UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Silver Spring, Maryland 20910

JAN 20 2000

Barry

Mr. Thomas H. Essig, Acting Chief
Generic Issues and Environmental Projects Branch
Division of Reactor Program Management
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555-0001

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Dear Mr. Essig:

This responds to a request by the Nuclear Regulatory Commission (NRC) to reinitiate Endangered Species Act (ESA) Section 7 Consultation on the operation of the cooling water intake system at the Brunswick Steam Electric Plant (BSEP) in Brunswick County, North Carolina. On April 30, 1999, the National Marine Fisheries Service (NMFS) issued a biological opinion (Opinion) and Incidental Take Statement (ITS) on the operation of the cooling water intake system at BSEP. Between April 30, 1999, and September 1999, BSEP documented the mortality of two endangered Kemp's ridley sea turtles, thus triggering the need for reinitiation of formal consultation on the operation of the BSEP.

On September 14, 1999, the North Carolina Sea Turtle Coordinator, personnel from NMFS, NRC, and BSEP, met at BSEP to observe plant operations and to discuss possible reasons for meeting the anticipated incidental take of Kemp's ridley turtles so quickly. After viewing the cooling water intake system and BSEP's procedures for sea turtle protection, NMFS believes that these existing procedures are reasonable and prudent for the protection of sea turtles. BSEP personnel also presented information showing ways in which dead sea turtles, for which the mortalities may be due to other causes, were being washed into the intake water canal. Based on this information, NMFS has included criteria for identifying previously dead turtles within this Opinion.

Enclosed is a new biological opinion prepared by NMFS concerning the operation of BSEP's cooling water intake system over the next 20 years. It is based on the information used from the April 30, 1999, Opinion, information presented in the September 14, 1999, meeting, and information in the NRC's letter date October 29, 1999. NMFS concludes that this action is not

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likely to jeopardize the continued existence of loggerhead, Kemp's ridley, green, leatherback, and hawksbill sea turtles. In formulating this opinion, NMFS used the best available scientific information.

As you are aware, our regulations require that federal agencies immediately request reinitiation of formal consultation if the amount or extent of taking specified in the incidental take statement is exceeded (50 CFR § 402.16). In the accompanying incidental take statement, we have made assumptions regarding the level of incidental take which may reasonably be expected due to operation of the BSEP. Given that the annual level of incidental take anticipated for several of the turtle species is relatively low, we recommend that you consider requesting reinitiation of consultation when this level is approached or likely to be met, prior to exceeding the specified level of incidental take.

We look forward to further cooperation with you on other NRC activities to ensure the conservation and recovery of our threatened and endangered marine species.

Sincerely,

Donald R. Knowles
Director
Office of Protected Resources

Enclosure

Endangered Species Act - Section 7 Consultation
Biological Opinion

Agency: U.S. Nuclear Regulatory Commission

Activity: Operation of the Cooling Water Intake System at the Brunswick Steam Electric Plant Carolina Power and Light Company

Consultation Conducted By: National Marine Fisheries Service, Southeast Region

Date Issued: JAN 20 2000

This document transmits the National Marine Fisheries Service's (NMFS) biological opinion (Opinion) based on our review of the cooling water intake system at the Brunswick Steam Electric Plant (BSEP) located on the Cape Fear River Estuary in Brunswick County, North Carolina for the next 20 years. This is a reinitiation of a consultation that was completed on April 30, 1999. The Nuclear Regulatory Commission (NRC) requested this reinitiation because BSEP had reached the anticipated incidental take, by injury or mortality, of two endangered Kemp's ridley sea turtles in September 14, 1999. NRC also presented new information showing how dead sea turtles, possibly from surrounding areas, are washed into the intake canal by flood and high tides, but are attributed to plant operations. This Opinion reviews the effects of this activity on loggerhead, Kemp's ridley, green, hawksbill, and leatherback sea turtles in light of this new information from NRC and BSEP. This Opinion was prepared in accordance with section 7 of the Endangered Species Act (ESA) of 1973 as amended (16 U.S.C. 1531 et seq.).

This Opinion is based on the information used for the April 30, 1999, Opinion (attached), information presented in a September 14, 1999, meeting with NRC, NMFS and BSEP personnel, and information in the NRC's letter dated October 29, 1999. In formulating this opinion, NMFS used the best available scientific information. A complete administrative record of this reinitiation of consultation is on file at the Southeast Regional Office (SERO), St. Petersburg, Florida.

I. History of the Consultation

BSEP has been monitoring sea turtle take in its cooling water intake canal since 1986. The operation of the cooling water intake system at BSEP had resulted in 123 incidental takes of sea turtles from 1986 through 1996; of these, 22 were lethal. As a result of these takings, NRC and BSEP personnel met with NMFS' SERO and Southeast Fisheries Science Center (SEFSC) personnel on August 12, 1997 to discuss section 7 consultation requirements for the cooling water intake system at BSEP. NRC submitted a biological assessment and request for formal consultation to NMFS' SERO on March 9, 1998. The biological assessment concluded that listed species of sea turtles are likely to be adversely affected by the cooling water intake system, and suggested that these effects would not jeopardize the continued existence of listed sea turtles. NMFS requested a meeting at BSEP to gather additional information on the operation of the cooling water intake system; this meeting was held in May 1998. NMFS issued an Opinion based on this information on April 30, 1999.

The Incidental Take Statement (ITS) of the April 30, 1999, Opinion anticipated that 50 loggerheads, 5 green, and 8 Kemp's ridley sea turtles would be incidentally taken, but released without harm, on a biennial basis during operations of the BSEP. The ITS also anticipated the incidental take by injury or mortality, on a biennial basis, of 1 hawksbill or leatherback, and 6 loggerheads, 2 greens, and 2 Kemp's ridleys during BSEP operations. Between April 30, 1999, and September 14, 1999, BSEP documented the mortality of two endangered Kemp's ridley sea turtles, thus meeting the anticipated level of incidental take for the operation of the BSEP, and triggering the need for reinitiation of formal consultation.

On September 14, 1999, the North Carolina Sea Turtle Coordinator (NCSTC), personnel from NMFS, NRC, and BSEP, met at BSEP to observe plant operations and to discuss possible reasons for meeting the anticipated level of incidental take of Kemp's ridleys so quickly. After viewing the cooling water intake system and BSEP's procedures for sea turtle protection, NMFS believes that these existing procedures are reasonable and prudent for the protection of sea turtles and that there is little more BSEP could do to protect turtles. BSEP personnel also presented information that indicated dead sea turtles, killed elsewhere were being washed into the intake canal. On November 5, 1999, NMFS received a letter from the NRC, dated October 29, 1999, requesting reinitiation of ESA section 7 consultation.

II. Description of the Proposed Action

Action Area

The BSEP is located in Brunswick County near Southport, North Carolina on the Cape Fear River estuary. BSEP is comprised of two nuclear fueled units: Unit 1 began commercial operation in 1975 and Unit 2 began commercial operations in 1977. BSEP operates in a once-through cooling mode by withdrawing water from the Cape Fear River through a three-mile-long intake canal. The intake canal is approximately 300 ft wide, 18 ft deep and located approximately 6 miles north of the mouth of the Cape Fear River. It is separated from the river by a diversion structure. The water from the intake canal is passed through the plant's condensers, sent through a six-mile-long discharge canal, pumped 2,000 ft offshore through subaqueous pipes, and then is discharged into the Atlantic Ocean at a depth of 18 ft. The two nuclear units operate independently, but share a common intake and discharge canal. Approximately 1.5 billion gallons of water pass through the plant each day when both units are operating. At each unit, trash racks and traveling screens collect and remove debris and aquatic organisms prior to the water entering the plant through the intake structure. The action area consists of the intake canal, a diversion structure and the area immediately riverward of the structure, the trash racks and traveling screens, and the discharge system.

Proposed Action

BSEP constructed a permanent diversion structure at the mouth of the intake canal in 1982. This structure is intended to reduce the numbers of large fish, shellfish and marine debris entering the canal. The diversion structure consists of 37 bays with a total of 134 screen panels made of a copper-nickel alloy with a mesh size of 3/8 x 5/8 inches. It is V-shaped to increase screen area and to reduce approach-flow velocity. The intake canal at the diversion structure varies from a depth of approximately 18 ft at its center to about 4 ft at the end bays on either side. The screen panels are designed to release from their frames under high debris load to prevent overall damage to the diversion structure. Each screen release creates an opening of about 2 x 4 to 3 x 4 ft. These screen releases have allowed turtles to enter the intake canal. BSEP has full time staff to maintain the diversion structure. The structure is generally inspected and maintained (i.e. cleaned) daily; blowouts are repaired during daily inspections. Since July 1997, BSEP has experimented with fixed 6-inch blocker panels on the diversion structure to further decrease turtle entrapment.

BSEP conducts daily sea turtle patrols at low tide during late April through August. During the inspections at the intake structure, each trash rack is closely inspected for sea turtle strandings and the area around the intake structure is observed for 30 to 60 minutes for sea turtle surfacing. The area around the diversion structure is also observed from April through August for 30 to 60 minutes daily for turtle surfacing. If turtles get into the intake canal, BSEP has a set plan to capture and return them to the Atlantic Ocean. If a turtle is located near the plant intake structure, it is captured using a 200 ft by 22 ft net, deployed from boats. If a turtle is sighted near the diversion structure, a 300 ft by 22 ft deep net (this net may be used at both locations) is deployed from boats upstream from the diversion structure. Once the net is deployed, it is monitored at all times. When a turtle is snared in the net it is quickly removed from the water. It is then tagged, photographed, and a turtle stranding report is completed. The turtle is released into the Atlantic Ocean at Yaupon Beach, North Carolina, 6 miles south of the plant.

III. Status of Listed Species and Critical Habitat

The following endangered and threatened sea turtle and fish species are under the jurisdiction of

NMFS and are known to occur in the Cape Fear River Estuary region:

Common Name	Scientific Name	Status
Sea Turtles		
Loggerhead turtle	*Caretta caretta*	T
Green turtle	*Chelonia mydas*	E/T*
Leatherback turtle	*Dermochelys coriacea*	E
Hawksbill turtle	*Eretmochelys imbricata*	E
Kemp's ridley	*Lepidochelys kempii*	E
Fish		
Shortnose sturgeon	*Acipenser brevirostrum*	E

* Green turtles in U.S. waters are listed as threatened except for the Florida breeding population, which is listed as endangered. Due to the inability to distinguish between the populations away from the nesting beaches, green turtles are considered endangered wherever they occur in U.S. waters.

Green turtle (*Chelonia mydas*)

Green turtles are distributed circumglobally, mainly in waters between the northern and southern 20° C isotherms (Hirth, 1971). Green turtles were traditionally highly prized for their flesh, fat, eggs, and shell. Fisheries in the United States and the Caribbean are largely to blame for the decline of the species.

In the western Atlantic, several major nesting assemblages have been identified and studied (Peters, 1954; Carr and Ogren, 1960; Parsons, 1962; Pritchard, 1969; Carr *et al.*, 1978). In the continental United States, green turtle nesting occurs on the Atlantic coast of Florida (Ehrhart, 1979). Nesting has been documented along the Gulf coast of Florida, at Southwest Florida beaches, as well as the beaches on the Florida Panhandle (Meylan *et al.*, 1995). On the west coast of Florida, the Florida Department of Environmental Protection (FDEP) documented 35 nests in 1996, only 6 in 1997, and 45 in 1998. However, most documented green turtle nesting activity occurs on Florida index beaches, which are on the east coast and were established to standardize data collection methods and effort on key nesting beaches. The pattern of green turtle nesting shows biennial peaks in abundance, with a generally positive trend during the six years of regular monitoring since establishment of the index beaches in 1989, perhaps due to increased protective legislation throughout the Caribbean (Meylan *et al.*, 1995). On the East coast of Florida, the FDEP documented 3,061 nest in 1996, 731 in 1997, and 5,512 in 1998.

While nesting activity is obviously important in identifying population trends and distribution, the majority portion of a green turtle's life is spent on the foraging grounds. Green turtles are herbivores, and appear to prefer marine grasses and algae in shallow bays, lagoons and reefs

(Rebel, 1974). Some of the principal feeding pastures in the Gulf of Mexico include inshore south Texas waters, the upper west coast of Florida and the northwestern coast of the Yucatan Peninsula. Additional important foraging areas in the western Atlantic include the Indian River Lagoon System in Florida, Florida Bay, the Culebra archipelago and other Puerto Rico coastal waters, the south coast of Cuba, the Mosquito coast of Nicaragua, the Caribbean coast of Panama, and scattered areas along Colombia and Brazil (Hirth, 1971). The preferred food sources in these areas are *Cymodocea, Thalassia, Zostera, Sagittaria,* and *Vallisneria* (Babcock, 1937; Underwood, 1951; Carr, 1952; 1954).

Green turtles were once abundant enough in the shallow bays and lagoons of the Gulf to support a commercial fishery, which landed over one million pounds of green turtles in 1890 (Doughty, 1984). Doughty (1984) reported the decline in the turtle fishery throughout the Gulf of Mexico by 1902. Currently, green turtles are uncommon in offshore waters of the northern Gulf, but abundant in some inshore embayments. Shaver (1994) live-captured a number of green turtles in channels entering into Laguna Madre in south Texas. She noted the abundance of green turtle strandings in Laguna Madre inshore waters and opined that the turtles may establish residency in the inshore foraging habitats as juveniles. Algae along the jetties at entrances to the inshore waters of south Texas was thought to be important to green turtles associated with a radio-telemetry project (Renaud *et al.*, 1995). Transmitter-equipped turtles remained near jetties for most of the tracking period. This project was restricted to late summer months, and therefore may reflect seasonal influences. Coyne (1994) observed increased movements of green turtles during warm water months.

Hawksbill turtle (*Eretmochelys imbricata*)

The hawksbill turtle is relatively uncommon in the waters of the continental United States, preferring coral reefs, such as those found in the Caribbean and Central America. Hawksbills feed primarily on a wide variety of sponges but also consume bryozoans, coelenterates, and mollusks. Nesting areas in the western North Atlantic include Puerto Rico and the Virgin Islands. NMFS has designated the coastal waters surrounding Mona and Monito Islands, off the west coast of Puerto Rico, as critical habitat for hawksbills. Mona Island supports the largest population of nesting hawksbills in the U.S. Caribbean. In the northern Gulf of Mexico, a surprising number of small hawksbills are encountered in Texas. Most of the Texas records are probably in the 1-2 year class range. Many of the individuals captured or stranded are unhealthy or injured (Hildebrand 1983). The lack of sponge-covered reefs and the cold winters in the northern Gulf of Mexico probably prevent hawksbills from establishing a strong presence in that area.

Leatherback turtle (*Dermochelys coriacea*)

The Recovery Plan for Leatherback Turtles (*Dermochelys coriacea*) contains a description of the natural history and taxonomy of this species (FWS and NMFS, 1992). Leatherbacks are widely distributed throughout the oceans of the world, and are found throughout waters of the Atlantic, Pacific, Caribbean, and the Gulf of Mexico (Ernst and Barbour, 1972). Leatherbacks are predominantly pelagic, feeding primarily on jellyfish such as *Stomolophus, Chryaora,* and

Aurelia (Rebel, 1974). They may come into shallow waters if there is an abundance of jellyfish near shore. Leary (1957) reported a large group of up to 100 leatherbacks just offshore of Port Aransas, Texas, associated with a dense aggregation of *Stomolophus*.

The status of the leatherback population is the most difficult to assess since major nesting beaches occur over broad areas within tropical waters outside the United States. The primary leatherback nesting beaches occur in French Guiana and Suriname in the western Atlantic and in Mexico in the eastern Pacific. Although increased observer effort on nesting beaches has resulted in increased reports of leatherback nesting, declines in nest abundance have been reported from the beaches of greatest nesting densities. At Mexiquillo, Michoacan, Mexico, Sarti *et al.* (1996) reported an average annual decline in leatherback nesting of about 23 percent between 1984 and 1996. The total number of females nesting on the Pacific coast of Mexico during the 1995-1996 season was estimated at fewer than 1,000. The major western Atlantic nesting area for leatherbacks is located in the Suriname-French Guiana trans-boundary region. Chevalier and Girondot (1998) report that combined nesting in the two countries has been declining since 1992. Nesting occurs on Florida's east coast, in 1998 the FDEP recorded 351 nests and 146 false crawls. However, nests are likely under reported because surveys are not conducted during the entire period that leatherbacks may nest. In the eastern Caribbean, nesting occurs primarily in the Dominican Republic, the Virgin Islands, and on islands near Puerto Rico; Sandy Point, on the western edge of St. Croix, Virgin Islands, has been designated by the U.S. Fish and Wildlife Service as critical habitat for nesting leatherback turtles. Anecdotal information suggests nesting has declined at Caribbean beaches over the last several decades (NMFS and FWS, 1995).

Kemp's ridley turtle (*Lepidochelys kempii*)

Of the seven extant species of sea turtles of the world, the Kemp's ridley has declined to the lowest population level. The Recovery Plan for the Kemp's Ridley Sea Turtle (*Lepidochelys kempii*) (FWS and NMFS, 1992b) contains a description of the natural history, taxonomy, and distribution of the Kemp's or Atlantic ridley turtle. Kemp's ridleys nest in daytime aggregations known as arribadas, primarily at Rancho Nuevo, a stretch of beach in Mexico. Most of the population of adult females nest in this single locality (Pritchard, 1969). When nesting aggregations at Rancho Nuevo were discovered in 1947, adult female populations were estimated to be in excess of 40,000 individuals (Hildebrand, 1963). By the early 1970s, the world population estimate of mature female Kemp's ridleys had been reduced to 2,500-5,000 individuals. The population declined further through the mid-1980s. Recent observations of increased nesting, discussed below, suggest that the decline in the ridley population has stopped, and there is cautious optimism that the population is now increasing.

The near shore waters of the Gulf of Mexico are believed to provide important developmental habitat for juvenile Kemp's ridley and loggerhead sea turtles. Ogren (1988) suggests that the Gulf coast, from Port Aransas, Texas, through Cedar Key, Florida, represents the primary habitat for subadult ridleys in the northern Gulf of Mexico. Stomach contents of Kemp's ridleys along the lower Texas coast had a predominance of near shore crabs and mollusks, as well as fish, shrimp and other foods considered to be shrimp fishery discards (Shaver, 1991). Analyses of stomach contents from sea turtles stranded on upper Texas beaches apparently suggest similar near shore foraging behavior (Plotkin, pers. comm.).

Research being conducted by Texas A&M University has resulted in the intentional live-captured of 100s of Kemp's ridleys at Sabine Pass and the entrance to Galveston Bay. Between 1989 and 1993, 50 of the Kemp's ridleys captured were tracked by biologists with the NMFS Galveston Laboratory using satellite and radio telemetry. The tracking study was designed to characterize sea turtle habitat and to identify small and large scale migration patterns. Preliminary analysis of the data collected during these studies suggests that subadult Kemp's ridleys stay in shallow, warm, near shore waters in the northern Gulf of Mexico until cooling waters force them offshore or south along the Florida coast (Renaud, NMFS Galveston Laboratory, pers. comm.).

In recent years, unprecedented numbers of Kemp's ridley carcasses have been reported from Texas and Louisiana beaches during periods of high levels of shrimping effort. NMFS established a team of population biologists, sea turtle scientists, and managers, known as the Turtle Expert Working Group (TEWG) to conduct a status assessment of sea turtle populations. Analyses conducted by the group have indicated that the Kemp's ridley population is in the early stages of recovery; however, strandings in some years have increased at rates higher than the rate of increase in the Kemp's population (TEWG, 1998). While many of the stranded turtles observed in recent years in Texas and Louisiana are believed to have been incidentally taken in the shrimp fishery, other sources of mortality exist in these waters. These stranding events illustrate the vulnerability of Kemp's ridley and loggerhead turtles to the impacts of human activities in near shore Gulf of Mexico waters.

The TEWG report (1998) developed a population model to evaluate trends in the Kemp's ridley population through the application of empirical data and life history parameter estimates chosen by the TEWG. Model results identified three trends in benthic immature Kemp's ridleys. Benthic immatures are those turtles that are not yet reproductively mature but have recruited to feed in the near shore benthic environment, where they are available to near shore mortality sources that often result in strandings. Benthic immature ridleys are estimated to be 2-9 years of age and 20-60 cm in length. Increased production of hatchlings from the nesting beach beginning in 1966 resulted in an increase in benthic ridleys that leveled off in the late 1970s. A second period of increase followed by leveling occurred between 1978 and 1989 as hatchling production was further enhanced by the cooperative program between the U.S. Fish and Wildlife Service (FWS) and Mexico's Instituto Nacional de Pesca to increase the nest protection and relocation program in 1978. A third period of steady increase, which has leveled off in the past two years, has occurred since 1990 and appears to be due to the greatly increased hatchling production and an apparent increase in survival rates of immature turtles beginning in 1990 due, in part, to the introduction of Turtle Excluder Devices (TEDs). Adult ridley numbers have now grown from a low of approximately 1,050 adults producing 702 nests in 1985, to greater than 3,000 adults producing 1940 nests in 1995 and about 3,350 nests in 1999.

The TEWG (1998) was unable to estimate the total population size and current mortality rates for the Kemp's ridley population. However, the TEWG report (1998) listed a number of preliminary conclusions, and indicated that the Kemp's ridley population appears to be in the early stage of exponential expansion. Over the period 1987 to 1995, the rate of increase in the annual number of nests accelerated in a trend that would continue with enhanced hatchling production and the use of TEDs. The TEWG report (1998) estimated that in 1995 there were 3,000 adult ridleys. The increased recruitment of new adults is illustrated in the proportion of neophyte (first-time) nesters, which has increased from 6% to 28% from 1981 to 1989 and from 23% to 41% from 1990 to 1994. The population model in the TEWG report (1998) projected that Kemp's ridleys could reach the intermediate recovery goal identified in the Recovery Plan of 10,000 nesters by the year 2020 if the assumptions of age to sexual maturity and age specific survivorship rates plugged into their model are correct. It determined that the data reviewed suggested that adult Kemp's ridley turtles were restricted somewhat to the Gulf of Mexico in shallow near shore waters, and benthic immature turtles of 20-60 cm straight line carapace length are found in near shore coastal waters including estuaries of the Gulf of Mexico and the Atlantic.

The TEWG report (1998) identified an average Kemp's ridley population growth rate of 13% per year between 1991 and 1995. However, the 1996 and 1997 nest numbers reflected a slower rate of growth, while the increase in the 1998 nesting level was much higher with a slight decrease in 1999. The population growth rate does not appear as steady as originally forecasted by the TEWG, but annual fluctuations, due in part to irregular internesting periods, are normal for other sea turtle populations.

The area surveyed for ridley nests in Mexico was expanded in 1990 due to destruction of the primary nesting beach by Hurricane Gilbert. The TEWG report (1998) assumed that the increased nesting observed particularly since 1990 was a true increase, rather than the result of expanded beach coverage. Because systematic surveys of the adjacent beaches were not conducted prior to 1990, there is no way to determine what proportion of the nesting increase documented since that time is due to the increased survey effort rather than an expanding ridley nesting range. As noted by TEWG report (1998), trends in Kemp's ridley nesting even on the Rancho Nuevo beaches alone suggest that recovery of this population has begun but continued caution is necessary to ensure recovery and to meet the goals identified in the Kemp's Ridley Recovery Plan.

Loggerhead turtle (*Caretta caretta*)

The loggerhead is a highly migratory species and is found in waters around the globe. The threatened loggerhead is the most abundant species of sea turtle occurring in U.S. waters. The near shore waters of the Gulf of Mexico are believed to provide important developmental habitat for juvenile loggerheads. Studies conducted on loggerheads stranded on the lower Texas coast (south of Matagorda Island) have indicated that stranded individuals were feeding in near shore waters shortly before their death (Plotkin *et al.*, 1993).

The TEWG report (1998) identified four nesting subpopulations of loggerheads in the western North Atlantic based on mitochondrial DNA evidence. These include: (1) the northern subpopulation producing approximately 6,200 nests/year from North Carolina to northeast Florida; (2) the south Florida subpopulation occurring from just north of Cape Canaveral on the east coast of Florida and extending up to Naples on the west coast and producing approximately 64,000 nests/year; (3) the Florida Panhandle subpopulation, producing approximately 450 nests/year; and (4) the Yucatan subpopulation occurring on the northern and eastern Yucatan Peninsula in Mexico, producing approximately 1,500-2,000 nests/year.

Genetic analyses of benthic immature loggerheads collected from Atlantic foraging grounds identify a mix of the east coast subpopulations that is disproportionate to the number of hatchlings produced in these nesting assemblages. Although the northern nesting subpopulation produces only approximately 9% of the loggerhead nests, loggerheads on foraging grounds from the Chesapeake Bay to Georgia are nearly equally divided in origin between the two subpopulations (Sears, 1994; Sears *et al.*, 1995; Norrgard, 1995). Of equal interest, 57% of the immature loggerheads sampled in the Mediterranean were from the south Florida subpopulation, while only 43% were from the local Mediterranean nesting beaches (Laurent *et al.*, 1993; Bowen, 1995). Genetic work has not yet been done on nesting or foraging loggerheads in the Gulf of Mexico.

The TEWG report (1998) considered nesting data collected from index nesting beaches to index the population size of loggerheads and to consider trends in the size of the population. The TEWG report (1998) constructed total estimates by considering a ratio between nesting data (and associated estimated number of adult females and therefore adults in near shore waters), proportion of adults represented in the strandings, and in one method, aerial survey estimates. These two methods indicated that for the 1989-1995 period, there were averages of 224,321 or 234,355 benthic loggerheads, respectively. The TEWG report (1998) listed the methods and assumptions in their report, and suggested that these numbers are likely underestimates. Aerial survey results suggest that loggerheads in U.S. waters are distributed in the following proportions: 54% in the southeast U.S. Atlantic, 29% in the northeast U.S. Atlantic, 12% in the eastern Gulf of Mexico, and 5% in the western Gulf of Mexico.

The TEWG report (1998) considered long-term index nesting beach data sets when available to identify trends in the loggerhead population. Overall, the TEWG determined that trends could be identified for two loggerhead subpopulations. The northern subpopulation appears to be stabilizing after a period of decline; the south Florida subpopulation appears to have shown significant increases over the last 25 years suggesting the population is recovering, although the trend could not be detected over the most recent seven years of nesting. An increase in the numbers of adult loggerheads has been reported in recent years in Florida waters without a concomitant increase in benthic immatures. These data may forecast limited recruitment to south Florida nesting beaches in the future. Since loggerheads take approximately 20-30 years to mature, the effects of decline in immature loggerheads might not be apparent on nesting beaches for decades. Therefore, the TEWG report (1998) cautions against considering trends in nesting too optimistically.

Briefly, the TEWG report (1998) made a number of conclusions regarding the loggerhead population. The report concluded that four distinct nesting populations exist based on genetic evidence, although separate management is not possible because of insufficient information on the in-water distribution of each subpopulation. The report concluded that the recovery goal of more than 12,800 nests for the northern subpopulation was not likely to be met. Currently, nests number about 6,200 and no perceptible increase has been documented. The recovery goal of "measurable increases" for the south Florida subpopulation (south of Canaveral and including southwest Florida) appears to have been met, and this population appears to be stable or increasing. However, index nesting surveys have been done for too short a time; therefore, it is difficult to evaluate trends throughout the region. Recovery rates for the entire subpopulation cannot be determined with certainty at this time. However, caution is warranted because, although nesting activity has been increasing, catches of benthic immature turtles at the St. Lucie Nuclear Power Plant intake canal, which acts as a passive turtle collector on Florida's east coast, have not been increasing, as one might expect if there are more benthic immatures. The TEWG report (1998) recommended establishing index nest surveys areas in the Gulf of Mexico to monitor those populations, which do not currently have recovery goals assigned to them.

Fish

Shortnose Sturgeon (*Acipenser brevirostrum*)

The December 1998 Final Shortnose Sturgeon Recovery Plan (NMFS, 1998a) gives the current best available information on the distribution and abundance of shortnose sturgeon. South of the Chesapeake Bay, there is inadequate information to estimate the shortnose sturgeon population size in most rivers.

Generally in southern rivers, adult sturgeon remain in estuaries and at the interface of salt and freshwater until late winter, when they move upriver to spawn. Embryos produced tend to remain in areas of irregular bottom, where they appear to seek cover. Juveniles, like adults, occur primarily at the interface between salt and freshwater. Recent observations suggest that salinity levels greater then 7 ppt are harmful (Smith *et al.,* 1992). In the Savannah River, shortnose sturgeon are found over sand/mud substrate in 10-14 m depths (Hall *et al.,* 1991). Spawning occurs in upstream channels of the Savannah, where the substrate consists of gravel, sand and logs (Hall *et al.,* 1991). Shortnose sturgeon feed on crustaceans, insect larvae and molluscs (NMFS, 1995).

Although genetic variation within and among shortnose sturgeon occurring in different river systems is not known, life history studies indicate that the shortnose sturgeon populations from different river systems are substantially reproductively isolated (Kynard, 1997) and, therefore, should be considered discrete. Based on the biological and ecological differences, NMFS recognizes 20 distinct population segments of the shortnose sturgeon inhabiting 25 river systems ranging from Saint Johns River in New Brunswick, Canada, to the Saint Johns River, Florida (NMFS, 1998b). The Final Shortnose Sturgeon Recovery Plan (NMFS, 1998a, 1998b) lists the Cape Fear River as having one of the 20 distinct population segments. This segment is thought to consist of less than 50 fish.

The range of the shortnose sturgeon brings it into direct conflict with human activity. Activities such as commercial and recreational fishing, bridge construction, contaminants, dams, reduction of dissolved oxygen due to industry, dredging activities, reservoir operations, and cooling water intakes at power plants have had significant negative impacts to the species along its whole range, including the Cape Fear River.

Direct harvest of shortnose sturgeon is prohibited by the ESA; however, shortnose sturgeon are taken incidentally to commercial and recreational fishing. They are also targeted by poachers (Dadswell, 1979; Dovel *et al.,* 1992; Collins *et al.,* 1996). Collins *et* al. (1996) reported that the shad gillnet fishery accounted for 83% (n=10) of the shortnose sturgeon takes in the Georgia coastal fishery. In the Saint John's River estuary, shortnose sturgeon are taken incidentally in shad, salmon, striped bass, and alewife fisheries. In most cases the fish are returned to the river unharmed (NMFS, 1998a). Moser and Ross (1993) found that captures of shortnose sturgeon in commercial shad nets disrupted spawning migrations in the Cape Fear River, and Weber (1996) reported that these incidental captures caused abandonment of spawning migrations in the Ogeechee River, Georgia.

Bridge construction and demolition projects may interfere with normal shortnose sturgeon migratory movements and disturb sturgeon concentration areas (NMFS, 1998a). During bridge construction upstream of sturgeon spawning habitat in the Connecticut River, concerns were raised that fine sediment emanating from the construction site might build up in the downstream spawning site and impair egg survival. In that instance, concerns abated after it was demonstrated that fine sediments are cleanly dislodged from the spawning site during the high spring flood (NMFS, 1998a). Bridge demolition may include plans for blasting piers with powerful explosives. Unless appropriate precautions are made to mitigate the potentially harmful effects of shock wave transmission to physostomous (i.e., air-bladder connected to the gut) fish like the shortnose sturgeon, internal damage and/or death may occur (NMFS, 1998a).

Contaminants, including toxic metals, polychlorinated aromatic hydrocarbons (PAHs), pesticides, and polychlorinated biphenyls (PCBs) can have substantial deleterious effects on aquatic life including production of acute lesions, growth retardation, and reproductive impairment (Cooper, 1989; Sindermann, 1994). Ultimately, toxins introduced to the water column become associated with the benthos and can be particularly harmful to benthic organisms like sturgeon. Heavy metals and organochlorine compounds are known to accumulate in fat tissues of sturgeon, but their long term effects are not yet known (NMFS, 1998a). Available data suggest that early life stages of fish are more susceptible to environmental and pollutant stress than older life stages (Rosenthal and Alderdice, 1976).

Hydroelectric power operations (dams) may affect shortnose sturgeon by restricting habitat, altering river flows or temperatures necessary for successful spawning and/or migration, and causing mortalities to fish that become entrained in turbines. In all but one of the rivers supporting sturgeon populations, the first dam on the river marks the upstream limit of the shortnose sturgeon population range (Kynard, 1997). An inability to move upstream and use potentially beneficial habitats may restrict population growth (NMFS, 1998a). Since sturgeon require adequate river flows and water temperatures for spawning, any alterations that dam operations pose on a river's flow pattern, including increased or decreased discharges, can be detrimental to sturgeon reproductive success (NMFS, 1998a).

Maintenance dredging of federal navigational channels can adversely affect or jeopardize shortnose sturgeon populations. In particular, hydraulic dredges can lethally harm sturgeon by entraining them in dredge dragarms and impeller pumps (NMFS, 1998a). In addition to direct effects, dredging operations may also impact shortnose sturgeon by destroying benthic feeding areas, disrupting spawning migrations, and filling spawning habitat with resuspended fine sediments. Other dredging methods may also adversely affect sturgeon. Atlantic sturgeon were killed in both hydraulic pipeline and bucket-and-barge operations in the Cape Fear River (NMFS, 1998a). Two shortnose sturgeon carcasses were discovered in a dredge spoil near Tullytown, Pennsylvania and apparently killed by a hydraulic pipeline dredge operating in the Delaware River in March 1996 (NMFS, 1998a). In early 1998, three shortnose sturgeon were killed by a hydraulic pipeline dredge operating in the Florence to Trenton section of the upper Delaware River (NMFS, 1998a).

The COE's operation of reservoirs in major rivers may impact sturgeon by altering natural river flow rate and volume (NMFS, 1998a). Unplanned but controlled reservoir releases can diminish or reduce sturgeon spawning success by artificially extending high flow periods during the time when water temperatures reach ideal ranges for spawning (NMFS, 1998a).

Shortnose sturgeon are susceptible to impingement on cooling water intake screens. Documented mortalities of sturgeon have occurred in the Delaware, Hudson, Connecticut, Savannah and Santee Rivers. Between 1969 and 1979, 39 shortnose sturgeon were impinged at power plants in the Hudson River (Hoff and Klauda, 1979). Approximately 160 shortnose sturgeon were estimated to be impinged on intake screens at the Albany Steam Generating Station between October 1982 and September 1983 (NMFS, 1998a). Eight shortnose sturgeon were discovered on the intake trash bars of the Salem Nuclear Generating Station in the Delaware River between June 1978 and November 1992 (NMFS, 1998a). On rare occasions, the operation of power plants can also have unforeseen and extremely detrimental impacts to water quality in areas where listed species occur. The St. Stephen Power Plant near Lake Moultrie, South Carolina was shut down for several days in June 1991, when large mats of aquatic vegetation entered the plant's intake canal and clogged the cooling water intake gates. Decomposing plant material in the canal coupled with the turbine shut down triggered a low dissolved oxygen water condition downstream and a subsequent fish kill. The South Carolina Wildlife and Marine Resources Department reported that 20 shortnose sturgeon were killed in the die-off (NMFS, 1998a).

Analysis of the Species Likely to be Affected

Of the above listed species occurring in the action area, NMFS believes that Kemp's ridley, loggerhead, and green sea turtles are likely to be adversely affected by the proposed action. Leatherback and hawksbill sea turtles may also be adversely affected, but their occurrence in the action area is far less likely.

According to BSEP's biological assessment, Kemp's ridley, green and loggerhead have stranded in the intake canal. There are no records of leatherback or hawksbill strandings in the canal; however because they may possibly occur in the action area the proposed action could also adversely affect them.

The diversion structure is designed to keep large fish and shellfish out of the intake canal. There are no records of shortnose sturgeon being found in the canal, nor are there any records of shortnose sturgeon being found in that section of the Cape Fear River (Mary Moser personal communication, 1999). NMFS believes that the likelihood for shortnose sturgeon to be adversely effected by the proposed action is low enough to be considered discountable. Therefore NMFS has determined that it is unlikely that a shortnose sturgeon would be adversely affected by the proposed action. There will be no further discussion of the proposed action's effects on shortnose sturgeon in this Opinion.

IV. Environmental Baseline

Status of the Species Within the Action Area

The five species of sea turtles that occur in the action area are all highly migratory. NMFS believes that no individual members of any of the species are likely to be year-round residents of the action area. Individual animals will make migrations into near shore waters as well as other areas of the North Atlantic Ocean, Gulf of Mexico, and the Caribbean Sea. Therefore, the range-wide status of the five species of sea turtles, given in section III above, most accurately reflects the species status within the action area. Likewise, while the following discussion of factors affecting species reflects conditions both inside and outside of the immediate action area, this discussion most accurately reflects those factors acting on sea turtles which may only occasionally occur within the action area.

Factors Affecting the Species Within the Action Area

This section is an analysis of the effects of past and ongoing human and natural factors leading to the current status of the species, its habitat (including designated critical habitat), and ecosystem, within the action area. The environmental baseline is a snapshot of a species health at a specified point in time and includes state, tribal, local, and private actions already affecting the species, or that will occur contemporaneously with the consultation in progress. Unrelated federal actions affecting the same species or critical habitat that have completed formal or informal consultation are also part of the environmental baseline, as are federal and other actions within the action area that may benefit listed species or critical habitat.

The near shore and inshore waters of the western North Atlantic (which include the action area) are heavily used for commercial purposes: oil and gas exploration and extraction and many commercial fisheries, including shrimp, oysters, crabs and a variety of finfish. As discussed above, however, sea turtles are not strict residents of the action area and may be affected by human activities within the action area and throughout their migratory range. Therefore, this section will discuss the impacts of Federal actions on sea turtles throughout the Gulf of Mexico and in the western North Atlantic (including the action area).

Federally-regulated commercial fishing operations represent the major human source of sea turtle injury and mortality in U.S. waters. Shrimp trawlers in the southeastern U.S. are required to use TEDs, which reduce a trawler's capture rate of sea turtles by 97%. Even so, NMFS estimated that 4,100 turtles may be captured annually by shrimp trawling, including 650 leatherbacks that cannot be released through TEDs, 1,700 turtles taken in try nets, and 1,750 turtles that fail to escape through the TED (NMFS, 1998). Henwood and Stuntz (1987) reported that the mortality rate for trawl-caught turtles ranged between 21% and 38%, although Magnuson *et al.* (1990) suggested Henwood and Stuntz's estimates were very conservative and likely an underestimate of the true mortality rate. The mid-Atlantic and Northeast fisheries for summer flounder, scup, and black sea bass uses otter trawl gear that also captures turtles. Summer flounder trawlers fishing south of Cape Henry, Virginia (south of Oregon Inlet, North Carolina from January 15 to March 15) are required to use TEDs. Participants in this fishery who use a type of trawl known as a flynet, however, are not required to use TEDs, as TEDs for flynets have not been researched and NMFS is collecting further observer information on turtle bycatch by flynet vessels. The estimated annual incidental take by injury or mortality for turtles in this multispecies fishery is 15 loggerheads and 3 leatherbacks, hawksbills, greens, or Kemp's ridley, in combination (NMFS, 1996a). The pelagic fishery for swordfish, tuna, and shark, which is prosecuted over large areas of the northwestern Atlantic and the Gulf of Mexico (including the action area), also has a fairly large bycatch of sea turtles. NMFS (1997b) estimated that the longline component of this fishery would annually take, through hooking or entanglement, 690 leatherbacks, 1,541 loggerheads, 46 green, and 23 Kemp's ridley turtles, with a projected mortality rate of 30%. In the driftnet component of the fishery, estimated annual levels of injury or mortality are 40 leatherbacks, 58 loggerheads, 4 Kemp's ridleys, 4 greens, and 2 hawksbills.

Military activities, including vessel operations and ordnance detonation, also affect listed species of sea turtles migrating through and adjacent to the action area. U.S. Navy aerial bombing training in the ocean off the southeast U.S. coast, involving drops of live ordnance (500 and 1,000-lb bombs) is estimated to have the potential to injure or kill, annually, 84 loggerheads, 12 leatherbacks, and 12 greens or Kemp's ridley, in combination (NMFS, 1997a). The U.S. Navy will also conduct ship-shock testing for the new SEAWOLF submarine off the Atlantic coast of Florida, using 5 submerged detonations of 10,000 lb explosive charges. This testing is estimated to injure or kill 50 loggerheads, 6 leatherbacks, and 4 hawksbills, greens, or Kemp's ridleys, in combination on an annual basis (NMFS, 1996b). The U.S. Coast Guard's operation of their boats and cutters, meanwhile, is estimated to take no more than one individual turtle of any species per year (NMFS, 1995). Formal consultation on Coast Guard or Navy activities in the Gulf of Mexico has not been conducted.

The construction and maintenance of Federal navigation channels has also been identified as a source of turtle injury and/or mortality. Hopper dredges, which are frequently used in ocean bar channels and sometimes in harbor channels and offshore borrow areas, move relatively rapidly and can entrain and kill sea turtles, presumably as the drag arm of the moving dredge overtakes the slower moving turtle. Along the Atlantic coast of the southeastern United States, NMFS estimates that annual, observed injury or mortality of sea turtles from hopper dredging may reach 35 loggerheads, 7 greens, 7 Kemp's ridleys, and 2 hawksbills (NMFS, 1997c). Along the north and west coasts of the Gulf of Mexico, channel maintenance dredging using a hopper dredge may injure or kill 30 loggerhead, 8 green, 14 Kemp's ridley, and 2 hawksbill sea turtles annually (NMFS, 1997d).

Sea turtles entering coastal or inshore areas have been affected by entrainment in the cooling-water systems of electrical generating plants. At the St. Lucie nuclear power plant at Hutchinson Island, Florida, large numbers of green and loggerhead turtles have been captured in the seawater intake canal in the past several years. Annual capture levels from 1994 - 1997 have ranged from almost 200 to almost 700 green turtles and from about 150 to over 350 loggerheads. Almost all of the turtles are caught and released alive; NMFS estimates the survival rate at 98.5% or greater (1997e). However, the anticipated mortality for green turtles was exceeded in 1999. NRC and NMFS have not yet determined the cause of the increased mortality. Other power plants in south Florida, west Florida, and North Carolina have also reported low levels of sea turtle entrainment. A biological opinion completed in June 1999 on the operations at the Crystal River Energy Complex in Crystal River, Florida estimates that the level of incidental take of sea turtles in the plant's intake canal may reach 55 sea turtles with an estimated 50 being released alive biennially.

Throughout the coastal United States, the loss of thousands of acres of wetlands is occurring due to natural subsidence and erosion. Impacts caused by residential, commercial and agricultural developments appear to be the primary causes of wetland loss in North Carolina. Wetland loss can affect sea turtle food supplies by eliminating the nursery areas where juvenile marine organisms live and feed until mature. Some of these marine organisms can be important sea turtle food sources. Wetlands also act as a buffer to sediment and contaminants in storm water runoff, helping decrease contamination and turbidity in sea turtle habitats.

Oil spills from tankers transporting foreign oil, as well as the illegal discharge of oil and tar from vessels discharging bilge water will continue to affect water quality in the Atlantic and Gulf of Mexico. Cumulatively, these sources and natural oil seepage contribute most of the oil discharged into the Atlantic and Gulf of Mexico. Floating tar sampled during the 1970s, when bilge discharge was still legal, concluded that up to 60% of the pelagic tars sampled did not originate from the northern Gulf of Mexico coast. After plastics, tar balls have been shown to be the next most common marine debris ingested by sea turtles.

Marine debris will likely persist in the action area in spite of MARPOL prohibitions. In Texas and Florida, approximately half of the stranded turtles examined have ingesfed marine debris (Plotkin and Amos, 1990; Bolten and Bjorndal, 1991). Of 43 dead stranded green turtles examined by Bjorndal *et al.* (1994) 24 had ingested some sort of debris. Although fewer individuals are affected, entanglement in marine debris may also contribute frequently to the death of sea turtles.

Coastal runoff and river discharges carry large volumes of petrochemical and other contaminants from agricultural activities, cities and industries into the Atlantic and Gulf of Mexico. Although these contaminant concentrations do not likely affect the more pelagic waters of the action area, the species of turtles analyzed in this biological opinion travel between near shore and offshore habitats and may be exposed to and accumulate these contaminants during their life cycles.

An extensive review of environmental contaminants in turtles has been conducted by Meyers-Schöne and Walton (1994); however, most available information relates to freshwater species. High concentrations of chlorobiphenyls and organochlorine pesticides in the eggs of the freshwater snapping turtle, *Chelydra serpentina*, have been correlated with population effects such as decreased hatching success, increased hatchling deformities and disorientation (Bishop *et al.* 1991, 1994). Very little is known about baseline levels and physiological effects of environmental contaminants on marine turtle populations (Witkowski and Frazier 1982; Bishop *et al.* 1991). There are a few isolated studies on organic contaminants and trace metal accumulation in green and leatherback sea turtles (Davenport and Wrench 1990; Aguirre *et al.* 1994). Mckenzie *et. al* (1999) measured concentrations of chlorobiphenyls and organochlorine pesticides in marine turtles tissues collected from the Mediterranean (Cyprus, Greece) and European Atlantic waters (Scotland) between 1994 and 1996. Omnivorous loggerhead turtles had the highest organochlorine contaminant concentrations in all the tissues sampled, including those from green and leatherback turtles. It is thought that dietary preferences were likely to be the main differentiating factor among species. Decreasing lipid contaminant burdens with turtle size were observed in green turtles, most likely attributable to a change in diet with age. Sakai *et al.* (1995) found the presence of metal residues occurring in loggerhead turtle organs and eggs. More recently, Storelli *et al.* (1998) analyzed tissues from twelve loggerhead sea turtles stranded along the Adriatic Sea (Italy) and found that characteristically, mercury accumulates in sea turtle livers while cadmium accumulates in their kidneys, as has been reported for other marine organisms like dolphins, seals and porpoises by Law *et al.* (1991). Research is needed on the short- and long-term health and fecundity effects of chlorobiphenyl, organochlorine, and heavy metal accumulation in sea turtles.

In a study conducted by the NMFS Galveston Laboratory between 1993 through 1995, 170 ridleys were reported associated with recreational hook-and-line gear; including 18 dead stranded turtles, 51 rehabilitated turtles, 5 that died during rehabilitation, and 96 that were released by fishermen (Cannon and Flanagan, 1996). The Sea Turtle Stranding and Salvage Network (STSSN) also receives stranding reports that identify carcass anomalies that may be associated with the recreational fishery (entangled in line or net, fish line protruding, fish hook in mouth or digestive tract, fish line in digestive tract). The reports do not distinguish between commercial or recreational sources of gear, such as hook, net, and line, which may be used in both sectors. Cumulatively, fishery entanglement anomalies are noted in fewer than 4% of the stranded sea turtle carcasses reported between 1990 and 1996, and some carcasses carry more than one anomaly (e.g., fishing line in digestive tract/fishing line protruding from mouth or cloaca),

therefore summing these reports may result in some double counting.

The Minerals Management Service permits the explosive removals of offshore oil rigs and platforms when they are no longer needed. All sea turtle species found in the Gulf of Mexico have been observed at rigs, although loggerheads are seen the most. The limited data available on the effects of explosives on sea turtles suggest that sea turtles in the vicinity of platforms are vulnerable to injury or mortality. In March and April of 1986, 51 dead sea turtles, primarily Kemp's ridleys, washed ashore on Texas beaches after the removal of platforms that involved 22 underwater explosions. Because shrimping in the area was at a very low level at the time, the explosions were identified as the probable cause of death (Klima *et al.* 1988). In a study on the causes of sea turtle mortalities, the National Research Council (1990) estimated that up to 100 loggerheads and 50 Kemp's ridleys were killed annually by explosive rig removals in the Gulf of Mexico.

Sea turtle observation rates from aerial surveys conducted in association with rig removal surveys have been higher offshore of central and western Louisiana than throughout the rest of the Gulf (Gitschlag and Herczeg 1994). Surveys conducted through 1997 have noted sea turtles at 14 to 18 percent of the rigs. Between 1987 and 1997, NMFS observers attended 1,013 platform removals. A total of 110 to 146 sea turtle observations were made at 115 sites. Seven loggerheads were collected before detonation, and two were recovered injured after blasting. Although the two injured turtles were rehabilitated and released, one loggerhead was killed due to blasting during 1988 (Gitschlag, pers. comm.). At a removal site of a caisson in 1991, a loggerhead with a fracture down the length of its carapace surfaced within one minute of detonation (Gitschlag, personal communication, in National Research Council, 1996). Although some mortality may occur and go undetected, the dedicated rig removal observer program appears to effectively minimize mortalities. The low incidence of documented takes suggests that established procedures have minimized the effects of explosive rig removals on listed sea turtles.

Overall in the northern Gulf of Mexico, the number of rig removals for which permits are being requested in recent years has been increasing. This trend will likely continue into future years as structures built in the 1960s, during the beginning of the oil boom of the Gulf of Mexico, become unproductive. Oil companies and the explosive industry are researching smaller shaped charges capable of severing piles. Reduced environmental effects are anticipated in future years when the new charges are available despite increased rig removals.

Summary and Synthesis of the Status of Species and Environmental Baseline

In summary, several factors are adversely affecting species of sea turtles within the action area:

- Federally regulated commercial fishing operations continue to cause significant injury and mortality of sea turtles in U.S. waters;

- military activities which involve vessel operations and ordnance detonation continue to injure

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Summary and Synthesis of the Status of Species and Environmental Baseline

In summary, several factors have adversely affected sea turtles which may occur in or migrate through the action area. NMFS expects that many of these activities will continue at current levels and assumes:

- Federally regulated commercial fishing operations will continue to cause significant injury and mortality of sea turtles in U.S. waters;

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In summary, several factors have adversely affected sea turtles which may occur in or migrate through the action area. NMFS expects that many of these activities will continue at current levels and assumes:

- Federally regulated commercial fishing operations will continue to cause significant injury and mortality of sea turtles in U.S. waters;

- military activities which involve vessel operations and ordnance detonation continue to injure or kill sea turtles;

- construction and maintenance of Federal navigation channels has, and will likely continue to be a significant source of sea turtle mortality;

- sea turtles will continue to be entrained by cooling-water systems of electrical generating plants;

- activities controlled by state or local government or private entities that cause or control the reduction of wetlands, increased marine debris, recreational activities on the water, polluted runoff, and oil spills will continue;

- short- and long-term health and fecundity effects of chlorobiphenyl, organochlorine, and heavy metal accumulation in sea turtles will continue;

- explosive oil rig removals will continue to kill or injure sea turtles.

Ongoing beneficial actions which assist in the recovery of sea turtles in the action area include the full-time use of TEDs by the Gulf of Mexico shrimp fleet. TEDs save thousands of turtles yearly from drowning in shrimp trawls. Coast Guard fisheries enforcement activities help ensure compliance with Federal TED regulations in the action area.

There are no known tribal actions which affect the species, however, state, local and private actions significantly improve the survival of sea turtles. For example, coastal city lighting ordinances regulate and enforce the types of beach lighting permissible during sea turtle nesting season to prevent hatchlings from inadvertently straying landward after hatching. Other beneficial activities include beach patrols carried out by state workers and trained volunteers participating in coastal states' sea turtle stranding and salvage networks to mark, protect, and when necessary, relocate turtles nests; actions by private citizens; and the actions of privately funded organizations such as the nonprofit Sea Turtle Hospital in Marathon, Florida, which provides first-aid and long term care to injured or diseased sea turtles using a volunteer staff of trained veterinarians.

Federally-mandated pre- and post-detonation aerial and diver surveys during explosive removals of abandoned oil rigs and platforms in the Gulf of Mexico also save a small number of turtles each year from injury. Corps of Engineers-permitted dredging projects often include mitigation in the form of creation of wetlands and islands from dredge spoils, which eventually provide developmental and foraging habitat for sea turtles. Coast Guard regulations and enforcement activities and international agreements such as the MARPOL Treaty help to limit and prevent the discharge of marine pollutants, i.e., garbage and oil and the emptying of oily bilges into Gulf of Mexico waters by recreational and commercial vessels, actions which also help improve water quality with beneficial effects to sea turtles.

NMFS assistance to the Government of Mexico and Mexican sea turtle biologists working at the Kemp's ridley nesting beaches in Tamaulipas, Mexico, Mexican protection of those nesting beaches, Mexican hatchery programs, and the annual "head-starting" and release into Gulf of Mexico waters of 180 Kemp's ridley hatchlings donated by Mexico to the NMFS Galveston Laboratory, also are beneficial actions which yield positive results for Kemp's ridleys. Some evaluations may suggest that the mortality rate on Kemp's ridleys is so high that few if any released individuals will survive to reproduce (Frazer, 1992). The large-scale headstart program (2,000 Kemp's ridley hatchlings obtained annually from Mexico) ended in 1993 because there was no documented evidence that the program increased survivorship (Byles, 1993). A major criticism of the headstart programs is that they try to correct low abundance that is caused by factors that enhancement cannot address such as adult mortality due to commercial fishing (Heppell *et al.* 1996).

The above adverse and beneficial actions combine to either injure or kill a significant number of sea turtles, or save a significant, though unquantifiable number (estimated to be thousands) of sea turtles and hatchlings each year. All in all, NMFS believes that the overall populations of sea turtle species found in the action area appear to be stable or increasing as a result of ongoing management, enforcement, and conservation measures.

V. Effects Of The Action

BSEP has been monitoring turtle take since 1986. The operation of BSEP has resulted in 203 incidental takes of sea turtles from 1986 through September 1999; of these, 31 have been lethal. When turtles are stranded in the intake canal, they can suffer starvation if not observed and removed in a timely manner; they can also be impinged on the trash racks if they are in a weakened state while in the canal. However, based on information provided by BSEP personnel, NRC, and the NCSTC, NMFS believes that the majority of the lethal take attributed to the intake system are animals that were already dead and washed into the canal through a blowout or flood tide. During high tide conditions, sea turtles killed outside the intake canal are washed over the marshes adjacent to the diversion structure and are sometimes washed over the structure itself (See attached photos attachment 2). The breakdown of these takes are (these numbers are only for 1992 to September 1999 as 1992 is the year BSEP started recording take by species): 18 Kemp's ridley (6 dead); 13 green (2 dead); and 84 loggerhead (8 dead).

Most turtles taken at BSEP are immature based on their carapace length (Ruth Boettcher, 1996, NCSTC, personal communication). The young turtles move into the Cape Fear estuary for feeding and foraging. It has been confirmed that immature turtles use shallow waters for foraging areas in coastal North Carolina, particularly during the months of April through June (Epperly, *et al.* 1995). During the years 1986 through September 1999 only one incidentally taken turtle (loggerhead) at BSEP has been an adult of reproductive age.

BSEP's incidental take of sea turtles in 1996 was 49. This was the largest take for any year recorded by BSEP and coincides with the largest recording of strandings along the North Carolina coast at 502. The NCSTC believes there could have been numerous factors for the increase in turtle strandings along North Carolina in 1996. Some of these factors include fluctuations in fishing effort, changes in environmental conditions, changes in turtle distribution, and increased vigilance in reporting strandings (Ruth Boettcher, 1999, NCSTC, personal communication).

There have never been leatherback nor hawksbill turtles taken at BSEP. From 1988 to Sept. 1999 there were never more than 5 lethal takes in any given year, with 5 lethal takes in 1988. The average lethal take from 1986 through 1996, at BSEP, is 2 per year. However, since 1996 the average lethal take has risen to 3 per year. Based on these numbers NMFS expects that there is a possibility that 3 sea turtles will be incidentally taken by mortality or injury causally related to plant operations. However, based on the above numbers, the variability of the species mix in the action area, and the fact that another anomalous year such as 1996 is possible, NMFS believes that the level of incidental take of sea turtles by injury or mortality, in BSEP's intake canal, causally related to plant operations, may reach 6 loggerhead, 2 Kemp's ridley and 3 green turtles annually. NMFS also believes that 50 sea turtles in any combination of the 5 species may be taken and released alive. The capture of dead sea turtles that were killed prior to any interaction with the plant's intake system will vary with the intensity of human activities in and around the action area, the concentration of turtles in the area, and various other environmental factors.

As stated above no leatherback or hawksbill turtles have been taken by BSEP. The North Carolina Wildlife Resources Commission reports only 30 leatherback turtles and no hawksbill turtles have been recorded stranded from 1995 through 1996 in the State of North Carolina. Therefore, there is only a remote chance that the proposed action could take 1 leatherback or 1 hawksbill (live or dead) turtle on a annual basis.

VI. Cumulative Effects

Cumulative effects are the effects of future state, local, or private activities that are reasonably certain to occur within the action area considered in this biological opinion. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the ESA. Within the action area, major future changes in human activities, that are not part of a Federal action, are not anticipated. The present, major human uses of the action area -- commercial fishing and oil and gas exploration and extraction -- are expected to continue at the present levels of intensity in the near future. As discussed in Section IV, however, listed species of turtles migrate throughout the Gulf of Mexico and may be affected during their life cycles by non-Federal activities outside the action area.

Beachfront development, lighting and beach erosion control are ongoing activities along the southwest Florida coast. These activities potentially reduce or degrade sea turtle nesting habitats or interfere with hatchling movement to sea. Nocturnal human activities along nesting beaches may also discourage sea turtles from nesting sites. The extent to which these activities reduce sea turtle nesting and hatchling production is unknown. However, more and more coastal counties are adopting more stringent protective measures to protect hatchling sea turtles from the disorienting effects of beach lighting. Some of these measures are being drafted in response to ongoing law suits brought against the counties by concerned citizens who have charged the counties with failing to uphold the ESA by allowing unregulated beach lighting which continues to result in lethal takes of disoriented hatchlings.

State-regulated commercial and recreational fishing activities in the Gulf of Mexico waters take endangered species. It is expected that states will continue to license/permit large vessel and thrill-craft operations which do not fall under the purview of a Federal agency and will issue regulations that will affect fishery activities. NMFS will continue to work with states to develop ESA section 6 agreements and section 10 permits to enhance programs to quantify and mitigate these takes. Any increase in recreational vessel activity in inshore waters of the Gulf of Mexico will likely increase the number of turtles taken by injury or mortality in vessel collisions. Recreational hook-and-line fisheries have also been known to lethally take sea turtles, including Kemp's ridleys. Cooperation between NMFS and the states on these issues should help identify ways to avoid and/or minimize take of sea turtles caused by recreational activities.

The Cape Fear River drainage basin is completely contained within the State of North Carolina. Over 1,465,451 people live in the basin within 114 municipalities. Land uses in the basin are diverse. In addition to the large urban populations, the basin includes one of the most concentrated turkey and hog production regions in the country. Two counties in the basin, Duplin and Sampson, produce more hogs than any other county in the United States. This activity can lead to fecal coliform contamination, via runoff from the production areas.

Approximately 27% of the basin's estuarine waters are use-impaired. This is due to fecal coliform bacteria and low oxygen levels. There has been an increase in the number of shellfish bed closures because of pollution caused primarily by development (CALS NCSU WOP, 1997).

About 35% of the streams in the Cape Fear drainage basin are considered threatened and 18% impaired by pollution (College of Agriculture and Life Science (CALS), NCSU Water Quality Programs (WQP), 1997). Sediment is the major pollutant, but other types of pollution which pose significant threats to water quality include nutrients, oxygen-demanding wastes, and toxic substances (CALS NCSU WQP, 1997). Oxygen-demanding wastes from agricultural sources can reduce dissolved oxygen levels. Heavy metals and organochlorines are known to accumulate in fat tissues of turtles.

The Clean Water Responsibility and Environmentally Sound Policy Act, signed by North Carolina's governor on August 26, 1997 puts a moratorium on hog farms, requires comprehensive planning across the state to ensure clean water and gives counties the right to zone large hog farms and restricts where hog farms can be built. The new law also tightens limits on the amount of nitrogen cities and industries can discharge into nutrient sensitive waters, requires additional stormwater controls and authorizes studies of water pollution.

The Lower Cape Fear River Program is a collaboration among academia, government, industry and the public. UNCW's Center for Marine Science Research oversees the program which is a large-scale water quality assessment program covering estuaries and a large portion of the lower watershed. Program objectives are to develop an understanding of the fundamental scientific processes shaping and controlling the Cape Fear River system and provide a mechanism for information exchange and public education. Numerous physical, chemical, and biological measurements are collected at thirty-four different sites on a regular basis so biologists, chemists, physicists, and geologists will be able to understand freshwater, estuarine, and near shore marine environments. This research will complement and refine the current basin wide management plans being developed by the State of North Carolina Dept. of Environment, Health and Natural Resources. At present, the Lower Cape Fear River Program focuses on the lower basin but will be expanded to include the middle basin of the river. This initiative combined with the Clean Water Responsibility and Environmentally Sound Policy Act should help improve water quality of the Cape Fear River and estuary.

Integration and Synthesis of Effects

This section provides an integration and synthesis of the information presented in the Status of the Species, Environmental Baseline, Cumulative Effects, and Effects of the Action sections of this Opinion. The intent of the following discussion is to provide a basis for determining the additive effects of continuing the operation of the BSEP on green, loggerhead, leatherback, Kemp's ridley, and hawksbill sea turtles, in light of their present and anticipated future status in southern Atlantic waters.

The Status of the Species discussion describes how all listed sea turtle populations affected by the proposed action have been adversely affected by human-induced factors such as commercial fisheries, direct harvest of turtles, and modification or degradation of the turtle's terrestrial and aquatic habitat. Effects occurring in terrestrial habitats have generally resulted in the loss of eggs or hatchling turtles, or nesting females, while those occurring in aquatic habitat have caused the mortality of juvenile, subadult and adult sea turtles through entanglement in fishing gear, ingestion of debris or pollution. While losses of eggs and juvenile turtles has likely adversely affected the ability of all sea turtle populations considered in this Opinion to maintain or increase their numbers by limiting the number of individuals that survive to sexual maturity, loss of adult females has likely resulted in reductions in future reproductive output.

Species with delayed maturity such as sea turtles are demographically vulnerable to increases in mortality, particularly of juveniles and subadults, those stages with higher reproductive value. As discussed in the Status of the Species, the age of sexual maturity of most species of sea turtles is currently unknown, although the sexual maturity of loggerhead sea turtles may be as high as 35 years, and green turtles may not reach maturity until 30-60 years. The potential for an egg to develop into a hatchling, into a juvenile, and finally into a sexually mature adult sea turtle varies among species, populations, and the degree of threats faced during each life stage. It is reasonable to assume that females killed prior to their first successful nesting will have contributed nothing to the overall maintenance or improvement of the species' status, while females killed after their first successful nesting may have produced some juvenile turtles that survive to sexual maturity. Based on information provided in the Status of the Species, it is currently unknown how past and present mortalities of individual sea turtles due to a variety of natural and human-induced factors have affected the ability of individual sea turtles to replace themselves, thereby maintaining population numbers.

Although a long-term, qualitative analysis of the anticipated effects to sea turtles due to the continued operation of the BSEP is complicated by a lack of information regarding the age-specific survivorship and age-specific fecundity of each of the sea turtle species considered in this Opinion, certain assumptions can be made using limited information from sea turtles in general and basic concepts of conservation biology. For example, an understanding of loggerhead sea turtle demography has been developed which provides a fundamental understanding of the relative reproductive values of various life history stages (Crouse 1987, 1999; NRC 1990), which can be broadly extended to other sea turtles. As described in the Status of the Species discussion, sea turtles face numerous natural and human-induced factors in both the marine and terrestrial phases of their life cycles. While the most vulnerable stages may be the early ones, the reproductive value of a turtle egg or hatchling is relatively low and the sensitivity of population growth to a loss of an egg or hatchling also is low. This high mortality at early life stages has led to strong evolutionary pressures selecting for a high adult survival of sea turtles and a resulting ability for repeated reproduction. As a result sea turtle populations under normal conditions are better adapted to withstanding losses at early life stages than their subadult and adult phases. Environmental factors which cause injury or mortality to individual juvenile, subadult, or adult sea turtles are more likely to have longer term, adverse effects on sea turtles at a population level than loss of eggs or hatchlings.

Of all the known factors identified in NMFS decision to list sea turtles as threatened or endangered, Status of the Species, and the current Environmental Baseline and anticipated Cumulative Effects described in this Opinion, by far the most significant sources of injury or mortality of large juvenile, subadult, and adult sea turtles are those associated with commercial fishing. Assuming observations of loggerhead demographics apply broadly to all sea turtles, these factors are acting on the life stages with the greatest reproductive value for the survival and recovery of sea turtle populations, large juveniles and subadults. The reproductive value of a mature sea turtle can be assumed to remain high for several years under normal conditions. Based on this, we can conclude that the population growth of sea turtles is most sensitive to changes in the survivorship of large juveniles and subadults, and continued reductions in individuals from these life stages may have longer term effects than losses due to other factors affecting eggs or hatchlings. To date most of the turtles entrained in the cooling intake canal at BSEP have been immature that have moved into the Cape Fear estuary for feeding and foraging.

Other fishing operations, such as lost fishing gear and marine debris, are also known to injure or kill sea turtles in waters off the southeastern U.S. and U.S. Gulf of Mexico, but these factors, and others discussed in the environmental baseline section such as dredging, entrainment in power plant intakes, collisions with boats, natural disease and parasites are not well quantified and affect sea turtles at all life stages. Likewise, although natural predation on turtles in all life stages, parasitism, disease, oceanic regime shifts, inclement weather, beach erosion and accretion, thermal stress, and high tides will continue to exert adverse pressures on sea turtle populations, especially on nesting beaches, the long term effects of these ongoing factors to the future status of sea turtles are uncertain.

To evaluate fully the comparative significance of these different sources of mortality, better information is needed on age at reproductive maturity, age-specific survivorship, age-specific fecundity, and their variances. In addition, data on age structure and sex composition of sea turtles taken incidentally to the operation of the BSEP, and other activities which incidentally take sea turtles is limited, there is generally little information on survival rate of various age classes of turtles, and the population structure of sea turtles in waters off the southeastern U.S. and U.S. Gulf of Mexico is uncertain. Absent this information, NMFS assumes that the status of green, hawksbill, loggerhead, Kemp's ridley and leatherback sea turtles in waters off the southeastern U.S. and U.S. Gulf of Mexico will continue as described, and sources of injury and mortality of sea turtles described in the Environmental Baseline will continue at current levels. However, population growth rates are far more sensitive to changes in annual survival rates of juveniles and adults (Crouse et al., 1987) and reliable estimates of other factors such as nesting success are not readily available.

This Opinion has estimated that six loggerhead, 2 Kemp's ridley, 3 green, and 1 hawksbill or leatherback sea turtles per year are likely to be injured or killed as a result of the proposed operation of the BSEP. Therefore, based on these estimates, NMFS anticipates that over the next twenty years 120 loggerhead, 40 Kemp's ridley, 60 greens, and 20 hawksbill or leatherback in combination, will be taken incidentally to the plant operations. The short- and long-term effects of these losses will vary widely with, among other factors, the level of take (injury or mortality), and composition and sex of the species. Since only one reproductively mature turtle has been documented as taken at BSEP from 1986 to 1999, NMFS has assumed that most of the injuries and mortalities which may occur at the BSEP will be immature sea turtles. Also, since leatherbacks and hawksbills have never been documented to be taken at BSEP, NMFS has assumed that injury or mortality of individual leatherback or hawksbill sea turtles will be rare.

The possible or anticipated injury or mortality of 120 loggerhead, 40 Kemp's ridley, 60 greens, and 20 hawksbill or leatherback in combination over the next twenty years is in addition to other significant ongoing adverse and beneficial effects identified in the preceding discussion of the status of species, environmental baseline, and cumulative effects. Several of these ongoing activities have been claiming large numbers of serious injuries and mortalities of turtles for several years and were considered as factors in NMFS' decision to list sea turtles as threatened or endangered. For example, ongoing shrimp trawling activities are expected to continue to injure or kill approximately 4,100 sea turtles a year (with 21-38% mortality); longline and driftnet fishing for swordfish, tuna, and shark is expected to continue to injure or kill 2,408 sea turtles (with 30% mortality); U.S. Navy bombing and ship shock testing activities are expected to continue to injure or kill 168 sea turtles per year; ACOE dredging activities in the north and west Gulf of Mexico and Atlantic coast of the southeastern U.S. is expected to continue to injure or kill 105 sea turtles per year; and cooling-water systems of electrical generating plants are expected to continue to injure or kill an estimated 200 - 700 sea turtles (with 1.5 - 25% mortality) per year. Other factors which exert significant adverse effects on sea turtle populations such as poaching, wetland loss, and disease are expected to continue at existing levels for the next twenty years.

Considering that activities identified in the environmental baseline and cumulative effects analysis, and their adverse effects on the present and future status of sea turtles in waters off the southeastern U.S. and U.S. Gulf of Mexico are assumed to continue as described, NMFS has determined that it is not reasonable to expect that the additional incidental take anticipated from the continued operation of the BSEP, will, directly or indirectly, appreciably reduce the likelihood of both the survival and recovery of Kemp's ridley, green, loggerhead, leatherback, and hawksbill sea turtles in the wild by reducing their reproduction, numbers, or distribution.

VII. Conclusion

After reviewing the current status of the affected species of sea turtles, the environmental baseline for the action area, and the effects of the action, it is NMFS's biological opinion that the operation of the water intake system of the Brunswick Steam Electric Plant as outlined in the Nuclear Regulatory Commission's Biological Assessment, dated March 9, 1998 is not likely to jeopardize the continued existence of the loggerhead, leatherback, green, hawksbill, or Kemp's ridley sea turtles. No critical habitat has been designated for these species in the action area; therefore, none will be affected. This conclusion is based on the proposed action's anticipated effects on each of these species being limited to the incidental take, through death or injury, of a small number of immature sea turtles per year over the next 20 years.

VIII. Incidental Take Statement

Section 9 of the ESA and Federal regulations pursuant to section 4(d) of the ESA prohibit the take of endangered and threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, collect, or to attempt to engage in any such conduct. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2) of the ESA, taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the ESA provided that such taking is in compliance with the terms and conditions of this Incidental Take Statement.

The measures described below are nondiscretionary, and must be undertaken by the NRC so that they become binding conditions of any grant or permit issued to the applicant, as appropriate, for the exemption in section 7(o)(2) to apply. The NRC has a continuing duty to regulate the activity covered by this Incidental Take Statement. If the NRC fails to assume and implement the terms and conditions the protective coverage of section 7(o)(2) may lapse. In order to monitor the impact of incidental take, the NRC must report the progress of the action and its impact on the species to NMFS as specified in the Incidental Take Statement.

Amount or Extent of Anticipated Take

Based on stranding records, incidental captures aboard commercial shrimp vessels and historical data, five species of sea turtles are known to occur in western North Atlantic waters. Current available information on the relationship between sea turtle mortality and interaction with power plant cooling water intake systems indicates that injury and/or death of sea turtles may result from the proposed action. Therefore, pursuant to section 7(b)(4) of the ESA, NMFS anticipates an incidental take (by injury or mortality causally related to plant operations) of 6 loggerhead, 2 Kemp's ridley, 3 green turtles, and 1 hawksbill or leatherback annually. An additional 50 sea turtles in any combination are anticipated to be captured, relocated, and released alive without injury. Almost all of the turtles anticipated to be incidentally taken at BSEP are assumed to be immature. This Opinion analyzed the effects of the proposed action on sea turtles based on a 20-year period. This would amount to a total of 120 loggerheads, 40 Kemp's ridleys, 60 greens, and 20 hawksbill or leatherback in combination, taken incidentally, by injury or mortality, to the plant operations.

NMFS also expects that the NRC and BSEP may capture and collect an additional unquantifiable number of previously dead sea turtles (turtles not killed as a result of plant operations) within the intake canal of the BSEP. The death of these turtles will not be considered related to plant operations if: the dead or injured turtle is seen floating into the canal, the turtles was killed or injured by boat props and debris (such as discarded fishing equipment), if a turtle found on the trash racks during April through August (this is when daily inspections of the trash racks is done) is in an advanced state of decay, and any dead or injured turtle found in the canal more than 100 feet away from the trash racks (NMFS assumes that it is unlikely that a turtle could be killed on the trash racks and then come loose and go against the flow and into the main canal). All take considered unrelated to plant operations will be verified by the NCSTC.

Effect of the Take

In the accompanying Opinion, NMFS determined that this level of anticipated take is not expected to, directly or indirectly, reduce appreciably the likelihood of survival or recovery of Kemp's ridley, green, loggerhead, leatherback, or hawksbill sea turtles in the wild by reducing their reproduction, numbers, or distribution.

Reasonable and Prudent Measures

NMFS believes the following reasonable and prudent measures are necessary and appropriate to minimize impacts of incidental take of the Kemp's ridley, green, loggerhead, leatherback, and hawksbill sea turtles:

1. BSEP shall conduct patrols of the cooling water intake system to look for signs of sea turtle strandings.

2. BSEP shall inspect and maintain the diversion structure.

3. BSEP shall have a program in place to rescue and release sea turtles stranded in the intake canal.

4. BSEP shall maintain records on all sea turtle takings.

Terms and Conditions

In order to be exempt from the prohibitions of section 9 of the ESA, the NRC must comply with the following terms and conditions which implement the reasonable and prudent measures described above and outline required reporting and monitoring requirements. These terms and conditions are non-discretionary.

1. BSEP shall conduct daily sea turtle patrols, depending on tides, weather and personnel weekend schedules, to inspect intake trash racks as near to low tide as possible during the period from late April through August. This period coincides with the historical higher-than-average occurrences of sea turtles in the area. The inspection will consist of visual observations of the entire length of the canal from the diversion structure to the plant's intake trash racks. As part of this protocol, visual examinations of one-half hour to one hour of the plant's intake and diversion structures are required to note sea turtle surfacing.

2. Plant personnel will inspect the diversion structure each year, prior to the turtle season, to ensure its integrity. The inspection will include a subsurface check by divers.

3. Daily inspections of the intake canal and annual inspections of the diversion structure will be annotated in a logbook. This logbook will be made available to NMFS personnel upon request.

4. Crews that maintain the diversion structure on a year-round basis will also look for signs of sea turtles inside the canal, on the diversion structure, or outside the diversion structure on the river side, while completing their duties. Plant security will report any signs of sea turtles in the canal noticed while on patrol.

5. Once a turtle is sighted, plant environmental personnel will attempt to capture the turtle following the procedures outlined in the biological assessment. Live turtles will be photographed, tagged, and released in the surf at Yaupon Beach, North Carolina or other area beach as determined through consultation with the NCSTC. Injured sea turtles will be given appropriate medical treatment or if severely injured the NCSTC will be consulted to determine the appropriate action. Dead turtles will be removed from the canal, photographed, and a necropsy, or other action determined appropriate by the North Carolina Sea Turtle Coordinator, will be performed. Plant personnel will request that the NCSTC make a determination as to weather or not the turtle was killed or injured as a result of plant operations. If a determination can not be made then the take will be considered causally related to plant operations. Documentation of this determination will be provided to, NMFS South East Regional Office, Protected Resources Section, at 9721 Executive Center Drive, North, Saint Petersburg, Florida 33702, within 30 days of the incident. This documentation shall include any photographs taken during the retrieval and necropsy.

7. All sea turtle takings will be recorded by species, size and time of year taken. These records will be made available to NMFS no later than 30 days after the first of the year or upon request.

NMFS anticipates that sea turtle takes by injury or mortality will reach no more than 6 loggerhead, 2 Kemp's ridley, 3 green turtles, and 1 hawksbill or leatherback annually. Over the 20-year period analyzed in this Opinion, NMFS anticipates that a total of 120 loggerheads, 40 Kemp's ridleys, 60 greens, and 20 hawksbill or leatherback in combination, taken by injury or mortality, incidentally to the proposed action. The reasonable and prudent measures, with their implementing terms and conditions, are designed to minimize the impact of incidental take that might otherwise result from the proposed action. If, during the course of the action, this level of incidental take is exceeded, such incidental take represents new information requiring reinitiation of consultation and review of the reasonable and prudent measures provided. The NRC must immediately request initiation of formal consultation, provide an explanation of the causes of the taking, and review with NMFS the need for possible modification of the reasonable and prudent measures.

IX. Conservation Recommendations

Section 7(a)(1) of the ESA directs Federal agencies to utilize their authorizations to further the purposes of the ESA by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information.

1. BSEP should conduct inspections of the diversion structure, to ensure the structure's integrity, to include subsurface inspections at least twice during the time between late April through August and one time outside that time period.
2. BSEP should monitor the trash racks, canal and diversion structure for signs of shortnose sturgeon.
3. BSEP should contact the Fisheries Department of the University of North Carolina-Wilmington on at least a yearly basis to determine if shortnose sturgeon have been tracked near the area of the intake canal.
4. BSEP should conduct tissue sampling for the genetic identity of turtles interacting with the plant's cooling water intake system.

In order for NMFS to be kept informed of actions minimizing or avoiding adverse effects or benefitting listed species or their habitats, NMFS requests notification of the implementation of any conservation recommendations.

X. Reinitiation of Consultation

This concludes formal consultation on the actions outlined in the NRC's letter dated October 29, 1999. As provided in 50 CFR 402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if (1) the amount or extent of taking specified in the incidental take statement is met or exceeded, (2) new information reveals effects of the action that may affect listed species or critical habitat (when designated) in a manner or to an extent not previously considered, (3) the identified action is subsequently modified in a manner that causes an effect to listed species or critical habitat that was not considered in the biological opinion, or (4) a new species is listed or critical habitat designated that may be affected by the identified action. In instances where the amount or extent of incidental take is exceeded, the NRC must immediately request reinitiation of formal consultation.

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