Comment number	Comments	Responses

STATEMENT OF JACK E. RAVAN

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IV
345 Courtland Street
Atlanta, Georgia 30365

June 12, 1986

4 PM - EA/HJM

Mr. R. L. Morgan
Department of Energy
Savannah River Operations Office
P.O. Box A
Aiken, South Carolina 29802

SUBJECT: DEIS for Alternative Cooling Water Systems, Savannah River Plant, Aiken, South Carolina

Dear Mr. Morgan:

Pursuant to our responsibilities under Section 309 of the Clean Air Act (CAA) and the National Environmental Policy Act (NEPA), the Environmental Protection Agency (EPA) has reviewed the Draft Environmental Impact Statement (DEIS) for Alternative Cooling Water Systems at the Savannah River Plant, Aiken, South Carolina. Our review has concentrated on the potential environmental impacts on water and air quality, wetlands, aquatic habitat and radiological considerations of the proposed alternatives. The purpose of the DEIS document is to assess the relative impacts of various alternative ways to comply with the discharge temperature limitations for the on-site streams. The document covers the discharge from the C-Reactor, the K-Reactor and the D-Area coal-fired power plant.

Table J-2. DOE responses to comments on Draft EIS (continued)

Comment number	Comments	Responses
	For both of the reactors, two primary alternatives are proposed: once-through cooling (subsequently referred to as "helper cooling" herein) and recirculating cooling (referred to as "closed-cycle cooling" herein. For the D-Area power plant, direct discharge to the Savannah River and increased flow with continued discharge to Beaver Dam Creek were the alternatives considered. Although all the proposed action alternatives are a major improvement over existing conditions, our review has identified several areas of major concern which must be addressed in the Final Environmental Impact Statement (FEIS) before an alternative can be selected. In formulating our comments we have met with the SRP staff on two occasions to discuss our concerns and have coordinated our review with the South Carolina Department of Health and Environmental Control (SCDHEC) and the U.S. Fish and Wildlife Service (USFWS).	
BC-1	Should DOE continue to prefer an alternative cooling technology which would require a 316 variance, the FEIS should present predictive biological data which demonstrates a reasonable probability that Section 316 requirements can be achieved. Prior to implementation of a cooling alternative, it will be necessary for DOE to assure that the system will achieve compliance with water quality standards requirements or to obtain a variance to those standards under Section 316(a) of the Clean Water Act.	See response to comment BB-3.

Table J-2. DOE responses to comments on Draft EIS (continued)

Comment number	Comments	Responses
	A summary of additional areas of concern follow (a more complete discussion is contained in the attached "Detailed Comments").	
	• The high sedimentation levels and the resultant stream delta growth expected from the helper cooling alternative would continue to adversely impact vegetated wetlands and aquatic habitat.	
	• The requirements for biocides and corrosion inhibitors for the cooling system alternatives and their potential impacts on the aquatic community were not addressed in adequate detail in the DEIS.	
	<u>Conclusions</u>	
	EPA's review of the DEIS has identified a number of major environmental concerns which need to be addressed in the FEIS before a final alternative can be selected for implementation. These concerns relate directly to the alternatives ability to meet water quality standards or obtain a variance under Section 316(a), and thus be environmentally acceptable and permitable. To provide a technical basis for resolving our concerns additional information should be provided in the FEIS for a number of areas including:	
BC-2	• Predictive biological data for alternatives requiring a 316(a) variance;	See response to comments BB-3 and BB-5.
BC-3	• The results of the proposed Habitat Evaluation Procedure (HEP);	A HEP analysis was conducted for the habitats of the receiving streams. The results of this analysis are presented in Chapter 4 and Appendix C; the complete report is available at DOE Public Reading Rooms in Aiken, South Carolina, and Washington, D.C.

Table J-2. DOE responses to comments on Draft EIS (continued)

Comment number	Comments	Responses
BC-6	• A present worth analysis of the considered alternatives to provide a common basis for comparing capital, operating and production costs.	Costs in the draft EIS were based on preliminary engineering information used for the alternatives listed on pages 2-43 and 2-50 of the draft EIS. Revised costs shown below reflect additional engineering studies; they are also included in Comparison of Alternatives (Section 2.3) of the FEIS. For the conceptual designs evaluated, the estimated production loss for a once-through cooling water system is about 0.2 percent, and that for a recirculation system is about 3.7 percent. Present worth was calculated using the following parameters: 15 year life; 10 percent discount rate; 6.2 percent escalation; power cost $47.50/MW-hr.; and reactor cost $300,000/day. A 15 year life is assumed for the current reactors. For recirculating cooling water systems the costs include the decrease in electricity use (i.e., a savings) because much less water is pumped from the river. <u>C-AREA</u> • <u>Gravity Flow Mechanical Draft, once-through system</u> – Present worth excluding production losses $60,300,000 – Present worth including production losses $64,300,000 • <u>Pumped Flow Mechanical Draft, once-through system</u> – Present worth excluding production losses $81,400,000 – Present worth including production losses $86,000,000

Table J-2. DOE responses to comments on Draft EIS (continued)

Comment number	Comments	Responses
BC-4	• Further assurances that the cooling tower design will be able to achieve the projected discharge temperatures;	Cooling-tower performance and sizing calculations were based on once-through operations. The temperatures of water directed from an SRP reactor into a cooling tower is much higher than for steam-electric generating plants. Therefore, Du Pont employed a cooling-tower consultant and contacted cooling-tower vendors to discuss sizing and performance of potential towers for the SRP's unusually high inlet temperature with low approach temperature. In addition, the specification for production losses were "less than 10 percent" for a once-through system and "approximately 4 percent" for a recirculating system. The request for bids from cooling-tower vendors is based on a performance specification. It is the vendor's responsibility to design and build a tower that will meet or exceed the performance specifications. The contract with the successful bidder will include liquidated damages for failure of the tower to meet the performance specified. Based on current information and planned contract negotiations. Du Pont is confident the cooling towers will operate as stated in the EIS.
BC-5	• A more in-depth evaluation of water chemistry requirements (biocides and corrosion inhibitors) and their possible air and water quality impacts; and	See response to comments BB-1 and BB-2.

Table J-2. DOE responses to comments on Draft EIS (continued)

Comment number	Comments	Responses

- <u>Pumped Flow Mechanical Draft, recirculating system</u>
  - Present worth excluding production losses $65,800,000
  - Present worth including production losses $97,600,000

<u>K-AREA</u>

- <u>Gravity Flow Mechanical Draft, once-through system</u>
  - Present worth excluding production losses $59,000,000
  - Present worth including production losses $63,300,000
- <u>Pumped Flow Mechanical Draft, once-through</u>
  - Present worth excluding production losses $80,400,000
  - Present worth including production losses $86,000,000
- <u>Pumped Flow Mechanical Draft, recirculating</u>
  - Present worth excluding production losses $65,800,000
  - Present worth including production losses $97,600,000

Although estimated costs for gravity-flow, once-through natural draft towers were not shown in the draft EIS, the estimates since developed are:

Table J-2. DOE responses to comments on Draft EIS (continued)

Comment number	Comments	Responses
		<u>C-AREA</u> • <u>Gravity Flow Natural Draft, once-through system</u> – Present worth excluding production losses $42,400,000 – Present worth including production losses $44,000,000 <u>K-AREA</u> • <u>Gravity Flow Natural Draft, once-through system</u> – Present worth excluding production losses $41,400,000 – Present worth including production losses $43,000,000 Below are estimated costs for a gravity flow natural draft tower with pumped feed to a mechanical draft tower in a recirculating mode that was developed after the draft EIS was completed and is explained in greater detail in Chapter 2 of this Final EIS: <u>C- and K-AREAS</u> • <u>Recirculating System</u> – Present worth excluding Production losses 58,000,000 – Present worth including Production losses $89,800,000

Comment number	Comments	Responses
	This additional information is important in assessing the impact of the proposed alternatives on the natural environment for the expected life of the project. In addition, EPA feels strongly that the NEPA process is the appropriate means of identifying and addressing any major permitting issues such as the Section 316(a) variance question. Only in this manner can an alternative be selected that both addresses environmental impacts and can successfully achieve permit requirements. Based on our review, EPA rates the Draft Environmental Impact Statement for the Alternative Cooling Water Systems an EO-2 (i.e, significant issues have been identified relative to the preferred alternative being able to meet water quality standards thermal criteria, which may require substantial modification of the alternative or consideration of other alternatives). Also, as discussed above, the FEIS should contain the additional requested information as well as addressing the DEIS comments. My staff will be available to meet with DOE, SCDHEC and USFWS in order to assist in further defining the needed studies and data. We appreciate the additional time you have given us to comment on the DEIS. We hope that through the on-going close cooperation with DOE the environmental concerns can be successfully resolved and the most acceptable	

Table J-2. DOE responses to comments on Draft EIS (continued)

Comment number	Comments	Responses
	alternative can be identified. The primary EPA point of contact for this project is Heinz J. Mueller, (FTS) 257-7901 or (404) 347-7901. Sincerely yours, Jack E. Ravan Regional Administrator Enclosure cc: See attached cc: Mr. James A. Joy, III Director of Industrial and Agricultural Wastewater Management Division South Carolina Department of Health and Environmental Control Columbia, S.C. 29201 Mr. Roger Banks, Field Supervisor Ecological Services U.S. Fish and Wildlife Service 217 Ft. Johnson Road Charleston, S.C. 29412 ATTN: Mr. Prescott Brownell	

Table J-2. DOE responses to comments on Draft EIS (continued)

Comment number	Comments	Responses
	DETAILED COMMENTS FOR ALTERNATIVE COOLING WATER SYSTEM DEIS Savannah River Plant, Aiken, South Carolina <u>Water Quality</u> Currently, both the C- and K-Reactor are discharging cooling water into Four Mile Creek and Pen Branch, respectively, at temperatures averaging 70° to 77°C (158° to 170.6°F). This exceeds the State of South Carolina Water Quality Standards (SCWQS) Class B criterion which specifies a maximum instream temperature of 32.2°C (90°F). Based on the calculations in the DEIS, both major alternatives being considered, helper and closed-cycle cooling, appear to meet this maximum temperature criterion. However, there are a number of areas of concern that must be addressed in the FEIS prior to selection of a final cooling system.	
BC-7	As indicated in the DEIS, the helper cooling alternative for the C- and K-Reactor will not achieve compliance with the 2.8°C (5°F) criterion allowed by the water quality standards for increases in ambient stream temperatures. During the winter and spring months projected increases will be 13 to 15°C (23.4° to 27°F) based on Table 2.1. Selection of the helper alternative would require a variance to the temperature increase criterion. Under Section 316(a) of the Clean Water Act, a permittee for an NPDES permit may obtain a variance to applicable thermal limitations if a demonstration can be made that the applicable limitations are more stringent than necessary to "assure the protection and propagation of a balanced, indigenous population of shellfish, fish, and wildlife, in and on that body of water."	See responses to comments BB-3 and BB-5.

Table J-2. DOE responses to comments on Draft EIS (continued)

Comment number	Comments	Responses
BC-8	A predictive Section 316(a) assessment will be necessary prior to NPDES permit issuance to demonstrate that the level of thermal release calculated for the helper cooling alternative (or any alternative which would not achieve compliance with applicable temperature requirements) would assure compliance with 316 requirements. Therefore, to assure that the 316(a) process proceeds without delay, it will be necessary for DOE to provide predictive biological data in the FEIS. Such data must demonstrate that discharge from the alternative proposed has a reasonable chance to achieve 316(a) requirements. That is, that reasonable reproduction of aquatic organisms will be ensured in both the receiving creeks and associated marsh areas under all discharge temperature and flow conditions resulting from all planned plant operating modes, as well as periods of normal and extended shutdown. Data on rate of creek and wetland drainage as a function of reactor shutdown and Savannah River stage will be needed in this evaluation. Data presented in the DEIS indicate that discharge temperatures predicted for the helper cooling tower system during the spring (25 to 28°C) would be high and would likely prevent the successful spawning and reproduction of many of the fish species indigenous to the Savannah River system. As indicated in "Thermal Performance" below, these predicted temperatures may be low. Even should successful spawning occur, subsequent short- or long-term shutdown of the reactor could leave the eggs or fry in a dry overbank area of the creeks or section of marsh. Additionally, longer periods of shutdown have historically been observed which might further compound this impact. In order to obtain a 316(a) variance, it will be necessary for DOE to demonstrate that these concerns are not of	See responses to comments BB-3 and BB-5.

Table J-2. DOE responses to comments on Draft EIS (continued)

Comment number	Comments	Responses
	significance to the propagation and protection of the aquatic community in both the free-flowing creeks and associated marshes.	
BC-9	According to the data in the DEIS, the discharge from the closed-cycle cooling alternative for both the C- and K-Reactor would exceed the ambient stream temperature by 1°C during winter conditions while the temperature of the effluent will approach the ambient for extreme summer conditions. Use of the closed-cycle system may achieve direct compliance with water quality standards thermal limitations and no 316(a) variance would be required. Therefore, greater consideration should be given to the closed-cycle system, if the blowdown temperatures noted in Table B-1 can be achieved (see "Thermal Performance" below).	The recirculating cooling-tower systems discussed in this final EIS have been modified from those described in the draft EIS. The recirculating system in the draft EIS assumed design for 10°C wet bulb temperature and 28°C approach. This has been determined to be difficult and costly to achieve. Recirculating cooling-tower systems for alternatives now being considered are designed to achieve 29.5°C cold water temperature (CWT) at 26.7°C WBT. Wet bulb temperatures would have to exceed 29.5°C before blowdown temperatures would reach 32.2°C; basic data indicates that 27.8°C WBT was exceeded only twice during the period from 1952 through 1983. Cooling-tower performance is dependent on ambient air conditions; Savannah River water temperatures lag behind seasonal air temperature changes. If receiving stream temperature is assumed to be the same as the Savannah River and historical monthly average temperatures are used, the 2.8°C maximum allowable temperature difference between cooling-tower blowdown and receiving stream will be exceeded during the period from December through July. Maximum monthly average difference is 6.7°C in March based on recirculating cooling-tower systems designed for 26.7°C WBT with 2.8°C approach.

Table J-2. DOE responses to comments on Draft EIS (continued)

Comment number	Comments	Responses
		The maximum delta-T of 2.8°C must be met continuously, not as an average. No cooling tower system can guarantee compliance with that maximum at all times, particularly during sudden weather changes. The recirculation system would come closer to meeting the delta-T regulation than the once-through system because it is designed for a closer approach to ambient wet bulb temperature. This is achieved, however, at a much higher investment cost with greater system complexity. None of the recirculating systems presently being evaluated include blowdown cooling facilities. Blowdown temperatures from these recirculating systems is expected to be lower (due to two cooling towers in series) than those which occur at steam-electric generating plants for comparable ambient conditions. Therefore, blowdown cooling systems used by those plants would not be as effective for SRP systems.
BC-10	Due to the high flow rate of the helper cooling alternative, minimal reduction in the existing high level of suspended solids would be expected in the receiving creeks; especially, if the proposed holding ponds are eliminated. The closed-cycle system, however, would result in a significant reduction of suspended solids and the attendant stream/marsh sedimentation. Also see discussion in "Wetland", below.	The DEIS discussed the discharge of total suspended solids and sedimentation rates in the delta areas in Chapter 4. Discussions on water quality and hydrology summarized current conditions and changes expected with once-through and recirculating systems. The maximum flow rate discharged from a once-through cooling tower would be 11.3 cubic meters per second, which is the same as existing conditions. There would be minimal reduction in the total suspended solids from existing conditions. The discharge flow rate from a recirculating

Table J-2. DOE responses to comments on Draft EIS (continued)

Comment number	Comments	Responses
		system would be about 0.51 to 0.57 cubic meter per second due to blowdown. The total suspended solids that would be discharged with the recirculating system would be greatly reduced because the intake flow of Savannah River water for this alternative is much less than for the once-through system. All discharges would comply with NPDES permit requirements and State Class B water classification standards.
BC-11	Although discussion to this point has centered on reactor discharges, the D-Area power plant preferred cooling alternative apparently will also require a 316(a) variance. Pumping of excess water for thermal pollution control is not normally accepted practice due to impingement and entrainment impacts and other factors. In this case, however, pumping to maintain the 32.2°C maximum thermal criterion of the South Carolina Water Quality Standards would appear to be the preferred alternative. Pumping during other periods should be minimized consistent with maintaining temperature patterns demonstrated to be acceptable for the protection and propagation of the aquatic community. In order to demonstrate the appropriateness of a variance and the establishment of appropriate discharge temperatures, it is suggested that DOE prepare a proposed plan of pump operation as a function of discharge temperature and month of the year as it relates to the life stages of the aquatic community.	See response to comment BB-5.
BC-12	The biological data necessary to support any required 316(a) variance request as well as the Habitat Evaluation Procedure (HEP) analysis should be documented in the FEIS.	See response to comments BB-3, BB-5, and BC-3.

Table J-2. DOE responses to comments on Draft EIS (continued)

Comment number	Comments	Responses
	<u>Additional Alternatives</u>	
BC-13	Although only two alternatives for reactor cooling were proposed in the DEIS, variations to those might be considered. Since the presently proposed closed-cycle series tower design appears to be capable of compliance with all SCWQS thermal criteria, use of these towers in helper mode or in partial recycle mode (i.e., with some recycle of cooling water to the reactor to reduce discharge flow relative to helper mode) may reduce aquatic impacts.	See discussion of the recirculating cooling tower alternative in Chapter 2 of the FEIS.
	<u>Thermal Performance</u>	
BC-14	Based on EPA experience with existing cooling tower performance at steam electric power generating facilities, the following items are presented for DOE consideration in the design of cooling towers for the SRP site. Calculation of helper tower discharge temperatures based on direct use of closed-cycle cooling tower performance curves is not appropriate since the discharge temperatures computed are low. This is due to the fact that recirculation of cooling water produces a build-up of heat in the cooling system and higher tower inlet temperatures relative to the design wet bulb temperature. Higher tower inlet temperatures produce a greater driving force for tower cooling which is incorporated in standard performance curves for closed-cycle towers. Available information has been provided to DOE to allow recomputation of helper tower discharge temperatures, if necessary.	In addition to the following see also response to comment BC-4. Performance curves used in the engineering evaluations were provided by cooling-tower vendors and reviewed by the consultant. Engineering evaluation studies were continued for the recirculating system alternatives after the draft EIS was issued. Estimated blowdown temperatures were calculated for the recirculating system described in Chapter 2 of the DEIS and for additional alternatives. The evaluation included estimating temperatures following reactor shutdown, including total loss of electrical power. The maximum flow of cooling water from a reactor to a cooling tower is 11.3 cubic meters per second. For short shutdowns, the flow is 3.3 cubic meters per second, but for long shutdowns the flow is reduced to 0.63 to 1.3 cubic meters per second. Following

Table J-2. DOE responses to comments on Draft EIS (continued)

Comment number	Comments	Responses
		shutdown of the reactor, the temperature of the cooling water discharged from the reactor heat exchangers rapidly decreases in 100 seconds after shutdown and approaches 32.2°C in 300 to 400 seconds after shutdown.
		The attached figure shows cooling water discharge temperature (water entering the cooling tower) following a reactor shutdown (scram). The temperatures shown are with a river water inlet temperature of 27.8°C, the approximate river water temperature in July. Although not shown on the figure, data obtained during the study showed that the reactor effluent temperature is within 1.1°C of reactor influent temperature 24 hours after shutdown.
		The temperature of the water in a recirculating system would rapidly decrease as the tower rejected the heat remaining in the recirculating system. Reactor heat would decline in a manner and time frame similar to that shown on the cooling water figure.
		The once-through cooling towers are bypassed only when the reactor is down. On recirculating system towers some maintenance can be completed while the tower is in operation. For maintenance requiring an empty system, near ambient temperature water (less than 32.2°C) would be discharged to the stream when the reactor is down.

Table J-2. DOE responses to comments on Draft EIS (continued)

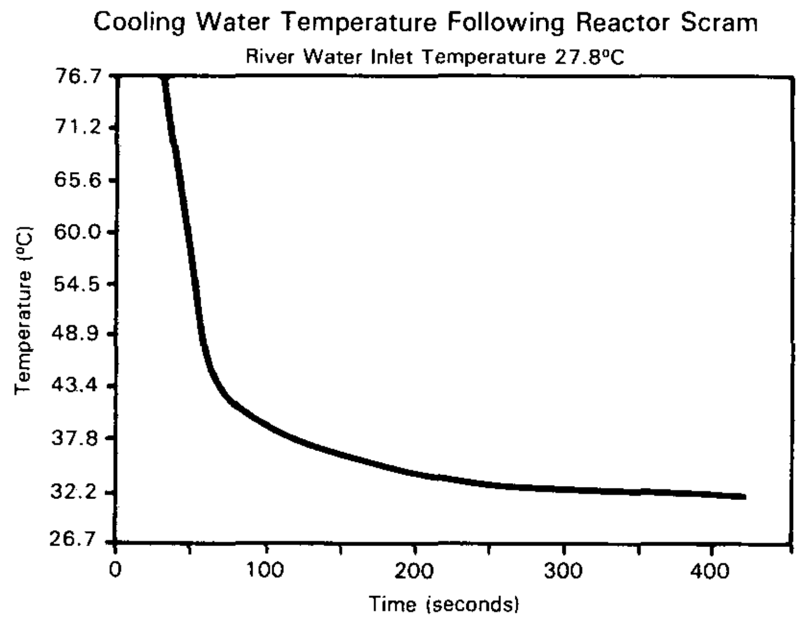
Comment number	Comments	Responses
		
BC-15	Environmental Systems Corporation has reported (see Attachment A): "Based on data acquired by Environmental Systems Corporation from their own acceptance and performance tests of over twenty	An estimate of cooling performance with deficient design was addressed for the type systems being considered for SRP reactor coolant discharges. A consultant was

Table J-2. DOE responses to comments on Draft EIS (continued)

Comment number	Comments	Responses
	fossil and nuclear power plant closed-cycle cooling systems, as *well as data from contributing* electrical utilities, cooling tower capability averaged 85 percent. The lowest of these was 76 percent while the highest was 99 percent." They further concluded that "this translates into roughly 3°F above higher return water temperature..." Should the the towers proposed for SRP (either helper or closed-cycle) achieve only 85 percent of design capability, discharge temperatures of more than 3°F above the present estimates would probably result due to the higher inlet temperatures which occur at SRP compared to utility condensers. Unless flexibility is included in the tower design, once constructed it is seldom possible to significantly increase thermal performance. It is to be noted that where actual tower capability is less than design in a closed-cycle tower system, the owner suffers economic penalties due to lower production caused by the higher cooling water temperatures. However, in a helper tower system, only the environment suffers unless the production rate is reduced. It is therefore suggested that in addition to presentation of information for the 100 percent tower capability case, thermal data and biological data presented in the FEIS be based on a tower capability of 85 percent of design unless persuasive information can be provided as to why these conditions are not applicable to SRP.	hired to estimate the performance of the *natural-draft cooling tower needed* if it operates at 10 percent deficiency. The natural-draft cooling tower would be designed for: 1. Startup of the tower with 54.5°C inlet hot water temperature (HWT) with discharge cold water temperature of 32.2°C or less. 2. With reactor operating, 76.7°C inlet hot water temperature and approximately 31.1°C discharge cold water temperature. 3. 27.8°C wet bulb temperature (WBT) based on historical data and return-on-investment considerations to reduce reactor shutdowns caused by discharge temperatures being higher than 32.2°C, and 4. 40 percent relative humidity (RH). If this tower has a 90-percent thermal capability, the consultant estimates the following: 1. During startup of the tower when inlet water temperature reaches 54.5°C, tower discharge temperature (to tower basin) a. 32.8°C if wet bulb temperature is 27.8°C b. 32.4°C if wet bulb temperature is 27.2°C

Table J-2. DOE responses to comments on Draft EIS (continued)

Comment number	Comments	Responses
		2. When the reactor is operating in the summer and the inlet temperature to the tower reaches 76.7°C, the tower discharge temperature is a. 31.7°C if wet bulb temperature is 27.8°C, or b. 31.1°C if wet bulb temperature is 27.2°C. 3. In winter operation the cold water temperature increase would be about 1° to 2°C for 90-percent capability at 50°C wet bulb temperature.
	<u>Cooling Tower Chemistry</u>	
BC-16	The type and management of the biocide and any corrosion inhibiting compounds being considered for the cooling alternatives is an important factor necessary for assessing the overall environmental impacts on the aquatic ecosystem. This is an area that was not adequately addressed in the DEIS and should be presented in detail in the FEIS.	See responses to comments BB-1 and BB-2.
BC-17	The FEIS should discuss the biocide alternatives being considered, expected effluent concentrations and durations, associated environmental impacts, and any plans for treatment and control. If chlorination is planned, the FEIS should address the specific steps that will be taken to ensure that the SC toxicity criteria for total residual chlorine will be met. Dechlorination should be discussed in the FEIS.	See responses to comments BB-1 and BB-2.
BC-18	It is possible that in a recirculated cooling system with the high reactor temperatures and recycled water chemistry involved, corrosion of reactor cooling piping will be a more significant	See response to comment BB-2.

Table J-2. DOE responses to comments on Draft EIS (continued)

Comment number	Comments	Responses
	problem than postulated and will require the use of high levels of chromium or other toxic corrosion inhibitors. The addition of these chemicals could require chemical treatment of blowdown prior to discharge. Thorough evaluation of this situation at SRP should be made in the FEIS with the information provided and a comparative assessment made relative to the cooling water system materials of construction as they relate to the blowdown water treatment provided at the Oak Ridge, Tennessee and Paducah, Kentucky DOE facilities.	
	Wetland	
	Current operations of the C- and K-Reactor have resulted in approximately 1827 acres of wetlands being impacted by thermal discharges high flow rates and the resultant sedimentation and growth of the stream deltas. D-Area operations has impacted 382 acres of wetlands.	
BC-19	Helper cooling would reduce wetland losses due to thermal discharges downstream from the C- and K-Reactor, however, reestablishment of vegetation would be limited because of continued high and fluctuating flow rates and the accompanying sedimentation. The high silt levels continue to build deltas in the swamps at the mouths of the receiving streams. This high level of sedimentation continues to remove aquatic habitat and adversely impact the environment and therefore should be reduced. The closed-cycle cooling system alternative would restore flows to near natural levels and greatly reduce the level of suspended solids. Successional revegetation to bottomland hardwoods would be expected of 1500 of the impacted acres for the C- and K-Reactor and for a major percentage of the D-Area impacted acreage.	Operational impacts to the wetland community are addressed in Chapter 4, Appendix C, and Appendix F of this Final EIS.

Table J-2. DOE responses to comments on Draft EIS (continued)

Comment number	Comments	Responses
	Aquatic Habitat	
BC-20	By reducing the temperature to within the 32.2°C criterion, both the helper and the closed-cycle cooling alternatives would significantly reduce the thermal impacts on the on-site streams and the Savannah River swamp. However, exceedances of the 2.8°C temperature increase criterion by the presently proposed helper cooling system (in addition to preventing the reproduction of fish as previously noted) may not permit the establishment of a stable aquatic community. This is a factor that must be considered in any 316(a) demonstration performed by DOE that assesses either helper or partially recycled cooling. The closed-cycle cooling system, however, would produce flows more nearly approaching natural levels in the impacted streams and thus permit the reestablishment of a more stable and diverse aquatic community. Spawning conditions for indigenous fish species would improve and there would be much less potential for cold shock from winter reactor shutdown. Because of the decreased flow rates of the closed-cycle alternative, stream sedimentation and changes in the stream morphology would be reduced proportionately, thus resulting in a more stable and healthy aquatic habitat. In addition, since the closed-cycle cooling water system decreases the raw water intake from the River, there would be a reduction in both the level of entrainment and impingement losses by as much as 85 percent.	See responses to comments BB-3 and BB-5.
	Air Quality	
BC-21	Air quality concerns exist for possible health effects of any releases of chromium if used as a corrosion inhibitor in the cooling system.	Design of cooling towers will include an allowance for injection of a corrosion inhibitor if needed. A non-chromated,

Table J-2. DOE responses to comments on Draft EIS (continued)

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	Although this is a relatively new area, research is underway by EPA at the Research Triangle Park to develop a model and determine potential health risks (A point of contact has been provided on the study). DOE should address the possible problems of using chromium in those alternatives where applicable (the results should be incorporated into the FEIS).	organic-based chemical made by Wright Chemical Company would be used. This chemical is approved by SCDHEC for use in cooling tower systems and is presently being used at the Savannah River Plant.
	<u>Radiological</u>	
BC-22	Only very small differences exist among the alternatives in radiological activity with the amount of release not being affected, just the pathway (with a slight decrease for liquid releases and a slight increase for the atmospheric pathway). Slight changes in the radiocesium transport would result from the differences in release rates into the streams. The recirculating cooling alternative would result in 0.4 curies (Ci) reduction in cesium release for the C-Reactor and 0.6 Ci for the K-Reactor over the existing and helper cooling systems.	The operation of the recirculating alternative would reduce flows in both Pen Branch (K-Reactor) and Four Mile Creek (C-Reactor), resulting in a calculated decrease in the cesium released to the Savannah River of 0.12 curie per year for Pen Branch and 0.21 curie per year for Four Mile Creek.
	<u>Construction Impacts</u>	
BC-23	Best Management Practices should be followed during all construction activities. The FEIS should address the following pre-construction and construction related impacts: • Point Source Discharges - sanitary, concrete mixing plant, etc.; • Solid Waste Management - clearing debris; • Other construction related water quality impacts - oil and hazardous substances spill prevention, and use of herbicides, insecticides, etc.; and • The use of erosion and sedimentation control measures such as - silt fences, sedimentation ponds and early revegetation of disturbed areas.	Best management practices would be followed during all construction activities. In addition, impacts of construction are addressed more completely in Chapter 4 of the FEIS.

Comment number	Comments	Responses

TIN P2-1954
Attachment A

FLORIDA POWER CORPORATION
ANCLOTE SITE
CIRCULAR MECHANICAL DRAFT COOLING TOWER
THERMAL ACCEPTANCE TEST

PREPARED FOR:

FLORIDA POWER CORPORATION

BY:

ENVIRONMENTAL SYSTEMS CORPORATION
200 TECH CENTER DRIVE
KNOXVILLE, TENNESSEE 37912

JUNE, 1982

Comment number	Comments	Responses

COOLING TOWER TEST FACILITY PROGRAM
ESTIMATE OF THE ECONOMIC IMPACT OF
DEFICIENT COOLING TOWERS

The performance of a power plant with a closed-cycle cooling system is intimately tied to the *performance of the cooling system, especially* during demanding meteorological conditions. If the cooling system is deficient, the condenser back pressure will be higher than design and the plant heat rate will increase. Capacity and energy penalties can be sizeable depending on unit design and the degree of inefficiency of the system.

Based on data acquired by Environmental Systems Corporation from their own acceptance and performance tests on over twenty fossil and nuclear power plant closed-cycle cooling systems, as well as data from contributing electrical utilities, cooling tower capabilities averaged 85 percent. The lowest of these was 76 percent while the highest was 99 percent. (As a point of interest, although not included in the subsequent economic analyses, four cooling towers tested at a geothermal installation averaged 87% capability, ranging from 70% to 95%). The majority of these tests were conducted on towers that have been operating for less than two years. Older cooling equipment, if not properly maintained, could be expected to have lower capabilities.

With this background, an estimate of the economic impact of deficient cooling towers follows. This technique is similar to that included in EPA-600/7-79-001 "Closed Cycle Cooling Systems for Steam Electric Power Plants: A State of the Art Manual." The megawatt ratings of existing and proposed plants with cooling towers were obtained

Table J-2. DOE responses to comments on Draft EIS (continued)

Comment number	Comments	Responses
	from the METER (Meteorological Effects of Thermal Energy Releases) computer inventory, which was part of an Oak Ridge National Laboratory study performed by Miller and Patrinos. There is assumed to be approximately 250,000 Mwe of fossil plants and 20,000 Mwe of nuclear plants serviced by cooling towers. If the cooling towers servicing these units are operating at 85 percent capability, this translates into roughly 3°F higher return water temperature to the condenser and attendant higher turbine exhaust pressures. In many cases, not only is unit heat rate increased, but during the more demanding summer meteorology, the unit is forced to reduce load to avoid higher-than-design turbine back pressures. The economic assessment, consisting of three parts, follows:	

1. Replacement Capacity Penalty (P_1)

$$P_1 = k \times FCR \times \Delta kw$$

where:

P_1 = Capacity penalty in dollars

k = Replacement capacity rate, \$/kw

FCR = Annual fixed charge rate

Δkw = Loss of capacity due to the deficient cooling system

Assuming a total 100 units with 3 Mwe reduction each, and applying constants derived from recent utility data,

$$P_1 = (\$500/kw) \times (0.2) \times (300{,}000\ kw) = \$30{,}000{,}000.$$