

PMVogtleCOLPEm Resource

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Sent: Wednesday, February 17, 2010 2:45 PM
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Subject: Impingement Study
Attachments: Impingement Rpt_fnl.pdf

Mallecia,

Please find attached a courtesy copy of the final Fish Impingement Study at Vogtle. This report will be included in the March 12th submittal to the NRC Document Services.

If you have any questions let me know.

Thanks!!!!
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**FINAL REPORT OF FISH IMPINGEMENT
AT THE PLANT VOGTLE
ELECTRIC GENERATING PLANT
WAYNESBORO, GEORGIA**

Prepared by:



A SOUTHERN COMPANY

March 2009

TABLE OF CONTENTS

	<u>Page</u>
LIST OF FIGURES	v
EXECUTIVE SUMMARY AND FORWARD WITH ERRATUM	3
1. INTRODUCTION	4
1.1 Study Objective	5
2. STUDY AREA DESCRIPTION.....	6
2.1 Environment	6
2.2 Intake Canal and Structure.....	7
2.3 Make-up Water Pumps	8
3. METHODS.....	9
3.1 Impingement Assessment	9
3.2 Calculation of Impingement Rate.....	10
3.3 Quality Assurance and Quality Control.....	10
3.4 Plant Operations and Environmental Parameters	11
3.4.1 Plant Operations.....	11
3.4.2 Environmental Parameters.....	11
4. RESULTS	12
4.1 Species Composition	12
4.2 Relative Abundance and Biomass	12
4.3 Sample Population Size Distribution.....	13
4.4 Temporal and Diel Distribution.....	13
4.5 Sample Disposition.....	14
4.6 Impingement Rate.....	14
5. OPERATIONAL AND ENVIRONMENTAL PARAMETERS.....	15
5.1 Operational Parameters.....	15
5.2 Environmental Parameters.....	15

6. SUMMARY AND DISCUSSION..... 16
7. REFERENCES 19

LIST OF APPENDICES

APPENDIX A: Field Data Sheet Templates

APPENDIX B: Summaries of Environmental Parameters Recorded during the Study

APPENDIX C: Summaries of Impingement Sampling Results

LIST OF FIGURES

Figure 2-1. Sampling Location Map

LIST OF TABLES

Table 4-1. Summary of Species Collected during Impingement Sampling at the Plant Vogtle Make-Up Water Intake Structure, March - December 2008

EXECUTIVE SUMMARY AND FORWARD WITH ERRATUM

This final report follows the Interim Report of Fish Impingement at the Plant Vogtle Electric Generating Plant, GPC, Jan. 2009. The interim report provided in-progress results for 10 months of the 12-month study. At that time, study progress reported that impingement at Vogtle Units 1&2 intake was very low - potentially impacting up to 1,941 individual fish weighing approximately 23.3 lbs at the 95% upper confidence limit (UCL). The interim report estimated potential impingement impact for Units 3&4 in combination with Units 1&2 as derived by doubling the estimate described above. That result indicated that approximately 3,882 fish weighing approximately 46.6 lbs may be impinged annually (based on the 10-month study result) at the newly expanded Plant Vogtle. In transitioning from the interim to final reporting stage, a calculation error was discovered in data review that affected the 10-month impingement estimate with an increase. The corrected 10-month impingement estimate was 2,421 fish with a biomass up to 30.1 lbs (or 3,881 fish weighing up to 44.9 lbs at the 95% UCL).

The following report sections provide a final report version for the entire 12 months of study. Consistent with low impingement rate during the last two months of sampling, the final study result showed an approximate 6% increase in annual impingement rate compared to the 10-month estimate. Further, a range of potential, annual impinged biomass is suggested to allow consideration for organism mortality prior to impingement. Annual impingement at Vogtle Units 1&2, based on 12-months of impingement sampling, resulted in an impingement baseline of 3,229 organisms weighing between 18.2 to 41.2 lbs.

At the 95% UCL, the effect of operating Units 3&4 and Units 1&2 simultaneously may result in annual impingement of 6,458 fish, each measuring approximately 69 mm in length, weighing up to 82.4 lbs. The biomass estimate may range as low as 37 lbs based on the study observations that a few large-bodied fish were moribund before becoming impinged. Considering the fact that the vast majority of fish encountered at the intake structure during sampling are juveniles, the annual impingement estimated is further deemed to be conservative in that the sizes/ages of fish observed in the impingement sample would likely suffer natural mortality before reaching maturity. Based on the 12-month study, the potential net impingement effect is considered to be low and not pose a significant impact on the fishery resources of the Savannah River.

1. INTRODUCTION

In February of 2008, Georgia Power Company's (GPC) Environmental Services staff based in Smyrna, Georgia responded to Southern Nuclear's request to conduct an aquatic impingement and entrainment assessment of Plant Vogtle's make-up water intake structure. Following a site reconnaissance in early March 2008, GPC submitted a plan of study. The sampling approach included four primary components including:

- 1) source water ichthyoplankton sampling in the Savannah River,
- 2) source water/intake canal ichthyoplankton sampling,
- 3) impingement sampling via the traveling screen wash system, and
- 4) performance of work under a quality assurance/quality control plan to ensure that work was performed in high quality manner consistent with standard scientific practices, and as it pertains to sampling methodology, perform a comparison between collection gear types and data between two sampling locations upstream of the intake structure.

Following a brief period of internal review by Southern Nuclear, a sampling plan was established with authorization to proceed including implementations by Plant Vogtle to install temporary procedure modifications in order to provide GPC staff site access to aquatic impingement and entrainment sampling. Plant Vogtle Operations personnel have provided and continue to provide communications and staff resources to operate the traveling screen system for the ongoing impingement study component.

Field components of the study were initiated on 10 March 2008. Study components 1, 2, and 4 described above were completed for the entrainment portion of the study. The methods and results of those study components are described in a separate report (GPC 2008). Study component no. 3, the impingement study, was designed as a 12-month study encompassing twice per month sampling.

Under direction and support provided by Southern Nuclear, the study approach, field sampling components, and data analysis of this study have been conducted and managed by Georgia Power Company's Environmental Services Group based at 5131 Maner Road in Smyrna, GA.

Field methods used in this study are based on widely accepted, standard scientific practices and stem from Georgia Power Company staff's previous experience in

performing entrainment and impingement assessment studies following applicable EPA guidance.

Planning elements for this study include:

- review of historical and recent studies characterizing the fish community in the vicinity of the site and potential fish community impacts via Plant Vogtle Operations
- a sampling approach to support development of a scientifically valid estimate of impingement rate at Plant Vogtle
- an assessment of fish communities susceptible to impingement in the vicinity of the make-up water intake structure to include:
 - taxonomic identification of fish and their life stages to the lowest practical taxon
 - description of abundance and temporal/spatial characteristics
 - characterization of annual, seasonal, and diel variations in impingement rate
 - documentation of current impingement rates of all life stages of fish and shellfish at the facility
 - identification of any Federal and/or State protected species

The following sections provide a description of the Plant Vogtle Study Area, the make-up water intake structure (Section 2), methods (Section 3), description of available environmental parameters that may aid data interpretation (Section 4), and discussion of the study results including calculation of the annual impingement rate at Plant Vogtle (Section 5).

1.1 Study Objective

The objective of the impingement assessment study is to characterize the current impingement rate at Plant Vogtle Unit 1 & 2 make-up water intake structure and use that information to infer impingement rate for the similarly designed intake structure for the proposed Vogtle Units 3 & 4.

2. STUDY AREA DESCRIPTION

2.1 Environment

The Plant Vogtle Site is located at Savannah River Mile (RM) 150.9. The plant is located approximately 26 miles south-southeast of Augusta, in Burke County, Georgia (Figure 2-1) directly across the river from the Department of Energy's Savannah River Plant (SRP) property. The Savannah River, which provides the make-up-cooling water source for Plant Vogtle's cooling tower system, is a primary river that drains the eastern and western boundaries of Georgia and South Carolina, respectively. The Savannah River originates in the mountains of North Carolina, South Carolina, and Georgia and flows approximately 505 kilometers (km) to the Atlantic Ocean. The Savannah River in the vicinity of Plant Vogtle lies in the Coastal Plain physiographic province which is characterized by sandy or sandy loam soils with rolling hills and a mixed pine-hardwood vegetative association. The Savannah River upstream from the Plant Vogtle intake structure receives wastewater discharges from municipalities and industries. The river at the site is typical of large southeastern Coastal Plain rivers except that the channel was historically dredged and maintained by the Corps of Engineers (COE) so that it is highly channelized. Studies on the Savannah River have been conducted since 1951 (GPC 1984). In a recent publication by Marcy et al. 2005, *Fishes of the Middle Savannah River Basin*, the Savannah River was characterized as being high in fish diversity and home to at least 118 native fish species. The middle Savannah River in the vicinity of Plant Vogtle is home to at least 98 species of fish - fifteen of which are species introduced mostly for fisheries management purposes. Aquatic entrainment and impingement at Plant Vogtle was initially characterized in early siting studies of the mid-1970s and reported later in GPC's 1984 Operations Environmental Report for licensing of Plant Vogtle (GPC 1984).

The 1984 report of site studies performed during January through August of 1974 suggested that prevailing biological and physical factors combined with the low intake canal velocities would result in minimal entrainment of eggs and larvae and not have a significant effect on the fish population of the Savannah River.



**Vogtle I&E
Sampling**
Burke County

Figure 2-1 Sample Location Map

Legend

GA Counties

Site Location

0 200 400 600 800 Feet

Date: 09/08/2008
Scale: 1 : 4,800
Created by: B. Brinkman

2.2 Intake Canal and Structure

Among its major components, the Plant Vogtle river water intake system consists of the intake canal structure and make-up pumps. The intake canal is 356 feet (ft) long, 140 ft wide with an earthen bottom at 67 ft above mean sea level (msl), at the time it was constructed, and vertical steel sheet pile sides (canal walls) extending to 98 ft msl. The intake canal has a surface skimmer weir at about 78 ft msl with guide vanes at the river entrance. The skimmer weir consists of fixed and removable sections with the fixed sections having elevations less than 78 ft msl. A bottom canal weir is located approximately 100 ft from the mouth of the canal. Silting protection is provided by a sedimentation basin formed by the skimming weir and the canal weir. A floating trash boom is located in front of the skimmer weir to divert large floating debris (GPC 1984).

The component of river velocity parallel to the canal opening is small thus minimizing the potential for fish entering the canal. In addition, a lateral passageway is provided at the canal entrance which permits fish to escape (GPC 1984).

Flow through the intake canal is determined by plant operating conditions. Water velocities in the canal are also dependent on the river water level. Based on pre-construction engineering calculations summarized in GPC's 1984 Environmental Report, average velocity at the river intake canal was estimated as ranging from 0.01 ft/second (s) at minimum plant withdrawal rate of 13,000 gallons per minute (gpm) and a river water level of 98 msl (top of the canal sheet pilings) to a 1.05 ft/s at a maximum plant withdrawal rate (72,000 gpm) based on all four make-up water pumps running and a minimum river water level of 78.4 ft msl (allowing for a 2 ft degradation of river bed elevation) at a flow of 5,800 cubic ft/s (ft^3/s). At average plant operating conditions (42,000 gpm with two intake makeup water pumps operating) and annual water level (84 ft msl based on average river flow of 10,300 ft^3/s), the canal entrance velocity is 0.11 ft/s.

The intake structure is a 147 ft long, 72 ft wide concrete structure with four chambers, each housing one pump, a traveling water screen, a trash rack, stop logs, and screen wash discharge to a common pit with coarse-grated steel insert basket. The traveling screens are FMC type-45A (3/8 -inch size steel mesh of ASTM A36 structural steel shape) that currently are set to rotate one cycle every eight hours (hrs) or on a high screen differential of six inches of water at the low-setting rotation speed of five ft per minute (min). The velocities of water through the traveling screens at average annual water level (84.0 ft msl) is 0.69 ft/s and 0.82 ft/s with river level at minimum stage

(78.4 ft msl) (GPC 1984). Debris that collects on the screens is washed by water spray into the trash channel where it is sluiced into the trash basket. Screen wash water is returned via a drainage pipe from one corner of the trash pit and back into the intake structure of traveling screen unit no.1 (southernmost unit on the intake structure). The trash basket is emptied periodically and the contents are carried to a permitted offsite landfill.

2.3 Make-up Water Pumps

Four vertical pumps, each name-plate-rated at 22,000 gpm (or 15.84 million gallons per day [MGD]) are located in the river intake structure. The typical operating scenario utilizes two pumps. Total pumping rates can vary day to day based on operational needs. Pumping rates vary periodically due to make-up water needs based on cooling basin water levels. Also, periodically, cooling tower blow-down requires added dilution which requires increased pumping volumes for discharge compliance.

3. METHODS

Copies of template field data sheets used for impingement sampling are included in Appendix A.

3.1 Impingement Assessment

Screen wash from the intake structure traveling screen system was sampled for a period of one year at a rate of approximately once every two weeks during 10 March 2008 through 26 February 2009. One scheduled sampling event, 11-12 February 2009, was postponed one week due to a switch repair that affected the operation of the traveling screens.

Samples were collected with a PVC-frame mounted fabric insert net (6 ft x 6 ft x 6 ft mesh bag) that filters screen-wash water entering the screen wash pit. The collection net is constructed of 1/4-inch nylon mesh netting in order to ensure collection of any organisms that would have been collected on the 3/8-in traveling screen. Each impingement sampling event represented a 24-hr collection period split into two approximately equal 12-hr samples (yielding a day vs. night sample for examination of diel attributes). The typical “day sample” was typically initiated at 0830 hrs and extended until 2030 hrs on day one and the “night sample” was started at 2030 hrs on the same day and ending the following morning at 0830 hrs.

Prior to each sampling event, all traveling screens were rotated for a complete rotational cycle as a means to purge the traveling screens before starting the actual sampling period. The screens travel at a rate of approximately 5 ft/min and the rotation speed was not changed during the study. Following the screen purge, the field crew manually installs the impingement sample insert net into the screen wash pit. The insert net is positioned, by means of tie-off ropes and the overlying safety handrail, under the screen wash discharge chute in order to capture any screen wash water during a given sample cycle. Once the actual sampling period was started, the traveling screens were allowed to rotate in the typical mode until the end of the 12-hr sample period.

Typically, two make-up water pumps operate at full capacity (22,000 gpm each) during each 24-hr impingement (and entrainment) sampling event. Twenty-four hours of pumping under the typical daily make-up water needs at Plant Vogtle during the study period equaled 63.36 MGD.

At the end of each 12-hr sample period, all operational traveling screens were rotated and washed, before retrieval of the insert sample net. The net was untied and its contents were manually lifted out of the wash pit. To collect an impingement sample, field personnel manually separated any fish and shellfish from organic debris collected in the insert net such as aquatic weed fragments, leaves, twigs, relict and sometime live shells of Asian clam (*Corbicula fulminea*). Sample organisms were then sorted by species and enumerated and reported in field data sheets for each collection period. All 24 planned impingement samples were collected and processed for inclusion in this report.

Sample processing followed a standard protocol. Once retrieved, all impinged fish were either preserved in formalin and transported to the lab for processing or were processed on site following each sample collection. During processing, impinged organisms were enumerated, weighed (grams) and total length (TL) measured to the nearest millimeter (mm). Data were recorded on field data sheets.

3.2 Calculation of Impingement Rate

Impingement rate for derived for species using the following equation:

$$\sum E_i = R_i \times D_i \text{ where:}$$

E_i = estimated number of fish impinged for time period i

R_i = average impingement rate per day for time period i

D_i = number of days that the sample represented

Time periods bracketed the interval between sampling events and collectively accounted for 12 months of plant operation. Time intervals used for extrapolation represented half-month sampling intervals. A 95-percent upper confidence limit was calculated and confidence intervals for individual species/taxa groups were extrapolated to yield an upper, annual impingement estimate based on the relative abundance of each species in the impingement sample.

3.3 Quality Assurance and Quality Control

Project quality assurance/quality control (QA/QC) procedures for this study followed established procedures for general field and laboratory studies conducted by Georgia Power's Environmental Laboratory (GPC, 2002). Each sampling event included senior technical involvement and preparation of trip reports summarizing field

observations on the performance of the collection system including the sample collection, handling, processing, record keeping, any health and safety issues on site and communication with plant personnel.

3.4 Plant Operations and Environmental Parameters

Plant operational parameters were recorded at Plant Vogtle throughout the course of the study including intake make-up water flow rates and ambient and/or inlet water temperature. Environmental parameters such as river stage data and precipitation data were obtained from electronic sources. Appendix B contains tabular and/or graphical summaries of these supporting data.

3.4.1 Plant Operations

The frequency of power generation, and thus the frequency of make-up cooling water and pump flows at Plant Vogtle, is very stable. Although, each of the four make-up water intake pumps at Plant Vogtle are design-rated to pump 22,000 gpm (63.36 mgd or 240,000 m³/day), actual pump flows through a given period of time can be affected by daily operational needs, periodic maintenance (outage), and to a minor degree, changes in flow head pressure due to fluctuations in river stage elevation. A summary of mean pumping rate per half-monthly sampling period is as recorded during the study period is shown in Table B-1, Appendix B.

3.4.2 Environmental Parameters

Table B-2 in Appendix B provides a summary of water quality parameters recorded during the source water study component. Water temperature data were collected through a variety of means during the study including manually recorded ambient river surface water temperatures via a multi-array Hydrolab water quality meter, and for the purpose of trend analysis electronic USGS daily water quality data records as available and applicable for the study area.

The river stage at Plant Vogtle changes constantly in response to regulated flow conditions from Corps of Engineers operations upstream and is influenced by local precipitation and/or riparian vegetation evapo-transpiration rates. Regional ambient air temperatures, river stage and discharge, and precipitation records were electronically obtained from the USGS Waynesboro gage (Station No. 021973269) and the University of Georgia weather monitoring net work (Figures B-1 through B-3; Appendix B).

4. RESULTS

4.1 Species Composition

A total of 21 taxa representing 10 taxonomic families were collected (Table 4-1). The impingement sample included 19 fish taxa and two crustaceans. Impinged fish species represented eight taxonomic fish families. The Centrarchidae (sunfishes) is the most speciose family represented in the impingement data with seven species. Twelve of the 21 species collected were represented by five or fewer individual specimens in the sample (Table C-1, Appendix C). One specimen each of three separate species including spottail shiner (*Notropis hudsonius*), chain pickerel (*Esox niger*), redbreast sunfish (*Lepomis auritus*) were observed in the screen wash basket prior to initiation of sampling events on 3 and 17 December 2008. Because it was not known exactly when those fish were impinged when captured, those fish were excluded from the annual estimate of impingement.

The potential for State or Federally-listed threatened or endangered fish species to occur in the Savannah River at Plant Vogtle was evaluated via desk top information review prior to study initiation. The U.S. Fish and Wildlife Region IV county by county database identified one fish species (shortnose sturgeon, *Acipenser brevirostrum*) as an endangered species that may occur in the region. Additionally, the State of Georgia lists three protected species of fish that may occur in the region of Plant Vogtle's intake including shortnose sturgeon, bluebarred pygmy sunfish, *Elassoma okatie*, and robust redhorse, *Moxostoma robustum*. No protected species were collected in the impingement study.

4.2 Relative Abundance and Biomass

A total of 168 organisms were collected from the impingement sample from March 2008 through February 2009 (Table C-1; Appendix C). The most abundant fish family was the Centrarchidae (sunfishes) accounting for 57.7 percent of the sample. The numerically dominant individual species was spotted sunfish (*Lepomis punctatus*) with 64 individuals (or 38.1 percent of the sample), followed in decreasing order or ranked abundance by hogchoker (*Trinectes maculatus*) (10.7 percent), white catfish (*Ameiurus catus*) (8.3 percent), and bluegill (*L. macrochirus*) (7.1 percent). The two crustaceans observed in impingement samples include three specimens of the common shore shrimp (*Paleomonetes pugio*) and 11 specimens of brushnose crayfish (*Procambarus pubescens*).

**TABLE 4-1. CHECKLIST OF IMPINGED SPECIES COLLECTED AT PLANT VOGTLE,
MARCH 2008 - FEBRUARY 2009**

Families	Common Name*	Species	Common Name	Status
Aphredoderidae	Pirate Perch	<i>Aphredodearous sayanus</i>	pirate perch	Native
Astacidae	Crayfishes	<i>Procambarus pubescens</i>	brushnose crayfish	Native
Centrarchidae	Sunfishes	<i>Enneacanthus gloriosus</i>	bluespotted sunfish	Native
		<i>Lepomis auritus</i>	redbreast sunfish	Native
		<i>Lepomis gulosus</i>	warmouth	Native
		<i>Lepomis macrochirus</i>	bluegill	Native
		<i>Lepomis marginatus</i>	dollar sunfish	Native
		<i>Lepomis punctatus</i>	spotted sunfish	Native
		<i>Pomoxis nigromaculatus</i>	black crappie	Native
Clupeidae	Herrings	<i>Dorosoma cepedianum</i>	gizzard shad	Native
		<i>Dorosoma petenense</i>	threadfin shad	Native
Cyprinidae	Minnows	<i>Cyprinell leedsi</i>	bannerfin shiner	Native
		<i>Notropis maculatus</i>	taillight shiner	Native
Esocidae	Pikes	<i>Esox niger</i>	chain pickerel	Native
Ictaluridae	Catfishes	<i>Ameiurus brunneus</i>	snail bullhead	Native
		<i>Ameiurus catus</i>	white catfish	Native
		<i>Ameiurus platycephalus</i>	flat bullhead	Native
		<i>Noturus leptacanthus</i>	speckled madtom	Native
Palaemonidae	Shore Shrimps	<i>Palaemonetes pugio</i>	shore shrimp	Native
Percidae	Perches and Darters	<i>Percina nigrofasciata</i>	blackbanded darter	Native
		<i>Trinectes maculatus</i>	hogchoker	Native

Notes:

* = Nomenclature by Page and Burr, 1991.

Total impinged biomass was 985.4 grams (g) (~2.2 pounds [lbs]). Sample biomass was dominated by the Centrarchidae (sunfish family) accounting for 42.0 percent of the impingement sample biomass. The single largest biomass contribution was attributed to black crappie (*Pomoxis nigromaculatus*) accounting for 28.7 percent of the sample. Among the crappie was a single large specimen, severely bodily damaged and missing tissue (implying morbidity prior to impingement) that accounted for 28.5 percent of the entire sample. Two gizzard shad (*Dorosoma cepedianum*), in the herring family, represented the second single largest biomass contribution representing 26.3 percent of the sample. The numerically most abundant specie, spotted sunfish accounted for 6.4 percent of the annual sample biomass. Seventeen of the 19 fish species each contributed less than 3.3 percent of the sample biomass (Table C-2; Appendix C).

4.3 Sample Population Size Distribution

Length distribution information for each impinged species is summarized in Table C-3, Appendix C. The minimum length recorded for any impinged organism was 17 mm (total length (spotted sunfish)) and the maximum length for any single species was 303 mm TL (gizzard shad). The mean length of all impinged organisms combined was 69 mm TL. Approximately 84 and 95 percent of all impinged organisms were less than 3 and 4 inches (76.2 and 101.6 mm) in total length, respectively. Overall, the size class data indicate that, except for gizzard shad, black crappie, pirate perch, and taillight shiner, primarily young of the year and juveniles were impinged at Plant Vogtle.

4.4 Temporal and Diel Distribution

Impingement sample abundance varied periodically during the study with three empirically observable nodes of higher impingement rate including late-July and mid-December (Table C-1, Appendix C). The single sampling event with the largest number of impinged organisms (33) occurred during the night sample of 17 December 2008. No organisms were collected during 16 of the 48 individual 12-hour sampling events. When removing the single large-bodied black crappie and gizzard shad as potential outlier data points, the period of early-November through early-January represented the period with the highest rate of impinged biomass (Table C-2, Appendix C).

Diel distribution of impingement at the Plant Vogtle intake was determined through examination of approximate 12-hr daytime and nighttime samples. Overall, to date, 56.9 percent of impinged organisms were collected during nighttime periods (Table C-1; Appendix C); whereas, 68.6 percent of impinged biomass was collected at night.

Although no statistically significant relationship was found, sampling events yielding the highest impingement rate appeared to be empirically related to incidences of higher river flow. This likely indicates increased vulnerability of fish to impingement during instances of elevated river stage as fish mobility changes in response to change in stage and flow.

4.5 Sample Disposition

The disposition or condition of each specimen was recorded in field data sheets based on the field samplers observations. Specimen condition was coded at the time of impingement sample collection based on the following descriptors.

<u>Code</u>	<u>Condition Description</u>
L	alive
R	recently moribund; in visually good body, gill, and eye condition
R1	recently moribund with body, gills, and or eyes mildly necrotized
D	deceased with obvious signs of body tissue and/or gill necrosis
M	deceased with necrotic and missing tissues

Of the 168 specimens collected in the study, 60 percent were observed as recently moribund but otherwise exhibiting good body condition. This indicated that those specimens may have suffered mortality after impingement and possibly after landing in the insert net. Twenty-six percent of the sample was alive during examination of the sample in the field. R specimens showed obvious post-mortem signs and accounted for about 11 percent of the sample. Other specimens, accounting for the remaining three percent of the sample, were either coded D or R1.

4.6 Impingement Rate

As shown in Table C-4, Appendix C, based on 168 organisms collected in the impingement sample, the estimated annual impingement rate is 2,580 organisms. Fish comprised 91.6 percent (2,365) of the estimate and crustaceans comprised the remainder. At the 95-percent upper confidence limit (UCL), annual impingement may range up to 3,229 organisms. Table C-5, Appendix C presents actual vs. calculated annual biomass impingement. Actual biomass of impinged organisms during the study to date was 985.4 g (~2.2 lbs). Accounting for all impinged organisms encountered in the sample, calculated annual biomass impingement rate is 15,028 g (33.1 lbs). At the

95-percent UCL, the annual rate of biomass impingement may range up to 18,692 g (or 41.2 lbs).

Three species including black crappie, hogchoker, and gizzard shad accounted for 73.8 percent of impinged biomass. A single large specimen each of black crappie and gizzard shad accounted for 45.2 percent of the annual impingement biomass. At the time of collection, those specimens were observed in states of relatively advanced decay indicating mortality before becoming impinged unlike the vast majority of other specimens collected during the study. Accounting for the single specimens of crappie and gizzard shad that are believed to have deceased before being impinged, the biomass estimate could be conservatively overestimated as much as 45.2 percent. Assuming this observation to be reasonable, the revised annual rate of impinged biomass would be 8,271 g (~18.2 lbs). At the 95% UCL, this revised, annual biomass estimate would range up to 10,021 g or about 22.1 lbs.

In summary, the study result demonstrated that annual impingement at the Vogtle Units 1&2 intake could affect up to 3,229 organisms weighing between 18.2 to 41.2 lbs.

5. OPERATIONAL AND ENVIRONMENTAL PARAMETERS

5.1 Operational Parameters

Plant Vogtle conducted make-up water pumping through its intake structure throughout the entire study period. Copies of operational reports showing daily recorded make-up water pumping are included in Appendix B. Mean daily make-up water pumping rate during the study period was approximately 63.1 mgd (or 238.9 m³). At the time of this report preparation, daily cooling water intake flows for February 2009 were unavailable. For the purpose of calculation, intake flows during February were assumed to be typical near 63.36 MGD.

Owing to routine maintenance issues, all four screens were operational during 15 of the 20 sampling events. At least three screens were always operational during other events. An intake pump located behind an out of service traveling screen was not operated until the traveling screen was repaired and placed back into service.

5.2 Environmental Parameters

Water quality data were recorded by the field crew during each field sampling event (Table B-2, Appendix B). Surface water temperature ranged from 12.0 to 29.1°C. The pH (standard units) varied from 6.7 to 8.4. Specific conductance ranged from

103.4 to 140.1 uS/cm with the highest measurements recorded at the end of the sampling period. Dissolved oxygen ranged from 6.7 to 9.0 mg/L consistent with inverse response to increasing water temperature. Turbidity ranged from 0 to 6.4 NTUs varying with precipitation.

Regional daily minimum air temperature ranged from -7.6 to 38.1° C based on the Midville, Georgia weather monitoring station (Figure B-1, Appendix B). River stage ranged from 5.9 to 11.7 ft (USGS Waynesboro Gage Station) with a daily mean stage of 6.8 ft. River flow ranged from 3,760 to 16,300 cfs with a daily mean of 4,728 cfs. River stage data exhibited relatively steady flow with seasonal highs in early spring and mid-winter (Figure B-2, Appendix B). Daily precipitation throughout the study period ranged from 0 to 1.9 inches with mean daily rainfall of 0.11 inches (Figure B-3, Appendix B) characteristic of severe drought conditions for the second consecutive year in the region.

Daily impingement rate was statistically regressed against these environmental variables. No significant correlation relationship was found between impingement and trends in air temperature, water temperature, precipitation, or river stage.

6. SUMMARY AND DISCUSSION

The year-long impingement study of Plant Vogtle's make-up water intake structure was conducted bi-weekly by GPC environmental field services staff during March 2008 through February 2009.

No statistically significant relationship was found between variation in rates of pumping, precipitation, diel change or temperature. Sampling events yielding the highest impingement rates appeared to be empirically related to incidences of higher river flow. This may be indicative of increased vulnerability to impingement for certain species via behavioral attributes (increased mobility) along shoreline habitats during those periods.

A total of 168 aquatic organisms were impinged during the study. The sample was comprised of 21 taxa including 19 fish taxa and two decapod crustaceans. Sunfishes were the most abundant group impinged. Spotted sunfish and hogchoker were the most abundant individual species impinged. No organisms were impinged in 16 of the 40 sampling events. Size class data for impinged species indicate that except for gizzard shad, black crappie, taillight shiner and pirate perch, primarily young of the year and juvenile life stages were impinged at Plant Vogtle.

Impinged biomass weighed 985.4 g (~2.2 lbs) and was dominated by the sunfishes with 57.7 percent of the total biomass. A single large specimen of black crappie and gizzard shad accounted for the majority of impingement biomass. Both specimens were noted as being in states of relatively advanced decay indicating those specimens were likely deceased before becoming impinged unlike the vast majority of other specimens collected during the study.

The 2008 study indicates that fish impingement rate at Plant Vogtle's intake is very low. When extrapolated to simulate 365 days of cooling-water withdrawal, annual impingement rate is estimated as 2,580 organisms with a biomass of 33.1 lbs (or 3,229 fish weighing 41.2 lbs at the 95% UCL). When doubled to estimate the potential effect of Units 3&4 in combination with Units 1&2, the annual impingement estimate would be 5,160 fish weighing up to 66.2 lbs (or 6,458 fish weighing up to 82.4 lbs the 95% UCL).

Approximately 84 percent of fish encountered at the intake structure were juvenile life stages (sub-stock size) of relatively common, non-protected species of the type mostly not sought after by anglers. As juveniles, a large portion of fish observed in the sample would otherwise be expected to likely suffer natural mortality effects before reaching maturity in the wild.

To add perspective on the numbers of estimated impingement rate, the adjacent Savannah River Plant (SRP), prior to shutdown of reactors L, K, and P, based on bi-weekly sampling, impinged an average of 2,680 fish per year including 35 species in 1977 and average of 7,603 fish per year including up to 62 species during 1983 -1985 (in Kilgo, et al. 2005; USDOE 1987). This impingement average for SRP's operations was obviously more than the estimated for Plant Vogtle's combined Units 1 through 4. The USDOE report of 1987 concluded that the reported levels of impingement did not appear to have a significant impact on the Savannah River fisheries.

As an example for understanding the level of impact of biomass impingement at Vogtle, SRP reported in its 1992 midyear health physics meeting, that the 1988 angler sport fish harvest from the Savannah River was approximately 152,000 lbs of fish. The Georgia and South Carolina commercial fish catch from the Savannah River for 1989 additionally reported of 12,081 lbs consisting primarily of carp, sturgeon, and catfish. Assuming these numbers to be reasonably representative of recreational and commercial harvest then and since then, any impact from estimated annual impingement at Plant Vogtle Units 1-4 appears at a level that poses no significant consequence to those important components of the Savannah River Fishery or overall.

The SRP report of 1992 further reported no significant changes in aquatic populations that one might reasonably attribute to a cooling water system at Vogtle had

been observed in periodic biological surveys of the river by DOE contractors at the Savannah River Site, the Georgia and South Carolina departments of natural resources, other agencies or universities.

Further, the Savannah River fishery receives management attention from the Georgia Department of Natural Resources (GDNR) which results in an annually-published fishing prospects report. The angling prospects are compiled by fisheries biologists based on river sampling efforts of GDNR, *knowledge of past fishing trends*, angling experience, and information provided by anglers and marina owners. Information in the following narrative was generated from GDNR's 2009 website.

In its Savannah River 2009 fishing prospects report for the Savannah River downstream of the New Savannah Bluff Lock and Dam, GDNR indicated that bluegill and redear sunfish are abundant. Redbreast (sunfish) and other sunfishes also are present, but not as plentiful as bluegill or redear. The largemouth bass population continues to be healthy in this system. Drought conditions have contributed to slightly slower growth rates over the last few years, but good numbers of large fish are still present. Fishing should be good this spring as water temperatures rise and water levels fall. Fishing for catfish is excellent in the Savannah River. White catfish make up the majority of catfish species, but channel catfish tend to be a bit larger. Since 2005, stripers greater than 27 inches have been open to harvest with a daily limit of two per angler. The number of striped bass and the number of legal-size fish have rebounded thanks to the stocking program that began in the 1990s. Twenty-pound striped bass are common and the occasional 40- to 50-pound striper is reported (GDNR, 2009).

To capture these points of perspective in summary, the Savannah River downstream of Augusta appears to sustain among its multiple uses a healthy, desirable fishery in the face of operation of the Vogtle facility since it began operations in the mid-1980's as well as any past effects of cooling water withdrawals from SRP operations during the 1950's through 1980's. The 2008-2009 impingement study indicates that impingement effect at the Plant Vogtle make-up water intake structure is minimal and, when projected in combination with impingement effects from Units 3&4, likely poses no significant impact to the Savannah River fishery in the greater Savannah River system downstream of Augusta or the Middle Savannah Basin.

7. REFERENCES

GDNR. 2009. Georgia Wildlife Resources website for its annual fishing prospects for the Savannah River downstream of the New Savannah Bluff Lock and Dam. <http://www.gofishgeorgia.com/Assets/Documents/fisheries/sav09.pdf>

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GPC. 2008. Entrainment Assessment at the Plant Vogtle Electric Generating Plant, Waynesboro, Georgia. Prepared for Southern Nuclear Operating Company by Georgia Power Company, Atlanta, GA.

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Kilgo, J.C, J.I. Blake, and H.R. Pulliam. 2005. Ecology and Management of a Forested Landscape: Fifty Years on the Savannah River Site. Island Press, ISBN 1597260118, 9781597260114, 479 pp.

Marcy, B.C., D.E. Fletcher, F.D. Martin, M. Paller, and M.J.M. Reichert. 2005. Fishes of the Middle Savannah Basin: with emphasis on the Savannah River Site. The University of Georgia Press. Athens, Georgia.

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APPENDIX A

Field Data Sheet Templates

FIGURE A-1 PLANT VOGTLE IMPINGEMENT MONITORING DATA FORM

Sample Information

Page: _____ of _____

Collector(s): _____

Remarks: _____

12-hour Period (circle)

DAY

NIGHT

Start Date

--

Time		
------	--	--

End Date

--

Time		
------	--	--

Elapsed Time

--	--	--

Plant and CWIS Operating Conditions

	No. Pumps	Pump Flow (gpm)		No. of VTS Operating
Start				
Finish				

Physicochemical parameters:

	River Stage (ft.)
Start	
Finish	

D.O.		mg/L
pH		SU
Cond.		uS/cm
Turbidity		NTU

Water Temperature (°C)	
Start	
Finish	

Location of Measurement: _____

Field Conditions/Other Observations

FIGURE A-3. Vogtle I & E Study Sample Chain Of Custody

Collected by: _____

Sample No.	Integrated Sample ID and Collection Date	Approximate Time of Collection	Preservative	Shipped to taxonomy lab	Archived at GPC Smyrna
		~0000 HRs	5% formalin or 10% formalin Wet Ice	√	√
1	ENLD1A				
2	ENLD2A				
3	ENLDCOMP				
4	ENLN1A				
5	ENLN2A				
6	ENLNCOMP				
7	IMDA				
8	IMNA				
9	SWLD1A				
10	SWLD2A				
11	SWLDCOMP				
12	SWMD1A				
13	SWMD2A				
14	SWMDCOMP				
15	SWRD1A				
16	SWRD2A				
17	SWRDCOMP				
18	SWLN1A				
19	SWLN2A				
20	SWLNCOMP				
21	SWMN1A				
22	SWMN2A				
23	SWMNCOMP				
24	SWRN1A				
25	SWRN2A				
26	SWRNCOMP				
27					
28					
29					
30					

EN = entrainment sample D1 = first day sample C = composited 1st and 2nd day or night samples
 IM = impingement sample N2 = second night sample
 SW = source water sample A = archived 6-hour sample

Relinquished by: _____ Date: _____ Time: _____

Received by: _____ Date: _____ Time: _____

APPENDIX B

Summaries of Operational and Environmental Parameters

Figure B-1
Daily Minimum and Maximum Air Temperatures Recorded at
the Midville, GA, Burke County, Weather Station

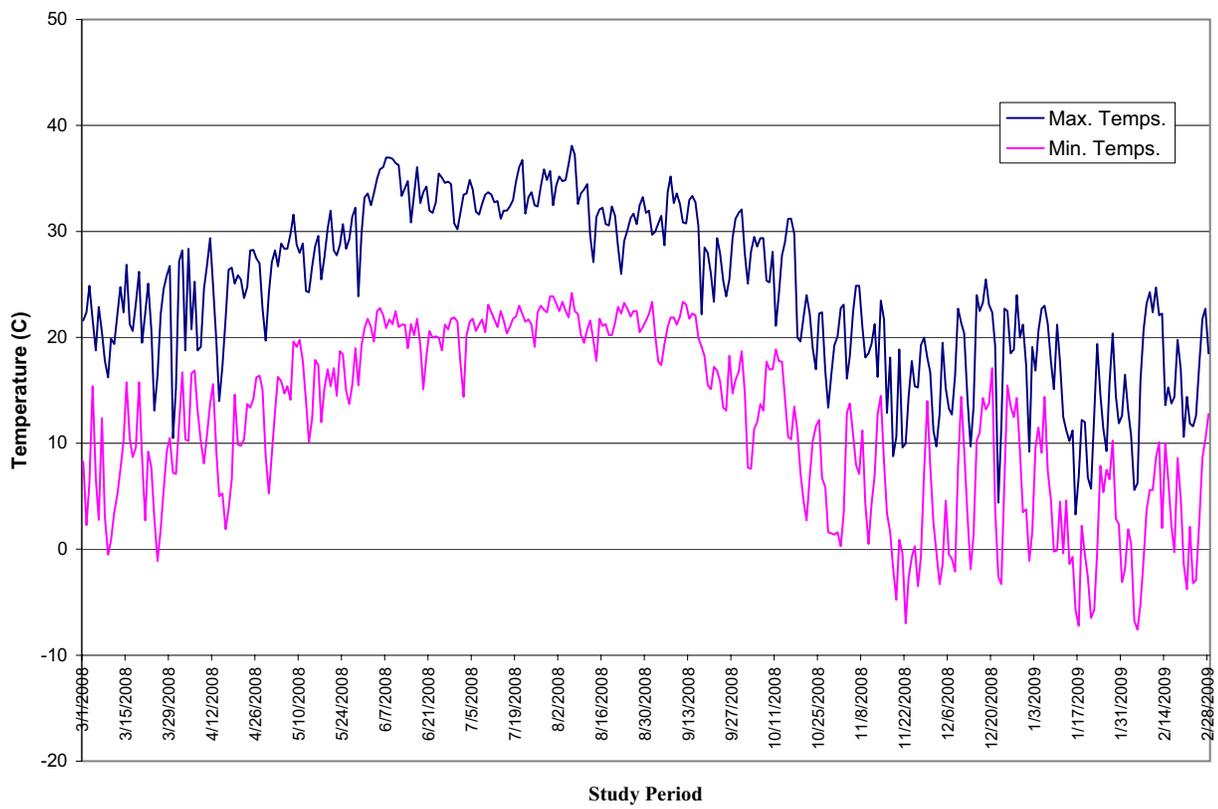


Figure B-2
Savannah River Daily Average
Flow (cfs)

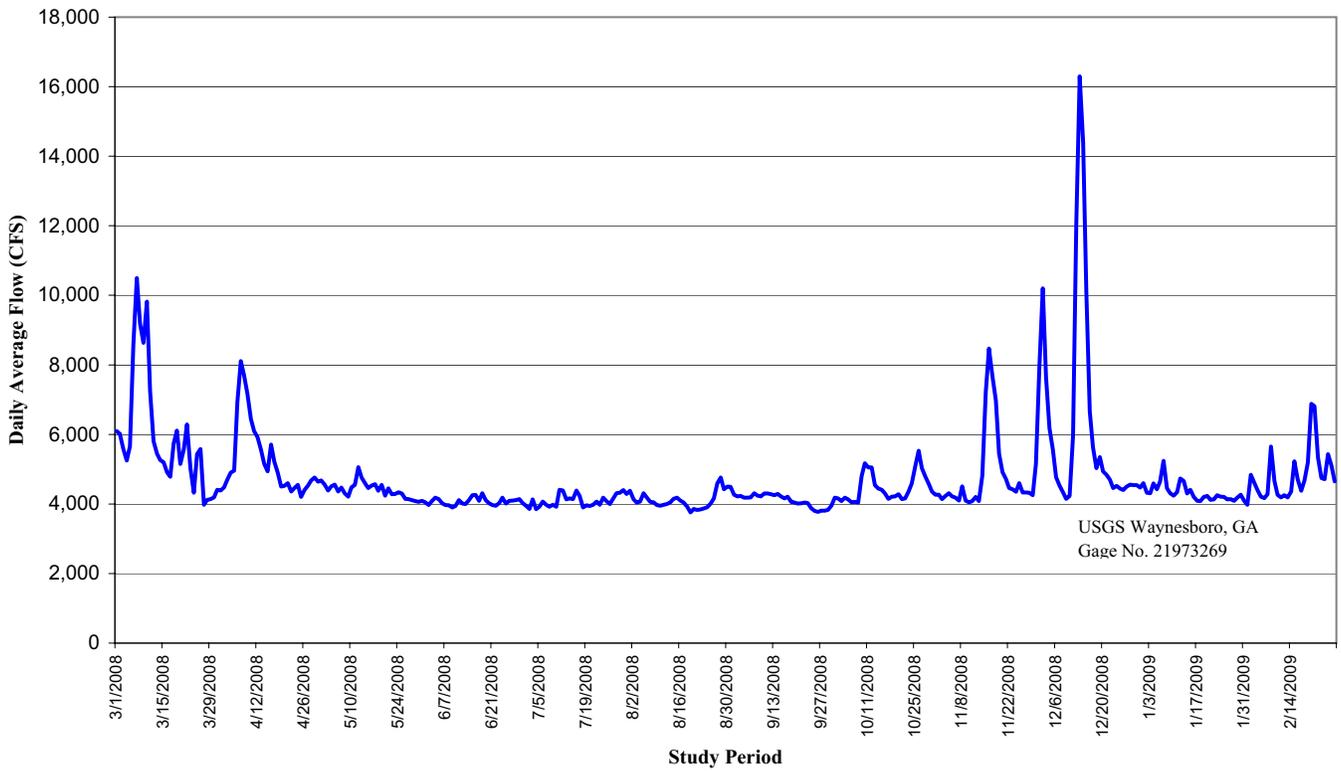


TABLE B-1. SUMMARY OF HALF-MONTHLY MAKE-UP WATER INTAKE PUMPING VOLUMES AT PLANT VOGTLE, MARCH 2008 - FEBRUARY 2009

Sample Period	Daily Average Pump Volume (MGD)¹
early March 2008	61.1
late March 2008	61.4
early April 2008	63.4
late April 2008	63.4
early May 2008	61.9
late May 2008	62.2
early June 2008	64.3
late June 2008	63.4
early July 2008	62.8
late July 2008	70.7
early August 2008	61.4
late August 2008	61.4
early September 2008	69.3
late September 2008	63.4
early October 2008	61.3
late October 2008	61.4
early November 2008	63.4
late November 2008	64.4
early December 2008	62.0
late December 2008	62.0
early January 2009	61.8
late January 2009	60.0
early February 2009	--
late February 2009	--

Notes:

1 = MGD - million gallons per day

* = February data not available at time of report preparation. Pump Volume assumed to equal name-plate rated pumping capacity.

TABLE B-2. SUMMARY OF PHYSICOCHEMICAL WATER QUALITY MEASUREMENTS COLLECTED DURING THE IMPINGEMENT AND ENTRAINMENT STUDY AT PLANT VOGTLE, MARCH 2008 - FEBRUARY 2009

	Event	Mean Water Temperature (°c)	pH (SU)	Conductivity (uS/cm)	Disolved Oxygen (mg/L)	Turbidity (NTU)
Entrainment, Source Water and Impingement Sampling	10-12 March 2008	12.5	7.4	123.0	8.5	--
	17-19 March 2008	15.5	7.0	103.4	8.8	0.8
	8-10 April 2008	17.0	6.7	118.0	8.2	0.8
	22-24 April 2008	18.4	7.1	113.4	9.0	0.0
	6-8 May 2008	22.4	7.2	121.1	7.7	0.0
	20-22 May 2008	22.7	7.1	106.2	7.2	6.4
	10-12 June 2008	28.6	8.0	128.5	7.2	0.0
	24-25 June 2008	27.0	8.2	127.5	7.4	0.0
	15-16 July 2008	26.5	7.2	130.5	6.7	0.3
	29-30 July 2008	27.6	8.4	140.1	6.9	0.0
Impingement Sampling Only	11-12 August 2008	29.1	--	--	--	--
	25-26 August 2008	28.0	--	--	--	--
	9-11 September 2008	27.5	--	--	--	--
	24-25 September 2008	24.0	--	--	--	--
	7-8 October 2008	22.5	--	--	--	--
	22-23 October 2008	18.3	--	--	--	--
	5-6 November 2008	17.3	--	--	--	--
	19-20 November 2008	13.5	--	--	--	--
	3-4 December 20008	12.5	--	--	--	--
	17-18 December 2008	13.0	--	--	--	--
	6-7 January 2009	14.0	--	--	--	--
	21-21 January 2009	12.0	--	--	--	--
	17-18 February 2009	13.0	--	--	--	--
	25-26 February 2009	14.0	--	--	--	--

Monthly Surface Water Withdrawal Report (Raw Water Intake Data)

System Name:		Southern Nuclear Operating Company-Plant Vogtle	
WSD # or SIC #:		SIC 4911	
Month:		March	
Year:		2008	
Send to: Georgia Environmental Protection Division Watershed Protection Branch, SW M&I Unit 4220 International Parkway Suite 101 Atlanta, GA 30354-3902 Phone: (404) 675-1646 Fax: (404) 675-6244 E-mail: surface_water@mail.dnr.state.ga.us			
I certify that all information contained on this form is correct and true to the best of my knowledge.			
 Signature		4-2-8 Date	
Cliff Buck Print Name		Chemistry Manager Title	
contact information for SNC Env. Affairs (205) 992 6387 Phone Number			
(205) 992 6108 Fax Number			
* MG represents millions of gallons. (MG = Gallons / 1,000,000)			
** MGD represents million gallons per day. Average is calculated by dividing total quantity of water withdrawn by the number of days in the calendar month. Average = (Total in MG / Days in month)			

Day of Month	Surface Water		Surface Water		Surface Water		Surface Water	
	Withdrawal Permit #:	Withdrawn (MG)*						
1	017-0191-05	63.36						
2		63.36						
3		63.36						
4		63.36						
5		63.36						
6		63.36						
7		63.36						
8		63.36						
9		63.36						
10		63.36						
11		63.36						
12		63.36						
13		58.83						
14		63.07						
15		63.36						
16		63.36						
17		63.36						
18		63.36						
19		63.36						
20		63.36						
21		63.36						
22		63.36						
23		63.36						
24		63.36						
25		63.36						
26		63.36						
27		63.36						
28		63.36						
29		63.36						
30		63.36						
31		63.36						
Total (MG)*		1959.34						
Average (MGD)**		63.20						
Max Day (MG)*		63.36						

Submit data for each Surface Water Withdrawal Permit. Permits that were not used must still be reported by inputting zero's for each day.

Monthly Surface Water Withdrawal Report (Raw Water Intake Data)

System Name:		Southern Nuclear Operating Company-Plant Vogtle	
WSID # or SIC #:		SIC 4911	
Month:		April	
Year:		2008	
Send to: Georgia Environmental Protection Division			
Watershed Protection Branch, SW M&I Unit			
4220 International Parkway			
Suite 101			
Atlanta, GA 30354-3902			
Phone: (404) 675-1646			
Fax: (404) 675-6244			
E-mail: surface_water@mail.dnr.state.ga.us			
I certify that all information contained on this form is correct and true to the best of my knowledge.			
Signature		Date	
<i>for</i>		5-2-08	
<i>for</i>		Cliff Buck	
Cliff Buck		Print Name	
Chemistry Manager			
Title			
contact information for SNC Env. Affairs			
(205) 992 - 6387		Phone Number	
(205) 992 - 6108		Fax Number	
*: MG represents millions of gallons.			
(MG = Gallons / 1,000,000)			
**: MGD represents million gallons per day.			
Average is calculated by dividing total quantity of water withdrawn by the number of days in the calendar month.			
Average = (Total in MG / Days in month)			

Report all Values in Millions of Gallons (Gallons/1,000,000)	Surface Water									
	Withdrawal Permit #:									
017-0191-05										
Water Source:	Savannah River									
Day of Month	Withdrawn (MG)*									
1	63.36									
2	63.36									
3	63.36									
4	63.36									
5	63.36									
6	63.36									
7	63.36									
8	63.36									
9	63.36									
10	63.36									
11	63.36									
12	63.36									
13	63.36									
14	63.36									
15	63.36									
16	63.36									
17	63.36									
18	63.36									
19	63.36									
20	63.36									
21	63.36									
22	63.36									
23	63.36									
24	63.36									
25	63.36									
26	63.36									
27	63.36									
28	63.36									
29	63.36									
30	63.36									
Total (MG)*	1900.8									
Average (MGD)**	63.36									
Max Day (MG)*	63.36									

Submit data for each Surface Water Withdrawal Permit. Permits that were not used must still be reported by inputting zero's for each day.

Monthly Surface Water Withdrawal Report (Raw Water Intake Data)

Report all Values in Millions of Gallons (Gallons / 1,000,000)	Surface Water Withdrawal Permit #: 017-0191-05	Surface Water Withdrawal Permit #:			
	Water Source: Savannah River	Water Source:	Water Source:	Water Source:	Water Source:
Day of Month	Withdrawn (MG)*	Withdrawn (MG)*	Withdrawn (MG)*	Withdrawn (MG)*	Withdrawn (MG)*
1	63.36				
2	63.36				
3	63.36				
4	63.36				
5	63.36				
6	63.36				
7	71.24				
8	63.36				
9	63.36				
10	63.36				
11	63.36				
12	63.36				
13	63.36				
14	63.36				
15	63.36				
16	63.36				
17	63.36				
18	63.36				
19	63.36				
20	63.36				
21	63.36				
22	63.36				
23	63.36				
24	76.89				
25	63.36				
26	63.36				
27	63.36				
28	63.36				
29	63.36				
30	63.36				
31	63.36				
Total (MG)*	1985.57				
Average (MGD)**	64.05				
Max Day (MG)*	76.89				
Submit data for each Surface Water Withdrawal Permit. Permits that were not used must still be reported by inputting zero's for each day.					

System Name:
Southern Nuclear Operating Company-Plant Vogtle

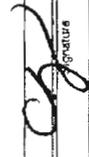
WSID # or SIC #: **SIC 4911**

Month: **May**

Year: **2008**

Send to: Georgia Environmental Protection Division
Watershed Protection Branch, SW M&I Unit
4220 International Parkway
Suite 101
Atlanta, GA 30354-3902
Phone: (404) 675-1646
Fax: (404) 675-6244
E-mail: surface_water@mail.dnr.state.ga.us

I certify that all information contained on this form is correct and true to the best of my knowledge.


Signature
Date: **6-6-08**

Cliff Buck
Print Name

Chemistry Manager
Title

contact information for SNC Env. Affairs
(205) 992 6987
Phone Number

(205) 992 6108
Fax Number

*: MG represents millions of gallons.
(MG = Gallons / 1,000,000)

** : MGD represents million gallons per day.
Average is calculated by dividing total quantity of water withdrawn by the number of days in the calendar month.

Average = (Total in MG / Days in month)

Monthly Surface Water Withdrawal Report (Raw Water Intake Data)

Report all Values in Millions of Gallons (Gallons/1,000,000)	Surface Water Withdrawal Permit #:						
	017-0191-05						
	Water Source: Savannah River	Water Source:					
Day of Month	Withdrawn (MG)*						
1	63.36						
2	63.36						
3	63.36						
4	66.40						
5	73.30						
6	64.06						
7	63.36						
8	63.36						
9	63.36						
10	63.36						
11	63.36						
12	63.36						
13	63.36						
14	63.36						
15	63.36						
16	63.36						
17	63.36						
18	63.36						
19	63.36						
20	63.36						
21	63.36						
22	63.36						
23	63.36						
24	63.36						
25	63.36						
26	63.36						
27	63.36						
28	63.36						
29	63.36						
30	63.36						
Total (MG)*	1914.48						
Average (MGD)**	63.82						
Max Day (MG)*	73.30						

System Name: Southern Nuclear Operating Company-Plant Vogtle	
WSD # or SIC #:	SIC 4911
Month:	June
Year:	2008
Send to: Georgia Environmental Protection Division Watershed Protection Branch, SW M&I Unit 4220 International Parkway Suite 101 Atlanta, GA 30354-3902 Phone: (404) 675-1646 Fax: (404) 675-6244 E-mail: surface_water@mail.dnr.state.ga.us	
I certify that all information contained on this form is correct and true to the best of my knowledge.	
 Signature: Stan Vorhies for Cliff Beck Date: 7-10-08 Print Name: Cliff Beck	
Chemistry Manager Title	
contact information for SNC Env. Affairs (205) 992 6387 Phone Number (205) 992 6108 Fax Number	
* MG represents millions of gallons. (MG = Gallons / 1,000,000)	
** MGD represents million gallons per day. Average is calculated by dividing total quantity of water withdrawn by the number of days in the calendar month. Average = (Total in MG / Days in month)	

Submit data for each Surface Water Withdrawal Permit. Permits that were not used must still be reported by inputting zero's for each day.

Monthly Surface Water Withdrawal Report (Raw Water Intake Data)

Report all Values in Millions of Gallons (Gallons/1,000,000)	Surface Water		System Name:									
	Withdrawal Permit #:	Withdrawn (MG)*	Southern Nuclear Operating Company-Plant Vogtle									
	017-0191-05										W/SID # or	SIC 4911
	Water Source:		Water Source:		Water Source:		Water Source:		Water Source:		SIC #:	
	Savannah River										Month:	July
Day of Month	Withdrawn (MG)*	Withdrawn (MG)*	Year:	2008								
1	63.36											
2	63.36											
3	63.36											
4	63.36											
5	63.36											
6	63.36											
7	63.36											
8	63.36											
9	63.36											
10	63.36											
11	73.15											
12	63.36											
13	63.36											
14	75.61											
15	63.36											
16	63.36											
17	63.36											
18	63.36											
19	75.35											
20	74.76											
21	70.62											
22	75.94											
23	75.31											
24	75.39											
25	71.04											
26	71.70											
27	76.47											
28	72.20											
29	76.27											
30	63.36											
31	63.36											
Total (MG)*		2104.29										
Average (MGD)**		67.88										
Max Day (MG)*		76.47										

I certify that all information contained on this form is correct and true to the best of my knowledge.



 Signature: Cliff Buck Date: 8/5/08

Title: Chemistry Manager

contact information for SNC Env. Affairs
 Phone Number: (205) 992 6387
 Fax Number: (205) 992 6108

*: MG represents millions of gallons.
 (MG = Gallons / 1,000,000)

** : MGD represents million gallons per day.
 Average is calculated by dividing total quantity of water withdrawn by the number of days in the calendar month.

Average = (Total in MG / Days in month)

Submit data for each Surface Water Withdrawal Permit. Permits that were not used must still be reported by inputting zero's for each day.

Monthly Surface Water Withdrawal Report (Raw Water Intake Data)

System Name:		Southern Nuclear Operating Company-Plant Vogtle	
WISD # or SIC #:		SIC 4911	
Month:		August	
Year:		2008	
Send to: Georgia Environmental Protection Division			
Watershed Protection Branch, SW M&I Unit			
4220 International Parkway			
Suite 101			
Atlanta, GA 30354-3902			
Phone: (404) 675-1648			
Fax: (404) 675-6244			
E-mail: surface_water@mail.dnr.state.ga.us			
I certify that all information contained on this form is correct and true to the best of my knowledge.			
 Signature		9/3/08 Date	
C.H. Bluck Print Name		Chemistry Manager Title	
contact information for SNC Env. Affairs			
(205) 992 - 6387 Phone Number		(205) 992 - 6108 Fax Number	
* MG represents millions of gallons. (MG = Gallons / 1,000,000)			
** MGD represents million gallons per day. Average is calculated by dividing total quantity of water withdrawn by the number of days in the calendar month.			
Average = (Total in MG / Days in month)			

Report all Values in Millions of Gallons (Gallons/1,000,000)	Surface Water		Surface Water		Surface Water		Surface Water	
	Withdrawal Permit #:	Withdrawn (MG)*						
017-0191-05								
Water Source:			Water Source:		Water Source:		Water Source:	
Savannah River								
Day of Month	Withdrawn (MG)*	Withdrawn (MG)*						
1	63.51							
2	63.36							
3	63.36							
4	63.36							
5	63.36							
6	63.36							
7	63.36							
8	63.36							
9	71.39							
10	63.36							
11	69.94							
12	75.24							
13	64.04							
14	63.36							
15	63.36							
16	63.36							
17	63.36							
18	63.40							
19	63.36							
20	73.50							
21	63.47							
22	63.36							
23	63.45							
24	63.36							
25	72.71							
26	70.71							
27	63.36							
28	63.45							
29	63.36							
30	72.20							
31	63.36							
Total (MG)*	2027.49							
Average (MGD)**	65.40							
Max Day (MG)*	75.24							
Submit data for each Surface Water Withdrawal Permit. Permits that were not used must still be reported by inputting zero's for each day.								

Monthly Surface Water Withdrawal Report (Raw Water Intake Data)

Report all Values in Millions of Gallons (Gallons/1,000,000)	Surface Water		System Name:									
	Withdrawal Permit #:	Withdrawn (MG)*	Southern Nuclear Operating Company-Plant Vogtle									
	017-0191-05										WSID # or SIC #:	SIC 4911
	Water Source:		Water Source:		Water Source:		Water Source:		Water Source:		Month:	September
	Savannah River										Year:	2008
Day of Month	Withdrawn (MG)*	Withdrawn (MG)*	Send to: Georgia Environmental Protection Division Watershed Protection Branch, SW M&I Unit 4220 International Parkway Suite 101 Atlanta, GA 30354-3902 Phone: (404) 675-1646 Fax: (404) 675-6244 E-mail: surface_water@mail.dnr.state.ga.us									
1	63.36										I certify that all information contained on this form is correct and true to the best of my knowledge.	
2	63.36											
3	76.36											
4	76.80											
5	63.36											
6	72.82											
7	63.40											
8	68.60											
9	63.36											
10	75.17											
11	73.48											
12	77.04											
13	75.31											
14	63.36											
15	63.36											
16	63.36											
17	63.36											
18	63.36											
19	63.36											
20	63.36											
21	63.36											
22	63.36											
23	63.36											
24	63.36											
25	63.36											
26	63.36											
27	63.36											
28	63.36											
29	63.36											
30	63.36											
Total (MG)*	1989.54										* MG represents millions of gallons. (MG = Gallons / 1,000,000)	
Average (MGD)**	66.32										** MGD represents million gallons per day. Average is calculated by dividing total quantity of water withdrawn by the number of days in the calendar month.	
Max Day (MG)*	77.04										Average = (Total in MG / Days in month)	
Submit data for each Surface Water Withdrawal Permit. Permits that were not used must still be reported by inputting zero's for each day.												



 Signature
 Cliff Buck
 Print Name
 Chemistry Manager
 Title
 contact information for SNC Env. Affairs
 (295) 992 6387
 Phone Number
 (205) 992 6108
 Fax Number

Monthly Surface Water Withdrawal Report (Raw Water Intake Data)

Report all Values in Millions of Gallons (Gallons/1,000,000)	Surface Water Withdrawal Permit #:						
	017-0191-05						
	Water Source: Savannah River	Water Source:					
Day of Month	Withdrawn (MG)*						
1	63.36						
2	63.36						
3	63.36						
4	63.36						
5	63.36						
6	62.77						
7	63.36						
8	63.36						
9	63.36						
10	63.36						
11	63.36						
12	63.36						
13	63.36						
14	63.36						
15	63.36						
16	63.36						
17	63.36						
18	63.36						
19	63.36						
20	63.36						
21	63.36						
22	63.36						
23	63.36						
24	63.36						
25	63.36						
26	63.36						
27	63.38						
28	63.36						
29	63.36						
30	63.36						
31	63.36						
Total (MG)*	1963.59						
Average (MGD)**	63.34						
Max Day (MG)*	63.38						

System Name:	Southern Nuclear Operating Company-Plant Vogtle
WSID # or SIC #:	SIC 4911
Month:	October
Year:	2008
Send to:	Georgia Environmental Protection Division Watershed Protection Branch, SW M&I Unit 4220 International Parkway Suite 101 Atlanta, GA 30354-3902 Phone: (404) 675-1646 Fax: (404) 675-6244 E-mail: surface_water@mail.dnr.state.ga.us
I certify that all information contained on this form is correct and true to the best of my knowledge.	
Signature	
Print Name	Cliff Buck
Title	Chemistry Manager
contact information for SNC Env. Affairs	(205) 992 6387 Phone Number
	(205) 992 6109 Fax Number
* MG represents millions of gallons. (MG = Gallons / 1,000,000)	
** MGD represents million gallons per day. Average is calculated by dividing total quantity of water withdrawn by the number of days in the calendar month. Average = (Total in MG / Days in month)	

Submit data for each Surface Water Withdrawal Permit. Permits that were not used must still be reported by inputting zero's for each day.

Monthly Surface Water Withdrawal Report (Raw Water Intake Data)

Report all Values in Millions of Gallons (Gallons/1,000,000)	Surface Water Withdrawal Permit #:						
	017-0191-05						
	Water Source: Savannah River	Water Source:					
Day of Month	Withdrawn (MG)*						
1	63.36						
2	63.36						
3	63.36						
4	63.36						
5	63.36						
6	63.36						
7	63.36						
8	63.36						
9	63.36						
10	63.36						
11	63.36						
12	63.36						
13	63.36						
14	63.36						
15	63.36						
16	63.36						
17	63.38						
18	63.36						
19	63.36						
20	63.36						
21	63.36						
22	63.36						
23	63.36						
24	63.45						
25	63.36						
26	71.94						
27	64.33						
28	69.48						
29	63.36						
30	63.36						
Total (MG)*		1916.58					
Average (MGD)**		63.89					
Max Day (MG)*		71.94					
Submit data for each Surface Water Withdrawal Permit. Permits that were not used must still be reported by inputting zero's for each day.							

System Name: Southern Nuclear Operating Company-Plant Vogtle	
WSID # or SIC #:	SIC 4911
Month:	November
Year:	2008
Send to: Georgia Environmental Protection Division Watershed Protection Branch, SW M&I Unit 4220 International Parkway Suite 101 Atlanta, GA 30354-3902 Phone: (404) 675-1646 Fax: (404) 675-6244 E-mail: surface_water@mail.dnr.state.ga.us	
I certify that all information contained on this form is correct and true to the best of my knowledge.	
 Signature: _____ Date: 12/4/08	
Cliff Buck Plant Name	
Chemistry Manager Title	
contact information for SNC Env. Affairs (205) 992-6387 Phone Number Fax Number	
(205) 992-6108 Fax Number	
* MG represents millions of gallons. (MG = Gallons / 1,000,000)	
** MGD represents million gallons per day. Average is calculated by dividing total quantity of water withdrawn by the number of days in the calendar month. Average = (Total in MG / Days in month)	

Monthly Surface Water Withdrawal Report (Raw Water Intake Data)

System Name:		Southern Nuclear Operating Company-Plant Vogtle	
WSID # or SIC #:		SIC 4911	
Month:		December	
Year:		2008	
Send to: Georgia Environmental Protection Division			
Watershed Protection Branch, SW M&I Unit			
4220 International Parkway			
Suite 101			
Atlanta, GA 30354-3902			
Phone: (404) 675-1646			
Fax: (404) 675-6244			
E-mail: surface_water@mail.dnr.state.ga.us			
I certify that all information contained on this form is correct and true to the best of my knowledge.			
Signature		Date	
		1-2-2009	
Cliff Buck		Title	
Prim Name		Chemistry Manager	
contact information for SNC Env. Affairs			
Phone Number		Fax Number	
(205) 992 - 6387		(205) 992 - 6108	
* MG represents millions of gallons. (MG = Gallons / 1,000,000)			
** MGD represents million gallons per day. Average is calculated by dividing total quantity of water withdrawn by the number of days in the calendar month.			
Average = (Total in MG / Days in month)			

Day of Month	Surface Water		Surface Water		Surface Water		Surface Water	
	Withdrawal Permit #:	Withdrawn (MG)*						
1	017-0191-05	63.36						
2		63.36						
3		63.36						
4		63.36						
5		63.36						
6		63.36						
7		63.36						
8		63.36						
9		63.36						
10		63.36						
11		63.36						
12		66.35						
13		70.25						
14		63.36						
15		63.43						
16		63.36						
17		63.36						
18		63.36						
19		63.36						
20		63.36						
21		63.36						
22		63.40						
23		63.36						
24		63.36						
25		63.36						
26		63.36						
27		63.36						
28		63.36						
29		73.37						
30		63.36						
31		63.36						
Total (MG)*		1984.16						
Average (MGD)**		64.01						
Max Day (MG)*		73.37						

Submit data for each Surface Water Withdrawal Permit. Permits that were not used must still be reported by inputting zero's for each day.

Monthly Surface Water Withdrawal Report (Raw Water Intake Data)

Report all Values in Millions of Gallons (Gallons/1,000,000)	Surface Water Withdrawal Permit #:						
	017-0191-05						
	Water Source: Savannah River	Water Source:					
Day of Month	Withdrawn (MG)*						
1	63.36						
2	63.36						
3	63.36						
4	63.40						
5	63.36						
6	63.36						
7	63.36						
8	69.92						
9	63.36						
10	63.36						
11	63.36						
12	63.36						
13	63.36						
14	63.36						
15	63.36						
16	63.36						
17	63.36						
18	63.36						
19	63.45						
20	63.36						
21	63.36						
22	63.36						
23	72.84						
24	63.36						
25	63.36						
26	63.36						
27	63.36						
28	63.36						
29	63.36						
30	63.36						
31	63.36						
Total (MG)*	1980.33						
Average (MGD)**	63.88						
Max Day (MG)*	72.84						

System Name: Southern Nuclear Operating Company-Plant Vogtle

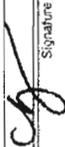
WSD # or SIC #: SIC 4911

Month: January

Year: 2009

Send to: Georgia Environmental Protection Division
 Watershed Protection Branch, SW M&I Unit
 4220 International Parkway
 Suite 101
 Atlanta, GA 30354-3902
 Phone: (404) 675-1646
 Fax: (404) 675-6244
 E-mail: surface_water@mail.dnr.state.ga.us

I certify that all information contained on this form is correct and true to the best of my knowledge.

 Signature 2-5-09 Date

Cliff Buckley
 Plant Name

Chemistry Manager
 Title

contact information for SMC Env. Affairs
 (205) 992 6387 Phone Number
 (205) 992 6109 Fax Number

* MG represents millions of gallons.
 (MG = Gallons / 1,000,000)

** MGD represents million gallons per day.
 Average is calculated by dividing total quantity of water withdrawn by the number of days in the calendar month.

Average = (Total in MG / Days in month)

Submit data for each Surface Water Withdrawal Permit. Permits that were not used must still be reported by inputting zero's for each day.

APPENDIX C

Impingement Sampling Results

**TABLE C-3. LENGTH CHARACTERISTICS OF ORGANISMS
IMPINGED AT THE PLANT VOGTLE INTAKE, MARCH 2008 -
FEBRUARY 2009**

Species	Number (N)	Total Length (mm)		
		Minimum	Average	Maximum
bannerfin shiner	1	57	57	57
black crappie	2	62	136.5	211
blackbanded darter	3	57	65.3	77
bluegill	12	25	38.9	53
bluespotted sunfish	2	30	34	38
chain pickerel	1	55	55	55
brushnose crayfish	11	33	53.3	78
dollar sunfish	1	82	82	82
flat bullhead	1	46	46	46
gizzard shad	2	234	268.5	303
hogchoker	18	32	72.7	106
pirate perch	6	28	49.8	68
redbreast sunfish	11	31	48.9	82
shore shrimp	3	38	39.0	40
snail bullhead	6	50	63.7	80
speckled madtom	2	27	33	39
spotted sunfish	64	17	38.3	63
taillight shiner	1	38	38	38
threadfin shad	2	114	120.5	127
warmouth	5	30	56.4	87
white catfish	14	28	51.9	78

Means

53.0	69.0	86.1
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**TABLE C-4. ANNUAL IMPINGEMENT AT PLANT VOGTLE, DATA COLLECTED
PLANT VOGTLE INTAKE DURING MARCH 2008 - FEBRUARY 2009**

Common Name	Annual Impingement		Actual Number of Organisms Impinged, Mar 08 - Feb 09
	Cumulative Estimate	Upper Confidence Limit (1)	
bannerfin shiner	15	19	1
black crappie	31	38	2
blackbanded darter	46	58	3
bluegill	184	231	12
bluespotted sunfish	31	38	2
chain pickerel	15	19	1
brushnose crayfish	169	211	11
dollar sunfish	15	19	1
flat bullhead	15	19	1
gizzard shad	31	38	2
hogchoker	276	346	18
pirate perch	92	115	6
redbreast sunfish	169	211	11
shore shrimp	46	58	3
snail bullhead	92	115	6
speckled madtom	31	38	2
spotted sunfish	983	1,230	64
taillight shiner	15	19	1
threadfin shad	31	38	2
warmouth	77	96	5
white catfish	215	269	14
TOTAL	2,580	3,229	168

Notes:

1 = 95% UCL calculated based on mean bi-monthly impingement rate.

Confidence limit for each species is estimated using relative abundance percentages applied to the actual 95% UCL.

TABLE C-5. ANNUAL IMPINGEMENT BIOMASS (grams) BASED ON DATA COLLECTED AT THE PLANT VOGTLE INTAKE DURING MARCH 2008 - FEBRUARY 2009

Common Name	Annual Biomass (g) Impingement		Actual Impinged Biomass (g)	Relative Abundance of Impinged Biomass
	Cumulative Estimate	Upper Confidence Limit (1)		
bannerfin shiner	20	25	1	0.1%
black crappie	4,319	5,372	283	28.7%
blackbanded darter	110	137	7	0.7%
bluegill	143	178	9	1.0%
bluespotted sunfish	21	27	1	0.1%
chain pickerel	18	23	1	0.1%
brushnose crayfish	483	601	32	3.2%
dollar sunfish	160	199	11	1.1%
flat bullhead	11	13	1	0.1%
gizzard shad	3,946	4,908	259	26.3%
hogchoker	2,832	3,523	186	18.8%
pirate perch	181	226	12	1.2%
redbreast sunfish	398	495	26	2.6%
shore shrimp	11	14	1	0.1%
snail bullhead	282	351	19	1.9%
speckled madtom	15	19	1	0.1%
spotted sunfish	969	1,206	64	6.4%
taillight shiner	8	9	1	0.1%
threadfin shad	442	550	29	2.9%
warmouth	300	374	20	2.0%
white catfish	356	443	23	2.4%
TOTAL	15,028	18,692	985.4	

Note:

Notes:

1 = 95% UCL calculated based on bi-monthly mean impingement rate.

Confidence limit for each species estimated using relative abundance percentages applied to the 95% UCL.