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*Energy to Serve Your World™*  
NL-04-0047

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Docket Nos.: 50-321  
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U. S. Nuclear Regulatory Commission  
ATTN: Document Control Desk  
Washington, D. C. 20555-0001

Edwin I. Hatch Nuclear Plant  
Update to the Hatch Biological Assessment Under the  
Endangered Species Act for Shortnose Sturgeon

Ladies and Gentlemen:

In response to NRC letter dated November 26, 2003, Southern Nuclear Operating Company (SNC) has revised the August 31, 2000, "Biological Assessment of the Potential Impact On Shortnose Sturgeon Resulting From An Additional 20 Years of Operation of the Edwin I. Hatch Nuclear Power Plant, Units 1 and 2," originally developed in support of license renewal for Edwin I. Hatch Nuclear Plant. SNC has revised the document to address questions resulting from a meeting between the NRC, National Marine and Fisheries Service, and the U.S. Army Corps of Engineers. The revision addresses the questions in the NRC correspondence referenced above, by including where practicable, additional detail and new information.

Please contact Mr. Tom Moorer, SNC Environmental Services Supervisor at 205-992-5807, if you have any additional questions.

Sincerely,

A handwritten signature in black ink that reads "H. L. Sumner, Jr." in a cursive style.

H. L. Sumner, Jr.

HLS/JTD/TCM

Enclosure: Biological Assessment Under the Endangered Species Act

IE25  
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U. S. Nuclear Regulatory Commission

NL-04-0047

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cc: Southern Nuclear Operating Company  
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**ENCLOSURE**  
**EDWIN I. HATCH NUCLEAR PLANT**  
**BIOLOGICAL ASSESSMENT UNDER THE ENDANGERED SPECIES ACT**

**BIOLOGICAL ASSESSMENT OF THE POTENTIAL IMPACT ON  
SHORTNOSE STURGEON RESULTING FROM A  
MODIFICATION OF THE DREDGING FOOTPRINT  
EDWIN I. HATCH NUCLEAR POWER PLANT, UNITS 1 AND 2**

Division of Regulatory Improvement Programs  
Office of Nuclear Reactor Regulation  
U.S. Nuclear Regulatory Commission  
Washington, DC 20555-0001

August 2000 - Revised

## I. INTRODUCTION

In November 1999, Southern Nuclear Operating Company prepared and submitted to the NRC a Biological Information Update to address the impacts of continued operation of E. I. Hatch Nuclear plant on the Altamaha river population of the federally endangered shortnose sturgeon *Acipenser brevirostrum*. This biological update was utilized by the U. S. Nuclear Regulatory Commission (NRC) to develop the "Hatch Biological Assessment under the Endangered Species Act for the Shortnose Sturgeon" submitted to the National Marine Fisheries Service on August 31, 2000 in support of informal consultation conducted under Section 7 of the Endangered Species Act. In February 2002, the NRC renewed the operating licenses for the E. I. Hatch Nuclear plant, Units 1 and 2 for an additional 20 years. The Operating License for Unit 1 extends through August 6, 2034 and the Operating License for Unit 2 extends through June 13, 2038. The documentation supporting the "Generic Environmental Impact Statement for License Renewal of Nuclear Plants Supplement 4, Regarding Edwin I. Hatch Nuclear Plant, Units 1 and 2" contains language concluding that the relicensing of Plant Hatch "may affect but is not likely to adversely affect" the shortnose sturgeon in the Altamaha River.

Based on recent discussions between the NRC, National Marine Fisheries Services and the U. S. Army Corps of Engineers, summarized in an NRC letter dated November 26, 2003, this Biological Assessment (BA) originally developed for the Hatch relicensing process has been revised. The revision was developed to include any additional available information on the shortnose sturgeon in the Altamaha River, and to provide an assessment of activities conducted under the Corps of Engineers Maintenance Dredging permit issued under Section 404 of the Clean water Act relative to potential for impact on the shortnose sturgeon. This revision updates existing information on the sturgeon, adds a detailed discussion of the potential for maintenance dredging at Plant Hatch to impact the sturgeon, and provides answers to specific questions raised in the referenced November 26, 2003 correspondence.

## II. PROPOSED ACTION

The proposed action is the continued operation of the E. I. Hatch Nuclear Plant under the recently renewed NRC Operating Licenses. At the request of the NRC, National Marine Fisheries Service and the U. S. Army Corps of Engineers, Southern Nuclear has revised this BA to respond to specific questions identified in the November 26, 2003 NRC letter. The information contained in the original BA submitted by the NRC in support of license renewal has been revised herein, as appropriate, to respond to the specific questions identified in the November 26, 2003 NRC letter.

### III. DESCRIPTION OF PROJECT AREA

#### A. General Plant Information

The HNP is a steam-electric generating facility operated by Southern Nuclear Operating Company (SNC). HNP is located in Appling County, Georgia, at river kilometer (rkm) 180, slightly southeast of the U.S. Highway 1 crossing of the Altamaha River. It is approximately 11 miles north of Baxley, Georgia; 98 miles southeast of Macon, Georgia; 73 miles northwest of Brunswick, Georgia; and 67 miles southwest of Savannah, Georgia.

HNP is a two-unit plant. Each unit is equipped with a General Electric Nuclear Steam Supply System that utilizes a boiling-water reactor with a Mark I containment design. Both units were originally rated at 2,436 megawatt-thermal and designed for a power level corresponding to approximately 2,537 megawatt-thermal. Both units are now licensed for 2,763 megawatt-thermal. HNP uses a closed-loop system for main condenser cooling that withdraws from and discharges to the Altamaha River via shoreline intake and offshore discharge structures. Descriptions of HNP can be found in documentation submitted to the NRC for the original operating license and subsequent license amendments. Georgia Power Company (GPC) submitted environmental reports for the construction stage and operating license stage for HNP in 1971 and 1975, respectively (References 1 and 2). In 1972, the Atomic Energy Commission (AEC)<sup>1</sup> issued a Final Environmental Statement (FES) for Units 1 and 2 (Reference 3), and in 1978, NRC issued a FES for Unit 2 (Reference 4). The FESs evaluate the environmental impacts from plant construction and operation in accordance with the National Environmental Policy Act (NEPA).

The property at the HNP site totals approximately 2,240 acres and is characterized by low, rolling sandy hills that are predominantly forested. The property includes approximately 900 acres north of the Altamaha River in Toombs County and approximately 1,340 acres south of the River in Appling County. All industrial facilities associated with the site are located in Appling County. The restricted area, which comprises the reactors, containment buildings, switchyard, cooling tower area and associated facilities, is approximately 300 acres. Approximately 1,600 acres are managed for timber production and wildlife habitat.

#### B. Heat Dissipation System

The excess heat produced by HNP's two nuclear units is absorbed by cooling water flowing through the condensers and the service water system. Main condenser cooling is provided by mechanical draft cooling towers. Each HNP circulating water system is a closed-loop cooling system that utilizes three cross-flow and one counter-flow mechanical-draft cooling towers for dissipating waste heat to the atmosphere.

For both Units 1 and 2, cooling tower makeup water is withdrawn from the Altamaha River through a single intake structure. The intake structure is located along the southern shoreline of the Altamaha River and is positioned so that water is available to the plant at both minimum flow and probable flood conditions (Attachment 1). The main river channel (thalweg) is located closer to the northern shoreline. The intake is approximately 150 feet long, 60 feet wide, and the

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<sup>1</sup>. Predecessor agency to NRC.

roof is approximately 60 feet above the water surface at normal river level. The water passage entrance is about 27 feet wide and extends from 16 feet below to 33 feet above normal water levels. Large debris is removed by trash racks, while small debris is removed by vertical traveling screens with a 3/8 inch mesh. Water velocity through the intake screens is 1.9 feet per second (fps) at normal river elevations and decreases at higher river flows. The U. S. Army Corps of Engineers issued permit Number 940003893 under Section 404 of the Clean Water Act to support maintenance dredging in front of the Hatch intake structure to remove accumulated sand, silt, and debris and ensure adequate water supply for plant operation. The specifics of this permit and the maintenance dredging process are discussed in detail in a subsequent section.

Water is returned to the Altamaha River via a submerged discharge structure that consists of two 42-inch lines extending approximately 120 feet out from the shore at an elevation of 54 feet mean sea level. The point of discharge is approximately 1,260 feet down-river from the intake structure and approximately 4 feet below the surface when the river is at its lowest level. The National Pollutant Discharge Elimination System (NPDES) Permit for HNP, issued by the Environmental Protection Division (EPD) of the Georgia Department of Natural Resources (GA DNR) in 1997 requires weekly monitoring of discharge temperatures, but does not stipulate a maximum discharge temperature or maximum temperature rise across the condenser. Maximum discharge temperatures measured at the mixing box, which are reported to EPD on a quarterly basis, range from 62 °F in winter to 94 °F in summer.

### C. Surface Water Use

The Altamaha River is the major source of water for the plant. Water is withdrawn from the River to provide cooling for certain once-through loads and makeup water to the cooling towers. SNC is permitted to withdraw a monthly average of up to 85 million gallons per day with a maximum 24-hour rate of up to 103.6 million gallons. As a condition of this permit, SNC is required to monitor and report withdrawals. HNP withdraws an annual average of 57.18 million gallons per day (88 cubic feet per second [cfs]).

The evaluation of surface water use in the FES concluded that the consumptive losses would be approximately 46 percent of the total water withdrawn from the River. In its environmental assessment for an extended power uprate, the NRC staff concluded that the necessary increase in makeup water to support the higher heat load would be insignificant and that cooling tower blowdown would decrease by approximately 626 gallons per minute (1.4 cfs). Consumptive water use for the plant operating at the extended power level is expected to be 57 percent of the total withdrawal.

The thermal discharge plume has been modeled using the Motz-Benedict model for horizontal jet discharges. The predictive thermal plume model was field verified during 1980 following commencement of Unit 2 operation (Reference 5). Twelve thermal plume monitoring surveys were conducted during 1980 and compared to model predictions. During each of the twelve surveys, temperatures were taken at depths of one foot, three feet, and five feet. All temperatures measurements were made from a boat moving along a pre-selected transects in the river using a temperature probe and continuous recorder. Monitoring equipment was calibrated in the laboratory before each survey and rechecked in the field before and after each survey. The average projected fully mixed excess temperature under average summer conditions (average river flow of 3000 cfs,  $\Delta T$  of 4.7 °F) is 0.09 °F. During the 1980 field

surveys, the period of lowest river flow and greatest cooling tower heat rejection (3220 cfs, and  $\Delta T$  of 4.5 °F, respectively) resulted in a fully mixed excess temperature of 0.05 °F. The NRC modeled average expected thermal conditions and extreme thermal conditions under conservative assumptions in the Unit 2 Final Environmental Impact Statement (FES) (Reference 4). In that environmental statement, the NRC noted the small size of the thermal plume even under the conservative assumptions, and concluded thermal blockage in the Altamaha River from the plant discharge was not possible.

To control biofouling of cooling system components such as condenser tubes and cooling towers, an oxidizing biocide (typically sodium hypochlorite or sodium bromide) is injected into the system as needed to maintain a concentration of free oxidant sufficient to kill most microbial organisms and algae. When the system is being treated, blowdown is secured to prevent the discharge of residual oxidant into the river. After biocide addition, water is recirculated within the system until residual oxidant levels are below discharge limits specified in the NPDES permit.

#### D Maintenance Dredging of Intake

In order to ensure adequate depth of water at the Hatch intake structure to provide a dependable water supply for continued plant operation, the river bottom in the area of the intake structure must be maintained to remove accumulated sand, silt, and debris. Maintenance is performed by dredging with a hydraulic dredge, clamshell, or dragline. Permit Number 94003873 (Reference 26) has been issued by the Savannah District – U. S. Army Corps of Engineers under Section 404 of the Clean Water Act. The permit authorizes periodic maintenance dredging by hydraulic dredge, clamshell, or dragline for a ten (10) year period. Removed material is spoiled in an upland disposal area with no return of material to the river. The permit contains numerous special conditions to ensure protection of aquatic habitat. Special Conditions 1, 2, and 3 limit dredging to a specific time of the year (August 15 – November 31) and specifically prohibit dredging from December 1 through June 30 to ensure protection of anadromous fish. The permit also requires monitoring of dissolved oxygen during dredging and requires suspension of dredging operations if dissolved oxygen levels fall below 3.0 mg/L. The permit also specifies recordkeeping for each dredge event and reporting to the Corps of Engineers.

Recently, Plant Hatch applied for a permit modification to support a change in the size and shape of the dredge footprint. This modification was based on hydraulic engineering studies that indicated removal of the upstream sandbar area would enhance natural scouring properties of the river and ultimately reduce the amount of dredging required to maintain the intake structure. This permit modification is currently under consideration by the Savannah District Corps of Engineers. The requested modification proposes an increase in the current L-shaped profile to a larger L-shaped profile. The increase in profile size produces a maximum 8,571 yd<sup>3</sup> increase in the amount of material removed during each dredging event to maintain the footprint (Attachment 1). The increase in profile size is recommended as a mechanism to reduce the frequency of dredging by making the profile more amenable to natural flushing during high flow events. SNC recommends removal of material on the upstream side of the current footprint to expose the area near the intake structure to the effects of high flows and naturally flush accumulated material. Less frequent dredging provides an economic benefit to the plant and also benefits the environment by disturbing the river habitat less often. The increase in profile size does not have any relationship to the amount of water withdrawn by

Plant Hatch. No changes in withdrawal are associated with the modification request. The primary purpose of maintenance dredging at Plant Hatch is to ensure adequate water depth for the river water intake pumps and to minimize the amount of silt entrained by pump operation. The proposed modification will support the required dredging on a less frequent basis.

The area in front of the Hatch intake consists primarily of accumulated sand deposits that shift constantly with changes in river flow. This type of bottom has little value relative to the shortnose sturgeon. During the time dredging is conducted, shortnose sturgeon inhabit the area of the Altamaha near the fresh/saltwater interface or the deep hole refuges in the lower Altamaha (Reference 9).

Plant Hatch routinely conducts surveys of the river bottom in front of the intake structure to evaluate the need for dredging. A copy of the May 2003 River Bottom Topographical Survey is provided as Attachment 1.

Based on the above information, no significant impact to the Altamaha River population of the shortnose sturgeon should result from maintenance dredging activities at Plant Hatch. This conclusion is consistent with the "may affect but is not likely to adversely affect" finding in previous correspondence.

#### IV. STATUS REVIEW OF SHORTNOSE STURGEON

##### A. Life History

The shortnose sturgeon, *Acipenser brevirostrum*, is a member of the family Acipenseridae, a long-lived group of ancient anadromous and freshwater fishes. The species is currently known by at least 19 distinct population segments inhabiting Atlantic coast rivers from New Brunswick, Canada to northern Florida (Reference 6). Most shortnose sturgeon populations have their greatest abundance in the estuary of their respective river (Reference 7). The species is protected throughout its range.

The distribution of shortnose sturgeon strongly overlaps that of the Atlantic sturgeon, but life histories differ greatly between the two species. The Atlantic sturgeon is truly anadromous with adults and older juveniles spending large portions of their lives at sea. Shortnose sturgeon, however, are restricted to their natal streams. Shortnose sturgeon are not known to move among or between different river drainages (References 8 and 6).

Seasonal migration patterns and some aspects of spawning may be partially dependent on latitude. In northern rivers, shortnose sturgeon move to estuaries in summer months. In southern rivers, movement to estuaries usually occurs in winter (Reference 6). Shortnose sturgeon spawn in freshwater like the Atlantic sturgeon, but then return to the estuaries and spend much of their lives near the fresh/salt water interface. Fresh tidewaters and oligohaline areas serve as nurseries for shortnose sturgeon (Reference 9). Availability of spawning and rearing habitats may be limited throughout the range of shortnose sturgeon (Reference 7).

Shortnose sturgeon exhibit faster growth in southern rivers, but will reach larger adult size in northern rivers (Reference 6). Thus, shortnose sturgeon will reach sexual maturity (45-55 cm FL, [Reference 7]) at a younger age in southern rivers. Spawning by individual fish may only

occur at intervals with frequencies of a few to several years. Dadswell, et al. (Reference 10) composed a detailed summary of the known biology of shortnose sturgeon.

Rivers of the deep south are on the edge of the natural range of the shortnose sturgeon and present somewhat unique problems for the species. The majority of southern rivers and estuaries regularly reach temperatures unfavorable to shortnose sturgeon. Intolerant of saline environments and limited to riverine habitats, shortnose sturgeon must seek thermal refuges during most summers in the south. The refuges are found in lower river reaches and consist usually of a few deep holes, possibly cooled by springs or seeps. The fish concentrated in a few of these thermal refuges quickly exhaust local food supplies and appear to just be surviving the summer (Reference 9). A life history that restricts the species to individual drainages, combined with seasonally restricted use of habitats, may be directly related to the species' current endangered status. Sturgeons have long been commercially important species, which may be a leading cause in their rapid decline worldwide. For more than a century, atlantic and shortnose sturgeon populations were subjected to extensive fishing, likely contributing to the massive population declines along the east coast (Reference 6). Prior to 1900, sturgeon catches were averaging over 3.0 million kg per annum, but this harvest was sustained for less than a decade. Prior to the closure of most east coast fisheries during the 1980s, catches had decreased to less than 1% of historical levels (Reference 11).

Although the shortnose sturgeon was severely overharvested in the past, the greatest threats to survival presently include barriers to its spawning grounds created by dams, loss of habitat for other life history stages, poor water quality, and incidental capture in gill net and trawl fisheries targeting other species (References 8 and 10). Shortnose sturgeon was listed as endangered in 1967 by the U.S. Fish and Wildlife Service. In 1974, the National Marine Fisheries Service reconfirmed this decision under the Endangered Species Act of 1973 (References 8 and 6).

#### B. Status in Altamaha River

The Altamaha River is large, with the largest watershed east of the Mississippi River. The Altamaha River is located entirely within the state of Georgia. It flows over 800 km from its headwaters to the Atlantic Ocean. The main body of the Altamaha is formed by the confluence of the Oconee and Ocmulgee rivers in the central coastal plain at Altamaha rkm 212 (Reference 8).

The incidences of catch and overharvest of sturgeons from Georgia rivers paralleled the trends of other states. From 1888 through 1892, sturgeon catches in Georgia averaged 71,000 kg per annum (Reference 12). "As recently as 49 years ago, a dealer in Savannah (GA) was shipping 4,500 kg of carcasses per week (6,500 kg in the round) during the peak three to five weeks of the spring run"(Reference 12). Similar harvests were recorded from the Altamaha River (Reference 9).

Catch rate data for sturgeons in Georgia are just as startling. In 1880, and average seasonal catch was 100 fish per net. During a 20-year period from the late 1950s through the late 1970s, net fishermen in the lower Altamaha River caught just 1.1 to 3.2 fish per net per season (Reference 13, as presented in Reference 9). These data indicate a 97-99% decline in the sturgeon fishery (Reference 9).

There is a continuing high demand for sturgeon roe and flesh. From 1962 to 1994 the source of

the majority of sturgeon catches has shifted among the Savannah, Ogeechee, and Altamaha rivers. The Altamaha River has been the focus of a "much-throttled" fishery from 1982 to present. Certain recent events have kept prices for sturgeon products high or rising, fueling commercial fisheries and some poaching (Reference 11). Some of these events were an increasing US domestic demand for all seafood products, decreased supplies of sturgeon products as fisheries closed in the US, and sturgeon stocks worldwide were becoming more depleted by overharvest and habitat degradation, particularly in the republics of the old Soviet Union (Reference 11).

The Altamaha River population of shortnose sturgeon has been the focus of much recent research to assess abundance and distribution, determine migration patterns, and describe habitat utilization. Some authors suggested the Altamaha River population of shortnose sturgeon was in better shape than the population in the Savannah River, Georgia-South Carolina (Reference 11). Another study indicated shortnose sturgeon in the Altamaha River may be experiencing lower juvenile mortality rates than in the Ogeechee River, Georgia (Reference 7). The Shortnose Sturgeon Recovery Team indicated that the Altamaha River population was the largest and most viable population south of Cape Hatteras, North Carolina (Reference 6). Relative abundance data from one sampling station during 1986-1991 appear to demonstrate a relatively stable population with little trend in the abundance of juveniles (Reference 9).

Telemetry studies have revealed much information about the seasonal migrations of shortnose sturgeon in the Altamaha River and the importance of certain habitats. During summer in the Altamaha River, most fish ages 1+ and older are concentrated at or just upstream of the fresh/salt water interface in physiological refugia. Cooling water temperatures in the fall spur a movement of all sizes of fish to generally more saline waters. Some adult and most large juvenile fish move back to fresh tidewater near the end of autumn to overwinter with little movement or activity. In preparation for spawning in late winter-early spring, some adults will move upstream to locations near spawning sites. It is believed that spawning occurs during the February to March time frame (Reference 11). The majority of adults and a few large juveniles remain in oligohaline waters near the fresh/salt water interface and may be very active (Reference 8).

Several suspected spawning sites for shortnose sturgeon have been located within the Altamaha River system. Much of the spawning activity occurs in a 70-kilometer section of the Altamaha River centered about Doctortown, Georgia. Spawning has also been suspected in the lower Ocmulgee River, which is several kilometers upstream of the shoals marking the transition to the upper coastal plain (Reference 8). This reach is about 40 rkm upstream of HNP. However, recent discussions with Dr. Doug Peterson, a Professor at the University of Georgia currently conducting studies of the sturgeon spawning behavior for the National Marine Fisheries Service indicate that there is no scientific evidence to confirm the presence of spawning sites in the Ocmulgee (Reference 24). In addition, discussions with Mr. Jimmy Evans, Fisheries Biologist with the Georgia Department of Natural Resources confirm that no data exists to support the viability of this site. The potential site in the Ocmulgee River discussed in previous correspondence has been previously speculated to be a spawning site, no data currently exists to confirm this site. A map indicating the suspected spawning areas in relation to Plant Hatch is provided as Attachment 2.

Suspected spawning areas in the Altamaha River system were often adjacent to river bluffs with gravel, cobble, or hard rock substrate (Reference 11). Shortnose sturgeon eggs are demersal and adhesive after fertilization, sinking quickly and adhering to sticks, stones, gravel, and rubble on the stream bottom.

Shortnose sturgeon, especially juveniles, appear severely restricted to certain habitats near the fresh/salt water interface of the lower Altamaha River. During summers when the water temperature exceeds 28 °C, the fish are further restricted to a few deep holes near the interface. Recaptures of tagged fish indicate that the fish move little and lose weight during this time, which indicates the oversummering habitat is very important, and that food resources may be quickly exhausted (Reference 9). Flournoy, et al. (Reference 9) proposed that shortnose sturgeon were using a few deep holes in the lower Altamaha as physiological refuges, and that these holes may constitute critical habitat. They further hypothesized that the Altamaha River population of shortnose sturgeon existed only because the physiological refugia were available.

The Shortnose Sturgeon Recovery Team has identified numerous factors that may affect the continued survival and potential recovery of the species. Some of these factors may be habitat degradation or loss from dams, bridge construction, channel dredging, and pollutant discharges, as well as mortality from cooling water intake systems, dredging, and incidental capture in other fisheries (Reference 6). Recent evidence of illegal directed take of shortnose sturgeon in South Carolina indicate that poaching may also be a significant source of mortality (Reference 7).

All of the above factors may contribute to mortality in shortnose sturgeon populations, and the significance of each may vary with latitude and individual circumstances. However, the prevailing evidence seems to indicate, at least for the Altamaha River, that the primary threats to the population are commercial harvest and limited oversummering habitat. Dahlberg and Scott (Reference 14) recognized that shortnose sturgeon were often caught in gill nets by shad fishermen in the Altamaha River. The threat of bycatch remains real as many of the individual shortnose sturgeon used in recent studies were captured or recaptured with shad fishing gear. Rogers, et al. (Reference 11) stated that at least one of their tagged fish released in the estuary was captured in commercial shad gear, and six of the 36 individuals telemetered were initially collected with shad gear. Even if the fish are recognized as protected shortnose sturgeon and returned to the river, the capture may result in abandonment of spawning activity (Reference 7).

Several authors suggested the Altamaha River population of shortnose sturgeon may be healthier than the Savannah River population (Reference 8). Both rivers have discharges of similar magnitude and neither is dammed below the fall line. Both the Savannah and Altamaha are moderately industrialized, including paper mills and nuclear generating stations along their reaches from the fall line to the coast. Only the Savannah, however, is heavily altered and industrialized in its estuarine zone (Reference 11).

Previous research has shown shortnose sturgeon ages one year and older aggregate in the Altamaha River at or just upstream of the fresh/saltwater interface during the summer. These fish appear to move downstream into more saline water at the end of summer. During late fall and early winter, movement to less saline water occurs and some adults may move upstream toward spawning areas. Spawning is thought to occur during February through March. Some spawning fish move downstream immediately, while other remain upstream (Reference 8).

### C. Low Potential for HNP to affect Shortnose Sturgeon

Biological, hydraulic, and physical factors affect the rates of impingement and entrainment. The shortnose sturgeon's known behavior and use of the Altamaha River indicates a low potential for impingement or entrainment with the cooling water for HNP. The low potential for impingement or entrainment is further reduced by siting, design, and operational characteristics of HNP. This is discussed in greater detail, below.

Available literature suggests there is little opportunity for shortnose sturgeon eggs or larvae to encounter the cooling water intakes at HNP. Much of the available spawning habitat for shortnose sturgeon in the Altamaha River is well downstream of HNP. Eggs and larvae from these spawning locations are not available for entrainment by HNP.

There is a suspected spawning area in the lower Ocmulgee River about 40 rkm upstream from HNP, but entrainment of eggs or larvae of from this site is also unlikely. Fertilized shortnose sturgeon eggs sink quickly and adhere tightly to rough substrates, even under high flow conditions. Shortnose sturgeon larvae seek bottom cover quickly upon hatching and seldom stray from cover (Reference 15). The larvae grow quickly and are able to maintain bottom contact without being swept downstream (Reference 15), and may linger near the spawning area for the first year of life (Reference 6). Some authors, after attempting to capture shortnose sturgeon larvae, speculated the larvae of shortnose sturgeon, contrary to larvae of Atlantic sturgeon, do not spend much time in the drift (References 16 and 17). These early life history behaviors suggest a very low potential for entrainment effects at HNP.

The location of the cooling water intake at HNP should further reduce the potential for entrainment and impingement. The intake structure was constructed flush with the shallow, southern shoreline of the Altamaha River. The deep river channel (thalweg) hugs the northern bank opposite of the intake structure. Literature indicates that shortnose sturgeon migrate along the bottom of river channels, often seeking the deepest water available. This behavior and the cooling water intake location on the shoreline opposite the river channel should minimize the probability of shortnose sturgeon encountering the intake structure.

Entrainment and impingement effects are also a function of withdrawal rates, which are reduced for facilities with closed cycle cooling systems in comparison to once through cooling systems. HNP is operated using 3 mechanical draft cooling towers per unit as described in Section III B of this assessment. Cooling towers have been suggested as mitigative measures to reduce known or predicted entrainment and impingement losses (see, for example, Reference 18). EPA has endorsed closed cycle cooling towers as the "best available technology" for minimizing entrainment and impingement mortality (Reference 19). The relatively small volumes of makeup and blowdown water needed for closed-cycle cooling systems result in concomitantly low entrainment, impingement, and discharge effects. In the GEIS for license renewal (Reference 20), the staff noted that studies of intake and discharge effects of closed-cycle cooling systems have generally judged the impacts to be insignificant.

#### D. Existing Monitoring Data for HNP

This section briefly describes the methods and results of previous studies conducted at HNP. Initial preoperational surveys were conducted at HNP as required by the Unit 1 and 2 Final Environmental Statement (Reference 3) to "perform preoperational measurements of aquatic species to establish base-line data". During these surveys, one adult shortnose sturgeon was collected by gill net on March 13, 1974, in the vicinity of HNP. Three additional specimens of *Acipenser* sp. (two juveniles and one larva) were collected but could not be identified to species (Reference 4). No adult, juvenile, or larval shortnose sturgeon were collected during subsequent impingement and entrainment sampling conducted following startup of either Unit 1 or Unit 2.

Preoperational drift surveys were conducted weekly from February through May in 1973, and every 6 weeks June through December 1973. Samples were collected at four quadrates for transect above and below the plant intake and two locations close to the plant intake. Typical sample sets consisted of 14 individual samples from 15-minute collections. Drifting organisms were collected with a one-meter diameter 000-mesh nylon plankton net, set 6-12 inches above the river bottom. Samples were washed into a quart container and preserved with formalin.

Cataostomids, cyprinids, and centrarchids were the dominant ichthyoplankton families collected. Commercially important fish in these collections included *Alosa sapidissima* eggs, with mean densities approaching 0.3 per 1000 m<sup>3</sup> in March. *Alosa sapidissima* larvae were present in drift samples from May through June, with the density never exceeding 0.03 individuals per 1000 m<sup>3</sup>. A sturgeon larva was collected during this sampling and sent to Dr. Donald Scott for identification of species, but could not be identified beyond the genus *Acipenser*. This is the only record of larval sturgeon found in the vicinity of HNP.

Entrainment samples at HNP were collected for the years 1975, 1976, and 1980 following unit startup. Samples were collected weekly during 1975 and 1976, and monthly in 1980 (Reference 21). Additional ichthyological drift data are available for 1974 (weekly collection) and 1979 (monthly collection), but were not used in summarizing entrainment rates. Monthly entrainment data for each taxa for 1975, 1976 represent entrainment estimates for Unit 1 operation. The 1980 data include entrainment estimates for Unit 1 and Unit 2 operation. There was no increase in fish eggs and larvae entrainment at HNP with both units operating. The differences in numbers of fish eggs and larvae reported in the studies are due to differences in species abundance from year to year, spawning activity upstream from the plant, river discharge, and time of year. No sturgeon larvae were found in any entrainment samples collected during operational monitoring.

The entrainment estimates assume a uniform distribution of fish eggs and larvae, while the cross section measurements suggest that the greater densities would occur in the channel furthest from the intake. Under normal flow and pumping conditions, the intake velocity is 1.9 fps. The measured range of intake velocities was from 0.3 fps to 2.7 fps. Estimated percent of river flow entrained in Plant Edwin I. Hatch cooling water has remained less than one percent with the exception of the months of July, August, and September, 1980. The increase in estimated percent flow entrained during this period was due to extremely low river elevations resulting from the lack of rainfall. The spawning period for the shortnose sturgeon in the Altamaha River occurs during the months of February and March. Review of historical river flow indicates that the flow during February and March, and following months when eggs or larval sturgeon could

be present is traditionally high (Reference 11, 25 & Attachment 3) such that entrainment impacts would be further minimized.

Impingement data are available for five years, including 1975, 1976, 1977, 1979, and 1980. Impingement samples include weekly samples in 1975, 1976, and 1977 and monthly samples for 1979 and 1980. Each sample represents impingement for at least a 24-hour period. A total of 165 fish representing 22 species were collected. The highest number impinged per year, 61 fish, was in 1975, while the lowest, 14 fish, was in 1980. The data indicate low impingement estimates per day and per year. The 1975 estimates are 1.2 fish per day and 438 per year; 1976 estimates are 0.4 fish per day and 146 per year; 1977 estimates are 1.1 fish per day and 401.5 per year; 1979 estimates are 1.3 fish per day and 474.5 per year; and 1980 estimates are 1.2 fish per day and 438 per year. The hogchoker, *Trinectes maculatus*, was the most abundant and the only species collected consistently each year. Most species were collected only once during the five years. No sturgeon were collected in impingement samples during five years of sampling. In addition, no adult sturgeon has been reported impinged by the intake structure during the operation of the plant. Recent information (Reference 24) indicates that the likelihood of sturgeon spawning areas upstream of Plant Hatch is remote. This further supports the conclusion that potential for impingement of sturgeon by the Plant Hatch intake is low.

## E. Comparison with other power generation facilities

The staff has performed an assessment (Reference 22) of the potential impact of the operation of the Delaware River nuclear power plants, Salem 1 and 2 (once-through) and Hope Creek 1 (closed cycle), and concluded that plant operation was unlikely to adversely affect shortnose sturgeon. This conclusion was based on a combination of life history information, plant siting considerations, and engineering design to mitigate potential adverse impacts (Reference 22). The Hudson River, New York, supports a large sturgeon population including both shortnose and Atlantic species. There are six fossil-fueled and one nuclear electricity generating plants located along the Hudson River, and much research has been conducted to address impingement and entrainment concerns. Results for entrainment and impingement at the power generation facilities Bowline, Indian Point, and Roseton have been recently summarized for the period from 1972 through 1998 (Reference 17). These three facilities withdraw 62% of the maximum permitted water withdrawal from this reach of the Hudson River. Bowline Units 1 and 2 are two fossil fuel steam electric plants with combined capacity of 1200 MWe and utilize an intake structure located on an embayment off of the Hudson River. The maximum pumping rate is 384,000 gpm. Indian Point Units 2 and 3 are separate pressurized water reactors with combined capacity of 2042 MWe utilizing two separate shoreline intake structures. Predicted condenser cooling water flow rates are 840,000 gpm and 870,000 gpm for Indian Point Units 2 and 3, respectively. Roseton is a two-unit fossil-fueled steam electric plant with combined capacity of 1248 MWe and utilizes a shoreline intake structure. Maximum pumping rate is 641,000 gpm. Unlike HNP, all three of these facilities use once-through cooling. For comparison, the maximum pumping rate for HNP is 72,000 gpm. The GEIS for license renewal (Reference 20) notes that "Water withdrawal from adjacent bodies of water for plants with closed-cycle cooling systems is 5 to 10 percent of that for plants with once-through cooling systems, with much of this water being used for makeup of water by evaporation." The operation of the HNP cooling system is consistent with this description.

One of the environmental impacts identified for the three facilities on the Hudson River is entrainment and impingement of aquatic organisms, including striped bass, white perch, Atlantic tomcod, American shad, bay anchovy, alewife, blueback herring, and spottail shiner. Other species were considered, including Atlantic sturgeon (*Acipenser oxyrinchus*) and shortnose sturgeon. No shortnose sturgeon eggs or larvae were collected in entrainment samples for these facilities over periods ranging from 5 to 14 years. As a result, entrainment effects on shortnose sturgeon are believed to be negligible.

Adult shortnose sturgeon, however, were collected in impingement samples at these facilities. Indian Point Unit 2 reported shortnose sturgeon in impingement samples for 10 of 19 years reported (ranging from 1 to 6 individuals per year). Indian Point Unit 3 reported shortnose sturgeon in impingement samples for 7 of 15 years reported (ranging from 1 to 3 individuals per year). The size of impinged shortnose sturgeon ranged from 12 to 18 inches. The low rate of impingement and the return of impinged fish to the Hudson River alive lead to the conclusion that impingement effects were negligible (Reference 17). Even though sampling has documented large numbers of affected fish at intakes along the Hudson River, and a large resident population of sturgeon exists, shortnose sturgeon are a very small component of the impingement and entrainment numbers (Reference 17). In fact, some recent research suggests that the shortnose sturgeon population in the Hudson River has increased during the last ten years and is now more numerous than the commercially exploited Atlantic sturgeon (Reference 23).

The use of closed cycle cooling minimizes water withdrawals from the Altamaha River. As a result, the probability is much lower of impinging shortnose sturgeon, particularly when compared to similarly situated facilities using once-through cooling systems. In addition, the existing monitoring data support the finding that no impacts are known to occur to shortnose sturgeon from entrainment and impingement at HNP.

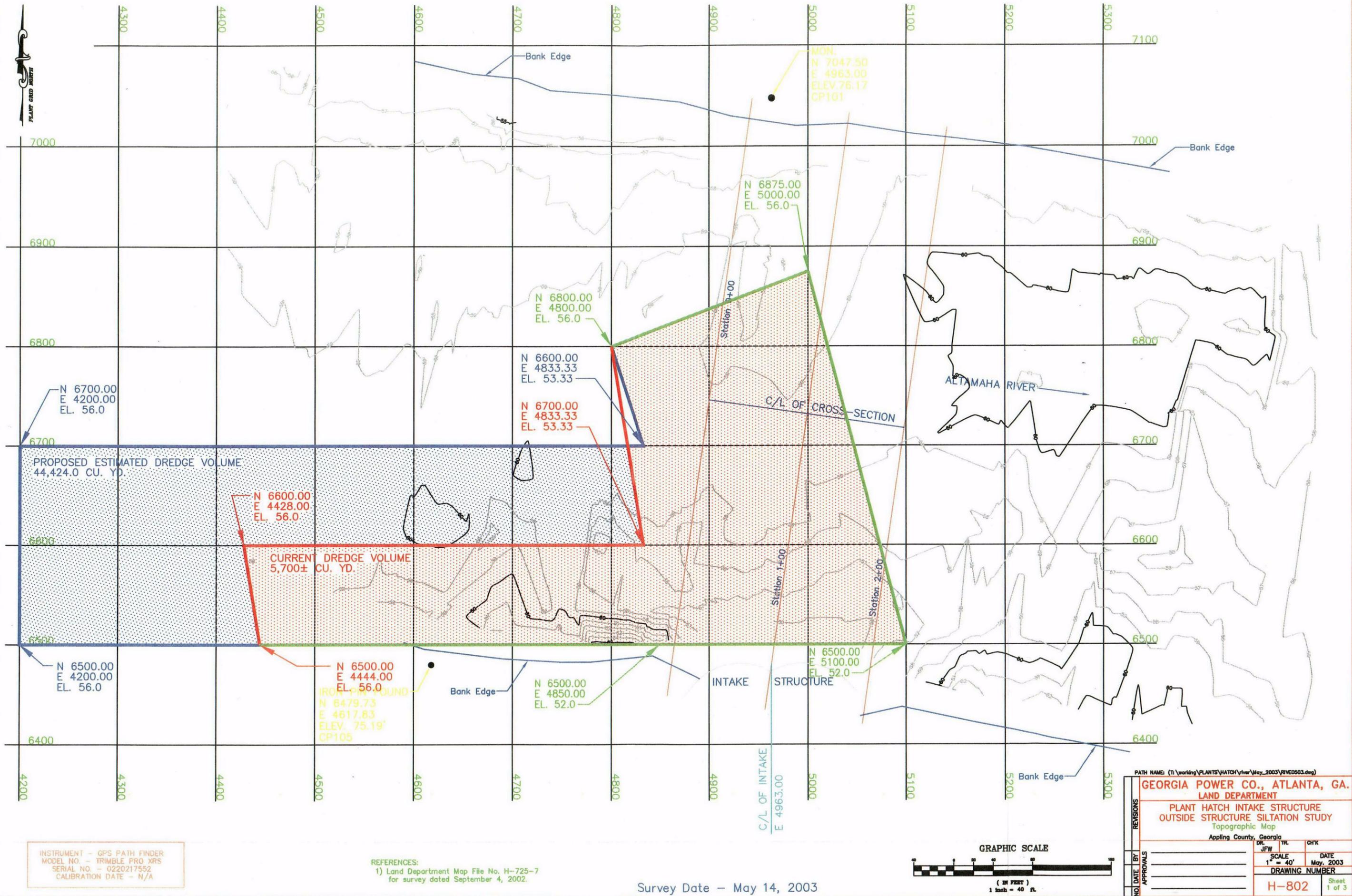
#### V. CONCLUSION

The Plant Hatch intake structure is not located near designated critical habitat of the shortnose sturgeon. Based on the life history characteristics of shortnose sturgeon, siting and operational characteristics of the plant, and the seasonal dredging restrictions the continued operation of Plant Hatch may affect, but is not likely to adversely affect, the shortnose sturgeon, *Acipenser brevirostrum*.

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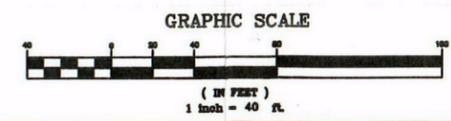
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INSTRUMENT - GPS PATH FINDER  
 MODEL NO. - TRIMBLE PRO XRS  
 SERIAL NO. - 0220217552  
 CALIBRATION DATE - N/A

REFERENCES:  
 1) Land Department Map File No. H-725-7  
 for survey dated September 4, 2002.

Survey Date - May 14, 2003



PATH NAME: (F:\working\PLANTS\WATCH\river\May\_2003\RIVE0503.dwg)

**GEORGIA POWER CO., ATLANTA, GA.**  
**LAND DEPARTMENT**

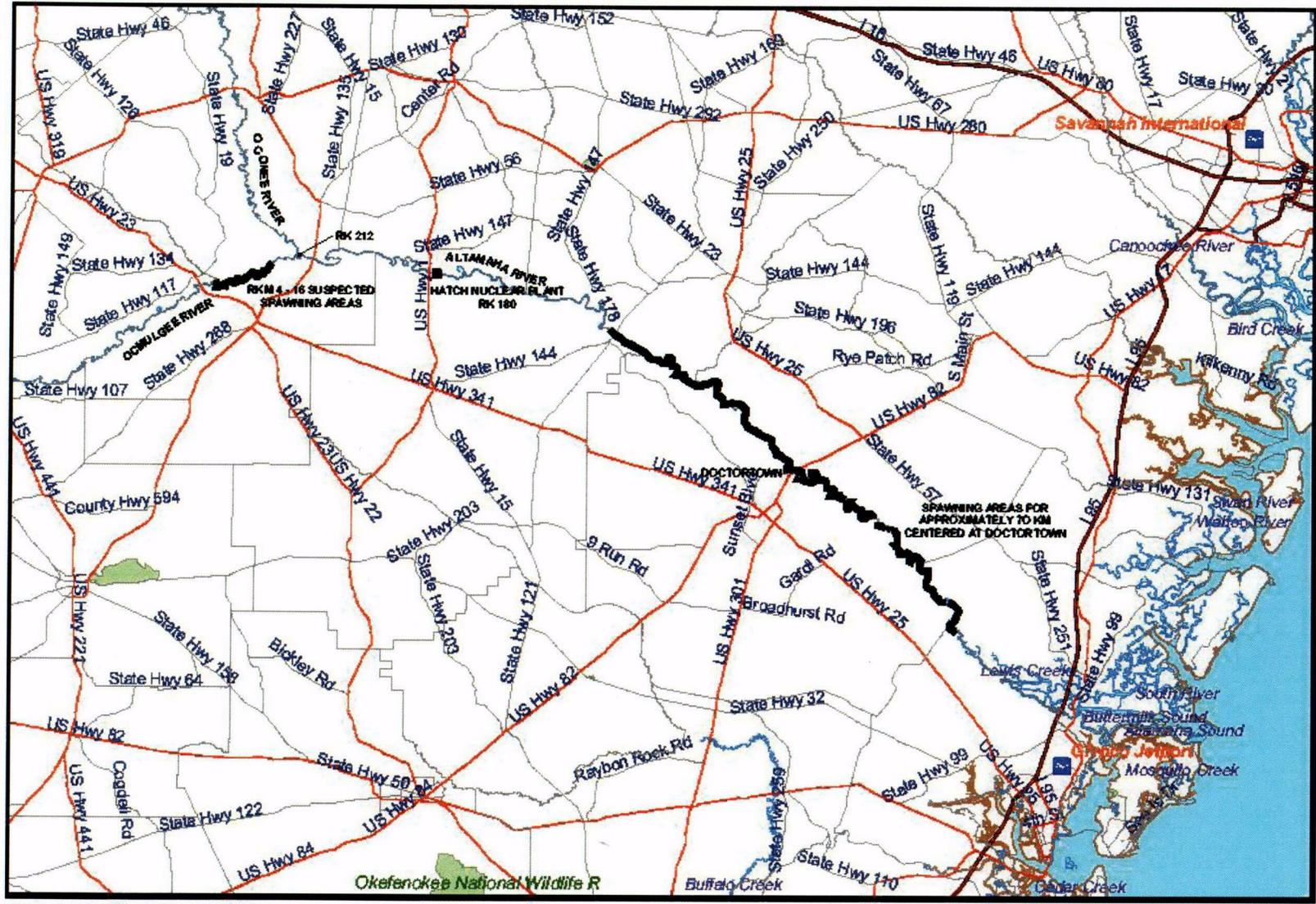
**PLANT HATCH INTAKE STRUCTURE**  
**OUTSIDE STRUCTURE SILTATION STUDY**  
 Topographic Map  
 Appling County, Georgia

NO.	DATE	BY	APPROVALS	REVISIONS

DATE	BY	CHK

SCALE: 1" = 40'  
 DATE: May, 2003  
 DRAWING NUMBER: H-802  
 Sheet 1 of 3

C01



**ALTAMAHA RIVER FROM  
THE CONFLUENCE WITH  
THE OCMULGEE RIVER  
TO THE COAST**

— Potential Spawning Reaches  
for the Shortnose Sturgeon  
*Acipenser brevirostrum*



Map produced by Environmental Field Services,  
December 12, 2003.



Scale = 1:800,000



Water Resources

 Data Category: 
 Geographic Area:  

## Monthly Streamflow Statistics for Georgia

Times for Georgia stations are shown as Eastern Standard Time. If your clock is set to Eastern Daylight Savings Time, add one hour to the time shown on the Web page to compare to your clock time.

Additional information may be found on the [USGS Water Resources of Georgia](#) page, including [low-flow statistics](#) and [flood-frequency information](#) for selected stations.

### USGS 02225000 ALTAMAHA RIVER NEAR BAXLEY, GA

 Available data for this site  

Appling County, Georgia Hydrologic Unit Code 03070106 Latitude 31°56'20", Longitude 82°21'13" NAD27 Drainage area 11,600 square miles Contributing drainage area 11,600 square miles Gage datum 61.51 feet above sea level NGVD29	<b>Output formats</b> <input type="button" value="HTML table of all data"/> <input type="button" value="Tab-separated data"/> <input type="button" value="Reselect output format"/>
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YEAR	Monthly mean streamflow, in ft <sup>3</sup> /s											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1949									13,860	6,434	5,945	6,499
1950	6,487	7,121	14,750	9,769	5,739	6,116	4,993	4,204	5,028	5,179	4,560	6,533
1951	10,130	9,138	10,530	14,760	6,545	3,719						
1970										2,625	5,421	5,933
1971	16,320	20,430	42,630	23,880	16,640	6,393	6,879	12,870	7,735	5,050	5,252	16,280
1972	30,520	34,170	16,250	11,670	7,252	6,749	6,418	4,436	3,268	2,597	3,663	10,210
1973	23,210	41,600	24,310	41,490	16,960	19,380	8,219	7,668	4,179	4,209	3,496	5,694
1974	13,819	31,950	16,490	21,160	6,596	6,070	4,314	7,554	6,599	2,912	3,474	6,871
1975	18,250	26,540	47,260	41,730	20,630	14,660	11,440	12,160	7,419	11,210	8,366	8,516
1976	14,590	16,180	20,970	13,070	16,720	14,490	8,429	4,157	3,968	7,206	6,808	22,430
1977	24,320	11,640	28,980	22,270	5,586	4,273	3,284	5,205	4,297	4,623	11,020	8,182
1978	18,180	34,260	17,820	10,250	16,660	5,820	3,774	5,779	2,877	2,224	2,336	4,486
1979	8,723	18,790	34,890	22,330	14,640	5,177	5,102	3,666	4,582	6,106	6,810	7,056
1980	10,800	15,900	38,300	39,450	11,150	10,240	6,049	3,053	2,468	3,018	3,094	4,089
1981	3,395	14,670	10,310	14,490	3,665	3,666	2,211	2,874	2,484	1,864	2,115	3,202
1982	22,220	27,080	15,270	13,610	12,280	8,321	6,153	6,112	3,464	3,992	3,932	11,690
1983	18,790	29,049	34,410	38,390	10,280	5,602	4,395	2,933	3,309	2,731	4,571	25,140
1984	22,790	22,970	29,809	24,710	18,970	8,064	6,274	16,580	3,597	2,665	4,048	4,821

## Attachment 3

1985	5,721	20,230	9,112	5,711	5,225	2,932	3,301	5,440	3,928	4,186	8,722	14,700
1986	8,503	14,800	10,770	5,635	2,576	2,406	1,810	2,093	3,129	2,133	4,530	15,650
1987	30,540	28,210	31,830	18,770	6,421	5,634	5,677	2,692	2,597	1,903	2,193	2,763
1988	7,281	11,870	11,290	9,252	6,040	2,302	1,796	1,902	4,272	3,286	3,191	3,495
1989	5,068	4,803	11,080	15,970	7,685	7,304	12,900	6,613	4,193	16,030	6,086	12,600
1990	24,000	24,890	31,550	14,900	6,298	3,830	2,666	2,765	2,975	4,952	5,538	4,915
1991	14,580	28,930	32,690	20,410	17,980	8,625	12,030	13,150	6,415	2,750	3,021	4,123
1992	12,889	20,900	23,680	13,500	4,406	7,088	5,355	8,880	11,050	11,350	12,120	29,870
1993	36,550	23,380	38,020	34,840	8,955	5,634	3,484	2,821	2,759	2,373	5,158	7,806
1994	10,380	18,370	21,950	16,530	5,651	5,401	32,470	19,600	10,570	24,560	12,440	21,550
1995	20,470	37,360	31,550	9,998	5,479	11,550	4,364	4,211	5,748	9,150	14,480	9,693
1996	11,940	29,970	30,190	18,540	9,603	6,536	3,430	4,028	3,297	4,415	3,767	7,034
1997	14,290	24,790	25,970	6,286	10,560	6,672	4,942	4,377	2,228	6,541	19,540	31,920
1998	46,750	60,419	65,210	35,290	20,520	6,713	3,547	4,968	7,308	6,099	4,481	3,784
1999	7,933	17,160	8,597	5,817	3,950	2,753	4,741	2,106	1,643	3,140	2,522	4,312
2000	6,949	11,120	10,470	9,326	2,813	1,877	1,666	1,683	3,133	2,542	2,471	4,488
2001	6,860	5,805	32,020	19,850	3,956	10,600	5,981	4,074	2,685	2,064	1,870	2,424
2002	3,504	7,193	7,977	8,436	4,035	2,285	1,880	1,627	2,170			
Mean of monthly streamflows	15,790	22,110	24,620	18,590	9,484	6,732	6,060	5,827	4,683	5,356	5,795	9,964

Questions about data [gs-w-ga\\_NWISWeb\\_Data\\_Inquiries@usgs.gov](mailto:gs-w-ga_NWISWeb_Data_Inquiries@usgs.gov)  
 Feedback on this website [gs-w-ga\\_NWISWeb\\_Maintainer@usgs.gov](mailto:gs-w-ga_NWISWeb_Maintainer@usgs.gov)  
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