NATIONAL MARINE FISHERIES SERVICE
ENDANGERED SPECIES ACT
BIOLOGICAL OPINION

Agency: Army Corps of Engineers, New York District

Activity Considered: Construction of a Soft Dike at the American Sugar Refining Company Facility, Yonkers, New York
F/NER/2004/00473

Conducted by: National Marine Fisheries Service
Northeast Region

Approved by: ______________________

Date Issued: Dec 7, 2004

This constitutes the National Marine Fisheries Service's (NOAA Fisheries) biological opinion (BO) on the effects of the Army Corps of Engineer's (ACOE) approval of a permit for the construction of a soft dike composed of sand-filled geotextile bags on the bottom of the Hudson River near Yonkers, New York on threatened and endangered species in accordance with Section 7 of the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. 1531 et seq.). This BO is based on information provided in the Biological Assessment (BA) submitted by ACOE, correspondence with ACOE staff, and other sources of information. A complete administrative record of this consultation will be kept at the NOAA Fisheries Northeast Regional Office. Formal consultation was initiated on July 28, 2004.

CONSULTATION HISTORY

In March 2004, the ACOE contacted Diane Rusanowsky of NOAA Fisheries' Habitat Conservation Division for information on the requirements under Section 7 for a proposed project by the American Sugar Refining Company, Inc. (Domino Sugar). At this time, NOAA Fisheries informed the ACOE that formal consultation would be required for the project if it was likely to affect the endangered shortnose sturgeon (*Acipenser brevirostrum*). On July 28, 2004, NOAA Fisheries received a request for formal consultation from the ACOE. Accompanying this letter was a BA prepared by the applicant and submitted to the ACOE as well as other documentation for the proposed project. As NOAA Fisheries had all the information necessary for consultation, the date of the July 28 letter serves as the date for the initiation of formal consultation.

DESCRIPTION OF THE PROPOSED ACTION

The applicant, Domino Sugar, has requested ACOE authorization to discharge fill material into the Hudson River in the City of Yonkers, New York. The work will involve the discharge of fill material in the form of sand-filled geotextile bags. Each of these bags, filled with between three and four cubic yards (CY) of sand, will be dropped on the river bottom from split-hull barges in a pattern that would form a "soft dike." Each geotextile bag will be filled in an on site barge and will weigh approximately 10,000 pounds each. A total of approximately 5000CY of sand will be used, with a total of approximately 1700 bags being dropped. The soft dike will act as a current deflection structure. At its base, the soft dike would be approximately 270 feet long by 90 feet wide, and rise from a bottom elevation of approximately 32 feet below the plane of Mean Low Water to an elevation of 10 feet below the plane of Mean Low Water. The soft dike, with an areal expanse of approximately 0.58 acres of river bottom, would be located just north of the applicant's berthing area. In order to make the public aware of the soft dike's presence, the applicant proposes to install two US Coast Guard lighted buoys. The installation of the proposed dike will take approximately 15 days. Work is expected to occur 10 hours a day, 7 days per week.

Action Area
The action area is defined in 50 CFR 402.02 as "all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action." The proposed project area is located in the Hudson River in the City of Yonkers in Westchester County, New York. The site is located approximately 200 feet off the east bank of the Hudson River. The Action Area for this consultation encompasses the area where the soft dike will be installed as well as the surrounding Hudson River.

STATUS OF AFFECTED SPECIES
This section will focus on the status of the species within the action area, summarizing information necessary to establish the environmental baseline and to assess the effects of the proposed action.

The only endangered or threatened species under NOAA Fisheries' jurisdiction in the Action Area is the endangered shortnose sturgeon (*Acipenser brevirostrum*). No critical habitat has been designated for shortnose sturgeon.

Shortnose sturgeon life history
Shortnose sturgeon are benthic fish that mainly occupy the deep channel sections of large rivers. They feed on a variety of benthic and epibenthic invertebrates including molluscs, crustaceans (amphipods, chironomids, isopods), and oligochaete worms (Vladykov and Greeley 1963; Dadswell 1979 *in* NOAA Fisheries 1998). Shortnose sturgeon have similar lengths at maturity (45-55 cm fork length) throughout their range, but, because sturgeon in southern rivers grow faster than those in northern rivers, southern sturgeon mature at younger ages (Dadswell et al. 1984). Shortnose sturgeon are long-lived (30-40 years) and, particularly in the northern extent of their range, mature at late ages. In the north, males reach maturity at 5 to 10 years, while females mature between 7 and 13 years. Based on limited data, females spawn every three to five years while males spawn approximately every two years. The spawning period is estimated to last from a few days to several weeks. Spawning begins from late winter/early spring (southern rivers) to mid to late spring (northern rivers) when the freshwater temperatures increase to 8-9°C. Several published reports have presented the problems facing long-lived species that delay sexual maturity (Crouse et al. 1987; Crowder et al. 1994; Crouse 1999). In general, these reports concluded that animals that delay sexual maturity and reproduction must

gg production for this species are difficult to calculate because females do not spawn every year (Dadswell et al. 1984). Further, females may abort spawning attempts, possibly due to interrupted migrations or unsuitable environmental conditions (NOAA Fisheries 1998). Thus, annual egg production is likely to vary greatly in this species. Fecundity estimates have been made and range from 27,000 to 208,000 eggs/female (Dadswell et al. 1984).

At hatching, shortnose sturgeon are blackish-colored, 7-11mm long and resemble tadpoles (Buckley and Kynard 1981). In 9-12 days, the yolk sac is absorbed and the sturgeon develops into larvae which are about 15mm total length (TL; Buckley and Kynard 1981). Sturgeon larvae are believed to begin downstream migrations at about 20mm TL. Laboratory studies suggest that young sturgeon move downstream in a 2-step migration; a 2 to 3-day migration by larvae followed by a residency period by young of the year (YOY), then a resumption of migration by yearlings in the second summer of life (Kynard 1997). Juvenile shortnose sturgeon (3-10 years old) reside in the interface between saltwater and freshwater in most rivers (NOAA Fisheries 1998).

In populations that have free access to the total length of a river (e.g., no dams within the species' range in a river: Saint John, Kennebec, Altamaha, Savannah, Delaware and Merrimack Rivers), spawning areas are located at the farthest upstream reach of the river (NOAA Fisheries 1998). In the northern extent of their range, shortnose sturgeon exhibit three distinct movement patterns. These migratory movements are associated with spawning, feeding, and overwintering activities. In spring, as water temperatures rise above 8°C, pre-spawning shortnose sturgeon move from overwintering grounds to spawning areas. Spawning occurs from mid/late March to mid/late May depending upon location and water temperature. Sturgeon spawn in upper, freshwater areas and feed and overwinter in both fresh and saline habitats. Shortnose sturgeon spawning migrations are characterized by rapid, directed and often extensive upstream movement (NOAA Fisheries 1998).

Shortnose sturgeon are believed to spawn at discrete sites within the river (Kieffer and Kynard 1996). In the Merrimack River, males returned to only one reach during a four year telemetry study (Kieffer and Kynard 1996). Squires (1982) found that during the three years of the study in the Androscoggin River, adults returned to a 1-km reach below the Brunswick Dam and Kieffer and Kynard (1996) found that adults spawned within a 2-km reach in the Connecticut River for three consecutive years. Spawning occurs over channel habitats containing gravel, rubble, or rock-cobble substrates (Dadswell et al. 1984; NOAA Fisheries 1998). Additional environmental conditions associated with spawning activity include decreasing river discharge following the peak spring freshet, water temperatures ranging from 8 - 12° C, and bottom water velocities of 0.4 to 0.7 m/sec (Dadswell et al. 1984; NOAA Fisheries 1998). For northern shortnose sturgeon, the temperature range for spawning is 6.5-18.0C (Kieffer and Kynard in press). The eggs are separate when spawned but become adhesive within approximately 20 minutes of fertilization (Dadswell et al. 1984). Between 8° and 12°C, eggs generally hatch after approximately 13 days. The larvae are photonegative, remaining on the bottom for several days. Buckley and Kynard (1981) found week old larvae to be photonegative and form aggregations with other larvae in concealment.

Adult shortnose sturgeon typically leave the spawning grounds soon after spawning. Non-spawning movements include rapid, directed post-spawning movements to downstream feeding areas in spring and localized, wandering movements in summer and winter (Dadswell et al. 1984; Buckley and Kynard 1985; O'Herron et al. 1993). Kieffer and Kynard (1993) reported that post-spawning migrations were correlated with increasing spring water temperature and river discharge. Young-of-the-year shortnose sturgeon are believed to move downstream after hatching (Dovel 1981) but remain within freshwater habitats. Older juveniles tend to move downstream in fall and winter as water temperatures decline and the salt wedge recedes. Juveniles move upstream in spring and feed mostly in freshwater reaches during summer.

Juvenile shortnose sturgeon generally move upstream in spring and summer and move back downstream in fall and winter; however, these movements usually occur in the region above the saltwater/freshwater interface (Dadswell et al. 1984; Hall et al. 1991). Non-spawning movements include wandering movements in summer and winter (Dadswell et al. 1984; Buckley and Kynard 1985; O'Herron et al. 1993). Kieffer and Kynard (1993) reported that post-spawning migrations were correlated with increasing spring water temperature and river discharge. Adult sturgeon occurring in freshwater or freshwater/tidal reaches of rivers in summer and winter often occupy only a few short reaches of the total length (Buckley and Kynard 1985). Summer concentration areas in southern rivers are cool, deep, thermal refugia, where adult and juvenile shortnose sturgeon congregate (Flourney et al. 1992; Rogers and Weber 1994; Rogers and Weber 1995; Weber 1996). While shortnose sturgeon are occasionally collected near the mouths of rivers and often spend time in estuaries, they are not known to participate in coastal migrations and are rarely documented in their non-natal river.

The temperature preference for shortnose sturgeon is not known (Dadswell *et al.* 1984) but shortnose sturgeon have been found in waters with temperatures as low as 2 to 3°C (Dadswell *et al.* 1984) and as high as 34°C (Heidt and Gilbert 1978). In the northern part of its range (Chesapeake Bay and north), shortnose sturgeon are seldom found in shallow water once temperature exceeds 22°C (Dadswell 1975; Dovel 1978 as reported in Dadswell *et al.* 1984). Studies in the St. John River in Canada (Dadswell *et al.* 1984) demonstrated that the movement by shortnose sturgeon to deeper waters was prompted by surface temperatures greater than 21°C. Dadswell *et al.* (1984) reported that shortnose sturgeon experience distress and/or mortality at temperatures greater than 25°C. More recent studies (Flourney *et al.* 1992; Campbell and Goodman 2003) indicate that temperatures above 28°C and 29°C respectively, adversely affect shortnose sturgeon. In the Altamaha River, temperatures of 28-30°C during summer months create unsuitable conditions and shortnose sturgeon are found in deep cool water refuges (Flourney *et al.* 1992).

Shortnose sturgeon are known to occur at a wide range of depths. A minimum depth of 0.6m is necessary for the unimpeded swimming by adults. Shortnose sturgeon are known to occur at depths of up to 30m but are generally found in waters less than 20m (Dadswell et al. 1984; Dadswell 1979). The current literature on shortnose sturgeon includes reports of shortnose sturgeon at depths of 1-25 meters (Kieffer and Kynard 1993; Savoy and Shake 2000; Welsh *et al.*2000; Pottle and Dadswell 1979; Dadswell *et al.*1984; Dadswell 1979; Hastings 1983).

Shortnose sturgeon have demonstrated tolerance to a wide range of salinities. Shortnose sturgeon have been documented in freshwater (Taubert 1980; Taubert and Dadswell 1980) and in waters with salinity of 30 parts-per-trillion (ppt) (Holland and Yeverton 1973; Saunders and Smith 1978). Shortnose sturgeon have generally been reported in salinities of 0-25ppt (Dadswell 1975, 1979; McLeave *et al.*1977; Kieffer and Kynard 1973; Squiers *et al.*1979). Distribution studies indicate that shortnose sturgeon prefer riverine and estuarine habitats over marine habitats (see Secor 2003). While shortnose sturgeon have been reported in coastal waters up to 31ppt, they typically occur within several kilometers of their natal estuaries (Dadswell *et al.*1984; Kynard 1997). Mcleave *et al.*(1977) reported adults moving freely through a wide range of salinities, crossing waters with differences of up to 10ppt within a two hour period. The tolerance of shortnose sturgeon to increasing salinity is thought to increase with age (Kynard 1996). Niklitschek 2001 reports that shortnose sturgeon did not show a preference between 8-15ppt salinity, but exhibited stress and reduced survival at 29ppt salinity. Shortnose sturgeon typically occur in the deepest parts of rivers or estuaries where suitable oxygen and salinity values are present (Gilbert 1989).

Status and Trends of Shortnose Sturgeon Rangewide

Shortnose sturgeon were listed as endangered on March 11, 1967 (32 FR 4001), and the species remained on the endangered species list with the enactment of the ESA in 1973. Although the original listing notice did not cite reasons for listing the species, a 1973 Resource Publication, issued by the US Department of the Interior, stated that shortnose sturgeon were "in peril…gone in most of the rivers of its former range [but] probably not as yet extinct" (USDOI 1973). Pollution and overfishing, including bycatch in the shad fishery, were listed as principal reasons for the species' decline. In the late nineteenth and early twentieth centuries, shortnose sturgeon commonly were taken in a commercial fishery for the closely related and commercially valuable Atlantic sturgeon (*Acipenser oxyrinchus*). More than a century of extensive fishing for sturgeon contributed to the decline of shortnose sturgeon along the east coast. Heavy industrial development during the twentieth century in rivers inhabited by sturgeon impaired water quality and impeded these species' recovery; possibly resulting in substantially reduced abundance of shortnose sturgeon populations within portions of the species' ranges (e.g., southernmost rivers of the species range: Santilla, St. Marys and St. Johns Rivers). A shortnose sturgeon recovery plan was published in December 1998 to promote the conservation and recovery of the species (see NOAA Fisheries 1998). Shortnose sturgeon are listed as "vulnerable" on the IUCN Red List.

Although shortnose sturgeon are listed as endangered range-wide, in the final recovery plan NOAA Fisheries recognized 19 separate populations occurring throughout the range of the species. These populations are in New Brunswick Canada (1); Maine (2); Massachusetts (1); Connecticut (1); New York (1); New Jersey/Delaware (1); Maryland and Virginia (1); North

Carolina (1); South Carolina (4); Georgia (4); and Florida (2). NOAA Fisheries has not formally recognized distinct population segments (DPS)[1] of shortnose sturgeon under the ESA. Although genetic information within and among shortnose sturgeon occurring in different river systems is largely unknown, life history studies indicate that shortnose sturgeon populations from different river systems are substantially reproductively isolated (Kynard 1997) and, therefore, should be considered discrete. The 1998 Recovery Plan indicates that while genetic information may reveal that interbreeding does not occur between rivers that drain into a common estuary, at this time, such river systems are considered a single population compromised of breeding subpopulations (NOAA Fisheries 1998).

More recent studies have provided evidence that suggests that years of isolation between populations of shortnose sturgeon have led to morphological and genetic variation. Walsh et al. (2001) examined morphological and genetic variation of shortnose sturgeon in three rivers (Kennebec, Androscoggin, and Hudson). The study found that the Hudson River shortnose sturgeon population differed markedly from the other two rivers for most morphological features (total length, fork length, head and snout length, mouth width, interorbital width and dorsal scute count, left lateral scute count, right ventral scute count). Significant differences were found between fish from Androscoggin and Kennebec rivers for interorbital width and lateral scute counts which suggests that even though the Androscoggin and Kennebec rivers drain into a common estuary, these rivers support largely discrete populations of shortnose sturgeon. The study also found significant genetic differences among all three populations indicating substantial reproductive isolation among them and that the observed morphological differences may be partly or wholly genetic.

Grunwald et al. (2002) examined mitochondrial DNA (mtDNA) from shortnose sturgeon in eleven river populations. The analysis demonstrated that all shortnose sturgeon populations examined showed moderate to high levels of genetic diversity as measured by haplotypic diversity indices. The limited sharing of haplotypes and the high number of private haplotypes are indicative of high homing fidelity and low gene flow. The researchers determined that glaciation in the Pleistocene Era was likely the most significant factor in shaping the phylogeographic pattern of mtDNA diversity and population structure of shortnose sturgeon. The Northern glaciated region extended south to the Hudson River while the southern non-glaciated region begins with the Delaware River. There is a high prevalence of haplotypes restricted to either of these two regions and relatively few are shared; this represents a historical subdivision that is tied to an important geological phenomenon that reflects historical isolation. Analyses of haplotype frequencies at the level of individual rivers showed significant differences among all systems in which reproduction is known to occur. This implies that although higher level genetic stock relationships exist (i.e., southern vs. northern and other regional subdivisions), low gene flow exists between the majority of populations.

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1 The definition of species under the ESA includes any subspecies of fish, wildlife, or plants, and any distinct population segment of any species of vertebrate fish or wildlife which interbreeds when mature. To be considered a DPS, a population segment must meet two criteria under NOAA Fisheries policy. First, it must be discrete, or separated, from other populations of its species or subspecies. Second, it must be significant, or essential, to the long-term conservation status of its species or subspecies. This formal legal procedure to designate DPSs for shortnose sturgeon has not been undertaken.

Waldman et al. (2002) also conducted mtDNA analysis on shortnose sturgeon from 11 river systems and identified 29 haplotypes. Of these haplotypes, 11 were unique to northern, glaciated systems and 13 were unique to the southern non-glaciated systems. Only 5 were shared between them. This analysis suggests that shortnose sturgeon show high structuring and discreteness and that low gene flow rates indicated strong homing fidelity.

Wirgin et al. (in press), also conducted mtDNA analysis on shortnose sturgeon from 12 rivers (St. John, Kennebec, Androscoggin, Upper Connecticut, Lower Connecticut, Hudson, Delaware, Chesapeake Bay, Cooper, Peedee, Savannah, Ogeechee and Altamaha). This analysis suggested that most population segments are independent and that genetic variation among groups was high.

The best available information demonstrates differences in life history and habitat preferences between northern and southern river systems and given the species' anadromous breeding habits, the rare occurrence of migration between river systems, and the documented genetic differences between river populations, it is unlikely that populations in adjacent river systems interbreed with any regularity. This likely accounts for the failure of shortnose sturgeon to repopulate river systems from which they have been extirpated, despite the geographic closeness of persisting populations. This characteristic of shortnose sturgeon also complicates recovery and persistence of this species in the future as if a river population is extirpated in the future it is unlikely that this river will be recolonized. Consequently, this BO will treat the nineteen separate populations of shortnose sturgeon as subpopulations (one of which occurs in the action area) for the purposes of this analysis.

Historically, shortnose sturgeon are believed to have inhabited nearly all major rivers and estuaries along nearly the entire east coast of North America. The range extended from the St John River in New Brunswick, Canada to the Indian River in Florida. Today, only 19 populations remain ranging from the St. Johns River, Florida (possibly extirpated from this system) to the Saint John River in New Brunswick, Canada. Shortnose sturgeon are large, long lived fish species. The present range of shortnose sturgeon is disjunct, with northern populations separated from southern populations by a distance of about 400 km. The species is anadromous in the southern portion of its range (i.e., south of Chesapeake Bay), while northern populations are amphidromous (NOAA Fisheries 1998). Population sizes vary across the species' range. From available estimates, the smallest populations occur in the Cape Fear (~8 adults; Moser and Ross 1995) and Merrimack Rivers (~100 adults; M. Kieffer, United States Geological Survey, personal communication), while the largest populations are found in the Saint John (~100,000; Dadswell 1979) and Hudson Rivers (~61,000; Bain et al. 1998). As indicated in Kynard 1996, adult abundance is less than the minimum estimated viable population abundance of 1000 adults for 5 of 11 surveyed northern populations and all natural southern populations. Kynard (1996) indicates that all aspects of the species' life history indicate that shortnose sturgeon should be abundant in most rivers. As such, the expected abundance of adults in northern and north-central populations should be thousands to tens of thousands of adults. Expected abundance in southern rivers is uncertain, but large rivers should likely have thousands of adults (Kynard 1996). The only river systems likely supporting populations of these sizes are the St. John, Hudson and possibly the Delaware and the Kennebec, making the continued success of shortnose sturgeon in these rivers critical to the species as a whole. While no reliable estimate of the size of either the total species or the shortnose sturgeon population in the Northeastern United States exists, it is clearly below the size that could be supported if the threats to shortnose sturgeon were removed.

Threats to shortnose sturgeon recovery

Shortnose sturgeon were originally listed as an endangered species by the US Fish and Wildlife Service on March 11, 1967 under the Endangered Species Preservation Act (32 FR 4001, Appendix 1). NOAA Fisheries later assumed jurisdiction for shortnose sturgeon under a 1974 government reorganization plan (38 FR 41370). Although the original listing notice did not cite reasons for listing the species, a 1973 Resource Publication (Appendix II in NOAA Fisheries 1998), issued by the US Department of Interior, stated that shortnose sturgeon were "in peril...gone in most of the rivers of its former range [but] probably not as yet extinct." Pollution and overfishing, including bycatch in the shad fishery, were listed as principal reasons for the species' decline.

The Shortnose Sturgeon Recovery Plan (NOAA Fisheries 1998) identifies habitat degradation or loss (resulting, for example, from dams, bridge construction, channel dredging, and pollutant discharges) and mortality (resulting, for example, from impingement on cooling water intake screens, dredging and incidental capture in other fisheries) as principal threats to the species' survival.

Several natural and anthropogenic factors continue to threaten the recovery of shortnose sturgeon. Shortnose sturgeon continue to be taken incidentally in fisheries along the east coast and are probably targeted by poachers throughout their range (Dadswell 1979; Dovel et al. 1992; Collins et al. 1996). Bridge construction and demolition projects may interfere with normal shortnose sturgeon migratory movements and disturb sturgeon concentration areas. Unless appropriate precautions are made, internal damage and/or death may result from blasting projects with powerful explosives. Hydroelectric 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. Maintenance dredging of Federal navigation channels and other areas can adversely affect or jeopardize shortnose sturgeon populations. Hydraulic dredges can lethally take sturgeon by entraining sturgeon in dredge dragarms and impeller pumps. Mechanical dredges have also been documented to lethally take shortnose sturgeon. 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. Shortnose sturgeon are susceptible to impingement on cooling water intake screens at power plants. Electric power and nuclear power generating plants can affect sturgeon by impinging larger fish on cooling water intake screens and entraining larval fish. The operation of power plants can have unforeseen and extremely detrimental impacts to water quality which can affect shortnose sturgeon. For example, the St. Stephen Power Plant near Lake Moultrie, South Carolina was shut down for several days in June 1991 when large mats of aquatic plants entered the plant's intake canal and clogged the cooling water intake gates. Decomposing plant material in the tailrace canal coupled with the turbine shut down (allowing no flow of water) triggered a low dissolved oxygen water condition downstream and a subsequent fish kill. The South Carolina Wildlife and Marine Resources Department reported that twenty shortnose sturgeon were killed during this low dissolved oxygen event.

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; Sinderman 1994). Ultimately, toxins introduced to the water column become associated with the benthos and can be particularly harmful to benthic organisms (Varanasi 1992) 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 (Ruelle and Henry 1992; Ruelle and Kennlyne 1993). Available data suggests that early life stages of fish are more susceptible to environmental and pollutant stress than older life stages (Rosenthal and Alderdice 1976).

Although there is scant information available on the levels of contaminants in shortnose sturgeon tissues, some research on other related species indicates that concern about the effects of contaminants on the health of sturgeon populations is warranted. Detectible levels of chlordane, DDE (1,1-dichloro-2, 2-bis(p-chlorophenyl)ethylene), DDT (dichlorodiphenyl-trichloroethane), and dieldrin, and elevated levels of PCBs, cadmium, mercury, and selenium were found in pallid sturgeon tissue from the Missouri River (Ruelle and Henry 1994). These compounds were found in high enough levels to suggest they may be causing reproductive failure and/or increased physiological stress (Ruelle and Henry 1994). In addition to compiling data on contaminant levels, Ruelle and Henry also determined that heavy metals and organochlorine compounds (i.e. PCBs) accumulate in fat tissues. Although the long term effects of the accumulation of contaminants in fat tissues is not yet known, some speculate that lipophilic toxins could be transferred to eggs and potentially inhibit egg viability. In other fish species, reproductive impairment, reduced egg viability, and reduced survival of larval fish are associated with elevated levels of environmental contaminants including chlorinated hydrocarbons. A strong correlation that has been made between fish weight, fish fork length, and DDE concentration in pallid sturgeon livers indicates that DDE increases proportionally with fish size (NOAA Fisheries 1998).

Contaminant analysis was conducted on two shortnose sturgeon from the Delaware River in the fall of 2002. Muscle, liver, and gonad tissue were analyzed for contaminants (ERC 2002). Sixteen metals, two semivolatile compounds, three organochlorine pesticides, one PCB Aroclor, as well as polychlorinated dibenzo-p-dioxins (PCDDs), and polychlorinated dibenzofurans (PCDFs) were detected in one or more of the tissue samples. Levels of aluminum, cadmium, PCDDs, PCDFs, PCBs, DDE (an organochlorine pesticide) were detected in the "adverse affect" range. It is of particular concern that of the above chemicals, PCDDs, DDE, PCBs and cadmium, were detected as these have been identified as endocrine disrupting chemicals. While no directed studies of chemical contamination in shortnose sturgeon in the Delaware River have been undertaken, it is evident that the heavy industrialization of the Delaware River is likely adversely affecting this population. As the lower Hudson is also heavily industrialized, it is likely that shortnose sturgeon in the Hudson River experience similar contaminant loads.

During summer months, especially in southern areas, shortnose sturgeon must cope with the physiological stress of water temperatures that may exceed 28°C. Flourney *et al.*(1992) suspected that, during these periods, shortnose sturgeon congregate in river regions which support conditions that relieve physiological stress (i.e., in cool deep thermal refuges). In southern rivers where sturgeon movements have been tracked, sturgeon refrain from moving during warm water conditions and are often captured at release locations during these periods (Flourney *et al.* 1992; Rogers and Weber 1994; Weber 1996). The loss and/or manipulation of these discrete refuge habitats may limit or be limiting population survival, especially in southern river systems.

Pulp mill, silvicultural, agricultural, and sewer discharges, as well as a combination of non-point source discharges, which contain elevated temperatures or high biological demand, can reduce dissolved oxygen levels. Shortnose sturgeon are known to be adversely affected by low oxygen levels (below 5 mg/L). Shortnose sturgeon may be less tolerant of low dissolved oxygen levels in high ambient water temperatures and show signs of stress in water temperatures higher than 28°C (Flourney *et al.* 1992). At these temperatures, concomitant low levels of dissolved oxygen may be lethal.

The major known sources of anthropogenic mortality and injury of shortnose sturgeon include entrainment in dredges and entanglement in fishing gear. Injury and mortality can also occur at power plant cooling water intakes and structures associated with dams in rivers inhabited by this species. Shortnose sturgeon may also be adversely affected by habitat degradation or exclusion associated with riverine maintenance and construction activities and operation of power plants. Entanglement could include incidental catch in commercial or recreational gear as well as directed poaching activities. Shortnose sturgeon are most likely to interact with fisheries in and around the mouths of rivers where they are found. Thus, interactions are likely to occur in state or unregulated fisheries that occur in State waters. Interactions are also most likely to occur during the spring migration (NOAA Fisheries 1998b). According to information summarized by NOAA Fisheries (1998b), operation of gillnet fisheries for shad may result in lethal takes of as many as 20 shortnose sturgeon per year in northern rivers. Shortnose sturgeon may be taken in ocean fisheries near rivers inhabited by this species. No comprehensive analysis of entanglement patterns is available at this time, in part due to the difficulty of distinguishing between shortnose and Atlantic sturgeon with the similarity in appearance of these two species. For example, several thousand pounds of "sturgeon" were reported taken in the squid/mackerel/butterfish fishery in 1992. However, this information is not broken down by species.

The Shortnose Sturgeon Recovery Plan (NOAA Fisheries 1998) identifies habitat degradation or loss (resulting, for example, from dams, bridge construction, channel dredging, and pollutant discharges) and mortality (resulting, for example, from impingement on cooling water intake screens, dredging and incidental capture in other fisheries) as principal threats to the species' survival. The recovery goal is identified as delisting shortnose sturgeon populations throughout their range, and the recovery objective is to ensure that a minimum population size is provided such that genetic diversity is maintained and extinction is avoided.

Status of Shortnose Sturgeon in the Hudson River

Shortnose sturgeon were first observed in the Hudson River by early settlers who captured them as a source of food and documented their abundance (Bain et al. 1998). Shortnose sturgeon in the Hudson River were documented as abundant in the late 1880's (Ryder 1888 in Hoff 1988). Prior to 1937, a few fishermen were still commercially harvesting shortnose sturgeon in the

Hudson River, however, fishing pressure declined as the population decreased. During the late 1800s and early 1900s, the Hudson River served as a dumping ground for pollutants that lead to major oxygen depletions and resulted in fish kills and population reductions. During this same time, there was a high demand for shortnose sturgeon eggs (caviar), leading to overharvesting. Water pollution, overfishing, and the commercial Atlantic sturgeon fishery are all factors that may have contributed to the decline of shortnose sturgeon in the Hudson River (Hoff 1988).

In the 1930s, the New York State Biological Survey launched the first scientific analysis that documented the distribution, age, and size of mature shortnose sturgeon in the Hudson River (Bain et al. 1998). In the 1970s scientific sampling resumed precipitated by the lack of biological data and concerns about the impact of electric generation facilities on fishery resources (Bain et al. 1998). The current population of shortnose sturgeon has been documented by studies conducted throughout the entire range of shortnose sturgeon in the Hudson River (Hoff et al. 1988, Geoghegan et al. 1992, Bain et al. 1998, Bain et al. 2000, Dovel et al. 1992).

From 1993 through 1997, researchers at Cornell University (Bain et al. 1998) completed the most recent population estimate of shortnose sturgeon in the Hudson River. Utilizing targeted and dispersed sampling methods, 6,430 adult shortnose sturgeon were captured and 5,959 were marked. Based upon the population sampled, the total population of shortnose sturgeon in the Hudson River is estimated to be 61,057. This estimate includes adults and an estimated 4,439 juveniles. Based upon size structure analysis of the sampling results, juveniles make up approximately 3% of the total population. Although fish populations dominated by adults are not common for most species, there is no evidence that this is atypical for shortnose sturgeon (Bain et al. 1998). This study provides the best information available on the current status of the Hudson River population and suggests that population is relatively healthy, large, and particular in habitat use and migratory behavior (Bain et al. 1998).

Shortnose sturgeon have been documented in the Hudson River from upper Staten Island (RM -3) to the Troy Dam (RM 155)[2] (Bain et al. 2000, ASA 1980-2002). In recent years (since 1999), shortnose sturgeon have been documented below the Tappan Zee Bridge from June through December (ASA 1999-2002; Dynegy 2003). While shortnose sturgeon presence below the Tappan Zee Bridge had previously been thought to be rare (Bain et al. 2000), increasing numbers of shortnose sturgeon have been documented in this area over the last several years (ASA 1999-2002; Dynegy 2003) suggesting that the range of shortnose sturgeon is extending downstream. Shortnose sturgeon were documented as far south as the Manhattan/Staten Island area in June, November and December 2003 (Dynegy 2003).

From late fall to early spring, adult shortnose sturgeon concentrate in a few overwintering areas. Reproductive activity the following spring determines overwintering behavior; spawning adults concentrate near Kingston (RM 87.5) while one group of non-spawning adults concentrates near Kingston and another group of non-spawners concentrates near Haverstraw Bay (RM 34-38) (Buckley and Kynard 1985; Dovel et al. 1992; Bain et al. 1998). Recent capture data suggests that these areas may be expanding (Hudson River 1999-2002, Dynegy 2003). Tagging studies by Geoghehan (1992) provide additional earlier data confirming the presence of mature adults in

2 See Appendix A for a map of the Hudson River with these areas highlighted.

the Kingston and Haverstraw Bay regions. Typically, movements during overwintering periods are localized and fairly sedentary. In the Hudson River, males usually spawn at approximately 3-4 years of age while females spawn at approximately 6-8 years of age (Bain et al. 1998). The period between spawnings is estimated to range from 1-5 years (T.I.J. Smith 1985). Mature males feed only sporadically prior to the spawning migration, while females do not feed at all in the months prior to spawning.

In approximately mid-April, when water temperatures are sustained at 8°C for several days[3], reproductively active adults begin their migration upstream to the spawning grounds that extend from below the Federal Dam at Troy to about Coxsackie (RM 150-119) (Bain et al. 1998). Spawning occurs over several days to several weeks, typically ending by the time water temperatures have reached 15°C (which typically occurs from late April to mid-May) although shortnose sturgeon have been documented on the spawning grounds with water temperatures as high as 18°C. After spawning, adults disperse quickly downstream into their summer range, where feeding resumes. The broad summer range occupied by adult shortnose sturgeon extends from approximately RM 12 to RM 117 (NOAA Fisheries 1998). Similar to the overwintering areas, based on an analysis of recent capture data (Hudson River 1999-2002, Dynegy 2003), NOAA Fisheries believes that these summer concentration areas may also be expanding.

Shortnose sturgeon eggs adhere to solid objects on the river bottom for approximately 10 to 15 days until the larvae hatch (Bain et al. 1998). The Hudson River population of shortnose sturgeon larvae generally range in size from 15 to 18 mm TL at hatching (Bain et al. 1998). Larvae gradually disperse downstream after hatching, entering the tidal river. Larvae are found throughout the Hudson River estuary and are most commonly found in deep waters with strong currents, typically in the channel (Bain et al. 1998; Dovel et al. 1992). The transition from the larval to juvenile stage generally occurs in the first summer of life when the fish grows to approximately 2 cm TL and is marked by fully developed external characteristics (Bain et al. 1998).

Similar to non-spawning adults, most juveniles occupy the broad region of Haverstraw Bay (RM 34-40) (Dovel et al. 1992; Geoghegan et al. 1992) by late fall and early winter. Migrations from the summer foraging areas to the overwintering grounds are triggered when water temperatures fall to 8°C (NOAA Fisheries 1998), typically in late November[4]. Juveniles are distributed throughout the mid-river region during the summer and move back into the Haverstraw Bay region during the late fall (Bain et al. 1998; Geoghegan et al. 1992; Haley 1998).

The shortnose sturgeon is a bottom feeder and juveniles may use the protuberant snout to vacuum the river bottom. Curran & Ries (1937) described juvenile shortnose sturgeon from the Hudson River as having stomach contents of 85-95% mud intermingled with plant and animal material. Other studies found stomach contents of adults were solely food items, implying that

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3 Based on information from the USGS gage in Albany (gage no. 01359139), in 2002 water temperatures reached 8°C on April 10 and 15°C on April 20; 2003 - 8°C on April 14 and 15°C on May 19; 2004 - 8°C on April 17 and 15°C on May 11.

4 In 2002, water temperatures at the USGS gage at Hastings-on-Hudson (No. 01376304; approximately 5 miles south of Yonkers and the farthest downstream gage on the river) fell to 8°C on November 23. In 2003, water temperatures at this gage fell to 8°C on November 29.

feeding is more precisely oriented. The ventral protrusable mouth and barbells are adaptations for a diet of small live benthic animals. Juveniles feed on smaller and somewhat different organisms than adults. Common prey items are aquatic insects (chironomids), isopods, and amphipods. Unlike adults, mollusks do not appear to be an important part of the diet of juveniles (Bain 1997). As adults, their diet shifts strongly to mollusks (Curran & Ries 1937).

ENVIRONMENTAL BASELINE

By regulation, environmental baselines for BOs include the past and present impacts of all State, Federal or private actions and other human activities in the action area, the anticipated impacts of all proposed Federal projects in the action area that have already undergone formal or early section 7 consultation, and the impact of State or private actions which are contemporaneous with the consultation in process (50 CFR 402.02). The environmental baseline for this BO includes the effects of several activities that affect the survival and recovery of shortnose sturgeon in the action area.

Dredging

The construction and maintenance of Federal navigation channels and other maintenance dredging projects have been identified as a source of sturgeon mortality. Interactions between shortnose sturgeon and dredge operations have been fairly well documented. Lethal takes of shortnose sturgeon have been documented in hopper, pipeline and mechanical dredge operations in several rivers in the Northeastern US. The Hudson River Federal Navigation Channel is maintained by the ACOE. Maintenance dredging began September 10, 1987 and was completed October 10, 1987. Bottom material lying above the plane of 32 feet below mean low water was removed in specified areas of Haverstraw Bay. A clamshell dredge was used and 346,706 cubic yards of material was removed during 1987 maintenance dredging. The ACOE also permits maintenance of the Tarrytown Federal Navigation Channel. This area was last dredged in 1992. Many other small scale dredging projects routinely occur in the Hudson River near the action area.

Since dredging requires the removal of material from the bottom of the River down to a specified depth, it causes severe disruption to the benthic community. Disruption of the benthos may affect shortnose sturgeon foraging and migration behavior given that they are benthic omnivores. Dredging has also been known to cause temporary displacement, injury and/or mortality, which may also affect the ability of shortnose sturgeon in the Hudson River to recover.

In 2002, the ACOE issued a permit for the construction of the Millennium Pipeline in the Haverstraw Bay region of the Hudson River. In a BO issued in 2002, NOAA Fisheries concluded that the project may adversely affect but was not likely to jeopardize the continued existence of shortnose sturgeon. In an accompanying Incidental Take Statement, the take of one shortnose sturgeon was authorized during the duration of the project. However, due to the denial of a Coastal Zone Management consistency appeal, this project is no longer likely to occur.

Contaminants and Water Quality

Historically, shortnose sturgeon were rare in the lower Hudson River, likely as a result of poor water quality precluding migration further downstream (Dovel et al. 1992, Bain et al. 2000). However, in the past several years, the water quality has improved and sturgeon have been found as far downstream as the Manhattan/Staten Island area (Hudson River 1999-2002, Dynegy 2003). It is likely that contaminants remain in the water and in the action area, albeit to reduced levels. Sewage, industrial pollutants and waterfront development has likely decreased the water quality in the action area (ACOE 2004). Contaminants introduced into the water column or through the food chain, eventually become associated with the benthos where bottom dwelling species like shortnose sturgeon are particularly vulnerable. Several characteristics of shortnose sturgeon life history including long life span, extended residence in estuarine habitats, and being a benthic omnivore, predispose this species to long term repeated exposure to environmental contaminants and bioaccumulation of toxicants (Dadswell 1979).

Principal toxic chemicals in the Hudson River include pesticides and herbicides, heavy metals, and other organic contaminants such as PAHs and PCBs (ASA 2000). Concentrations of many heavy metals also appear to be in decline and remaining areas of concern are largely limited to those near urban or industrialized areas(ASA 2000). With the exception of areas near New York City, there currently does not appear to be a major concern with respect to heavy metals in the Hudson River, however metals could have previously affected shortnose sturgeon.

PAHs, which are products of incomplete combustion, most commonly enter the Hudson River as a result of urban runoff. As a result, areas of greatest concern are limited to urbanized areas, principally near New York City. The majority of individual PAHs of concern have declined during the past decade in the lower Hudson River and New York Harbor (ACOE 2004; ASA 2000).

PCBs are the principal toxic chemicals of concern in the Hudson River. Primary inputs of PCBs in freshwater areas of the Hudson River are from the upper Hudson River near Fort Edward and Hudson Falls, New York. In the lower Hudson River, PCB concentrations observed are a result of both transport from upstream as well as direct inputs from adjacent urban areas. Two General Electric plants, located in Fort Edward and Hudson Falls, are responsible for discharge the majority of the PCB's into the Hudson River between 1947 and 1977. PCBs tend to be bound to sediments and also bioaccumulate and biomagnify once they enter the food chain. This tendency to bioaccumulate and biomagnify results in the concentration of PCBs in the tissue concentrations in aquatic-dependent organisms. These tissue levels can be many orders of magnitude higher than those observed in sediments and can approach or even exceed levels that pose concern over risks to the environment and to humans who might consume these organisms (ASA 2000).

PCBs can have serious deleterious effects on aquatic life and are associated with the production of acute lesions, growth retardation, and reproductive impairment (Ruelle and Keenlyne 1993). PCB's may also contribute to a decreased immunity to fin rot (Dovel et al. 1992). Large areas of the upper Hudson River are known to be contaminated by PCBs and this is thought to account for the high percentage of shortnose sturgeon in the Hudson River exhibiting fin rot. Under a statewide toxics monitoring program, the NYSDEC analyzed tissues from four shortnose sturgeon to determine PCB concentrations. In gonadal tissues, where lipid percentages are highest, the average PCB concentration was 29.55 parts per million (ppm; Sloan 1981) and in all tissues ranged from 22.1 to 997.0 ppm. Dovel (1992) reported that more than 75% of the shortnose sturgeon captured in his study had severe incidence of fin rot.

Heavy metals are also a problem in the Hudson River. Cadmium is a soft, white metal obtained as an industrial by-product of the production of zinc, copper and lead. Cadmium is highly toxic to all forms of life. It is known as a teratogen carcinogen and as a possible mutagen. It accumulates in the kidneys of organisms. There are several sites on the Hudson River where cadmium has been and still is discharged (ACOE 2004).

In the Connecticut River, coal tar leachate was suspected of impairing sturgeon reproductive success. Kocan (1993) conducted a laboratory study to investigate the survival of sturgeon eggs and larvae exposed to PAHs, a by-product of coal distillation. Only approximately 5% of sturgeon embryos and larvae survived after 18 days of exposure to Connecticut River coal-tar (i.e., PAH) demonstrating that contaminated sediment is toxic to shortnose sturgeon embryos and larvae under laboratory exposure conditions (NOAA Fisheries 1998). There are known MGP contaminated sites in the Hudson River as well.

Point source discharge (i.e., municipal wastewater, paper mill effluent, industrial or power plant cooling water or waste water) and compounds associated with discharges (i.e., metals, dioxins, dissolved solids, phenols, and hydrocarbons) contribute to poor water quality and may also impact the health of sturgeon populations. The compounds associated with discharges can alter the pH of receiving waters, which may lead to mortality, changes in fish behavior, deformations, and reduced egg production and survival.

Heavy usage of the Hudson River and development along the waterfront could have affected shortnose sturgeon throughout the action area. Coastal development and/or construction sites often result in excessive water turbidity, which could influence sturgeon spawning and/or foraging ability. Industries along the Hudson River have likely impacted the water quality, as service industries, such as transportation, communication, public utilities, wholesale and retail trades, finance, insurance and real estate, repair and others, have increased since 1985 in all nine counties in the lower Hudson River.

The Hudson River is used as a source of potable water, for waste disposal, transportation and cooling by industry and municipalities. Rohman et al. (1987) identified 183 separate industrial and municipal discharges to the Hudson and Mohawk Rivers. The greatest number of users were in the chemical industry, followed by the oil industry, paper and textile manufactures, sand, gravel, and rock processors, power plants, and cement companies. Approximately 20 publicly owned treatment works discharge sewage and wastewater into the Hudson River. Most of the municipal wastes receive primary and secondary treatment. A relatively small amount of sewage is attributed to discharges from recreational boats.

Power Plant Impingement

Historically, impingement of shortnose sturgeon at Hudson River power plants has been a major concern. For example, Hoff and Klauda (1979) reported the impingement of 39 shortnose sturgeon at power plants along the Hudson from 1969-1979. Approximately 160 shortnose sturgeon were estimated to be impinged on intake screens at the Albany Steam Generating Station in Albany between October 1982 and September 1983. In recent years, due to advances in technology, the number of shortnose sturgeon documented impinged at power plants has decreased dramatically. This is evidenced by the fact that no shortnose sturgeon impingements have been documented at the Albany station since 1985. Several power plants are located in the area surrounding the action area (Indian Point, Mirant Bowline, Roseton, Mirant Lovett, and Danskammer). The Roseton and Danskammer Plants have an ITP issued pursuant to Section 10 of the ESA (No. 1269) which authorizes a level of take of shortnose sturgeon incidental to the operation of the power plants and associated water intakes. Take levels of 2 shortnose sturgeon at Roseton and 4 at Danskamer Point are authorized each year (evaluated as a 5-year running average to account for inter-annual variation).

Mirant Lovett and Mirant Bowline each employ a Gunderboom Marine Life Exclusion System (MLES) in front of their intakes to prevent aquatic life from becoming impinged or entrained in these intakes. The Gunderboom MLES is a water-permeable barrier comprised of two layers of fine-mesh fabric. The MLES curtain is anchored to existing shoreline intake structures and completely surrounds the intake structure, preventing organisms from entering the system. The large surface area of the MLES allows water velocity through the curtain to be up to 98 percent less than the velocity near the intake structure, enabling even small fish larvae to drift away from the curtain. Data from worst-case test conditions shows that contact with an operating MLES does not adversely affect fish eggs or larvae (Gunderboom 2004). These systems are expected to prevent all life stages of shortnose sturgeon from being impinged and/or entrained at these plants.

No estimate exists for the number of shortnose sturgeon taken annually at the two Indian Point intakes as monitoring of the intakes ceased in the early 1970s. However, these intakes historically impinged shortnose sturgeon and this take likely still occurs.

Scientific Studies

The Hudson River population of shortnose sturgeon have been the focus of a prolonged history of scientific research. In the 1930s, the New York State Biological Survey launched the first scientific sampling study and documented the distribution, age, and size of mature shortnose sturgeon (Bain et al. 1998). In the early 1970s, research resumed in response to a lack of biological data and concerns about the impact of electric generation facilities on fishery resources (Hoff 1988). In an effort to monitor relative abundance, population status, and distribution, intensive sampling of shortnose sturgeon in this region has continued throughout the past forty years. Sampling studies targeting other species also incidentally capture shortnose sturgeon. As a result of techniques associated with these sampling studies, shortnose sturgeon have been subjected to capturing, handling, and tagging. For example, 45 shortnose sturgeon were captured during one study in 2003. The same study captured 50 shortnose sturgeon in 2000. It is possible that research in the action area may have influenced and/or altered the migration patterns, reproductive success, foraging behavior, and survival of shortnose sturgeon. There are currently two active Incidental Take Permits, issued pursuant to Section 10 of the ESA, for research activities in the Hudson River, including the action area. These permits have been issued to Dynegy and the NYSDEC. These permits are issued for a period of five years and authorize varying levels of incidental take. The Dynegy permit (ITP No. 1254) authorizes annually the lethal take of 40 larval shortnose sturgeon and the non-lethal take of 13 juvenile and 82 juvenile and adult shortnose sturgeon. The NYSDEC permit (ITP No. 885) authorizes the annual non-lethal take of 5,000 shortnose sturgeon and the lethal take of two shortnose sturgeon.

Fisheries
Unauthorized take of shortnose sturgeon is prohibited by the ESA. However, shortnose sturgeon are taken incidentally in other anadromous fisheries along the East coast and may be targeted by poachers (NOAA Fisheries 1998). In the Hudson River, American shad, river herring, and blue crab are the target of commercial fishing operations (Kanhley 2001, pers. comm.) Seasonal restrictions apply to the American shad and river herring gillnet fisheries that operate in the spring (Kahnley 2001, pers. comm.). In Haverstraw Bay, recreational fisherman target a number of species such as bluefish, weakfish and white codfish. The incidental take of shortnose sturgeon on the Hudson River has been documented in commercial shad fisheries as well as recreational hook and line fisheries (Clancy 2000). However, no estimate of the annual take of shortnose sturgeon is available.

Status of shortnose sturgeon in the action area
The project area is situated within the summer habitat of this species and is likely used as a migration corridor for fish migrating to the overwintering area in Haverstraw Bay. As shortnose sturgeon are not expected to move to the overwintering grounds until water temperatures reach 8°C and water temperatures are likely to be above 8°C during the time of year proposed for the project[5], there is the potential for juvenile and adult shortnose sturgeon to be present. Most shortnose sturgeon are expected to occur in the deepest part of the river, generally the channel. However, shortnose sturgeon are known to occur in shallower near shore areas while attempting to forage and the current literature on shortnose sturgeon includes reports of shortnose sturgeon at depths of 1-25 meters (Kieffer and Kynard 1993; Savoy and Shake 2000; Welsh *et al.*2000; Pottle and Dadswell 1979; Dadswell *et al.*1984; Dadswell 1979; Hastings 1983).

Trawling surveys in the action area have confirmed the presence of shortnose sturgeon from May through October and shortnose sturgeon have been captured downstream of the action area through December 18 (Hudson River 1993-2002; Dynegy 2003). As no trawling has been done from January – April, no shortnose sturgeon have been documented by survey during these months. As the project is located with the summer range of this species, it is reasonable to assume that shortnose sturgeon may be present from the time water temperatures reach 8°C in the spring (typically mid to late April) until they fall to 8°C in the fall (typically in late November). At this time it is unknown whether the fish captured in the Manhattan area in 2003 (13 captured from 11/17/2003-12/29/2003; 8 captures after water temperatures dropped below 8°C) are overwintering in the Manhattan area or whether they made a late migration to the overwintering area in Haverstraw Bay. As previous surveys in Manhattan at this time of year had not captured shortnose sturgeon, it is likely that these fish later migrated to the overwintering area and the presence of shortnose sturgeon this far down in the river when water temperatures were below 8°C was a rare occurrence and was related to some other unknown environmental influence. Based on this analysis, NOAA Fisheries expects shortnose sturgeon to be present in the action area when water temperatures are above 8°C in any year (expected to be from mid-April to late November).

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5 In 2002, water temperatures at the USGS gage at Hastings-on-Hudson (No. 01376304; approximately 5 miles south of Yonkers) fell to 8°C on November 23. In 2003, water temperatures at this gage fell to 8°C on November 29.

No estimates on the number of shortnose sturgeon that would typically occur in the action area is known; however, as shortnose sturgeon presence has been confirmed in the action area, a percentage of the Hudson River shortnose sturgeon population may be present in the action area at any time. As noted above, based on the best available information, adult and juvenile shortnose sturgeon are likely to be present in the action area when the project is expected to occur (October and November).

Shortnose sturgeon and their habitat in the Hudson River may be affected by several different factors including: impaired water quality from both point and non-point sources; incidental take in scientific studies and commercial and recreational fisheries; impingement at power plants; and dredging activities. NOAA Fisheries has collaborated with various federal action agencies conducting work in the Hudson River to minimize the potential for these activities to adversely affect shortnose sturgeon.

EFFECTS OF THE ACTION

This section of a BO assesses the direct and indirect effects of the proposed action on threatened and endangered species or critical habitat, together with the effects of other activities that are interrelated or interdependent (50 CFR 402.02). Indirect effects are those that are caused later in time, but are still reasonably certain to occur. Interrelated actions are those that are part of a larger action and depend upon the larger action for their justification. Interdependent actions are those that have no independent utility apart from the action under consideration (50 CFR 402.02).

The purpose of this assessment is to determine if it is reasonable to expect that the ACOE's proposed action will have direct or indirect effects on threatened and endangered species that will appreciably reduce their likelihood of both survival and recovery in the wild by reducing the reproduction, numbers, or distribution of that species [which is the "jeopardy" standard established by 50 CFR 402.02]. As outlined above (see page 16), shortnose sturgeon are expected to be present in the action area during the October and November time frame slated for this project. If the project continues past the time when water temperatures fall below 8C, no shortnose sturgeon are expected to be present in the action area.

Effects of construction of the soft dike

Placement of the Geotextile Bags

Shortnose sturgeon are likely to be present during October and November when the soft dike will be installed. As indicated above, the filled geotextile bags will be dropped from a barge and allowed to fall onto the river bottom. Each geotextile bag will weigh approximately 10,000 pounds. Due to the heavy weight of the bags, if a bag were to land on a shortnose sturgeon it is expected that the sturgeon would be crushed and die. It is expected that, similar to a dredge operation, most motile organisms, including shortnose sturgeon, are likely to be able to avoid the falling bags. As such, few shortnose sturgeon are likely to be directly affected by this action. In order for a shortnose sturgeon to be crushed, it would not only have to be present in the area immediately under the barge but would also have to be unable to swim away from the impact area in time to avoid being crushed by the falling bag.

Evidence of take of sturgeon by dredges indicates that sturgeon are sometimes unable to avoid underwater equipment. Shortnose sturgeon have been killed in pipeline and hopper dredge operations and by mechanical bucket dredges. As pipeline and hopper dredges both operate by suction which further reduces the ability of an animal to avoid the intake, the ability of a shortnose sturgeon to avoid a mechanical dredge is a better proxy for the ability to avoid a falling geotextile bag. Similar to the geotextile bags, a dredge bucket descends from a barge and travels directly to the bottom. Atlantic sturgeon, also a large benthic species, and shortnose sturgeon have been killed in bucket dredge operations (Cape Fear River and Kennebec River). Based on the number of sturgeon documented to be taken in bucket dredging operations (3), NOAA Fisheries believes this is an uncommon, but not unlikely occurrence. The two sturgeon documented to be killed in bucket dredging operations were lacerated, suggesting that the bucket hit the fish while they were on the bottom. This implies that the sturgeon were unable to avoid the falling bucket. Based on this analysis, it is assumed that the ability of a sturgeon to avoid a dredge is likely to be similar to the ability to avoid the falling geotextile bags. As noted above, most shortnose sturgeon should be able to avoid the falling bags. However, as evidenced by takes of sturgeon by bucket dredges, these fish are not always able to avoid large objects descending from barges and it is likely that some number of sturgeon will be unable to avoid the falling geotextile bags.

The number of shortnose sturgeon that will be directly affected by the action (i.e., unable to avoid the falling bags and crushed by the placement of bags on the river bottom) is likely to be a small percentage of the total number of shortnose sturgeon in the Hudson River for several reasons: (1) the project is located several miles downstream of Haverstraw Bay, the primary concentration area for shortnose sturgeon in the summer and fall; (2) the project is located along the shoreline and extends a maximum of 1275 feet into the River where the river is approximately 1 mile wide (i.e., approximately 25% river width); (3) the project is located away from the main channel where shortnose sturgeon are most often located; (4) the project area is not a known foraging area for shortnose sturgeon; and (5) most shortnose sturgeon are expected to be able to avoid the geotextile bags as they are dropped from the barge. Based on the factors outlined above, during the course of the construction it is expected that no more than one shortnose sturgeon is likely to be unable to avoid a falling bag and be killed.

Noise

There is likely to be noise associated with the presence of the barge, the filling of the bags with sand and the deposition of the geotextile bags on the bottom of the River. Recent studies commissioned by the Georgia Ports Authority (ATM 2004), demonstrate that the noise made by a barge is only slightly louder than ambient noise in a busy industrial harbor. As shortnose sturgeon are frequently found in busy industrial areas frequented by tugboats and barges (e.g., in the Delaware River at Philadelphia, in the Kennebec River at the Bath Iron Works facility in the Savannah River at Savannah Harbor), it is assumed that the fish are not disturbed by the ambient noise levels in these areas. As underwater noise dissipates as it travels from its source (ATM 2004), it is reasonable to expect that it will be noisiest under the barge and that the noise will dissipate as it travels towards the channel where most shortnose sturgeon are expected to be present. As the noise is not expected to rise a detectable amount above the ambient noise levels in the action area, the noise is not expected to affect the migratory movements of any fish that are moving to the upstream overwintering grounds in the Tarrytown area (RM 27-40) or the

Kingston area (RM 85-95) or to affect the movements and distribution of shortnose sturgeon in the Hudson River in any other way.

Increased Turbidity/Sedimentation

Due to the weight and size of the geotextile bags, some sediment is likely to be disturbed as the bags land on the river bottom. This will cause some amount of sediment to be suspended in the water column. The ACOE and the applicant (Pyburn & Odum 2004) have indicated that there will only be a slight increase in turbidity resulting from this project and that this effect will be temporary. The increase in sediment is only likely to occur during the placement of the bottom layer of geotextile bags. As only one bag will be released at a time, only a small amount of sediment will be disturbed at any one time. This amount of sediment is expected to quickly disperse in the water column and then settle out onto the bottom. Due to the small amount of sediment being disturbed at any one time, a sediment plume (i.e., an area of high suspended sediment load in the water column) is not expected to be generated.

Numerous studies have assessed the impact of turbidity/suspended sediment on fish. While results of these studies (Muncy et al. 1979 in Burton 1993; Sherk et al. 1975; Turner 1967; Vineyard and O-Brien 1976; Heimstra et al. 1969 in Burton 1993) demonstrate that suspended sediment may have an adverse impact on other fish species, observations made during maintenance dredging in the Delaware River indicate adult sturgeon seem to be able to withstand some degree of suspended sediments given they frequently are found in turbid waters (Hastings 1983). It is unclear at what level suspended sediment begins to affect sturgeon behavior. It is not likely that concentrations expected at the construction site will inhibit migratory behavior. Given construction of the soft dike will effect less than 25% of the width of the river, shortnose sturgeon should still be able to use the channel as a migration corridor as well as being able to utilize the other side of the river.

Several studies have also examined the effects of turbidity on larvae. Observations in the Delaware River indicate that larval populations may be decimated when suspended material resettles out of the water column (Hastings 1983). However, non-motile (i.e., drifting) larvae will not be present at the time of year proposed for the project. Shortnose sturgeon are no longer considered larvae once they reach 2cm which is expected to occur early in the first summer of life (typically in July). As such, any young-of-the-year that may be present in the action area are expected to be free swimming and be able to avoid any areas of suspended sediment. Shortnose sturgeon are not likely to be adversely affected by the small amount of suspended sediment that will be distributed in the water column during construction of the soft dike.

Contaminant Release

Testing in the action area has confirmed that the sediments present contain low levels of PCBs. This contamination is due to the dropout of sediments at the action area transported from elsewhere in the river system (Pyburn & Odom 2004). As indicated above, a large amount of suspended sediment is not expected to be generated from the construction activity. As such, the potential for resuspension of PCB contaminated sediment is relatively low and will be temporary. Sturgeon are particularly susceptible to repeated long term exposure due to their extended life span. PCBs are known to be present in the sediment at the project area. Although shortnose sturgeon in the action area may experience a temporary increase in exposure to PCBs, this exposure is not likely to be greater than the levels shortnose sturgeon are exposed to in the suspended sediment that naturally travels through the river. Any increased exposure in the action area will not be long term and should not affect sturgeon health.

Effects from operation of the soft-dike

Effects to forage base

Information on preferred prey items and habitat use of shortnose sturgeon in the Hudson River is limited; however, some data does exist. Carlson and Simpson (1987) examined the food habits of juvenile shortnose sturgeon impinged on power plant intake screens in the Hudson River Estuary. For all sizes of shortnose sturgeon collected, midge larvae and amphipods were the most important food items, occurring in 76% of all stomachs sampled. Midge larvae contributed 51% of all organisms found and amphipods 43% (Carlson and Simpson 1987). Yearling and juvenile sturgeon were found to have consumed the amphipods *Gammarus spp.* and the isopod *Cyathura*. The increased use of amphipods as food items appears to be in response to their peak abundance during the late summer (Carlson and Simpson 1987). Preferred foraging grounds for shortnose sturgeon in the Hudson were found to be sandy-mud bottom (Carlson and Simpson 1987). Observations in other river systems support these results (Dadswell 1979; Pottle and Dadswell 1979; Dadswell 1984).

Only recently have new techniques allowed gut contents to be sampled without sacrificing the fish (Haley 1998). Using a gastric lavage technique, the gut contents of sturgeon in the Hudson River were sampled (Haley 1998). Identifiable prey was recovered from 39 out of the 48 sturgeon. Based upon the results of this sampling effort, preferred food items of shortnose sturgeon in the Hudson Estuary include: amphipods *Gammarus,* chironomids, isopods *Cyathura polita*, zebra mussels, and snails.

The area that will be affected is largely unvegetated and is heavily scoured and is not known to support shortnose sturgeon forage items. As such, it is expected to be only an occasional foraging area for shortnose sturgeon. Given that the placement of the geotextile bags will destroy all benthic resources in the affected 0.58 acre area, any sedentary forage items associated with the bottom sediments would be destroyed. While some organisms may recolonize the soft dike structure, it is unknown whether sturgeon would feed on organisms colonizing the structure as these organisms would no longer be associated with the benthos. However, sturgeon have extensive foraging habitat outside the affected area and the Yonkers area is not known to be a primary foraging ground. Thus, any reduction in benthic forage items should not adversely affect shortnose sturgeon.

Disruption to migratory movements

The soft dike is designed to interrupt the eddy pattern in the action area to reduce the amount of fine grained material from depositing in the area of the docking facility. The soft dike is expected to realign the river currents in a downstream direction. Based on engineering analysis (Pyburn & Odom 2004b), a change to the flow and currents in the channel where sturgeon are expected to be most often present is not expected to occur. The elimination of the eddys at the docking facility is not expected to affect the migratory movements of shortnose sturgeon as these movements are expected to occur in the channel. While the soft dike may alter the course of swimming fish (i.e, they may swim higher in the water column due to the presence of the dike on the bottom), it will affect only a small portion of the total river width and is not expected to deter fish from passing the area or otherwise disrupt up- or down- stream movements. As such, the proposed action is not expected to affect the migratory movements of shortnose sturgeon in the Hudson River.

CUMULATIVE EFFECTS

Cumulative effects are defined in 50 CFR §402.02 as those effects of future state or private activities, not involving Federal activities, that are reasonably certain to occur within the action area of the Federal action subject to consultation.

Contaminants and Water Quality

Contaminants found in the action area could be linked to some industrial development along the waterfront. Heavy metals, and waste associated with point source discharges are likely to be present in the future due to continued operation of industrial facilities. In addition, many contaminants such as PCBs remain present in the environment for prolonged periods of time and would not disappear even if contaminant inputs were to decrease. It is likely that shortnose sturgeon will continue to be affected by contaminants in the action area in the future.

Some industrialized waterfront development will continue to impact the water quality in and around the action area. Five power plants are present near the action area and are likely to continue to operate. Excessive water turbidity and water temperature variations are likely with continued future operation of these facilities. As a result, shortnose sturgeon spawning, foraging and/or distribution in the action area may be impacted.

Scientific Studies

It is likely that additional scientific studies will be conducted on shortnose sturgeon in the action area. Continued capturing, handling, tagging, and tracking of shortnose sturgeon may affect their migration, reproduction, foraging, and survival.

Fisheries

Incidental take of shortnose sturgeon has been documented in both commercial and recreational fisheries in the Hudson River (NOAA Fisheries 1998). The potential for incidental take to occur in the future is likely when fisheries are known to occur in the presence of shortnose sturgeon. Thus, the operation of these recreational and commercial fisheries in the action area could result in shortnose sturgeon injury and/or mortality.

INTEGRATION AND SYNTHESIS OF EFFECTS

The shortnose sturgeon is endangered throughout its entire range and can be divided into nineteen populations (NOAA Fisheries 1998). The shortnose sturgeon residing in the Hudson River form one of the nineteen sturgeon populations.

The most recent available estimate of the size of the population of adult shortnose sturgeon in the Hudson River is 61,057 individuals (NOAA Fisheries 1998). As indicated above, adult and juvenile shortnose sturgeon are likely to be present in the action area during the time when construction of the soft dike is proposed (i.e., October and November). Shortnose sturgeon are also likely to be present in the area from April through November in the years following construction as the soft dike is operated. The presence of adults and/or juveniles in the action area during the proposed project is likely to lead to interactions with the construction of the soft dike. However, the number of shortnose sturgeon expected to be directly affected by this project (1) is a very small percentage of the total shortnose sturgeon population in this River. While some indirect effects are likely to occur (i.e., some reduction in the amount of benthic forage items, potential suspension of sediments) none of these are expected to adversely affect shortnose sturgeon in the Hudson River.

CONCLUSION
After reviewing the current status of the species discussed herein, the environmental baseline for the action area, the effects of the proposed action and the cumulative effects, it is NOAA Fisheries' biological opinion that while the proposed action may affect shortnose sturgeon in the Hudson River, the proposed action will not reduce the reproduction, numbers and distribution of the Hudson River shortnose sturgeon population in a way that appreciably reduces their likelihood of survival and recovery in the wild or that of the species as a whole. The crushing and subsequent death of one shortnose sturgeon, will not affect the reproduction, numbers and/or distribution of shortnose sturgeon in the Hudson River. While there are other indirect effects of this project, none of these are likely to adversely affect shortnose sturgeon. It is the opinion of NOAA Fisheries that the proposed construction of a soft dike at the Domino Sugar site will adversely affect but likely will not jeopardize the continued existence of either the Hudson River shortnose sturgeon population or the species as a whole. The number of shortnose sturgeon likely to be killed during the action (1) represents a very small percentage of the Hudson River population and the species as a whole. While no reliable estimate of the shortnose sturgeon population as a whole exists, based on the best available information it is expected to be at least 170,000 fish. The one fish expected to be affected by this action represent less than 0.0001% of the total shortnose sturgeon population. The conclusion of this BO is based on the small number of shortnose sturgeon likely to be directly affected by this action and the lack of any adverse indirect effects expected as a result of this action.

INCIDENTAL TAKE STATEMENT
Section 9 of the ESA prohibits the take of endangered species. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. NOAA Fisheries interprets the term "harm" as an act which actually kills or injures fish or wildlife. Such an act may include significant habitat modification or degradation where it actually kills or injures fish or wildlife by significantly impairing essential behavioral patterns, including breeding, spawning, rearing, migrating, feeding or sheltering (50 CFR §222.102). 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), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited under the ESA provided that such taking is in compliance with the terms and conditions of this Incidental Take Statement.

Reasonable and prudent measures are non-discretionary, and must be undertaken by the ACOE so that they become binding conditions for the exemption in section 7(o)(2) to apply. The ACOE had a continuing duty to regulate the activity covered by this Incidental Take Statement. If the ACOE (1) fails to assume and implement the terms and conditions or (2) fails to adhere to the terms and conditions of the Incidental Take Statement through enforceable terms, the protective coverage of section 7(o)(2) may lapse. In order to monitor the impact of incidental take, the ACOE is required to report the progress of the action and its impact on the species to NOAA Fisheries as specified in the Incidental Take Statement [50 CFR §402.14(3)].

Extent of take

As outlined in the accompanying biological opinion, the number of shortnose sturgeon that will likely be directly affected by the action (i.e., crushed and killed under the geotextile bags) is expected to be no more than one shortnose sturgeon. As the project is located with the summer range of this species, it is reasonable to assume that shortnose sturgeon may be present from the time water temperatures reach 8°C in the spring (typically mid to late April) until they fall to 8°C in the fall (typically in late November). As such, shortnose sturgeon will likely be present in the area when the geotextile bags are placed. While most shortnose sturgeon are expected to avoid the falling geotextile bags, it is likely that during the course of the 150 hours that bags will be dropped, one shortnose sturgeon will be unable to avoid a bag and that this fish will be crushed. As outlined in the BO (see page 18), the ability of a sturgeon to avoid a mechanical dredge is likely to be similar to the ability to avoid the falling geotextile bags. In the three dredging operations where sturgeon have been documented to be taken by bucket dredging operations, no more than one sturgeon has been detected despite differences in project duration, time of year, and sturgeon population size. If it is assumed that the ability of a shortnose sturgeon to avoid a falling geotextile bag is similar to the ability to avoid a bucket dredge, it is reasonable to assume that one shortnose sturgeon will be taken during the construction of the soft dike. As outlined in the BO, any shortnose sturgeon that is hit by a geotextile bag is expected to be crushed and die. Survivable injury is unlikely due to the size and weight of the bags. This assessment of the number of sturgeon likely to be killed during project operations is based on the magnitude of the project, the high likelihood of shortnose sturgeon presence in this region of the Hudson River and the likelihood that most, but not all, sturgeon will be able to avoid the falling geotextile bags.

NOAA Fisheries believes this level of incidental take is reasonable given (1) the distribution and abundance of adult and juvenile shortnose sturgeon in the immediate project area; (2) the time of year proposed for the project; and (3) the duration of the project. In the accompanying BO, NOAA Fisheries determined that this level of anticipated take is not likely to result in jeopardy to the species. If the project occurs after water temperatures fall below 8C, no shortnose sturgeon are expected to be in the action area and none are expected to be affected by the proposed project.

Reasonable and prudent measures

Reasonable and prudent measures are those measures necessary and appropriate to minimize and monitor incidental take of a listed species. Several options for monitoring or minimizing the potential for take were considered and eliminated because they were either unsafe or not feasible. It is often possible to construct coffer dams around riverine project sites. In those situations the presence of the coffer dam prevents additional fish from entering the project site and nets can be used to remove the fish that are captured inside the cofferdam. However, due to the size of this particular project site, the distance from shore, and the depth of water at the site, the installation of a coffer dam around the project site is not feasible. The potential to send divers down to attempt to detect the presence of crushed shortnose sturgeon was also contemplated. However, due to the size and number of the geotextile bags, it is unlikely that a diver would be able to detect the presence of shortnose sturgeon underneath one or more bags. As such, this idea was dismissed as ineffective and potentially unsafe. However, there is the potential for an electronic "fish finder" sonar device to detect the presence of large benthic fish. These detections are likely to be of sturgeon as they are among the largest of the benthic fish species likely to be present in the action area. If the applicant avoids dropping geotextile bags when the presence of large benthic fish is detected, this is likely to further reduce the number of shortnose sturgeon affected by the proposed action.

As explained above, for this particular action it is not possible to design reasonable and prudent measures that are necessary and appropriate to monitor take. As such, the purpose of the reasonable and prudent measure below is to monitor the progress of the action, report any detected interactions with shortnose sturgeon to NOAA Fisheries and to minimize, to the extent possible, the effects of the action on shortnose sturgeon in the Hudson River.

(1) ACOE must contact NOAA Fisheries within 24 hours of the beginning of the project and within 24 hours of the project exceeding the expected 420 working-hour duration.

(2) ACOE must contact NOAA Fisheries within 24 hours of the completion of the project.

(3) The barge used for deployment of the geotextile bags must be equipped with an electronic "fish finder" sonar device.

(4) Geotextile bags must not be deployed when the fish finder indicates that large benthic fish (likely to be shortnose sturgeon) are present in the area where the bags will be dropped or when shortnose sturgeon are observed in the action area (i.e., jumping to the surface). NOAA Fisheries expects that the incorporation of this condition into the permit issued by ACOE will ensure that the take of shortnose sturgeon is minimized as it will ensure that no bags are dropped when large numbers of sturgeon are in the area.

(5) ACOE must contact NOAA Fisheries within 24 hours of any detected interactions with shortnose sturgeon.

Terms and conditions

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

(1) ACOE must contact Julie Crocker by email (julie.crocker@noaa.gov) or phone (978) 281- 9328 ext.6530 at least 24-hours before the first geotextile bag is dropped and within 24-hours of the completion of construction of the soft dike.

(2) ACOE must contact Julie Crocker by email or phone within 24 hours of the project exceeding the expected 420 working-hour time period contemplated in this BO.

(3) ACOE must contact Julie Crocker by email or phone within 24 hours of the project approaching the 648 working-hour time period.

(4) The ACOE must ensure that the barge is equipped with an electronic fish finder capable of detecting the presence of benthic fish. This must be verified and the ACOE must confirm its installation with NOAA Fisheries before the first geotextile bag is dropped.

(5) Barge staff must be trained in the proper operation of the fish finder.

(6) This fish finder must be operational and monitored at all times when the bags are being dropped. No bags shall be dropped if the fish finder detects groups of large benthic fish (likely to be sturgeon). Once these groups are no longer detected, dropping may continue.

(7) No bags shall be dropped if shortnose sturgeon are observed in the action area. Shortnose sturgeon are most likely to be seen when they are leaping from the water.

(8) If any injured SNS are found, the applicant shall report immediately to NOAA Fisheries (see contact information on Appendix B). Injured fish must be photographed and measured and the reporting sheet must be submitted to NOAA Fisheries within 24 hours. If the fish is badly injured, the fish should be retained, if possible, until obtained by a NOAA Fisheries recommended facility for potential rehabilitation.

(9) If any whole shortnose sturgeon (alive or dead) or sturgeon parts are detected during the duration of the project, ACOE must contact Julie Crocker (978) 281-9328 ext.6530 or Pat Scida (978) 281-9208 **within 24 hours** of the take. An incident report for shortnose sturgeon take (Appendix B) must also be completed by the observer and sent to Julie Crocker via FAX (978) 281-9394 within 24 hours of the take.

(10) Every incidental take (alive or dead) must be photographed and measured.

(11) At the end of the project, a report must be submitted to NOAA Fisheries which includes information on each shortnose take, including photographs and a copy of Appendix B for each take.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the ESA directs Federal agencies to utilize their authorities 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. NOAA Fisheries has determined that the proposed project is not likely to jeopardize the continued existence of endangered shortnose sturgeon. NOAA Fisheries recommends that the ACOE implement the following conservation measures:

(1) If any dead shortnose sturgeon are detected, appropriate personnel should take fin clips (according to the procedure outlined in Appendix C) to be returned to NOAA Fisheries for ongoing analysis of the genetic composition of shortnose sturgeon populations.

(2) If any dead shortnose sturgeon are detected, the ACOE and/or the applicant should arrange for contaminant analysis of the specimen. If this recommendation is to be implanted, the fish should be frozen and NOAA Fisheries should be contacted immediately to provide instructions on shipping and preparation.

REINITIATION OF CONSULTATION

This concludes formal consultation on the actions outlined in the BA for the Domino Sugar Soft Dike project. 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 exceeded; (2) new information reveals effects of the action that may affect listed species or critical habitat 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 this 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, section 7 consultation must be reinitiated immediately.

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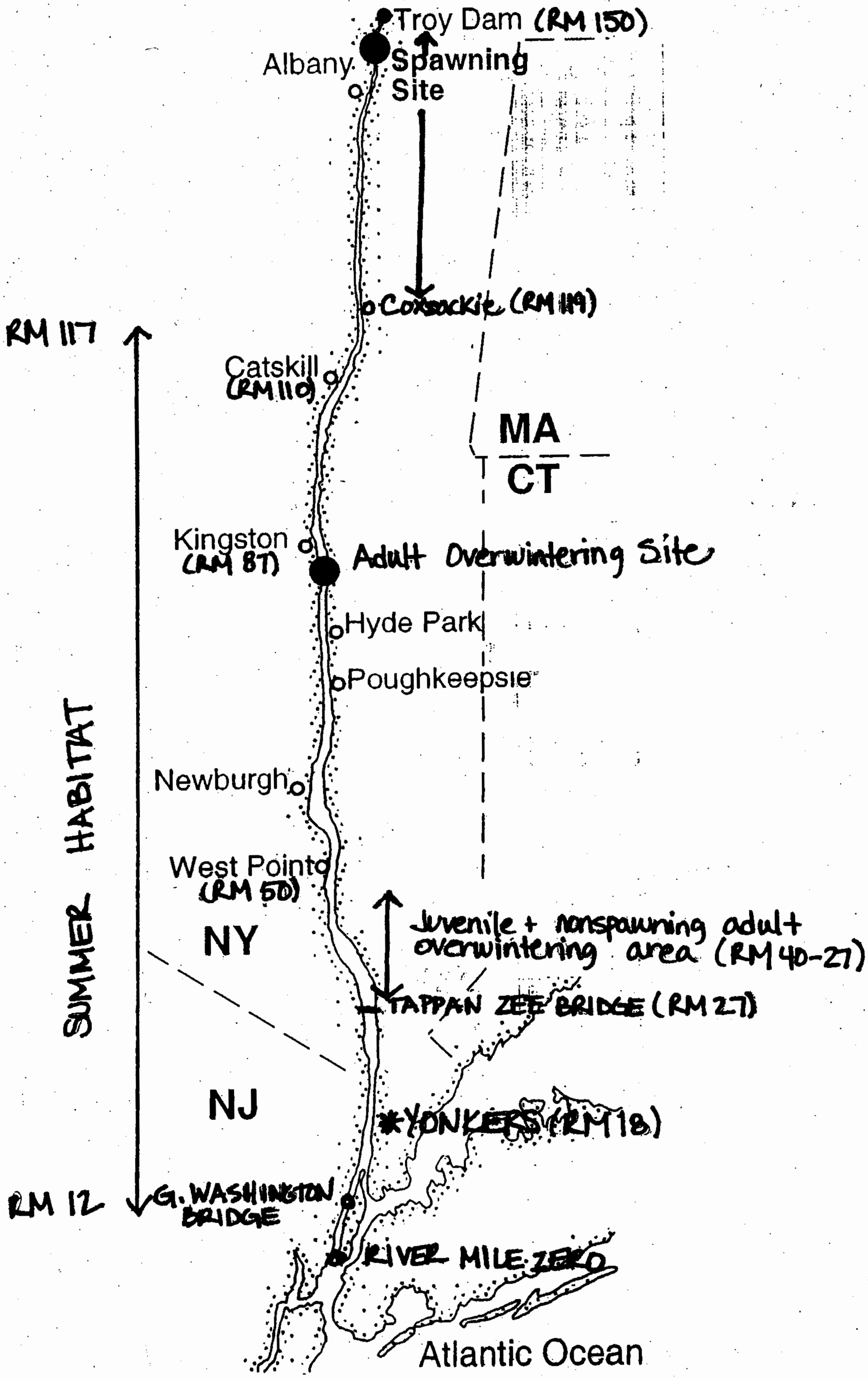
APPENDIX A

HUDSON RIVER SHORTNOSE STURGEON DISTRIBUTION



Water temp: Surface _______________ Below midwater (if known)_______________

Species Information: *(please designate cm/m or inches.)*

Total length: ___________ Fork length: ___________ Weight: ___________
Condition of fish/description of animal ______________________________

____

____

Fish tagged: YES / NO / DON'T KNOW
Please record all tag numbers. Tag # _________________________

Photograph attached: YES / NO
(please label *species, date,* and *geographic site* on back of photograph)

Comments/other ____

____

____

____

Observer's Name ________________________________
Observer's Signature ________________________________