide a substantial economic benefit to New England (MASSPORT, 2005).

Cape Cod, Massachusetts

Cape Cod Bay is enclosed by the Cape Cod peninsula on the south and east and the mainland of Massachusetts on the west. The Cape Cod Canal creates a shortcut for vessel traffic from Buzzard's Bay to Cape Cod Bay. Mariners traveling north or south use the canal instead of routing around Cape Cod. This canal is 480 feet wide and 32 feet deep (146 m wide and 9.8 m deep) at mean low water.[14] A small port in Provincetown on the tip of Cape Cod is utilized by commercial fishing vessels, whale-watching vessels, small cruise boats, ferry boats, and other commercial and recreational vessels.

New Bedford, Massachusetts

New Bedford is located on the southeastern coast of Massachusetts. It provides access to New England and Canadian markets and has established itself as one of the busiest ports in the state. Since the early 1960s, New Bedford has been one of the area's largest handlers of perishable goods, servicing vessels from around the world. Shipments include fruit, vegetables, and bulk commodities of frozen fish and meat products. Currently, New Bedford has various vessel berths and is able to accommodate the largest refrigerated vessels afloat.[15] Commercial fishing products, such as frozen fish, are transported from this port to various destinations in the United States. Using Federal grants and local funds, the city and the Harbor Development Council are planning a $1 million, 8,500-square-foot passenger terminal at State Pier to support passenger ferry service.

Providence, Rhode Island

Providence is New England's third largest city and the Northeast's premier deep-water multimodal port facility for international and domestic trade. The Port of Providence, or ProvPort, was officially founded in 1994 as a fully licensed, bonded Deep Water Port specializing in bulk and break-bulk commodities. In the past ten years, the port has added trading connections with Central and South America, Europe, the Far East, Russia, Africa, Australia, and New Zealand. More than 15 tons of cargo has passed through ProvPort since it opened, including

[14] www.nae.usace.army.mil/recreati/ccc/navigation/navigation.htm
[15] Seaport Advisory Council: http://www.mass.gov/seaports/newbed.htm

such commodities as cement, chemicals, coal, heavy machinery, liquid petroleum products, lumber, and steel products.[16]

New London, Connecticut

The Port of New London is located in Connecticut on Long Island Sound. The Port of New London is a historic whaling port, currently utilized by commercial shipping vessels as well as passenger vessels. The Block Island Sound and Cross Sound Ferries operate out of this port. The USCG Academy and a naval submarine base are located in New London.

New Haven, Connecticut

The Port of New Haven is located on Long Island Sound. As the largest deep-water port in Connecticut, the Port of New Haven is an important contributor to the regional economy. In 2002, 55 percent of the waterborne commerce (by short tons) in Connecticut moved through New Haven. Since 2002, New Haven's port traffic has increased by approximately 17 percent, and its share of Connecticut's total traffic has increased 13 percent. The Port primarily handles petroleum and manufactured goods.[17]

Bridgeport, Connecticut

The Bridgeport Port Authority was created in 1993. Currently, Bridgeport is underutilized but growing. The primary tenant is the Bridgeport-Port Jefferson Steamboat Company, a year-round passenger and vehicular ferry service between Bridgeport and Port Jefferson in Long Island, NY. Expected future developments include barge feeder service and high-speed ferry service between Bridgeport, Stamford, and New York.

Long Island, New York

The ports located on Long Island, New York are not as busy as the Port of NY/NJ, although they are frequented by tank barges, tankers, and passenger vessels. There is a regular ferry service from Port Jefferson, NY to Bridgeport, CT, which crosses Long Island Sound. Cold Spring Harbor on Long Island is a historical maritime port.

New York – New Jersey

The port of New York and New Jersey, a natural deep-water harbor that covers 1,500 square miles (sq mi) (3,885 sq km) approximately 9 mi (14.5 km) from the Atlantic Ocean, is the gateway to the densest and wealthiest consumer market in the world. Each year, more than 25 million tons of general cargo move through the port, which has more than 1,100 waterfront facilities, most of which are privately owned and operated. The remaining facilities are owned or operated by railroads serving the port itself, the Port Authority of New York and New Jersey, and by the city, state, and the Federal government (United States Coast Pilot [USCP] 2, 2005). Four major terminals handle cargo and containerships. A passenger ship terminal, the New York Cruise Terminal, is operated by P&O Ports North America for the City of New York. This terminal provides five berths that can accommodate some of the largest cruise ships. The cruise lines calling there include Carnival, Celebrity, Costa, Crystal Cruises, Cunard, Holland America, Norwegian, P&O Cruises, Princess, Radisson Seven Seas, Royal Caribbean, Seabourne, and Silversea (Port Authority of NY/NJ, 2005).

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[16] Providence Port Authority website: http://www.provport.com
[17] New Haven Port Authority: http://www.cityofnewhaven.com/govt/Port_Authority

A billion dollars worth of port improvement initiatives is preparing the New York port area to accommodate growing demand, including ongoing dredging projects.

Philadelphia, Pennsylvania

The Port of Philadelphia is at the intersection of the Delaware and Schuylkill Rivers. For more than 300 years Philadelphia has been an important port city and a major center for international commerce. Philadelphia and its international seaport maintain a preeminent position in several areas of trade, such as the importing of perishable cargoes from South America and high-quality paper products from Scandinavia (Philadelphia Port Authority, 2005). The port has two major terminals with more than 45 deep-water piers and wharves and is also a Strategic Military Port (Philadelphia Regional Port Authority, 2005). The port authority has plans to initiate a Delaware River Channel-Deepening Project. Vessel arrivals for the Port of Wilmington, Delaware are included with Philadelphia in the socioeconomic analysis contained in this FEIS.

Baltimore, Maryland

The port of Baltimore, which supports both commercial shipping and passenger-vessel industries, is located at the head of navigable waters of the Patapsco River, approximately 12 mi (19.3 km) northwest of the Chesapeake Bay. Baltimore's location provides immediate access to the 6.8 million people in the Washington/Baltimore region, the nation's fourth-largest and one of the wealthiest consumer markets in the United States.[18] Additionally, the port's inland location makes it the closest Atlantic port to major Midwestern population and manufacturing centers, putting it within a day's reach of one-third of all US households. Baltimore is one of the country's top container terminals, with high-tech, computerized facilities that greatly increase the port's efficiency and cost-effectiveness. The port has six public terminals and seven private ones, with more than 200 piers and wharves owned by both the Maryland Port Administration and private companies (USCP 3, 2005).

Hampton Roads, Virginia

The port area of Hampton Roads is located in southeastern Virginia, at the southwest corner of Chesapeake Bay, 18 mi (29 km) from the open sea. It encompasses 25 sq mi (64.75 sq km) of accessible waterways. In terms of general cargo, Hampton Roads is the second largest port on the East Coast, after the Port of New York-New Jersey (Hampton Roads Maritime Association [HMRA], 2005). It includes the ports of Norfolk and Newport News, and has more than 200 piers and wharves (USCP 3, 2005). A new terminal is scheduled to open in 2007 on the Elizabeth River in Portsmouth that will allow the port to handle an additional 500,000 containers per year (HRMA, 2005). The City of Norfolk has plans to build a new terminal to support the growing cruise industry.

In addition to being a major commercial port, Hampton Roads is home to the US Atlantic Fleet and the largest naval base in the world, in Norfolk. Approximately 58 Navy vessels are homeported in Norfolk. The Hampton Roads area is also home to one of the highest concentrations of Coast Guard personnel in the country. The South Atlantic Region of the US Department of Transportation's Maritime Administration (MARAD) in Norfolk is responsible for all MARAD operations on the East Coast (HRMA, 2005).

[18] Maryland Department of Transportation: www.mdot.state.md.us.

Morehead City, North Carolina

The port of Morehead City is located 4 mi (6.4 km) from the ocean on the Newport River and Bogue Sound. It is one of the deepest ports on the East Coast. The port has 5,500 ft (1,676 m) of continuous wharf, two berths for loading and unloading, and handles break-bulk and bulk cargo. Morehead City is a major port for phosphate products. Container traffic was facilitated by the opening of two inland terminals in the 1980s. More expansions are being planned.[19]

Wilmington, North Carolina

The Port of Wilmington is located on the east bank of the Cape Fear River. It has facilities to handle containerized, bulk cargo, and break-bulk cargo.[19] It is close to the center of the Southeast market, the fastest-growing region in the country.

Georgetown, South Carolina

The Port of Georgetown is South Carolina State Ports Authority's dedicated bulk cargo and break-bulk cargo facility. Top commodities are steel, salt, cement, aggregates, and forest products (South Carolina State Ports Authority [SCSPA], 2005).

Charleston, South Carolina

Charleston is the largest city and port in South Carolina. The port of Charleston consists of five terminals dedicated to commercial cargo and containers (SCSPA, 2005). It also has a cruise terminal, which hosted about 49 arrivals in 2005. Norwegian Cruise Line, Carnival, Clipper, Royal Caribbean, and several other smaller cruise companies call at this port. MARAD also utilizes several piers at the former Navy Yard.

Savannah, Georgia

The port of Savannah is Georgia's chief port. It has two deep-water terminals with numerous wharves owned by the Georgia Ports Authority and private entities (Georgia Port Authority [GPA], 2005). The Georgia Port Authority has been planning for the expansion of Savannah Harbor since 1999. This project would deepen the channel to a maximum depth of 48 ft (14.6 m). An EIS assessing the impacts of the proposed dredging project is currently being prepared (GPA, 2005). The Elba Island LNG terminal, owned and operated by Southern LNG, is located on the Savannah River.

Brunswick, Georgia

The Port of Brunswick is located on the Brunswick and East Rivers. There are three terminal facilities owned by the Georgia Ports Authority. These terminals handle break-bulk, bulk and roll-on roll-off (ro-ro) vessels. There is a harbor-deepening project planned for the Port of Brunswick that would increase the channel depth from 30 to 36 ft (9.8 m to 11 m) (GPA, 2005).

Fernandina Beach, Florida

Fernandina Beach is the main center of activity on Amelia Island. The port specializes in break-bulk forest products and container liner services to the Caribbean and South America.

[19] http://www.ncports.com.

Jacksonville, Florida

The Jacksonville Port Authority (JAXPORT) is a full-service international trade seaport operating three public terminals and one passenger cruise terminal. Of 27 principal piers and wharves, six are owned by JAXPORT; the others are privately owned and operated (USCP 2, 2005). Celebrity and Carnival cruise lines operate out of this port (Jacksonville Port Authority, 2005).

Port Canaveral, Florida

Port Canaveral is strategically located on Florida's central Atlantic Coast and has intermodal connections to reach all of Florida and other states in the Southeast. In addition, it is an ideal hub between the southeastern United States, the Caribbean, and Central America. More than 3 million tons of bulk cargo moves through the port every year. Products include fresh produce, frozen food, juice concentrates, milled lumber, bagged cement, steel, and newsprints.

3.4.1.3 Existing Vessel Regulations

The Ports and Waterways Safety Act of 1972 authorized the USCG to implement measures to control and supervise vessel traffic to ensure navigational safety and environmental protection in US ports and waterways. Under this authority, the USCG conducts Port Access Routes Studies (PARS) for changes in vessel operations, including the one conducted of vessel-routing measures to protect right whales. The Act also authorizes the USCG to require vessels to carry devices that are compatible for use with the Vessel Traffic Services (VTS) system. The VTS is designed to improve the safety and efficiency of vessel traffic and to protect the environment through a national transportation system that collects, processes, and disseminates information on the marine operating environment and maritime vessel traffic in major US ports and waterways. The VTS system was established under Chapter V (Safety of Navigation) of the International Convention on the Safety of Life at Sea (SOLAS). The convention states that governments may establish a VTS when the volume of traffic or the degree of risk justifies such services (IMO, 2004b). Currently, the only VTS within the geographical scope of the operational measures is in New York Harbor.

The USCG also issues periodic notices to mariners regarding information about aids to navigation, hazards to navigation, and other information regarding navigational safety (USCG, 2004). In April 2005, the USCG updated the Broadcast Notice to Mariners regarding the presence of right whales within 30 nm (56 km) of the coast along the US mid-Atlantic. Notice to Mariners is broadcast via VHF and single-side-band radios and published for distribution. The current message states that right whales are prone to vessel collisions, approaching within 500 yards (yds) (457 m) is prohibited, and provides several sources to obtain information on sightings and advisories. The new message suggests that vessel operators use caution and proceed at safe speeds in areas used by right whales. In 2007, the notice was updated with a message that NOAA recommends speeds of 10 knots or less in areas used by right whales.

The USCG designates Regulated Navigation Areas (RNAs) to control vessel traffic by specifying times of vessel entry, movement, or departure to, from, within, or through ports, harbors, or other waters. There are several designated RNAs within the geographic scope of the proposed rulemaking. The RNA in the Chesapeake Bay Entrance, around Hampton Roads, Virginia, and adjacent waters, requires that all vessels of 300 GRT or greater reduce speeds to 8 knots in the vicinity of the Naval Station Norfolk, to improve security measures and reduce the potential threat to Naval Station Norfolk security that may be posed by these vessels (67 FR 41337). This temporary final rule was republished in the *Federal Register* on December 2002 (68 FR 2201). This rule placed a 5-knot speed limit in Little Creek, a 6-knot speed limit in the southern branch of the Elizabeth River, and a 10-knot speed limit in Norfolk Harbor Reach. The RNA in the Long Island Sound Marine Inspection and Captain of the Port Zone excludes all vessels from operating within 700 yds (640 m) of the Millstone Nuclear Power Plant or 100 yds (91 m) from an anchored USCG vessel, to ensure public safety and prevent sabotage or terrorist acts. The rule also includes speed restrictions in the vicinity of Naval Submarine Base New London and Lower Thames River, whereby vessels 300 GRT or more are restricted to 8 knots and lower speeds. This rule was effective from December 2001 to June 2002.

The Convention on the International Regulations for Preventing Collisions at Sea, 1972 (COLREGS) established "safe speeds" for mariners and traffic-separation schemes. Rule 10 sets out the navigational rules for vessels operating in or near TSSs. Regulation 8 of SOLAS states that the IMO is the only organization competent to deal with international measures concerning the routing of ships (IMO, 2004a).

In July 2004, Canada, Transport Canada, the World Wildlife Federation, and others submitted a proposal to the IMO to move shipping lanes in the Bay of Fundy away from important right whale feeding grounds. The proposal was adopted by the IMO at its annual meeting of the Marine Safety Committee in December of 2002 in London, England, and was enacted in 2003 (WWF, 2003). This shift in the TSS added 5 mi (8 km) to the distance traveled for vessels calling at Saint John and 11 mi (18 km) for vessels calling at Bayside and Eastport. Currently marine scientists and Transport Canada are developing a proposal for the implementation of an ATBA in Roseway Basin.

Regulation 19, Chapter V of SOLAS, requires that all vessels of 300 gross tonnage and greater engaged in international voyages, cargo ships of 500 gross tonnage and greater not engaged in international voyages, and passenger ships (irrespective of size) built on or after July 1, 2002, carry an Automated Identification System (AIS) capable of providing information about the ship to other ships and to coastal authorities automatically (IMO, 2004b). The Regulation also applies to ships built before July 2002 engaged in international voyages, according to the following timetable:

- Passenger ships by 1 July 2003.
- Tankers by 1 July 2003.
- Ships, other than passenger ships and tankers, of 50,000 gross tonnage and greater by 1 July 2004.

Ships other than passenger ships and tankers from 300 to 50,000 gross tonnage were required to have AIS by 31 December 2004. It is possible that AIS could be used to alert mariners when whales are sighted.

Port State Control (PSC) is an international protocol developed by the IMO that gives authority to a nation state to inspect foreign ships and verify that the ship and its crew are in compliance with international regulations (IMO, 2005). The United States is a signatory to IMO protocols and the USCG is the lead PSC agency in the United States. The USCG is also the lead agency in developing guidelines for the International Ship and Port Security (ISPS) compliance inspections.

As a sovereign state, the United States has extensive authority to regulate ships entering its ports and to establish port-of-entry conditions. Therefore, the United States has the authority to require foreign flag vessels calling at US ports to adhere to the vessel operational measures to reduce ship strikes.

Vessel Traffic

Several types of routing measures are used by the USCG and IMO to provide safe access routes to and from ports, including recommended routes, anchorage/no anchorage areas, and TSSs. The purpose of a TSS is to separate opposing streams of traffic by appropriate means and establish traffic lanes (33 CFR 167). TSSs have been adopted by the IMO in certain areas of the world to aid in navigation safety; all vessels must adhere to operating rules within these routes, although vessels may enter a TSS anywhere along its course. There are several TSSs in the waters along the East Coast.

Northeast

There are two internationally-adopted TSSs in the Northeast. One has been established in the approaches to the harbor of Portland, Maine. This TSS consists of directed inbound and outbound traffic lanes with a separation zone and a precautionary area. The second TSS has been established in the approach to Boston, Massachusetts. It originates in the Great South Channel, heads in a northerly direction to a point just off the easterly side of Provincetown, from which it continues in a northwesterly direction, crossing Stellwagen Bank and ending in a Precautionary Area off the entrance to Boston Harbor (NOS, 1993a). The Boston TSS intersects the Great South Channel right whale critical habitat and several of the proposed management areas.

In addition to TSSs, there are other nonofficial, but highly-utilized areas or lanes in that area. The majority of the vessels transiting Cape Cod Bay are tugs and barges, which generally operate on the western side of the bay. Some vessels cross the right whale critical habitats northbound to ports in Boston, New Hampshire, Maine, and Canada, and a small portion calls at Provincetown, Massachusetts, (Russell *et al*., 2005) and southbound to the Canal. Vessels also transit Stellwagen Bank via the Cape Cod Canal (NOS, 1993a). Analysis of Mandatory Ship Reporting System (MSRS) data found that traffic headed for Massachusetts from the east generally uses four “high-use routes” that pass through the Great South Channel critical habitat and Stellwagen Bank and converge near the Boston Approach (Ward-Geiger *et al.,* 2005).

Overall, the area experiences heavy vessel traffic, including within the two critical habitat areas and a national marine sanctuary. There were no existing routes for vessels traveling into or out of the Cape Cod Canal, until the recommended routes within Cape Cod Bay were established in November 2006.

Mid-Atlantic

Significant amounts of ship traffic utilize ports in the mid-Atlantic. Coastwise (moving up and down the coast) ship traffic travels through the right whale’s migratory corridor and vessels approaching and leaving ports intersect the migratory corridor. Some mid-Atlantic ports have domestic or internationally-adopted TSSs. TSSs exist for the approaches into Narragansett Bay, Rhode Island, and Buzzards Bay, Massachusetts through Rhode Island Sound (USCP 2, 2005). There are also TSSs into the approaches of Delaware Bay and Chesapeake Bay. The Off New York TSS has four approaches: two eastern approaches – off Nantucket and off Ambrose Light, one southeastern approach, and one southern approach (USCP 2, 2005).

Southeast

The major ports in this area are Jacksonville, Fernandina, Brunswick, and Canaveral. There are no internationally-adopted traffic schemes in this region. A MSRS is in effect within the southeastern right whale critical habitat. This system does not specify routing measures, although it provides mariners with information on the location of right whales in the area. Upon receipt of the information, the mariner can decide if a heading change is necessary based on the whales' location. This system also yields data on the location of vessels and their routes.

Analysis of data received from the MSRS identified two "high-use" routes associated with the approach to Jacksonville, one of the most frequented ports, followed by Brunswick, and Fernandina Beach (Ward-Geiger *et al.,* 2005). Both of these routes have southern approaches, although one is oriented more toward the east than the other. Most large ship traffic does not navigate coastwise through the SEUS. Northbound traffic generally stays in the Gulf Stream to take advantage of the current and remains east of the proposed Southeast management area. Southbound traffic is sparse and tends to stay off the coasts of Georgia and Florida. Tug and barge, and recreational traffic tend to use coastwise routes.

3.4.1.4 General Vessel Characteristics

Vessel Types

A range of vessel types call at East Coast ports and could be affected by the proposed operational measures. For the purpose of the economic analysis, the following 12 vessel types were considered:

- Bulk carriers
- Combination carriers
- Containerships
- Freight barges
- General cargo vessels
- Passenger vessels
- Refrigerated cargo vessels
- Ro-Ro cargo vessels
- Tank barges
- Tank ships
- Towing vessels
- Other (includes fishing vessels, industrial vessels, research vessels, and school ships)

East Coast Arrivals by Type

Table 3-9 shows how many ships in each category arrived at the 26 port areas in 2003 and 2004, based on the USCG vessel-arrival database.[20] In 2003, there were 25,532 vessel arrivals at the ports considered here. In 2004, arrivals increased by 7.3 percent, to 27,385 arrivals.

[20] Reconciliation of the USCG data is described in detail in the supporting Economic Impact Report, prepared by Nathan Associates, Inc. Vessel arrival data for 2005 through 2007 did not became available until after the majority of work on the economic analysis had been completed. Vessel-arrivals data for 2003 and 2004 provide a suitable

Containerships were the most numerous, with 8,623 arrivals in 2003 (about one third of all arrivals) and 8,886 arrivals in 2004 (a little under one third of all arrivals). Tank ship was the next most frequent vessel type, with 5,439 arrivals in 2003 and 5,513 in 2004. Other significant vessel types include bulk carriers (3,149 arrivals in 2004), ro-ro cargo vessels (3,054 arrivals in 2004), and general cargo vessels (1,843 arrivals in 2004). These top five vessel types accounted for 85 percent of total vessel arrivals in 2003 and 82 percent in 2004.

Table 3-9
East Coast Vessel Arrivals by Vessel Type, 2003 and 2004

Vessel Type	2003	2004
Bulk carrier	2,743	3,149
Combination carrier	150	106
Containership	8,623	8,886
Freight barge	243	274
General cargo vessel	1,752	1,843
Passenger vessel	1,229	1,666
Refrigerated cargo vessel	621	548
Ro-Ro cargo vessel	3,107	3,054
Tank barge	1,127	1,492
Tank ship	5,439	5,513
Towing vessel	416	745
Other[1]	82	109
Total	**25,532**	**27,385**

[1] Includes fishing vessels, industrial vessels, research vessels, and school ships.
Source: Nathan Associates Inc., 2005.

Vessel Weight

In addition to type, vessel arrivals are also analyzed here by dead weight tons (DWT) and/or GRT, which are the customary units used by the shipping industry for classifying vessels by size category to estimate vessel operating costs.

In most categories, a range of ship weights is represented. On average, combination carriers are the largest, with an average weight of 74,697 DWT in 2003 and 59,777 DWT in 2004. Tank ships are next, with an average of 54,513 DWT in 2003 and 57,060 DWT in 2004. The average containership was 40,895 DWT in 2003 and 40,760 DWT in 2004. Dry bulk carriers were the only other vessel type with an average DWT in excess of 30,000 DWT, registering 36,193 DWT in 2003 and 36,620 DWT in 2004.

basis for identifying the level of economic impact for later years, as annual variations in the composition and volume of vessel traffic are relatively modest. For example, while new and larger vessels come into service each year, these new vessels would not significantly alter the average vessel operating costs used in this analysis by type and size of vessel. Similarly, the annual growth in overall traffic would affect all alternatives analyzed and pales in significance when compared to the large differences amongst the alternatives analyzed.

East Coast Arrivals by Weight

The size of vessels calling at East Coast ports can vary considerably depending on a number of factors including cargo and vessel type, length of ocean voyage, port and channel draft limitations at the loading or unloading port, customers' preferred consignment size, and vessel-routing considerations. For the entire East Coast, 38 percent of vessel arrivals are comprised of vessels less than 20,000 DWT. Approximately 24 percent of arrivals are of vessels between 20,000 and 40,000 DWT, 25 percent between 40,000 and 60,000 DWT, and 13 percent over 60,000 DWT in 2003 and 2004.

In 2003, the port area of Portland had the highest average vessel DWT (53,810) on the East Coast. The port area of Philadelphia was second with an average of 46,371 DWT. Large tankers bringing principally fuel oil for local power plants account for more than 50 percent of the arrivals to both these port areas. High average vessel DWTs were also reported in 2003 for the port areas of Salem, MA (44,738) and Hampton Roads (42,749). The average vessel DWT by port area was similar in 2004 to what it was in 2003. (The supporting Economic Impact Report provides a further analysis of average vessel size by DWT quartile for each of the port areas and vessel size by vessel type.)

Arrivals by Port Area

The potential for each port area to be affected by the proposed action varies with the amount of shipping activity occurring every year. Measures of this activity are the number and combined weight of vessels calling at each port. Data Chart 3-1 summarizes arrival data by port region, port area, and DWT for 2003 and 2004.

As noted above, in 2003, there were 25,532 vessel arrivals at the ports considered in this FEIS, and 27,385 in 2004. Considering arrivals into each port region, the most active region in both years was the Port of New York/New Jersey, with 5,426 and 5,550 vessel arrivals in 2003 and 2004, respectively. The Chesapeake Bay port region was next, with 4,486 and 4,875 arrivals in 2003 and 2004, respectively. Other port regions with more than 2,000 vessel arrivals in 2004 include the Southeastern United States (4,315 vessel arrivals), the Delaware Bay region (2,661 vessel arrivals), and the Block Island Sound region (2,563 vessel arrivals).

In terms of single port areas, New York City had the most vessel arrivals (5,550 arrivals) in 2004, followed by Hampton Roads (2,834 arrivals), Philadelphia (2,661 arrivals), Jacksonville (2,517 arrivals), Savannah (2,474 arrivals), Charleston (2,473 arrivals), Baltimore (2,041 arrivals), and Port Canaveral (1,062 arrivals).

Operating Speed

Table 3-10 shows average speeds by vessel type and DWT category based on data from MSRS reports, United States Army Corps of Engineers (USACE) estimates of vessel service speeds, and comments from the maritime industry. Further information on these data sources is provided in the Economic Impact Report.

Data Chart 3-1
Vessel Arrivals by Region, Port Area and DWT, 2003-2004

	2003					2004				
	DWT					DWT				
Port Region and Port Area	0 - 19,999	20,000 - 39,999	40,000 - 59,999	60,000 and Greater	Total	0 - 19,999	20,000 - 39,999	40,000 - 59,999	60,000 and Greater	Total
Northeastern US - Gulf of Maine										
Eastport, ME	23	4	13	-	40	17	-	26	-	43
Searsport, ME	132	43	18	3	196	117	46	31	2	196
Portland, ME	209	111	83	217	620	201	103	104	233	641
Portsmouth, NH	32	91	74	2	199	33	48	91	1	173
Subtotal	396	249	188	222	1,055	368	197	252	236	1,053
Northeastern US - Off Race Point										
Salem, MA	1	1	5	2	9	6	6	-	3	15
Boston, MA	237	109	127	10	483	237	109	127	10	483
Subtotal	238	110	132	12	492	243	115	127	13	498
Northeastern US - Cape Cod Bay										
Cape Cod, MA	9	-	3	10	22	15	1	8	12	36
Subtotal	9	0	3	10	22	15	1	8	12	36
Mid-Atlantic Block Island Sound										
New Bedford, MA	46	33	12	19	110	41	28	8	22	99
Providence, RI	172	74	92	12	350	157	89	72	4	322
New London, CT	96	19	20		135	118	25	36	1	180
New Haven, CT	309	116	117	5	547	520	81	94	6	701
Bridgeport, CT	278	4	15	22	319	349	2	14	27	392
Long Island, NY	624	59	9	88	780	691	77	17	84	869
Subtotal	1,525	305	265	146	2,241	1,876	302	241	144	2,563
Mid-Atlantic Ports of New York/New Jersey										
New York City, NY	1,353	1,311	1,830	932	5,426	1,324	1,548	1,774	904	5,550
Subtotal	1,353	1,311	1,830	932	5,426	1,324	1,548	1,774	904	5,550
Mid-Atlantic Delaware Bay										
Philadelphia, PA	1,117	472	296	594	2,479	1,153	556	327	625	2,661
Subtotal	1,117	472	296	594	2,479	1,153	556	327	625	2,661
Mid-Atlantic Chesapeake Bay										
Baltimore, MD	754	483	415	168	1,820	759	588	443	251	2,041
Hampton Roads, VA	429	763	950	524	2,666	472	855	871	636	2,834
Subtotal	1,183	1,246	1,365	692	4,486	1,231	1,443	1,314	887	4,875
Mid-Atlantic Morehead City and Beaufort, NC										
Morehead City, NC	30	74	15	4	123	37	77	33	4	151
Subtotal	30	74	15	4	123	37	77	33	4	151
Mid-Atlantic Wilmington, NC										
Wilmington, NC	196	168	238	26	628	221	176	240	30	667
Subtotal	196	168	238	26	628	221	176	240	30	667
Mid-Atlantic Georgetown, SC										
Georgetown, SC	19	18	26	-	63	27	28	14	-	69
Subtotal	19	18	26	0	63	27	28	14	0	69
Mid-Atlantic Charleston, SC										
Charleston, SC	371	692	986	228	2,277	406	817	1,045	205	2,473
Subtotal	371	692	986	228	2,277	406	817	1,045	205	2,473
Mid-Atlantic Savannah, GA										
Savannah, GA	507	667	908	316	2,398	496	739	823	416	2,474
Subtotal	507	667	908	316	2,398	496	739	823	416	2,474
Southeastern US										
Brunswick, GA	282	126	46	4	458	271	149	28	4	452
Fernandina, FL	225	4	26	-	255	247	2	35	-	284
Jacksonville, FL	1,376	457	358	49	2,240	1,562	514	389	52	2,517
Port Canaveral, FL	763	70	46	10	889	878	84	85	15	1,062
Subtotal	2,646	657	476	63	3,842	2,958	749	537	71	4,315
All Port Areas	**9,590**	**5,969**	**6,728**	**3,245**	**25,532**	**10,355**	**6,748**	**6,735**	**3,547**	**27,385**

Source: Prepared by Nathan Associates based on analysis of U.S. Coast Guard data on vessel calls at U.S. ports, 2003-2004.

Table 3-10
Average Vessel Operating Speeds (Knots) by Vessel Type and Weight (000 DWT)

Vessel Type	0 to 5	5 to 10	10 to 15	15 to 20	20 to 25	25 to 30	30 to 35	35 to 40	40 to 45	45 to 50	50 to 60	60 to 70	70 to 80	80 to 90	90 to 100	100 to 120	120 to 150	150 and Over
Bulk carrier	11.6	11.6	12.2	12.5	12.5	12.5	13	13	13.4	13.4	14	14	14.1	14.1	14.1	14.1	14.1	14.1
Combination carrier	11.6	11.6	12.2	12.2	12.5	12.5	13	13	13.4	13.4	14	14	14.1	14.1	14.1	14.1		
Containership	13	15.8	17.4	18.5	19.3	20	20.7	21.2	21.7	22.1	22.7	23.4	24.1	24.6				
Freight barge	12	14.2	15.3	16.1	16.8	17.3	17.7	18.1	18.4	18.8	19.2							
General cargo vessel	12	14.2	15.3	16.1	16.8	17.3	17.7	18.1	18.4	18.8								
Passenger vessel	16	18	20	22	24													
Refrigerated cargo vessel	13	15.8	17.4	18.5	19.3	20	20.7	21.2	21.7	22.1	22.7							
Ro-Ro cargo vessel	13	15.8	17.4	18.5	19.3	20	20.7	21.2	21.7	22.1	22.7	23.4	24.1					
Tank barge	13.2	13.7	13.9	14	14.2	14.2	14.3	14.4	14.4	14.5	14.5							
Tanker	13.2	13.7	13.9	14	14.2	14.2	14.3	14.4	14.4	14.5	14.5	14.6	14.7	14.7	14.8	14.8	14.9	15
Towing vessel	13.2	13.7	13.9	14	14.2	14.2	14.3	14.4	14.4	14.5								
Other[1]	12	12	12	12	12.	12	12											

1. Includes fishing vessels, industrial vessels, research vessels, school ships
Source: Nathan Associates Inc., 2005

Data Chart 3-2
Hourly Vessel Operating Costs at Sea for Foreign Flag and US Flag, Vessel Type and DWT Size Range, June 2008 ($)

	DWT (000s)																	
Vessel type and flag	0-5	5-10	10-15	15-20	20-25	25-30	30-35	35-40	40-45	45-50	50-60	60-70	70-80	80-90	90-100	100-120	120-150	150+
Foreign Flag 2008 Hourly Operating Costs at Sea																		
Bulk Carrier	1,153	1,181	1,209	1,239	1,269	1,300	1,332	1,364	1,398	1,432	1,484	1,558	1,635	1,715	1,800	1,935	2,183	2,522
Combination Carrier (e.g. OBO)	1,210	1,240	1,270	1,301	1,333	1,365	1,398	1,433	1,467	1,503	1,559	1,636	1,716	1,801	1,890	2,032	2,292	2,648
Container Ship	1,137	1,291	1,466	1,664	1,890	2,145	2,436	2,766	3,140	3,565	4,313	5,560	7,167	9,239	11,911	17,433	-	-
Freight Barge	697	853	1,044	1,279	1,566	1,917	2,348	2,874	3,520	4,310	-	-	-	-	-	-	-	-
General Dry Cargo Ship	697	853	1,044	1,279	1,566	1,917	2,348	2,874	3,520	4,310	-	-	-	-	-	-	-	-
Passenger Ship a/	5,164	7,558	11,062	17,252	22,240	-	-	-	-	-	-	-	-	-	-		-	-
Refrigerated Cargo Ship	2,558	2,905	3,298	3,744	4,251	4,827	5,481	6,223	7,065	8,021	9,704	-	-	-	-	-	-	-
Ro-Ro Cargo Ship	1,251	1,420	1,612	1,831	2,078	2,360	2,679	3,042	3,454	3,922	4,744	6,116	7,884	-	-	-	-	-
Tank Barge	1,323	1,349	1,375	1,401	1,428	1,456	1,484	1,512	1,541	1,571	1,617	-	-	-	-	-	-	-
Tank Ship	1,323	1,349	1,375	1,401	1,428	1,456	1,484	1,512	1,541	1,571	1,617	1,679	1,745	1,812	1,883	1,994	2,193	2,459
Towing Vessel	1,323	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Other b/	697	853	1,044	1,279	1,566	1,917	2,348	-	-	-	-	-	-	-	-		-	-
US Flag 2008 Hourly Operating Costs at Sea																		
Bulk Carrier	1,672	1,720	1,768	1,819	1,870	1,923	1,977	2,033	2,091	2,150	2,242	2,371	2,507	2,651	2,803	3,048	3,504	4,143
Combination Carrier (e.g. OBO)	1,756	1,806	1,857	1,909	1,963	2,019	2,076	2,135	2,195	2,258	2,354	2,489	2,632	2,783	2,943	3,200	3,679	4,350
Container Ship	1,741	1,933	2,147	2,385	2,649	2,942	3,267	3,628	4,030	4,476	5,238	6,461	7,970	9,831	12,126	16,611	-	-
Freight Barge	1,143	1,372	1,647	1,977	2,374	2,850	3,421	4,107	4,931	5,920	7,787	-	-	-	-	-	-	-
General Dry Cargo Ship	1,143	1,372	1,647	1,977	2,374	2,850	3,421	4,107	4,931	5,920	7,787	-	-	-	-	-	-	-
Passenger Ship a/	7,734	10,595	14,514	20,953	25,845	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigerated Cargo Ship	3,917	4,350	4,831	5,366	5,959	6,619	7,351	8,164	9,067	10,070	11,786	-	-	-	-	-	-	-
Ro-Ro Cargo Ship	1,915	2,127	2,362	2,623	2,914	3,236	3,594	3,991	4,433	4,923	5,762	7,107	8,767					
Tank Barge	2,187	2,228	2,270	2,312	2,355	2,400	2,445	2,490	2,537	2,585	2,658	-	-	-	-	-	-	-
Tank Ship	2,187	2,228	2,270	2,312	2,355	2,400	2,445	2,490	2,537	2,585	2,658	2,758	2,862	2,971	3,083	3,260	3,577	3,998
Towing Vessel	2,187	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Other b/	1,143	1,372	1,647	1,977	2,374	2,850	3,421	4,107	4,931	5,920	7,787	-	-	-	-	-	-	-

a/ Includes recreational vessels.

b/ Includes fishing vessels, industrial vessels, research vessels, and school ships.

Source: Prepared by Nathan Associates Inc. as decribed in text from data provided in U.S. Army Corps of Engineers, Economic Guidance Memorandum 05-01, Deep Draft Vessel Operating Costs and adjusted for bunker fuel prices reported by Bunkerworld for IFO380 and MDO for New York as of June 13, 2008.

Operating Costs at Sea

In addition to estimates of vessel service speeds, the USACE prepares estimates of vessel operating costs to be used by planners to determine the potential benefits of harbor-improvement projects. Vessel operating costs include annual capital costs as determined by the replacement cost of the vessels and application of capital recovery factors; estimates of fixed annual operating costs such as for crew, lubricants and stores (supplies), maintenance and repair, insurance and administration; the number of operational days per year; and fuel costs at sea and in port.

Data Chart 3-2 shows hourly vessel-operating costs at sea for foreign flag and US flag vessels by type and DWT in 2008, based on data published by the USACE. Operating costs were calculated for both US and foreign flag vessels because of the disparity between similar vessel types in these two categories. For example, operating costs for US flag bulk carriers, combination carriers, and tankers are generally double those of similar foreign flag vessels. Operating costs for US flag containerships, ro-ro vessels, and passenger vessels are about 1.5 times higher than comparable foreign flag vessels.

Data-chart 3-2 shows costs based on 2008 bunker fuel prices because comments from the shipping industry raised concerns that USACE vessel operating costs for 2004 would not adequately reflect current conditions, especially due to the increased cost of fuel. The USACE operating-cost estimates provide the assumed fuel consumption per day at sea for the primary propulsion and auxiliary propulsion for each vessel type and DWT size. The primary propulsion is assumed to use heavy viscosity oil while the auxiliary propulsion is assumed to use marine diesel oil. For the purposes of this study, 2005 USACE vessel operating costs were updated to reflect the average bunker fuel prices per ton as reported by Bunkerworld for New York as of June, 2008.[21] In 2008, the price for heavy viscosity oil was $631 per metric ton and marine diesel oil was $1,245 per metric ton, representing increases of approximately 360 percent over average bunker fuel prices for 2004. While consumption of fuel varies by vessel type and DWT size, the overall increase in vessel operating costs in 2008 due to bunker fuel cost is about 95 to 115 percent for foreign flag general cargo vessels and tankers, 130 percent for foreign dry bulk vessels, and 150 to 170 percent for foreign containerships. As the USCG vessel-arrival database did not provide adequate information to distinguish single-hull and double-hull tankers, operating costs for double-hull tankers were used in the analysis (generally the additional vessel-operating cost per hour for double-hull tankers varies from 1 percent greater for the smaller tankers to 7 percent greater for the largest tankers).

3.4.2 Commercial Shipping Industry

The volume and value of goods carried by vessels calling at East Coast ports are major indicators of the economic significance of maritime activity that may be affected by the proposed alternatives. To evaluate this activity, foreign trade statistics published by the US Census Bureau at a Custom District and port level have been analyzed for 2003 and 2004.

[21] New York is a major distribution area for fuel and is generally regarded as an important price point for the US.

Census Bureau data on US imports of merchandise is compiled primarily from automated data submitted through the US Customs' Automated Commercial System.[22] Data are also compiled from import entry summary forms, warehouse withdrawal forms, and Foreign Trade Zone documents that must by law be filed with the US Customs Service. Information on US exports of merchandise is compiled from copies of Shipper's Export Declarations (SEDs) and data from qualified exporters, forwarders, or carriers. Copies of SEDs must be filed with Customs officials at the port of export.

For this study, the following data were used:

- **Customs Import Value.** The value of imports appraised by the US Customs Services in accordance with the legal requirements of the Tariff Act of 1930, as amended. This value is generally defined as the price actually paid or payable for merchandise when sold for exportation to the US excluding US import duties, freight, insurance and other charges incurred in bringing the merchandise to the United States.
- **Import Charges.** The aggregate cost of all freight, insurance, and other charges (excluding US import duties) incurred in bringing the merchandise from alongside the carrier at the port of exportation to placing it alongside the carrier at the first port of entry in the United States.
- **F.A.S. Export Value.** The free alongside-ship value of exports at the US seaport based on the transaction price, including inland freight, insurance, and other charges incurred in placing the merchandise alongside the carrier at the US port of exportation. The value, as defined, excludes the cost of loading merchandise aboard the exporting carrier as well as freight, insurance, and any other charges or transportation costs beyond the port of exportation.
- **Shipping Weight.** The gross weight in metric tons including weight of moisture content, wrappings, crates, boxes, and containers.
- **District of Exportation.** The customs district in which the merchandise is loaded on the vessel that takes the merchandise out of the country.
- **Import District of Unloading.** The district where merchandise is unloaded from the importing vessel.

Data Charts 3-3a and 3-3b present East Coast maritime trade data (value and weight of imports and exports) by port region and area for 2003 and 2004, respectively.[23]

[22] The description and definition of information from the US Census Bureau Foreign Trade Statistics is based on the Guide to Foreign Trade Statistics: Description of the Foreign Trade Statistical Program, available on the US Census Bureau website.
[23] Maritime trade refers to the method of transportation by which the merchandise arrived in or departed from the US.

Data Chart 3-3a
US East Coast Maritime Trade by Port Region and Port Area, 2003

ANPR Port Region and Port Area	Imports: Custom import value ($ millions)	Imports: Shipping Weight (m.t. 000s)	Exports: F.A.S. export value ($ millions)	Exports: Shipping Weight (m.t. 000s)	Total Trade: Merchandise Value ($ millions)	Total Trade: Shipping Weight (m.t. 000s)
Gulf of Maine						
Eastport, ME	0.0	0.0	133.3	309.7	133.3	309.7
Searsport, ME	295.4	1,342.7	5.6	2.0	301.0	1,344.7
Portland, ME	892.6	3,330.4	122.9	187.4	1,015.4	3,517.8
Portsmouth, NH	576.9	4,329.3	74.6	149.5	651.5	4,478.9
Subtotal	1,764.9	9,002.5	336.3	648.6	2,101.2	9,651.1
Racepoint, MA						
Salem, MA	29.4	790.9	9.4	4.2	38.8	795.1
Boston, MA	5,126.5	15,893.1	798.8	821.1	5,925.3	16,714.3
Subtotal	5,155.8	16,684.1	808.2	825.3	5,964.1	17,509.4
Cape Cod, MA						
Cape Cod, MA	0.0	0.0	0.1	0.0	0.1	0.0
Subtotal	0.0	0.0	0.1	0.0	0.1	0.0
Block Island Sound						
New Bedford, MA	135.9	2,087.1	7.9	5.2	143.8	2,092.3
Providence , RI	2,665.2	4,522.9	61.3	296.4	2,726.5	4,819.3
New London, CT	149.5	193.3	11.3	56.2	160.9	249.5
New Haven, CT	961.6	2,764.0	35.3	234.7	996.9	2,998.7
Bridgeport, CT	146.0	1,677.8	2.0	6.5	148.0	1,684.4
Subtotal	4,058.4	11,245.1	117.7	599.0	4,176.1	11,844.0
New York						
New York City, NY	78,601.0	68,879.8	21,760.0	9,585.8	100,361.0	78,465.5
Subtotal	78,601.0	68,879.8	21,760.0	9,585.8	100,361.0	78,465.5
Delaware Bay						
Philadelphia, PA	21,817.7	71,221.2	2,080.8	1,768.0	23,898.5	72,989.2
Subtotal	21,817.7	71,221.2	2,080.8	1,768.0	23,898.5	72,989.2
Chesapeake Bay						
Hampton Roads, VA	20,885.7	11,357.2	12,245.2	17,242.8	33,130.9	28,600.0
Baltimore, MD	20,412.1	17,726.0	5,753.1	4,708.8	26,165.2	22,434.8
Subtotal	41,297.8	29,083.2	17,998.3	21,951.7	59,296.1	51,034.8
Morehead City, NC						
Morehead City, NC	226.7	463.8	359.6	40.2	586.4	504.1
Subtotal	226.7	463.8	359.6	40.2	586.4	504.1
Wilmington, NC						
Wilmington, NC	1,250.7	3,337.1	953.2	730.1	2,203.9	4,067.2
Subtotal	1,250.7	3,337.1	953.2	730.1	2,203.9	4,067.2
Georgetown, SC						
Georgetown, SC	37.1	610.7	24.3	47.3	61.3	658.0
Subtotal	37.1	610.7	24.3	47.3	61.3	658.0
Charleston, SC						
Charleston, SC	26,063.4	11,886.0	13,483.2	5,399.4	39,546.7	17,285.3
Subtotal	26,063.4	11,886.0	13,483.2	5,399.4	39,546.7	17,285.3
Savannah, GA						
Savannah, GA	13,630.7	11,888.7	7,634.1	8,134.9	21,264.8	20,023.6
Subtotal	13,630.7	11,888.7	7,634.1	8,134.9	21,264.8	20,023.6
Southeastern U.S.						
Brunswick, GA	4,679.6	1,138.3	657.5	689.5	5,337.1	1,827.8
Fernandina, FL	79.4	92.8	194.6	239.7	274.0	332.5
Jacksonville, FL	8,884.0	8,826.5	3,475.7	942.9	12,359.7	9,769.5
Port Canaveral, FL	355.4	2,647.4	127.8	131.1	483.2	2,778.5
Subtotal	13,998.3	12,705.1	4,455.6	2,003.2	18,454.0	14,708.3
All Port Areas	207,902.6	247,007.2	70,011.5	51,733.4	277,914.1	298,740.7

Source: Prepared by Nathan Associates from U.S Census Bureau Foreign Trade Statistics for 2003 as described in text.

Data Chart 3-3b
US East Coast Maritime Trade by Port Region and Port Area, 2004

	Imports		Exports		Total Trade	
Port Region and Port Area	Custom import value ($ millions)	Shipping Weight (m.t. 000s)	F.A.S. export value ($ millions)	Shipping Weight (m.t. 000s)	Merchandise Value ($ millions)	Shipping Weight (m.t. 000s)
Gulf of Maine						
Eastport, ME	0.0	0.0	115.7	260.9	115.7	260.9
Searsport, ME	394.4	1,554.0	1.6	0.8	396.0	1,554.8
Portland, ME	1,126.0	3,331.7	339.2	177.6	1,465.2	3,509.3
Portsmouth, NH	625.7	3,640.4	105.6	239.7	731.2	3,880.1
Subtotal	2,146.0	8,526.0	562.0	679.1	2,708.0	9,205.2
Racepoint, MA						
Salem, MA	23.5	543.6	10.2	3.1	33.7	546.7
Boston, MA	6,102.0	16,508.9	850.4	986.2	6,952.4	17,495.2
Subtotal	6,125.5	17,052.6	860.6	989.3	6,986.1	18,041.9
Cape Cod, MA						
Cape Cod, MA	0.4	0.0	0.0	0.0	0.4	0.0
Subtotal	0.4	0.0	0.0	0.0	0.4	0.0
Block Island Sound						
New Bedford, MA	128.7	2,114.7	9.4	12.2	138.0	2,126.9
Providence , RI	2,835.4	4,549.4	63.7	256.8	2,899.1	4,806.3
New London, CT	276.6	241.7	1.9	5.9	278.6	247.6
New Haven, CT	976.7	2,426.0	47.1	239.8	1,023.8	2,665.8
Bridgeport, CT	83.5	1,555.2	1.1	0.4	84.5	1,555.6
Subtotal	4,300.8	10,887.1	123.2	515.1	4,424.0	11,402.2
New York						
New York City, NY	90,968.3	70,340.7	23,567.1	10,303.3	114,535.4	80,644.0
Subtotal	90,968.3	70,340.7	23,567.1	10,303.3	114,535.4	80,644.0
Delaware Bay						
Philadelphia, PA	27,164.9	74,650.0	3,334.5	1,887.0	30,499.4	76,537.0
Subtotal	27,164.9	74,650.0	3,334.5	1,887.0	30,499.4	76,537.0
Chesapeake Bay						
Hampton Roads, VA	24,713.9	12,047.4	13,260.7	18,550.2	37,974.6	30,597.7
Baltimore, MD	24,410.9	22,589.5	6,905.5	6,273.8	31,316.5	28,863.3
Subtotal	49,124.8	34,636.9	20,166.3	24,824.0	69,291.1	59,461.0
Morehead City, NC						
Morehead City, NC	307.8	404.8	282.7	67.4	590.5	472.2
Subtotal	307.8	404.8	282.7	67.4	590.5	472.2
Wilmington, NC						
Wilmington, NC	1,516.1	4,206.4	1,109.9	856.4	2,626.1	5,062.8
Subtotal	1,516.1	4,206.4	1,109.9	856.4	2,626.1	5,062.8
Georgetown, SC						
Georgetown, SC	82.2	661.8	17.6	20.7	99.8	682.5
Subtotal	82.2	661.8	17.6	20.7	99.8	682.5
Charleston, SC						
Charleston, SC	31,103.0	12,823.8	15,341.5	5,778.6	46,444.5	18,602.3
Subtotal	31,103.0	12,823.8	15,341.5	5,778.6	46,444.5	18,602.3
Savannah, GA						
Savannah, GA	16,540.5	15,701.7	9,661.9	8,609.1	26,202.4	24,310.8
Subtotal	16,540.5	15,701.7	9,661.9	8,609.1	26,202.4	24,310.8
Southeastern U.S.						
Brunswick, GA	5,349.2	1,249.9	761.3	678.4	6,110.5	1,928.3
Fernandina, FL	92.9	116.7	199.9	239.7	292.7	356.4
Jacksonville, FL	9,165.5	9,490.9	4,541.1	1,168.2	13,706.6	10,659.1
Port Canaveral, FL	406.1	2,835.1	127.1	138.7	533.2	2,973.7
Subtotal	15,013.6	13,692.5	5,629.4	2,225.0	20,643.0	15,917.6
All Port Areas	244,393.8	263,584.2	80,656.8	56,755.1	325,050.6	320,339.3

Source: Prepared by Nathan Associates from U.S Census Bureau Foreign Trade Statistics for 2004 as described in text.

In 2003, the custom import value of merchandise arriving to the ports of the East Coast was $207.9 billion, nearly three times the $70 billion value of exports.[24] The port area of New York City was the largest in terms of the value of imports ($78.6 billion) and exports ($21.8 billion). It accounted for 38 percent of the value of East Coast imports and 31 percent of the exports.

The port areas of Charleston, Philadelphia, Hampton Roads, and Baltimore constituted the next tier of port areas, with import values ranging from $20.4 billion to $26.1 billion. For exports, the port area of Charleston recorded exports of $13.5 billion in 2003, followed by Hampton Roads and Savannah, with exports of $12.2 billion and $7.6 billion, respectively.

In 2004, the value of East Coast imports increased by 17.6 percent over 2003 values to $244.4 billion and the value of exports increased by 15.2 percent to $80.7 billion. The value of total trade increased by 17 percent to $325.1 billion in 2004 (see Data Chart 3-3b).

2003 and 2004 shipping weight values for each port are presented in Data Charts 3-3a and 3-3b, respectively. The total shipping weight of East Coast imports was 247 million tons in 2003 (263.5 million tons in 2004); the total shipping weight for exports was 51.7 million tons (56.7 om 2004). In 2003, the port area of Philadelphia was the largest in terms of import shipping weight, with 71.2 million tons, followed by New York City, with 68.9 million tons. These two areas accounted for 57 percent of the total East Coast import shipments by weight. With regard to exports, Hampton Roads was first, with 17.2 million tons, followed by New York City, with 9.6 million tons, and Savannah with 8.1 million tons. Rankings in 2004 were similar.

The Census Bureau reports vessel import charges associated with import of merchandise by customs district.[25] Vessel import charges represent the aggregate cost of all freight, insurance, and other charges (excluding US import duties) incurred in loading the merchandise from alongside the carrier at the port of exportation and unloading it alongside the carrier at the first port of entry.

In 2003, vessel import charges at East Coast customs districts totaled $11.1 billion, or 5.3 percent of the vessel import value (Data Chart 3-4).[26] In 2004, vessel import charges increased by 18.5 percent to $13.2 billion, representing 5.3 percent of the vessel import value. In 2004, vessel import charges ranged from 11.9 percent of vessel import value for the customs district of Charlotte to 2.8 percent for the customs district of Providence. Factors such as composition and volume of cargo, value of the merchandise per ton, distance of ocean voyage, size and type of vessel used, and port charges affect the relative importance of vessel import charges at a customs district level.

[24] For purposes of this study, ports south of Port Canaveral, FL are excluded.
[25] As vessel import charges are not reported by the US Census Bureau at the port level, these charges were only analyzed at the customs district level. The data presented do not necessarily correspond to the vessel import values shown in Data Charts 3-3a and 3-3b by port area as ports included in customs district that are outside the scope of this study have been excluded from this table.
[26] Vessel import value is equivalent to custom import value for merchandise transported by vessels.

Data Chart 3-4
US East Coast: Vessel Import Charges as a Percent of Vessel Import Value by Customs District of Unloading, 2003 and 2004

	2003			2004		
Custom District of Unlading	Vessel Import Value (Millions of Dollars)	Vessel Import Charges (Millions of Dollars)	Percent of Vessel Import Value	Vessel Import Value (Millions of Dollars)	Vessel Import Charges (Millions of Dollars)	Percent of Vessel Import Value
1 Portland, ME	$1,765	$86	4.9%	$2,146	$103	4.8%
4 Boston, MA	$6,549	$341	5.2%	$7,591	$407	5.4%
5 Providence, RI	$2,665	$68	2.6%	$2,835	$78	2.8%
10 New York City, NY	$78,601	$4,046	5.1%	$90,968	$4,711	5.2%
11 Philadelphia, PA	$21,818	$1,507	6.9%	$27,165	$1,797	6.6%
13 Baltimore, MD	$20,412	$735	3.6%	$24,411	$944	3.9%
14 Norfolk, VA	$20,886	$1,143	5.5%	$24,714	$1,386	5.6%
15 Charlotte, NC	$1,477	$165	11.1%	$1,824	$217	11.9%
16 Charleston, SC	$26,101	$1,231	4.7%	$31,185	$1,483	4.8%
17 Savannah, GA	$18,310	$1,222	6.7%	$21,890	$1,433	6.5%
18 Tampa, FL	$11,357	$566	5.0%	$12,197	$612	5.0%
Total	$209,941	$11,112	5.3%	$246,927	$13,170	5.3%

Source: Prepared by Nathan Associates Inc. from U.S. Census Bureau, Foreign Trade Statistics for 2003 and 2004.

3.4.3 Commercial Fishing Industry

Commercial fishing along the East Coast is a multimillion dollar industry. In 2005, commercial fish landings at East Coast ports for which fishing constitutes a significant share of their activity totaled $801 million (Data Chart 3-5). In 2004 and 2005, New Bedford ranked highest in the United States for landings by port in dollars, with $206.5 million and $282.5 million, respectively.

Operational measures would apply to vessels with a length of 65 ft (19.8 m) or greater. Analysis of commercial fishing permits issued by NMFS indicated that the vast majority of commercial fishing vessels 65 ft (19.8 m) and longer have a GRT of less than 150 tons and therefore, are not captured in the USCG vessel-arrival database. Compilation of data on such vessels required use of commercial fishing permit data, in addition to the USCG arrival database. Approximately 84 percent of fishing vessels greater than 65 ft (19.8 m) in the Southeast region are less than 150 tons (Data Chart 3-6). In the Northeast region, almost 67 percent of fishing vessels greater than 65 ft (19.8 m) are less than 150 tons. Many commercial fishing vessels steam at 10 knots or below, and would not be affected by a 10-knot speed restriction. The typical steaming speed for other commercial fishing vessels is assumed to be 12 knots (Table 3-10). Information was not obtained on state-permitted vessels, as impacts to the commercial fishing industry are expected to be low.

Data Chart 3-5
US East Coast Commercial Fishery Landings by Port, 2002 – 2005 (millions of dollars)

Port	2002	2003	2004	2005
New Bedford, MA	168.6	176.2	206.5	282.5
Hampton Roads, VA	69.5	79.6	100.6	85.2
Cape May-Wildwood, NJ	35.3	42.8	68.1	68.4
Gloucetser, MA	41.2	37.8	42.7	45.9
Point Judith, RI	31.3	32.4	31.5	38.3
Portland,ME	40.4	28.7	24.2	34.6
Stonington, ME	21.7	20.5	7.5	32.3
Reedville, VA	24.2	24.2	26.1	27.1
Long Beach-Barnegat, NJ	14.6	16.4	20.6	26.7
Point Pleasnat, NJ	19.7	22.8	19.2	21.6
Provincetown-Chatham, MA	15.2	13.5	14.1	19.8
Wanchese-Stumpy Point, NC	23.2	21.0	20.6	19.6
Atlantic City, NJ	22.4	20.8	17.7	18.5
Montauk, NY	11.1	11.0	13.0	16.5
Charleston -Mt. Pleasant, SC	9.3	13.0	8.5	12.2
Boston,MA	8.6	8.9	8.8	10.6
Beaufort- Morehead City, NC	19.1	15.0	16.9	9.7
Hampton Bay-Shinnicock, NY	8.3	6.5	6.6	8.1
Rockland, ME	4.3	4.1	2.7	7.4
Cape Canveral, FL	6.2	6.8	9.3	6.1
Engelhard-Swanquarter, NC	11.1	8.0	7.8	5.3
Oriental-Vandemere, NC	8.5	5.0	7.2	4.7
Beaufort, SC	n.a.	7.0	n.a.	n.a.
Ocean City, MD	8.1	6.6	n.a.	n.a.
Georgetown, SC	5.2	6.0	n.a.	n.a.
Belhaven- Washington, NC	6.2	5.0	3.7	n.a.
Sneads Ferry-Swansboro, NC	6.4	5.0	n.a.	n.a.
Darien-Belville, GA	6.9	6.0	5.0	n.a.
Total	646.6	650.6	688.9	801.1

Source: NOAA Fisheries.

Data Chart 3-6
Fishing Permits Issued to Vessels 65 Feet and Longer by Region, 2003

	Southeast Region				Northeast Region	
Vessel gross registered tons	Fishing perrmits	%	Unique vessels	%	Fishing perrmits	%
All vessels	557	100.0%	347	100.0%	856	100.0%
Vessels less than 150 GRT	482	86.5%	290	83.6%	572	66.8%
Vessels 150 GRT and above	75	13.5%	57	16.4%	284	33.2%

Note: For the Northeast Region fishing permit data provided was for unique vessels only.
Source: Prepared by Nathan Associates Inc. from data provided by National Marine Fisheries Service, Sustainable Fisheries Division, Southeast Fisheries Science Center and NOAA Fisheries, Northeast Fisheries Science Center.

3.4.4 Passenger Vessel Industry

In 2003, there were 1,229 passenger vessel arrivals at East Coast ports, rising in 2004 to 1,666 arrivals[27] (Data Chart 3-7). The USCG category of passenger vessels consists principally of cruise ships and ferries that are 150 GRT and greater. Approximately 53 percent of the vessel arrivals are of vessels of more than 60,000 GRT.

In 2003, the SEUS region accounted for 46 percent of East Coast passenger-vessel arrivals with 562 arrivals; Port Canaveral alone accounted for 547 of these. New York City had the second-highest number of passenger-vessel arrivals, with 226 in 2003. Boston ranked third, with 94 arrivals, followed by Searsport with 66, and Baltimore and Charleston, with 40 arrivals each in 2003. In 2004, the SEUS region had 695 passenger-vessel arrivals, 42 percent of the East Coast total. Port Canaveral again accounted for most of those arrivals (579). New York City again had the second-highest (307), followed by Boston with 94 arrivals, Jacksonville (89), Searsport (81), and Baltimore (75). The importance of Port Canaveral to the cruise industry in the SEUS region is indicated below. In 2004, over 95 percent of the passenger-vessel arrivals in Port Canaveral were of vessels greater than 60,000 GRT, an indication of the importance of the cruise industry there. Disney Cruise Line uses Port Canaveral as the home port for its 83,000-GRT Disney Magic and Disney Wonder vessels. Various other cruise companies, including Carnival, RCI, Holland America, Norwegian, SunCruz, and Sterling Casino Lines, also dock at this port.

The port area of New York/New Jersey is the second most active area for passenger vessels, including ferry vessels. There were 226 vessel arrivals in 2003 and 307 in 2004. Over half of the arrivals are of vessels greater than 60,000 GRT.

3.4.4.1 Cruise Vessels

In 2004, the North American cruise industry[28] contributed more than $30 billion to the US economy, an 18 percent increase from 2003. US residents taking cruises increased by 11.1 percent from 2003, and the industry increased its total direct spending in the United States by 13.8 percent, to $14.7 billion. The cruise ship fleet increased by eight ships, to a total of 192.

The expansion of the cruise industry benefits US ports through the increase in cruise passengers and homeporting. All US ports combined handled 8.6 million cruise embarkations in 2005 (a 6.3 percent increase from 2004); US residents accounted for 77 percent of the global cruise passengers (Business Research and Economic Advisors [BREA], 2006). From 2000 to 2005, the Port of Miami had the greatest number of embarkations, and had nearly 1.8 million passengers in 2005. Strong growth at Port Everglades moved it from third rank with 0.8 million passengers in 2000 to second rank with nearly 1.3 million passengers in 2005. Port Canaveral also grew from 0.9 million passengers in 2000 to 1.2 million passengers in 2005 (Data Chart 3-8). Benefits to the general economy from the cruise industry include expenditure on air transportation, food and beverages, ship maintenance and refurbishment, engineering and travel agent commissions. On the East Coast, Florida, New York, and Georgia are the states that benefit most (in terms of direct purchases, employment, and income) from the cruise industry (BREA, 2006).

[27] Ports south of Port Canaveral, Florida, are excluded from the data presented here as they are outside the geographical scope of the proposed action.
[28] The North American cruise industry is defined as those companies that primarily market their trips in North America.

Data Chart 3-7
Passenger Ship Arrivals by Port Region, Port Area and GRT, 2003 – 2004

	2003					2004				
	Gross Registered Tonnage					Gross Registered Tonnage				
Port Region and Port Area	0 - 19,999	20,000 - 39,999	40,000 - 59,999	60,000 and Greater	Total	0 - 19,999	20,000 - 39,999	40,000 - 59,999	60,000 and Greater	Total
Northeastern US - Gulf of Maine										
Eastport, ME	-	-	-	-	0	-	-	-	-	0
Searsport, ME	3	14	28	21	66	21	16	27	17	81
Portland, ME	-	2	6	11	19	5	3	10	8	26
Portsmouth, NH	1	-	-	-	1	1	-	-	-	1
Subtotal	4	16	34	32	86	27	19	37	25	108
Northeastern US - Off Race Point										
Salem, MA	-	1	-	-	1	3	-	3	-	6
Boston, MA	8	16	46	24	94	8	16	46	24	94
Subtotal	8	17	46	24	95	11	16	49	24	100
Northeastern US - Cape Cod Bay										
Cape Cod, MA	1	2	5	1	9	3	2	8	-	13
Subtotal	1	2	5	1	9	3	2	8	0	13
Mid-Atlantic Block Island Sound										
New Bedford, MA	-	-	-	-	0	2	-	-	-	2
Providence, RI	6	4	11	14	35	15	4	9	15	43
New London, CT	32	-	-	-	32	54	-	3	-	57
New Haven, CT	5	-	-	-	5	-	-	-	-	0
Bridgeport, CT	4	-	-	-	4	4	-	-	-	4
Long Island, NY	32	-	-	-	32	38	-	-	-	38
Subtotal	79	4	11	14	108	113	4	12	15	144
Mid-Atlantic Ports of New York/New Jersey										
New York City, NY	8	22	82	114	226	28	45	65	169	307
Subtotal	8	22	82	114	226	28	45	65	169	307
Mid-Atlantic Delaware Bay										
Philadelphia, PA	3	5	11	7	26	3	15	15	-	33
Subtotal	3	5	11	7	26	3	15	15	0	33
Mid-Atlantic Chesapeake Bay										
Baltimore, MD	3	7	1	29	40	9	16	3	47	75
Hampton Roads, VA	5	12	2	12	31	13	17	28	6	64
Subtotal	8	19	3	41	71	22	33	31	53	139
Mid-Atlantic Morehead City and Beaufort, NC										
Morehead City, NC	-	-	-	-	0	7	-	-	-	7
Subtotal	0	0	0	0	0	7	0	0	0	7
Mid-Atlantic Wilmington, NC										
Wilmington, NC	-	-	-	-	0	4	2	-	-	6
Subtotal	0	0	0	0	0	4	2	0	0	6
Mid-Atlantic Georgetown, SC										
Georgetown, SC	-	-	-	-	0	1	-	-	-	1
Subtotal	0	0	0	0	0	1	0	0	0	1
Mid-Atlantic Charleston, SC										
Charleston, SC	6	5	10	19	40	17	11	25	11	64
Subtotal	6	5	10	19	40	17	11	25	11	64
Mid-Atlantic Savannah, GA										
Savannah, GA	4	1	-	1	6	45	4	-	-	49
Subtotal	4	1	0	1	6	45	4	0	0	49
Southeastern US										
Brunswick, GA	1	-	-	-	1	8	-	-	-	8
Fernandina, FL	1	1	-	-	2	17	2	-	-	19
Jacksonville, FL	7	-	5	-	12	19	1	56	13	89
Port Canaveral, FL	104	4	2	437	547	18	9	1	551	579
Subtotal	113	5	7	437	562	62	12	57	564	695
All Port Regions	**234**	**96**	**209**	**690**	**1,229**	**343**	**163**	**299**	**861**	**1,666**

Source: Prepared by Nathan Associates based on analysis of U.S. Coast Guard data on vessel calls at U.S. ports, 2003-2004.

Data Chart 3-8
Embarkations of the North American Cruise Industry for Selected US East Coast Ports, 2000-2005 (passengers in 000s)

Port	2000	2001	2002	2003	2004	2005
Miami	1,682	1,700	1,804	1,965	1,682	1,771
Port Everglades	798	1,046	1,202	1,213	1,324	1,283
Port Canaveral	941	870	1,028	1,089	1,220	1,234
New York	309	238	326	438	547	370
Jacksonville	n.a.	n.a.	n.a.	6	113	137
Norfolk	8	27	39	48	47	45
Baltimore	n.a.	n.a.	57	57	105	67
Boston	n.a.	n.a.	69	69	100	80
Charleston	n.a.	n.a.	n.a.	31	39	41
Philadelphia	48	60	1.5	24	29	50

Source: Business Research & Economic Advisors, The Contribution of the North American Cruise Industry to the US economy in 2005, prepared for the International Council of Cruise Lines, August 2006. Jacksonville, Norfolk, and Charleston data from U.S. Maritime Administration.

3.4.4.2 Ferry Boats

As previously noted, the USCG vessel-arrival database does not include information on vessels of less than 150 GRT. Most passenger and car ferries are below this threshold, and therefore USCG arrival data do not reflect all ferry traffic. Instead, information on ferry vessels and ferry routes was obtained from the National Ferry Database published online by the US Department of Transportation (USDOT), Bureau of Transportation Statistics. The National Ferry Database is a comprehensive inventory of existing ferry operations in the United States and its possessions. Data were collected as part of a survey conducted by the Federal Highway Administration from March 1 to September 30, 2000.

The 224 ferry operators surveyed provided services on 487 nonstop ferry route segments comprising 352 ferry routes and serving 578 ferry terminal locations with 677 ferry vessels. Based on the National Ferry Database, 261 ferry vessels operating on the East Coast in 2000 were identified (Data Chart 3-9). (A complete inventory of ferry vessels operating in each state, including the type of service [passenger, ro-ro, or rail], typical speed, vessel length and gross tonnage is presented in Appendix E). New York State had 65 ferry vessels in operation; Massachusetts had 36, North Carolina 35, and Maine 23. More than 64 percent of the ferry vessels (168) had an overall length of 65 feet or greater. With regard to speed, most ferry vessels can be considered either *conventional,* with typical speeds of 8-16 knots, or *high speed,* with typical speeds in excess of 25 knots.

The National Ferry Database contained information on 172 East Coast ferry routes in 2000 (Data Chart 3-10). New York State had the most routes (46). Massachusetts was next with 36 routes, followed by Maine (23 routes), and North Carolina (16 routes). Most of the ferry routes were within rivers, harbors, sounds, or bays; only 10 of the 172 routes enter the Atlantic Ocean proper. Hence, most ferry operations on the East Coast would not be affected by the proposed regulations as they operate landward of COLREGS lines. Further information on each of the ferry routes, including the city or port served, water body crossed, type of service, number of passengers and vehicles served, and beginning and end of operating season is presented in Appendix E (Data Chart 3-9 and 3-10 refer to Appendix C of the Economic Report).

Data Chart 3-9
Ferry Vessels Operating on the US East Coast by State, 2000

State	Number of Ferry Vessels	Ferry Vessels with LOA of 65 feet or greater	
		Number	Average speed (knots)
Maine	23	11	11.5
New Hampshire	2	2	n.a.
Massachussetts	36	37	16.5
Rhode Island	7	1	n.a.
Connecticut	17	14	19.3
New York	65	45	10.6
New Jersey	20	16	n.a.
Pennsylvania	3	1	n.a.
Delaware	10	7	16.4
Maryland	10	2	n.a.
Virginia	13	6	9.2
North Carolina	35	23	10.1
South Carolina	10	0	0.0
Georgia	4	1	10.0
Florida	6	2	6.0
Total	261	168	n.a.

Source: Prepared by Nathan Associates Inc. from U.S. Department of Transportation, Bureau of Transportation Statistics, National Ferry Database as presented in Appendix C.

Data Chart 3-10
Ferry Routes Operating on the US East Coast by State, 2000

State	Number of Routes	Routes via Atlantic Ocean
Maine	23	5
New Hampshire	1	1
Massachussetts	36	4
Rhode Island	7	0
Connecticut	5	0
New York	46	0
Pennsylvania	1	0
Delaware	4	0
Maryland	7	0
Virginia	12	0
North Carolina	16	0
South Carolina	6	0
Georgia	4	0
Florida	4	0
Total	172	10

Source: Prepared by Nathan Associates Inc. from U.S. Department of Transportation, Bureau of Transportation Statistics, National Ferry Database as presented in Appendix C.

3.4.5 Whale-Watching Industry

In 2000, there were 36 whale-watching operations permitted and registered in New England alone (Data Chart 3-11).[29] It is estimated that more than 1.2 million passengers participated in whale-watching tours in 2000, generating more than $30 million in revenue. Massachusetts accounted for nearly 80 percent of the New England totals for both passengers and revenues. The peak months for whale watching in New England are July and August, although the season spans from late spring to early fall.

Data Chart 3-11
Characteristics of the New England Whale Watching Industry, 2000

State	Number of Operations	Number of Vessels	Annual Ridership	Annual Revenue ($ millions)
Massachusetts	17	30-35	1,000,000	$24.0
New Hampshire	4	6-10	80,000	$1.9
Maine	14	18-24	137,500	$4.4
Rhode Island	1	1	12,500	$0.3
Total	36	55-70	1,230,000	$30.6

Source: Hoyt, Erich Whale Watching 2000: Worldwide Tourism Numbers, Expenditures and Expanding Socioeconomic Benefits, 2000.

Whale-watching vessels operate out of Bar Harbor, Boothbay, Portland, and Kennebunkport in Maine; and Newburyport, Hyannis, Salem, Provincetown, Boston, Plymouth, and Gloucester in Massachusetts. Fare for a four- to six-hour trip averages $30–$40. Vessels range in size from inflatable boats, such as Zodiacs, to vessels up to 80 ft (24.4 m). Some companies operate multiple vessels and may operate charter fishing trips or other types of sightseeing tours.

Along the East Coast outside New England, whale watching is a less important activity: in 2005, out of 49 East Coast companies, one was in New York State, six in New Jersey, and two in Virginia, in contrast to 21 in Massachusetts, 15 in Maine, three in New Hampshire, and one in Rhode Island.

In addition to providing an ecotourism activity, whale watching has also played a role in outreach and education. Most whale watching operators hire naturalists to educate customers about the whale species they encounter and conservation issues facing the species. Some operators even provide a platform for research when scientists conduct photo-identification projects on board, which provides important data about whale sightings (Hoyt, 2001).

By definition, whale-watching vessels operate within whale habitats. Currently, vessels must adhere to a 500-yd (457-m) "no approach" regulation for right whales (50 CFR 222.32). NOAA has also developed whale-watching guidelines for the northeastern United States. Operational guidelines vary depending on the distance between vessel and whales. Distances at which approach is prohibited range from 100 ft (30.5 m) to 1 to 2 mi (1.6 to 3.2 km). Detailed approach guidelines can be found at: *http://www.nero.noaa.gov/shipstrike/info/guidetxt.htm*.

[29] Although whale-watching operations exist in the mid- and south-Atlantic states, the level of activity is smaller than operations in New England and cannot be reliably distinguished from tours to view other species, such as dolphins.

3.4.6 Charter Vessel Operations

The charter fishing industry along the East Coast is particularly active in the Carolinas, Virginia, Florida, New Jersey, and Massachusetts. The industry consists of half-day charters of about 6 hours that typically go up to 20 nm (37 km) from shore, full-day charters of between 11 and 12 hours that can go out to 40 nm (74 km) from shore, and extended full-day charters that can last from 18 to 24 hours and go up to 50 nm (92.6 km) from shore. The majority of the charter fishing industry consists of modern and well-equipped fishing boats of less than 65 ft (19.8 m) length overall (LOA); these vessels would not be subject to the operational measures.

Some of the target species off the East Coast inshore and offshore waters include cod, pollock, bluefish, mackerel, fluke, tautog, striped bass, drumfish, croaker, weakfish, sharks, marlin, swordfish, mahi mahi, wahoo, and tuna. Some of these fisheries are seasonal; charter trips are also contingent on the season in temperate states.

A small segment of the industry referred to as headboats often uses vessels of 80 ft (24.4 m) LOA and above that can accommodate 60 to 100 passengers. These vessels go up to 50 nm (92.6 km) from shore and may anchor over wreck or rock formations for species such as red snapper, grouper, triggerfish, and amberjack. The charter fee for a headboat is typically $50 to $80 per person. Table 3-11 shows the number of charter and party boat trips in 2003 and 2004 by state.

Table 3-11
Number of Charter Boat Trips, 2003 & 2004

State	Number of Trips	
	2003	2004
Maine	14,246	52,098
New Hampshire	35,376	39,648
Massachusetts	145,303	154,785
Rhode Island	60,371	45,140
Connecticut	63,570	40,468
New York	405,533	399,045
New Jersey	465,975	468,865
Delaware	37,685	56,297
Maryland	186,916	250,795
Virginia	86,243	94,122
North Carolina	173,573	177,380
South Carolina	39,290	39,284
Georgia	12,190	18,526
East Florida	186,678	179,481

Note: The number of trips for the states in the north- and mid-Atlantic include party and charter boats.
Source: NMFS – Marine Recreational Fisheries Statistics Survey.

3.4.7 Federal Vessels

Many comments were received about the exemption of vessels owned or operated by, or under contract to, Federal agencies, and several commenters requested a description of such Federal vessels in the FEIS. Table 3-12 provides an approximate number of Federal vessels 65 ft (19.8 m) and longer that are located and/or operate on the East Coast. An estimated 302 Federal vessels operate on the East Coast, but this number is not indicative of the number of vessels at sea at one time; these vessels may be deployed to other regions, and may be docked for a significant portion of the year. The percentage of time at sea varies with the specific mission and objectives of each agency. For example, a study conducted on Navy vessel traffic estimated that of the Navy's 121 East Coast vessels, there are 12 vessels on the East Coast within 200 nm (370.4 km) of shore at any given time (Filadelfo, 2001). Some agencies only operate at sea intermittently for training missions or research cruises, while others are at sea patrolling on a regular basis. The remainder of this section describes the standard operations of these vessels for each Federal agency.

State law-enforcement vessels would be exempt from the proposed speed restrictions when engaged in enforcement or human safety missions. Because the majority of state law-enforcement vessels are less than 65 ft (19.8 m) in length and would, therefore, be exempt from the proposed restriction on this basis, this exception would have a negligible effect on the number of exempted vessels. For this reason, state law-enforcement vessels are not described in this section.

Table 3-12
Federal Vessel Operations

Summary of US East Coast Federal Vessels ≥ 65 Feet in Length		
Agency	**Total Number**	**Number on East Coast**
Navy	261[a]	121
MARAD (National Defense Reserve Fleet)	230	55[b]
USCG	250	108[c]
NSF	25	5
NOAA	18	6
USACE (Dredges – FY07 Operations)	11	4[d]
EPA	1	1
DOI (MMS, FWS, NPS, USGS)	2	2[e]
Total Federal vessels	**798**	**302**

Notes:
[a] The total for Navy vessels excludes vessels in the Military Sealift Command.
[b] MARAD has a total of 86 vessels in the East Coast/South Atlantic inventory, although 30 of these vessels are outported to other US ports, leaving 55 vessels anchored in the James River, VA, excluding one vessel in the Custody program (explained below). These vessels are not at sea on a regular basis, and are generally only deployed during times of war or national emergency.
[c] East Coast totals overestimate the actual number of affected vessels, as the estimates include Miami, Key West, and other cities that are not within the geographic scope of the rulemaking.
[d] USACE dredges include vessels scheduled to operate on the East Cost for Fiscal Year (FY) 07, although the schedule may change and vessels may relocate to areas outside of the East Coast during the FY. Only two of the four vessels scheduled to operate on the East Coast are actually docked on the East Coast. The USACE vessels only include those owned by the USACE; dredges contracted/operated by USACE are described below because the number of dredges varies every year.
[e] USGS, Woods Hole Science Center occasionally leases two research vessels.
Numbers are accurate as of December 2006.

3.4.7.1 United States Army Corps of Engineers

The missions of the USACE, among other things, include the congressionally-mandated requirement to maintain safe, reliable, and economically efficient navigation channels. USACE maintains navigation channels from Maine to Miami Harbor on the Atlantic Coast using four of its own dredges and approximately 50 others under contract to USACE. Not all navigation channels are dredged every year and some dredging operations may last days while others could last a month or longer. These dredges make multiple transits to 44 Atlantic Coast ocean dredged-material disposal areas when engaged in dredging navigation channels. The very nature of maintaining navigation channels necessitates that the dredges operate in the navigation channels and that dredged-material disposal operations operate outside of the navigation channels (J. Wilson, e-mail communication, January 22, 2007).

The USACE owns 11 dredging vessels that operate in waters throughout the entire United States. Only four of these vessels operate in waters off the East Coast, and this number varies depending on project locations each year. For Fiscal Year 2007 (FY07), four of the USACE-owned dredges are scheduled to operate in waters off the East Coast, although only two of the dredges are physically located on the East Coast. The major project locations for FY07 are within the Philadelphia and Wilmington districts, although there are projects in various cities in other districts (USACE, 2007). USACE also owns a number of survey vessels (some longer than 65 ft [19.8 m]) and several drift collection vessels that are 65 ft (19.6 m) and longer. These vessels are sometimes mobilized by the USCG for emergency operations in waters off the East Coast. These vessels are not included in Table 3-12, as they rarely operate in right whale habitat.

USACE utilizes contractors for the majority of dredging projects. In addition to the USACE-owned dredges above, an additional 53 contracts were issued for projects on the East Coast in FY06. The majority of the projects in FY06 were within the Wilmington and Jacksonville districts. These vessels are not included in Table 3-12 because this number changes every year, depending on the specific projects in each district. These contracted vessels are only in the project area for the duration of the project, and then may move to another project at any US port.

These dredges generally transit from the project sites (river, harbor, etc.) to near-shore sites for beach renourishment, or ocean disposal sites, which range from approximately 0 to 20 nm (0 to 37 km) offshore. In the New England District, there are 11 active disposal sites, including three in waters off the coast of Maine (Cape Arundel, Portland, and Rockland), three in waters off of Massachusetts (Massachusetts Bay, Cape Cod, and Buzzards Bay), one in waters off of Rhode Island (Rhode Island Sound), and four off the coast of Connecticut in Long Island Sound (New London, Cornfield Shoals, and Central and Western Long Island Sound). Four disposal sites exist in the Philadelphia District (Manasquan, Barnegat, Absecon, and Cold Springs Inlets). There are no active disposal sites in the Baltimore District. There are two sites in the Norfolk District (Dam Neck and Norfolk), and four in the Wilmington District (although only two – Morehead City and Wilmington Harbor – are active). There are six sites in the Charleston District, including one for the Charleston, South Carolina harbor-deepening project. In the Savannah District, there are two sites, one for Savannah Harbor and another for Brunswick. The Jacksonville district includes the entire state of Florida, although there are only two sites within the geographic scope of the proposed action – Fernandina Beach and Jacksonville (USACE, 2007).

Since the late 1980's USACE Atlantic Coast dredging operations have operated under one or more Biological Opinions (BOs). Those BOs contain a number of provisions aimed at protecting endangered sea turtles and marine mammals, including requirements to have trained observers onboard each vessel during times of the year when species of concern are anticipated to be present, and vessel speed limits at night and when sea and weather conditions limit visibility. Dredges operate under the requirements of a BO, whether operated by, or under contract to USACE. Requirements imposed under existing BOs provide the same if not a greater level of protection to right whales from USACE dredging operations than would occur from the proposed rule, thus warranting the exemption (J. Wilson, e-mail communication, January 22, 2007).

3.4.7.2 Maritime Administration

MARAD's National Defense Reserve Fleet (NDRF) has several internal programs that categorize vessels by the type of vessel operations and the status of the vessel. Vessels in the Custody program are owned and/or sponsored by other Federal agencies for use within their agency programs, but are being maintained by MARAD in the NDRF on a reimbursable basis. Agencies participating in this program include the Army, Navy, NOAA, and USCG. Vessels in the Non-retention program no longer have a useful application and are pending disposal. The Retention program includes MARAD vessels that are being preserved for Federal-agency programs. These programs include, but are not limited to, the Emergency Sealift, fleet support, military useful, school ships, and training. The Ready Reserve Force includes active vessels that are ready to support Department of Defense (DoD) surge sealift requirements. Altogether, as of October 31, 2006, MARAD's fleet consists of 230 vessels (not including 19 vessels in the Custody program, because they might be counted twice if they were added to MARAD's inventory). Fifty-five of these vessels are anchored on the East Coast; six are in the Retention program, 49 are in the Non-retention program, and there are no vessels in the Ready Reserve Force (Table 3-12) (MARAD, 2006). Therefore, the vast majority of these vessels (49 of 55) no longer operate at sea and soon will be disposed of.

3.4.7.3 United States Coast Guard

The USCG is a military, multi-mission, maritime service within the Department of Homeland Security and one of the nation's five armed services. To serve the public and meet its missions, the USCG has five fundamental roles: maritime safety, maritime security, maritime mobility, national defense, and protection of natural resources. The USCG cutters listed in Table 3-12 operate in US waters to fulfill these roles (USCG, 2006). A "cutter" is any USCG vessel 65 feet (19.8 m) in length or greater; all other USCG vessels are smaller boats that do not meet the length threshold for the rule. As mentioned in Section 1.7.3, the BOs for these vessels are summarized in Appendix A.

3.4.7.4 Environmental Protection Agency, National Science Foundation, and National Oceanic and Atmospheric Administration

The vessels operated by these agencies are for oceanic and atmospheric research, mapping, and monitoring. The National Science Foundation (NSF) utilizes vessels within the University-National Oceanographic Laboratory System (UNOLS). UNLOS is an organization of 62 academic institutions and National Laboratories involved in oceanographic research formed for the purpose of coordinating oceanographic ships' schedules and research facilities. Funding for operation of these vessels is provided by academic institutions and the following Federal agencies: NSF, Minerals Management Service (MMS), Navy, NOAA, USCG, and the US Geological Survey (USGS) (University of Rhode Island [URI], 2007). The economic analysis for this FEIS estimates 12 knots as the average speed of research vessels[30], which is based on several data sources. The EPA only has one vessel greater than 65 ft (19.8 m); it is a coastal monitoring vessel (EPA, 2006). The NSF and NOAA have less than 10 vessels combined that are 65 feet or longer operating on the East Coast (URI, 2007; NOAA Marine and Aviation Operations [NMAO], 2006).

3.4.7.5 Department of the Interior

MMS, USFWS, and NPS do not own or have long-term leases on any vessels 65 ft (19.8 m) or longer on the East Coast. The USGS Woods Hole Science Center in Massachusetts does occasionally lease ships for short-term use. The two most used are the research vessel (R/V) MEGAN MILLER out of Port Jefferson, NY (Miller Marine) and the R/V ATLANTIC SURVEYOR from Dive Masters Corp. out of Manasquan, NJ, both of which are 65 ft (19.8 m) or longer (C. MacArthur, personal communication, December 8, 2006).

3.4.7.6 Navy

The 261 Navy vessels listed in Table 3-12 do not include vessels in the Navy's Military Sealift Command (MSC). The MSC operates non-combatant, civilian-crewed ships worldwide that provide combat logistics support to Navy ships at sea; special mission support to US government agencies; prepositioning of US military supplies and equipment at sea; and ocean transportation of DoD cargo in both peacetime and war (MSC, 2007). As of March 2007, there are 136 ships in the MSC (not including the 46 ships in the MARAD's Ready Reserve Force, because these vessels that are not outported are already included in MARAD's vessel count in Table 3-12). There are 108 vessels with full operating status: 36 in the Naval Fleet Auxiliary Force, 23 special mission ships, 29 prepositioning ships, and 20 sealift ships. Not including MARAD's Ready Reserve Force vessels, there are 28 vessels with reduced operating status (F. Stone, personal communication, March 22, 2007). The majority of the these vessels operate overseas, and only transit in waters off the East Coast when departing or arriving from overseas destinations or for maintenance. There is an average of six to seven MSC vessels operating in waters off the US East Coast at any one time (F. Stone, personal communication, March 22, 2007).

A study of Navy vessel traffic estimated that Navy vessels account for roughly three percent of vessel traffic out to 200 nm (370.4 km) on each coast of the United States (Filadelfo, 2001). These vessels primarily operate in specific waters designated for the Navy, although they must transit other waters to get to and from these areas. The DoD designates areas within US territorial waters and the US EEZ as "operating areas" (OPAREAs) and air space as "warning areas" in support of military operations involving training, readiness, and support of national defense and security interests (NOS, 1993). The six military operating areas on the Atlantic that overlap with the geographical scope of the rulemaking are briefly described below. All OPAREAs listed below (except for the Jacksonville/Charleston [JAX/CHASN] OPAREA) are controlled by the Fleet Area Control and Surveillance Facility Virginia Capes (FACSFAC VACAPES).

[30] Research vessels are included in the 'other' vessel category of the USCG arrival database, and also include fishing vessels, industrial vessels, and school ships.

- The Boston OPAREA extends from Washington County, Maine, south to offshore Nantucket Island, and includes such exercises as submarine operations, gunnery practice, anti-submarine warfare tactics, sea trials, radar tracking, warship maneuvers, and general operations (NOS, 1993). Stellwagen Bank National Marine Sanctuary lies within the Boston OPAREA.
- The Narragansett Bay OPAREA is located off the coasts of Massachusetts, Rhode Island, and New York. With the departure of the operational Navy from Rhode Island, this OPAREA is seldom utilized.
- The Atlantic City OPAREA is located off the coasts of New York and New Jersey. This area is occasionally utilized for surface and surface-to-air exercises.
- The Virginia Capes (VACAPES) OPAREA is located in the coastal and offshore waters off Delaware, Maryland, Virginia, and North Carolina, and is utilized by the Navy for various preparedness exercises. As previously stated, Norfolk is a major port in this OPAREA. "Naval operations represent 5 percent of the total traffic moving in and out of the Chesapeake Bay" (Russell, 2001).
- The Cherry Point (CHPT) OPAREA is located in the coastal and offshore waters of North Carolina, and is used for various training and mission preparedness exercises. This OPAREA is contiguous to VACAPES.
- The JAX/CHASN OPAREA is located in the coastal and offshore waters off North Carolina, South Carolina, Georgia, and northeastern Florida. This OPAREA is controlled by FACSFAC Jacksonville and is utilized for various preparedness exercises.

As mentioned in Section 1.7.3, a summary of the Navy's mitigation measures as stipulated by BOs is provided in Appendix A.

The impacts on Federal vessels are not analyzed in Chapter 4 of the FEIS because Federal vessels are exempt from the operational measures. While NMFS does request all Federal agencies to voluntarily observe the conditions of the regulations when and where their missions are not compromised, it is assumed that they would observe the speed restrictions and/or routing measures only under the specified conditions, and that therefore there would be minimal impacts on Federal agencies. Because of the Navy's mitigation measures, this exemption is not expected to have significant adverse effects on right whales.

3.4.8 Demographics and Environmental Justice

3.4.8.1 Port Area Demographic Profiles

This section briefly describes the demographic environment of the 26 port areas most likely to be affected by the proposed action based on Census 2000 data. The census area chosen for each port varied with its size; the areas are as follows:

- Eastport: Washington County, ME
- Searsport: Knox, Hancock, and Waldo counties, ME
- Portland: York, Cumberland, and Sagadahoc counties, ME
- Portsmouth: Strafford and Rockingham counties, NH
- Boston: Middlesex, Suffolk, Norfolk, and Plymouth counties, MA

- Salem: Essex County, MA
- Cape Cod: Barnstable County, MA
- New Bedford: Bristol County, MA
- Providence: Providence, Bristol, Kent, Newport, and Washington counties, RI
- New London: New London County, CT
- New Haven: New Haven County, CT
- Bridgeport: Fairfield County, CT
- Long Island: Nassau and Suffolk counties, NY
- New York City: Bronx, Kings, New York, Putnam, Queens, Richmond, Rockland, and Westchester counties, NY; Bergen, Essex, Hudson, Middlesex, Monmouth, Morris, Ocean, Passaic, Somerset, Sussex, and Union counties, NJ; and Pike County, PA
- Philadelphia: Philadelphia, Montgomery, Delaware, Chester, and Buck counties, PA; New Castle, Burlington, Camden, Gloucester, and Salem counties, NJ; and Cecil County, MD
- Baltimore: Anne Arundel, Baltimore, Carroll, Harford, Howard, Queen Anne's counties, and Baltimore City, MD
- Hampton Roads: Matthews, Gloucester, James City, Surry, Isle of Wight, and Suffolk counties, VA; Williamsburg, Newport News, Poquoson, Hampton, Norfolk, Portsmouth, Virginia Beach, and Chesapeake cities, VA; and Currituck County, NC
- Morehead City: Carteret and Beaufort counties, NC
- Wilmington: Pender, New Hanover, and Brunswick counties, NC
- Georgetown: Georgetown County, SC
- Charleston: Berkeley, Dorchester, and Charleston counties, SC
- Savannah: Effingham, Bryan, and Chatham counties, GA
- Brunswick: McIntosh, Glynn, and Brantley counties, GA
- Fernandina: Nassau County, FL
- Jacksonville: Duval, St. Johns, Clay, and Baker counties, FL
- Port Canaveral: Brevard County, FL

General demographic characteristics are presented in Data Chart 3-12. Data on income, employment, and poverty status are presented in Data Chart 3-13.

In 2000, the 26 port areas under consideration taken together were home to almost 40 million people, or 14.2 percent of the total US population. Racial distribution differed somewhat from that of the national population, with higher percentages of African-Americans and, to a smaller degree, people of Asian descent (17 and 5 percent respectively, as opposed to 12.3 and 3.6 respectively, for the United States as a whole).

There were, however, wide variations from port to port both in total population and racial makeup – from Eastport, Maine, with about 34,000 residents, 93 percent of whom were white, to the New York City area, with 15.6 million residents, only 58 percent of them white. Nine out of the 26 ports considered exhibited proportionately smaller white populations than the United States as a whole, all of them south of, and including, New York City.

Data Chart 3-12
US East Coast Port Areas: Demographic Characteristics, 2000

Port	Area	Population 2000	Racial Distribution (Percentage): White Alone	Black or African American Alone	Asian Alone	Other[(a)]	Percentage of Population that is Hispanic or Latino[(b)]
Eastport	ME	33,941	93.4	0.3	0.5	5.8	0.9
Searsport	ME	127,689	97.8	0.2	0.3	1.7	0.6
Portland	ME	487,568	96.6	0.7	0.9	1.7	0.9
Portsmouth	NH	389,592	96.7	0.6	1.1	1.6	1.2
Boston	MA	3,278,333	81.8	7.3	5.5	6.2	6.0
Salem	MA	723,419	86.4	2.5	2.4	8.8	11.0
Cape Cod	MA	222,230	94.3	1.5	0.6	3.5	1.3
New Bedford	MA	534,678	91.0	2.0	1.4	5.6	3.6
Providence	RI	1,048,319	85.0	4.3	2.3	8.4	8.6
New London	CT	259,088	86.9	5.1	1.9	6.2	5.2
New Haven	CT	824,008	79.3	11.2	2.4	7.1	5.0
Bridgeport	CT	882,567	79.2	10.0	3.2	7.6	11.8
Long Island	NY	2,753,913	82.0	8.4	3.5	6.1	10.3
New York	NY	15,569,089	58.0	19.7	8.1	14.2	21.1
Philadelphia	PA	5,687,147	72.6	19.7	3.3	4.5	5.0
Baltimore	MD	2,552,994	67.4	27.2	2.7	2.7	2.0
Hampton Roads	VA	1,576,370	62.4	30.9	2.7	4.0	3.1
Morehead City – Beaufort	NC	104,341	80.7	16.7	0.4	2.3	2.1
Wilmington	NC	274,532	79.5	17.0	0.6	2.8	2.5
Georgetown	SC	55,797	59.6	38.7	0.3	1.4	1.5
Charleston	SC	549,033	65.2	30.5	1.4	2.9	2.4
Savannah	GA	293,000	61.1	34.9	1.6	2.4	2.0
Brunswick	GA	93,044	73.4	23.7	0.7	2.2	2.4
Fernandina	FL	57,663	90.1	7.4	0.7	1.8	1.8
Jacksonville	FL	1,065,087	71.9	22.2	2.3	3.6	3.9
Port Canaveral	FL	476,230	86.7	8.1	1.5	3.7	4.6
Total All Areas		**39,919,672**	**69.5**	**17**	**5**	**8.5**	**11.5**
United States		**281,421,906**	**75.1**	**12.3**	**3.6**	**9**	**12.5**

(a) Includes American Indian and Alaska Native alone, Native Hawaiian and Other Pacific Islander alone, some other race alone and two or more races. Source: US Census Data, Census 2000, data set SF-3.

(b) A self-designated classification for people whose origins are from Spain, the Spanish-speaking countries of Central or South America, the Caribbean, or those identifying themselves generally as Spanish, Spanish-American, etc. Origin can be viewed as ancestry, nationality, or country of birth of the person or person's parents or ancestors prior to their arrival.

Data Chart 3-13
US East Coast Ports: Socioeconomic Characteristics, 2000

Port Area	Labor Force Participation Rate[(a)]	Unemployment Rate[(b)]	Median Household Income (% of US MHI) [(c)]	Per Capita Income (% of US PCI) [(d)]	Number of People Occupied in Rail, Water and Other Transportation Occupations[(e)]	Percentage of People Below Poverty Line
Eastport, ME	57.0	8.5	25,869 (61.6)	14,119 (65.4)	23	19.0
Searsport, ME	63.9	4.8	35,606 (84.8)	19,189 (88.9)	308	11.3
Portland, ME	68.7	3.5	43,736 (104.1)	22,648 (104.9)	1,031	8.0
Portsmouth, NH	72.5	3.1	54,291 (129.3)	24,877 (115.2)	653	5.8
Boston, MA	67.3	4.2	55,882 (133.1)	28,755 (133.2)	4,289	8.8
Salem, MA	65.5	4.6	51,576 (122.8)	26,358 (122.1)	991	8.9
Cape Cod, MA	58.9	5.1	45,933 (109.4)	25,318 (117.3)	508	6.9
New Bedford, MA	65.8	5.8	43,496 (103.6)	20,978 (97.2)	806	10.0
Providence, RI	64.6	5.6	42,370 (100.9)	21,688 (100.5)	1,346	11.9
New London, CT	67.8	3.9	50,646 (120.6)	24,678 (114.3)	516	6.4
New Haven, CT	65.5	5.9	48,834 (116.3)	24,439 (113.2)	1,015	9.5
Bridgeport, CT	66.0	4.8	65,249 (155.4)	38,350 (177.7)	611	6.9
Long Island, NY	64.3	3.8	68,579 (163.3)	29,278 (135.6)	4,433	5.6
New York, NY	60.8	7.4	48,417 (115.3)	25,693 (119.0)	24,848	15.1
Philadelphia, PA	64.2	6.1	49,077 (116.9)	23,972 (111.0)	7,755	10.8
Baltimore, MD	66.4	4.9	50,572 (120.4)	24,398 (113.0)	3,261	9.8
Hampton Roads, VA	67.9	5.0	43,086 (102.6)	20,313 (94.1)	3,342	10.6
Morehead City - Beaufort, NC	58.7	5.5	35,284 (84.0)	19,305 (89.4)	444	14.5
Wilmington, NC	63.0	5.4	38,438 (91.5)	21,469 (99.5)	546	13.0
Georgetown, SC	58.2	6.2	35,312 (84.1)	19,805 (91.7)	70	17.1
Charleston, SC	64.5	5.3	39,232 (93.4)	19,772 (91.6)	942	14.0
Savannah, GA	63.6	5.4	39,558 (94.2)	20,752 (96.1)	758	14.5
Brunswick, GA	63.0	5.5	36,539 (87.0)	19,581 (90.7)	137	15.6
Fernandina, FL	63.9	4.7	46,022 (109.6)	22,836 (105.8)	75	9.1
Jacksonville, FL	66.8	4.6	42,825 (102.0)	21,567 (99.9)	2,016	10.8
Port Canaveral, FL	57.4	4.9	40,099 (95.5)	21,484 (99.5)	746	9.5
United States	63.9	3.7	41,994	21,587		12.4

(a) The labor force includes all people classified in the civilian labor force, plus members of the US Armed Forces (people on active duty with the United States Army, Air Force, Navy, Marine Corps, or Coast Guard). The Civilian Labor Force consists of people classified as employed or unemployed.

(b) All civilians16 years old and over are classified as unemployed if they (1) were neither "at work" nor "with a job but not at work" during the reference week, and (2) were actively looking for work during the last 4 weeks, and (3) were available to accept a job. Also included as unemployed are civilians who did not work at all during the reference week, were waiting to be called back to a job from which they had been laid off, and were available for work except for temporary illness.

(c) In 1999.

(d) In 1999.

(e) From employed civilian population 16 years and over.

Source: US Census Data, Census 2000.

The 26 ports had proportionately a slightly smaller Hispanic population than the United States as a whole (11.5 and 12.5 percent respectively), but here also, the ports exhibited ranges in demographic make-up – from less than one percent (0.6) Hispanics in Searsport, Maine, to more than 21 percent in New York City.

Economic conditions varied substantially from port to port (Data Chart 3-13; Figure 3-11). At one end of the spectrum, one port area – Eastport, Maine – showed clear signs of economic weakness for all indicators compared to the United States as a whole as well as to the other port areas under consideration. Conversely, indicators of economic health were higher in areas like Bridgeport, Connecticut, and Long Island, New York, than in the nation at large. Only three areas – Portland, Maine, Portsmouth, New Hampshire, and Long Island, New York – had an unemployment rate under the national rate, also a sign of economic health. All other port areas had unemployment rates higher than the national average – up to 8.5 percent in Eastport, but generally in the 4 to 6 percent range.

The median household income in 1999 for the port areas of Long Island ($68,579) and Bridgeport, CT ($65,249), was well above that for the nation as a whole and more than 2.5 times the level of median household income reported for Eastport, Maine ($25,869) (Figure 3-12). Of the 26 areas considered, 17 had a median household income higher than that of the United States as a whole, and 14 had a higher per capita income (Figure 3-13). In general, incomes were higher in the north than in the south: with the exception of Eastport, ME, and Searsport, ME, the median household income in all port areas from Hampton Roads to the north exceeded $40,000. With the exception of Fernandina, FL, and Jacksonville, FL, all port areas south of Hampton Roads had a median household income under $40,000.

Eight of the 16 port areas had rates of poverty exceeding the national rate, with the highest percentages in Eastport, ME (19.0 percent), Georgetown, SC (17.1 percent), Brunswick, GA, (15.6 percent) and New York City (15.1 percent) (Figure 3-14). The port areas with the lowest percentage of people below the poverty line were Long Island (5.6 percent), Portsmouth, NH (5.8 percent), New London, CT (6.4 percent), and Bridgeport, CT (6.9 percent).

3.4.8.2 EO 12898 – Environmental Justice

Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*, requires Federal agencies to take appropriate and necessary steps, to the greatest extent practicable and permitted by law, to identify and address disproportionately high and adverse effects of Federal projects on the health or environment of minority and low-income populations. These areas are referred to as Environmental Justice Communities.

To determine whether a potentially-affected Environmental Justice community is present within the study area, Council on Environmental Quality guidance on Environmental Justice (CEQ, 1997) offers the following guidelines:

- The minority population of the affected area exceeds 50 percent.
- The minority population percentage of the affected area is meaningfully greater than the minority population of the general population or other appropriate unit of geographic analysis.

- Low-income populations in an affected area should be identified with the annual statistical poverty thresholds from the Bureau of the Census's current Populations Report, Series P-60.

Table 3-13 lists the minority percentages in each area potentially affected by one or more of the proposed vessel operational measures. There was one area where the minority population exceeded 50 percent: New York. Minority (nonwhite or white Hispanic) population represented 30.9 percent of the US population in 2000. Six of the port areas had proportionately larger minority population than the United States as a whole: New York (50.7 percent), Hampton Roads (38.9 percent), Georgetown (41 percent), Charleston (35.9 percent), Savannah (39.8 percent), and Baltimore (33.7 percent).

Table 3-14 lists the percentages of people living under the poverty level based on Census 2000 data. The average percentage of people living in poverty in the United States as a whole was 12.4. While the number for the 26 port areas together (11.7) was lower than the US average of 12.4, eight areas had higher percentages than the US average: Eastport (19 percent), New York City (15.1 percent), Morehead City (14.5 percent), Wilmington (13 percent), Georgetown (17.1 percent), Charleston (14 percent), Savannah (14.5 percent), and Brunswick (15.6 percent). These areas, therefore, are considered as Environmental Justice communities for the purposes of this FEIS.

Based on these data, a total of ten of the 26 port areas constitute Environmental Justice communities as determined by either race and/or poverty levels: Eastport, New York City, Baltimore, Hampton Roads, Morehead City, Wilmington, Georgetown, Charleston, Savannah, and Brunswick.

Table 3-13
Minority Populations within the Scope of the Proposed Action

Area	% Nonwhite	% Hispanic	% Minority (Nonwhite or White Hispanic)
Eastport, ME	6.52	0.81	7
Searsport, ME	2.10	0.61	2.5
Portland, ME	3.51	0.87	4
Portsmouth, NH	3.35	1.15	4.2
Boston, MA	19.01	6.02	21.6
Salem, MA	13.56	11.04	16.9
Cape Cod, MA	5.77	1.35	6.6
New Bedford, MA	9.02	3.60	10.6
Providence, RI	14.99	8.66	18.2
New London, CT	13.00	5.11	15.4
New Haven, CT	20.60	10.09	25.3
Bridgeport, CT	20.69	11.88	27
Long Island, NY	17.97	10.27	23.6
New York, NY	42.02	21.09	50.7
Philadelphia, PA	27.45	5.03	29.4
Baltimore, MD	32.65	2.01	33.7

U.S. East Coast Unemployment Rate, 2000

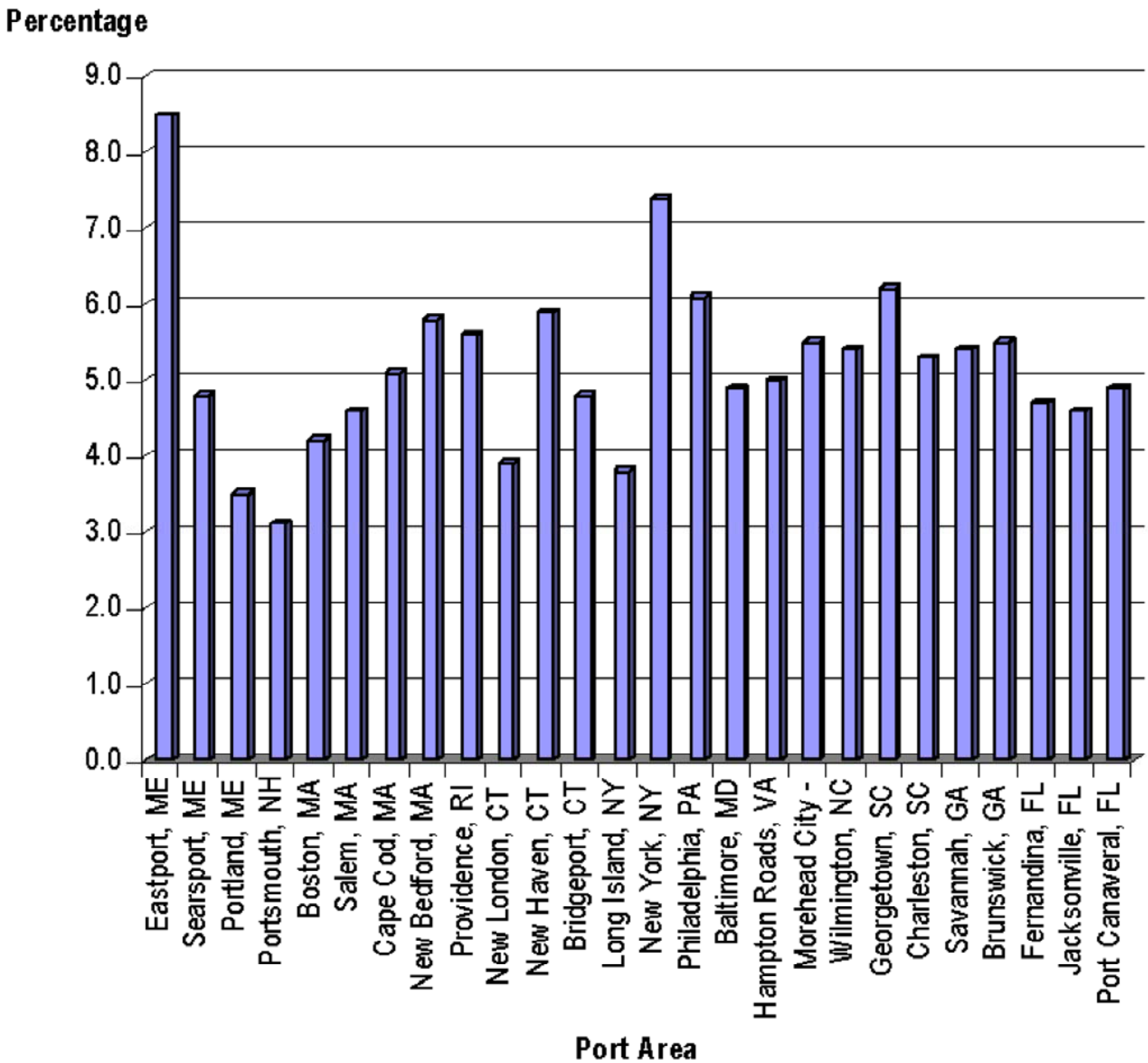

Figure 3-11

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U.S. East Coast Port Areas: Median Household Income, 1999

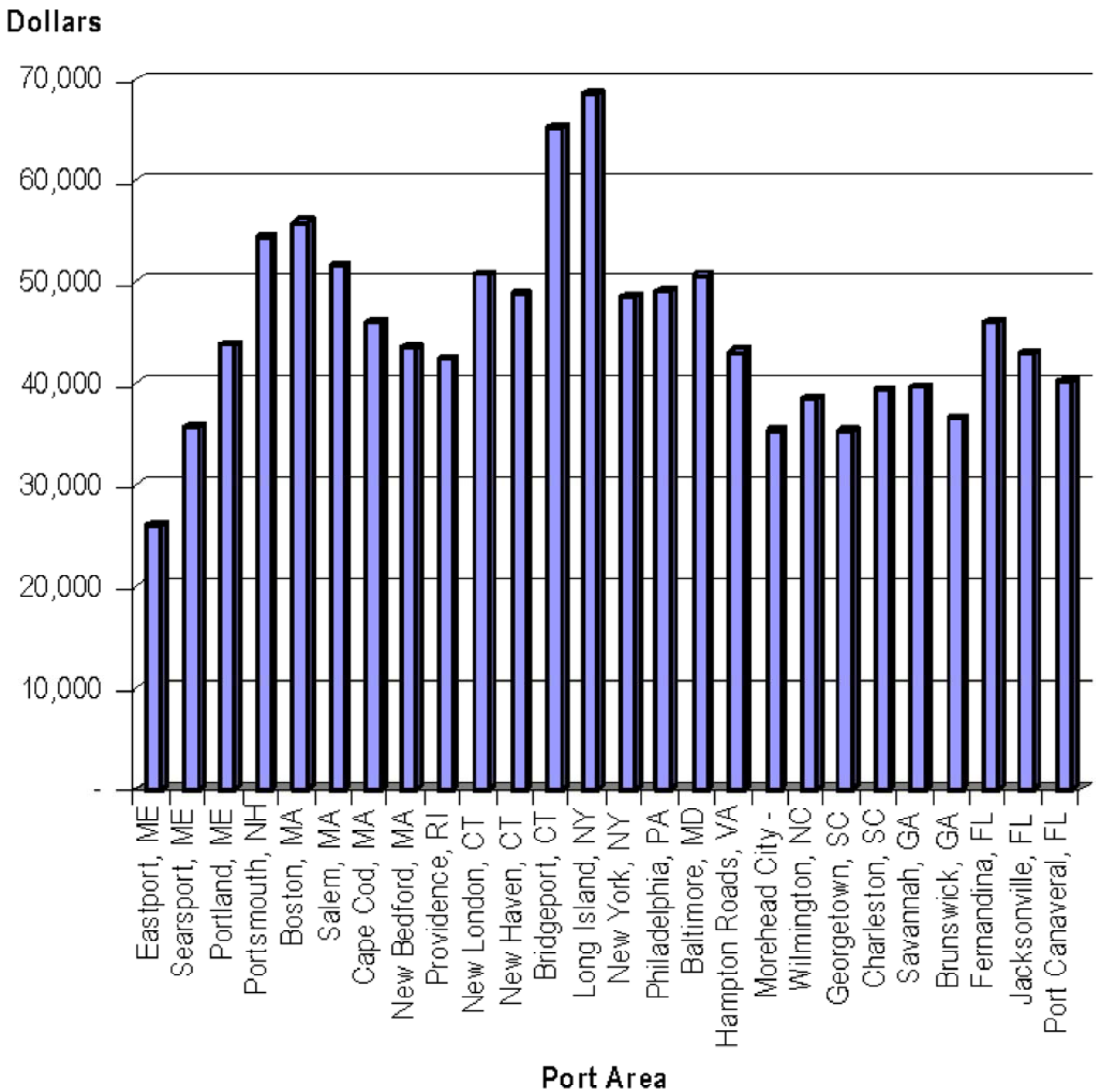

Figure 3-12

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U.S. East Coast Port Areas: Per-Capita Income, 1999

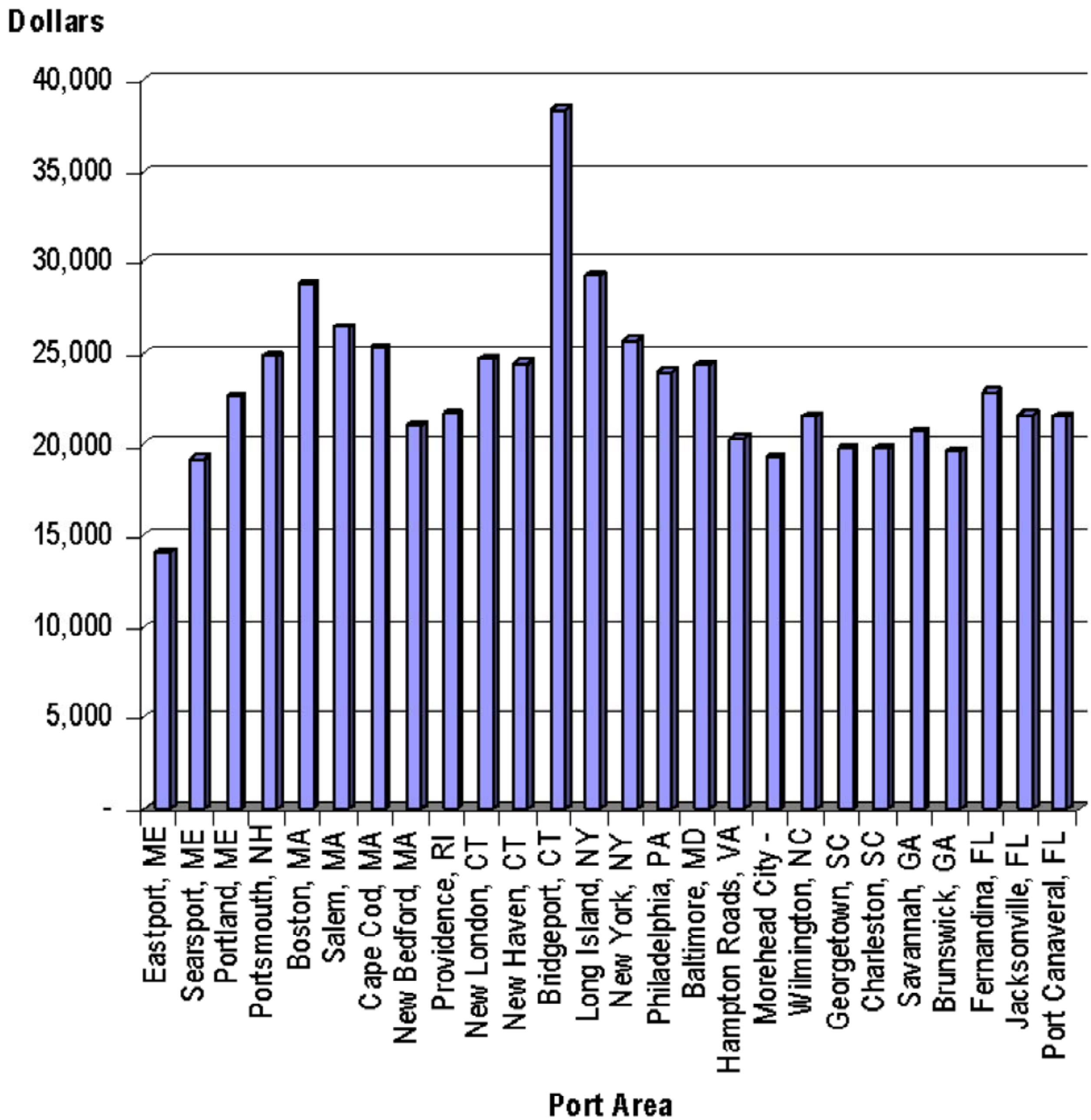

Figure 3-13

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U.S. East Coast Port Areas: Percentage of People below the Poverty Line, 2000

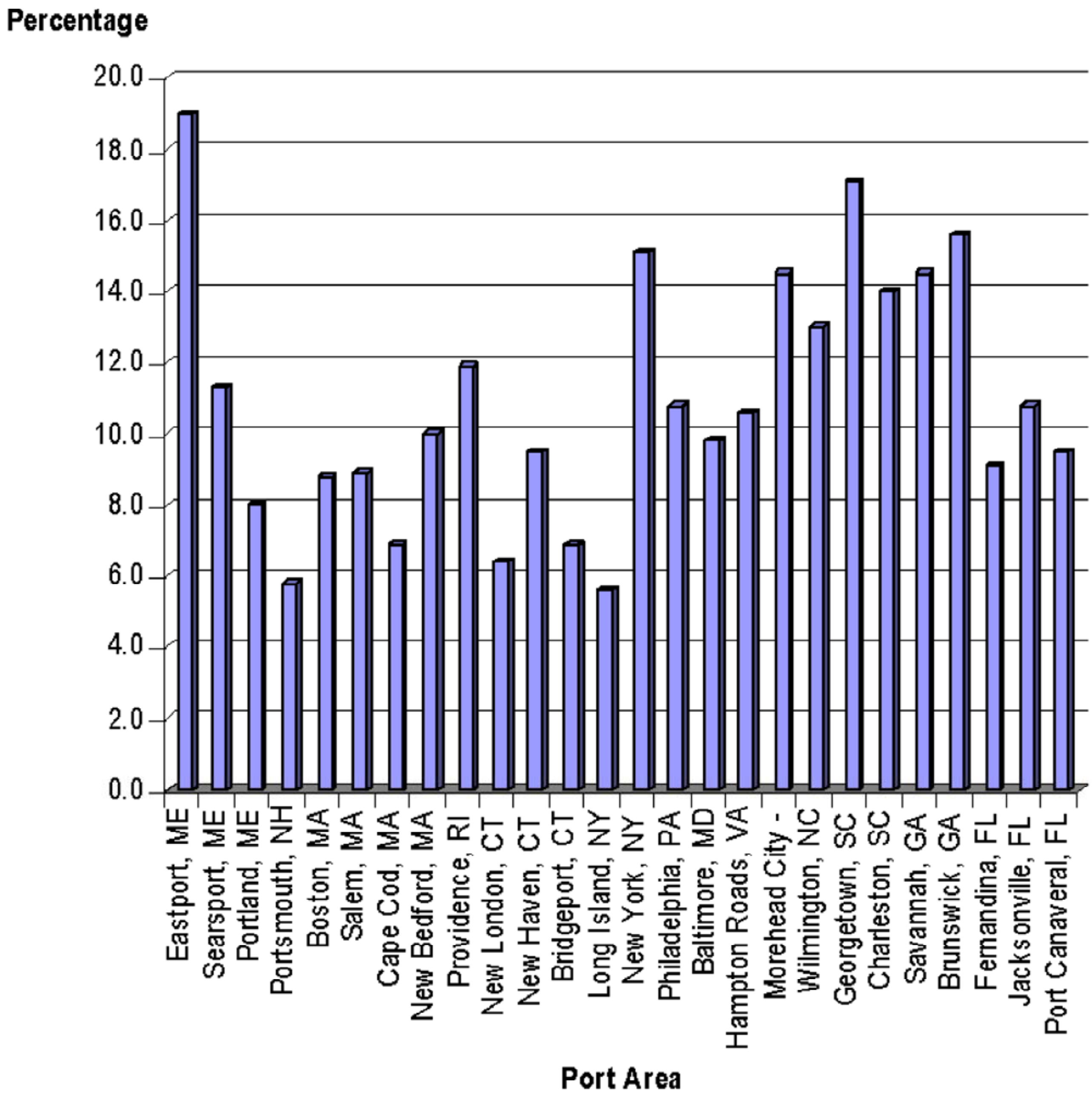

Figure 3-14

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Area	% Nonwhite	% Hispanic	% Minority (Nonwhite or White Hispanic)
Hampton Roads, VA	37.60	3.11	38.9
Morehead City, NC	19.13	2.39	20.4
Wilmington, NC	20.53	2.45	21.6
Georgetown, SC	40.31	1.65	41
Charleston, SC	34.90	2.38	35.9
Savannah, GA	38.76	2.18	39.8
Brunswick, GA	26.70	2.44	28.1
Fernandina, FL	9.98	1.51	11.1
Jacksonville, FL	28.06	3.91	30.3
Port Canaveral, FL	13.19	4.61	16.4
TOTAL ALL AREAS	**30.51**	**11.65**	**35.9**
TOTAL US	**24.86**	**12.55**	**30.9**
Source: US Census Data, Census 2000, Data set SF-1, Table DP1.			

Table 3-14
Poverty Levels within the Scope of the Proposed Action

Area	# Poverty Determined	# in Poverty	% in Poverty
Eastport, ME	32,985	6,272	19.0
Searsport, ME	124,390	13,997	11.3
Portland, ME	476,960	38,369	8.0
Portsmouth, NH	381,112	22,080	5.8
Boston, MA	3,167,516	277,649	8.8
Salem, MA	706,651	63,137	8.9
Cape Cod, MA	218,058	15,021	6.9
New Bedford, MA	521,285	52,236	10.0
Providence, RI	1,010,000	120,548	11.9
New London, CT	247,198	15,780	6.4
New Haven, CT	797,702	75,733	9.5
Bridgeport, CT	865,257	59,689	6.9
Long Island, NY	2,707,916	151,802	5.6
New York, NY	15,276,079	2,299,973	15.1
Philadelphia, PA	5,528,515	598,949	10.8
Baltimore, MD	2,486,691	243,792	9.8
Hampton Roads, VA	1,507,652	160,249	10.6
Morehead City, NC	102,902	14,910	14.5
Wilmington, NC	268,858	34,969	13.0
Georgetown, SC	55,263	9,439	17.1
Charleston, SC	531,170	74,504	14.0
Savannah, GA	284,788	41,216	14.5
Brunswick, GA	91,946	14,376	15.6

Area	# Poverty Determined	# in Poverty	% in Poverty
Fernandina, FL	56,772	5,192	9.1
Jacksonville, FL	1,042,976	112,924	10.8
Port Canaveral, FL	466,775	44,218	9.5
TOTAL ALL AREAS	**38,957,417**	**4,567,024**	**11.7**
TOTAL US	**273,882,232**	**33,899,812**	**12.4**
Source: US Census Data, Census 2000.			

3.5 Cultural Resources

Section 106 of the National Historic Preservation Act of 1966 (NHPA) requires Federal agencies to take into account the effects of their undertakings on historic properties (any prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion in, the National Register of Historic Places). This includes Native American and Native Hawaiian tribal properties and values. The proposed action would only affect the operations of certain vessels 65 feet (19.8 m) and longer and has no component that could have an impact on known or unknown, on-land or underwater cultural resources. Under 36 CFR 800.3(a)(1), if the undertaking considered is a type of activity that does not have the potential to cause effects on historic properties (assuming such properties were present) the agency official has no further obligations under Section 106.