Table K-3. Scoping statements and EIS sections or DOE's responses (continued)

Comment number	Statement	Scoping topic	EIS section or DOE comment
	We at this time want to reiterate that the Environmental Impact Statement should not represent a legalistic charade but a sincere commitment to seek and evaluate pertinent information. Obviously, any Environmental Assessment which led to the Finding of No Significant Impact needs to be reviewed, evaluated and expanded upon, with full regard to the input of a broad range of interests, including state agencies, the academic community, public interest groups, and private citizens. We would like to offer some comments on the information supplied by DOE relative to the probable contents of the EIS.		
F3	In the category of production alternatives: It would seem important to re-evaluate the need for increased production and make every attempt to scale down those needs. It is inescapable that the question of the need to produce plutonium is part of the greater ongoing national security debate.	Need	Section 1.1 See Comment D1
F4	If it is indeed essential that plutonium production be stepped up, the viable alternatives should be thoroughly explored in the EIS.	Alternatives	Section 2.1
F5	In the category of socioeconomics: A broad consideration of the state needs to be incorporated, beyond the immediate jobs at SRP during construction and as an ongoing operation. South Carolina has tremendous potential for non-nuclear economic and recreational development, much of which could be precluded by real and feared impacts of nuclear activities.	Socioeconomic effects	Section 5.2.1

Table K-3. Scoping statements and EIS sections or DOE's responses (continued)

Comment number	Statement	Scoping topic	EIS section or DOE comment
	STATEMENT OF JAMES W. STALLINGS		
	I am James W. Stallings, research chemist, retired, from Barnwell, South Carolina. Background qualifications: I practiced chemistry for 46 years with four national companies, research and development in industrial/technical management. Memberships: Fellow of the American Institute of Chemists and the American Men of Science. Authored six U.S. patents.		
G1	I want to address a matter of what we might call groundwater problems. I've had ten years' experience in the industrial use of chlorinated solvents; namely, trichloroethylene and perchloroethylene. These are subjects of the SRP groundwater contamination, plus, of course, other materials.	Groundwater contamination	Sections 4.1.1.2, 5.1.1.2, Appendix F
	Earlier there appeared an article of mine in the paper. This was entitled "Contamination in Our Tuscaloosa Aquifer." I would like to bring up some points listed in that article and, thereafter, go more specifically to what is being thought of today by me.		
	Tuscaloosa Aquifer contaminants are trichloroethylene and perchloroethylene.		
	The pertinence of the aquifer contamination is seen in the broad voids in the required on-the-job engineering knowledgeability of the handling of chlorinated solvents. This was a mistake in the first place. This is a problem that has to be faced today, which is enormous. This is with respect to recovery by reclaimative distillation rather than the dumping of waste in the earth.		
	Where the average fellow needs to know something about this, I've given some limited but factual data that should clarify to the interested layman why the aforementioned contaminants proceed through and into groundwater rather than evaporate. You have water entrainment at 8.34 pounds per gallon; perchloroethylene at 13.61 pounds per gallon. Perchloroethylene, for all practical purposes, is insoluble in water. Trichloroethylene is 12.15 pounds per gallon with one-tenth of one gram solubility per hundred grams of water, 100 cc or milliliters.		

Table K-3. Scoping statements and EIS sections or DOE's responses (continued)

Comment number	Statement	Scoping topic	EIS section or DOE comment
	Normally, these typical chlorinated industrial solvents are recovered by distillation in a closed system both from a standpoint of economy and to prevent air and water pollution.		
	The earthen cesspool, or seepage basin, offers no more than a waste dump wherein solvent evaporation will be rather insignificant if water is present in the basin, and water would be present in the unsheltered, exposed basin. Thus, with water present in the basin from rain or otherwise, the 12-pound-per-gallon trichloroethylene, or the 13.6-pound-per-gallon perchloroethylene will immediately layer beneath the 8.3-pound-per-gallon water on the bottom of the basin.		
	The complete insolubility of perchloroethylene in water assures that it begins a seepage trail from the bottom of the basin into the ground above the aquifer. Likewise, trichloroethylene will proceed completely after a saturation of any water in the basin to the extent of about 3.8 grams per gallon. Mixtures of trichlor and perchlor will behave as would perchlor in their soil penetration by seepage.		
	We have, of course, a trichlor problem there. We have the greater part of the water in this area -- all of the drinking water in this area and surrounding communities, all of that comes from the Tuscaloosa Aquifer and its, let's call it, aquifer tributaries.		
	You know, I can see no more important matter than to clean up the water, first of all. This is a release here, too, and this is given in the Augusta Chronicle as of July 19, 1983. They call it a water cleaner. This must be something absolutely new, and unless it's something very new, it might be something that we found in a Rube Goldberg book. But how in the world are you going to blow solvent out of water unless it's completely insoluble in it? Why do we think that we can go and blow 50 tons of stuff out of the Tuscaloosa Aquifer, and if we did, it would blow into the air where you have 200 parts per million of trichloroethylene. It's the maximum allowable limit. What do you want people in this area to do, breathe that stuff, too?		

Table K-3. Scoping statements and EIS sections or DOE's responses (continued)

Comment number	Statement	Scoping topic	EIS section or DOE comment
G2	Well, we got to find out. I cannot go along with this, and it is not my job to, but I've known DuPont in Wilmington, Delaware, for more than 50 years. I can assure you they have the answers there if they are not in Aiken. The stability of chlorinated solvents is another matter, too. These require stabilizers and these disappear in time. So in all cases in these areas where there's solvent in the ground, you've got perhaps destabilized material. You've produced acids, et cetera. There are solutions to the problem I do not go along with. And as being reasonably intelligent in this area, to say that a water cleanser is the answer down there where we do this for the next hundred years at taxpayers' expense, if we need somebody to do this thing, I think we need to go to an outside source. It used to be the most reliable in the country was Arthur D. Little in Cambridge, Mass. Well, they are still there. Whether they do this or not I don't know, but I would suggest that in this EIS statement, the probable solutions will probably turn out you are going to have to mine this stuff out that is below these basins. You will probably have to -- it will probably have to go down the Savannah River on a monitored basis. That's the most practical solution. There might be a means of catalytic decomposition of this to produce HCL hydrochloric acid, and to neutralize that. Lastly, and on a personal basis, I consider that the cleanup of the Tuscaloosa Aquifer is, in itself, more demanding than the startup of the L-Reactor because if what I call the mess at hand is not corrected, there is little chance that this or other sources of contamination will receive the corrective attention required for safe drinking water in South Carolina and Georgia from the aquifer. That's my feelings, and I thank you for being able to express myself.	Mitigation measures	Sections 4.4.3.1, 4.4.3.2 See Comment B6

Table K-3. Scoping statements and EIS sections or DOE's responses (continued)

Comment number	Statement	Scoping topic	EIS section or DOE comment
	STATEMENT OF MICHAEL F. LOWE		
	My name is Michael F. Lowe. I am Director of the Palmetto Alliance, Inc.		
H1 H2	We are a statewide organization dedicated to advocacy on nuclear waste issues, particularly on nuclear waste. I'd like to associate myself with the comments of the others here today, particularly on the need for nuclear weapons material in the EIS, addressing that subject. But it has come to our attention that DOE has disregarded our remarks before the Armed Services Committee and, again, the scoping of the EIS has omitted consideration of the impact of the additional volume of liquid, high-level wastes that will be generated as a result of L-Reactor operations.	Need Radioactive waste	Section 1.1 Section 5.1.2.8
H3	We also feel that the ability of the planned defense waste processing facility to handle this additional volume in a timely manner should be considered. The Defense Waste Processing Facility would be required to handle approximately 30 percent more than was originally planned.	Radioactive waste	Section 5.1.2.8
	We believe there are many variables that would make the stabilization and ultimate disposal of this waste uncertain. Those variables include the feasibility to vitrify high-level wastes on an industrial scale, which has not yet been proven.		
	The congressional approval for funding to complete this project, the Defense Wastes Processing Facility, could be in jeopardy given economic conditions in the future and the environmental concerns of both the public and scientific community could lead to further delay in addressing the problem of stabilization and ultimate disposal of high-level waste.		
	In our remarks on February 9th, we said that -- and I would like to reiterate that -- it is unfair, unjust, and unwise to ask South Carolina to tolerate generation of more nuclear wastes in our state, and I would ask that the EIS consider this.		

Table K-3. Scoping statements and EIS sections or DOE's responses (continued)

Comment number	Statement	Scoping topic	EIS section or DOE comment
	STATEMENT OF WILLIAM McDANIELS		
	My name is William McDaniels, and I live in Aiken County, South Carolina. I'm representing no particular organization but I am concerned and I think this has been voiced by the previous speakers here about toxic wastes. I'm concerned about our table water, our atmosphere, and things in general. I am a member of the Sierra Club. I also belong to the American Associations of Retired Persons. I will be Chairman of the National Council of Senior Citizens Corporation nationwide.		
	I don't know enough about this L-Reactor here because I've only been down here about ten months. I have moved from the state of Michigan, but I know what happened in Midland, Michigan, on this reactor there, the Dow Chemical reactor. There was ten rivers poisoned forever, and they will never, never be the same.		
I1	I feel that the toxic waste here in South Carolina and for miles out is -- I feel that these contaminants have already got down to the table water, and we know that the table water only moves two inches every 24 hours. We have a very fragile thing here, and we're talking about table water.	Groundwater contamination	Sections 4.1.2, 5.1.1, Appendix F See Comment B6
	The same thing applies to ozones that have been destroyed.		
I2 I3	First of all, I just wanted to voice my opinion that I'm opposed to the startup of this reactor. I don't think that it is necessary, and I feel, first of all, before you start any other reactor or bringing any other reactor into existence, that we should have more study on the method of neutralizing the waste that comes from these reactors. This is one of my main concerns.	Need Radioactive waste	Section 1.1 Sections 4.1.2.8, 5.1.2.8
	I moved into South Carolina not knowing that we had this L-Reactor. I read nothing about it. And, of course, we bought a place here. I was born and raised in Tennessee, and I will not dwell too much on anything in particular here, but I have been working in ecology and have been a concerned citizen and a member of DAPL, Downriver Anti-Pollution League in Michigan, but I have worked in ecology in my spare time, I'd say, for since 1948 and '49.		

Table K-3. Scoping statements and EIS sections or DOE's responses (continued)

Comment number	Statement	Scoping topic	EIS section or DOE comment
	I'm concerned for our younger people that's coming along. I will be 68 years old in September of next year, but I want to leave something behind for the younger generation. I don't want to leave a contaminated nation, a world -- I would like to see them survive. I have three children and I have three grandchildren, and I think -- I don't think we are getting enough information or input out to the public, like here, in regards to this L-Reactor. This is about all I have to say. It's nice coming. When I got concerned yesterday, of course, I've had a fall and broke all my ribs, and I would not have probably come out except I read yesterday in the paper, Aiken paper, that there was only one person that spoke in Augusta, so I felt I must make myself present to voice my opinion as a concerned citizen.		

Table K-3. Scoping statements and EIS sections or DOE's responses (continued)

Comment number	Statement	Scoping topic	EIS section or DOE comment
	STATEMENT OF VIRGINIA DYKES		
	I'm Virginia Dykes from Greer, South Carolina. I intended to come to represent myself.		
	I've done quite a bit of research on nuclear issues. In fact, I spent so much time in the Greenville County Library reading government documents that they finally invited me to work there.		
	But I was asked also to present a letter that the Greenville County Democratic Women sent, so I'd like to do that, and then also represent myself.		
	The letter was sent -- we're an organization of about 200 women in Greenville, South Carolina. And on our last meeting we voted unanimously to send this letter. This was before the EIS was decided upon. It went to Dr. Robert Jackson of the Department of Health and Environmental Control of our state and to the Honorable Donald Hodel, Secretary of the Department of Energy.		
	The membership of Democratic Women of Greenville County, South Carolina, has voted to support the position of Senator Ernest F. Hollings and Senator Mack Mattingly in their efforts to require an Environmental Impact Statement before the startup of the L-Reactor at the Savannah River Project.		
J1	It is known that operation of this reactor will flush radioactive cesium into the Savannah River and that millions of	Radiocesium remobilization	Sections 3.7.2, 4.1.2.4, Appendix B, Appendix D
J2	gallons of hot water will kill vegetation over a wide area.	Wetland impacts	Sections 4.1.1.4, 4.4.2, 5.1.1.2, 5.2.4, Appendix C, Appendix I
J3	We are also concerned about the contamination of the Tuscaloosa aquifer that has already occurred, and we would appreciate being advised as to what action is being taken by your agency to remove these chemicals from the aquifer.'	Groundwater contamination	Sections 4.1.2, 5.1.1, Appendix F See Comment B6
J4	Millions of gallons of high-level wastes have been accumulating in tanks at the Savannah River Project over the last 30 years. These tanks, some of which have leaked in the past, are also	Radioactive waste	Sections 4.1.2.8, 5.1.2.8

Table K-3. Scoping statements and EIS sections or DOE's responses (continued)

Comment number	Statement	Scoping topic	EIS section or DOE comment
	located above the aquifer. Unfortunately, money has never been made available to solidify and remove this waste to permanent storage.		
	While we agree that employment and national defense considerations are also of importance in this matter, we believe the significant long-term damage to our environment which has already occurred at the facility must be alleviated before the problem is further aggravated by the operation of the L-Reactor.		
	We appreciate your consideration of the concerns of our membership who, as residents of this state, are most closely affected by this situation, and we look forward to your response. Sincerely. This was signed by the Co-Chairs of the Legislative Committee, Dianne Smock, who is an attorney in Greenville, and Libby Yarborough, who is a builder and developer.		
	Thank you.		
	This is my own statement that I'd like to make, please.		
J5	South Carolina has the highest infant mortality in the United States. The people of our state die younger than anywhere else in this country. Our students have the lowest Scholastic Aptitude Test scores. When all three of these indicators are the dead worst in the nation, it points to something in the environment.	Health effects	Sections 4.2.1.6, 5.1.2.5, 5.2.7
	We do have a unique feature in our environment: one of the world's largest reprocessing plants, which has been pouring out radioactive emissions continuously for 30 years.		
	People do not realize that reprocessing produces large quantities of radioactive gases and liquids that are released routinely from the stack and into the river. A normally operating power plant emits about 10 curies of tritium per year, while the Savannah River Plant emits 300,000 curies, or more than all the power plants in the world put together.		

Table K-3. Scoping statements and EIS sections or DOE's responses (continued)

Comment number	Statement	Scoping topic	EIS section or DOE comment
	Unlike power plants where the fuel is handled very gently, at a reprocessing plant, this highly radioactive product is dissolved in acid, treated with chemicals, and the plutonium is solidified. Even a government document (Air Cleaning Handbook) calls reprocessing an inherently dirty operation.		
J6	At the Savannah River Plant about 560,000 curies of krypton 85 and 300,000 curies of tritium are released per year, according to government sources. My sources happen to be that I called up the Department of Energy and asked for the officials in charge, and just asked them how much was released. These amounts reflect the plant's normal operations, not including accidents or the addition of the L-Reactor.	Radiological effects	Sections 4.2.1, 5.1.2, 5.2.6, Appendix B, Appendix G
J7	Although these isotopes are difficult to filter and dispose of, improved technology does exist which is not being used currently at SRP. A method using fluorocarbons to capture krypton has been developed at Oak Ridge. Voloxidation is a process that can be used to remove tritium before it becomes diluted with water.	Safety alternatives	Section 4.4
J8	We are told that the hundreds of thousands of curies of tritium dumped into the air and into the Savannah River are harmless, but research papers show that the amounts approved for drinking water may, in fact, be a health hazard. Tritium has been shown to be almost three times as damaging to living systems as are gamma rays at equivalent low-level exposures. Tritium circulates as freely as water within individual body cells including sperm and egg cells where minute amounts can cause genetic damage. Human deaths have occurred from tritium exposure. Tritium has a half-life of twelve years, and all of us now carry a body burden of manmade tritium within our bodies continually. I would like to make part of the official record three research papers on tritium which I obtained from the Duke Medical Center Library: The first is Dr. R. Lowry Dobson, Lawrence Livermore Laboratories of the University of California, How Toxic is Tritium? Relevance of High-Dose Results and Gamma Ray Data to Evaluating Low-Level, Chronic Exposure.	Health effects	Sections 4.2.1.5, 4.2.1.6, 5.1.2.5, 5.2.7, 6.1.4, Appendix B, Appendix G

Table K-3. Scoping statements and EIS sections or DOE's responses (continued)

Comment number	Statement	Scoping topic	EIS section or DOE comment
	The second is Drs. S. Zamenhof and E. van Marthens, Mental Retardation Research Center, University of California at Los Angeles School of Medicine, The Effects of Chronic Ingestion of Tritiated Water on Prenatal Brain Development. The third is Dr. Takashi Ito and Katsumi Kobayashi, University of Tokyo, Mutagenesis in Yeast Cells by Storage in Tritiated Water. One of these papers shows that pregnant rats, when fed with water containing minute amounts of tritium, produce offspring with fewer than the normal number of brain cells. I am suggesting that we can't add 60,000 more curies of tritium out the stack and into the river without doing something about the immense problem we already have, and I think that you do need to make this part of your Environmental Impact Statement. And I think studies such as these scientific papers, when you read something like Tritium Control Technology, a government document, they make passing references to these research papers, but they say it's not practical to remove tritium; it's a very difficult thing. Therefore, it's not being done. They will even say the reason that tritium emissions are accepted is that they are so difficult to remove.		
J9	Well, I'm saying we got to address this question, and this is the time to do it. When we're having an Environmental Impact Statement is our golden opportunity to see what has tritium done in the past, what is it going to do, what are the further emissions going to do to us in this state.	Radiological effects	Sections 4.2.1, 5.1.2, 5.2.6, Appendix B, Appendix G
J10	Other nations have not located their large reprocessing plants where emissions are released into the air and drinking water of the population. France, England, and Japan have located their reprocessing plants on the edge of the ocean. France has a long pipe along the ocean bed to carry waste a safe distance out. Dumping radioactive waste into the ocean isn't a wonderful solution, but it is better than putting it into a river that is used for drinking water.	Radiological effects	Sections 5.1.2, 5.2.6
J11	It is not possible to relocate or shut down the Savannah River Plant, which employs 8,000 people and which is needed for defense, but the concept of laying a waste pipe down the full	Radioactive waste	Sections 4.1.2.8, 5.1.2.8

Table K-3. Scoping statements and EIS sections or DOE's responses (continued)

Comment number	Statement	Scoping topic	EIS section or DOE comment
	length of the river and out to sea should be examined. The coastal communities may not like it, but it is better for them than the present system which releases radioactive materials upstream and upwind. Moving the waste by pipeline out to sea may be more practical than a closed circuit cooling system at SRP, given the problem of cooling water becoming more radioactive every time it recycles through the plant.		
J12	Studies should be made for the EIS comparing infant mortality and other health records of communities downwind and downstream from SRP with towns in the opposite direction. The accidental release of 479,000 curies of tritium in one day in 1974 presents an opportunity to examine infant mortality in the following year in the path of the radioactive release.	Health effects	Sections 4.2.1.6, 5.1.2.5, 5.2.7, 6.1.4, Appendix B
J13	The additional emissions from the L-Reactor cannot by accepted without adequate controls when SRP already produces one of the greatest concentrations of radioactive pollution of any location on earth.	Regulatory requirements	Chapter 7

Table K-3. Scoping statements and EIS sections or DOE's responses (continued)

Comment number	Statement	Scoping topic	EIS section or DOE comment
	STATEMENT OF JOHN DENTON My name is John Denton. I'm a concerned citizen from North Augusta. I have a Bachelor of Science from Western Carolina in 1936. I never worked for the government or DuPont either, and I have no DuPont stock. I've heard the meeting with Dr. Thurmond and in -- Senator Thurmond had in North Augusta, and quite a few comments. I think there's a lot of confusion that really isn't necessary. We need to be well informed on this matter. We need whatever information that is necessary, but some of the figures and things that were asked for and seem to be required, I'm sure Russia would like to have that information. This reminds me of when I was starting up a plant in Baton Rouge, Louisiana, a few years ago when the media and various people worked people into a fanatic state when the chlorine barge was dumped into the river by the hurricane. On the morning that the barge was raised, according to the TV, 20,000 people fled the city. I couldn't get enough men to start my unit, and the danger was equivalent to the possibility of you falling out of bed tonight and breaking your neck. Now, that seems to me to be somewhat of the case in this L-Reactor startup. I have worked all over the world. The United States is the greatest nation in the world. War is a terrible spectre for me. I saw a few shells come over in World War II, and I don't like it. I'd hate to see a nuclear holocaust, but whose choice is it? The United States has never been a nation to go to war on its neighbor. In fact, it has a record of helping everybody all over the world. Now, we need that L-Reactor. We need to get it going. Some people question that, and maybe honestly, but we can't get this information from Russia, what they're doing over there, and we need to -- we need to get on with it. I know a lot of people that work for DuPont, probably 8,000 people out there, and for each one of those people that work out there, there's five or six supportive occupations in this		

Table K-3. Scoping statements and EIS sections or DOE's responses (continued)

Comment number	Statement	Scoping topic	EIS section or DOE comment
	area. They can't be here today to voice their opinion about it. We have a certain number of groups that come down here like flies on a warm biscuit with jelly on it and try to push their ideas down our throats. I don't agree with that. We should go ahead and start that reactor. Sure, we need the information, but three to five million dollars for an Impact Statement, it's our taxes. I've been paying taxes since 1936. I've never drawn unemployment or welfare, and I'd like to see my taxes well spent. If we have to have that, go ahead and get it, but let's get this reactor started.		

Table K-3. Scoping statements and EIS sections or DOE's responses (continued)

Comment number	Statement	Scoping topic	EIS section or DOE comment
	STATEMENT OF BEATRICE JONES		
	I am Beatrice Jones, I have no affiliation, but I am a concerned citizen.		
	With regard to the present serious environmental circumstances at the Savannah River Plant, there should be no more errors that underestimate, or decisions that intentionally downplay, the dangers of environmental impacts of the public health and safety.		
L1	Concerns about radiation discharges to the environment, both routine and accidental, continue to be taken lightly by the DOE even though they know full well there is no evidence for any safe amount of ionizing radiation.	Radiological effects	Sections 4.2.1, 5.1.2, 5.2.6, Appendix B, Appendix D, Appendix G
L2	The restart of the L-Reactor is an anti-social, ill-considered, technological venture that does not seriously take into account the health and safety of citizens in South Carolina and Georgia, or the protection of a fragile environment.	Health effects	Sections 4.1.2.6, 4.2.1.5, 5.1.2.5, 5.2.7
	Decisions to move forward with the L-Reactor were made by men who should understand that they will be held accountable for their decisions. As I have said before, it is immoral to put a low dollar value on human and other life forms in South Carolina and Georgia, while pushing hazardous technology where there is already too much.		
	Morality, however, is not likely to visibly enter into Savannah River Plant technological considerations, at least not until mechanisms of rationalization no longer surface so abundantly to protect even the most obviously indefensible positions.		
	I have serious reservations about whether an expedited EIS can adequately address the L-Reactor's impacts, particularly when almost all the problems at SRP are interrelated and were brought to a head by the L-Reactor. The EIS study should be done in relation to the past 30 years of operational impacts, that would take into account the errors of the past, so that they won't become the errors of the future as well.		

Table K-3. Scoping statements and EIS sections or DOE's responses (continued)

Comment number	Statement	Scoping topic	EIS section or DOE comment
L3	I am not at all certain that the time element for restarting the L-Reactor is as crucial to national security as is claimed, but rather the DOE's fears of too much environmental impact disclosure.	Need	Section 1.1
L4	Nevertheless, even though the expedited EIS will be far less than what is needed, every effort should be made for a complete as possible, honestly disclosed, evaluation of the L-Reactor's environmental impacts. The DOE's own reports contain projections of severe environmental impacts without mitigation measures.	Mitigation measures	Section 4.4
	It is comforting to know that Senator Hollings has asked the General Accounting Office to review certain health and safety issues, which have for some time been my own concerns, as well as those of many other people in South Carolina and Georgia.		
L5	The scope of the EIS should certainly include the routine and accidental radiation hazards at SRP. It is an area of concern, perhaps the biggest area of concern, for many people. Also, perhaps the most far-reaching. The body dose to individuals from the L-Reactor's startup would increase from 1.8 to approximately 10.7 millirems per year. Twice NRC standards.	Accident analysis	Sections 4.2, 4.3.2.3, 4.4.1, 4.4.5, Appendix G
L6		Radiological effects	Sections 4.2.1, 5.1.2, 5.2.6, Appendix B
L7	The public should not look for immediate effects when the real hazard is delayed. For most of the serious environmental poisons cancer at 5 to 25 years after poisoning is precisely the kind of effect we must be concerned about. Genetic effects occurring in subsequent generations could be many times more serious.	Health effects	Sections 4.1.2.6, 5.1.2.5, 5.2.7, 6.1.4
L8	The restart of the L-Reactor would substantially increase the cumulative hazards of radiation, and because of its age, will very likely be more accident prone, releasing even greater quantities of radioactivity to the already overburdened environment. Containment domes should be required for the L-Reactor and all other operating reactors at the Savannah River Plant.	Accident analysis	Sections 4.2.1, 4.4.1, Appendix G
L9		Safety alternatives	Section 4.4.1, Appendix G
L10	Clearly, the impacts of the seepage basins to groundwater should also be another of the most important parts of the EIS	Seepage basins	Section 4.4.3 See Comment B6

Table K-3. Scoping statements and EIS sections or DOE's responses (continued)

Comment number	Statement	Scoping topic	EIS section or DOE comment
L11	scoping. The enormity of the known contamination, and the potential for even greater contamination has reached almost nightmarish proportions. It is obvious that all seepage basins still in use should be phased out as soon as possible, and those at the L-Reactor site should not be put to use. Government should have been preventing these things from happening instead of making them happen.	Groundwater contamination	Sections 4.1.2.2, 5.1.1.2, 5.1.1.4, Appendix F See Comment B6
L12	As we all know, toxic chemicals from seepage basins in the M area have contaminated the Tuscaloosa Aquifer, a major source of fresh water in the area. The DOE's earlier assessment of the problem indicated the problem was under control, but their assessment was inaccurate. Earth has functions other than to serve as a nuclear sewer.	Seepage basins	Section 4.4.3 The contamination of the Tuscaloosa Aquifer will be the subject of a separate NEPA document.
L13	It appears to me that it would be helpful if the U.S. Geological Survey would be permitted to go on site to do a detailed hydrological and geological study. I believe it is more difficult for government officials with conflicts of interest to assess problems with the proper perspective. It is every person's authoritative right to protect the purity of their drinking water. Government should not only respect, but help to protect this right.	Groundwater contamination	See Comment L12
L14	For the avoidance of illegal 174 degree Fahrenheit thermal discharges into Steel Creek, cooling towers should be put into place before the L-Reactor's start-up. Without the benefit of cooling towers, all wildlife in the wetlands will be destroyed,	Alternative cooling	Section 4.4.2 See Comment E6
L15	fish in the Savannah River will be killed, and the cesium in the water will pose a serious threat to the health of people who drink Savannah River water. This is another issue which concerns me greatly, and one that I would like to see addressed. I am concerned about all 11 of the issues listed in the "DOE News," and appreciate your efforts for the scoping meetings. I do feel, however, that so many people voiced their concerns and suggestions during the February and May hearings, that there is little else to do but reiterate what has been said before. The areas of greatest concern are obvious.	Radiocesium remobilization	Sections 3.7.2, 4.1.2.4, Appendix B, Appendix D

Table K-3. Scoping statements and EIS sections or DOE's responses (continued)

Comment number	Statement	Scoping topic	EIS section or DOE comment
L16	I hope all the issues will be given serious attention and mitigation measures taken into account, because constructive action is possible to protect lives, health and the environment.	Mitigation measures	Section 4.4
	I would like to take just another moment to make a few suggestions not related to the EIS.		
L17	1. Monthly measurements monitoring reports should be made public.	Monitoring	Sections 6.1, 6.2
L18	2. All notifications of accidents at SRP that are filed with the Energy Department on radioactivity or chemical substances should be made public.	Emergency planning	Appendix G, Appendix H
L19	3. There should be off-site gamma measurements by aerial surveillance as well as the on-site measurements.	Monitoring	See Comment B8
L20	4. Any health effects researched should be done by a Federal Public Health Agency. As taxpayers, we support these agencies that are supposed to protect us.	Health effects	Section 6.1.4

Table K-3. Scoping statements and EIS sections or DOE's responses (continued)

Comment number	Statement	Scoping topic	EIS section or DOE comment
	STATEMENT OF BARBARA WISE		
	My name is Barbara Wise, and I'm an area resident.		
	I'd like to preface my comments with the fact that I am a lay person, I haven't spent much time on the technology involved in the scope of an EIS. What I will tell you today is what my personal concern is, and I'm not sure but I hope that it will be within the scope of the EIS.		
	I want to give a brief summary of the concerns I would like to see addressed in the EIS.		
M1	First, how am I at risk as an area citizen and how am I to be informed of my risk? I and the other citizens who live in the environs of the Savannah River Plant are taxpayers. We help to fund the operation of Savannah River Plant. We have the right to know how we and our children and our environment are put at risk by the start-up.	Accident Analysis	Section 4.2.1, Appendix G
M1a		Health effects	Sections 4.1.2.6, 4.2.1.5, 5.1.2.5, 5.2.7, Appendix H
M2		Emergency planning	Appendix H
M3	I would like to know how the L-Reactor releases and wastes will affect us when combined with and added to the ongoing releases and wastes already occurring at SRP.	Cumulative radiological effects	Section 5.2.6
M4	I would like to know about the synergistic effects of the total radioactive releases from the Savannah River Plant, including L-Reactor releases, when combined with the urban and industrial chemical pollutants to which we are already subjected.	SRP and regional effects	Section 5.2.6 The cumulative radiological effects from SRP are small (EIS Section 5.2.6) and no synergistic effects are expected.
M5	In addition to this, what are the predictable increases in accidents, so-called incidents, and problems we can expect with regard to this restart? I have grave doubts that we will be informed in any meaningful way of any of these dangers because we haven't been in the past. It's true that information is published sometimes and maybe and usually is buried in other technical data in some report or article somewhere, but without any explanation of real implications that ordinary people can understand.	Accident analysis	Sections 4.2.1, 4.4.1, Appendix G
	Things are always within safe parameters, it seems, at SRP when you hear any comments from the Department of Energy or other satellite agencies.		

Table K-3. Scoping statements and EIS sections or DOE's responses (continued)

Comment number	Statement	Scoping topic	EIS section or DOE comment
	I'd like to cite one example. In 1977 there was an accident at which time a massive amount of radioactive tritium was released into the environment, 479,000 curies of tritium were released in one single day. The ordinary lay person cannot interpret this. What is a curie?		
	To give perspective on this, approximately one half this amount, 250,000 curies was released in 1979 at the tritium facility in Tucson, Arizona, at which point the State of Arizona revoked its license. To know that the American Atomic Tritium facility is shut down because it released approximately one-half the amount in a year that SRP releases in one day is one way to give perspective to otherwise meaningless technical data.		
M6	I know from my reading, and there is agreement among the experts that there is no safe level of ionizing radiation. Cancer deaths and fetal deaths and genetic mutation will occur in direct ratio to dosage received. Yet, there have been no comprehensive health studies around here to address this problem.	Health effects	Section 6.1.4
M7	I understand that this is probably not in the scope of an EIS, but what could be more relevant than health effects on humans in an Environmental Impact Statement. We're at least as important as the Sturgeons. That is what needs to be done most of all, and if that is beyond the scope of an EIS, then the EIS should demand that a comprehensive health study of radiation effects on humans be begun immediately in addition to the EIS.	SRP and regional effects	Section 6.1.4
	Until that time, we, the area residents, are functioning in the role of laboratory animals in this ongoing nuclear experiment. Given the choice, I would prefer to be an informed laboratory animal.		
M8	In a final remark, I would like to express my concern over the fact that DOE is doing any part of that Environmental Impact Statement. Now, I know they have been charged to do it, but it seems to me in my lack of knowledge of these things that it is inherently improper regulatory practice for an agency to regulate itself, nor is DuPont or any other benefactor, affiliate, or satellite of SRP an appropriate designee to conduct the EIS. The conflict of interest is blatantly obvious.	NEPA procedures	Foreword

Table K-3. Scoping statements and EIS sections or DOE's responses (continued)

Comment number	Statement	Scoping topic	EIS section or DOE comment
	If you are in the primary business of production, you can be assured that protection will be compromised and we have only to look at the record to know this. I guess what I'm requesting is that there will be some mechanism built into the EIS to enhance objectivity.		
M9	Last, I would like to request that the EIS draft be given the full 45 days as is the usual procedure.	NEPA procedures	Foreword

Table K-3. Scoping statements and EIS sections or DOE's responses (continued)

Comment number	Statement	Scoping topic	EIS section or DOE comment
	STATEMENT OF MARY LOU SEYMOUR		
	Okay, I'm Mary Lou Seymour. I live in Bath, South Carolina, about, oh, ten miles from here, and I'm just a concerned citizen.		
N1	I haven't really got anything very prepared, but I have a few points that I'd like to bring out. In the first place, from what I understand, the Savannah River Plant is allowed to put much hotter water into the creeks than the other local industries and doesn't have to abide by the South Carolina State laws, and I don't think that's right. I think that should be changed. They should have to abide by the state laws like other industries, government or not.	Regulatory requirements	Chapter 7
N2	Also, I agree completely with Ms. Wise's point about the health study. A full epidemiological study should be made. There never has been one made, and it's just beyond comprehension that it hasn't been. The Savannah River Plant has been there for like over 20 some-odd years, and there, you know, could be plenty of data on birth defects, cancer, leukemia, and the like, that should be collected and given to the public so we can know what we are living with out there.	Health effects	Section 6.1.4
N3	Also, one note on the civil defense or whatever you call it when people are supposed to be notified to evacuate. This last accident or leak incident or whatever it was they had a couple of weeks ago, I heard about it on the national news. It wasn't on any local news at all, and I was kind of upset, so I called up the Civil Defense emergency number in Aiken County, and they had never heard of it. And I talked to one lady on the phone, and then she got, I suppose, her boss in, and he told me, "Well, don't worry about it because I'm sure if it was anything they would have told us."	Emergency planning	Section 4.2.1.3, Appendix G, Appendix H
	And then I read in the paper later on that the leak happened like at 11:15 at night, and they didn't even tell DHEC until 12:45. That was like an hour and a half that nobody knew about it, not even DHEC, and then the citizens didn't know about it at all unless they watched the national news, and I think that's inexcusable.		

Table K-3. Scoping statements and EIS sections or DOE's responses (continued)

Comment number	Statement	Scoping topic	EIS section or DOE comment
N4	Also, there's one comment that I heard on the news. I didn't make the hearings last night, but one of the people that testified mentioned the possibility of a melt-down, and someone from the Savannah River Plant or DOE or somewhere said that these reactors are different than commercial reactors, that they can't melt down because they don't get hot enough. Well, now, I'm not a scientist, but I thought a melt-down was when it went out of control. I didn't know it had anything to do with the operating temperature.	Accident analysis	Sections 4.2.1, 4.4.1, Appendix G
	Now, if I'm wrong there, you know, I would appreciate knowing. It's just like you are living in ignorance all the time, and you feel like, you know, I mean, I hope everything is going okay out there but they don't tell you about it when something happens.		
	Like Ms. Wise says about "I'd rather be an informed laboratory animal," I mean, it just makes you feel better at least to know what's going on. I don't think there would be any panic caused if we had just been told to close our windows, that a cloud of tritium might be going by, just close your windows or something, don't go out. I mean, we had friends over at our house and they left about when it happened, at 11:00 o'clock at night, and I thought about that. Like I say, I am not a scientist but if there is this much concern about it, apparently the whole place was covered with people from DOE and NRC the next day out gathering samples in helicopters, it must have been something fairly important or they wouldn't, I don't assume, wouldn't have spent the money to do all of that.		
N5	And just one thing I would like to see in the Environmental Impact Statement, is to take it really seriously. I mean, it just seems like it's taken, you know, a lot of people fighting a long time just to get to this point, and it seems like that should just be done automatically, and I certainly think it should get the full 45 days it's supposed to, and not be cut down to 30 days.	NEPA procedures	Foreword
	And that's it.		

Table K-3. Scoping statements and EIS sections or DOE's responses (continued)

Comment number	Statement	Scoping topic	EIS section or DOE comment

STATEMENT OF DR. ZOE TSAGOS

My name is Zoe Tsagos. I hold the Energy Chair in the League of Women Voters of Northern Beaufort County.

I speak in behalf of our organization which is a participant in the suit, in part pending, against the Department of Energy.

On July 15, 1983, United States District Court Judge Thomas Penfield Jackson ruled on the first part of the suit brought by the National Resources Defense Council and others for the issuance of an Environmental Impact Statement by the DOE before the restart of the L-Reactor at the Savannah River Plant.

The previous day, July 14, the President signed the Energy and Water Development Appropriations Act, FY-1984.

For greater clarification, I quote from H.R. Report Number 98-272, 99th Congress.

And, I'm doing this, or I thought I would be doing this because people would be here, especially numbers of people, who might not have been following this whole matter.

But, nevertheless, I think it's pertinent. The pertinent section of this Act reads as follows:

> "None of the funds appropriated by this Act, or any other Act, or by any other provisions of law, shall be available for the purpose of restarting the L-Reactor at the Savannah River Plant, Aiken, South Carolina, until the Department of Energy completes an Environmental Impact Statement pursuant to Section 102(2)(C) of the National Environmental Policy Act of 1969, and until issued a discharge permit pursuant to the Federal Water Pollution Control Act, 33 U.S.C. 1251, following, as amended, which permit shall incorporate the terms and conditions provided in the Memorandum of Understanding, entered into between the Department of Energy and the State of South Carolina, dated April 27, 1983, relating to studies and mitigation programs associated with such restart."

Table K-3. Scoping statements and EIS sections or DOE's responses (continued)

Comment number	Statement	Scoping topic	EIS section or DOE comment
	The purpose of today's meeting by DOE is, as we understand it, to hear suggestions on what the EIS should encompass, a scoping operation based, in part, on public recommendations from previous hearings and written submissions.		
	Because of the limitation of time and because we realize that comments will be forthcoming in each of the eleven categories, from various sources, we shall confine ourselves to five recommendations which lie within one or more of the DOE listed areas.		
	1. Lying within the scope of Number 10, Cumulative Thermal Effects of discharging scalding radioactive effluent into Steel Creek and the Savannah River. And, Number 11, Cumulative Radiological Effects of emissions, both in the atmosphere and in the water.		
01	We strongly recommend that a method of cooling the reactor effluent be introduced, either by recyling, by cooling pools, or by any other acceptable method which will cool the emissions to the standard of 90 degrees Fahrenheit, acceptable to the South Carolina Department of Health and Environmental Control.	Alternative cooling	Section 4.4.2 See Comment E6
	2. Our second recommendation has to do with the use of seepage basins or containers, and falls within both Number 4 in the DOE identification of issues, which has to do with groundwater usage and the drawdown into the Tuscaloosa Aquifer, as well as Number 9, which concerns itself with groundwater contamination through seepage basins.		
02	We feel that new means of containment of radioactive and non-radioactive chemical wastes should be devised, and that frequent and thorough inspection is necessary of whatever receptacles would be used to prevent groundwater seepage as in the case of the contaminated wells and the penetration into the Tuscaloosa Aquifer of the cleaning agent Triclene.	Groundwater contamination	Sections 4.1.2.2, 4.4.3, 5.1.1.2, 5.1.1.4, Appendix F See Comment B6
03	3. Our third recommendation would touch upon all eleven areas listed by DOE. We feel that the present method of yearly environmental monitoring of the Savannah River Plant by DuPont, which prepares the study for DOE, would be better carried out by a carefully chosen independent commission, an independent body not connected with DuPont or with the Department of Energy	Monitoring	Sections 6.1, 6.2 See Comment B8

Table K-3. Scoping statements and EIS sections or DOE's responses (continued)

Comment number	Statement	Scoping topic	EIS section or DOE comment
	or with any other group involved with the operation of the Savannah River Plant. This is not necessarily a reflection on the work done and the contents of the DuPont report, whose full title is: Environmental Monitoring in the Vicinity of the Savannah River Plant. And, the one I have is as late as 1982. Obviously, information from those who operate the Savannah River Plant is valuable; however, taken together, the material required by government agencies, such as DHEC, the data that can be provided by DuPont and the independent observation of a public commission, would provide a report which would be as inclusive as possible, and which, incidentally, would spread the responsibility about the accuracy of the environmental impact information.		
04	4. Our fourth recommendation lies within the area of safety; Number 7 in the DOE list. Neither in the Environmental Assessment nor in the Environmental Monitoring Study is there an evacuation plan presented. In the EA under "Reactor Accidents," pages 4-26 through 4-31, covering nuclear, non-nuclear and accidents due to natural causes, there is a reference made to an evacuation plan. A reference only. On page 4-28 under "Risk Evaluation," the following statement is made: "An emergency response plan has been implemented at the Savannah River Plant to initiate actions or evacuation of employees during an emergency." We feel that with the putting in operation of a fourth reactor at the SRP, thus increasing the possibility of an accident, an evacuation plan should be included in the EIS showing the steps to be taken to evacuate not only the people in the SRP, but also the people which can be affected outside the production site.	Emergency planning	Section 4.2.1.3, Appendix G, Appendix H

Table K-3. Scoping statements and EIS sections or DOE's responses (continued)

Comment number	Statement	Scoping topic	EIS section or DOE comment
	An article in the New York Times of June 5, 1983, states the following: "In case of an accident in a nuclear plant, the Nuclear Regulatory Commission requires that preparations be made that those living within ten miles can be notified, sheltered or evacuated. "Plans must also be made to test for contamination of the food and water within 50 miles." This applies to commercial nuclear plants. But, an accident would be equally destructive whether it occurs in a commercial or federal installation. We, therefore, need to know what steps will be taken at the SRP in case of an accident. It should be spelled out.		
05	5. Our fifth recommendation rests squarely on the DOE issue Number 11, Cumulative Radiological Effects. We are disturbed at the present plan to restart the L-Reactor before the glassification or solidification plant will be in operation. We strongly recommend that serious consideration be given not to start the L-Reactor until the means of solidifying and removing the radioactive isotopes is available, thus making the effluent from the reactor far less destructive to the environment and less polluting of the Savannah River drinking water for 70,000 people. In summation, we are glad that an EIS, even an expedited one, will be prepared, not only because this was a pivotal point in our suit against DOE, but because both the people involved in the suit and the people who will be operating the L-Reactor will have time to take yet another look at the information which has been gathered in the testimony in North Augusta and at the several DOE hearings. This, we hope, will be an opportunity for a reappraisal and a sincere attempt by all of us to bring about the best possible solution to a difficult problem.	Radioactive waste	Sections 4.1.2.8, 5.1.2.8

Table K-3. Scoping statements and EIS sections or DOE's responses (continued)

Comment number	Statement	Scoping topic	EIS section or DOE comment
	STATEMENT OF SISTER HELENA PRICE		
	My name is Sister Helena Price. I am a member of the Religious Order of Sisters of Christian Doctrine, located in Suffern, New York. I am presently employed at St. Peter's Catholic Parish, located here in Beaufort. My main work consists in facilitating Religious Education programs, as well as serving the social needs in the local community.		
P1	I, along with many others, all interested citizens, object as well as fear the restart of the L-Reactor in the immediate Savannah area. We feel deep concern for the possible health hazards it could create, as well as the environmental destruction we could experience.	Health effects	Sections 4.1.2.6, 5.1.2.5, 5.2.7, 6.1.4, Appendix B, Appendix G
	We are in complete agreement with the federal judge's decision that an Environmental Impact Statement be made before the L-Reactor is restarted.		
	I, and those with whom I have spoken about this issue, hope that the Environmental Impact Statement will leave no doubts about the possible dangers for us and for succeeding generations to come.		
	That completes my statement.		

Comment number	Statement	Scoping topic	EIS section or DOE comment
	STATEMENT OF SUSAN GRABER		
Q1	I'm Susan Graber. I drink the water and I'm here for that reason. I'm thrilled, as all of us here in Beaufort are, that an EIS is going to be done, and I just wanted to point out one thing, that I just hope that you would consider taking into consideration the entire water problem that we have in this area. There are threats to our groundwater that concern us, saltwater intrusion, overuse and overpumpage creates problems,	Groundwater contamination	Sections 4.1.2.2, 4.4.3, 5.1.1.2, 5.1.1.4, Appendix F See Comment B6
Q2	and I would just hope you would take into consideration our water problem in its entirety and what the elimination of our surface water source would do, you know, considering our groundwater problems as well.	Surface water use	Sections 4.1.1.2, 5.1.1.4, 5.2.2, Appendix D
	I don't know if you have the Metropolitan Savannah groundwater study that the Corps of Engineers did, but if you would look at that and just consider the little bit of a tussle we are having with Savannah over our groundwater, okay, and how damage to our surface water would really greatly affect us on the coast.		

Table K-3. Scoping statements and EIS sections or DOE's responses (continued)

Comment number	Statement	Scoping topic	EIS section or DOE comment
	STATEMENT OF ZAIDA DILLON		
	I'm Zaida Dillon, and I have no affiliation, and I'm here as an individual to express my own personal delight with the fact that there will indeed be an EIS.		
	Addressing the issue of purity of air and purity of water for Beaufortonians who consider themselves very close downstream from the Savannah River Plant.		
R1 R2	Although I speak as an individual, the end of 1982, one thousand signatures were gathered from citizens in Beaufort by a group of us in Beaufort who are unaffiliated with any organization or political group, and in February, the signatures regarded the importation of high level nuclear wastes into South Carolina. However, I think there was hardly an individual who signed that petition who did not in addition make a comment about the fear of the threat of the Savannah River Plant as being a possible hazard to air and water, and these thousand signatures were presented personally to Secretary Hodel, in his office in the Forrestal Building, so I think that although there are very few people as citizens here tonight, I assure you that those thousand people, silent voices, are out there in Beaufort.	Atmospheric effects Groundwater contamination	Sections 4.1.1.6, 4.1.2.1, 4.2.2.1, 4.3.1, 5.1.1.3, 5.1.2.2, Appendix B Sections 4.1.2.2, 4.4.3, 5.1.1.2, 5.1.1.4, Appendix F

Comment number	Statement	Scoping topic	EIS section or DOE comment
	STATEMENT OF ANN HARRINGTON		
	My name is Ann Harrington, and I'm just speaking as a private citizen. I have something written, so I will read it.		
	Since your last hearing, I have been thinking of what I would like to say to the decision makers concerning the L-Reactor as well as the nuclear issue in general. It is my feeling that you are all good people concerned with doing what is best for our nation and our children's future.		
	I have no choice but to trust that you are competent, conscientious professionals. The ton of paperwork you have here assembled generated by your countless hours of research and the hours upon hours spent in research leave a layperson, like myself, little room to argue on any of the technical points. However, I have read some on the subject and reflected on it and have come to my own conclusions.		
S1	What we are concerned with here are environmental consequences, and I have one question that I wish someone could answer. Why, after 30 years of nuclear weapons and power development, is there no program for permanent storage of nuclear waste? I feel that it is foolish to continue to provide waste until a safe, permanent solution has been developed. Until this has occurred, I call for a freeze on any further production of nuclear weapons and nuclear power plants.	Radioactive waste	Nuclear Waste Policy Act of 1982 established responsibilities, procedures, and schedules for providing permanent storage of high level radioactive waste.
	I want you to know that I am afraid. I wonder if the day is coming when an accident at SRP will force us to evacuate our homes, never again to return. A catastrophe of this magnitude could cripple our country economically and destroy countless lives. Do we really need to take such a risk? Ultimately, you are to decide that. I hope you think long and hard on it.		

Table K-3. Scoping statements and EIS sections or DOE's responses (continued)

Comment number	Statement	Scoping topic	EIS section or DOE comment
	STATEMENT OF GERALDINE LEMAY		
	Mr. Cumbee, Mr. Sires, I am Geraldine LeMay, Chairman of the National Resources Committee of the League of Women Voters of Savannah-Chatham County and formerly Chairman of the Energy Committee of the League of Women Voters of Georgia.		
	Mrs. Lee Wash, President of the Georgia League, has asked me to represent her in speaking for the state League at this hearing.		
	Care for the environment is a major concern of the League, and the League of Women Voters of the U.S. in its policy toward energy development and implementation takes the position that "environmental protection is a primary consideration." This will be the major emphasis in my suggestions about the L-Reactor reactivation.		
	Perhaps I should comment first on my previous appearances at Savannah River Plant hearings. I am today for the third time speaking for the Georgia League at a public hearing on the proposed reactivation of the L-Reactor at the Savannah River Plant. My earlier statements, at meetings in February and May, were concerned specifically with the need for an Environmental Impact Statement. Happily, there will be no need to restate today those arguments, for an EIS is now being done. DOE is now in the progress of preparing such a statement.		
	I am most pleased that we have thus progressed to the position of doing a thorough study of the impacts on the physical and human environment before the final decision is made on whether to complete reactivation of the L-Reactor and place it in operation.		
	Some recommendations on the process of developing and desirable goals for the EIS: My concern is that the EIS be done in such a		

Table K-3. Scoping statements and EIS sections or DOE's responses (continued)

Comment number	Statement	Scoping topic	EIS section or DOE comment
T1	way that it both will be recognized as an adequate scientific analysis, and one which is truly objective. The EIS should not bring forth the kinds of criticism which the DOE's Environmental Assessment has aroused, of a biased approach, one too limited in scope, and perhaps sometimes inaccurate when at variance with other studies made of the area.	NEPA procedures	NEPA procedures require that the responsible agency ensure the professional integrity of the discussions and analyses in EISs. DOE has identified methods used and has made explicit references to the scientific and other sources relied on for conclusions.
T2	The goal stated above, in my opinion, might best be reached by DOE's establishment of an independent advisory committee to oversee studies and mitigation measures. Such a committee, with details on its possible makeup and responsibilities, has already been recommended to DOE by the plaintiffs in a lawsuit about the EIS. The proposed committee would be widely representative of all interested groups, having members from federal, South Carolina and Georgia governments, the plaintiffs, and other civic and environmental groups. On such a committee, there would be adequate scientific knowledge and sufficient representation of the public interest to assure that the EIS would both be and be recognized as adequate, accurate and objective a goal which I think DOE would want and should try to achieve. And now about the scope of the EIS as proposed by DOE: DOE's notice of intent to prepare an Environmental Impact Statement lists 11 issues which will be analyzed and suggests that others may be added following the public hearings. This indicates, commendably, a desire to include all aspects of the problem in the study. However, because of the short time in which this particular EIS is to be made, it may not be possible to cover adequately this broad a field, and some issues, although all listed by DOE are important, may have to be dropped. Issues finally chosen for study, if some do have to be dropped, should logically include those which a number of interested groups have pointed out as essential: First, human health effects; reactor safety and radioactive emissions; groundwater contamination; groundwater usage; thermal effects; transportation of radioactive materials.	NEPA procedures	Foreword.

Table K-3. Scoping statements and EIS sections or DOE's responses (*continued*)

Comment number	Statement	Scoping topic	EIS section or DOE comment
T3	And, now, comments on proposals for mitigation of potentially harmful impacts: Certain proposals for mitigation of potentially harmful environmental impacts from the L-Reactor reactivation have been strongly urged by interested civic and environmental groups. Many of these suggestions are also among alternative mitigation measures proposed by DOE in its notice of intent.	Mitigation measures	Section 4.4, Appendix I
T4 T5	For reactor safety: An improved confinement system; a containment dome; adoption of safety standards imposed upon commercial nuclear power plants.	Safety alternatives Regulatory requirements	Section 4.4.1, Appendix G Chapter 7
T6	To prevent groundwater contamination: The elimination of the use of seepage basins.	Seepage basins	Section 4.4.3 See Comment E6
T7	To reduce groundwater usage and thermal effects: The use of a recirculation system for the cooling water.	Cooling alternatives	Section 4.4.2
T8	For safe transportation of radioactive materials: Adherence to standards imposed on commercial nuclear activities. DOE should, I suggest, give special consideration to these methods of mitigating the potential harmful effects of the L-Reactor reactivation.	Regulatory requirements	Chapter 7
T9	What is, to me, the determining factor in the decision on reactivation of the L-Reactor: In concluding my remarks, I should like to say that the near completion of the renovation of the L-Reactor should not, in my opinion, be a determining factor in the decision on its reactivation.	Need	Section 1.1
T10	If the EIS does point to the likelihood of serious harm to people and to the physical environment, the L-Reactor should not be put back into operation. The health and safety of the people who live and work in the area should be accepted as infinitely more valuable than the millions of dollars invested in an idle nuclear reactor. The L-Reactor should not again be placed in operation if doing so will lower the quality of life for the people who live in its immediate area, in South Carolina and Georgia, and along the Savannah River below the plant site.	Health effects	Sections 4.1.2.6, 4.2.1.5, 5.1.2.5, 5.2.7, 6.1.4, Appendix G

Table K-3. Scoping statements and EIS sections or DOE's responses (continued)

Comment number	Statement	Scoping topic	EIS section or DOE comment
	STATEMENT OF LAWRENCE BENEDICT		
	It's nice to be here again. I am Lawrence Benedict. I am the Chairman of the Environmental Quality Committee, League of Women Voters, Savannah-Chatham. We thank you for allowing us input into this very vital Environmental Impact Study the department is conducting.		
	After hearing Geraldine LeMay, and I hope, Virginia Brown, you are well aware of the League's position regarding energy development, which is that environmental protection is a primary consideration. You are equally aware, I'm sure, that the League is not alone in this position, nationally and regionally.		
	Here, in what is darkly called "SRP Country," we particularly support the similar position of two of our co-plaintiffs in recent victorious lawsuit, which compelled the Department of Energy to conduct an Environmental Impact Study prior to restarting the Savannah River Plant's L-Reactor.		
	Further than that, we speak today on behalf of The Georgia Conservancy and Coastal Citizens for a Clean Environment, representatives of whom have been called away on long-planned vacations.		
	The primary concerns of these organizations are these:		
U1	Number One, the findings of the EIS should be thoroughly documented; that is, how did the conductors of the study reach particular conclusions, such as thermal effects in the Savannah River, or amounts of cesium to be released, et cetera.	NEPA procedures	Foreword
U2	Number Two, the cesium levels in Steel Creek Delta should be retested, not simply recalculated.	Radiocesium remobilization	Sections 3.7.2, 4.1.2.4, Appendix B, Appendix D
U3	Number Three, DOE should also produce documentation of the real need for the materials to come from the L-Reactor, without this information creating a national security risk.	Need	Section 1.1

Table K-3. Scoping statements and EIS sections or DOE's responses (continued)

Comment number	Statement	Scoping topic	EIS section or DOE comment
U4	Both The Conservancy and the CCFCE have questions about who will prepare the EIS. Both register reservations about the NUS Corporation continuing to serve DOE in environmental matters because of that company's Finding of No Significant Impact in the neighboring environment as reported in the flawed Environmental Assessment. You will recall, in the above-mentioned lawsuit, U.S. District Court Judge Thomas P. Jackson denounced the FONSI as "unreasonable, arbitrary and an abuse of discretion." The League concurs. But forcing DOE to conduct an EIS is only part of the victory in the Court. The Court's decision becomes even more significant than a presidential signature on an appropriations bill because, according to Attorney Jacob Scherr of the Natural Resources Defense Council, Inc., "It makes clear that DOE was acting in violation of the law and sets a precedent for DOE's decisions in the future regarding the Savannah River Plant."	NEPA procedures	Foreword
U5	And because there was a violation of the law in attempting to restart the L-Reactor, the League will continue to press the fight to win an injunction to halt the restart until all concerned are satisfied that the need for the reactor is matched by mitigating measures to protect the health and well-being of all the creatures and plants in SRP's surrounding area. Given the seeming willingness of DOE to comply now with the law, the signals we citizens get from SRP are that the whole system has been approaching a state of disaster in its latter years of a very large nuclear-materials-producing life. The components for disaster have been visible since the first cascade of scalding discharge water wiped out the marshes and denizens of Steel Creek Delta back in the fifties. Permanent radioactive damage was assured when the cesium it carried with it became an integral part of the delta's mud. Another of SRP's disaster components was registered, for the first time, last spring when it was discovered that discharged toxic liquid wastes were leeching through some of DOE's collecting ponds into the area's groundwater supplies, the extent to which has not yet been determined.	Mitigation measures	Section 4.4

Table K-3. Scoping statements and EIS sections or DOE's responses (continued)

Comment number	Statement	Scoping topic	EIS section or DOE comment
	And lately, just a few weeks ago, DOE announced the escape of a small quantity of tritium into the atmosphere. "A paltry supply it was," implied a DOE official. "No more radioactive material than one experiences every day flying at 30,000 feet."		
	Nonsense.		
	We are unconsoled by such analogies and turn instead to recent scientific studies which suggest that routine and accidental releases of tritium may be more hazardous than previously believed. Tritium is radioactive hydrogen which can combine to make radioactive water. This radioactive water becomes an unseen hazard in our rain, our rivers and eventually our food. These studies suggest that a dose of radiation from tritium may be three times as damaging as the same dose from x-rays. When tritium becomes a part of our food, our bodies are more likely to retain it. While tritium is inside our bodies, it bombards our body cells with radiation that can cause damage which can lead to cancer and other health problems. The unborn child is especially sensitive to damage from tritium, and young children are more sensitive than adults.		
	The bibliography that goes with that is from HEALTH AND ENERGY LEARNING PROJECT, 236 Massachusetts Avenue, Washington, D.C.		
U6	In closing, let me restate the League believes strongly in mitigation measures to correct the deficiencies in SRP's antiquated equipment. In our view, the real issues are not how little radioactivity is abroad in SRP's neighborhood, not how significant is the destruction of Steek Creek's ecology as compared to the rest of the marshlands and wildlife in Georgia and South Carolina.	Mitigation measures	Section 4.4, Appendix I
U7 U8 U9	The real issues are what caused the accidents at SRP and what is being done to prevent them. The answer to the latter issue is the installation of cooling towers and containment domes at all reactor sites at SRP and mechanisms supplied for recycling discharge waters.	Accident analysis Safety alternatives Alternative cooling	Sections 4.2.1, 4.4.1, Appendix G Section 4.4.1 Section 4.4.2, Appendix I See Comment E6
	The EIS now in progress, truncated though it may be, should address itself to this question. And the injunction we will seek in a hearing scheduled for Washington, August 16th, will stop the process at L-Reactor and assure a more meaningful EIS.		

Table K-3. Scoping statements and EIS sections or DOE's responses (continued)

Comment number	Statement	Scoping topic	EIS section or DOE comment
U10	More importantly, it will give pause to determine by what scale of risk do we measure the values of a healthy and stable environment versus expediency and cost effectiveness.	Health effects	Sections 4.1.2.6, 4.2.1.5, 5.1.2.5, 5.2.7, Appendix G

Table K-3. Scoping statements and EIS sections or DOE's responses (continued)

Comment number	Statement	Scoping topic	EIS section or DOE comment
	STATEMENT OF KEN MATTHEWS		
	I'm Ken Matthews, a member of Natural Resources and Energy Management Committee of the Savannah Area Chamber of Commerce. I'm speaking on behalf of our organization. I want to thank you for this opportunity to present our point of view on the scope of the Environmental Impact Statement relative to the proposed restart of the L-Reactor.		
	I might mention that the Savannah Chamber of Commerce is a business organization founded in 1803 that represents 1400 businesses in the community. Our primary emphasis is on economic development with additional concern for the quality of life that makes Savannah an attractive environment for our current residents as well as an incentive for attracting new business and industry to this area.		
V1 V2 V3	The Chamber, as expressed previously, has grave concerns over the Department of Energy's plans for reactivation and expansion of facilities at the Savannah River Plant. Since our community is 88 miles downriver and downwind from the Savannah River Plant, we fear that our air and water quality may be adversely affected by the L-Reactor restart. Consequently, we believe that the Environmental Impact Statement should take into account the cumulative effects of the present and proposed facilities at the Savannah River Plant as well as those of contiguous operations, such as Georgia Power Company's Plant Vogtle and the Allied General Nuclear Processing Facility in Barnwell, South Carolina.	Atmospheric effects Surface water use SRP and regional effects	Sections 4.1.1.6, 4.1.2.1, 4.2.2.1, 4.3.1, 5.1.1.3, 5.1.2.2, Appendix B Sections 4.1.1.2, 5.1.1.4, 5.2.2, Appendix D Section 5.2.6
V4 V5	The Chamber also opposes any additional plant expansions until such time as more effective control of radioactive substances has been demonstrated for the existing facilities. We have a further concern that there is a double standard applied to those projects of the Department of Energy as opposed to those carried out by the private sector. Our concern is that the Department of Energy's standards are not comparable to those of the Nuclear Regulatory Commission, nor are they subject to the independent review of that agency.	Cumulative radiological effects Regulatory requirements	Sections 3.7.1, 5.1.2, 5.2.6 Sections 7.1, 7.2

Table K-3. Scoping statements and EIS sections or DOE's responses (continued)

Comment number	Statement	Scoping topic	EIS section or DOE comment
V6	The Chamber has consistently expressed its concern for protection of the aquifer which is recharged near the Savannah River Plant. Quality groundwater is an extremely important natural resource to Savannah and must be protected.	Groundwater contamination	Sections 4.1.2.2, 4.4.3, 5.1.1.2, 5.1.1.4, Appendix F See Comment B6
V7	As the Savannah area's groundwater supply becomes more scarce through increased demand, we believe that the community will be forced to rely to a much greater extent on the resources of the Savannah River for potable drinking water and for industrial use.	Surface water use	Sections 4.1.1.2, 5.1.1.4, 5.2.2, Appendix D
V8	The Environmental Impact Statement should address these health and public safety concerns that could affect our community's ability to grow and prosper. We thank the Department of Energy for this opportunity to present our views to be considered in the scope of the Environmental Impact Statement, which we request address objectively our concerns for groundwater and river water contamination, cumulative effects of multiple radiological facilities in the area of the Savannah River, and thirdly, the L-Reactor components that are inconsistent with commercial facilities.	Socioeconomic effects	Sections 4.1.1.1, 4.2.1.5, 5.1.1.1, 5.2.1

Comment number	Statement	Scoping topic	EIS section or DOE comment
	STATEMENT OF JOEL REED		
	I'm Joel Reed, and I don't have any affiliation. I just have three specific suggestions on use of information and data which will go into the EIS.		
W1	It's my understanding that the calculations for the maximum permissible amount of atmospheric emissions is based on an even distribution throughout the circumference area.	Atmospheric effects	Sections 4.1.1.6, 4.1.2.1, 4.2.2.1, 4.3.1, 5.1.1.3, 5.1.2.2, Appendix B
	I would like to remind the Department they need to consider the wind factor, which will reach an uneven build-up in certain areas downwind from the plant.		
W2	This also applies for the calculations for the water emissions, the waste in the water. I believe it's Cesium-137.	Radiocesium remobilization	Sections 3.7.2, 4.1.2.4, Appendix B, Appendix D
	You can assume that there is going to be an uneven distribution by current and wind. All this is going to affect and lead to an increased build-up in one area and no build-up in another area.		
W3	And the third suggestion is to consider the bioaccumulation of the waste in the food chain of the environment. The wastes that are emitted by the reactor in both atmosphere and water are going to be absorbed into the ecological food chain at each level. That means each organism, plant, fish, birds and humans, will be subjected to an increased build-up of waste, so you can't just look at one level in that chain. You have to consider the effects in each level of the chain.	Radiological effects	Sections 5.1.2, 5.2.6, Appendix B

Table K-3. Scoping statements and EIS sections or DOE's responses (continued)

Comment number	Statement	Scoping topic	EIS section or DOE comment
	STATEMENT OF VIRGINIA BROWN		
	I had thought I was going to precede two other speakers, so the timing on some of my verbs isn't quite right.		
X1	To the United States Department of Energy: I am Virginia Brown *here today representing* the League of Women Voters of Savannah-Chatham. The local League has, over the past several months, worked closely with other Leagues of Women Voters which have involved themselves in the primary issues of environmental protection in connection with the start-up of the L-Reactor at the Savannah River Plant. We have joined forces also with other groups and individuals in some of their concerns about this issue and the other issues about environmental impact of the entire Savannah River Plant operation.	SRP and regional effects	Section 5.2
	The League of Women Voters has, from its beginning, concerned itself with taking action "in the public interest on government measures and policy." This is from a 1923 statement of *purpose and policy of the League of Women Voters of the United* States.		
	In the issue under discussion today regarding the Environmental Impact Statement on the L-Reactor, the League is gratified that our sought-after action to provide such an EIS is being implemented in accordance with requirements under the National Environmental Policy Act of 1969. The latter government policy measure was actively supported by the League of Women Voters of the United States from its inception.		
	Since then, the League has constantly monitored those activities which come under NEPA's regulatory requirements.		
	This week, our concerns about the Savannah River Plant have already been addressed by the League of Women Voters of South Carolina. We concur in the statement about needs made by the representatives of the South Carolina League.		
	Today, the Savannah-Chatham League of Women Voters is here to say we fully support statements about the Environmental Impact Statement regarding the L-Reactor and the impacts at the Savannah River Plant to be made by the League of Women Voters of		

Table K-3. Scoping statements and EIS sections or DOE's responses (continued)

Comment number	Statement	Scoping topic	EIS section or DOE comment
	Georgia, represented by Ms. Geraldine LeMay and by Georgia Conservancy and Coastal Citizens for Clean Environment representative Larry Benedict.		

Table K-3. Scoping statements and EIS sections or DOE's responses (continued)

Comment number	Statement	Scoping topic	EIS section or DOE comment
	STATEMENT OF MELISSA ALLEN HEATH		
	My name is Melissa Allen Heath. I just represent myself. I'm a law student at the University of Georgia and will be co-chairman of the Environmental Law Association there this year.		
	I echo all the concerns that have been voiced today. I have just a few things to add.		
	One, I would like to formally register an observation that this hearing has not been widely publicized. It took me over an hour on the telephone yesterday to find out where it was, and the DOE telephone numbers in Atlanta are, as listed in the Atlanta information, now the Department of Labor.		
Y1	I made several long-distance phone calls before I found this all out. My only other specific observation is the effect on a thousand acres of marshland through Steel Creek and possibly	Wetland impacts	Sections 4.1.1.4, 4.4.2, 5.1.1.2, 5.2.4, Appendix C, Appendix I
Y2	more each year should be measured not only in the effect on endangered species, but also the effect on all species and the	Endangered species	Sections 3.6.1.4, 3.6.2.3, 4.1.1.4, Appendix C
Y3	effect on the ecosystem in general, not only through bioaccumulation and the effects on the river, but also just on the im-	Radiological effects	Sections 5.1.2, 5.2.6, Appendix B
Y4	pact that will have on the ecosystem and on fisheries, which is a valuable resource in Georgia.	Fisheries	Sections 5.2.4.2, 5.2.5.1, Appendix C
Y5	Other than that, I think it's very important to consider the	Safety alternatives	Section 4.4.1
Y6	inclusion of a containment dome, cooling towers, recycling sys-	Alternative cooling	Section 4.4.2, Appendix I, See Comment E6
Y7	tem and that the groundwater effects are an increased concern to everyone that I have talked to the last few days in Savannah.	Groundwater contamination	Sections 4.1.2.2, 4.4.3, 5.1.1.2, 5.1.1.4, Appendix F See Comment B6

Table K-3. Scoping statements and EIS sections or DOE's responses (continued)

Comment number	Statement	Scoping topic	EIS section or DOE comment
	STATEMENT OF ELWIN E. TILSON		
	My name is Elwin Tilson, and I am representing myself at this meeting. I am an assistant professor of radiation science; although I have numerous concerns that I would like the EIS to address, I feel that most of those have been addressed by other people in other areas.		
	However, there is one area of extreme concern that I have in the preparation of the EIS, and that is in the rigor, the scientific rigor of the documents used to derive decisions used both in the Environmental Assessment, and I assume also being used in the development of the EIS.		
Z1	My professional opinion is that there are numerous cases in documents where there is insufficient scientific rigor, and there are assumptions that seriously affect the outcome of the study but are not adequately supported nor researched.	NEPA procedures	Foreword
	There are three examples I would just like to bring to the attention of the hearing as general examples. This process has happened in numerous documents that I have reviewed.		
Z2	The first is the method used to calculate the radiation doses in both airborne and waterborne contamination from radioisotopes. It has one basic assumption in it that makes the calculation method inappropriate, and the calculation is based on the assumption of uniform distribution of radionuclides in the air for airborne releases or in the water for waterborne releases.	Radiological effects	Sections 4.2.1, 5.1.2, 5.2.6, Appendix B, Appendix D
	Unfortunately, the way that these releases do operate, in reality, is not so that the release is uniformly distributed throughout a given volume of air or water. What happens is that the radiation is concentrated in areas and does tend to be -- it is very concentrated in some areas and unconcentrated in other areas.		
	Many of the documents that have been used in the past make the assumption that there is uniform dilution of radionuclides in both airborne and waterborne types of situations, a major flaw in methodology.		

Table K-3. Scoping statements and EIS sections or DOE's responses (continued)

Comment number	Statement	Scoping topic	EIS section or DOE comment
Z3	Another major flaw in methodology I have identified in the Environmental Assessment is the local lack of consideration of an effect called bioaccumulation. Bioaccumulation means just that plants and animals absorb radionuclides and will accumulate a higher level of radiation than the environment. They are in return eaten by higher organisms, and it accumulates further and further up the food chain. In many of the documents, it is totally ignored, and it is a major consequence from low level radiation release over periods of time.	Radiological effects	Appendix B
Z4	A third incidence of false assumptions when making conclusions is related to the containment system used at the L-Reactor. In the Environmental Assessment, the statement was made that irregardless of what the accident is, and one of the examples that they use was if they had a loss of coolant accident, that they have a filter system that is capable of removing virtually all or all of the airborne radionuclides. However, the one assumption they made there which is a false assumption is that the filters that are used in the containment system are equally effective when wet from steam, and in actuality, DOE documents do indicate that this particular filter system is not functional when it becomes water-saturated which, unfortunately, is exactly the situation that would happen with a loss of coolant accident.	Accident analysis	Sections 4.2.1, 4.4.1, Appendix G
Z5	There are many other types of examples that I could bring to the hearing, but my major concern is that in the preparation of the EIS, that the basic assumptions used behind the technical documents that are being used be reexamined and reassessed because, as I stated before, in my professional opinion, there are numerous false assumptions used to make decisions in documents.	NEPA procedures	Foreword

Table K-3. Scoping statements and EIS sections or DOE's responses (continued)

Comment number	Statement	Scoping topic	EIS section or DOE comment
	STATEMENT OF JOHN MACLEAN		
	My name is John Maclean. I represent a very informal group of about a half dozen people. We have basically two concerns that we would like the EIS to address, some of which you have pointed out in your presentation.		
AA1	The first concern is that the L-Reactor and the requirements for the L-Reactor, there seems to be a double standard that may be applied to the L-Reactor versus a private group. For example, the NRC regulations for a private or utility-based power plant would be lot stricter, it seems, than the standards that are to be applied for the L-Reactor. It would seem or would appear to seem that if the NRC is going to require a private utility plant to have various things, like a containment dome, a cooling tower, it would seem to make even more sense to have those same specifications, the same requirements for a plant that produces plutonium material for nuclear weapons. I think the double standard question should be addressed in the EIS.	Regulatory requirement	Chapter 7
AA2	The second concern is very similar and that is that the EIS should at least spend some time in addressing the same scenario that Babcock & Wilcox faced, Three Mile Island. For example, would the L-Reactor actually survive the scenario of a locked overflow valve, the subsequent misreading of temperature by the instruments, the subsequent cutting off of the coolant pumps, the subsequent melting of the zirconium around the reactor core and the subsequent creation of a bubble underneath. At least Three Mile Island had a containment dome. Could the L-Reactor survive that same scenario? Granted it's a worst case scenario, but it did happen.	Accident analysis	Sections 4.2.1, 4.4.1, Appendix G

Table K-3. Scoping statements and EIS sections or DOE's responses (continued)

Comment number	Statement	Scoping topic	EIS section or DOE comment
	The EIS should address whether or not the L-Reactor could survive that and should also address whether or not the NRC requirements should be applied to the L-Reactor.		

Table K-4. Authors of written letters

Author	Representing	Page
Banks, Roger	Fish and Wildlife Service	K-71
Dexter, Arthur	Self	K-74
Doherty, John	Self	K-80
Heinen, E. T.	USEPA Region 4, Environmental Assessment Branch	K-82
Hollings, Ernest	U.S. Senate, South Carolina	K-85
Maclean, John	Larry Sprague Mary Ellen Sprague Carolyn Rockwood Ferris Cann III Frances Maclean	K-91
McLaughlin, William	Self	K-93
Orselli, Janet	Radiation Awareness	K-96
Scherr, S. Jacob	National Resources Defense Council Energy Research Foundation The Georgia Conservancy Environmental Policy Institute S. David Stoney Justin Stephens McMillan Judith Gordon	K-100
Thomas, Lindsay	U.S. Congress, First District, Georgia	K-110
Thomas, Ruth	Environmentalists, Inc.	K-113
Thurmond, Strom	U.S. Senate, South Carolina	K-118
Tilson, Elwin	Self	K-121
Vang, Alfred	South Carolina Water Resources Commission	K-125
Worby, Linda	Nuclear Information and Resource Service	K-129

Table K-5. Scoping letters and EIS sections or DOE's responses

Comment number	Scoping letter	Scoping topic	EIS section or DOE comment
	LETTER OF ROGER L. BANKS UNITED STATES DEPARTMENT OF THE INTERIOR Fish and Wildlife Service P.O. Box 12559 217 Fort Johnson Road Charleston, South Carolina 29412 July 27, 1983 Mr. M. J. Sires, III Assistant Manager for Health, Safety and Environment U.S. Department of Energy Savannah River Operations Office P.O. Box A Aiken, South Carolina 29801 Re: Scoping comments - EIS for L-Reactor Dear Mr. Sires: The U.S. Fish and Wildlife Service offers the following comments and suggestions for consideration in connection with preparation of the above referenced EIS. The Service has previously reviewed, and is generally familiar with, the content of the Environmental Assessment (EA) prepared for L-Reactor start-up. Within the confines of addressing existing fish and wildlife resources, and impacts to these resources arising from thermal effluents from L-Reactor, the EA represents a substantial base from which to build the fish and wildlife portions of the EIS. The Service suggests the following additional informational needs and issues be addressed within the scope of a thorough impact analysis:		
AB1	1. The preliminary list of issues presented in DOE's	Wetland impacts	Sections 4.1.1.4, 5.1.1.2, 5.2.4, Appendix C, Appendix I

Table K-5. Scoping letters and EIS sections or DOE's responses (continued)

Comment number	Scoping letter	Scoping topic	EIS section or DOE comment
AB2	July 19, 1983 information release should be expanded	Wildlife	Sections 3.6.1, 3.6.2, 4.1.1, 4.4.2, Appendix C, Appendix I
AB3	to include the major topics of wetlands, wildlife and surface water quality.	Surface water quality	Section 4.1.1.5.
AB4	2. Qualification and quantification of available fisheries spawning and nursery habitat in the Steel Creek floodplain as it would be affected by L-Reactor start-up.	Fisheries	Sections 3.6.2, 5.2.5, Appendix C
AB5	3. Use of existing conditions in Steel Creek and its floodplain should be used as a baseline from which to determine start-up impacts rather than utilizing pre-1968 conditions.	NEPA procedures	Sections 3.4.1.2, 4.1.1, 4.1.2.2
AB6	4. Impact analysis should concentrate on habitat and resource losses as finite units rather than relating these losses as percentages of remaining unaffected similar habitats and resources at the Savannah River Plant (SRP) or within the whole Savannah River basin.	Wetlands impacts	Sections 4.1.1.4, 4.4.2, 5.2.4, Appendix C, Appendix I
AB7	5. Cumulative wetland habitat losses from all SRP operations should be discussed.	Thermal effects	Sections 4.1.1.4, 4.4.2, 4.4.3.4, 5.2.4, 5.2.5.1
AB8	6. Since the Steel Creek system is in an early successional stage of recovery from pre-1968 operational impacts, and since the fish and wildlife resource values of a system may vary with its successional state, a thorough discussion of future successional seres and values without the project should be included.	Wetlands impacts	Sections 4.1.1.4, 4.4.2, 5.1.1.2, 5.2.4, Appendix C, Appendix I
AB9	7. Adverse impacts on recreational fishing in the vicinity of the Steel Creek/Savannah River confluence should be addressed. Fisheries biologists with the South Carolina Wildlife and Marine Resources Department have reported that this is the most popular shad fishing spot in the State of South Carolina, and the most popular fishing spot for largemouth bass and redbreast in the Savannah River.	Fisheries	Sections 5.2.4.2, 5.2.5.1

Table K-5. Scoping letters and EIS sections or DOE's responses (continued)

Comment number	Scoping letter	Scoping topic	EIS section or DOE comment
AB10	8. The EIS should include a thorough discussion of current water quality standards as regulated by the South Carolina Department of Health and Environmental Control, and how the L-Reactor discharge would comply with these standards.	Regulatory requirements	Chapter 7
AB11	9. A thorough exploration of non-destructive cooling water alternatives such as cooling towers and/or cooling ponds should be incorporated with the EIS. Cooling pond alternatives should not be limited to damming segments of Steel Creek, but should also include the feasibility of digging lakes or ponds out of available uplands at SRP. Scheduling and/or financial concerns should not preclude thorough exploration of these cooling water alternatives.	Alternative cooling	Sections 4.4.2, Appendix I See Comment E6

The Service appreciates this opportunity for input into the EIS process at this early stage.

Sincerely yours,

Roger L. Banks
Field Supervisor

RLB/SG/lm

Table K-5. Scoping letters and EIS sections or DOE's responses (continued)

Comment number	Scoping letter	Scoping topic	EIS section or DOE comment

LETTER OF ARTHUR H. DEXTER

Rt. 1 Box 80A
Aiken, S.C. 29801
August 3, 1983

Mr. M. J. Sires, III
Assistant Manager for Health,
Safety and Environment
U.S. Dept. of Energy
Savannah River Operations Office
P.O. Box A
Aiken, S.C. 29801

Dear Mr. Sires:

My name is Arthur H. Dexter and I am a retired employee of the E. I. du Pont de Nemours and Co. After graduation from Rensselaer Polytechnic Institute with an M.S. degree in physics in 1951, I was assigned by du Pont to the Argonne National Laboratory where I led a small group of physicists in performing exponential experiments, with the CP-2 reactor at Palos Park, that determined the basic lattice parameters for the SRP reactors. In 1953, I was transferred to the Savannah River Plant and from then until retirement in 1981, I performed research, development, and safety studies that covered or touched on almost every aspect of the plant's processes from reactor monitoring and safety systems to separations processes and weapons development. During this period I served in the following Savannah River Laboratory divisions: Instrument Development, Applied Physics, Experimental Physics, Theoretical Physics, Nuclear Materials, Reactor Engineering, Environmental Transport, and Actinide Technology. As a result of these many assignments, I have an extensive overall knowledge of the SRP.

I am writing in reply to DOE's invitation of July 19, 1983 that invited members of the general public, like myself, to submit comments and suggestions for consideration in connection with the preparation of the Environmental Impact Statement (EIS) for the 105-L reactor. I remain as concerned about the safety of residents in the surrounding communities as I did as an SRP employee and I should like to feel that the EIS you will generate

Table K-5. Scoping letters and EIS sections or DOE's responses (continued)

Comment number	Scoping letter	Scoping topic	EIS section or DOE comment
AC1	is honest, factual, and presents an up-to-date evaluation of the risks to which the populace is subject. I am concerned in particular that the subject of confinement/containment, which after all is the most important concern of any operating reactor, should be treated accurately and openly. Perhaps it seems strange that I should expect anything other than this, but I am concerned that a recent publication that I read failed to do this. I refer to a handout distributed at the public hearings of 5/24/83 at the H. O. Weeks Center, Aiken, and which was entitled "Confinement vs. Containment" (no authorship given). This publication not only failed to give a factual presentation of the existing confinement/containment situation at SRP but actually created some impressions that just were not true. I subsequently obtained a copy of the Environmental Assessment and searched it for the basic information on confinement/	Safety alternatives	Section 4.4.1, Appendix G
AC2	containment that I expected to find, but to no avail. I am concerned that if this state of affairs carries over to the EIS, then that document will merely give lip service to safety without ever examining the actual risks to which the public is subject. Certainly DOE, du Pont, and the rest of us do not want this to occur. For this reason, I wish to present in *simplified form the essential information* that I believe the EIS must contain for accuracy. I will do this in three sections that present: A. the scenario that applies in the case of a loss of coolant accident (LOCA) with associated melting of the fuel, B. the role of the SRP confinement system in this scenario, and C. a summary that includes some personal comments that I feel relevant. A. <u>The Loss of Coolant Accident (LOCA)/Fuel Melt Down Scenario</u>	Accident analysis	Sections 4.2.1, 4.4.1, Appendix G.
AC3	In the event of a LOCA with an associated melting of reactor fuel, existing contingency plans at SRP call for flooding of the fuel core with water from the Savannah River, in order to provide emergency cooling of the fuel. Initial admission rates would be on the order of 1500 gallons per minute, as I recall. This emergency cooling water almost immediately overflows the 105-L reactor building and flows through: 1) the 106-"building" (a 50,000 gallon basin), and 2) a 500,000 gallon tank, exiting finally into an outdoor excavation that has a capacity of 50 million gallons. Since it is projected that cooling water will probably have to be provided for several weeks, the earthen	Accident analysis	Sections 4.2.1.5, Appendix G

Table K-5. Scoping letters and EIS sections or DOE's responses (continued)

Comment number	Scoping letter	Scoping topic	EIS section or DOE comment
	basin will be substantially filled by the end of this time. (At the initial rate of 1500 gallons per minute, 23 days would be required to fill the basin, but the initial flow would be reduced with time.)		
AC4	The major portion of the overall radioactivity released from the fuel will be transported by the emergency cooling water to the outdoor earthen basin where the radioactive noble gases and radioactive iodine (radioiodine) will diffuse from the basin water surface to the atmosphere. Studies that I have performed at SRP and reported upon at a Sun Valley, Idaho, "Air Cleaning Conference," indicate that there will be essentially a quantitative (100%) release of the radioiodine to the atmosphere. Those of us who have been involved with this scenario envision a "purple cloud" of iodine emanating from the basin and being transported by the dictates of the wind.	Accident analysis	Sections 4.2.1.1, 4.2.1.4, Appendix G
AC5	Only a small portion of the radioactivity released by the molten fuel is subject to retention in the 105-L reactor building: (1) the noble gases and radioiodine released directly to the building atmosphere and (2) noble gases and radioiodine that are released within the 500,000 gallon tank, as it fills with water, and which are piped back to the 105-L reactor building. The contribution from (2) will be terminated by the filling of the tank, which will require about five hours. The airborne radioactivity in the 105-L building will be carried by the building ventilation system to a series of demisters, high-efficiency particulate air filters (HEPA filters) and carbon absorption beds, which, in SRP parlance, is referred to as the confinement system.	Accident analysis	Sections 4.2.1.3, 4.2.1.4, Appendix G
	B. <u>The Confinement System</u>		
	The Confinement System is intended to remove: (1) radioactive aerosol particulates by means of the HEPA filters and (2) radioiodine by means of the carbon absorption beds. The radioactive noble gases are not affected by the confinement system and pass to the atmosphere through the 200 ft. stack of the 105-L reactor building.		
AC6	Since there has never been an accident at SRP of the kind described in the Scenario of Section A, it cannot be said with certainty that the confinement system will function as	Accident analysis	Section 4.2.1.4, Appendix G

Table K-5. Scoping letters and EIS sections or DOE's responses (continued)

Comment number	Scoping letter	Scoping topic	EIS section or DOE comment
	intended. However, even if it performs as designed it will serve only to remove a small portion of the total radioactivity released from the fuel since the majority will have passed to the 50-million gallon basin. However, there are several scenarios which have been advanced that may serve to partially, or even totally, negate the effectiveness of the confinement system:		
	• There is an ever present danger of a steam or hydrogen explosion accompanying the melt down accident. This could result in the generation of overpressures that could destroy the paper-like HEPA filters, particularly if there is steam wetting of the HEPA's, which would cause a loss in the inherent strength of the filter paper. Additionally, an explosion of this kind could cause the carbon beds to be coated with moisture which would render them ineffective for the removal of iodine. This could result in the release of essentially all airborne radioactivity to the outside environment via the 200 ft. stack.		
	• A second and equally serious failure of the confinement system can occur if there is an overloading of the carbon beds with sufficient radioactivity to cause self-heating, ignition, and fire in the charcoal material. This in turn could result in the release of all the previously absorbed radioiodine via the 200 ft. stack. The propensity of carbon for ignition is abetted by the reduction in ignition temperature that occurs in carbon as a result of aging.		
AC7	• Still another cause for failure of the carbon beds to function as intended is the inability of the carbon beds to absorb radioiodine when the radioiodine is in the form of an organic iodide compound. There is considerable experimental evidence to indicate that a very large portion of the radioiodine released by the molten fuel may be instantaneously converted to organic compounds in the course of a fuel meltdown. This radioiodine would not be absorbed by the carbon beds and would pass up the stack.	Accident analysis	Section 4.2.1.4, Appendix G

Table K-5. Scoping letters and EIS sections or DOE's responses (continued)

Comment number	Scoping letter	Scoping topic	EIS section or DOE comment
	C. Summary		
AC8	The major portion of the radioactivity released in a LOCA/fuel meltdown accident will pass to the excavated, 50-million gallon basin from which radioactive noble gases and radioiodine will diffuse to the atmosphere and will be carried off by the wind. A smaller portion of the airborne radioactivity in the reactor building may be retained by the SRP confinement system but there is a reasonable possibility that it may not be retained.	Accident analysis	Section 4.2.1.4, Appendix G
AC9	Finally, I wish to offer a few personal comments and observations as regards the EIS: While the message contained in the summary is not one that will instill confidence in those who reside near the plant, it is factual and honest in its essentials. A candid EIS should provide an overdue acknowledgement that the present SRP system is in reality a non-confinement system for the scenario outlined. Obviously the EIS must treat this matter and indicate how these deficiencies can be rectified. However, some nine or ten years ago I was one of several researchers who sought unsuccessfully for a means to retain the radioiodine in the 50-million gallon basin. My own studies with sodium thiosulfate proved unavailing in that the radioactivity of the basin water, it was demonstrated, would cause the release of radioiodine and negate the retention properties of the thiosulfate. I believe that we exhausted all practical mechanical and chemical possibilities at that time. In view of this, I can only conclude that the best hope for the protection of the populace and the environment lies in the retrofitting of a containment dome to the 105-L reactor. The effectiveness of such containment vessels has been amply demonstrated in the Three-Mile Island accident. Moreover, as you are probably aware, the Reactor Engineering Division of the Savannah River Laboratory has advanced proposals and designs for containment domes over a period of years. Unfortunately these proposals to have been turned down on the basis of cost. Perhaps it is time	Accident analysis	Sections 4.2.1.2, 4.4.1

Table K-5. Scoping letters and EIS sections or DOE's responses (continued)

Comment number	Scoping letter	Scoping topic	EIS section or DOE comment
	to acknowledge that the cost is a part of our doing business at SRP and not greatly different than the costs we are all willing to shoulder for the solidification of waste. I look forward to seeing the EIS and hope that it will lay to rest my concerns by examining the confinement/containment issues with greater candor and in greater detail than was done in the Environmental Assessment. Yours truly, Arthur H. Dexter		

Table K-5. Scoping letters and EIS sections or DOE's responses (continued)

Comment number	Scoping letter	Scoping topic	EIS section or DOE comment
	LETTER OF JOHN F. DOHERTY		
	318 Summit Ave. #3 Brighton, Mass. 02135		
	August 3, 1983		
	Mr. M. J. Sires, III Assistant Manager for Health, Safety & Environment U.S. Dept. of Energy Savannah River Operations Office P.O. Box A Aiken, S.C. 29801		
	Dear Mr. Sires:		
	Below are my written suggestions on the scope for the EIS for the L-Reactor Resumption of Operation, at the Savannah River Plant. I am replying to an Energy Department notice in the July 19, 1983, Federal Register, at Page 32966.		
AD1	1. The EIS should have a determination of the dose to a person of radioactivity at a distance of one mile, five miles and ten miles from the reactor in the event of a worst case accident.	Accident analysis	Section 4.2.1.5, Appendix G
AD2	2. The environmental consequences of a worst case accident should be analyzed in accordance with the recent Sierra Club vs Sigler, decision, 695 F 2d 957 (5th Cir: 1983) for both an L-reactor without a containment and one with a containment that meets the requirements of Nuclear Regulatory Commission regulations: 10 CFR 50, Appendix A, Design Criteria 50-57.	Safety alternatives	Section 4.4.1
AD3	3. A cost benefit analysis should be presented in the EIS comparing a reactor with containment with one without a containment (such as proposed in the EA, taking into	Safety alternatives	Section 4.4.1.6

Table K-5. Scoping letters and EIS sections or DOE's responses (continued)

Comment number	Scoping letter	Scoping topic	EIS section or DOE comment
	account doses to the public (iodine* and other materials) at varying distances with consequent non-fatal and fatal cancers, and non-fatal and fatal birth defects.		
	Thank you for this opportunity.		
	John F. Doherty		

*/ Iodine is important here because a containment's primary use is to contain gaseous iodine until it has disintegrated to lighter elements which are not subject to rapid uptake as iodine is to the thyroid gland.

Table K-5. Scoping letters and EIS sections or DOE's responses (continued)

Comment number	Scoping letter	Scoping topic	EIS section or DOE comment
	LETTER OF E. T. HEINEN		
	UNITED STATES ENVIRONMENTAL PROTECTION AGENCY Region IV 345 Courtland Street Atlanta, Georgia 30365		
	4 PM-EA/JM		
	Mr. M. J. Sires, III Assistant Manager for Health, Safety and Environment U.S. Department of Energy Savannah River Operations Office P.O. Box A Aiken, South Carolina 29801		
	Dear Mr. Sires:		
	On August 1 and 2, a member of my staff participated in a series of scoping meetings on the EIS the proposed resumption of the L-Reactor operation at the Savannah River Plant (SRP) in Aiken, South Carolina. Based upon these meetings and our review of the Federal Register notice for the initiation of the EIS scoping process, we believe that the Department of Energy (DOE) has identified the majority of the issues and analyses that need to be developed through the NEPA process. However, to ensure that our concerns are adequately addressed, we offer the following issues we believe need special attention in the EIS.		
AE1	First, we believe that all of the thermal mitigation alternatives for the heated water discharges from the L-Reactor need to be fully discussed in the EIS. Such a discussion should include the direct environmental impacts for each of the alternatives, estimated cost of implementing each alternative, and the relationship of each thermal mitigation alternative to the ongoing thermal mitigation study at SRP.	Alternative cooling	Section 4.4.2, Appendix I See Comment E6

Table K-5. Scoping letters and EIS sections or DOE's responses (continued)

Comment number	Scoping letter	Scoping topic	EIS section or DOE comment
AE2	Second, to assure the protection and propagation of a balanced, indigenous population of shellfish, fish and wildlife in the receiving stream, Section 316(a) of the Clean Water Act requires DOE to demonstrate that the plant's thermal discharge would not impact existing stream conditions. The EIS should provide the information needed to complete this analysis.	Fisheries	Sections 5.2.4.2, 5.2.5.1, Appendix C, Appendix I
AE3	Third, the South Carolina Department of Health and Environmental Control (SCDHEC) has drafted an NPDES permit for the L-Reactor that requires the effluent from the plant to comply with thermal stream criteria at the point of discharge into Steel Creek, rather than at the edge of a rather extensive mixing zone in the Savannah River (as specified in the current	Regulatory requirements	Chapter 7
AE4	NPDES permit). Consistent with this position, the EIS should discuss the effects of thermal discharge in the context of the direct and indirect effects on Steel Creek and its floodplain. In this regard, the EIS should also discuss the administrative procedures which DOE will utilize should the Draft NPDES permit be issued limiting thermal discharges into Steel Creek.	Thermal effects	Sections 4.1.1.4, 4.4.2, 4.4.3.4, 5.1.1.2, 5.2.4, 5.2.5.1
AE5	Fourth, to aid the general public in understanding the offsite radiation doses from the L-Reactor, the offsite dose levels	Radiological effects	Sections 5.1.2, 5.2.6, Appendix B, Appendix D
AE6	should be compared to normal background levels. Also, the health effects from the offsite exposure should be discussed in context with DOE's ongoing long term epidemiological study at SRP.	Health effects	Sections 5.1.2.5, 5.2.7, Appendix B
AE7	Finally, the EIS should develop alternatives for the waste discharges from the operation of the L-Reactor to the seepage basins at the chemical separation areas (F-area, H-area,	Seepage basins	Section 4.4.3
AE8	M-area, Fuel and Target Fabrication areas). These alternatives should be consistent with Parts 261-264 of the Resource Recovery and Conservation Act (RCRA).	Regulatory requirements	Chapter 7

Table K-5. Scoping letters and EIS sections or DOE's responses (continued)

Comment number	Scoping letter	Scoping topic	EIS section or DOE comment
	We appreciate the opportunity to comment on the proposed scope of the EIS and provide input into the planning for this important project. Members of my staff will be happy to discuss the specifics of any of the issues raised above. Sincerely yours, E. T. Heinen, Chief Environmental Assessment Branch Office of Policy & Management		

Table K-5. Scoping letters and EIS sections or DOE's responses (continued)

Comment number	Scoping letter	Scoping topic	EIS section or DOE comment

LETTER OF ERNEST F. HOLLINGS

UNITED STATES SENATE
115 Senate Office Building
Washington, D.C. 20510
202-224-6121

ERNEST F. HOLLINGS
South Carolina

Offices:
1835 Assembly Street
Columbia, South Carolina 29201
803-765-5731

103 Federal Building
Spartanburg, South Carolina 29301
803-585-3702

242 Federal Building
Greenville, South Carolina 29603
803-233-5366

112 Custom House
200 East Bay Street
Charleston, South Carolina 29401
803-724-4525

233 Federal Building
Florence, South Carolina 29503
803-662-8135

Committees:
BUDGET: Ranking Democrat

APPROPRIATIONS
State, Justice, Commerce and the Judiciary: Ranking Democratic
Defense
Labor, Health and Human Services, Education
Energy and Water Development
Legislative

COMMERCE, SCIENCE, AND TRANSPORTATION
Communications: Ranking Democrat
Surface Transportation
Science, Technology, and Space

DEMOCRATIC POLICY COMMITTEE

OFFICE OF TECHNOLOGY ASSESSMENT

NATIONAL OCEAN POLICY STUDY

Comment number	Scoping letter	Scoping topic	EIS section or DOE comment

August 3, 1983

Mr. Richard P. Denise, Acting Manager
Department of Energy
Savannah River Operations Office
Box A
Aiken, S.C. 29801

Dear Mr. Denise:

Thank you for your recent letter inviting my comments on the scope of the L-Reactor EIS. I appreciate you writing.

Since my position on the EIS issue is well-known, there seems no point in submitting a statement for this week's hearings. I simply enclose a portion of my July 10 statement on the Senate floor, in which I listed the topics which I feel the EIS should cover.

I am glad to see the EIS finally underway. If it fully answers the questions that have been raised, and if it presents the advantages and disadvantages of the different mitigation options, then it will do much to lay the present dispute to rest.

Thank you again for writing.

Sincerely,

Ernest F. Hollings

Enclosure

Table K-5. Scoping letters and EIS sections or DOE's responses (continued)

Comment number	Scoping letter	Scoping topic	EIS section or DOE comment

CONGRESSIONAL RECORD--SENATE
Excerpts from Senator Hollings'
June 10 floor statement on the
L-Reactor EIS

June 10, 1983

Finally, Mr. President, I want to emphasize again that this environment impact statement is to be a serious effort, and one that fully addresses the questions that have been raised by me, Senator MATTINGLY, and many others. Attached to this statement is a list of the topics that I want to see addressed in the EIS, and I ask that it be printed at the conclusion of these remarks.

Mr. President, I understand that the distinguished chairman of the Armed Services Committee, Senator TOWER, agrees with me on this point.

Mr. TOWER. Mr. President, I do agree with the Senator from South Carolina that this EIS should be a serious study and one that addresses the environmental questions that have been raised about the L-reactor project. I have seen the list of topics that the Senator wants the EIS to address, and I feel that this list is reasonable.

My concern has been to keep this EIS from taking so long that it hurts vital national security programs, but this expedited schedule ensures that the EIS will be completed in a timely way. It also provides the Department of Energy with sufficient time to perform a complete, indepth analysis of the issues raised.

Mr. HOLLINGS. I thank the Senator from Texas, and once again want to commend him, Senator JACKSON, and Senator MATTINGLY for their roles in this matter.

The material requested to be printed in the Record is as follows:

Topics That The L-Reactor EIS Should Cover in Detail

Table K-5. Scoping letters and EIS sections or DOE's responses (continued)

Comment number	Scoping letter	Scoping topic	EIS section or DOE comment
	Since the purpose of the L-Reactor EIS is to provide additional information to the public and to elected officials, and to allow for additional citizen input, the EIS should provide details on those issues that have been raised by citizens and government officials. In particular, the EIS should provide clear, complete information on the following topics.		
AF1	(1) Groundwater contamination.--Since the L-Reactor will lead to more fuel fabrication in the "M" area of the Savannah River Plant, one question that arises is whether restarting the L-Reactor will add to the already troubling groundwater contamination problems in M. There is also the question of whether L/Reactor-related activities in the separations area will, or possibly can, lead to groundwater contamination. Thus the EIS should discuss these matters in considerable detail, especially covering these points:	Groundwater contamination	Sections 4.1.2.2, Appendix F
AF2 AF3	(a) Potential impacts.--In particular, what quantities of chemicals and radioactive materials have already been discharged into the ground at both M-area and the separations area? What steps are being taken now to prevent further contamination in these areas, to monitor existing contamination, and to clean up those underground reservoirs now contaminated? In particular, what will be done to clean up or restore the Congaree and Tuscaloosa aquifers? How much would the L-Reactor's operation, using current pollution control equipment, add to the present discharges? And what are the pathways by which any such contamination could flow into areas outside of the Savannah River Plant?	Groundwater contamination Monitoring	Section 4.1.2.2, Appendix F Sections 6.1.1, 6.2.2
AF4	(b) Mitigation options.--It is very important that the EIS discuss in detail the options available--both in the short-term and the longer-term--to prevent or mitigate any groundwater contamination that might be caused by L or L-related activities. For instance, commercial plants of all kinds often use advanced waste water treatment technologies? Which are available here, at what costs, and with what time frames?	Mitigation measures	Section 4.4.3
	(2) Radiocesium and tritium:		

Table K-5. Scoping letters and EIS sections or DOE's responses (continued)

Comment number	Scoping letter	Scoping topic	EIS section or DOE comment
AF5	(a) Potential impacts.--There are a great many questions about the cesium now in the Steel Creek area that will be resuspended by L-Reactor operations. Among the questions that the EIS should explicitly address and answer are the following. How much cesium is in the Creek area, where exactly is it, and how did it get there? Where exactly is it likely to be deposited after the restart and at what pH? What concentrations are	Radiocesium remobilization	Sections 3.7.2, 4.1.2.4, Appendix B, Appendix D
AF6	likely at different locations along the Creek and the Savannah	Health effects	Section 4.1.2.4
AF7	River? What are the possible health effects of radiocesium? What data and assumptions lie behind DOE's answers to these questions? Similar details on waterborne and airborne tritium releases also should be provided.	Radiological effects	Sections 5.1.2, 5.2.6, Appendix B, Appendix D
AF8	(b) Mitigation options.--Would cooling towers or other cooling	Alternative cooling	Section 4.4.2, Appendix I, Comment E6
AF9	technologies reduce the resuspension or migration of the radiocesium in Steel Creek? It is possible to excavate the sediments presently holding the cesium? What technologies are available for retrieving and storing the cesium if it should end up in any city's water treatment filters or sludge?	Radiocesium remobilization	Section 4.1.2.4, Appendix B
AF10	Similarly, what, if anything, can be done to reduce tritium emissions from either the L-Reactor or L-related activities?	Mitigation measures	Sections 4.4.3.4, 4.4.5
	(3) Thermal effects.--Present DOE plans call for the direct discharge of the L-Reactor's cooling water into Steel Creek. This leads to several questions.		
AF11	(a) Potential impacts.--How would both the heat and flooding	Thermal effects	Sections 4.1.1.4, 4.4.2, 4.4.3.4, 5.1.1.2, 5.2.4, 5.2.5.1
AF12	caused by direct discharge affect both neighboring wetlands and animal life? What data and assumptions lie behind these calculations?	Wetlands effects	Sections 4.1.1.4, 4.4.2, 5.1.1.2, Appendix C, Appendix I
	(b) Mitigation options.--The EIS should contain detailed		
AF13	information on the options available to manage this cooling water. Both interim measures, such as spray cooling, and longer-term options, such as cooling towers, should be discussed. Details should be presented on cost, efficacy, and the time required to install.	Alternative cooling	Section 4.4.2, Appendix I See Comment E6

Table K-5. Scoping letters and EIS sections or DOE's responses (continued)

Comment number	Scoping letter	Scoping topic	EIS section or DOE comment
AF14	(4) Containment.--The reactors at the Savannah River Plant do not have containment domes of the type required at commercial nuclear power plants. The EIS should present a clear description of why this is the case, what technologies are now used to prevent accidental releases of nuclear material, and how much a containment dome for the L-Reactor might cost in terms of time and money.	Safety alternatives	Section 4.4.1, Appendix G

Table K-5. Scoping letters and EIS sections or DOE's responses (continued)

Comment number	Scoping letter	Scoping topic	EIS section or DOE comment
	LETTER OF JOHN MACLEAN, LARRY SPRAGUE, MARY ELLEN SPRAGUE, CAROLYN ROCKWOOD, FERRIS CANN III, AND FRANCES MACLEAN, August 8, 1983 Mr. M. J. Sires, III Assistant Manager for Health, Safety & Environment U.S. Department of Energy Savannah River Operations Office Post Office Box A Aiken, South Carolina 29801 Attention: EIS Scope Dear Mr. Sires: Please include the following comments in your Scope Review hearing testimony:		
AG1	1. The EIS should address the degree of urgency and necessity for the production of plutonium by the L-Reactor. In 1980 there were 200 MX missiles proposed which have been cut back to 100 and to the present 27. The need for the new plutonium should be addressed as the code words "urgency" and "national security" should not be allowed to override the concern for safety of the public.	Need	Section 1.1
AG2	2. The EIS should address the number of jobs and the amount of	Alternative cooling	Section 4.4.2, Appendix I Comment E6
AG3	money that will be pumped into the economy by construction of a cooling tower and a containment dome over the L-Reactor.	Safety alternative	Section 4.4.1, 4.4.2
AG4	3. The EIS should address the permanent disposal of 27 million gallons of high level waste which presently exists at the Savannah River Plant or at least address the permanent disposal of high level wastes which would be produced by the L-Reactor.	Radioactive waste	Section 4.1.2.8, 5.1.2.8

Table K-5. Scoping letters and EIS sections or DOE's responses (continued)

Comment number	Scoping letter	Scoping topic	EIS section or DOE comment
AG5	4. The EIS should address why the L-Reactor is considered an old facility and not a new facility for NRC requirement purposes in view of the fact that $215,000,000.00 will be spent on the facility.	Regulatory requirements	Chapter 7
AG6	5. The EIS should address why the NRC does not inspect the L-Reactor as it does all other commercial nuclear reactors but instead the DOE inspects the facility which it runs. It would appear to be a conflict of interest.	Regulatory requirements	Chapter 7
AG7	6. The EIS should address the effect the L-Reactor may have on an increase in cancer rates in Chatham County, Georgia, which are already highest in the state of Georgia, and also the effect the L-Reactor will have on the cancer rate in South Carolina which is three times the national average.	Health effects	Sections 4.1.2.6, 4.2.1.5, 5.1.2.5, 5.2.7, Appendix B, Appendix G
AG8	7. The EIS should compare the technical and safety requirements for the Vogtle reactor which is across the river from the Savannah River Plant with technical and safety requirements of the L-Reactor.	Regulatory requirements	Chapter 7
AG9	8. The EIS should address whether the L-Reactor has the same vapor trap problem that existed at Three-Mile-Island.	Accident analysis	Section 4.2.1, Appendix G Production reactors are different from pressurized water reactors and this is not a credible scenario for the L-Reactor.
AG10	9. The EIS should address the ability or lack of ability to recycle existing plutonium in existing obsolete bombs presently stockpiled.	Need	Section 1.1

Sincerely yours,

John Maclean
Larry Sprague
Mary Ellen Sprague
Carolyn Rockwood
Ferris Cann III
Frances Maclean

cc: Senator Mack Mattingly

Table K-5. Scoping letters and EIS sections or DOE's responses (continued)

Comment number	Scoping letter	Scoping topic	EIS section or DOE comment
	LETTER OF WILLIAM McLAUGHLIN		
	403 Tattnall Street Savannah, Georgia 31401 August 10, 1983		
	Mr. M. J. Sires Assistant Manager for Health, Safety and Environment U.S. Department of Energy Savannah River Operation Office P.O. Box A Aiken, S.C. 29801		
	Dear Mr. Sires:		
	I would like to request that this letter, and the questions that it addresses, be included in the scoping process on the Environmental Impact Statement for the L-Reactor at the Savannah River Plant.		
	The following are areas of grave concern to me as an environmentally concerned resident of Savannah.		
AH1	Charles R. Jeter, a regional administrator for the Environmental Protection Agency in Atlanta, stated in his testimony before the Armed Services Committee Hearing in North Augusta, South Carolina on February 9, 1983, the EPA's position on the restart and operation of the L-Reactor. Mr. Jeter stated that, "SRP plant officials agree to conduct a comprehensive hydrogeological investigation of the site." I would like to request that this be done as part of the L-Reactor's EIS.	Groundwater contamination	Appendix F
AH2	He also states that, "SRP is in the process of conducting an extensive evaluation of the M-Area to determine if remedial measures are necessary," for the protection of groundwater. I would like to request that this be done as part of the L-Reactor's EIS as an indication of potential problems of the use of seepage basins by the L-Reactor.	Groundwater contamination	Appendix F

Table K-5. Scoping letters and EIS sections or DOE's responses (continued)

Comment number	Scoping letter	Scoping topic	EIS section or DOE comment
AH3	Mr. Jeter further states that, "Section 316(b) of the Clean Water Act requires that the location, design, construction, and capacity of cooling water intake structures reflect the best technology available for minimizing impacts of the aquatic system. This is accomplished through provision in the NPDES permit." I would like to request that the L-Reactor's EIS address how the NPDES permit assures the best available 1983 technology.	Fisheries	Sections 4.1.1.2, 4.4.2, 5.2.4.2, 5.2.5, Appendix C
AH4	Mr. Jeter also presents, as part of the EPA's position, that "Acting under Executive Order 11990, Protection of Wetlands, measures could be implemented by DOE to minimize or compensate for adverse impacts upon wetlands." I would like to request that the L-Reactor's EIS address just what measures have been (or will immediately be) taken to minimize the adverse impacts on wetlands as required by Executive Order 11990.	Wetlands	Sections 4.1.1.4, 4.4.2, 5.1.1.2, 5.2.4, Appendix C, Appendix I
AH5	Mr. Ronald W. Cochran, representing the U.S. Department of the Interior-Fish and Wildlife Service, wrote in a letter concerning his department's review of the Environmental Assessment that "we cannot agree with a finding of no significant impact, and have major problems with several basic tenets of the document." He maintains that the Steel Creek system and associated wetlands have greatly recovered from the effects of operational discharges prior to 1968. Thus I would like to request that the L-Reactor's EIS use current 1983 Steel Creek wetlands conditions as the baseline from which to determine findings of impact, and not the misleading pre 1968 conditions.	NEPA procedures	Chapter 3, Appendix C, Appendix I
AH6	The NUS Corporation's Comparisons and Evaluation of Alternative Cooling Systems for L-Reactor done for the DOE ranks cooling towers as the most preferred option based on engineering and environmental criteria. I would like to request that the L-Reactor's EIS give this cooling tower recommendation option more reasonable and further consideration. In the EA this option was not considered because of the quickly upcoming projected start date. The way I understand it, this projected	Alternative cooling	Section 4.4.2 See Comment E6

Table K-5. Scoping letters and EIS sections or DOE's responses (continued)

Comment number	Scoping letter	Scoping topic	EIS section or DOE comment
	start up date is in question; *and it well should be in question*, when we are addressing environmental, health, and safety concerns for the citizens of South Carolina and Georgia. Thank you, I am anxiously awaiting a response. Sincerely, William McLaughlin		

Table K-5. Scoping letters and EIS sections or DOE's responses (continued)

Comment number	Scoping letter	Scoping topic	EIS section or DOE comment
	LETTER OF JANET T. ORSELLI		
	RADIATION AWARENESS P.O. Box 81 Folly Beach, S.C. 29439		
	August 8, 1983		
	Mr. M. J. Sires, III Assistant Manager for Health, Safety and Environment U.S. Department of Energy Savannah River Operations Office P.O. Box A Aiken, South Carolina 29801		
	Dear Mr. Sires:		
	I would like to submit comments from our organization, Radiation Awareness, on the preparation of the Environmental Impact Statement (EIS) for the L-Reactor at the Savannah River Plant (SRP).		
	Radiation Awareness strives to educate the public on nuclear-related issues and provides information on ways the public can protect themselves from radiation hazards.		
AI1	We have many concerns about the environmental impacts of the L-Reactor restart and want to encourage in-depth study and use of mitigation measures by the Department of Energy (DOE), to decrease environmental damage and serious future health effects.	Mitigation measures	Sections 4.4.1, 4.4.2, 4.4.3, 4.4.4, 4.4.5, Appendix I
	We agree that the EIS should at the minimum examine the eleven issues listed in the DOE News of July 19, 1983, and our organization would like to suggest a number of other significant factors that also need to be addressed to assure compliance with the National Environmental Policy Act (NEPA) requirements.		

Table K-5. Scoping letters and EIS sections or DOE's responses (continued)

Comment number	Scoping letter	Scoping topic	EIS section or DOE comment
AI2	Primarily, the EIS needs to provide the public and independent evaluating agencies with data concerning the levels of radiation exposure the public has received over the 25 year operation of SRP. In particular, the EIS needs to evaluate this past amount of nuclear contamination with a consideration of the additional future radioactive discharges to be released from the operation of the L-Reactor. An accounting is needed of the amount of routine or accidental releases of radiation which have occurred during each year of operation of the SRP, and then a total, cumulative radiation exposure level for members of the public during the 25 year period with an esti-	SRP & Regional effects	Section 5.2
AI3	mate of future levels of exposure from the operation of the L-Reactor. The EIS must explain and make justification for the need to increase the amount of nuclear contamination that we, the public will be forced to live with.	Need	Section 1.1 See comment D1
AI4	It is unfortunate that most members of the public are misled and misinformed concerning the long-term health effects of repeated exposure to radiation. The DOE needs to become much more honest with the public and be willing to explain the true health consequences that can result from the long-term ingestion or inhalation of radioactively contaminated particles. It is important that this EIS not downplay the health effects or mislead the public by equating the effects of internal radiation exposure, to the less dangerous type of external radiation exposure, such as riding on airplanes or watching T.V. To regain public confidence--to say nothing of providing that which should have been made available long ago, the EIS should provide the following data: 1. Accidental releases of radioactivity reported in accordance with the ERDA Manual-0502 2. Audits of SRP radioactive waste (from startup to present) 3. Releases of radioactivity at SRP (from startup to present)	Health effects	Sections 4.1.2.6, 5.1.2.5, 5.2.7, 6.1.4, Appendix B

Table K-5. Scoping letters and EIS sections or DOE's responses (continued)

Comment number	Scoping letter	Scoping topic	EIS section or DOE comment
	4. "Monthly Reports" 1951-1981 5. Two studies done by DOE on the L-Reactor in 1972 and 1977 Without this vital information it would be impossible to seriously evaluate the total, cumulative health effects of the L-Reactor restart.		
AI5	Another important consideration that needs evaluation in this EIS, is the type of emergency procedures that will be taken to alert South Carolina and Georgia residents of accidental releases of radiation. To our knowledge, throughout the history of SRP operations, the public has never been notified of radiation releases in time enough to take any protective measures. This is a serious deficiency that needs to be addressed in the EIS. An outline of the steps that will be taken to warn the public of radiation exposure, definitely needs to be included.	Emergency planning	Section 4.2.1.3, Appendix H, Appendix G
AI6	In addition, the EIS should provide cost/benefit studies to examine not just on an economic basis, but more importantly on a public health basis, the long-term health benefits of purchasing equipment to reduce radiation health effects by reducing the amount of radiation routinely released.	Mitigation measures	Sections 4.4.1, 4.4.2, 4.4.3, 4.4.4, 4.4.5
AI7	The EIS should also address what future plans will be made for the permanent disposal of high-level nuclear wastes produced by the L-Reactor. Also a consideration of the resulting costs and health risks of related operations, such as transportation, decommissioning and decontamination.	Radioactive waste	See Comment S1
AI8	In conclusion, this EIS should contain a consideration of alternatives to the proposed thermal discharge temperatures (such as cooling towers or recirculation systems). Of course, ultimately there needs to be an examination of the alternative to the L-Reactor restart period. Does the need to produce more	Alternative cooling	Section 4.4.2, Appendix I See Comment E6

Table K-5. Scoping letters and EIS sections or DOE's responses (continued)

Comment number	Scoping letter	Scoping topic	EIS section or DOE comment
AI9	nuclear weapons outweigh the potential serious health effects to be suffered by South Carolina and Georgia residents? Please send me a copy of the draft EIS when available. Sincerely, Janet T. Orselli Research Consultant cc: Senator Hollings Senator Mattingly	Need	Section 1.1

Comment number	Scoping letter	Scoping topic	EIS section or DOE comment

LETTER OF S. JACOB SCHERR

NATURAL RESOURCES DEFENSE COUNCIL, INC.
1725 I Street, N.W.
Suite 600
Washington, D.C. 20006

New York Office
122 East 42nd Street
New York, N.Y. 10168
212 949-0049

Western Office
25 Kearny Street
San Francisco, Calif. 94108
415 421-6561

August 9, 1983

Mr. M. J. Sires, III
Assistant Manager for Health, Safety,
and Environment
U.S. Department of Energy
Savannah River Operations Office
P.O. Box A
Aiken, South Carolina 29801

Dear Mr. Sires:

COMMENTS ON THE SCOPE OF
THE L-REACTOR ENVIRONMENTAL IMPACT STATEMENT

I am writing on behalf of the Natural Resources Defense Council, Energy Research Foundation, The Georgia Conservancy, Coastal Citizens for Clean Energy, Environmental Policy Institute, S. David Stoney, Justin Stephens McMillan, and Judith Gordon, in response to the Department of Energy's Notice of Intent ("NOI"), 48 Fed. Reg. 32966 (July 19, 1983), to initiate the preparation of an Environmental Impact Statement ("EIS"), pursuant to the National Environmental Policy Act of 1969, as amended ("NEPA"), 42 U.S.C. 4321 et seq. and DOE's implementing regulations and guidelines, on the proposed restoration and operation of the L-Reactor at the Savannah River Plant ("SRP") near Aiken, South Carolina.

Table K-5. Scoping letters and EIS sections or DOE's responses (continued)

Comment number	Scoping letter	Scoping topic	EIS section or DOE comment
	The above-named organizations and individuals are plaintiffs in the case of NRDC et al. v. Vaughan, C.A. No. 82-3173 (July 15, 1983), which held that the DOE decision of August 21, 1982 not to prepare an EIS on the L-Reactor Project was "arbitrary" and an "abuse of discretion." Thus, they have substantial interest in the preparation and review of an adequate EIS, which has now been ordered by the Court and the Congress.1/ We assume that DOE, in accordance with NEPA, will address clearly and fully the environmental impacts of the L-Reactor, particularly those which have been repeatedly identified as matters of concern in litigation, Congressional and administrative hearings, and statements, letters and other comments of Federal and State officials and technical personnel, and the public. We assume that DOE will make a concerted effort to fill the existing gaps in knowledge regarding the impacts of the L-Reactor which have been previously pointed out and will be discussed briefly below. It is our expectation that DOE, drawing mostly upon studies already completed or underway, will prepare an EIS which is the equivalent to that required for a commercial nuclear reactor, such as those at the Vogtle Nuclear Power Station across the Savannah River from SRP. We anticipate that DOE will give objective consideration to all reasonable alternatives, particularly those other than the one now preferred by DOE. Finally, we hope that DOE will carry out a full and fair NEPA review under the time constraints, which unfortunately here are the result of DOE's failure to properly begin the EIS process more than two years ago.2/ 1/ The NOI fails to note that DOE's Finding of No Significant Impact regarding the proposed operation of the L-Reactor, 47 Fed. Reg. 36691 (August 23, 1982), no longer has any legal validity as a result of the decision of the Court. Future DOE statements regarding the NEPA process for the L-Reactor should reflect this fact. 2/ An NOI to prepare an EIS on the L-Reactor was drafted in Spring 1981, but never published.		

Table K-5. Scoping letters and EIS sections or DOE's responses (continued)

Comment number	Scoping letter	Scoping topic	EIS section or DOE comment
AJ1	We ask DOE to exercise its discretion and provide the public and Federal and State agencies with a 45-day period for review and comment upon the L-Reactor Draft EIS. Given the serious concerns about the L-Reactor's operation as now proposed, the additional two weeks is necessary to assure a more meaningful opportunity for outside, independent technical review by other Federal agencies, State agencies, and the public. We believe that this request can be accommodated within the five-and-one-half months in which DOE is to complete the NEPA process.	NEPA procedures	Foreword
AJ2	We also request that a hearing be held in Washington, D.C. during the public comment period on the Draft EIS. There is substantial national interest in the L-Reactor, and the decisions on the proposed startup and mitigation measures will ultimately have to be made by DOE and Congress in Washington. A hearing there would serve two important public interests recognized by NEPA. It would foster public participation in the EIS process and would contribute to a better-informed decision on the L-Reactor.	NEPA Procedures	Public hearings will be held in S.C. and Georgia.
	Our specific comments on the proposed scope of the EIS are as follows:		
	<u>NEED FOR THE L-REACTOR</u>		
AJ3	The Draft EIS should contain a detailed justification for the proposed startup of the L-Reactor, particularly in regard to its timing which has bearing on the operational alternatives which would eliminate or reduce the environmental harm and hazard associated with its proposed operation. In light of public statements of DOE officials and changes in warhead requirements as a result of Congressional and Administration decisions, there appear to be substantial questions as to the immediacy of the need for the plutonium to be produced by the L-Reactor. DOE representatives have repeatedly testified before Congressional committees that the L-Reactor is needed to meet a possible shortfall in nuclear weapon materials in the early 1990s. Furthermore, as a result of other production initiatives, DOE is now already ahead of its targets to boost the production of these materials. Finally, Congress and the	Need	Section 1.1

Table K-5. Scoping letters and EIS sections or DOE's responses (continued)

Comment number	Scoping letter	Scoping topic	EIS section or DOE comment
	Administration have also apparently reduced the number of warheads scheduled to be produced over the next five years.3/		
	Recently the House Armed Services Committee found that "there is no basis to assume that large numbers of nuclear weapons will be produced in the years beyond 1990."4/		
	<u>ALTERNATIVES</u>		
	<u>Production Alternatives</u>		
AJ4	The Draft EIS should consider as a reasonable alternative a delay in the operation of the L-Reactor for an extended period to allow the implementation of "mitigation alternatives" combined with, if necessary, one or more of the following alternatives:	Alternative production	Section 2.1
	1. Boosting throughput at the SRP reactors and the N-Reactor,		
	2. Accelerating the recovery of nuclear materials from the retirement of obsolete warheads,		
	3. Accelerating development of a new production reactor,		

3/ As one example, the number of warheads for the MX missiles which are now scheduled to be deployed has been reduced from approximately 2000 to 1000. The New York Times, January 16, 1983, reported a DOE official as stating that the L-Reactor will produce each year enough plutonium for some 75 nuclear warheads. Thus, the reduction in the MX program alone suggests that the operation of the L-Reactor may be substantially delayed without risk to our nation's security in order to allow for the implementation of mitigation measures prior to startup.

4/ See, e.g., Greenville (S.C.) New, June 7, 1983, at 1-A.

Table K-5. Scoping letters and EIS sections or DOE's responses (continued)

Comment number	Scoping letter	Scoping topic	EIS section or DOE comment
	4. Accelerating developing of special isotope separation, and 5. Acquiring plutonium from a foreign source. In regard to the first, DOE now plans to install the Mark 15 core in one of the SRP reactors, an action which will increase its plutonium production by approximately 25%. The Draft EIS should address the possibility of the use of such cores in one or more additional reactors on an expedited schedule. In order to provide a rational basis for the choice among the various reasonable production alternatives, including the one of "delay/mitigation," the Draft EIS must provide and disclose to the public, to the fullest extent possible, the following information: 1. Identification of each material production alternative through 1995. 2. Identification by year of the Plutonium-equivalent production capability of each alternative. 3. Identification for each year of the Plutonium-equivalent inventory, stockpile, and future requirements. 4. Indication of precisely which, if any, weapons systems or warheads would have to be delayed if the L-Reactor operation was postponed one, two, three or four years. 5. Indication of whether and how a delay in L-Reactor operation of one or two years would affect the production of warheads already scheduled to 1988, or Plutonium contingency needs in the "out years." Safety System Alternatives		
AJ5	In addition to those mentioned in the NOI, the Draft EIS should consider, to the extent that they have not already been adopted, the following safety alternatives as earlier identified by SRP staff: Detritiation of moderator, Disassembly basin	Safety alternatives	Sections 4.4.1, 4.4.5

Table K-5. Scoping letters and EIS sections or DOE's responses (continued)

Comment number	Scoping letter	Scoping topic	EIS section or DOE comment
	air confinement, Disassembly basin purge containment, Containment of ECS water in 50m basin, and Heat exchangers.5/		
	Cooling Water Alternatives		
AJ6	The Draft EIS, unlike DOE's earlier Environmental Assessment ("EA"), should fully disclose both the capital and operational costs of each of the alternatives. It should provide complete documentation of the costs and scheduling for each such alternative in order to permit their meaningful outside review. For example, it has been suggested that a cooling tower for the L-Reactor could be constructed for much less money and much more quickly than as estimated in the EA.6/	Alternative cooling	Section 4.4.2, Appendix I See Comment E6
	Other Mitigation Alternatives		
AJ7	In addition to the liquid waste disposal alternatives mentioned in the NOI, the Draft EIS should consider, to the extent that they have not already been adopted or foreclosed, the following alternatives also identified earlier by SRP staff:7/ Alternative Steam Supplies (1) Coal-fired boiler at L (2) K to L steam line with back-up oil-fired boiler 186 Basin Sludge Removal (1) Landfill (2) Borrow Pit	Mitigation measures	Section 4.4

5/ *See* Attachment 1 to Memorandum from R. P. Denise, Deputy Manager, SRP, dated August 13, 1981, to F. C. Gilbert, Acting Deputy Assistant Secretary for Nuclear Materials Production, DOE.

6/ See 129 Cong. Rec. S10004, July 14, 1983: Statement of Senator Hollings.

7/ See Attachment to Denise Memorandum, *supra* note 5.

Table K-5. Scoping letters and EIS sections or DOE's responses (continued)

Comment number	Scoping letter	Scoping topic	EIS section or DOE comment
	Water Intake Structures (1) Modify existing intake structures (2) Reduce pumping capacity (a) Recirculating cooling system (pond)		
	Chlorine Tank (1) Detection Device (2) Nongaseous Sources of Chlorine (3) Move Tanks/Well Enclosure		
	<u>IDENTIFICATION OF ENVIRONMENTAL ISSUES</u>		
	<u>Socioeconomic</u>		
AJ8	The Draft EIS should consider not only employment and other related benefits in South Carolina and Georgia associated with the proposed operation of the L-Reactor, but also the costs. The L-Reactor may contribute to a drain of skilled and technical personnel away from private employers in the region.	Socioeconomics	Sections 5.1.1.1, 5.2.1, Appendix G
AJ9	The socioeconomic effects in the larger Savannah River Basin of accidental releases of radiation and water contamination should also be assessed. An accident could have serious implications for economic development in the region, particularly those areas downstream and downwind of SRP.	Accident analysis	Section 4.2.1, Appendix G
	<u>Endangered Species</u>		
AJ10	DOE should make every effort to facilitate the completion of the consultation with the U.S. Fish and Wildlife Service, pursuant to Section 7 of the Endangered Species Act, in regard to the endangered species which may be affected by the proposed startup of the L-Reactor. The Draft EIS should include also the biological evaluation and the development of mitigation measures for species of "special concern" to the State of South Carolina.	Endangered species	Sections 3.6.1.4, 3.6.2.3, 4.1.1.4, 7.3, Appendix C

Table K-5. Scoping letters and EIS sections or DOE's responses (continued)

Comment number	Scoping letter	Scoping topic	EIS section or DOE comment
	<u>Fisheries</u>		
AJ11	The Draft EIS should reflect the results of fisheries studies which SRP requested in late 1981 that DuPont prepare to demonstrate the adequacy of SRP cooling water intake structures to	Fisheries	Sections 5.2.5, 6.1.2, 6.2.4, Appendix C
AJ12	meet the requirements of Sec. 316b of the Clean Water Act. In addition, the effects of increased thermal effluents on the Savannah River at the point where they enter the river should be studied and disclosed. The Draft EIS should consider the combined effects upon fisheries of SRP and the Vogtle Nuclear	Thermal effects	Sections 4.1.1.4, 4.4.2, 4.4.3.4, 5.1.1.2, 5.2.4, 5.2.5.1
AJ13	Power Station. In addition to the endangered short-nose sturgeon, attention should be focused upon the American shad, a commercially important fish, and the blueback herring, which is listed as a species of "special concern" by the State of South Carolina.	Fisheries	Sections 3.6.2.3, 4.1.1.4, Appendix C
	<u>Surface Water Usage</u>		
AJ14	The Draft EIS should describe the increase in the withdrawal of Savannah River water for cooling purposes at SRP and any indications of existing and potential conflicts in the use of	Surface water usage	Sections 4.1.1.2, 5.2.2, 5.1.1.4, Appendix D
AJ15	this resource, such as the proposed hydroelectric facility on the Augusta canal. The adequacy of river flow under drought conditions should also be addressed.	Alternative cooling	Section 4.4.2, Appendix I See Comment E6
	<u>Radiological Effects</u>		
AJ16	The dose commitments from the routine operation of the L-Reactor, including those from radiocesium transport, and from L-Reactor accidental releases should be measured by the same standards and methodology applied to commercial nuclear reactors. The Draft EIS should clearly identify where those	Radiological effects	Sections 4.2.1, 5.1.2, 5.2.6, Appendix B, Appendix D, Appendix G
AJ17	standards, namely 10 CFR Parts 50 and 100, would be exceeded by the L-Reactor and by SRP as a multi-reactor site. In regard to	Regulatory requirements	Chapter 7 See Comment B7.
AJ18	the cesium discharges, it should evaluate the concentration of cesium by waterfowl and fish, particularly the American shad, and the effectiveness of cesium-137 removal by water treatment.	Radiocesium remobilization	Sections 3.7.2, 4.1.2.4, 4.2.4, Appendix B, Appendix D

Table K-5. Scoping letters and EIS sections or DOE's responses (continued)

Comment number	Scoping letter	Scoping topic	EIS section or DOE comment
	<u>Safety</u>		
AJ19	The Draft EIS should fully analyze the impacts of all possible reactor accident sequences, including so-called Class 9 accidents, as is required for all commercial nuclear reactors and using the same methodology. It should analyze the environmental, social, and economic effects of accidents up to a full core meltdown. The detailed quantitative analyses, which are needed to support probabilistic estimates of radioactive releases, should be incorporated into the EIS or referenced therein and made freely available to all interested parties. The Draft EIS should include a liquid pathways assessment to analyze the effects of L-Reactor accidental releases upon ground and surface waters, as well as drinking water drawn from the Savannah River.	Accident analysis	Section 4.2.1, Appendix G
	<u>Ground-water Contamination</u>		
AJ20	The Draft EIS should contain a clear explanation of the sources and consequences of the existing ground-water contamination at SRP. It should provide full documentation as to the possible movement of contaminants from superficial to deep aquifers.	Groundwater contamination	Sections 4.1.2.2, 4.4.3, 5.1.1.2, 5.1.1.4, 5.2.3, Appendix F
AJ21	The discussion in the Draft EIS should provide a basis for selection of an alternative to the presently outdated reliance	Seepage basins	Section 4.4.3
AJ22	on seepage basins. It should specify whether present SRP chemical waste disposal procedures conform with the legal requirements of the Resource Conservation and Recovery Act and its implementing regulations. If not, the Draft EIS should detail the steps that will be taken to bring the L-Reactor and SRP into compliance.	Regulatory requirements	Chapter 7
	<u>Radioactive Wastes</u>		
AJ23	The Draft EIS should describe the incremental increase in the production of high-level liquid and other radioactive wastes which would result from the proposed operation of the L-Reactor. It should specify what additional commitments of resources would be thus required for the storage and disposal of such wastes, including the construction of more liquid radioactive storage tanks at SRP. The Draft EIS should clearly	Radioactive waste	Sections 4.1.2.8, 5.1.2.8

Table K-5. Scoping letters and EIS sections or DOE's responses (continued)

Comment number	Scoping letter	Scoping topic	EIS section or DOE comment
	indicate whether the operation of the L-Reactor will result in prolonging the use of older storage tanks at SRP, particularly the single-walled type, two of which have leaked in the past. *** *** If we can provide further information in regard to these comments, please let me know. Sincerely yours, S. Jacob Scherr Attorney for Natural Resources Defense Council Energy Research Foundation The Georgia Conservancy Coastal Citizens for Clean Energy Environmental Policy Institute S. David Stoney Justin Stephens McMillan Judith Gordon		

Table K-5. Scoping letters and EIS sections or DOE's responses (continued)

LETTER OF THE HONORABLE LINDSAY THOMAS

MEMBER OF CONGRESS, FIRST DISTRICT, GEORGIA
CONGRESS OF THE UNITED STATES
House of Representatives
Washington, D.C. 20515

August 8, 1983

Mr. M. J. Sires, III
U.S. Department of Energy
Savannah River Operations
Office
Post Office Box A
Aiken, South Carolina 29801

Dear Mr. Sires:

Please be advised that this presents my additional comments for the Environmental Impact Statement being prepared now in conjunction with the proposed restart of the L-Reactor at the Savannah River Plant (SRP). It is my understanding that my previous statement delivered on February 9, 1983, at the Senate Armed Services Committee hearing in North Augusta, S.C., will also be made part of the EIS record. I am enclosing an additional copy of that statement for reference.

As the Representative for the people of the First Congressional District, my comments will focus on the impact of the L-Reactor and the SRP to the health and safety of the 20 counties of the First District.

Comment number	Scoping letter	Scoping topic	EIS section or DOE comment
AK1	I oppose the restart of the L-Reactor if, in the judgement of	Health effects	Sections 4.1.2.6, 4.2.1.5, 5.1.2.5, 5.2.7, Appendix B, Appendix G
AK2	the appropriate officials of the State of Georgia, this action presents danger to the health and safety of the people of our state. Georgia officials should have access to all relevant data regarding operational proposals of the SRP as required to assess any health and safety issue which may affect our state.	Accident analysis	Sections 4.2.1, 4.1.1, Appendix G

Table K-5. Scoping letters and EIS sections or DOE's responses (continued)

Comment number	Scoping letter	Scoping topic	EIS section or DOE comment
AK3	I further urge that the EIS on the L-Reactor include an issue which I believe is of even potentially greater import than the L-Reactor. This issue is the cumulative impact of operational expansions of the SRP in combination with the vast array of other nuclear facilities in the Savannah River Basin. The Savannah River Basin continues to become an area of major concentration of nuclear facilities. However, no scientific or environmental evaluation has been made to consider the appropriateness of this buildup. This trend is totally inappropriate for our area due to the extraordinary sensitivity of the local environment and the high population density. The Savannah River Basin now is home to the Chem-Nuclear, Inc. Radioactive Waste Disposal Facility in Barnwell County, South Carolina; the Allied General Nuclear Services-Barnwell Fuel Plant, and commercial nuclear power facilities. The area is the repository for one-third of the defense high-level nuclear waste in the nation. As I stated in my remarks in North Augusta, it is my objective to establish a Federal-State Task Force on the Savannah River Basin which would include the Nuclear Regulatory Commission, the Department of Energy, the Environmental Protection Agency, and the States of Georgia and South Carolina. The organization could provide the oversight necessary to control any proposed cumulative impact, rather than each proposal being handled on a piecemeal basis with no oversight coordination. This would also eliminate the frequent criticism of SRP as being apart from the kind of oversight which is required for private or non-DOE Federal nuclear facilities.	SRP & Regional effects	Section 5.2
AK4	Pending action on such a task force organization, the EIS on the L-Reactor must include a careful analysis of the impact of the restart of the L-Reactor as an additional source of potential nuclear danger in an area which already has more than its	Radiological effects	Sections 4.2.1, 5.1.2, Appendix B, Appendix D, Appendix G
AK5	share of such facilities. The EIS should include analysis of present and planned nuclear facilities, both private and government, in the Savannah River Basin. The analysis should consider the possibility that the level of activity at nuclear facilities in the area may have to be curtailed in proportion to an increase in activities at the SRP.	Cumulative radiological effects	Sections 5.1.2, 5.2.6

Table K-5. Scoping letters and EIS sections or DOE's responses (continued)

Comment number	Scoping letter	Scoping topic	EIS section or DOE comment
	Thank you for your cooperation in including these remarks in your record. Sincerely, Lindsay Thomas Member of Congress Enclosure		

Table K-5. Scoping letters and EIS sections or DOE's responses (continued)

Comment number	Scoping letter	Scoping topic	EIS section or DOE comment

LETTER OF RUTH THOMAS

ENVIRONMENTALISTS INC.
1339 Sinkler Road
Columbia, S.C. 29206
(803) 782-3000

August 8, 1983

Mr. M. J. Sires, III
Assistant Manager for Health,
Safety and Environment
U.S. Department of Energy
Savannah River Operations Office
Post Office Box A
Aiken, South Carolina 29801

Re: Preparation of an EIS on the proposed restarting of the L-Reactor at the SRP

Dear Mr. Sires:

In the attached Comments, Environmentalists, Inc. has highlighted some of the failures in the Environmental Assessment L-Reactor Operations, Savannah River Plant.

Consideration of Costs/Benefits and consideration of Alternatives were selected as subjects for our Comments, because the National Environmental Policy Act (1969) identifies these matters as crucial to a federal agency's complying with this law's mandate of taking environmental values into account "to the fullest extent possible."

The public will be expecting the Department of Energy to correct the deficiencies of the Environmental Assessment report when the agency prepares an Environmental Impact Statement

Table K-5. Scoping letters and EIS sections or DOE's responses (continued)

Comment number	Scoping letter	Scoping topic	EIS section or DOE comment
	related to the proposed restart of the L-Reactor at the Savannah River Plant. Sincerely, Ruth Thomas Authorized Representative Enclosure cc: Interested persons and organizations		

Table K-5. Scoping letters and EIS sections or DOE's responses (continued)

Comment number	Scoping letter	Scoping topic	EIS section or DOE comment
	ENCLOSURE OF RUTH THOMAS ENVIRONMENTALISTS INC. 1339 Sinkler Road Columbia, S.C. 29206 August 8, 1983 COMMENTS highlighting A NUMBER OF FAILURES IN THE "ENVIRONMENTAL ASSESSMENT, L-REACTOR OPERATIONS, SAVANNAH RIVER PLANT" WHICH SHOULD NOT BE REPEATED IN THE ENVIRONMENTAL IMPACT STATEMENT PREPARED BY THE DEPARTMENT OF ENERGY A. Failure to provide adequate evidence regarding the costs (damage to the environment and the public's health) of adding to the amount of nuclear contamination released by the proposed restart of the L-Reactor. For example:		
AL1	1. Failure to report thoroughly on <u>any</u> and <u>all</u> radioactive releases which have occurred since operations began at the Savannah River Plant (SRP) in the 1950's.	Radiological effects	Section 5.1.2, 5.2.6
AL2	2. Failure to give adequate attention to the fact that for more than 25 years people living in the SRP region have been continuously subjected to the routine releases of nuclear contamination, a type of poison whose damaging effects are cumulative.	Health effects	Sections 3.7.1, 4.1.2.6, 4.2.1.5, 5.1.2.5, 5.2.7, Appendix B
AL3	3. Failure to fully acknowledge the cumulative aspect of radiation exposure, particularly in terms of its harmful effects due to internal exposure resulting from the inhaling of radioactive particles and the ingesting of radioactively contaminated liquids and foods.	Cumulative radiological effects	Sections 5.1.2, 5.2.6, Appendix B
AL4	4. Failure to provide adequate data for predicting where the concentration of nuclear contamination from SRP's radioactive releases is most likely to exist.	Radiological effects	Sections 4.2.1, 5.1.2, Appendix B, Appendix D

Table K-5. Scoping letters and EIS sections or DOE's responses (continued)

Comment number	Scoping letter	Scoping topic	EIS section or DOE comment
AL5	5. Failure to provide adequate evidence to support the selection of a monetary value for the worth of a life and a monetary value to represent the loss of a person's health.	Radiological effects	Section 4.4.1.6, Appendix B, Appendix G
AL6	6. Failure to provide the evidence necessary to predict	Radiological effects	Sections 4.2.1, 5.1.2, 5.2.6, Appendix B, Appendix D
AL7	the impact which additional radioactive and thermal pollution is likely to have on the availability of adequate uncontaminated water for present residents and businesses of the region as well as in terms of pure water sources for future growth.	Thermal effects	Sections 4.1.1.4, 4.4.2, 4.4.3.4, 5.2.4, 5.2.5.1
	B. Failure to provide adequate evidence regarding the benefits of restarting the L-Reactor:		
AL8	1. Lack of evidence to support the view that more nuclear weapons would reduce the probability of there being an atomic war.	Need	See Comment D1
AL9	2. Lack of evidence to refute the view that increasing the production of nuclear weapons would increase the probability of there being an atomic war.	Need	See Comment D1
	C. Failure to adequately study, develop and describe alternatives to the restart of the L-Reactor as this operation is being proposed:		
AL10	1. Failure to provide adequate evidence regarding the alternative of delaying the restart of the L-Reactor.	Alternative production	Section 2.3
AL11	2. Failure to provide adequate evidence regarding the alternative of updating the once through cooling water proposal, in terms of reducing the flushing of radioactive contamination into water sources, in terms of using large quantities of water for cooling, in terms of reducing destruction of plant and animal life.	Alternative cooling	Section 4.4.2 See Comment E6
AL12	3. Failure to provide adequate evidence regarding the alternative of a new reactor.	Alternative production	Section 2.1

Table K-5. Scoping letters and EIS sections or DOE's responses (continued)

Comment number	Scoping letter	Scoping topic	EIS section or DOE comment
AL13	4. Failure to study, develop and describe alternatives to producing more nuclear weapons, such as increasing peace efforts and reducing the production of nuclear weapons.	Need	See Comment D1
	Respectfully submitted by, Ruth Thomas Authorized Representative		

Comment number	Scoping letter	Scoping topic	EIS section or DOE comment

LETTER OF THE HONORABLE STROM THURMOND

THE PRESIDENT PRO TEMPORE
UNITED STATES SENATE

August 4, 1983

Mr. Richard P. Denise
Acting Manager
Department of Energy
Savannah River Operations Office
Post Office Box A
Aiken, South Carolina 29801

Dear Mr. Denise:

Thank you for your invitation to participate in the scoping process associated with the expedited Environmental Impact Statement (EIS) for the restart of the L-Reactor at the Savannah River Plant in Aiken, South Carolina.

While I do not plan to actively participate in the scoping process, I wish to take this opportunity to briefly comment on several aspects of the L-Reactor EIS and to summarize for the record my involvement with this issue.

As you know, my involvement with the Savannah River Plant site, its programs, and the L-Reactor restart has been extensive. For many years I have worked for effective national defense programs at the site while seeking the fullest protection for the health and safety of citizens in the surrounding area and for the environment.

When environmental concerns regarding the L-Reactor were raised, I arranged for the Senate Armed Services Committee to hold a field hearing in North Augusta, South Carolina, and chaired that hearing. Subsequently, along with Senator Mattingly, I secured written commitments from Secretary Hodel to: (1) undertake a further public review and hearing process to thoroughly brief the public on plans for the reactor restart and to answer questions from the public; (2) conduct further

Table K-5. Scoping letters and EIS sections or DOE's responses (continued)

Comment number	Scoping letter	Scoping topic	EIS section or DOE comment
	thermal studies for all Savannah River Plant effluent streams as they impact on the Savannah River; (3) conduct comprehensive epidemiological studies associated with the L-Reactor restart; and (4) operate the L-Reactor within the limits set by the environmental assessment or modify operations as necessary to achieve compliance. I sent a staff representative to each of the eight additional public hearings held in South Carolina and Georgia that were conducted by the Energy Department in fulfillment of the first of Secretary Hodel's commitments to me and Senator Mattingly.		
AM1	As you are aware, I have recently supported three important amendments regarding the Savannah River Plant site. The first, an amendment to the FY 1984 Energy and Water Appropriations bill, requires the Energy Department to complete an expedited EIS on the L-Reactor. While I do not feel an EIS at this juncture will be particularly enlightening or productive, I supported that amendment because it improved an earlier proposal and offered an opportunity to facilitate the restart of the L-Reactor with a minimum delay. Now that an EIS has been mandated, both by Congress and a Federal District Court decision, I urge the Energy Department to make a thorough and complete study which will withstand the test of sufficiency and thereby avoid the possibility of further delays in restart.	NEPA procedures	Foreword
AM2	A second amendment was offered by me in the Senate Armed Services Committee during markup of the 1984 Department of Defense Authorization bill. It requires the Department of Energy to phase out some of its seepage basins and to clean up any existing chemical contaminants that may threaten our important groundwater resources. I would like to commend the Department of Energy for identifying this problem in a timely manner and for cooperating in seeking a responsible solution. I suggest that the relationship between the L-Reactor restart and the chemical groundwater contamination problem be addressed in the EIS to establish whether or not these issues are closely linked.	Groundwater	Sections 4.1.2.2, 4.4.3, 5.1.1.2, 5.1.1.4, Appendix F
	The third amendment, also an amendment to the 1984 Department of Defense Authorization bill, requires mitigation of the thermal effects associated with the L-Reactor as soon as practical and prior to restart unless the President determines that		

Table K-5. Scoping letters and EIS sections or DOE's responses (continued)

Comment number	Scoping letter	Scoping topic	EIS section or DOE comment
	the delay involved will jeopardize national security. I supported that amendment, which the Department of Energy requested, as a reasonable approach to addressing both the environmental and national security concerns.		
AM3	In addition, I wish to take this opportunity to encourage the Department of Energy to continue its careful monitoring of the operations at the site and to continue seeking operational improvements that will enhance the protection of our citizens and the environment. I hope that the Department of Energy will strive for increased public understanding of site operations because I believe that openness and factual information are the keys to public trust. In return, the Department of Energy may remain assured of my continued strong support and cooperation with respect to the Savannah River Plant programs.	Monitoring	Sections 6.1, 6.2
	With kindest regards and best wishes, Sincerely, Strom Thurmond ST/jjd		

Table K-5. Scoping letters and EIS sections or DOE's responses (continued)

Comment number	Scoping letter	Scoping topic	EIS section or DOE comment
	LETTER OF ELWIN R. TILSON 206 E. Liberty St. Savannah, GA 31401 August 10, 1983 M. J. Sires, III Asst. Manager for Health, Safety, and Environment Savannah River Operations Office P.O. Box A Aiken, S.C. 29801 Dear Mr. Sires: I am requesting that this letter be included in the Scoping process for the EIS being done on the L-Reactor. The following are areas of concern that I want addressed in the EIS:		
AN1	1. DOE documents indicate that 10,500 Cu of Tritium will be dumped into seepage basins from the L-Reactor in addition to substantial amounts of toxic wastes. Please address the long term effects of seepage basin usage to ground water and surface water sources.	Seepage basins	Section 4.4.3
AN2	2. DOE documents indicate that 7,800 acres of emergent wetlands adjacent to the river are on the SRP. Presently, 5,000 acres of wetlands have been seriously altered or destroyed and another 1,000-1,100 acres will become a "sacrifice zone" with the restart of the L-Reactor. Please see how such extensive alteration or destruction of wetlands can be declared as NSI.	Wetlands	Sections 4.1.1.4, 4.4.2, 5.1.1.2, 5.2.4, Appendix C, Appendix I
AN3	3. New standards for airborne radioisotopes were due to be published on March 29, 1983. What effect do the new standards have on the operation of the L-Reactor and how will the DOE meet them?	Regulatory requirements	Chapter 7
AN4	4. NEPA 43FR230 Sec 433.1 states that the operating facility must "restore and maintain environment." How can the	Endangered species	Sections 3.6.1.4, 3.6.2.3, 4.1.1.4, Appendix C

Table K-5. Scoping letters and EIS sections or DOE's responses (continued)

Comment number	Scoping letter	Scoping topic	EIS section or DOE comment
	proposed destruction of 1,100 acres of wetland used by four species of threatened or endangered animals meet the NEPA requirements?		
AN5	5. A study done by the NUS Corporation indicated that the use of Steel Creek as a discharge/cooling system would be the most expensive to maintain, cause the greatest Cs137 transportation, make the greatest demands on Savannah River flow rates, be one of the highest sources of liquid effluent, have the highest impact on the environment, have the highest impact on endangered or threatened species, and have a high impact on archaeologial resources. Please address how such costly option can be justified for use with the L-Reactor reactivation.	Alternative cooling	Section 4.4.2 See Comment E6
AN6	6. The Savannah River Ecology Lab reports (SREL-9, UC66e & SREL-11, UC66e) state that "additional study is needed to determine wetland degradation on migratory fish" before the L-Reactor is restarted. Please include such studies in the EIS.	Fisheries	Section 6.2.5
AN7	7. The SREL reports also state that "spring (season) studies are needed" before the restart of the L-Reactor. Please include such studies in the EIS.	Fisheries	Section 6.2.5
AN8	8. The EA misquotes the SREL-11 report in that the EA gives bioaccumulation a rating of 2,019. The SREL-11 report states that the rating is conservatively 3,000 and can be as high as 6,000 for large game fish. Please review the use of support documents used in the EA before using in the EIS and also address why bioaccumulation discrepancies occurred.	Radiological effects	Appendix B
AN9	9. NCR criteria 10 CFR part 100 require containment domes for all commercial reactors as a minimum safety system. Please address how the L-Reactor be declared acceptably safe without a requirement necessary for most reactors in this country.	Safety alternatives	Section 4.4.1.5
AN10	10. Please address how the L-Reactor operation can be considered in compliance with the concept of ALARA as outlined by the NCRP when large amounts of Cs137 and Tritium are routinely dumped into the environment.	Radiological effects	Section 4.2.1, 5.1.2, Appendix B, Appendix G

Table K-5. Scoping letters and EIS sections or DOE's responses (continued)

Comment number	Scoping letter	Scoping topic	EIS section or DOE comment
AN11	11. DuPont studies indicate that the reactor type used in L-Reactor has a history of coolant pipe leakage which would cause meltdown. Please address how the L-Reactor design has been modified to offset this historical problem.	Accident analysis	Section 4.2.1, Appendix G
AN12	12. Please include an independent safety review of the L-Reactor within the EIS.	Accident analysis	Section 4.2.1.2
AN13	13. The EA ignored a worst case study done by DuPont (EID L-Reactor Reactivation, p. 5-28: DPST-81-241, April 1982). The Du Pont study indicate that public dose rates to the thyroid from a worst case accident would be unacceptably high. Please include this study in calculations used in the EIS.	Accident analysis	Section 4.1.2.5, Appendix D
AN14	14. Please address the validity of radioisotope remobilization in Steel Creek in light of the constant changes in the levels reported with each different recalculation.	Radiocesium remobilization	Section 4.1.2.4, Appendix D
AN15	15. All accident probability calculations in the EA were based on single safety system failures. Please include multiple system failures when calculating accident probabilities in the EIS.	Accident analysis	Section 4.2.1, Appendix G
AN16	16. DPST-81-241, April 1982 states that radiocesium remobilization in Steel Creek would give a maximum individual dose of 10.5 mrem/yr. The EA states the MID would be only 5 mrem/yr. Please address this discrepancy and reanalyze data and assumptions used.	Radiocesium remobilization	Section 4.1.2.4, Appendix D
AN17	17. NPDES permits do not allow the SRP to increase the temperature of the Savannah River by the 1.25-1.5 degrees which will occur when the L-Reactor comes on line. Please address how SRP will keep within NPDES limits.	Thermal effects	Sections 4.1.1.4, 7.2.4
AN18	18. No study has been done on the thermal effects at the mouth of Steel Creek which is a major sports fishing area. Please include such studies in the EIS and also include thermal monitoring closer than the present six miles downstream.	Thermal effects	Section 5.2.5.1
AN19	19. No study has been done on thermal plumes. Please include such studies in the EIS.	Thermal effects	Sections 4.1.1.4, 5.2.4.2

Table K-5. Scoping letters and EIS sections or DOE's responses (continued)

Comment number	Scoping letter	Scoping topic	EIS section or DOE comment
AN20	20. No study has been done on the long term effects of accumulation of radionuclides in the Beaufort-Jasper water system. Please include such a study in the EIS.	Cumulative radiological effects	Sections 5.1.2, 5.2.6
AN21	21. The EA states that it assumes that there was "complete mixing in the river" of radiocesium when dose rates were calculated. This assumption needs reevaluation as it ignores accumulation of radiocesium in the environment and also does not take into consideration actual mixing processes in rivers. Please address this discrepancy and reevaluate calculations.	Radiocesium remobilization	Sections 4.1.2.4, Appendix B, Appendix D
AN22	22. Evaluate the environmental (specifically radiologic) impact of the restart of the L-Reactor in conjunction with existing impacts from other facilities at the SRP.	Cumulative radiological effects	Sections 5.1.2, 5.2.6

Your attention to these concerns in the EIS is appreciated.

Elwin R. Tilson

Comment number	Scoping letter	Scoping topic	EIS section or DOE comment
	LETTER OF ALFRED H. VANG EXECUTIVE DIRECTOR STATE OF SOUTH CAROLINA WATER RESOURCES COMMISSION P.O. Box 50506/1001 Harden Street, Suite 250 Columbia, S.C. 29250 (803) 758-2514 August 9, 1983 Mr. M. J. Sires, III Assistant Manager for Health, Safety and Environment U.S. Department of Energy Savannah River Operations Office P.O. Box A Aiken, South Carolina 29801 Dear Mr. Sires: The South Carolina Water Resources Commission staff has prepared the following comments for inclusion in the scoping process for the L-Reactor Restart Environmental Impact Statement. Please consider these comments and suggestions in your development of the Draft EIS.		
A01	1. Within limits imposed by national security considerations, we feel the EIS should provide a solid justification of the actual need for L-Reactor restart. The requirement for additional nuclear materials should be clearly documented.	Need	Section 1.1
A02	2. All State and Federal regulatory requirements pertinent to restart should be indicated along with DOE's intentions and methods to comply with these requirements. If there are any regulatory requirements which apply to private industrial facilities with similar potential impacts but do not apply to L-Reactor, these should be indicated along with the authorization for exemption. Any areas of L-Reactor operation which are not regulated by a State or Federal agency other than DOE should be identified.	Regulatory requirements	Chapter 7

Table K-5. Scoping letters and EIS sections or DOE's responses (continued)

Comment number	Scoping letter	Scoping topic	EIS section or DOE comment
A03	3. It is the position of the Water Resources Commission that the L-Reactor should be in compliance with State water quality standards for temperature at the time of initial restart. The EIS should clearly indicate if, how, and when this compliance will be accomplished.	Regulatory requirements	Chapter 7
A04	4. The EIS should contain a thorough evaluation of the effect of operation on surface water use throughout the Savannah River Basin. Surface water availability along with current and projected water uses, diversions, and interbasin transfer should be included in this evaluation. Since Savannah River flows of less than the 7Q10 level have occurred in the recent past, consideration of these low flows should be included in the evaluation. The consumptive loss of water due to L-Reactor alone, and in combination with other SRP operations, should be assessed.	Surface water use	Sections 4.1.1.2, 5.1.1.4, 5.2.2
A05	5. In assessing the impacts of restart, baseline environmental conditions considered should be those existing prior to the 1954-1968 period of previous operation. It is obvious from the Environmental Assessment that significant adverse impacts occurred during 1954-1968, with some recovery occurring since L-Reactor shut-down in 1968. We do not feel it legitimate to compare expected impacts of restart with the earlier period of documented environmental damage. The real issue is how the restart effects will differ from those that would exist if L-Reactor had never been constructed or operated.	NEPA procedures	Section 3.6, Appendix C
A06	6. Assessment of all restart impacts upon onsite environmental conditions and natural resources should be clearly related to corresponding effects on offsite conditions and resources. For example--what effect would the loss of fish and wildlife habitat in Steel Creek and associated wetlands have on fish and wildlife populations offsite?	Wetlands impacts	Sections 4.1.1, 4.4.2, 5.1.1.2, 5.2.4, Appendix C, Appendix I
A07	7. All releases and resuspensions of radioactive materials, whether routine or accidental, should be thoroughly addressed with regard to impacts on the environment and human populations. L-Reactor releases should be assessed in view of all other existing and potential sources of radioactive releases. Individual sources of release may not be considered significant, but the cumulative effect of multiple releases may be of	Radiological effects	Sections 4.2.1, 5.1.2, 5.2.6, Appendix B, Appendix D, Appendix G

Table K-5. Scoping letters and EIS sections or DOE's responses (continued)

Comment number	Scoping letter	Scoping topic	EIS section or DOE comment
A08	concern. It should be pointed out that there is no totally safe radiation dose level and that adverse biological effects, such as genetic effects can occur from even minute amounts of radiation. The assessment of radiological impacts should include a discussion of relevant regulations and standards and how these regulations and standards compare with those imposed on private industry.	Regulatory requirements	Chapter 7
A09	8. Our staff has the following specific ground water concerns relevant to L-Reactor restart. We suggest that these concerns be thoroughly addressed in the EIS. (a) Shallow ground water beneath the L-Area site moves generally either to the south-southeast or west-southwest; however, in areas where the confining bed is thin or absent, downward movement takes place presenting a potential for contamination of underlying aquifers. (b) Approximately 6000 wells have been drilled at the SRP. Many of these (approximately 600) were pre-existing domestic wells; some penetrating the Tuscaloosa, that have been abandoned. The status of these wells is not known, but any open holes or rusted-out casings provide a direct route for water from contaminated shallow aquifers to the Tuscaloosa. (c) The restart of L-Reactor is expected to increase deposits to the sanitary land fill. Metals, organics, and other contaminants have definitely increased in the ground water as a result of the disposal sites, some in excess of U.S. EPA drinking water standards. Two wells penetrating the Tuscaloosa formation have been abandoned because of the high levels of Triclene, Perclene, and TCE. (d) The presence of mica and kaolinitic clays in the subsurface will make ion exchange a significant problem in controlling the movement of contaminants in ground water, especially in the McBean formation. (e) Ground-water levels in the Tuscaloosa formation have definitely declined from 1965-1982. Water use by the L-Area (300 gpm) should add to these declines.	Groundwater contamination	Sections 4.1.2, 5.1.1.2, 5.1.1.4, Appendix F

Table K-5. Scoping letters and EIS sections or DOE's responses (continued)

Comment number	Scoping letter	Scoping topic	EIS section or DOE comment
	(f) Approximately 5,000 Ci of tritium have migrated southwest of the burial grounds and are contained in the ground-water. Any additional disposal of tritium would add to the problem.		
A010	9. The EIS should include a thorough evaluation of economic impacts on the immediate area and the entire State of South Carolina. This evaluation should include assessment of environmental effects, whether real or perceived, on recreation, tourism, future industrial development, and general economic well-being.	Socioeconomics	Sections 4.1.1.1, 4.2.1.5, 5.1.1.1, 5.2.1
	In addition to the above comments, there have been numerous suggestions and areas of concern expressed at public hearings and through other avenues of public input. We encourage you to consider and address all of these concerns in your preparation of the EIS.		
	Thank you for the opportunity to submit the above comments for inclusion in your scoping process. Please feel free to contact me if you have any questions in this matter.		
	Sincerely,		
	Alfred H. Vang Executive Director		
	AHV:cw		
	cc: S.C. Water Resources Commissioners		

Table K-5. Scoping letters and EIS sections or DOE's responses (continued)

Comment number	Scoping letter	Scoping topic	EIS section or DOE comment
	LETTER OF LAURA WORBY NUCLEAR INFORMATION AND RESOURCE SERVICE 1346 Connecticut Avenue, N.W., 4th Floor Washington, D.C. 20036 (202) 296-7552 August 5, 1983 Mr. M. J. Sires III Asst. Manager for Health, Safety and Environment U.S. DOE Savannah River Operations Office P.O. Box A Aiken, S.C. 29801 Dear Mr. Sires: This is in regard to the July 19, 1983 Federal Register Notice of intent to prepare an environmental impact statement (EIS) pertaining to the proposed resumption of L-Reactor operation at the Savannah River Plant. The Nuclear Information and Resource Service (NIRS) is a non-profit, membership organization which provides information and organizing assistance to citizens concerned about nuclear issues. Our interest in the L-Reactor EIS stems from our goal to facilitate maximum public discussion and participation in nuclear-related decisions, and our concern that military and civilian applications of nuclear technology be held to the same standards for protecting public health and safety and the environment.		
AP1	With regard to the scope of the EIS, we anticipate that the Secretary will examine all reasonable alternatives to production of plutonium in the L-Reactor. These alternatives should include the option of no plutonium production at all, as well as the production of plutonium in reactors other than the L-Reactor.	Alternative production	Section 2.1
AP2	In evaluating the alternatives, DOE must carefully consider and justify the need for additional plutonium. In justifying the need for plutonium, DOE should discuss recent reductions in projected warhead production, as well as the development of other sources of plutonium. These issues	Need	Section 1.1 See Comment D1

Table K-5. Scoping letters and EIS sections or DOE's responses (continued)

Comment number	Scoping letter	Scoping topic	EIS section or DOE comment
	deserve the most searching analysis, particularly at a time when the majority of U.S. citizens support at least a freeze, if not a reduction in the U.S. nuclear arsenal, which already contains some 25,000 thermonuclear warheads. We suggest that this question be addressed on an unclassified basis to the extent possible, so that it can be the subject of informed and intelligent public debate.		
AP3	If DOE finds that L-Reactor operation is the preferred option, the discussion of alternatives should examine the option of delaying start-up of the reactor, so that measures to mitigate environmental impacts and to improve the safety of the reactor may be taken.	Alternative production	Section 2.1
AP4	Regarding procedures for public review of the draft EIS, we ask the DOE provide 45 days for public and Federal and state agency review and comment on the document. The additional two weeks will allow commenters to provide more meaningful input, without significantly compromising DOE's ability to meet its 5-1/2 month schedule for completing the NEPA process.	NEPA procedures	Foreword
AP5	We also request that DOE hold a hearing in Washington, D.C. on the draft EIS as well as in South Carolina, in view of the substantial national interest in the L-Reactor. In addition, since the major decisions regarding start-up and mitigation measures will be made at DOE headquarters and by Congress in Washington, participation by members of the public and organizations in Washington will contribute to a better informed decision on the L-Reactor.	NEPA procedures	Hearings are being held in South Carolina and Georgia.

Please send a copy of the draft EIS when it is available. Thank you very much.

Sincerely,

Laura Worby
Radioactive Waste Specialist

APPENDIX L

ASSESSMENT OF PREFERRED COOLING-WATER ALTERNATIVE*

L.1 OBJECTIVE

The purpose of this appendix is to present a detailed, "standalone" assessment of the preferred cooling-water mitigation alternative supplementing the material in Section 4.5.

The preferred cooling-water alternative of the Department of Energy is to construct a 1000-acre lake before L-Reactor resumes operation, to redesign the reactor outfall, and to operate L-Reactor in a way (i.e., reduced reactor power when necessary) that assures a balanced biological community in the lake as specified in an NPDES permit to be issued by the State of South Carolina. The impacts from the 1000-acre lake are bracketed by the impacts from the 500-acre lake and the 1300-acre lake described in the Draft EIS.

The lake will require an anticipated minimum period of 3 to 5 years to establish and develop a balanced biological community. Initially, L-Reactor will be operated to maintain 32.2°C or less in about 50 percent of the lake. Studies will be conducted to confirm the biological characteristics and the cooling effectiveness of the lake. Following the results of these studies, L-Reactor operations will be adjusted as necessary to assure the continued maintenance of a balanced biological community.

In the Draft EIS issued in September 1983, the Department of Energy reviewed and evaluated specific cooling-water alternatives for L-Reactor. Based on the comments submitted during the public review and comment period, the Department has expanded the discussion of potential cooling-water alternatives in this Final EIS. Specifically, Section 4.4.2 now provides detailed discussions of additional combinations of engineered cooling-water systems and additional cooling-lake alternatives. The Department has also evaluated each alternative for attaining the thermal discharge standards of the State of South Carolina.

This review included new data from the U.S. Army Corps of Engineers, stating that they could complete construction of a lake on Steel Creek as large as 1000 acres within 6 months on an expedited basis. On this basis, DOE selected the 1000-acre cooling lake as its preferred cooling alternative for the L-Reactor restart because it would:

1. Meet all state and Federal regulatory and environmental requirements, substantially reducing or eliminating thermal impacts on the river, swamp, and unimpounded stream, while providing a productive balanced biological community within the lake.

2. Provide the earliest reactor startup and the maximum plutonium deliveries of any environmentally acceptable cooling-water alternative meeting regulatory requirements.

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*Because this appendix is new, it does not require vertical change bars.

3. Have the lowest costs of any environmentally acceptable cooling-water alternative meeting regulatory requirements.

4. Be amenable to backfitting with precooler systems, if needed, which could improve reactor operational flexibility and the production capability.

Under the Atomic Energy Act of 1954, the Department of Energy is responsible for developing and maintaining the capability to produce all defense nuclear materials required for the U.S. weapons program. The requirements for defense nuclear materials are contained in a classified document--the Nuclear Weapons Stockpile Memorandum--that is approved by the President. In the development of this memorandum, many factors are considered, including the needs of the armed services; the current status of legislative actions on weapons systems and production capability; and the current status of material inventory, material supply from weapon retirements, material production, and weapons fabrication.

The additional requirements for plutonium are contained in the Nuclear Weapons Stockpile Memorandum for fiscal years 1984 through 1989 approved by President Reagan on February 16, 1984. This current Nuclear Weapons Stockpile Memorandum defines the annual requirements for defense nuclear materials for 5 years (fiscal years 1984 through 1989), the planning directives for the next 5-year period, and 5 additional years of projections for long-range planning. In his approval of this Stockpile Memorandum, President Reagan emphasized the importance of meeting these annual requirements and maintaining an adequate supply of defense nuclear materials by directing that: "As a matter of policy, national security requirements shall be the limiting factor in the nuclear force structure. Arbitrary constraints on nuclear materials availability shall not be allowed to jeopardize attainment of the forces required to assure our defense and maintain deterrence. Accordingly, DOE shall . . . assure the capability to meet current and projected needs for nuclear materials and . . . restart the L-Reactor at the Savannah River Plant, Aiken, S.C., as soon as possible."

The specific need for L-Reactor is supported by quantitative analyses of the production capabilities of DOE facilities and the requirements set forth in the Nuclear Weapons Stockpile Memorandum. This information is classified in accordance with the Atomic Energy Act of 1954. A classified appendix to this EIS (Appendix A) provides a quantitative evaluation of the need for L-Reactor based on the latest approved Nuclear Weapons Stockpile Memorandum. The quantitative analysis in Appendix A supports the need to restart L-Reactor as soon as practicable.

Pursuant to Federal regulations on the discharge of dredged or fill material into navigable waters (40 CFR 230), several other alternatives were identified and discussed in Section 4.4.2 "which would have less adverse impact on the aquatic ecosystem" (40 CFR 230.10a). These included the recirculating alternatives and the once-through cooling tower with a separate canal and pipe to the Savannah River. None of these alternatives can be implemented in time to meet the need for nuclear materials, and all are more expensive and would delay reactor startup significantly. These alternatives were, therefore, rejected as impracticable when considered "in light of overall project purpose" (40 CFR 230.10a2); i.e., developing and maintaining the capability to produce defense nuclear materials required for the U.S. weapons program.

The primary contenders of the 1000-acre lake alternative are recirculating mechanical-draft cooling towers of the type described in Section 4.4.2.3.2. The best of these towers is, thus, the "best available technology." For purposes of life-cycle comparison, the 1000-acre lake is assumed to cost about $25 million; allow a reactor startup of February 1, 1985; and require an initial (averaged) reactor power reduction of 14 percent, which can be reduced to about 3 percent by February 1, 1987, by the expenditure of approximately $10 million for pre-coolers to improve lake performance. Similarly, it is assumed that the most efficient 2.8°C approach towers are used, which would cost from $60 to $75 million to construct (depending on blowdown treatment), allow a reactor startup of September 1986, and require a reactor power reduction of 6.5 percent (Crandall, 1984).

The life-cycle cost of the 1000-acre lake (i.e., construction, operation, and loss of production including the later startup of the cooling tower) is almost three times less than that of the recirculating cooling tower; this large advantage will persist over any other cooling alternative that meets current regulatory criteria.

The preferred alternative (1000-acre lake) can meet the State of South Carolina criteria and be implemented in the shortest time period to allow DOE to restart L-Reactor as soon as possible.

Although the preferred alternative may have more adverse impacts to the aquatic ecosystem than some of the alternatives discussed in Section 4.4.2, the Department of Energy has committed to initiating several additional mitigation measures to offset any potential adverse impacts for the preferred alternative:

- Funding long-term studies to assure a balanced biological community in the lake and downstream from the embankment.

- Developing a monitoring and mitigation plan for historic/archeological sites to ensure the preservation of the resources at the four sites below the embankment; the plan has been approved by the South Carolina State Historic Preservation Officer (SHPO) (Du Pont, 1983a). A resource recovery plan has been developed by the University of South Carolina Institute of Archeology and Anthropology for the one historic site (38 BR 288) located within the proposed lake area. This mitigation plan has been approved by the SHPO and the Advisory Council on Historic Preservation (ACHP) (Lee, 1982), which concurred that this mitigation plan will result in no adverse impacts to National Register properties. Archeological surveying and testing are presently being conducted in the proposed lake area by the University of South Carolina, Institute of Archeology and Anthropology. It is anticipated that several sites associated with the Ashley Plantation will be affected. The schedule for completion of the requirements under the National Historic Preservation Act, including data recovery, is consistent with the construction schedule for the embankment, and all mitigation will be completed prior to restart (Hanson, 1984). The study results, the determination of eligibility of potential sites, and the development of a mitigation plan are being coordinated with the SHPO and ACHP.

- Working with the Department of the Interior to perform a Habitat Evaluation Procedure (HEP). The HEP will identify the value of habitat to be gained or lost with implementation of the preferred cooling-water mitigation alternative for use in assessing further mitigation. If required, DOE will implement additional mitigative measures that might be identified through the HEP process, dependent on Congressional authorization and appropriation.

- The endangered wood stork forages at the Savannah River Plant but does not breed on the site. The feeding individuals have been observed to be from the Birdsville Rookery, some 50 kilometers away. Feeding occurs in the swamp downstream of the proposed lake; it could be affected by raised water levels of the Steel Creek delta if the L-Reactor cooling-water flow is discharged through the proposed lake. DOE initiated informal consultation with the U.S. Fish and Wildlife Service (FWS) in July 1983 as allowed by Section 7 of the Endangered Species Act. DOE has also initiated the formal consultation process by providing a Biological Assessment to FWS for a Biological Opinion (Sires, 1984a). While DOE concludes that the operation of L-Reactor will affect foraging habitat near the Steel Creek delta, the construction activities associated with Phase II of the NPDES permit to control the acidity of releases from the 400-area powerhouse ash basins will improve the quality of the foraging habitat in the Beaver Dam Creek area, assuring the continued availability of this habitat. Therefore, the loss of foraging habitat in the Steel Creek area should not jeopardize the continued existence of the wood stork. Any additional mitigation measures needed will be determined either as part of the HEP study or as part of this consultation process. DOE will also continue to fund long-term studies of the wood stork and its relationship to SRP.

- The 1000-acre lake construction activity would include an Environmental Protection Plan (see Section L.2.4.8.3).

- Construction of the lake will include shoreline refuge areas to enhance the biological productivity of the lake.

In accordance with Section 313 of the Federal Water Pollution Control Act, the 1000-acre cooling lake was compared with "innovative treatment processes and techniques" (e.g., thermal cogeneration). As discussed in Section 4.4.2.5.1, the costs of these innovative treatment processes would be significantly higher than those of the 1000-acre lake, would require as long as 12 years to implement, and would not meet State of South Carolina standards. Thus, these alternatives were considered impracticable in terms of cost, schedule, and compliance with standards to meet the overall project purpose.

The preferred alternative will meet the South Carolina standards within the necessary time frame to fulfill the need for nuclear materials. Thus, the preferred alternative with the implemented mitigation measures to offset adverse impacts constitutes the most practicable alternative to meet the overall project purpose.

L.2 SUMMARY

The preferred cooling alternative proposed for mitigating thermal impacts on Steel Creek and swamp is to form a 1000-acre cooling lake by constructing an embankment across Steel Creek (Figure L-1).

L.2.1 Description

The description in the following sections is representative of the lake design, but the detail is not exact (e.g., embankment dimensions) because the final design has not been completed.

L.2.1.1 Lake

The 1000-acre lake would be about 1200 meters wide at its widest point, averaging approximately 600 meters, and would extend about 7000 meters along the Steel Creek valley from the embankment to just beyond Road B (Figure L-2). The normal pool elevation of the lake would be 58 meters above mean sea level (MSL); the present elevation of Steel Creek at the dam site is 35 meters. The storage volume at the normal pool elevation would be about 31 million cubic meters.

L.2.1.2 Embankment

The embankment would be approximately 800 meters upstream from the Seaboard Coast Line Railroad Bridge across Steel Creek or 1700 meters upstream from Road A. It would be 1200 meters long at the crest which includes approximately 600 meters of low embankment connecting the west end of the main embankment to the natural ground at elevation 61 meters above mean sea level (Figure L-3). The main embankment would be a maximum of about 26 meters high, 12 meters wide at the top, and 200 meters wide at the base. The elevation at the top of the embankment would be 61 meters above mean sea level to allow 3 meters freeboard for flood pool, wave action, and earthquake settlement.

A paved road would be constructed along the top of the embankment to provide access for operation and maintenance. An outlet structure with gates would control the discharge from the lake to a conduit running 220 meters under the embankment. This conduit would discharge into a stilling basin to reduce the velocity before the water is released into Steel Creek.

A natural "saddle" in the ridge line between Steel Creek and Pen Branch watersheds is the lowest point in the drainage divide around the lake. This area, which has a low-point elevation 60 meters above mean sea level, would function temporarily as an emergency spillway to bypass extreme floods and prevent overtopping of the embankment. An engineered spillway would be constructed at a later date.

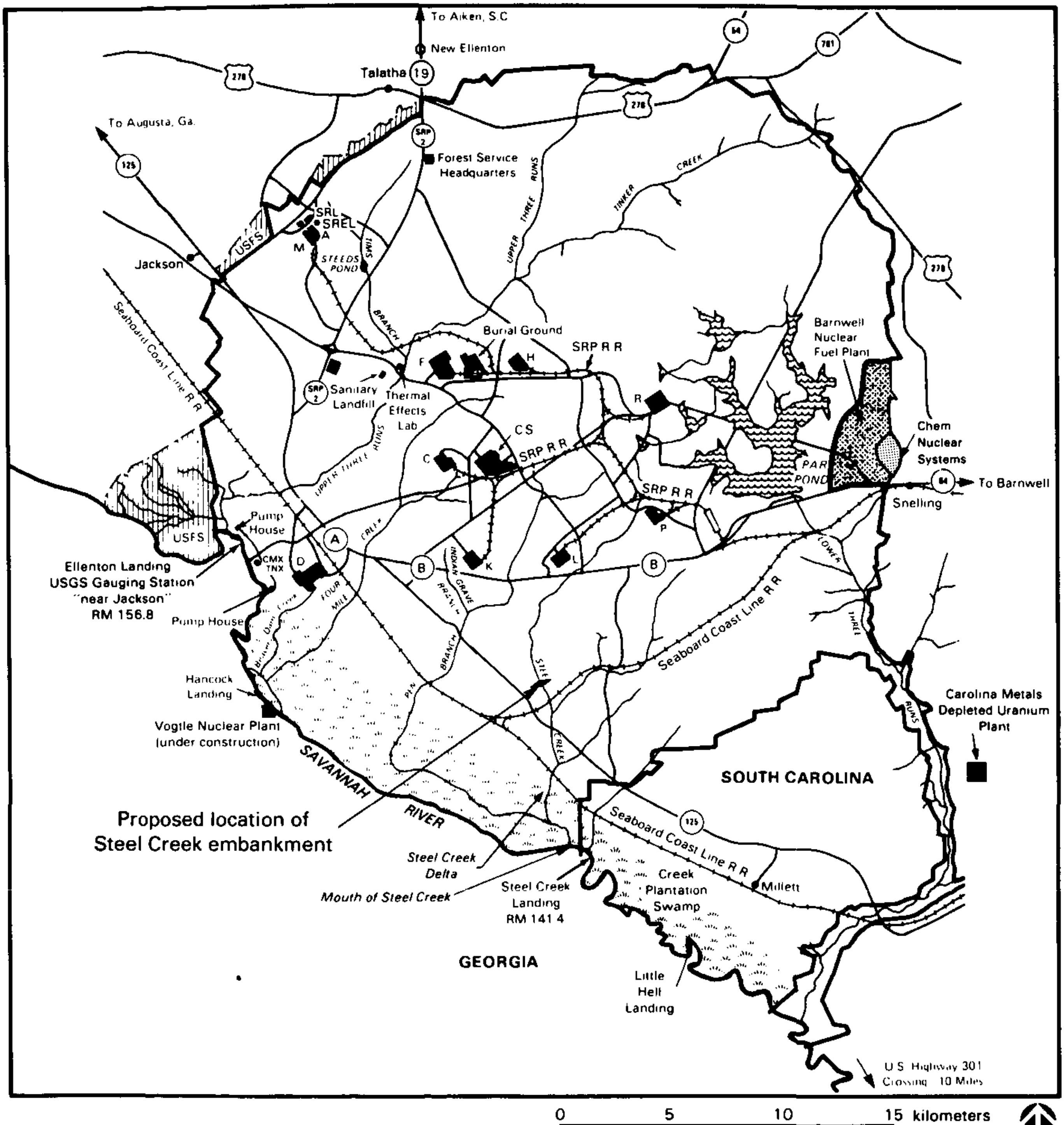


Figure L-1. Embankment location.

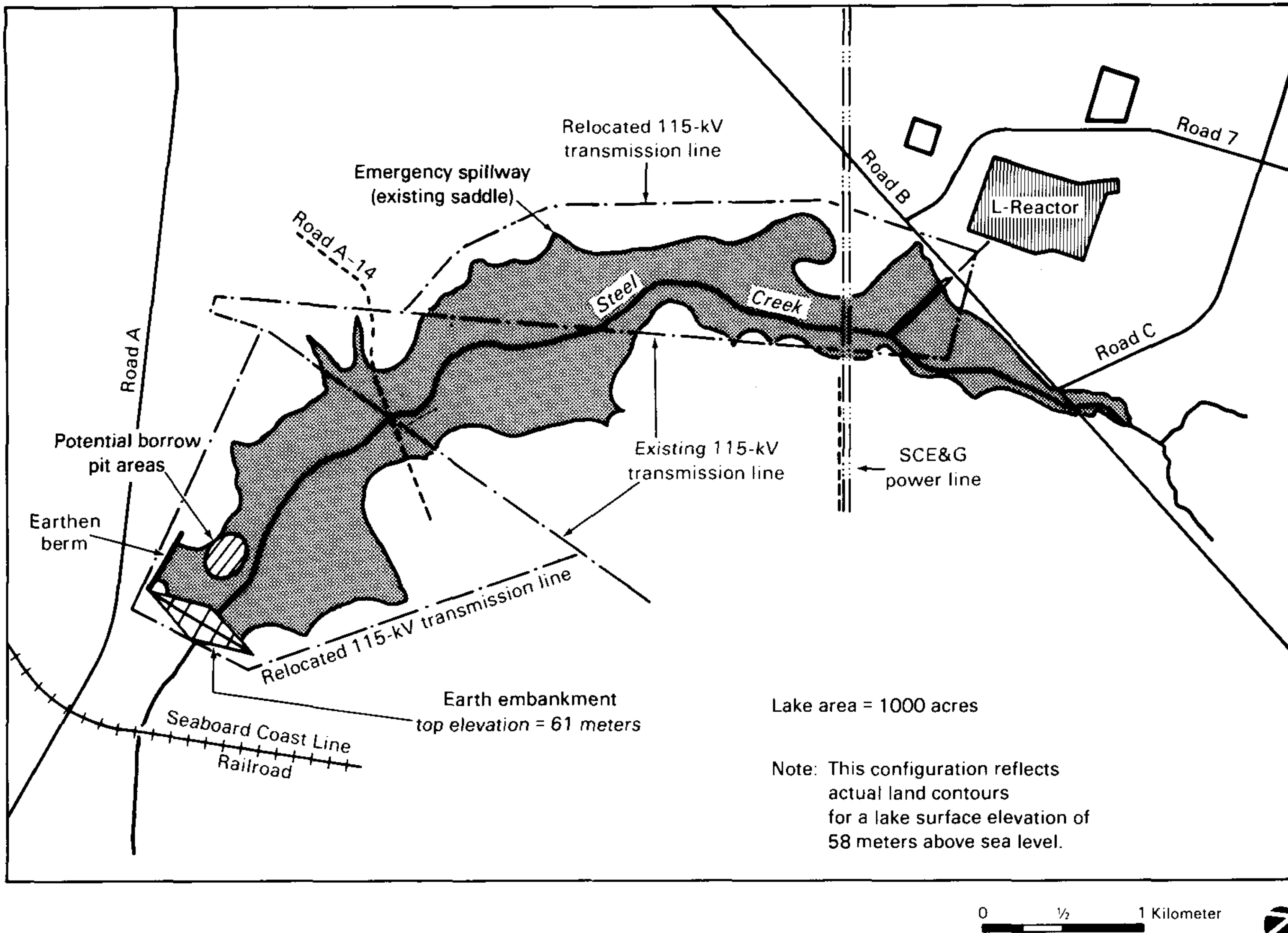


Figure L-2. Conceptual design for 1000-acre lake on Steel Creek.

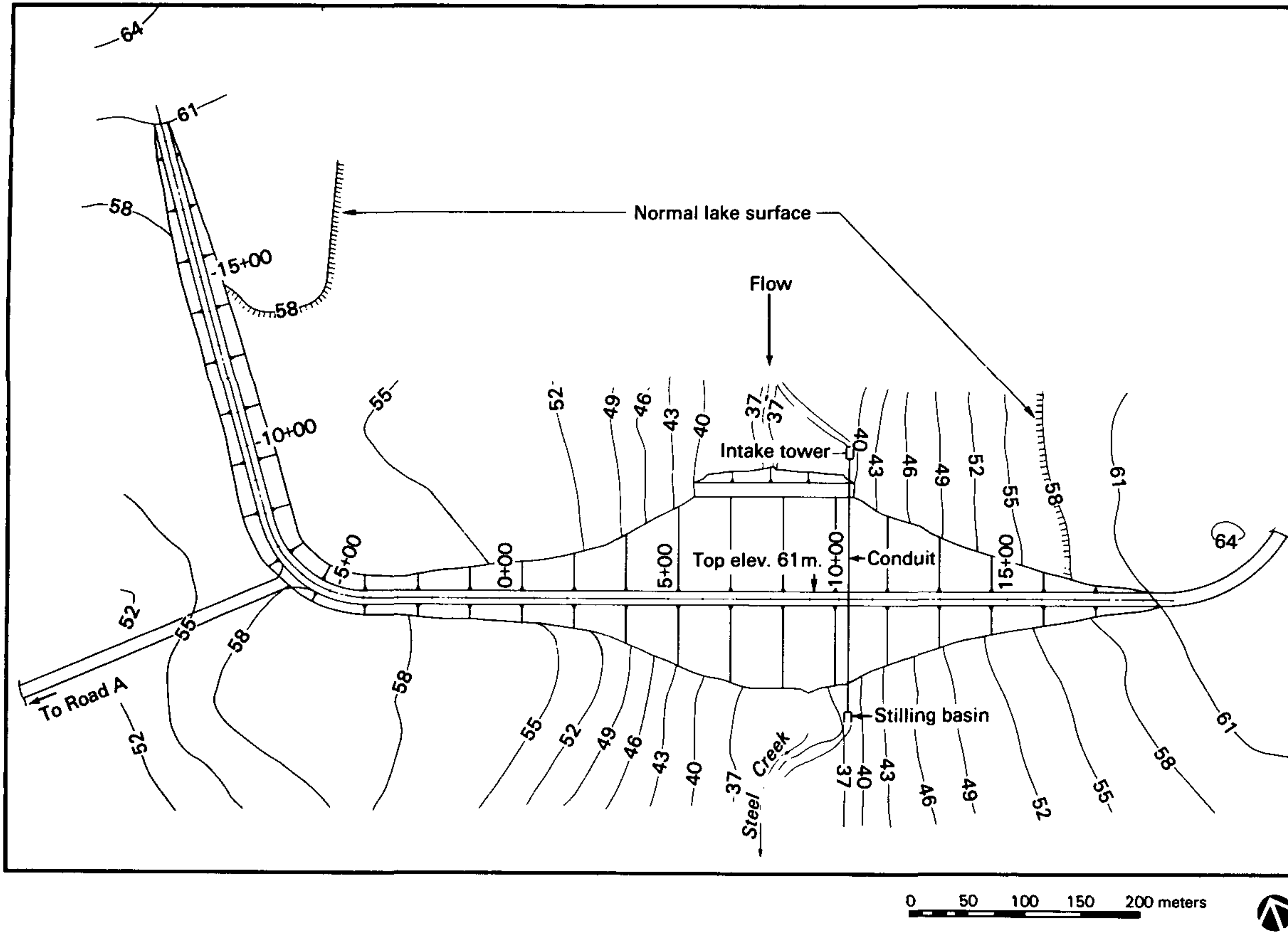


Figure L-3. Steel Creek embankment.

L.2.1.3 Relocation of existing facilities

The construction of the 1000-acre lake would require the relocation of a 115-kilovolt electric transmission line belonging to the South Carolina Electric and Gas Company (SCE&G) and two 115-kilovolt electric transmission lines and buried supervisor control and relay cable lines that serve the L- and P-Areas. The SCE&G line can be raised from existing wooden poles onto two new tall towers in its present alignment. However, the two SRP lines would have to be rerouted around the lake because of the buried cable and the width of the lake at those points. Also, two new SCE&G transmission lines presently being designed by that company will be constructed such that they will not interfere with the 1000-acre lake.

Road A-14 would be abandoned wherever it would become inundated by the lake. The access road across the embankment would begin at Road A west of the lake and be extended northeast from the east end of the embankment along a ridge to connect with Road A-14 east of the lake. This road would parallel one of the relocated SRP transmission and buried cable lines. Approximately 600 meters of Road B and 100 meters of Road C would be raised a maximum of 3 meters on their existing roadbeds at their intersection.

L.2.2 Operation

L.2.2.1 Thermal modeling

The thermal performance of the 1000-acre lake was estimated from a state-of-the-art mathematical model (Firstenberg and Fisher, 1980). The model calculates downlake temperatures for a laterally well-mixed water body (due to the long, narrow shape of the lake, total lateral mixing is a good assumption) given the shape of the lake, lake influent information (flow rate, temperature), and meteorological data (wind speed, air temperature, cloud cover, relative humidity, and time of year). The input information can be either constant or time dependent. The model has been verified by comparison with the temperature distributions of a number of operating cooling ponds.

For this analysis, 30 years of hourly meteorological data (1953-82) from Bush Field in Augusta, Georgia, were used in conjunction with monthly SRP reactor operating power levels to perform hour-by-hour simulations of lake temperature. The results of the study are described below.

L.2.2.2 Lake influent

L-Reactor will be operated at the highest allowed power level that is consistent with the maintenance of the balanced biological community in the lake, as specified in the NPDES permit that is expected to be issued by the State of South Carolina. Initially, L-Reactor will be operated to maintain 32.2°C or less in about 50 percent of the lake. Adjustments of reactor power levels will be based on near-term (several days in the future) meteorological predictions and the existing lake temperature distribution. Hourly meteorological data for the years 1953 through 1982 and the cooling-lake thermal performance model described in Section L.2.2.1 were used in an iterative fashion to determine reactor power levels that would be required to meet the above temperature criterion. The resulting average reactor power reduction was approximately 7 percent. For the life-cycle cost comparison in Section L.1, the average power reduction was increased to 14 percent to provide a sufficient margin in relation to the temperature criterion, due to the fact that reactor power levels will be based on predictive meteorology, and in recognition of the fact that frequent reactor power changes would also be restricted by considerations other than the thermal criterion.

L.2.2.3 Lake temperatures

As indicated in Section L.2.2.2, the plant will be operated in a manner such that the temperature of the water covering about 50 percent of the lake would not be greater than 32.2°C. Although the exact operating mode of the plant will depend on production schedules and meteorological conditions, the lake performance based on power levels determined in the iterative method discussed in the previous section will be used to represent the expected monthly temperature distributions in the lake. Figures L-4 through L-7 indicate the percentage of the lake surface area having a given temperature for each season of the year. (Note: In this analysis, winter is defined as December, January, and February; spring is March, April, and May; summer is June, July, and August; and fall is September, October, and November.) As can be seen from these figures, the water temperature of the coolest 50 percent of the lake ranges from 23° to 17°C in winter (with some months of the 30-year data base implying temperatures as low as 20°C to 14°C) and 32° to 31°C in summer.

Figures L-8 through L-11 show the estimated isotherms in the 1000-acre lake at a depth of approximately 1 to 2 meters. The shaded areas represent areas in the lake that will be below 32.2°C for each season, after accounting for reduced reactor operating power. An auxiliary flow model was used in conjunction with the lake temperature graphs presented in Figures L-4 through L-7 to derive these isotherm shapes. The actual distribution of lake water temperatures will vary from the isotherm representation shown in Figures L-8 through L-11. This variation will occur because of transient wind effects and water density differences.

The heated water being discharged into the lake would spread over the cooler water residing in the lake. This surface layer would tend to exist throughout most of the lake due to the relatively small advective transport of the discharge, the depth of the lake, and the large temperature difference (between the influent and the effluent) within the lake. In addition, the discharge into the lake would be accomplished so that mixing of the discharge and resident lake water would be kept low (a desirable condition to maximize the heat flux through the water surface). Based on observations in Par Pond, as well as theoretical considerations, the surface layer in the L-Reactor cooling lake is expected to be a few feet thick. This layer would be vertically well mixed due to wind-induced turbulence. A cooler sublayer would exist beneath the surface layer. This layer would be fed by lake water returning from the cold end to satisfy the continuity requirements of discharge mixing and lake withdrawal. Accordingly, the temperatures in the deeper portions of the lake would approximate the cold end temperatures. That is, the colder sublayer temperature

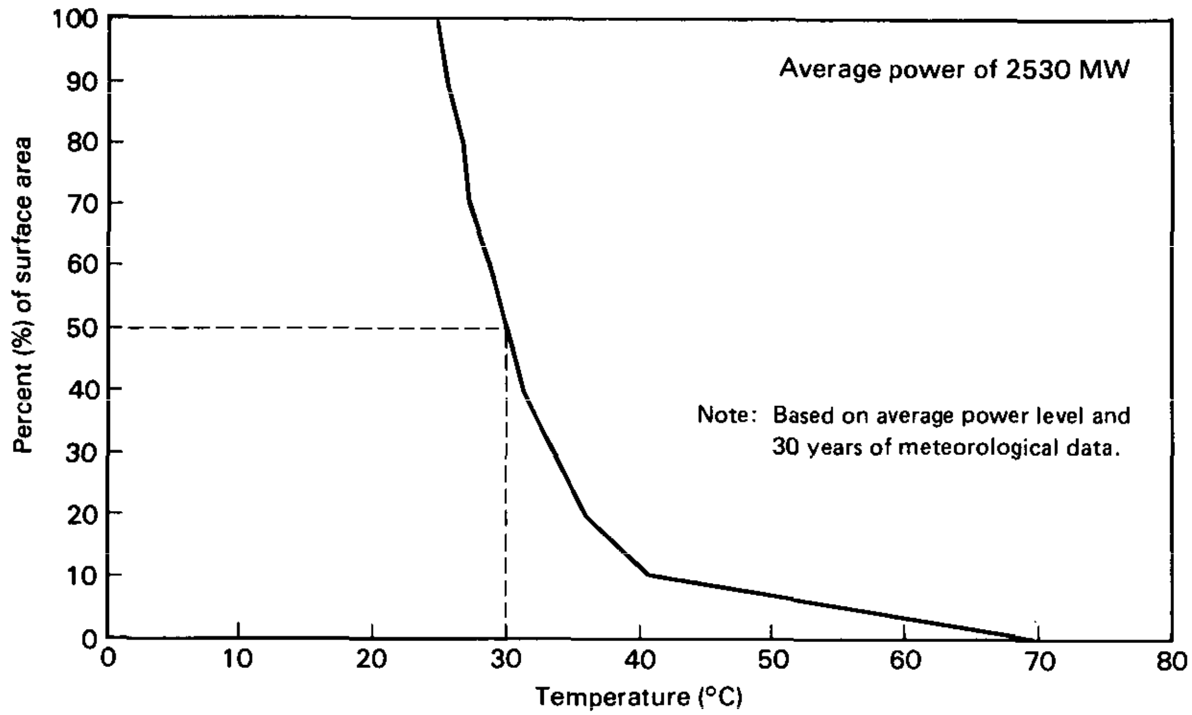


Figure L-4. Percent of lake surface with the temperature greater than indicated (spring).

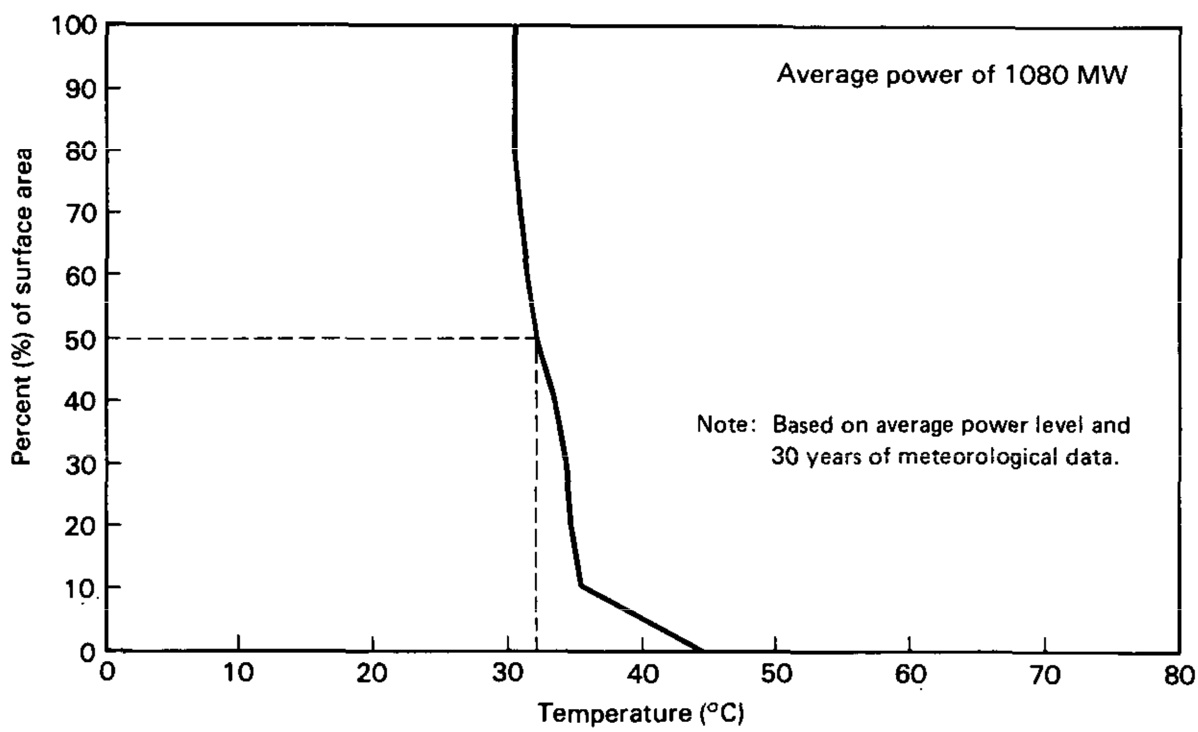


Figure L-5. Percent of lake surface with the temperature greater than indicated (summer).

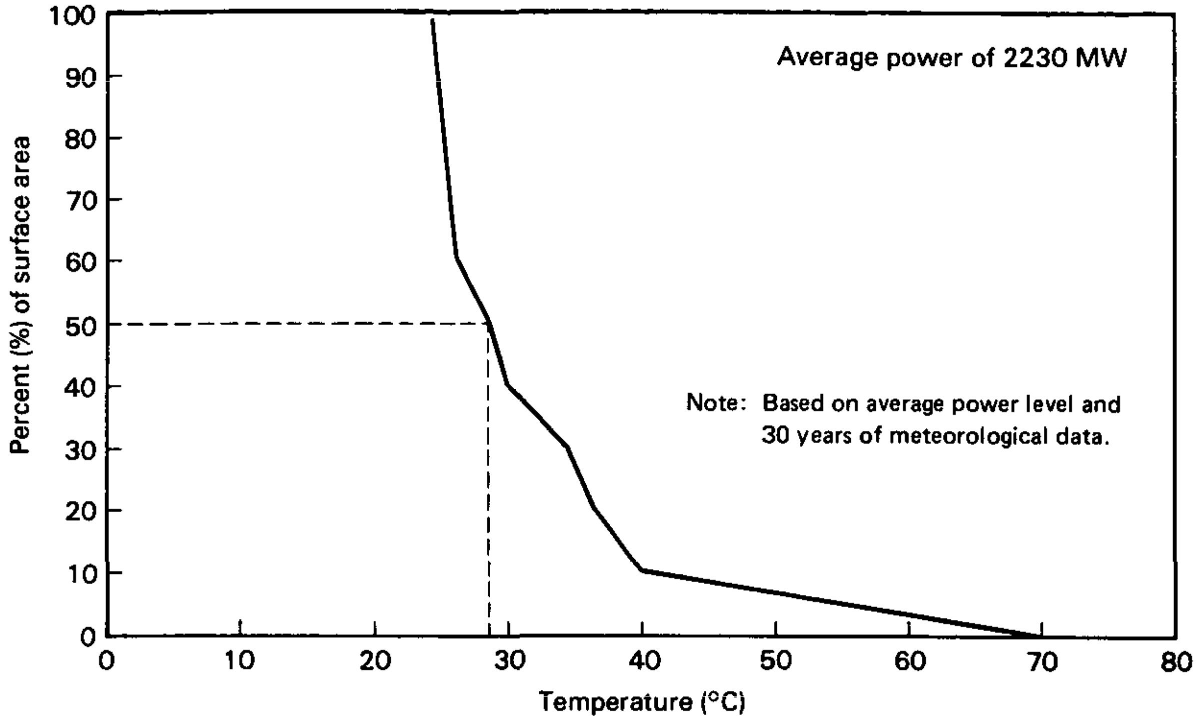


Figure L-6. Percent of lake surface with the temperature greater than indicated (fall).

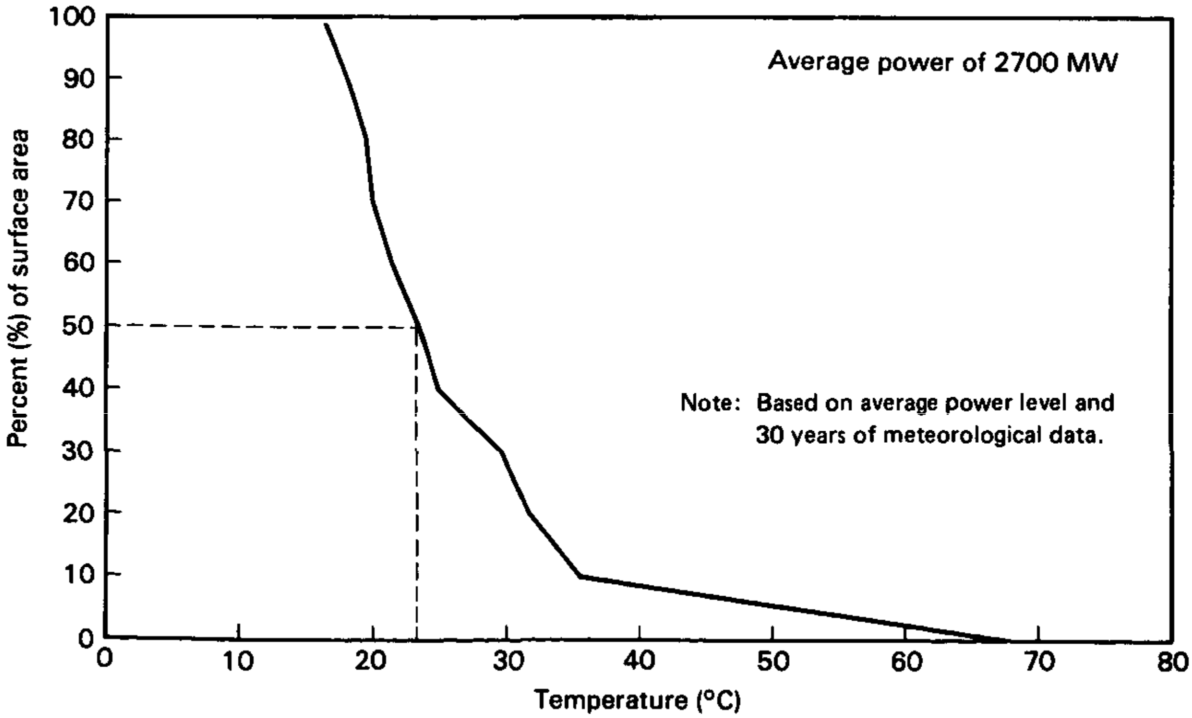


Figure L-7. Percent of lake surface with the temperature greater than indicated (winter).

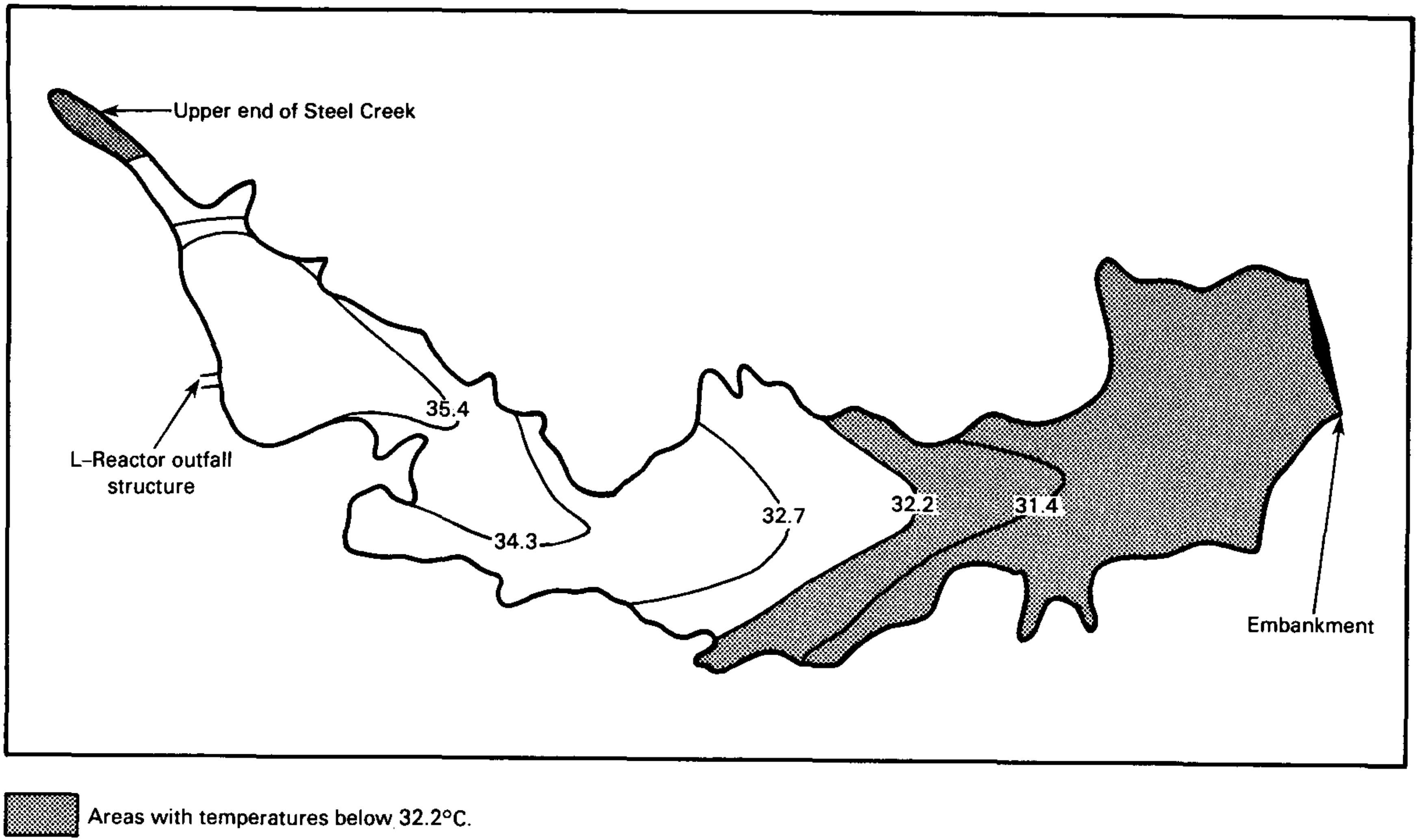
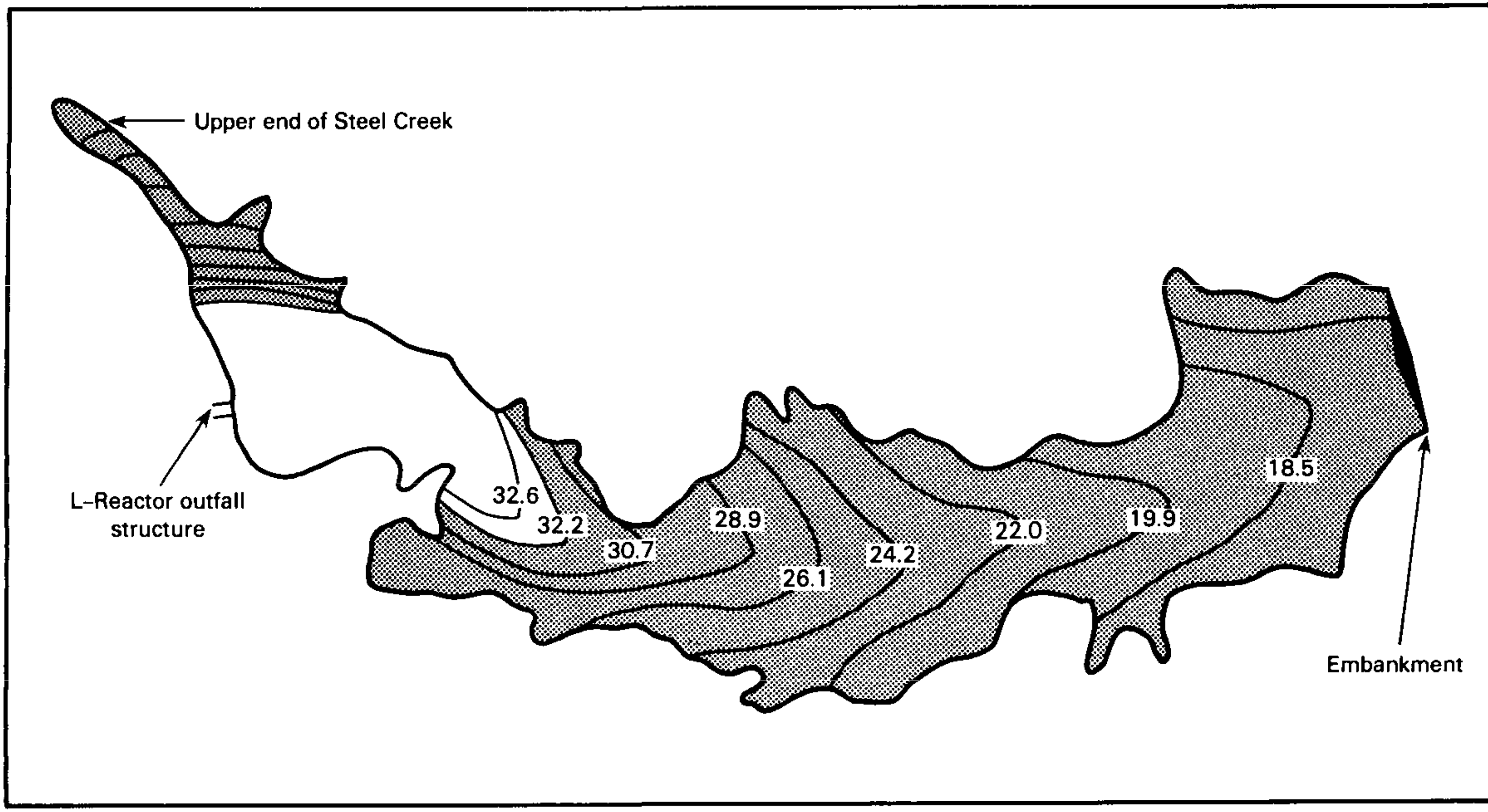


Figure L-8. Estimated isotherms for the 1000-acre lake (summer).



Areas with temperatures below 32.2°C.

Figure L-9. Estimated isotherms for the 1000-acre lake (winter).

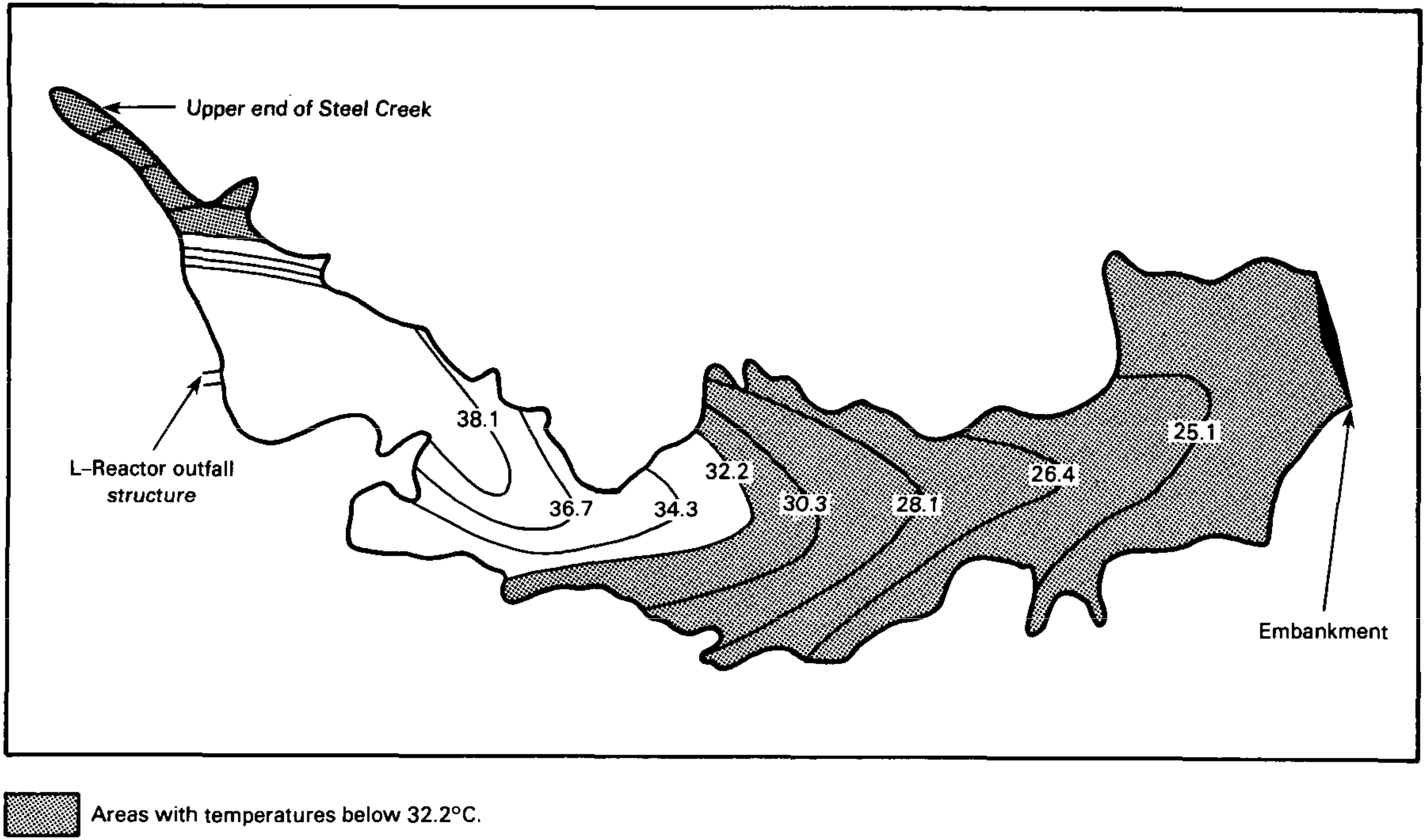


Figure L-10. Estimated isotherms for the 1000-acre lake (fall).

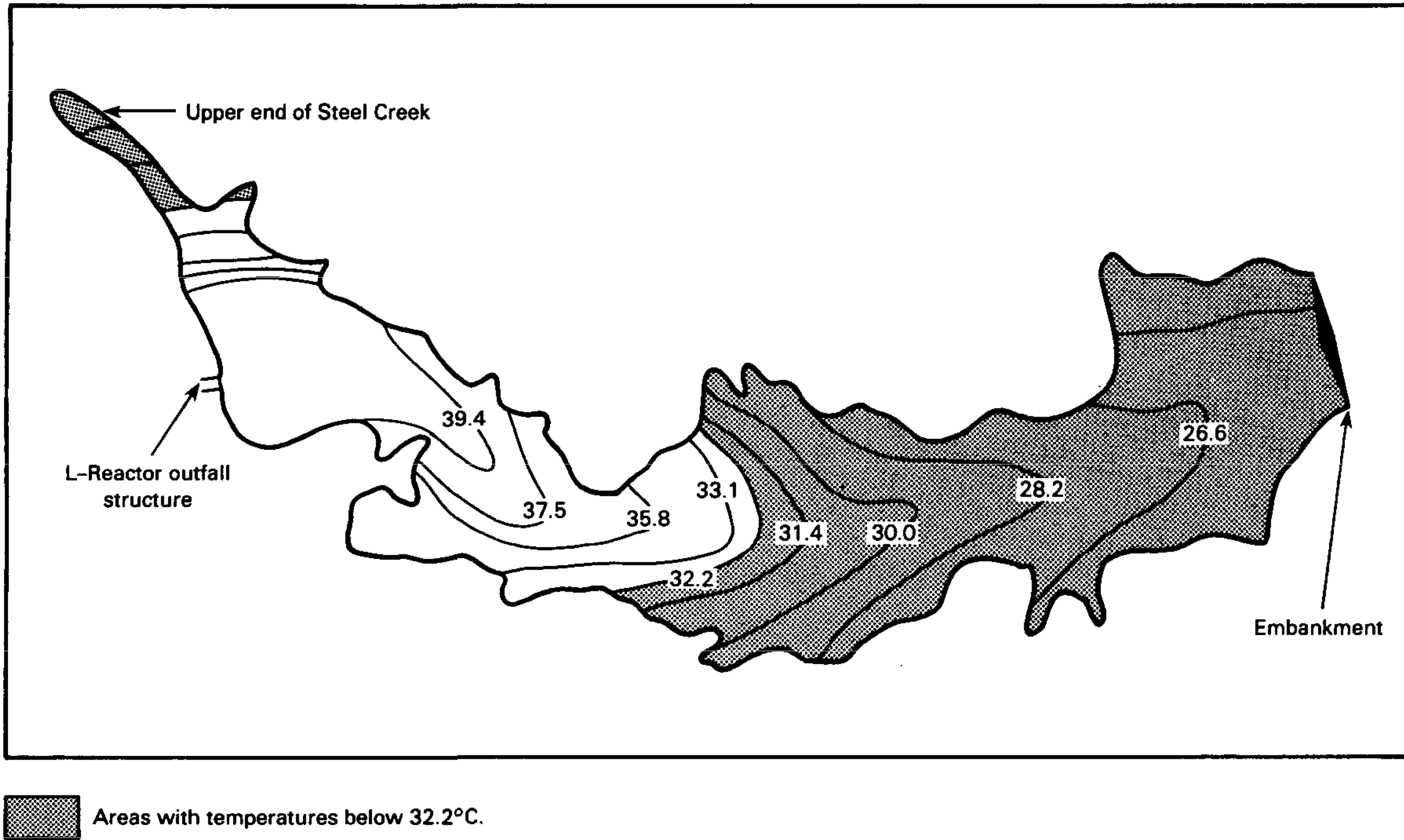


Figure L-11. Estimated isotherms for the 1000-acre lake (spring).

would range between approximately 17° and 31°C throughout the year (although some winter temperatures might be as low as 14°C, as inferred from the 30-year data base).

L.2.2.4 Lake operation

During construction of the embankment, streamflow would be carried through the work area in a temporary metal conduit laid parallel to the outlet works conduit. An upstream cofferdam, with a crest at elevation 43 meters above mean sea level, would divert the water into the metal conduit and protect the work site. A low downstream cofferdam would protect the site from rising tailwater. This diversion configuration would provide protection from a storm with a recurrence interval of between 25 and 50 years.

Following completion of the reconfigured discharge canal, outlet works and embankment, the outlet gates would be closed and the pool elevation of the lake would be allowed to rise to the design elevation of 58 meters above mean sea level. Assuming a constant inflow of about 11 cubic meters per second of Savannah River water from L-Reactor, 0.45 cubic meter per second from P-Reactor, and 0.62 cubic meter per second Steel Creek base flow, approximately 30 days would be required to fill the lake. As impoundment of the lake occurred, the response of the embankment would be monitored to verify design. Flow would be maintained down Steel Creek below the embankment during filling. Lake filling would be completed before startup of L-Reactor.

Cooling water and lake discharge flows would be managed to maintain a balanced biological community in the lake and in Steel Creek and swamp. Reactor cooling-water flow variations and lake discharge management would restrict water level fluctuations to assure a healthy aquatic macrophyte population in the lake. The development of shoreline refuge areas also would enhance this macrophyte population, which would provide the necessary habitat for growth and reproduction of certain fish and macroinvertebrates necessary to maintain a balanced biological community (see Section L.4.1.1.2).

Downstream flows would be maintained constant throughout reactor operating periods, except during periods of extreme rainfall. During short reactor outages occurring within the spring spawning period, the flow at Road A would be controlled to about 3 cubic meters per second, thereby maintaining good spawning habitat. The remainder of the year, flow in Steel Creek at Road A during shutdown periods would maintained at about 1.5 cubic meters per second, providing opportunities for fish to move freely from the base of the embankment to the Savannah River Swamp.

If long reactor outages should occur during the spawning period, flow would be maintained at a rate of about 3 cubic meters per second. For long outages at other times, only base flow conditions would occur in Steel Creek.

L.2.3 Design bases

L.2.3.1 Design flood

The embankment and its outlet works would be designed for the U.S. Army Corps of Engineers' "Standard Project Flood." The Standard Project Flood is the flood that can be expected from the most severe combination of meteorologic and hydrologic conditions that are considered reasonably characteristic of the region. It was established by the Corps of Engineers as a practicable expression of the degree of flood control works for situations that involve the protection of human life and high-value property.

Because the Standard Project Flood is developed from extreme hypothetical conditions, it cannot be assigned a specific recurrence interval. [A recurrence interval is defined as the average interval in years between the occurrence of a flood of specified magnitude and an equal or more severe flood (Linsley and Franzini, 1979).] A recurrence interval of a few hundred to a few thousand years is commonly associated with the Standard Project Flood.

At the site, the Standard Project Flood is a 96-hour storm of varying intensity that produces a total rainfall of 51 centimeters. Figure L-12 compares this storm with the precipitation-frequency characteristics of the area. The figure shows the maximum depth of rainfall for various durations and recurrence intervals. The maximum depth of rainfall for the design storm is superimposed on this. The design storm exceeds the 100-year storm for all durations. The dotted lines are extrapolations of the published precipitation-frequency data. They provide an indication of the design storm's recurrence interval for various durations. For example, the 96-hour duration, 51-centimeter depth corresponds to a recurrence interval of more than 10,000 years. The response time of the 1000-acre lake's watershed is such that durations in the 2- to 6-hour range are the most significant. In this range, the storm's recurrence interval varies from about 1000 to 40,000 years. Section L.3.4.1.3 describes the results of the computer analysis of the Standard Project Flood on Steel Creek.

An even rarer flood, the probable maximum flood (PMF), was also included in the design bases. This flood is the result of a 72-centimeter rainfall in 24 hours. The principal outlet works and existing natural emergency spillway (see Section L.2.3.3) are capable of controlling the PMF.

L.2.3.2 Seismic analyses

Seismic considerations would be included in the design of the foundation, embankment, and outlet works. Sand and gravel filters would be installed to dissipate pore pressures and heal possible cracking resulting from a seismic event. To reduce the effect of seismic-induced deformation, the embankment design would incorporate a wide crest, intermediate berm, and flat slopes. Analysis of the liquefaction potential of the foundation would be evaluated for any needed improvements. Detailed seismic analyses have not been performed, but the embankment design will include appropriate seismic considerations. The consequences of the unlikely event of embankment failure are discussed in Section L.4.2.2.

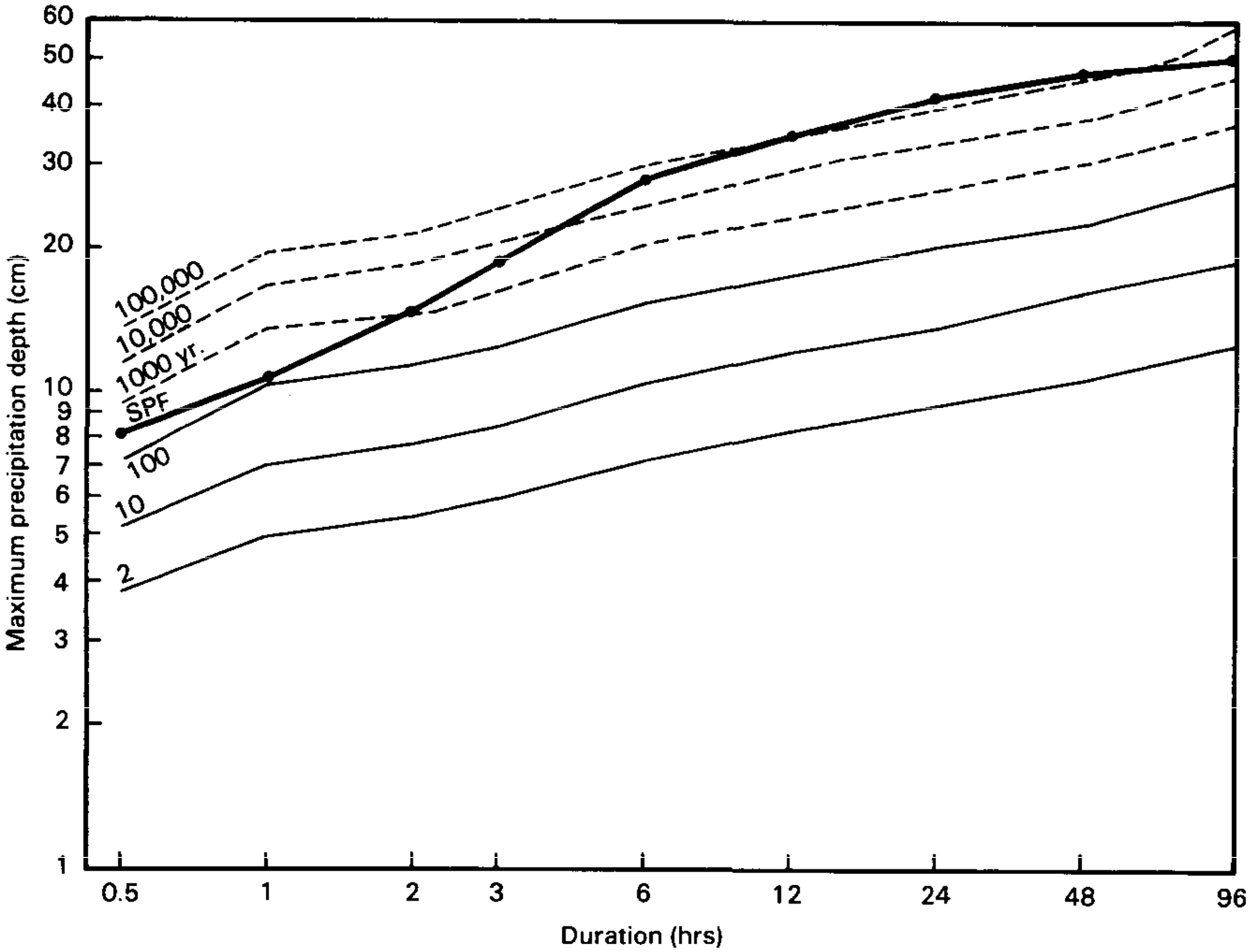


Figure L-12. Standard project flood related to site depth-duration-frequency.

L.2.3.3 Other design criteria

The outlet works would consist of a vertical intake tower with multilevel gates, a concrete conduit, and a stilling basin. These works would be designed to pass the L-Reactor cooling-water flow, the service-water flow from P-Reactor, and the natural base flow, while holding the lake elevation at 58 meters above mean sea level. They would also serve as the principal flood-control outlet designed to be fully capable of controlling the standard project flood.

In the extremely unlikely event of a flood that is more severe than the standard project flood, overtopping of the embankment would not occur. A natural saddle would serve as an emergency spillway and divert flow to Pen Branch. This saddle has an elevation of about 60 meters at its low point and spans 183 meters at the top of the embankment elevation of 61 meters. The probable maximum flood (PMF) would result in a maximum pool elevation between the low point of the saddle and the top of the embankment. Section L.3.4.1.3 describes the results of the computer analysis of the PMF on Steel Creek.

L.2.4 Construction

L.2.4.1 Relocation of existing facilities

SCE&G would design and relocate its own transmission lines. The design and construction of the relocation of the SRP roads and transmission and control cable lines would be performed by the Du Pont Engineering Department. The U.S. Forest Service would administer all clearing for these relocations as well as for the lake area.

L.2.4.2 Site preparation

L.2.4.2.1 Clearing

All areas upstream from the embankment and less than 58 meters above mean sea level would be cleared of second growth pine and hardwood to provide for the 1000-acre lake area. All marketable timber from this area and from the road and transmission corridors would be cut, removed, and sold under the supervision of the U.S. Forest Service. Timber and vegetation in any area flooded by Steel Creek waters since 1954 might contain low-level radioactivity and would not be marketable. Procedures for the removal and disposition of such material would be developed and approved before construction started. Underbrush and scrap from timber cutting outside the area flooded by Steel Creek since 1954 except around some of the shoreline area would be piled and burned. Stumps would be removed under all embankment areas but not from the area within the lake.

L.2.4.2.2 Foundation preparation

Areas to be covered by the embankment, inlet and outlet works, or roadways would be grubbed and stumps would be removed and burned. All topsoil would be stripped and stockpiled for use on the finished grade for turf establishment. It could be necessary to excavate unconsolidated sediments from the area under the dam to a depth of between 3 and 15 meters to expose a tight clay formation to which the embankment could be sealed. Approximately 600,000 cubic meters of unsuitable material could be removed from the embankment site before 1.2 million cubic meters of borrow fill and rip-rap would be placed to form the embankment. Spoil from the surface portion of the embankment foundation in the Steel Creek floodplain, estimated to contain a total of 0.2 curie of cesium-137 and 0.02 curie of cobalt-60, would be separated, contained, replaced outside the jurisdictional wetlands upstream of the embankment, and covered with subsurface spoil to prevent erosion during the construction period. ["Jurisdictional wetlands" are those areas inundated or saturated by surface or ground water at a frequency and duration sufficient to support and that under normal circumstances do support a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas (33 CFR 323.2c).] This relocation would have no effect on net cesium transport estimates. All other material would be removed and used for backfill in the borrow areas.

L.2.4.2.3 Abandoned well survey and sealing

Research is currently underway to determine how many wells were constructed within the lake area before Government acquisition of the SRP property. All of these wells would be sealed before the lake begins filling to reduce the chance of affecting ground-water quality.

In March 1984, a survey team from the Furman University Department of Geology performed a field survey of this portion of the Steel Creek watershed. Twenty old possible well sites were identified in this area, 11 of which were found to lie within the boundaries of the 1000-acre lake. The sites vary from shallow open depressions to deep-cased and screened wells. Several of these might be grave sites or archeological sites rather than wells.

Each site identified, as well as any others drilled or located during construction of the 1000-acre lake, would be sealed by filling from bottom to top with sand-cement or concrete in accordance with the South Carolina Primary Drinking Water Regulations, Section R-61-58.2 C (14) "Permanent Well and Test Hole Abandonment." All information relative to each site (e.g., exact plant coordinate location, depth, diameter) would be recorded and submitted to SCDHEC.

L.2.4.3 Earthwork and other civil construction

L.2.4.3.1 Embankment construction

The embankment would be of rolled earth construction, excavated from borrow areas nearby or within the lake area, and transported with standard earth-moving equipment. The interior of the embankment would be divided into impervious zones and drainage zones to provide internal and foundation drainage, relieve pore pressures, and heal possible cracking resulting from a seismic event. Piezometers would be installed during construction and permanent instrumentation to monitor embankment performance would be included as part of the design.

The design would limit the embankment slopes from 3 to 4 meters horizontally for each meter of height (Figure L-13). Flat berms might be required on both faces partway up the slopes. The exposed portion of the upstream slope would be protected against erosion caused by variations in water level and wave action by rip-rap on a gravel filter bedding.

Criteria of embankment stability design have established that seepage of water is a critical consideration. Therefore, the embankment will be designed so that total permanent seepage loss through the embankment abutments and foundation will be limited. To ensure positive restriction through the foundation of the embankment, an impervious soil or grout cutoff trench will be constructed to the maximum depth that is economically feasible and tied into the abutments. Seepage through the embankment will be slight, because the embankment will consist of three or four zones.

L.2.4.3.2 Roadway and utility access

An access road would be constructed from Road A approximately 400 meters to the west end of the embankment. This road would become the permanent access to the completed facility for operation and maintenance. Another road would be constructed from Road A-14 east of Steel Creek southwesterly along a ridge to the east end of the embankment. This road would provide a route from the railroad siding at Meyers Mill to the embankment site.

An electric transmission line would run southeasterly approximately 1500 meters from an existing substation near Roads A and A-16. This line would provide 120/208/460-volt electrical power service for lighting, instrumentation, and gate motors. A small building would be required at the embankment to house instruments and controls.

L.2.4.3.3 Borrow pit operation

Areas close to the embankment would provide the approximately 1.2 million cubic meters of borrow material necessary to construct the embankment. This material must meet the specifications for the various zones contemplated. Any borrow area outside the limit of the lake would have to be cleared and then regraded; ground cover would have to be established after the borrow material had been removed. Therefore, primary consideration would be given to finding suitable material within the area to be cleared for the lake. By excavating areas at or just above the normal pool elevation, the surface area of the lake could be increased at little additional cost. Some internal drainage material and all riprap material would be brought to the construction site from outside SRP.

L.2.4.3.4 Outlet works

The outlet works would consist of a freestanding intake tower with multilevel gates, a concrete conduit and a stilling basin (Figure L-13). The vertical intake tower would be a cast-in-place concrete structure consisting of a flood control passage and two collection wells. A concrete conduit would be used to carry water from the intake tower through the embankment. This conduit would also carry the normal releases from the lake. The outlet works would be fully capable of controlling floods with a recurrence interval of greater than 100 years.

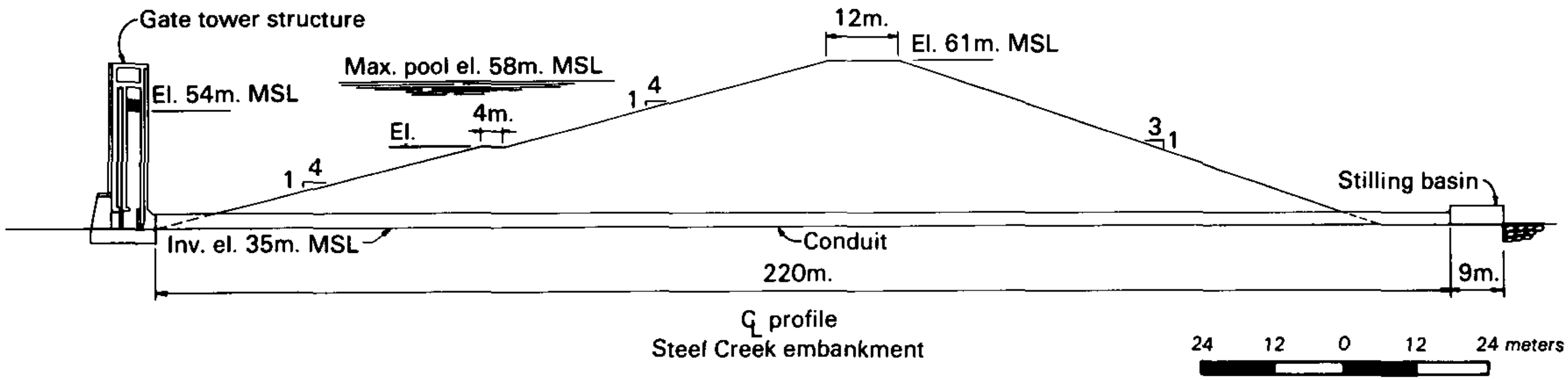


Figure L-13. Steel Creek embankment.

Four to six gates would be installed in the intake tower. One multilevel intake gate would be located in each of two opposing walls of the intake. The invert elevation of these gates would be 54 meters MSL. The two gates would pass about 11.3 cubic meters per second, the normal flow, and be operated in a totally open or totally closed position. Water could enter the discharge structure at a depth of 2 to 4 meters below the surface and/or from near the bottom of the lake. Discharge would be regulated with a service gate located at the bottom of each collection well at the tower invert (at 35 meters elevation). An emergency gate would be located upstream of each service gate to provide a positive cutoff should the service gate fail. A trash rack would be located upstream of the emergency gates to prevent debris from interfering with the operation of the service gates. The gates would be electrically controlled from the service building; provisions would be made for emergency manual operation of the gate.

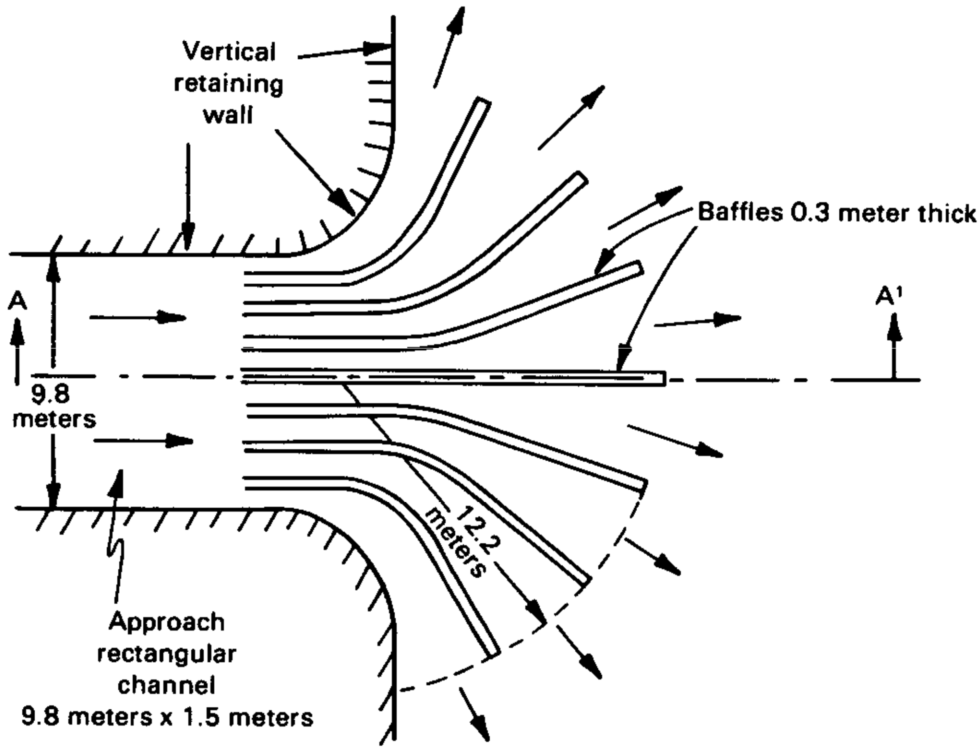
L.2.4.4 Reconfiguration of outfall canal

The existing outfall canal would be completely submerged by the 1000-acre lake, which would have a normal pool elevation of 58 meters above mean sea level. The existing 1.8-meter-diameter discharge pipe has a bottom elevation of 58.5 meters and drops vertically at a concrete headwall to an existing concrete stilling basin at the head of the outfall canal, which has a bottom elevation of 53.3 meters. Therefore some reconfiguration must be accomplished to reduce the 4.3-meters-per-second velocity and 1.8-meter height of the cooling-water flow where it would leave the pipe and enter the lake. Cooling efficiency of the lake would be enhanced by distributing the heated water over as large an area of the lake surface as possible without mixing it with the lower depths of the lake volume.

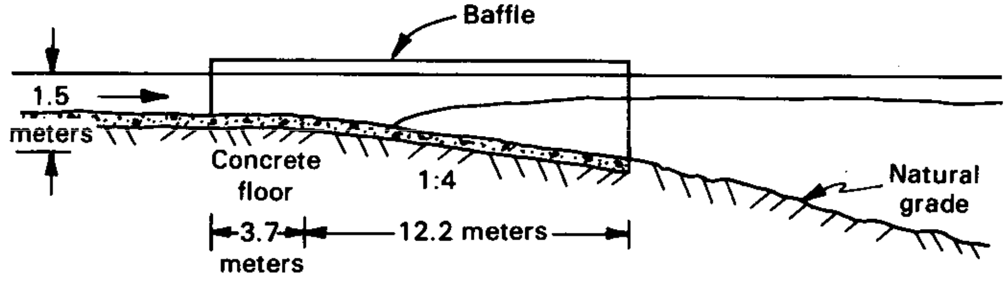
The design for the most appropriate method for reducing the velocity and distributing the heated effluent over the lake surface would be based on detailed engineering studies. Figure L-14 is an example of one possible configuration. Such a radial discharge design, consisting of radial baffles, would spread the flow momentum uniformly in all horizontal directions, thereby reducing eddying effects. With a properly engineered design, it could be possible to minimize the vertical entrance mixing by creating a stable interface and strongly reducing and horizontal circulations in the vicinity of the discharge.

L.2.4.5 Schedule

It was determined that with close coordination and cooperation between DOE and the Corps of Engineers, an expedited schedule could be met. Under the schedule, construction of the 1000-acre lake could be completed in 6 months. This expedited schedule would be possible because the Corps of Engineers has an experienced staff available to design and construct the embankment that would form the lake; this staff is available because it is now completing the construction of the Richard B. Russell Dam on the Savannah River. In addition, the construction does not depend on the procurement of long-lead-time items (i.e., the special-order pumps required for recirculating cooling towers).



A. Radial discharge design



B. Cross-section A–A

Figure L-14. Reconfigured outfall canal (top) and cross-section of proposed new canal structure (bottom).

L.2.4.6 Resource Requirements

L.2.4.6.1 Manpower

Approximately 550 workers would be required to construct the 1000-acre lake. These workers would include about 30 civil engineers for design and construction supervision, but would not include current DOE and Du Pont employees who would provide liaison to the construction managers.

Because most of the work in this alternative would be standard civil construction activities such as clearing, earthwork, and the building of minor concrete structures, and because the design includes few mechanical or electrical items, local labor should be able to sustain the level of effort necessary to complete this alternative in a timely manner.

L.2.4.6.2 Cost

Capital cost of the project is estimated to be approximately \$25 million, with an annual operating cost of \$3.4 million. The present worth would be \$111 million, and the annualized cost would be \$13.1 million.

L.2.4.7 Construction impacts

L.2.4.7.1 Historic/archeological

Four historic sites and one prehistoric site in the Steel Creek terrace and floodplain system have been determined to be eligible for inclusion in the National Register of Historic Places. No direct impacts are expected to the prehistoric site or to three of the historic sites because they would be below the embankment and outside the area affected by high-water flow conditions. One historic site area would be inundated when the lake was filled. These sites are shown on Figure L-15. These impacts would be mitigated as described in Section L.2.4.8.1.

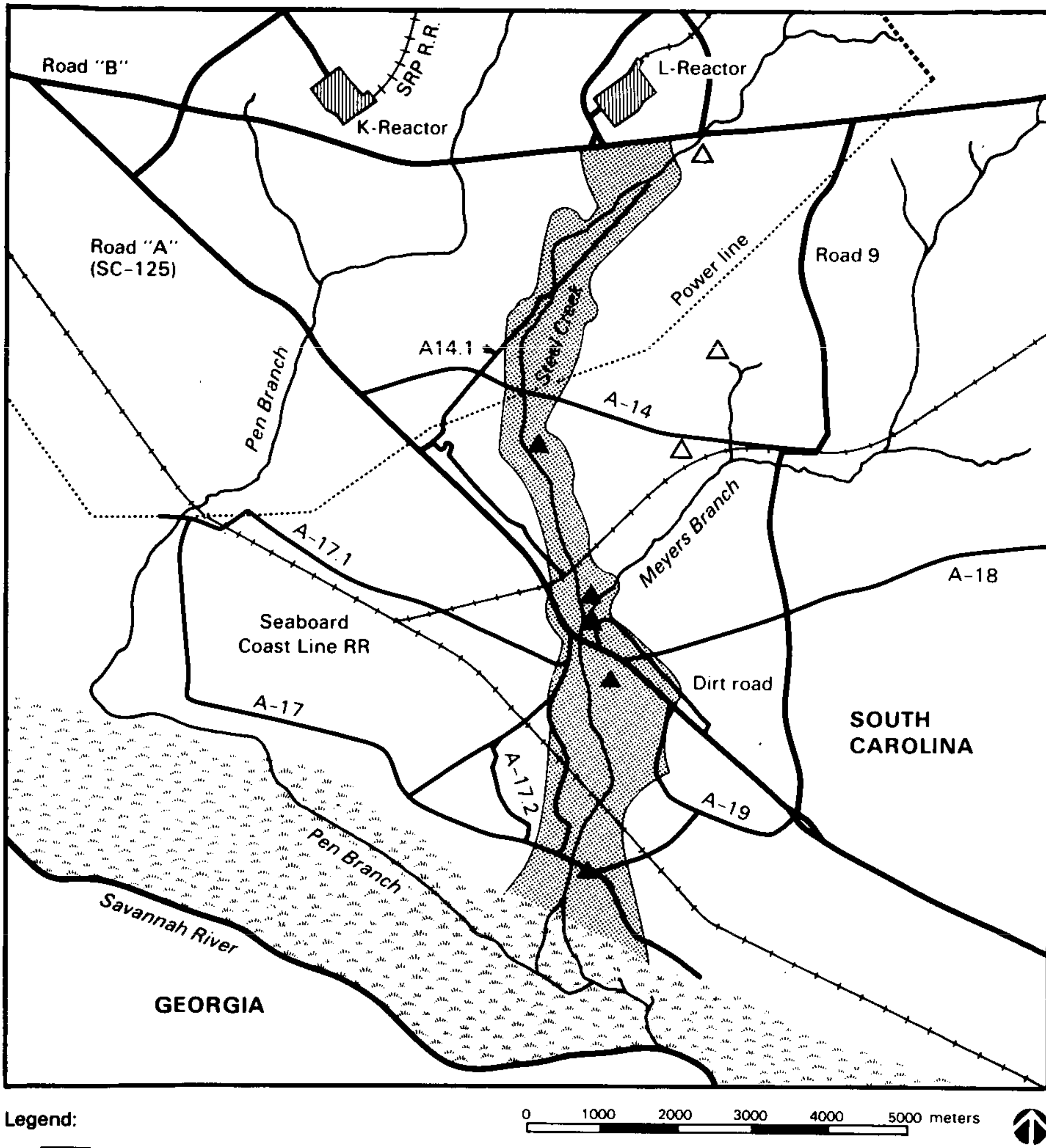
In March 1984, an intensive survey of the proposed excavation areas (embankment and borrow pit areas) was made (Brooks, 1984). This survey identified seven sites described as of ephemeral quality and not eligible for nomination to the National Register of Historic Places.

L.2.4.7.2 Ecology

There would be two principal sources of potential impact to the ecology of the area: (1) the construction of the embankment and associated appurtenances, and (2) the inundation by the lake.

L.2.4.7.2.1 Embankment construction

The construction of the earthen embankment and water diversion system for the lake would cause some temporary increases in suspended solids in Steel Creek. Suitable precautions would be taken (1) during the construction operations necessary to establish a foundation for the embankment, and (2) during



Legend:

Swamp

Area intensively surveyed

▲ Archeological/historic sites (Hanson et al., 1981)

△ Archeological/historic sites (Brooks, 1984)

Figure L-15. General map of archeological survey area and sites listed in the *National Register of Historic Places*.

emplacement of the fill to ensure that undue silt and debris loads do not move downstream from the construction site. Turbidity screens could minimize impacts to downstream areas.

Borrow pits for similar quantities of suitable materials have been identified in the past for construction at the Savannah River Plant, and have been controlled in an environmentally acceptable manner. About 90 percent of the fill material for the embankment would probably come from a borrow pit that would be submerged when the lake is filled. A second potential borrow site would not be inundated. A small volume of material might be taken from this location, which would result in the loss of about 5 acres of upland habitat.

The number and routing of access roads for construction have been carefully considered to minimize adverse environmental impacts. An estimated 33 acres of upland habitat outside the area to be inundated would be altered by the construction of access roads. The reconstruction of existing roads would not result in the alteration of any uplands since they would utilize the existing roadbed. The rerouting of powerline and buried cable rights-of-way would cause the loss of an additional 100 acres of upland habitat.

Spoil piles of the size expected for this alternative have been developed for past construction activities at the Savannah River Plant and have met the necessary environmental control requirements. Spoil from any excavation in the former floodplain of Steel Creek would be monitored for radioactive materials; any spoil containing radioactivity would be disposed of as discussed in Section L.2.4.2.2.

L.2.4.7.2.2 Inundation of habitats

The filling of the cooling lake would inundate 225 acres of wetlands and 775 acres of uplands in the Steel Creek corridor (approximately 150 acres of "jurisdictional wetlands" as defined by the Corps of Engineers). The vegetation in this area consists primarily of scrub-shrub and forested wetlands. These areas are classified as Resource Category 2 by the U.S. Fish and Wildlife Service. This category and its designation criteria include "high value for evaluation species and scarce or becoming scarce." The mitigation planning goal specifies that there be "no net loss of inkind habitat value" (USDOI, 1981).

L.2.4.7.3 Water quality

The potential impacts to water quality from construction would be erosion and sedimentation; these potential impacts would be mitigated as described in Section L.2.4.8.3.

L.2.4.7.4 Air quality and noise

About 400 to 550 acres of upland forest would be cleared. Trees of commercial value would be harvested and removed from the site in accordance with the SRP Forest Management Program. Open burning would be employed for disposal of forest slash cleared from the site. Clearing and burning would progress in reasonably sized units of a few acres to minimize local dust and smoke. The nearest roadways to the lake would be SRP Road B (less than 30 meters) and

Highway 125 (1 kilometer). Traffic could be rerouted from Road B if necessary during the burning of slash material. Because of its distance from the construction site, Highway 125 would not be affected. Burning would result in some releases of particulates and gases into the atmosphere, but releases would be local and generally short-lived. Offsite effects are not expected since the nearest location to the SRP site boundary from the lake would be approximately 8 kilometers.

Not all the lake would be grubbed and burned. About 200 acres of lake bottom near the shoreline would be maintained with the stumps in place as habitat for aquatic organisms. Other burnable slash might also be used to construct submerged habitat attraction structures, thus reducing the need to burn all material at the site. Temporary construction roads, laydown areas, and spoil areas would be graded, grassed, wetted, or sprayed with tackifiers as needed to reduce local dust. As much as possible, the roads would be designed to become permanent access roads once the project was completed, thus reducing the impacts of temporary haul roads.

The cooling lake construction site is in a forest area that is relatively remote from human habitation. Noise from construction, primarily from tree-cutting and earth-moving equipment, would have insignificant offsite environmental effect because of the remoteness of the site and the muffling effect of intervening forests. Members of the public using SC Highway 125 would not be in the immediate vicinity of noisy equipment and would have only brief exposure. Effects of this exposure would be insignificant. Noise levels from lake site construction in nearby L-Area, the nearest occupied onsite facility, are expected to be well within clearly acceptable standards (62 decibels). Operators of noisy construction equipment would wear protective equipment in accordance with Du Pont standards (where applicable) and OSHA regulations. Most other workers in the area would be exposed to high noise levels only intermittently, but protective equipment would be provided when the exposure could be expected to be sustained. No impulsive or impact noises in excess of acceptable standards would be expected.

L.2.4.7.5 Socioeconomic

The construction of the 1000-acre lake would be completed over a 6-month period at a capital cost of approximately $25 million and an annual operation cost of $3.4 million. The present worth of this alternative would be $111 million and the annualized cost would be $13.1 million. The construction would require about 550 workers. The potential economic effects on the local economy are expected to be positive; however, these effects will be small (in relation to other ongoing SRP projects--DWPF and FMF) and of short duration (6 months). Impacts to local community facilities and services are expected to be minor because most construction personnel will be hired from within the Central Savannah River Area. Such personnel are presently available because the Richard B. Russell Dam construction is near completion.

L.2.4.7.6 Land use

The 1000-acre cooling lake would be entirely within the present SRP area boundaries. Land use within the SRP area would be altered, in that 1000 acres would be inundated to become a cooling lake and the previous land uses as forest land and bottom land would be interrupted. The 1000 acres would include

450-600 acres of wetland in the Steel Creek Corridor and 400-550 acres of upland. Timber of commercial value would be harvested and removed from the site in accordance with SRP Forest Management Program. An additional area (about 100 acres) would be cleared for road and utility access relocation.

The timber which would be harvested consists of pine saw timber, pine pulp wood, hardwood saw timber, and hardwood pulp wood. Table L-1 summarizes the timber value and annual growth. The anticipated value from harvesting the timber is $950,000. The annual loss in timber productivity is projected to be $44,000. This impact is not amenable to mitigation.

Table L-1. Timber value and annual growth

	Present Volume/Value			Annual Growth	
Type of timber	Volume (1000 board feet)	Cords	Value ($1000)	Volume (%)	Value ($1000)
Pine, saw timber	5058	--	715	4	28
Pine, pulp wood	--	4326	102	8	12
Hardwood, saw timber	2550	--	128	3	4
Hardwood, pulp wood	--	3384	5	6	.3
Totals	--	--	950	--	44

L.2.4.8 Construction impact mitigation

L.2.4.8.1 Historic/archeological site mitigation

A monitoring and mitigation plan has been developed to ensure the preservation of the resources at the four sites below the dam, and the plan has been approved by the South Carolina State Historic Preservation Officer (SHPO) (Du Pont, 1983a).

A resource recovery plan has been developed by the University of South Carolina Institute of Archaeology and Anthropology for the one historic site (38 BR 288) located within the proposed lake area. This mitigation plan has been approved by the SHPO and the Advisory Council on Historic Preservation (ACHP) (Lee, 1982), which concurred that this mitigation plan will result in no adverse impacts to National Register properties.

Archeological surveying and testing are presently being conducted in the proposed lake area by the University of South Carolina, Institute of Archeology and Anthropology. It is anticipated that several sites associated with the Ashley Plantation will be affected. The schedule for completion of the requirements under the National Historic Preservation Act, including data recovery, is consistent with the construction schedule for the embankment, and all mitigation will be completed prior to restart (Hanson, 1984). The study results, determination of eligibility of potential sites, and the development of a mitigation plan are being coordinated with the SHPO and ACHP.

L.2.4.8.2 Ecological mitigation

The Department of Energy is working with the Department of the Interior to perform a Habitat Evaluation Procedure (HEP). The HEP will identify the value of habitat to be gained or lost with implementation of the preferred cooling-water mitigation alternative for use in assessing further mitigation. If required, DOE will implement additional mitigative measures that might be identified through the HEP process, dependent on Congressional authorization and appropriation.

The endangered wood stork forages at the Savannah River Plant but does not breed on the site. The feeding individuals have been observed to be from the Birdsville Rookery, some 50 kilometers away. Feeding occurs in the swamp away from the proposed lake; it could be affected by raised water levels in the Steel Creek delta if the L-Reactor cooling-water flow is discharged through the proposed lake. DOE initiated informal consultation with the Fish and Wildlife Service (FWS) in July 1983 and in March 1984 as required by Section 7 of the Endangered Species Act. DOE has also initiated the formal consultation process by providing a Biological Assessment to FWS for a Biological Opinion (Sires, 1984a). While DOE concludes that the operation of L-Reactor will affect foraging habitat near the Steel Creek delta, the construction activities associated with Phase II of the NPDES permit to control the acidity of releases from the 400-area powerhouse ash basins will improve the quality of the foraging habitat in the Beaver Dam Creek area, assuring the continued availability of this habitat. Therefore, the loss of foraging habitat in the Steel Creek area will not jeopardize the continued existence of the wood stork. Any additional mitigation measures needed will be determined either as part of the HEP study or as part of this consultation process.

L.2.4.8.3 Water quality mitigation

The lake construction activity would include an Environmental Protection Plan, which would include several measures designed to mitigate water quality impacts.

Earthwork brought to final grade would be protected as soon as practicable. All earthwork would be planned and conducted to minimize the duration of exposure of unprotected soils. Except in instances where the constructed feature obscures borrow areas and waste material areas, these areas would not initially be cleared in total. Clearing of such areas would progress in reasonably sized increments as needed.

Such methods as necessary would be utilized to effectively prevent erosion and control sedimentation, including but not limited to the following:

1. Retardation and control of runoff. Runoff from the construction site would be controlled by construction of diversion ditches, benches, and berms to retard and divert runoff to protected drainage courses.

2. Sediment basins. Sediment from construction areas would be trapped in temporary or permanent sediment basins in accordance with design plans. The basins would accommodate the runoff of anticipated storms. After each storm the basins would be pumped dry and accumulated sediment would be removed as necessary to maintain basin effectiveness. Overflow would be controlled by paved weir or by vertical overflow pipe, draining from the surface. The collected topsoil sediment would be reused for fill on the construction site, and/or conserved (stockpiled) for use elsewhere. Effluent quality monitoring programs would be required.

Temporary erosion and sediment control measures such as berms, dikes, drains, sedimentation basins, grassing and mulching would be maintained until permanent drainage and erosion control facilities were complete and operative.

Borrow areas and spoil-storage areas would be managed to minimize erosion and to prevent sediment from entering nearby water courses or lakes. Temporary excavations and embankments for work areas would be controlled to protect adjacent areas from despoilment.

Solid wastes (excluding clearing debris) would be placed in containers which would be emptied on a regular schedule. All handling and disposal would be conducted to prevent contamination. Chemical waste would be stored in corrosion-resistant containers, removed from the work area, and disposed of in accordance with Federal, state and local regulations.

Construction activities would be kept under surveillance, management and control to avoid pollution of surface and ground waters. The following special management techniques would be implemented to control water pollution: (1) wastewaters from construction activities would not be allowed to leave the site; they would be collected in retention ponds where suspended material could be settled out or the water could be evaporated so the pollutants would be separated; (2) the operation would be planned to minimize adverse impacts of dewatering, removal of cofferdams, and excavation, and to limit the impact of water turbidity on the habitat for wildlife and impacts on water quality for downstream use; (3) stream crossings would be controlled during construction; crossings would allow the movement of materials or equipment that did not violate Federal or state water pollution control standards; (4) all water areas affected by construction activities would be monitored; (5) construction activities would be kept under surveillance, management, and control to minimize interference with, disturbance to, and damage of fish and wildlife.

L.2.4.8.4 Air emissions and noise control

The construction Environmental Protection Plan would also require measures to mitigate air emissions and noise. Construction activities would be kept under surveillance, management, and control to minimize pollution of air resources. All activities, equipment, processes, and work performed would be in strict accordance with applicable requirements.

The following special management techniques would be implemented to control air pollution by the construction activities:

1. Dust particles, aerosols, and gaseous byproducts from all construction activities, processing and preparation of materials would be controlled at all times, including weekends, holidays, and hours when work is not in progress.

2. Particulates that could cause the air pollution standards to be exceeded or that could cause a hazard or a nuisance would be controlled at all excavations, stockpiles, haul roads, permanent and temporary access roads, plant sites, spoil areas, borrow areas, and all other work areas inside or outside the project boundaries. Sprinkling, chemical treatment of an approved type, light bituminous treatment, or other methods would be utilized to control particulates in the work area. Sprinkling would be repeated at intervals to keep the disturbed area damp. Particulate control would be performed as the work proceeded and whenever a particulate nuisance or hazard occurred.

3. Hydrocarbons and carbon monoxide emissions from equipment would be controlled to Federal and State allowable limits at all times.

4. Odors would be controlled at all times for all construction activities, processing and preparation of materials.

5. Air at all areas affected by the construction activities would be monitored.

Construction activities would be kept under surveillance and control to minimize damage to the environment by noise. Methods and devices would be used to control noise emitted by equipment to the levels shown in the COE, Savannah District Safety Manual (COE, 1981a).

L.3 COOLING-LAKE AFFECTED ENVIRONMENT

L.3.1 Geography

L.3.1.1 Location

The Savannah River Plant (SRP), including the L-Reactor and the proposed cooling lake, is located in southwestern South Carolina. The Plant occupies an almost circular area of approximately 780 square kilometers, bounded on its southwestern side by the Savannah River, which is also the Georgia-South Carolina border. Chapter 3, Section 3.1 presents the site location in relation to major population centers, the closest being Augusta, Georgia, and Aiken and Barnwell, South Carolina.

L.3.1.2 Historic/archeologic sites

During January and February 1981, a survey was conducted of the Steel Creek terrace and floodplain system below L-Reactor for archeological resources and sites that might qualify for inclusion in the National Register of Historic Places (Hanson et al., 1981). The area of Steel Creek surveyed was 13 kilometers long and 300 meters wide. Archeologists traversed the first and second terraces of the creek system, inspecting 4-square-meter plots every 5 meters along the creek.

The survey identified 18 historic and archeological sites along Steel Creek below L-Reactor. One archeological site, located at the confluence of Steel Creek and Meyers Branch, was considered significant in terms of National Register criteria. In July 1982, the DOE requested the concurrence of the Keeper of the National Register on this site's eligibility for nomination to the National Register. The Keeper concurred in this site's eligibility.

Seven additional sites were considered potentially significant in terms of National Register criteria. Three of these sites occur beyond the area of any potential effects from the 1000-acre lake alternative. The remaining four sites include three mill dams that date to the early nineteenth century and an historic roadway across the Steel Creek floodplain. In July 1982, the DOE requested the concurrence of the Keeper of the National Register regarding the eligibility of these sites for nomination to the National Register. The Keeper of the National Register concurred in the eligibility of these four sites for inclusion in the National Register. These sites are potentially affected. The remaining 10 sites were not considered significant.

In March 1984, an intensive survey of the proposed excavation areas (embankment and borrow pit areas) was made (Brooks, 1984). This survey identified seven sites described to be of ephemeral quality and not eligible for nomination to the National Register of Historic Places. DOE has provided this report to the SHPO to receive his concurrence in the conclusion that no eligible sites are located in the impact area.

Archeological surveying and testing are presently being conducted in the proposed lake area by the University of South Carolina Institute of Archeology and Anthropology. It is anticipated that several sites associated with the Ashley Plantation will be affected. The schedule for completion of the requirements under the National Historic Preservation Act, including data recovery, is consistent with the construction schedule for the embankment, and all mitigation will be completed prior to restart (Hanson, 1984). The study results, the determination of the eligibility of potential sites, and the development of a mitigation plan are being coordinated with the SHPO and ACHP.

L.3.2 Socioeconomic and community characteristics

Section 3.2 of this EIS provides a summary discussion of all aspects of socioeconomics and community characteristics in the SRP areas. Additional information on these topics can be found in the Socioeconomic Baseline

Characterization for the Savannah River Plant Area, 1981 (ORNL, 1981) and the Final Environmental Impact Statement, Defense Waste Processing Facility, Savannah River Plant, Aiken, South Carolina (DOE, 1982a). The impacts of the 1000-acre lake would be related primarily to jobs in connection with the construction.

L.3.3 Geology and seismology

L.3.3.1 Geology

L.3.3.1.1 Geologic setting

The L-Reactor cooling lake would be located in the Aiken Plateau physiographic division of the Upper Atlantic Coastal Plain of South Carolina (Cooke, 1936; Du Pont, 1980a). Figure 3-5 shows that the topography in the vicinity of the L-Reactor site at the Savannah River Plant is characterized by interfluvial areas with narrow, steep-sided valleys. The relief in the region of the cooling-lake embankment site measures about 56 meters.

The proposed site for the cooling-lake embankment is about 40 kilometers southeast of the Fall Line (Davis, 1902) that separates the Atlantic Coastal Plain physiographic province from the Piedmont physiographic province of the Appalachian region (Appendix F, Figure F-1). Crystalline rocks of Precambrian and Paleozoic age underlie the gently seaward-dipping Coastal Plain sediments of the Cretaceous and younger ages. Sediment-filled basins of Triassic and Jurassic age (exact age is uncertain) occur within the crystalline basement throughout the coastal plain of Georgia and the Carolinas (Du Pont, 1980a). One of these, the Dunbarton Triassic Basin, underlies parts of Savannah River Plant.

L.3.3.1.2 Stratigraphy

Coastal Plain sediments in South Carolina range in age from Cretaceous to Quaternary; they form a seaward-dipping and thickening wedge of interstratified beds of mostly unconsolidated sediments. At the cooling-lake site, these sediments are approximately 400 meters thick (Siple, 1967). The base of the sedimentary wedge rests on a Precambrian and Paleozoic crystalline basement, which is similar to the metamorphic and igneous rocks of the Piedmont, and on the siltstone and claystone conglomerates of the down-faulted Dunbarton Triassic Basin. Immediately overlying the basement is the Tuscaloosa Formation of the Upper Cretaceous age, which is about 230 meters thick and composed of prolific water-bearing sands and gravels separated by prominent clay units. Overlying the Tuscaloosa is the Ellenton Formation, which is about 18 meters thick and consists of sands and clays interbedded with coarse sands and gravel. Four of the formations shown in Figure 3-5--the Congaree, McBean, Barnwell, and Hawthorn--comprise the Tertiary (Eocene and Miocene) sedimentary section, which is about 85 meters thick and consists predominantly of clays, sands, clayey sands, and sandy marls. The near-surface sands of the Barnwell and Hawthorn Formations are usually in a loose to medium-dense state; they often contain thin sediment-filled fissures (clastic dikes) (Du Pont, 1980a).

Quaternary alluvium has been mapped at the surface in floodplain areas. Soil horizons at the site are generally uniform and relatively shallow, about

1 meter deep. They are characterized by bleached Barnwell-Hawthorn sediments, which result in a light tan sandy loam. Section 3.4.2 and Appendix F present additional stratigraphic information.

L.3.3.2 Seismology

L.3.3.2.1 Geologic structures

The Dunbarton Triassic Basin, which is similar to grabens in the Basin and Range Province in Nevada, underlies the Savannah River Plant at the L-Reactor site (Siple, 1967). Other Triassic-Jurassic basins have been identified in the Coastal Plain tectonic province within 300 kilometers of the site (Du Pont, 1980a; Popenoe and Zietz, 1977). The Piedmont, Blue Ridge, and Valley and Ridge tectonic provinces, which are associated with Appalachian mountain building, are northwest of the Fall Line. Several fault systems occur in and adjacent to the Piedmont and the Valley and Ridge tectonic provinces of the Appalachian system; the closest of these is the Belair Fault Zone, about 40 kilometers from the site. The U.S. Nuclear Regulatory Commission has determined that the Belair Fault is not capable within the meaning of 10 CFR 100 (Case, 1977). Studies sponsored by Georgia Power Company have shown that the faults postulated to occur near the southeastern boundary of the Savannah River Plant and about 40 kilometers farther southeast (Faye and Prowell, 1982) are not capable and that they might not exist (Georgia Power Company, 1982). There is no evidence of any recent displacement along any faults within 300 kilometers of the cooling-lake dam site (Du Pont, 1980a). In addition, no apparent association exists between local seismicity and specific faults near the Savannah River Plant, with the possible exception of the geophysically inferred faults (Lyttle et al., 1979; Behrendt et al., 1981; Talwani, 1982) in the meizoseismal area of the 1886 Charleston earthquake, which occurred approximately 145 kilometers from the Plant (Du Pont, 1982a).

Surface mapping and subsurface investigations in the L-Reactor region did not detect any faulting of the sedimentary strata or any other geologic hazards that would pose a threat to the reactor. Several surficial faults, generally less than 300 meters in length and with displacements of less than 1 meter, were mapped within several kilometers of the L-Reactor site. None of these faults is considered capable (Du Pont, 1980a).

L.3.3.2.2 Seismicity

Two major earthquakes have occurred within 300 kilometers of the proposed cooling-lake site: the Charleston earthquake of 1886, which had an epicentral Modified Mercalli Intensity (MMI) of X, was located about 145 kilometers away; and the Union County, South Carolina, earthquake of 1913, which had an epicentral shaking of MMI VII to VIII, was located approximately 160 kilometers away (Langley and Marter, 1973). An estimated peak horizontal shaking of 7 percent of gravity (0.07g) was calculated for the site during the 1886 Charleston earthquake (DOE, 1982b). No reservoir-induced seismicity is associated with Par Pond (Du Pont, 1982a).

Probabilistic and deterministic analyses commensurate with the criteria used by NRC (10 CFR 100) have established a design-basis earthquake acceleration of 0.20g for key seismic-resistant buildings at the Savannah River Plant. This acceleration is predicted to be exceeded only once in about 5000 years (Du Pont, 1982a). An evaluation of seismic forces would be included in the outlet works tower stability analysis; the joints would be designed to withstand seismic-induced movement.

L.3.4 Hydrology

L.3.4.1 Surface-water hydrology

L.3.4.1.1 Savannah River

The Savannah River Plant is drained almost entirely by the Savannah River, one of the major drainage networks in the southeastern United States (Langley and Marter, 1973). The peak historic flood between 1796 and 1983--10,190 cubic meters per second--corresponds to a stage of about 36 meters (DOE, 1982b). A domino-type failure of dams on the Savannah River above the Savannah River Plant would produce a flow of 42,500 cubic meters per second with a corresponding stage of 43.6 meters at the Plant (Du Pont, 1980a). Both of these flood stages are above the base of the proposed cooling-lake embankment (elevation 35 meters); however, only backwaters would reach the downstream embankment face, because a ridge on the west side of Steel Creek would shelter the embankment. The two nearest upstream reservoirs, Clarks Hill (completed in March 1953, with 3.1×10^9 cubic meters of storage) and Hartwell (completed in June 1961, with 3.1×10^9 cubic meters of storage), provide power, flood control, and recreational areas. These reservoirs and the New Savannah River Bluff Lock and Dam at Augusta, Georgia, have stabilized the river flow at Augusta to a yearly average of 288.8 cubic meters per second (Bloxham, 1979) and 295 cubic meters per second at Savannah River Plant. Russell Reservoir, which began filling in December 1983, will furnish 1.2×10^9 cubic meters of storage to further stabilize Savannah River flows.

Since 1963, it has been the operating practice of the U.S. Army Corps of Engineers to attempt to maintain a minimum flow of 178.4 cubic meters per second below the New Savannah River Bluff Lock and Dam at Butler Creek (River Mile 187.4, near Augusta, Georgia) (COE, 1981b). During the 18-year period from 1964 to 1981 (climatic years ending March 31), the average of the lowest 7-consecutive-day flow each year measured at the New Savannah River Bluff Lock and Dam was 181 cubic meters per second (Watts, 1982), or about 2.3 cubic meters per second less than at Savannah River Plant (Ellenton Landing, River Mile 156.8). The 7-day, 10-year low flow of the river at SRP is calculated to be 159.0 cubic meters per second.

Figure 3-6 shows the mean monthly flow rates for the Savannah River measured at Augusta, Georgia, from January 1964 through September 1981. The highest flows occur in the winter and spring, and the lowest occur in the summer and fall. This figure also indicates long-term mean and 7-day, 10-year low flows at Ellenton Landing.

Duke Power Company has entered into an agreement with the City of Greenville, South Carolina, to provide an interbasin transfer of as much as 0.53 cubic meter per second in 1985 and 8.3 cubic meters per second by 2020 from Lake Keowee. The States of Georgia and South Carolina have asked the Corps of Engineers for permission to withdraw as much as 1.8 cubic meters per second (total) from Lake Hartwell. The Corps of Engineers maintains, in accordance with its agreement with Duke Power Company, that the interbasin transfer from Lake Keowee to the City of Greenville is legal provided it has no effect on the ability of the Corps to generate electric power at Lake Hartwell and Clarks Hill. The Corps of Engineers is presently assessing the requests by South Carolina and Georgia to withdraw water from Lake Hartwell. This assessment will include the ability of the Corps to maintain its navigation project below the New Savannah Bluff Lock and Dam and to meet its electric-power-generation requirements. It will also consider the effects of the interbasin transfer. Until the Corps of Engineers completes its assessment, it will maintain the flow below the New Savannah Bluff Lock and Dam at the current levels.

The 1979-1982 average temperature of the Savannah River 3 kilometers above the Savannah River Plant was 17.8°C, with a range of 1.5° to 25.0°C. Similarly, below the Plant, the average temperature was 18.4°C and the range was 6.5° to 26.0°C. Figure 3-7 shows monthly average daily-maximum temperatures above and below the Savannah River Plant for the period 1960-1970. As shown in that figure, June, July, August, and September are the warmest river temperature months. The average river temperature during these months is about 25 percent higher than the annual average river temperature. From June 1955 through September 1982, the river temperature at Ellenton Landing equaled or exceeded 28°C three times and equaled or exceeded 28.3°C once. During the February, March, April, and May fish-spawning season, the monthly average daily-maximum temperatures (and standard deviations) at Ellenton Landing were 8.7°C (1.0°C), 11.0°C (1.3°C), 15.4°C (1.3°C), and 18.8°C (1.6°C), respectively.

L.3.4.1.2 SRP streams and swamp

The SRP site is drained almost entirely by five principal systems (drainage areas are in parentheses): (1) Upper Three Runs Creek (490 square kilometers); (2) Four Mile Creek, including Beaver Dam Creek (90 square kilometers); (3) Pen Branch (90 square kilometers); (4) Steel Creek (90 square kilometers); and (5) Lower Three Runs Creek (470 square kilometers). These streams rise on the Aiken Plateau and descend 30 to 60 meters before discharging to the Savannah River. The sandy soils of the area permit rapid infiltration of rainfall; seepage from these soils furnishes the streams with a rather constant supply of water through most of the year (Langley and Marter, 1973).

The three streams that have received the greatest input of thermal effluent (Four Mile Creek, Pen Branch, and Steel Creek) flow into a contiguous swamp of about 10,240 acres (Du Pont, 1983b) that is separated from the main flow of the Savannah River by a 3-meter-high natural levee along the river bank. These streams generally flow as shallow sheets, with well-defined channels only where they enter the swamp and near breaches in the levee (Smith, Sharitz, and Gladden, 1981). The combined natural flow and reactor effluent discharges have a strong influence on water levels in the swamp during nonflood conditions.

The flow of water in the swamp is altered when the Savannah River is in flood stage (about 27.7 meters) with a flow rate of about 440 cubic meters per second. Under flooding conditions, Four Mile Creek, Pen Branch, and Steel Creek discharge to the Savannah River at Little Hell Landing after crossing an offsite swamp (Creek Plantation Swamp). An analysis of the data from 1958 through 1980 indicates that on the average the Savannah River reaches flood stage at the Savannah River Plant 79 days or 22 percent of each year, predominantly from January through April. This result is in agreement with the results of a similar analysis performed by Langley and Marter (1973).

The L-Reactor site is drained by both Steel Creek and Pen Branch. Steel Creek was used from 1955 to 1968 to receive the reactor coolant discharge. The headwaters of Steel Creek rise near P-Area and flow southwesterly for about 7 kilometers, turn south for about 9 kilometers, and enter the Savannah River swamp about 3 to 5 kilometers from the river. A delta of about 100 acres surrounded by a partial tree-kill zone of another 180 acres has developed where the creek enters the swamp (Du Pont, 1983a). Beyond the delta, Steel Creek is joined by the flow from Pen Branch and some flow from Four Mile Creek before it discharges into the Savannah River near Steel Creek Landing (see Figure 3-2).

During the 1983 water year (October 1982 through September 1983), the flow of Steel Creek at Road B ranged between 0.28 and 3.96 cubic meters per second. The average flow for this period was 0.62 cubic meter per second. During the 4-month period from October 1983 to January 1984, the flow at Road B ranged from 0.19 to 4.39 cubic meters per second, and the average flow was 1.00 cubic meter per second. Of the average flow, about 0.45 cubic meter per second was discharged from P-Reactor at near-ambient temperatures (McAllister, 1983). Farther downstream at Cypress Bridge, about 2.8 kilometers below Road A, the average flow of Steel Creek during calendar years 1978 through 1980 was 1.36 cubic meters per second. During the 1983 water year, this flow ranged from 0.65 to 5.95 cubic meters per second and the average flow was 1.91 cubic meters per second. During the 4-month period from October 1983 to January 1984, this flow ranged from 1.13 to 5.55 cubic meters per second, with an average of 2.74 cubic meters per second. After subtracting the P-Reactor contribution, the natural flow of Steel Creek at Cypress Bridge is calculated to be about 0.91 cubic meter per second. Du Pont (1982b) estimated the natural flow of Steel Creek to be 1.0 cubic meter per second, based on drainage area considerations. Maximum daily flow rates (both natural storm runoff and with discharges from P-Reactor) were measured between 4.2 and 8.2 cubic meters per second during the past 8 years.

Steel Creek has had a varied history with respect to the release of reactor effluents. The release of thermal effluents into Steel Creek from L- and P-Reactors reached a peak of about 23 cubic meters per second in 1961. In 1963, P-Reactor effluents were diverted to Par Pond, and thermal discharges to the creek were reduced to about 11 cubic meters per second, about 1.3 times the maximum natural flow expected at Cypress Bridge after heavy rains. Since 1968, Steel Creek has received only infrequent and short-term inputs of thermal effluents (Smith, Sharitz, and Gladden, 1981, 1982a; Du Pont, 1982b). Between 1951 and 1972, the Steel Creek channel width increased more than three times due to effluent scour.

At the present time, several effluents from P-Reactor area normally flow into either Steel Creek or Meyers Branch. The effluents to Steel Creek consist of the process sewer outfall (0.45 cubic meter per second); infrequent cooling water from P-Reactor, and storm water outfall. The normal effluents to Meyers Branch include (1) overflow from ash settling/seepage basin (0.01 cubic meter per second), (2) periodic overflow from the coal pile runoff basin, (3) non-process cooling water (0.02 cubic meter per second), and (4) storm water outfalls.

Figure L-16 shows recent water temperatures along Steel Creek at Cypress Bridge, about 2.8 kilometers below Road A. The figure shows the temperature ranges and averages of monthly grab samples taken during the period of July 1973 through December 1982.

Water samples were taken every 2 weeks from 7 locations along Steel Creek and Meyers Branch between November 2, 1983, and January 31, 1984 (seven samples from each location) and analyzed for several constituents. Figure L-17 shows the sampling locations; Table L-2 lists the chemical analyses.

L.3.4.1.3 Design floods on Steel Creek

The design floods for the 1000-acre lake were modeled by computer analysis, using the latest revision of the U.S. Army Corps of Engineers' HEC-1 program. In the applications to this project, the program computed the lake inflow hydrograph (flow rate vs. time), then "routed" this hydrograph through the lake to produce the lake outflow hydrograph and lake surface elevations throughout the storm. The input required to produce the inflow hydrograph included the rainfall hydrograph (rainfall amounts vs. time), drainage area, percent of the area which is impervious, and parameters which reflect the response time of the watershed and the infiltration capability of the pervious fraction of the watershed. The input required to route the inflow hydrograph through the lake included the initial lake elevation and the "stage-storage-discharge" characteristics of the lake (i.e., volume of storage and outflow rate for various lake elevations).

The standard project flood assumes a 4-day storm of 51 centimeters. The rainfall intensity varies throughout the event. The most intense 30-minute period produced 8 centimeters of rainfall. The characteristics of this storm are discussed in detail in Section L.2.3.1. This storm produced 37 centimeters of runoff (rainfall minus infiltration) and a peak inflow rate of 403 cubic meters per second. As this flood wave entered the lake the lake level rose while outflow was released through the principal outlet works at a much lower rate. The peak outflow rate was 29 cubic meters per second and the peak lake elevation was 59.4 meters, about 1.6 meters below the top of the embankment. As a result of the existence of the lake, flood damage to lower Steel Creek would be substantially reduced.

The probable maximum flood (PMF) is a measure of the results of the most intense storm that is meteorologically possible for an area. Its probability of occurrence is so low that no attempt was made to relate it to a recurrence interval. Despite its extremely low probability of occurrence, it was incorporated into the design bases in order to test the adequacy of the natural saddle which is to serve temporarily as the emergency spillway.

The storm which produced the PMF totaled 72 centimeters in 24 hours, with a peak 30-minute rainfall of 16.3 centimeters. The storm produced 57 centimeters of runoff, with a peak flowrate of 848 cubic meters per second. The peak lake outflow rate was 42 cubic meters per second while the lake elevation rose to

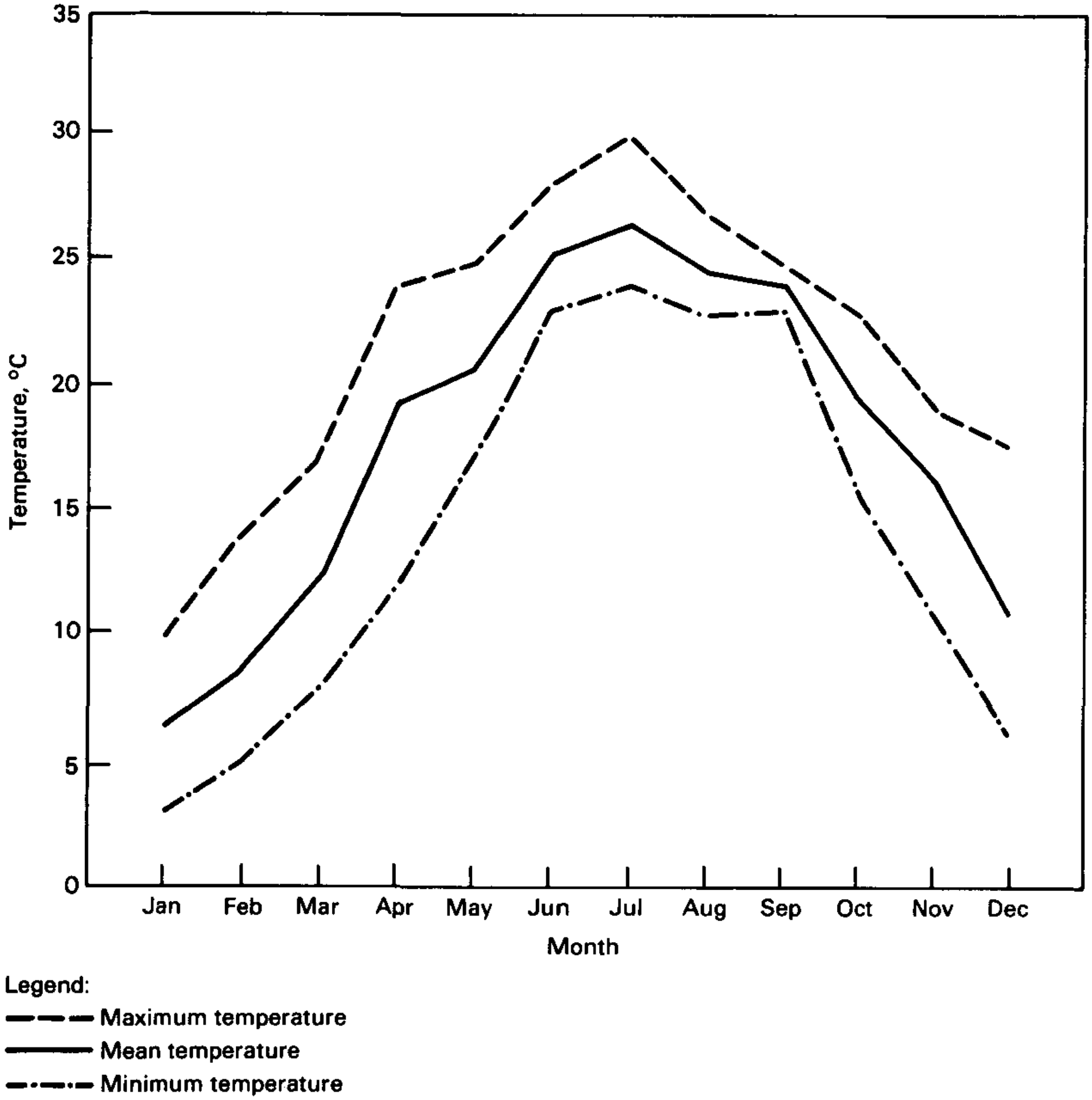
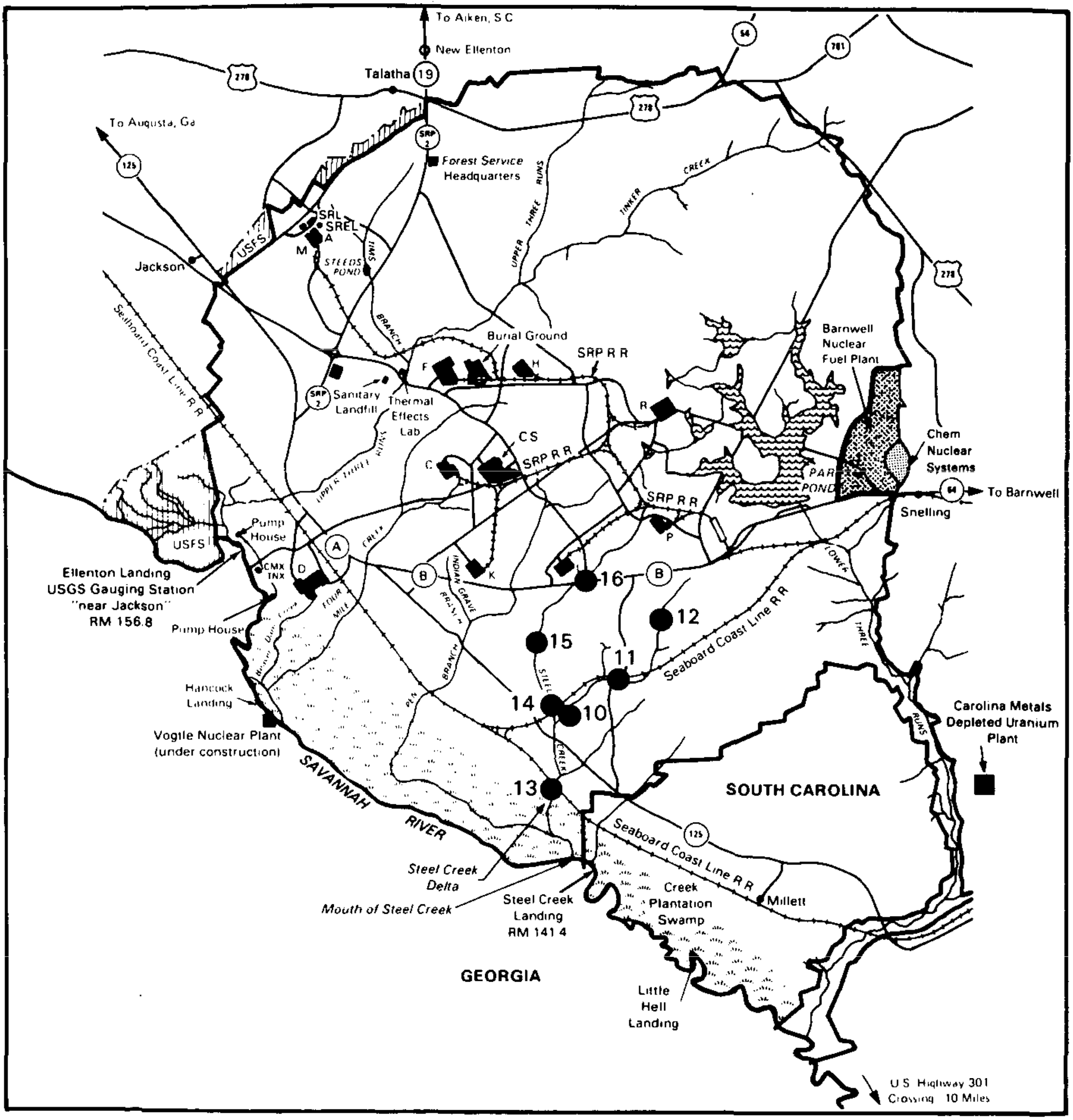


Figure L-16. Temperatures of monthly grab samples taken from Steel Creek from July 1973 through December 1982.



Legend:

● Water quality station

Figure L-17. Water sampling sites, Steel Creek and Meyers Branch.

Table L-2. Chemical composition of water samples taken from Steel Creek and Meyers Branch, November 1983 to January 1984

Constituent	Units	Average concentration at sample site						
		10	11	12	13	14	15	16
Water temperature	°C	9.9	9.6	9.5	11.1	12.0	12.7	12.7
pH	-	7.4	7.2	7.1	7.6	7.2	7.3	7.3
Specific conductance	µmhos/cm	33	33	48	56	42	54	52
Dissolved oxygen	mg/liter	8.3	8.4	7.6	8.0	8.1	8.2	8.2
Alkalinity ($CaCO_3$)	mg/liter	15.2	12.3	11.7	16.6	16.1	15.1	14.8
Chlorides	mg/liter	3.2	3.8	5.7	5.4	5.9	6.1	6.7
Total dissolved solids	mg/liter	1.9	3.6	2.3	8.1	18.7	16.7	15.4
Turbidity	NTU units	2.8	3.5	1.9	11.6	25.1	21.1	33.1
Total phosphorous (P)	mg/liter	0.012	0.020	0.043	0.050	0.053	0.054	0.038
Total orthophosphate (P)	mg/liter	0.016	0.010	<0.01	0.017	0.029	0.036	0.027
Dissolved orthophosphate (P)	mg/liter	<0.01	<0.01	<0.01	0.01	0.02	0.03	0.03
Nitrates (N)	mg/liter	0.07	0.08	0.09	0.18	0.26	0.27	0.28
Nitrites (N)	mg/liter	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Ammonia (N)	mg/liter	0.01	0.01	0.03	0.02	0.02	0.03	0.02
Total Kjeldahl nitrogen (N)	mg/liter	0.12	0.12	0.11	0.15	0.14	1.22	0.09

60.5 meters, 0.3 meters above the lowest point on the saddle but 0.5 meter below below the top of the embankment.

About 12 cubic meters per second of the peak outflow would pass over the saddle to Pen Branch. The maximum average velocity of flow over the saddle would be 6 centimeters per second. This is a mild velocity for a grassed waterway, so little, if any, damage would occur. As in the case of the standard project flood, substantial flood-damage reduction downstream of the embankment would result from the lake's ability to attenuate the peak flow from 848 cubic meters per second to 42 cubic meters per second.

L.3.4.1.4 Surface-water use

Downstream from Augusta, Georgia, the Savannah River is classified by the State of South Carolina as a Class B waterway, suitable for agricultural and industrial use, the propagation of fish, and--after treatment--domestic use. The river upstream from the Savannah River Plant supplies municipal water for Augusta, Georgia, and North Augusta, South Carolina. Downstream, the Beaufort-Jasper Water Authority in South Carolina (River Mile 39.2) withdraws about 19,700 cubic meters per day (0.23 cubic meter per second) to supply domestic water for a population of about 51,000. The Cherokee Hill Water Treatment Plant at Port Wentworth, Georgia (River Mile 29.0), withdraws about 116,600 cubic meters per day (1.35 cubic meters per second) to supply a business-industrial complex near Savannah, Georgia, that has an estimated consumer population of about 20,000 (Du Pont, 1982b). Plant expansions for both systems are planned for the future.

The Savannah River Plant currently withdraws a maximum of 26 cubic meters per second (about 63 percent of the maximum pumping rate of 41 cubic meters per second) from the river, primarily for use as cooling water in production reactors and coal-fired power plants (Du Pont, 1982b). Almost all of this water returns to the river via SRP streams (Du Pont, 1981a). The river receives sewage treatment effluents from Augusta, Georgia, and North Augusta, Aiken, and Horse Creek Valley, South Carolina, and other waste discharges along with the heated cooling water from the Savannah River Plant via its tributaries. The cooling-water withdrawal and discharge rate of about 1.2 cubic meters per second for both units of the Alvin Vogtle Nuclear Plant is expected later in the 1980s (Georgia Power Company, 1974). The Urquhart Steam Generating Station at Beech Island withdraws approximately 7.4 cubic meters per second of once-through cooling water. Upstream, recreational use of impoundments on the Savannah River, including water contact recreation, is more extensive than it is near the Savannah River Plant and downstream. No uses of the Savannah River for irrigation have been identified in either South Carolina or Georgia (Du Pont, 1982b).

The water quality of the Savannah River is discussed in Chapter 4. Historic data demonstrate that the water quality of the river downstream of the Savannah River Plant is similar to the water quality upstream (Marter, 1970).

L.3.4.2 Subsurface hydrology

The Coastal Plain sediments, which contain several prolific and important aquifers, consist of a wedge of stratified sediments that thickens to the southeast. Near L-Reactor, the sediments are about 400 meters thick and consist of sandy clays and clayey sands. The sandier beds form aquifers and the clayier beds form confining beds. The Coastal Plain sediments across the SRP generally consist of the Barnwell (combined with the Hawthorn as one mapping unit), McBean, Congaree, Ellenton, and Tuscaloosa Formations (Figure 3-5). Among these, the Tuscaloosa Formation is a particularly prolific ground-water unit because of both its thickness and its high permeability. Surficial deposits, including terrace sediments and alluvium, are not important sources of ground water at SRP. The lithology and water-bearing characteristics of the hydrostratigraphic units underlying the Savannah River Plant are described in Table 3-8. Additional detail is provided in Table F-1 and the text of Appendix F.

In the central part of the Savannah River Plant (including F-, H-, and L-Areas), the Barnwell and McBean Formations, and the McBean and Congaree Formations are separated by layers informally called the "tan clay" and the "green clay," respectively. The lowest unit of the Barnwell Formation is the tan clay. Borings in the Separations Areas and about 2 kilometers east of the Central Shops (Figure 3-2) indicate that the tan clay is about 2 meters thick, and that it commonly consists of two thin clay layers separated by a sandy zone (Du Pont, 1983c, D'Appolonia, 1980). In the L-Area, the tan clay is not readily evident from foundation borings, drillers logs, or geophysical logs; however, even in other areas of the SRP where it supports a significant head difference, this clay is not always apparent in soil cores alone.

In the L-Area the green clay, based on geophysical logs of water wells 104L and 55-2, is about 7 meters thick. At the Par Pond pumphouse, along the strike from L-Reactor, the green clay also apparently supports a large head difference; it also appears to have protected the Congaree ground water effectively from the large (27,000 picocuries per liter) concentrations of tritium in Par Pond (Ashley and Zeigler, 1981). In the central part of the SRP, this clay directs much of the water in the McBean laterally to local creeks.

Throughout the SRP, the clay at the base of the Congaree and the upper clay layer of the Ellenton Formation provide an effective confining unit for the sands of the Ellenton-upper Tuscaloosa Aquifer (see Table F-1).

As shown on Figure 3-8, the heads in the Ellenton and Tuscaloosa Formations are higher than those in the Congaree (upward head differentials) in the central portion of the SRP, thus preventing the downward movement of water from the Congaree to the Ellenton where this condition exists. This condition is caused by the drawing down of the head in the Congaree by natural drainage into Upper Three Runs Creek and the Savannah River. Figure 3-4 shows an approximation of the area where the head difference is upward from the Tuscaloosa to the Congaree; F-, H-, and L-Areas are within this area, but M-Area is not.

Figure 3-9 shows the locations of areas where there is a head reversal between the Congaree and the Tuscaloosa Formations (i.e., the latter's head is higher than the former's). This map shows that the head in the Tuscaloosa is higher than the head in the Congaree in a broad area within about 10 kilometers of the Savannah River and Upper Three Runs Creek. The head in the Congaree is higher than that of the Tuscaloosa in an area surrounding M-Area and in the vicinity of Par Pond.

A more detailed discussion of the hydrostratigraphic units and their head relationships across the entire site and in specific areas is given in Appendix F and in Du Pont (1983c).

L.3.5 Severe weather

The types of severe weather that might affect the cooling-lake operation are heavy precipitation and extreme winds.

The strongest winds in the SRP area occur in tornadoes, which can have wind speeds as high as 116 meters per second. The next strongest surface winds occur during hurricanes. During the history of the Savannah River Plant, only Hurricane Gracie, in September 1959, had winds in excess of 34 meters per second. Occasional winter storms with winds as high as 32 meters per second have been recorded (Du Pont, 1982b). Thunderstorms can generate winds as high as 18 meters per second with stronger gusts. The fastest 1-minute wind speed recorded at Augusta between 1951 and 1980 was 28 meters per second.

Heavy precipitation can occur in the SRP area in association with either localized thunderstorms or hurricanes. The maximum 24-hour total was about 15.2 centimeters, which occurred during August 1964 and was associated with Hurricane Cleo.

Severe weather values were used as design bases in Section L.2.3. More detailed severe weather information is presented in Section 3.5.3.

L.3.6 Ecology

The natural areas that could be affected by the construction and/or operation of the proposed cooling lake include Steel Creek, the Steel Creek corridor, the Savannah River swamp (including the Steel Creek delta), and the Savannah River. Section 3.6 and Appendix C contain baseline descriptions of the ecology of these areas. This section summarizes the major points in those descriptions; it emphasizes those environments that would be affected by this cooling alternative.

L.3.6.1 Terrestrial ecology

L.3.6.1.1 Vegetation

The preferred alternative would impact plant communities in two wetland areas: (1) those associated with the Steel Creek corridor from Road B to the delta, and (2) those associated with the Steel Creek delta and that portion of the swamp near the confluence of Steel Creek with the Savannah River. The structure and species composition of these areas reflect not only the heterogeneity of the physical environment but also the impacts of earlier reactor operations.

The upland areas that would be inundated by the lake consist almost entirely of coniferous forest. Some areas contain almost pure stands of pine and others include an admixture of hardwood species.

Steel Creek corridor

The vegetation of the Steel Creek corridor, which is classified as palustrine wetland (Cowardin et al., 1979), varies markedly above the delta (Figure C-3). More than 85 species of plants representing 50 families were listed from this area in the summer of 1981 (Appendix C). This parcel consists of aquatic beds, emergents, scrub-shrub wetland, and forested wetland (Section 3.6.1.2.1).

Steel Creek delta

The Steel Creek delta contains 10 vegetative associations and four zones differentiated by the degree of prior reactor discharges of thermal effluent (Figure C-4). Impacted zones that have experienced structural reductions of the vegetative canopy include deepwater habitats and the deltaic fan. Bottomland hardwoods and deepwater and upland habitats comprise the nonimpacted zones. Since the shutdown of L-Reactor in 1968, vegetative recovery has varied according to the hydrologic regime (Figure C-4). Figure C-5 shows the distribution of the principal plant communities of the delta.

L.3.6.1.2 Wildlife

The abundance and diversity of wildlife that inhabit the Savannah River Plant reflect the interspersion and heterogeneity of the habitats occurring there. Emphasis has been given to those fauna that inhabit Steel Creek and the Savannah River swamp. No species have been found in the Steel Creek system that have not been found elsewhere on the SRP site.

Amphibians and reptiles

Because of its temperate climate and the variety of aquatic habitats, the SRP site contains a diversified and abundant herpetofauna. Species include 17 salamanders, 26 frogs and toads, 10 turtles, 1 crocodilian, 9 lizards, and 31 snakes that have zoogeographic ranges that include the Savannah River Plant (Conant, 1975). The ranges of many other species are peripheral to the Plant, and they could also occur on SRP lands. Gibbons and Patterson (1978) provide an overview of the herpetofauna, including the abundance and distribution of peripheral species. The endangered American alligator, which occurs in the area, is discussed in Section L.3.6.1.3.

Birds

Birds of the Steel Creek ecosystem were studied in the summer of 1981. A total of 1062 birds representing 59 species was tabulated during the summer survey; these species presumably breed locally. The white-eyed vireo was the most abundant species based on all census techniques, followed closely by the Carolina wren (Smith, Sharitz, and Gladden, 1981).

Because of the interspersion of habitats and isolation from public hunting, the Steel Creek delta and Savannah River swamp provide an important sanctuary and refuge for regional waterfowl. Based on ground counts and aerial surveys, nine species of waterfowl have been observed in the Steel Creek delta area. The mallard and wood duck were the most predominant species of waterfowl; both used the Steel Creek delta extensively for roosting and feeding.

The endangered wood stork, which occurs in the area, is discussed in Section L.3.6.1.3.

Mammals

The Savannah River Plant includes zoogeographic ranges of more than 40 species of mammals, including the muskrat and black bear, which are known to occur near Steel Creek.

The short-tailed shrew, the least shrew, and the southeastern shrew were the most frequently captured small mammals during recent field investigations. The Steel Creek delta provides habitat for the rice rat, and probably for the eastern woodrat and the hispid cotton rat. The gray squirrel, the fox squirrel, and the southern flying squirrel were common in the upland and lowland forests along Steel Creek. Large mammals such as the feral pig and the white-tailed deer were common on the Steel Creek floodplain and delta. Other inhabitants of the floodplain and delta included the raccoon, the opossum and the gray fox. Beaver signs were common along the length of Steel Creek.

L.3.6.1.3 Threatened and endangered species

The American alligator and the wood stork are the only species listed as "endangered" by the U.S. Fish and Wildlife Service (USDOI, 1983, 1984) that have been identified in the area. No plant species with protective status has been found. No "critical habitat," as defined by the U.S. Fish and Wildlife Service, exists on the Savannah River Plant.

American alligator

Listed federally as endangered (USDOI, 1983), the alligator is common locally and breeds in Par Pond, in the Savannah River swamp (Gibbons and Patterson, 1978; Murphy, 1977), and along Steel Creek. The ecology of this species has been examined intensively on the Savannah River Plant. Early studies (Freeman, 1955; Jenkins and Provost, 1964) indicated that the alligator has always been a resident of the area. Its abundance probably increased greatly after the SRP was closed to the public in the early 1950s.

More recent studies of the alligator in the Steel Creek ecosystem were begun in 1981 (Smith, Sharitz, and Gladden, 1981, 1982a,b). These investigations have confirmed that alligators have utilized the Steel Creek ecosystem from the L-Reactor outfall to the Steel Creek delta and swamps, including other areas near Steel Creek such as Carolina bays, backwater lagoons, and beaver ponds. The population of alligators in the Steel Creek ecosystem was estimated to range between 23 and 35 individuals in 1981 and 1982 (Smith, Sharitz, and Gladden, 1982b). Sex ratio and size data suggest a higher reproductive potential in Steel Creek than is known for Par Pond, where nearly 80 percent of the adults are males (Murphy, 1977).

Studies of the wintering behavior and movements of alligators in the Steel Creek ecosystem were initiated in 1981 using radiotelemetry (Smith, Sharitz, and Gladden, 1982a). Generally, it was found that alligators on the Savannah River Plant do not utilize over-wintering dens, but remain active whenever winter temperatures are suitable. Several alligators moved between the lagoons near S.C. Highway 125. Individuals also utilized the swamp forest below the Steel Creek delta (Smith, Sharitz, and Gladden, 1982b). No alligator nests have been located in the Steel Creek system since 1981.

Based on the preferred cooling-water alternative (i.e., a 1000-acre lake), DOE prepared a new Biological Assessment and provided it to FWS (Sires, 1984b). This assessment included a March 1984 aerial survey of the proposed lake area, which contains marginal habitat for the alligator. Only one alligator was located in this area. The lake is expected to provide more suitable habitat than that currently in this area of Steel Creek, particularly in the portion that is maintained below 32.2°C; the critical thermal maximum for alligators is 38°C.

Wood stork

Recently listed as endangered by the U.S. Fish and Wildlife Service (USDOI, 1984), the wood stork uses the Steel Creek delta as one of its feeding grounds. A total of 102 individuals was observed feeding on or near the Steel Creek delta in late June to early July 1983. The maximum number of observations throughout the SRP swamp during this same period was 478 (Smith, Sharitz, and Gladden, 1983). The delta of Beaver Dam Creek also provides important feeding habitat for wood storks.

A recent Biological Assessment on the wood stork was submitted to FWS for their consideration (Sires, 1984a). The assessment concluded that the proposed L-Reactor operation and 1000-acre lake construction and operation would not jeopardize the continued existence of the wood stork.

These species and those listed by the State of South Carolina and the U.S. Fish and Wildlife Service as endangered, threatened, or of "special concern" are discussed in greater detail in Appendix C.

L.3.6.2 Aquatic ecology

L.3.6.2.1 Aquatic flora

Approximately 400 species of algae have been identified from the Savannah River near the Savannah River Plant (Patrick, Cairns, and Roback, 1967). Aquatic macrophytes in the river, most of which are rooted, are limited to shallow areas of reduced current and along the shallow margins of tributaries.

In the SRP streams that receive thermal effluents, the flora is sparse, reflecting the influence of high flow and elevated (greater than 40°C) water temperatures. In these streams, thermophilic bacteria and blue-green algae thrive (Gibbons and Sharitz, 1974).

A deepwater zone occurs where the main flow of Steel Creek courses toward the Savannah River. In this area, the vegetation is currently dominated by submergent and emergent macrophytes. Patches of duckweed occupy mats of submerged vascular plants such as hornwort and parrotfeather. Where the water flow is slow moving, smartweed forms dense colonies (Smith, Sharitz, and Gladden, 1981).

L.3.6.2.2 Aquatic fauna

Aquatic invertebrates

Shallow areas and quiet backwaters and marshes of the Savannah River near the SRP site support a diverse aquatic invertebrate fauna. However, the bottom substrate of most open portions of the river consists of shifting sand that does not provide the best habitat for bottom-dwelling organisms (Appendix C). The faunal composition now present reflects earlier impacts of dredging and polluted water conditions from which the community has not yet completely recovered.

The macrobenthic invertebrate drift communities in the river and SRP canals and creeks (including Steel Creek) are dominated by true-flies (particularly chironomids), which is typical of most riverine systems (see Appendix C). The attached invertebrate communities on wood substrate and macrophytes in Steel Creek are believed to be highly productive.

Mollusks, such as snails and clams, are an important component of the Savannah River invertebrate community (Patrick, Cairns, and Roback, 1967). The Asiatic clam, Corbicula, is found in the Savannah River, larger tributary streams in the vicinity of the SRP, and most thermally affected habitat on the SRP.

Fish

The Savannah River and its associated swamp and tributaries are typical of southeastern coastal plain rivers and streams, and support a diverse fish fauna (Appendix C). The diversity and abundance of fish in the thermally affected streams are high only during periods of reactor shutdown (McFarlane, 1976). In addition, the fauna upstream of the thermal effluents is depauperate in both numbers and diversity. With the exception of the mosquitofish, few fish live in the SRP thermal streams when heated effluent is present. During reactor shutdown, the streams return to ambient temperature and are invaded quickly by many fish from adjacent nonthermal areas. The diversity and abundance of species in the headwater tributaries of Four Mile Creek and Pen Branch upstream from reactor thermal effluents are reduced greatly in contrast to comparable areas in Upper Three Runs Creek or Steel Creek (McFarlane, 1976). Collection efforts have revealed that the first- and second-order tributaries of these streams have a low diversity of fish.

Fish population studies conducted in the Steel Creek swamp system (Appendix C) indicate a high species diversity. Fish of all sizes were collected in the swamp and a wide range of sizes was collected for most species. The collections were representative of both relative abundance and species composition of the swamp fish community. A total of 5313 fish representing 55 species was collected from the Steel Creek river-swamp from November 1981 through July 1982.

The high diversity of fish species is the result of the wide array of habitat types and niches available within the creek-swamp environment. The greatest abundance and diversity of fish occurred in deepwater areas where the tree canopy was eliminated during previous reactor operations, and the vegetation currently is dominated by submergent and emergent macrophytes. Fewer fish species and small numbers were collected in the reaches of Steel Creek that will be inundated by the cooling lake, compared to collections in the delta and swamp.

The use of the Steel Creek delta-swamp area by anadromous fish species (e.g., American shad and blueback herring) was minimal during 1982, although some American shad and blueback herring spawned near the mouth of Steel Creek that year. There was greater utilization of the Steel Creek delta-swamp by adults of the species in 1983 than in 1982. Also, two striped bass were collected in the delta-swamp area in 1983, while none were found the previous year. With the exception of the American eel, no migratory fish have been observed to utilize the upper reaches of Steel Creek that will be inundated by the cooling lake or will be isolated above it.

Recent studies have shown that Steel Creek contained numerous fish larvae, predominantly minnows, yellow perch, sunfish, and bass. Many blueback herring eggs were also collected. When compared to 19 other creeks, Steel Creek ranked eighth in larval density of all species combined.

L.3.6.2.3 Threatened and endangered species

Two aquatic species listed as "endangered" by the Federal Government (USDOI, 1983) and/or the State of South Carolina (Forsythe and Ezell, 1979) are known to occur on or in the vicinity of the SRP. These are the shortnose sturgeon (Federal list) and the brother spike mussel (State list).

The shortnose sturgeon is found only on the east coast of North America in tidal rivers and estuaries. Prior to 1982, this species had not been reported in the middle reaches of the Savannah River in the vicinity of SRP. However, in 1982 and 1983, shortnose sturgeon larvae were collected in the river near the site, indicating that spawning occurred in the river. The only known occurrence of the brother spike mussel in the Savannah River occurred in 1972, approximately 15 river miles downstream from the mouth of Steel Creek.

L.3.7 Radiocesium and radiocobalt in Steel Creek and the Savannah River

L.3.7.1 Radiocesium

Since 1955, approximately 560 curies of radiocesium have been discharged to onsite streams of the Savannah River Plant. Of this total, about 284 curies were released to Steel Creek. Annual releases ranged from about 0.02 curie since 1978 to a maximum of about 53 curies in 1964. The primary source of this radiocesium was leaking failed fuel elements stored in disassembly basins in the P- and L-Areas. Water was released routinely from these basins to maintain the clarity needed for underwater manipulation of irradiated fuel elements, hence the release of radiocesium (with a cesium-134-to-cesium-137 ratio of about

1:20).* A sharp decrease in the release of cesium-137 to Steel Creek occurred in the late 1960s and early 1970s when (1) the P-Area basin was fitted with sand filters and water was demineralized before its release; and (2) the leaking fuel elements were removed to an environmentally safe storage area.

After the radiocesium was discharged from the P- and L-Areas to Steel Creek, it became associated primarily with the silts and clays in the Steel Creek system. Here the sediments and associated cesium-137 were subjected to continued resuspension, transport, and deposition by the flow regime in the creek.

In addition to SRP releases, nuclear weapons testing since the mid-1940s deposited approximately 2850 curies of radiocesium on the Savannah River watershed, including about 80 curies on the Savannah River Plant.

The subsections that follow describe radiocesium in Steel Creek and Savannah River sediments, the radiocesium inventory in Steel Creek, cesium-137 in biota, and cesium-137 in water. Appendix D provides more details.

L.3.7.1.1 Cesium in sediments

Radiocesium, primarily cesium-137 in Steel Creek, is predominantly associated with the bottom sediments. The principal mechanisms for this association are (1) cation exchange with kaolinite and gibbsite clay minerals; (2) sorption on minerals; and (3) chelation with naturally occurring organic material. A distribution coefficient (K_d = 3960) measured for sediments from Four Mile and Steel Creeks (Kiser, 1979) demonstrates the affinity of cesium-137 for the sediments in the Steel Creek system.

Soil cores collected in 1974 at two transects in Steel Creek between Road A and the swamp showed that 69 percent of the radiocesium was located within the upper 20 centimeters of sediment and 86 percent was confined to the upper 40 centimeters. More extensive detailed coring conducted in 1981 at 12 transects between the Steel Creek delta and P-Reactor generally confirms the 1974 results; about 61 percent of the radiocesium was found in the upper 20 centimeters, and 83 percent in the upper 40 centimeters (Du Pont, 1982b; Smith, Sharitz, and Gladden, 1982a). Sediment samples taken in 1981 from the center of the creek had markedly lower radiocesium concentrations than the sediments near the edges of the floodplain. The radiocesium is predominantly associated with smaller soil particles (Table L-3).

*For convenience, the radiocesium will usually be described as cesium-137, when the presence of both cesium-134 and -137 is implied.

Table L-3. Range of cesium-137 concentrations (pCi/g dry weight) of soil types in Steel Creek, 1981

Soil type[a]	Number of samples	Percentage	Concentrations Mean	Standard error
1 (clay)	101	19	137	20
2	108	21	80	16
3	127	24	39	7
4	83	16	55	12
5 (sand)	106	20	17	3

[a]Soil samples were graded visually from 1 to 5, according to their "average" particle size; samples with the highest clay content are type 1 and those with the least clay and silt (i.e., predominantly sand) are type 5 (Smith, Sharitz, and Gladden, 1981).

L.3.7.1.2 Cesium in the Savannah River

Turbulence in the Savannah River generally keeps fine soil particles in suspension. These particles are deposited where the river velocity and turbulence are low (such as inside river bends, downstream from obstructions, in oxbow lakes, and on the floodplain), and where flocculation occurs in the estuary below River Mile 40. Riverbed sediments upstream from the Savannah River Plant normally have about 1 picocurie per gram or less of radiocesium (Du Pont, 1982b).

In 1974, riverbed sediments downstream of the Savannah River Plant had concentrations of about 2 picocuries per gram near the U.S. Highway 301 bridge and 6.5 picocuries per gram at the South Carolina Highway 119 bridge near Clyo, Georgia. Studies performed in 1978 showed that the radiocesium concentrations were about 0.6 picocurie per gram at the control station above the Savannah River Plant and less than 0.8 picocurie per gram at sampling stations between Little Hell Landing and the Highway 301 bridge (Du Pont, 1982b).

L.3.7.1.3 Cesium-137 in biota

Vegetation samples were collected at various times from 1970 to 1981 at 10 transects in Steel Creek between the delta and L-Reactor. Samples were also collected at 10 transects in the Savannah River swamp and Creek Plantation

Swamp. The average radiocesium concentrations in swamp vegetation are generally less than those in vegetation from the creek. The total radiocesium inventory in Steel Creek vegetation is about 0.4 curie (Du Pont, 1982b).

The concentration of radiocesium in wildlife is generally not high in Steel Creek, the Savannah River swamp, and Creek Plantation Swamp; concentrations in Savannah River fish are lower than those measured in fish from Steel Creek (Du Pont, 1982a). Additional details are provided in Appendix D.

L.3.7.1.4 Cesium-137 in water

Monitoring in the Savannah River by the Savannah River Plant shows that the concentration of radiocesium in river water has been very low in the past several years. From 1979 through 1982 the mean concentration of cesium-137 at the U.S. Highway 301 bridge was 0.08 picocurie per liter and near the limit of detection at the control station above the Plant (Du Pont, 1980b, 1981b, 1982c, 1983b). For the second quarter of 1983, measurements of the radiocesium in the potable (finished) water at the North Augusta, Beaufort-Jasper, and Cherokee Hill water-treatment plants averaged 0.006, 0.028, and 0.033 picocurie per liter, respectively. During this monitoring period, the radiocesium concentrations in the potable water were found to vary inversely with river flow (Kantelo and Milham, 1983). In 1982, the monthly average cesium-137 concentration in Steel Creek at the Cypress Bridge (just upstream from the delta; see Figure D-3) was about 3 picocuries per liter; this concentration is about the same as those measured during the previous 5 years.

In November and December 1981, seven water samples from Steel Creek between Road A and the delta were analyzed for their cesium-137 (and potassium) content (Ribble and Smith, 1983). The concentrations ranged from 3.9 to 7.9 picocuries per liter and had a mean value of 5.3 picocuries per liter (with a mean potassium concentration of 1.0 milligram per liter). About 84 percent of this value was associated with the dissolved fraction and 16 percent with the suspended solid fraction. Similarly, Shure and Gottschalk (1976) found that about 20 percent or less of the cesium-137 in water samples from Lower Three Runs Creek was associated with the suspended solid fraction.

More recently, Hayes (1983) reported the results of cesium-137 measurements in Steel Creek made from April through August 1983. During this period, the average transport of cesium-137 was 3.2 ± 1.5 millicuries per week at Cypress Bridge. From this basis, the annual transport would be about 0.17 ± 0.08 curie per year. These measurements indicated that about half the transported cesium-137 was due to remobilization from the creek floodplain system above L-Reactor.

Hayes (1983) also reported that the water that enters Steel Creek from L-Area, Meyer's Branch (the principal tributary of Steel Creek), and as local rainfall contained cesium-137 concentrations of less than 1 picocurie per liter. However, the measured cesium-137 concentrations at Cypress Bridge averaged about 3.7 ± 0.6 picocuries per liter during the April through August 1983 study period. Hayes contends that the cesium-137 concentrations are governed by a reequilibration process between the water and the cesium in the creekbed and floodplain sediments, because he could find no correlation during this period between cesium concentration and creek flow rate, or such other variables as suspended solid or tritium concentrations in Steel Creek water or rainfall in the area. Hayes concluded that the creekbed and floodplain sediments could support cesium concentrations as high as about 11 picocuries per liter at equilibrium, and that the lower concentrations (3.7 picocuries per liter) were probably due to insufficient time for the process to reach equilibrium between the water and the cesium-laden sediments. The travel time for water from L-Area to Cypress Bridge is less than 1 day.

L.3.7.2 Radiocobalt

Along with the radiocesium, small amounts of radiocobalt, 66 curies (Du Pont, 1983a), formed by neutron activation of stainless steel and dissolved in the fuel element storage basin water, were discharged to onsite streams. Of this total, approximately 27 curies were released to Steel Creek. As a result of radioactive decay, a small amount, about 2.1 curies, remains in Steel Creek or Creek Plantation Swamp, or has been transported to the river in a manner similar to radiocesium. Further examination of cobalt has not been performed because the inventories in both Steel Creek and the Savannah River system are significantly less than the bounding cesium inventories (Du Pont, 1983a). Additional details can be found in Appendix D.

L.3.7.3 Radiostrontium

During earlier operations, L- and P-Areas released approximately 0.5 curie of strontium-89 and 40.8 curies of strontium-90 to Steel Creek (Ashley, Zeigler, and Culp, 1982). Because of the short half-life of strontium-89 (50.5 days), no measurable quantities are likely to exist in the creekbed sediments. Strontium-90 has a half-life of about 28 years. About 14.3 curies of strontium-90 have been lost by radioactive decay. Based on ERDA (1977) and Marter (1974), another 20.8 curies have been transported to the Savannah River. Thus, about 5.7 curies of strontium-90 might still remain in the sediments of Steel Creek. Soil corings in Steel Creek at Road B and Cypress Bridge and near its mouth have detected strontium-90 concentrations ranging from 0.11-0.14 picocurie per gram in 1978 to 0.12-0.14 picocurie per gram in 1979. At the SRP control station, strontium-90 concentrations of soil samples were 0.06 picocurie per gram in 1978 and 0.14 picocurie per gram in 1979 (Ashley et al., 1982). These soil coring studies suggest that the inventory might be much less than 5.7 curies. It is not surprising that most of the strontium-90 has been transported from Steel Creek, because the kaolin clay particles of the creekbed sediments have little sorptive capacity for strontium. The distribution coefficient for strontium-90 in SRP kaolinitic soils might be as low as 20 (Oblath, Stone, and Wiley, 1983), which is at least 35 times less than that for cesium-137.

L.4 CONSEQUENCES OF OPERATION

L.4.1 Normal operation

L.4.1.1 Nonradiological impacts

L.4.1.1.1 Water use and quality impacts

L.4.1.1.1.1 Surface-water impacts

The surface-water usage would be the same as in the reference case, with a withdrawal of 11 cubic meters per second from the Savannah River. The thermal discharge from L-Reactor would flow into the 1000-acre lake; the discharge from L-Reactor and from the lake would be about 11 cubic meters per second. Table L-4 lists the estimated downstream temperatures in Steel Creek below the embankment for the summer, spring, and winter.

Table L-4. Temperatures (°C) downstream in Steel Creek below the 1000-acre lake[a]

Location	Summer[b]	Spring[c]	Winter[c]
Discharge temperature[d]	31	26	17
Road A	31	26	17
Swamp	31	25	15
Mid-swamp	30	22	13
Mouth of creek at river	30	22	13

[a]Assumes power reduction when necessary to meet water-quality standards.

[b]Based on worst 5-day meteorological conditions (July 11-15, 1980) and estimated operating power of reactor. Five-day worst-case meteorological conditions provide the basis for a conservatively high estimate of discharge and downstream temperatures that are likely to result from the implementation of a thermal mitigation alternative. The selection of 5-day worst-case meteorology is also based on a typical cycle of consecutive meteorological conditions; it is considered to be representative of extreme temperatures for which the maintenance of a balanced biological community can be measured under Section 316(a) of the Federal Water Pollution Control Act.

[c]Based on 30-year average values for meteorological conditions and actual power of an operating reactor. Summer average temperatures have been included to show the discharge and Steel Creek temperatures that could be expected if significant temperature excursions above and below average did not occur.

[d]The temperature entering Steel Creek from the lake.

Projected water temperatures in the summer (5-day, worst-case) at the Steel Creek delta, mid-swamp, and the mouth of Steel Creek would be within about 1°C of ambient. In the spring, water temperatures at the Steel Creek delta would be

3°C above ambient. Water temperatures would be near ambient at the mouth of Steel Creek. These conditions do not pose any adverse impacts to aquatic and semiaquatic biota. In the winter however, projected temperatures at Road A and points downstream would be 7°C to 9°C above ambient. These warmer conditions could concentrate fish at the mouth of Steel Creek. Reactor shutdowns during the winter would result in a gradual heat loss in this area, which would minimize any cold shock effects. This alternative would not adversely impact access to, and the spawning of riverine and anadromous fishes in, the Savannah River swamp below the Steel Creek delta.

The habitat inundated by the 1000-acre lake alternative would include 225 acres of wetlands in the Steel Creek corridor. The lake would also inundate 775 acres of uplands. There would be minimal thermal impact on wetlands below the embankment. However, the flow rate would adversely impact between 215 and 335 acres of wetlands in the Steel Creek delta and swamp that provide foraging habitat for the endangered wood stork and the endangered American alligator. These wetlands also represent important feeding and roosting habitat for as many as 1200 mallard and 400 wood duck. These wetlands are classified as Resource Category 2 by the U.S. Fish and Wildlife Service. This resource category and its designation criteria include "high value for evaluation species and scarce or becoming scarce." The mitigation planning goal specifies that there be "no net loss of inkind habitat value" (USDOI, 1981).

Wastewater and sanitary discharges would be similar to those associated with the reference case; no impacts from these discharges are anticipated.

No appreciable change is expected in the chemical characteristics of the effluent as the result of its passing through the lake, except that about 6 percent of the suspended solids would be removed from the river water by the 186-Basin and the impoundment.

Criteria of embankment stability design have established that seepage of water is a critical consideration. Therefore, the embankment will be designed so that total permanent seepage loss through the embankment abutments and foundation will be limited. To ensure positive restriction through the foundation of the embankment, an impervious soil or grout cutoff trench will be constructed to the maximum depth that is economically feasible and tied into the abutments. Seepage through the embankment will be slight, because the embankment will consist of three or four zones.

Due to the sandy soil in the area of the natural saddle, some seepage could occur from the lake to Pen Branch. A cut-off wall would be constructed if seepage became a problem.

L.4.1.1.1.2 Ground-water impacts

The use of ground water for L-Reactor would be 0.94 cubic meter per minute). This withdrawal is estimated to have minimal impacts.

Impounded water for a cooling lake would cause a local ground-water mound in the water-table aquifer which would tend to increase the travel time from the L-Reactor seepage basin to seepline springs near the lake's shore from 18 to 21 years. This effect of the lake would dissipate with depth and would be expected to have a small effect on water levels in the McBean Formation. The green clay is an important confining unit separating the McBean from the underlying Congaree Formation. It would prevent the increased head associated with a cooling lake from impacting the head differential between the Tuscaloosa and Congaree Formations. It is also an important barrier to the migration of contaminants from near-surface to lower hydrostratigraphic units. In the Separations Areas and near the Central Shops, the green clay (about 2 to 3 meters thick) supports a head difference of about 21 to 24 meters between the McBean and Congaree Formations. Based on water samples obtained for tritium analysis from the Congaree near the H-Area seepage basin, the green clay has effectively protected the Congaree ground water from contamination seeping into the ground (Marine, 1965). In the L-Area, the green clay is about 7 meters thick. At the Par Pond pumphouse, along the strike of the McBean and Congaree Formations, the green clay also supports a large head difference; the water pumped from the Congaree Formation shows no evidence of tritium contamination, even though tritium concentrations in Par Pond were measured at 27,000 picocuries per liter.

L.4.1.1.2 Ecological impacts

The operation of L-Reactor with the preferred cooling alternative would have some impacts on the ecology of the Savannah River, Steel Creek below and above the lake, the Steel Creek corridor, and the Savannah River swamp (including the Steel Creek delta). In addition, a portion of the lake itself would be affected by the heated water discharged into it. This section describes operational impacts on each of these natural areas.

L.4.1.1.2.1 Savannah River

The impacts of impingement and entrainment would be the same as those of the direct-discharge alternative (reference case). An average of 16 fish per day (5840 fish per year) would be impinged on the cooling-water intake screens, and approximately 7.7×10^6 fish eggs and 11.9×10^6 fish larvae would be lost to entrainment through the plant.

Thermal impacts on the biota in the river would be minimal because water temperatures would be very close to ambient at the point the discharge flow enters the river. There would be a zone of passage for the movement of fish up and down the river past the SRP site.

L.4.1.1.2.2 Steel Creek downstream from the lake

Projected water temperatures in the summer (5-day, worst-case) at the Steel Creek delta, mid-swamp and the mouth of Steel Creek would be within about 1°C of ambient (see Table 4-31). In the spring, water temperatures at the Steel Creek delta would be 3°C above ambient. Water temperatures would be near ambient at the mouth of Steel Creek. These conditions would not pose any adverse impacts to aquatic and semiaquatic biota. In the winter, however, projected temperatures at Road A and points downstream would be 7°C to 9°C above ambient. These warmer conditions could concentrate fish at the mouth of Steel Creek. Reactor shutdowns during the winter would result in gradual heat loss in this area which would minimize any cold shock effects. This alternative would not adversely impact access to and the spawning of riverine and anadromous fishes in the Savannah River swamp below the Steel Creek delta.

There would be minimal impacts in Steel Creek below the embankment. However, the flow of discharge water would have adverse impacts on between 215 and 335 acres of wetlands in the Steel Creek delta and swamp. This area, which is dominated by forested (45 percent) and scrub-shrub (36 percent) wetlands, provides foraging habitat for the endangered wood stork and American alligator. These wetlands also represent important feeding and roosting habitat for as many as 1200 mallard and 400 wood duck. A delta growth rate of about 1 to 2 acres per year is anticipated.

L.4.1.1.2.3 Steel Creek upstream from the lake

The embankment and cooling lake would prevent access by riverine and anadromous fish to about 100 acres of wetlands along Steel Creek above L-Reactor. However, the only migratory fish in this reach of Steel Creek would be the American eel. Also, access to Meyers Branch would not be affected by the embankment.

Preliminary results of investigations in Upper Steel Creek indicate that the macroinvertebrate community there is self-sustaining and therefore unlikely to undergo significant changes as a result of the creation of the 1000-acre lake. Sixteen species of fish have also been collected in this reach of Steel Creek during two recent surveys. Most of the species are small fish that prefer stream habitats. However, all but one of the species collected have been reported in thermal refugia (backwater or tributary stream areas) peripheral to reactor effluent streams on SRP; therefore, the fish populations in Upper Steel Creek could be capable of maintaining their present status in the 3- to 4-kilometer reach that would be isolated above the cooling lake when the reactor is operating. There would undoubtedly be shifts in patterns of relative abundance. For example, the thermally tolerant mosquitofish would probably increase in abundance and species that prefer pond habitats could thrive in the upper portions of the lake, where temperatures would be moderated by the inflow from Steel Creek.

L.4.1.1.2.4 Cooling lake

One of the principal concerns regarding the impacts of the operation of a 1000-acre cooling lake is the types of biological communities that would develop in the lake. Of particular importance is the requirement, pursuant to Section 316(a) of the Clean Water Act, for establishing and maintaining "balanced indigenous populations" in at least a portion of this water body. DOE has committed to operating L-Reactor in such a manner that such balanced communities would be maintained. Present estimates are that about 50 percent of the lake (about 500 acres) would have water temperatures below 32.2°C during the summer, which would be the most critical period for most aquatic organisms. During the remainder of the year, maximum water temperatures would be less critical, but nonetheless important.

Precisely describing in advance the aquatic communities that would develop in the cooling lake is difficult because:

1. Every new impoundment is unique because its physical and, particularly, its chemical characteristics depend on such factors as: the topography of the inundated area, the chemistry of the soil, the nature and extent of submerged vegetation, the internal pattern of circulation, the

source and quality of inflowing water, the exchange rate, mixing characteristics, etc. The biological communities that develop depend on the physical and chemical environment and on the types and numbers of organisms that move in to occupy the new water body and the speed and order in which they do so. The combinations of these important physical, chemical and biological factors are different for each impoundment that is created. Accordingly, the ecosystem that develops in each is also unique and changes slowly to resemble that in a natural water body of similar characteristics.

2. An artificial thermal regime would be present in this environment.

However, an indication of what might reasonably be expected can be obtained from analyzing the results of the biological studies of Par Pond and other thermally impacted water bodies on SRP. The following sections make this analysis for each of the major groups of organisms that would comprise the balanced aquatic community that would develop in the 1000-acre cooling lake. Due to the thermal regime in part of the lake, it is possible that Aeromonas bacteria could occur.

Fish

The inundation of this 7-kilometer reach of Steel Creek would create a lake environment where a flowing stream now exists. Accordingly, the productivity in this area would greatly increase because the cooling lake would be able to support many more fish than the existing reach of Steel Creek that it would replace. As explained below, the nature of the fish community that will develop can be predicted only in general terms, based on observations of the communities in existing SRP thermal ponds.

For example, the Par Pond system shows a generalized pattern of increasing fish abundance and diversity from Pond C, which is affected more heavily by heated discharges, to Par Pond, which receives less thermal impact. The structure of the fish communities in the two ponds is primarily determined by water temperature, although other factors such as habitat size and characteristics, historic introduction of species, and/or recolonization from the impounded drainage system are also important. Table L-5 lists the fish species found in these two cooling ponds and their relative abundance. Pond C contains fewer fish species (18), of which only two (largemouth bass and bluegill) make up more than 95 percent of the game fish species in this pond (Clugston, 1973). Par Pond contains 29 species of fish, seven of which are abundant; the fish community in Par Pond can be considered "balanced" and self-sustaining and, although the environment is thermally stressed, the community is not dominated by pollution-tolerant species. The standing crop of fishes in Par Pond was similar to that in nearby reservoirs in South Carolina (Clugston, 1973).

It is anticipated that the 1000-acre lake will contain a balanced fish community similar to that present in Par Pond. Also, other species from the Savannah River can enter the lake as eggs, larvae or fry in the cooling water that passes through the plant when thermal stress is low. The exact balance of species that will develop cannot be predicted accurately. However, based on Par Pond, it is anticipated that a bass-bluegill-sunfish dominated community will develop. Clugsten (1973) found that the size of the largemouth bass population in Par Pond is greater than that in other South Carolina reservoirs. This

Table L-5. Fishes of the Par Pond reservoir system

Species	Pond C	Par Pond
Mosquitofish	A	A
Bluegill	A	A
Red-breast sunfish	C	A
Largemouth bass	C	A
Redfin pickerel	R	R
Yellow bullhead	R	+
Lake chubsucker	R	A
Golden shiner	R	+
Black crappie	+	A
Flathead catfish	+	+
Swamp darter	+	+
Redear sunfish	+	+
Dollar sunfish	+	C
Warmouth	+	C
Pygmy sunfish	+	+
Pirate perch	+	
Blueback herring	+	R
Gizzard shad	+	R
Brook silversides		A
Yellow perch		R
American eel		+
Spotted sucker		+
Coastal shiner		+
Brown bullhead		+
Bowfin		R
Chain pickerel		C
Flat bullhead		+
Channel catfish		+
Tadpole madtom		+
Spotted sunfish		+

A = Abundant
C = Common
R = Rare
+ = Abundance uncertain

species occurs in a density of about 20 individuals per acre in Par Pond (Gilbert and Hightower, 1981). Accordingly, the numbers of this species that could be supported in the 500 acres of the 1000-acre lake to be maintained below 32.2°C is estimated to be 10,000. This is well above the level of 500 adult breeding individuals that has been identified as the minimum required for maintaining long-term balanced populations of these species. The size of the unstressed zone with the 1000-acre lake is sufficient to support a self-sustaining fish community made up of many other species such as sunfish, crappies, and silversides which are abundant in Par Pond. In addition, the mosquitofish is expected to be numerically abundant both in the stressed and unstressed lake areas.

The normal seasonal cycles evident in natural unstressed water bodies will be modified somewhat by the input of heated water to the cooling lake. Preliminary data from studies in Par Pond have shown that some fish species might spawn and produce fry successfully during the winter months rather than only during their normal reproductive season. Also, growth rates of fishes can be expected to be greater because of the absence of cold-weather dormant periods. Under the proposed operation plan, the fish would have large areas to seek optimum water temperatures year-round. They would be able to avoid hot, stressful zones during the summer and to seek out warmer water in the winter when the reactor is in operation. This artificial thermal regime has not prevented the establishment of a balanced fish community in Par Pond, and it is expected that a fish community of similar structure and function would develop in the 1000-acre lake. The stocking of certain species could also be a method to enhance the establishment of a balanced biological commmunity.

Benthic macroinvertebrates

It is anticipated that a balanced community of benthic macroinvertebrates will be developed and maintained in a portion of the cooling lake. Based on observations in Par Pond and the other thermally stressed SRP ponds, three different temperature zones can be identified:

Zone I (less than 32.2°C)--Balanced benthic community
Zone II (32.2°C to 35°C)--Stressed community
Zone III (35°C to 37°C)--Depauperate populations

Table L-6 lists the common invertebrates that might be found in these zones.

Zone I. Balanced benthic community. In this area, water temperatures will not exceed 32.2°C, even in the summer. A balanced biological community could develop in this zone. It would probably resemble the benthic assemblage present in the warm (but not hot) areas of Par Pond (Table L-6). Such assemblages are characterized by high diversity and density. They are not dominated by stress-tolerant taxa but resemble communities in other SRP areas that never received heated effluent or that are post-thermal. These groups of invertebrates can support organisms at higher trophic levels, including a range of fish species.

Another important criterion for the development of a balanced invertebrate community would be the availability of adequate shallow-water areas with suitable sediment. It is anticipated that such areas will be present along most of the shoreline of the cooling lake, particularly in any embayments or backwaters. There will be adequate dissolved oxygen in these critical habitat areas

Table L-6. Common macroinvertebrates that might be found in thermal zones in 1000-acre lake

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Zone I. Water temperatures less than 32.2°C ("balanced")

Turbellaria (flatworms)

Nematoda (Nematodes)

Oligochaeta (Segmented worms), mainly Noididae

Hirudinea (leeches)

Mollusca

Gastropoda (snails)

Physella heterostropha (Say)
Helisoma trivolvis (Say)
Helisoma anceps (Marke)
Campeloma docuim (Say)
Gyraulus parvus (Say)

Pelecypoda (clams and mussels)

Sphaeriidae (Sphaerium)
Corbicula fluminea (Muller)
Anodonta imbecillus (Say)

Arthropoda

Amphipoda (Scuds)

Hyalella azteca (Saussure)

Acari (water mites)

Decapoda (crayfish)

Procambarus spp.

Insecta (Insects)

Ephemeroptera (Mayflies)

Caenis diminuta (Walker)
Callibaetis sp.

Odonata (Dragonflies and damselflies)

Celithemis spp.
Epicordulia princeps (Hagen)

Table L-6. Common macroinvertebrates that might be found in thermal zones in 1000-acre lake (continued)

Zone I. Less than 32.2°C ("balanced") (continued)

Erythemis simplicollis (Say)
Ladona deplamota (Pambur)
Pachydiplax longipennis (Burmeister)
Perithemis tenera (Say)
Tetragoneuria cynosura (Say)
Aphylla willamsoni (Gloyd)
Anax junius (Diurg)
Enallagma spp.
Ischnura spp.

Trichoptera (Caddisflies)

Oecetis spp.
Oxyethira spp.
Orthotrichia sp.
Cernotina spirata (Kris)
Agrypnia vestita (Walker)
Ptilostomis spp.

Megaloptera (fishflies and alderflies)

Chauliodes spp.
Sialis spp.

Lepidoptera (butterflies and moths)

Parapoynx sp.

Hemiptera (true bugs)

Trichocorixa sp.
Hesperacorixa sp.
Sigara spp.
Belostoma sp.
Ranatra buenoi (Hungerford)
Buenoa spp.
Gerris spp.
Metrobates sp.
Mesovelia sp.
Microvelia sp.

Coleoptera (Beetles)

Berosus spp.
Hydroporus spp.
Hydrovatus spp.
Tropisternus spp.

Table L-6. Common macroinvertebrates that might be found in thermal zones in 1000-acre lake (continued)

Zone I. Less than 32.2°C ("balanced") (continued)

Peltodytes spp.
Cymbiodyta spp.
Celina spp.

Diptera (True flies)

Tipulidae

Culicidae

Ceratopogonidae

Chironomidae

Ablabeskyia spp.
Larsia sp.
Procladius spp.
Labrurdinia spp.
Coryoneura sp.
Cricitopus sp.
Eukieffer sp.
Brilla sp.
Chironomus spp.
Cryptochiromous
Dicrotendipes spp.
Glyptotendipes sp.
Microtomadipes
Polypedilum spp.
Harnischia spp.
Phaenopsecta spp.
Pseudochironamus spp.
Rheotanytarsus spp.
Tanytarsus spp.

Chaoboridae

Chaoborus punctipennis (Sax)

Tabanidae

Chrysops spp.
Tabanus spp.

Table L-6. Common macroinvertebrates that might be found in thermal zones in 1000-acre lake (continued)

Zone II. Water temperatures 32.2°-35°C ("stressed")

Oligochaeta (segmented worms), mainly Naididae

Nematoda (Nematodes - roundworms)

Gastropoda (Snails)

Physella heterostropha (Say)
Helisoma trivolvis (Say)

Pelecypoda (clams and mussels)

Corbicula fluminea (Muller)

Amphipoda (scuds)

Hyalella azteca (Saussure) (questionable presence)

Acare (water mites)

Insecta (insects)

Ephemeroptera (Mayflies)

Caenis diminuta (Walker)

Odonata (Dragonflies and damselflies)

Erythemis simplicicollis (Say)
Pachydiplax longipennis (Burmeister)
Perithemis tenera (Say)
Enallagma spp.
Ischnura spp.

Trichoptera (Caddisflies)

Oecetis spp.

Hemiptera (true bugs)

Corixidae
Belostoma sp.

Coleoptera (Beetles)

Hydrophilidae
Dystiscidae

Diptera (true flies)

Table L-6. Common macroinvertebrates that might be found in thermal zones in 1000-acre lake (continued)

<u>Zone II. 32.2°-35°C ("stressed") (continued)</u>

Ceratopogonidae

Chironomidae

Ablabesmyia spp.
Procladius spp.
Labrundinia spp.
Cricotopus spp.
Dicrotendipes spp.
Polypedilum spp.
Tanytarsus spp.
Tanytarsini

<u>Zone III. Water temperatures 35° to 37°C ("depauperate")</u>

Some Oligochaeta (segmented worms)

Some Nematoda (Nematodes; roundworms)

within Zone I because the water temperatures will be lower, stratification of the water column will be less, and the distances from the stressed zones of accelerated organic decomposition will be greater.

<u>Zone II. stressed community</u>. Water temperatures in this area will range from 32.2°C to 35°C in the summer. The community structure will be intermediate in complexity between those in Zones I and III. The benthic populations will be self-sustaining and "balanced" but will be characterized by stress-tolerant organisms. A list of the dominant species expected within this zone is given in Table L-6. A large percentage of the species present in Zone I will also be represented here. The principal differences are that some more thermally sensitive forms will be excluded from Zone II and that the relative dominance of species will change. The majority of individuals should be present at depths between 1 and 3 meters. Below these depths, the oxygen concentration in the water becomes limiting. Only a few species (but many individuals each) can tolerate the low oxygen-anoerobic conditions that probably would be present at greater depths. If the water column is stratified, the benthic assemblage below the thermocline in Zone II could resemble the deepwater assemblages in most areas of Par Pond. Above the thermocline, the benthic assemblage would probably roughly resemble the fauna in Coleman's Cove, a thermally stressed area of Par Pond. Community functioning within this zone should resemble that in a balanced biological community (but with less species and linkages), unless the source of nutritive organic matter changes significantly (e.g., by an increase in the relative abundance of blue-green algae and a significant decrease in other rooted, floating, and emergent macrophytes), in which case the community structure would further degrade to more stress-tolerant forms.

The organisms in this benthic zone will be an important additional source of food for fishes in the 1000-acre lake, particularly during the periods when water temperatures fall and fish re-enter shoreline areas from which they were excluded during the warmest summer months.

Zone III. Depauperate community. The water temperatures in this zone are so high (35°C-37°C) that very few, if any, benthic invertebrates would survive. The food source would be different than in other areas of the cooling lake. Blue-green algae would be the dominant primary producer. This would further reduce the kinds and numbers of benthic consumers present, because very few forms can utilize blue-greens directly or indirectly. Table L-6 lists some taxa that could be present in this zone.

Plankton

Phytoplankton, periphyton and zooplankton populations that would develop in the 1000-acre lake will resemble those present in Par Pond and Pond C. Tables L-7, L-8, and L-9 list the species from these three groups that have been collected from the existing thermal ponds on SRP. The temperature regime within the cooling lake should be the principal factor that determines whether the new plankton community is most similar to one or the other of the existing environments. In those areas where summer water temperatures do not exceed 32.2°C, a balanced biological community of plankton will be present. This community will be similar to that in Par Pond, except that the continuous input of relatively nutrient-rich Savannah River water would make the 1000-acre lake more productive and more likely to develop nuisance algal blooms than Par Pond. However, the expected shorter retention time within the once-through system may partially or completely offset this potential. Also, the input of Savannah River water and water from Upper Steel Creek might also increase the species richness and diversity of the plankton community in the 1000-acre lake.

The seasonal effects on the plankton would primarily be an increase in primary production during the winter months when water temperatures in the coolant lake would be warmer than in ambient water bodies. This beneficial effect would be partially or completely offset in the warmest summer months by decreased production by useful species and augmented production by blue-green nuisance species. The blue-greens will be the dominant alga at water temperatures above about 37°C. Primary production by this group in the summer could result in large mats of organic material being carried into the non-thermally stressed zones and adversely affecting the populations of other organisms therein. Table L-10 summarizes the expected condition of the plankton community within various temperature zones in the 1000-acre lake. A balanced community can exist only where water temperatures do not exceed 32.2°C.

Macrophytes

The presence of macrophytes in the 1000-acre lake will be an important factor in the establishment and maintenance of a balanced fish community within this body of water. Based on observations in Par Pond, it is anticipated that a balanced vascular plant community will develop in some shoreline areas of the cooling lake where maximum water temperatures do not exceed 32.2°C. Very few plants will exist in areas of higher temperature. This can be seen clearly in Table L-11, which lists those vascular plant species present in Par Pond (moderately thermally stressed) and in Pond C (highly thermally stressed).

Table L-7. Phytoplankton collected from Pond C and Par Pond

Species	Pond C	Par Pond
Bacillariophyta		
Achanthes linearis (W. Smith) Grun.	X[b]	X
Achanthes minutissima Kutz.	X	X
Asterionella formosa Hassal.	X	X
Atthea zachariasi J. Brun.		X
Caloneis sp.	X	
Cyclotella stelligera Cleve and Grun.	X	X
Cymbella minuta Hilsc ex. Rabh.	X	X
Eunotia pectinalis (Kutz.) Rabh.	X	X
Fragilaria crotonesis Kitton	X	X
Frustulia rhomboides (Ehr.) Det.		X
Gomphonema gracile Ehr.		
Gomphonema parvulum Kutz.	X	
Melosira ambigua (Grun.) O. Miller	X	
Melosira granulata (Ehr.) Ralfs	X	X
Melosira granulata v. angustissima Mull.	X	X
Navicula cryptocephala Kutz.	X	X
Navicula hustedtii Krasske	X	
Navicula sp.		X
Nitzschia acicularis W. Smith	X	X
Nitzschia denticula Grun.		X
Nitzschia dissipata (Kutz). Grun.	X	X
Nitzschia holsatica Hust.		X
Nitzschia palea (Kutz.) W. Smith	X(M)[c]	X
Rhizosolenia eriensis H. L. Smith	X	X(M)
Stauroneis sp.		X
Stephanodiscus hantzschii Grun.		
Stephanodiscus sp.		X
Synedra delicatissima W. Smith		X
Synedra rumpens Kutz.	X	X
Synedra planktonica Hains and Sebring	X	X(M)
Synedra ulna (Nitz.) Ehr.	X	X
Synedra vaucheriae Kutz.		X
Tabellaria fenestrata (Lynbg.) Kutz.	X	X(M)
Chlorophyta		
Actinastrum hantzschii Lag.		X
Ankistrodesmus convolutus Corda		X
Ankistrodesmus falcatus (Corda) Ralfs	X	X(M)
Ankistrodesmus falcatus v. mirabilis (Corda) Ralfs		X(M)
Ankistrodesmus spiralis (Turner) Lemm.		X(M)
Arthrodesmus sp.		X
Botryococcus braunii Kuetzing		
Carteria sp.	X	X
Chlamydomonas sp.	X(M)	X(M)

Table L-7. Phytoplankton collected from Pond C and Par Pond (continued)

Species	Pond C	Par Pond
Chlorophyta (continued)		
Chlorogonium elongatum (Dang.) Franze	X(M)	
Chlorogonium euchlorum Ehr.	X(M)	
Closteridium lunula Nitzsch.	X	
Closteridium sp.		
Closteriopsis longissima Lemm.		X
Coelastrum cambricum Archer	X	X
Coelastrum proboscideum Bohlin	X	X
Cosmarium sp. 1		X
Cosmarium tenue Archer		
Crucigenia quadrada Morren		X
Crucigenia tetrapedia (Kirch.) West and West		X
Dictyosphaerium pulchellum Wood		X
Elakatothrix gelatinosa Wille		X
Elakatothrix viridis (Snow) Printz		
Eudorina elegans Ehr.		X
Franceia droescheri (Lemm.) G. M. Smith	X	X
Franceia ovalis (France) Lemm.		X
Gloeocystis ampla (Kutz.) Lag.		X
Gloeocystis gigas (Kutz.) Lag.		X
Gloeocystis planctonica (West and West) Lemm.	X	X
Gloeocystis vesiculosa Naeg.		X
Gloeocystis sp.		X
Golenkinia radiata (Chod.) Wille	X	X(M)
Gonatozygon aculeatum Hastings		
Gonatozygon brebissonii De Bary		X
Gonium pectorale Mueller	X	X
Kirchneriella contorta (Schmidle) Bohlin		
Kirchneriella lunaris (Kirch.) Moebius		
Kirchneriella subsolitaria G. S. West	X	X
Lagerheimia quadriseta (Lemm.) G. M. Smith		X
Lagerheimia sp.		
Micractinium pusillum Fresenius	X(M)	X
Mougeotia sp.	X	X
Nephrocytium sp.	X	
Oedogonium sp.	X	
Oocystis borgei Snow		X
Oocystis elliptica W. West		X
Oocystis gloecystiformis Borge		
Oocystis lacustris Chod		X
Oocystis parva West and West		
Oocystis pusilla Hansgirg	X	X
Pandorina charkowiensis Korshikov	X	
Pandorina morum (Muell) Bory	X	

Table L-7. Phytoplankton collected from Pond C and Par Pond (continued)

Species	Pond C	Par Pond
Chlorophyta (continued)		
Pediastrum boryanum (Turp) Meneghini		X
Pediastrum duplex Meyen	X	
Pleurotaenium sp.		
Plurotaenium tridentulum (Wolle) West		X
Protococcus viridis C. A. Agardh		
Scenedesmus abundans (Kirch.) Chod.	X	
Scenedesmus bijuga (Turp.) Lag.	X	
Scenedesmus brevispina (Smith) Chod.	X	X
Scenedesmus denticulatus Lag.	X	X
Scenedesmus intermedius Chod.		X
Scenedesmus longispina v. asymmetricus Hortob.	X	
Scenedesmus opoliensis P. Richter	X	X
Scenedesmus quadricausa (Turp) Breb.	X	X
Schroederia setigera (Schroed.) Lemm.	X	X
Selenastrum capricornutum Printz.		X
Selenastrum gracile Reinsch		X
Selenastrum minutum (Naeg.) Collins	X(M)	X(M)
Staurastrum brasiliense W. and G. S. West		
Staurastrum chaetoceros (Schroed.) G. M. Smith		X
Staurastrum paradoxum Meyen		X
Staurastrum ravenellii Irenee-Marie		X
Staurastrum sp. 1	X	X
Staurastrum sp. 2		
Tetraedron caudatum (Corda) Hansgirg	X	X
Tetraedron gracile (Reinsch) Hansgirg	X	
Tetraedron minimum (A. Braun) Hansgirg		X
Tetraedron regulare Kutz.		X
Tetraedron sp.		X
Tetraedron trigonum (Naeg.) Hansgirg		X
Tetrastrum staurogeniaeforme (Schroed.) Lemm		X
Undetermined green flagellates		X(M)
Westella botryoides (W. West) deWildemann		X
Xanthidium cristatum v. leiodermum W. and G. S. West		
Xanthidium sp.		X
Cyanophyta		
Anabaena sp.	X	X(M)
Anacystis sp.	X	X(M)
Arthrospira jenneri (Kutz) Stitz.		
Arthrospira sp.	X	
Chroococcus limneticus Lemm.		
Chroococcus sp.	X	X
Dactylococcopsis fascicularis Lemm.	X	

Table L-7. Phytoplankton collected from Pond C and Par Pond (continued)

Species	Pond C	Par Pond
Cyanophyta (continued)		
Lyngbya limnetica Lemm.	X(M)	X(M)
Mastigocladus laminosus Cohn.	X(M)	X
Merismopedia sp.	X	
Merismopedia tenuissima Lemm.	X	X
Merismopedia trolleri Bachmann		
Oscillatoria geminata Menegh	X	X
Oscillatoria princeps Vaucher	X	
Oscillatoria sp.	X	
Phormidium sp.	X(M)	X
Schizothrix sp.		X
Spirulina major Kutz.		X
Cryptophyta		
Chroomonas sp.	X	
Cryptomonas erosa Ehr.	X	X(M)
Cryptomonas marsonii Skuja		X
Rhodomonas minuta Skuja	X(M)	X(M)
Rhodomonas sp.	X	X(M)
Chrysophyta		
Chromulina sp.	X(M)	
Dinobyron divergens Imhof.	X(M)	X
Dinobyron sertularia Ehr.		
Mallomonas alpina Pascher and Ruttner		
Mallomonas caudata Conrad		X
Mallomonas pseudocoronata Prescott		X
Mallomonas sp.		X
Mallomonas tonsurata Teiling		X
Ochromonas sp.		X
Ophiocytium capitatum Wolle		
Ophiocytium capitatum v. longispinum (Moebius) Lemm.		X
Synura caroliniana Whitford		
Synura petersenii Korshikov		X
Synura uvella Ehr.		X
Pyrrhophyta		
Glenodinum sp.		X
Peridinium sp.	X	X

Table L-7. Phytoplankton collected from Pond C and Par Pond (continued)

Species	Pond C	Par Pond
Euglenophyta		
Euglena minuta Prescott		X
Euglena sp. 1		
Euglena sp. 2	X	X
Eutreptia viridis Perty	X	
Lepocinclis sp.		
Phacus sp.	X	
Trachelomonas horrida Palmer		X
Trachelomonas sp.	X	
Trachelomonas volvocina Ehr.	X	
Rhodophyta		
Audouinella violacea (Kuetz.) Hamel	X	

[a]Taken from Wilde (1983).
[b]X = observed in a least one sample from the reservoir.
[c]M = major taxon comprising more than 5 percent of the total phytoplankton in at least one sample.

Table L-8. Periphyton collected from the Par Pond System

Principal taxa in the P-Reactor canal above Par Pond (taken from Tison et al., 1981).

Mastigocladus laminosus
Phormidium sp.
Oscillatoria sp.
Oedogonium sp. 1
Oedogonium sp. 2
Navicula confervacea
Melosira granulata
Synedra delicatissima

Principal diatoms in Par Pond (from artificial substrate sampling) unpublished data.[a]

Achnanthes affinis
Achnanthes lanceolata
Achnanthes minutissima
Anomoeoneis vitrea
Cyclotella pseudostelligera
Cyclotella stelligera
Cymbella delicatula
Cymbella microcephala
Cymbella minuta v. silesiaca
Fragilaria crotonensis
Fragilaria pinnata
Fragilaria vaucheriae
Gomphonema carolinense
Gomphonema grunowii
Gomphonema intricatum
Gomphonema parvuium
Gomphonema sudcavatum
Melosira distans v. alpigena
Melosira granulata v. angustissima
Nitzschia frustulum
Nitzschia frustulum v. perminuta
Synedra delicatissima v. angustissima
Synedra minuscula
Synedra rumpens
Synedra tenera
Synedra ulna
Tabellaria fenestrata

Nondiatomic algae from artificial substrate sampling (unpublished data[a]).

Actinastrum hantschii
Agmenellum elegans
Amphidinium sp.

Table L-8. Periphyton collected from the Par Pond System (continued)

Nondiatomic algae from artificial substrate sampling (unpublished data[a]). (continued)

Anabaena circinalis
Anabaena sp.
Anacystis cyanea
Ankistrodemus falcatus
Arthrodesmus octocornis
Bulbochaete sp.
Calothrix sp.
Ceratium hirundinella
Chlamydomonas sp.
Closterium cornu
Closterium sp.
Closterium venus
Cosmarium angulosum
Cosmarium asphaerosparum
Cosmarium bireme
Cosmarium bisphaericum
Cosmarium blyttii
Cosmarium circulare
Cosmarium comminsurale v. crassum
Cosmarium dentatum
Cosmarium excavatum f. duplomajor
Cosmarium exiguum
Cosmarium goleritum
Cosmarium impressulum
Cosmarium margaritatum
Cosmarium pardalis
Cosmarium phaseolus
Cosmarium pseudoconnatum
Cosmarium schliephakeanum
Cosmarium spp.
Cosmarium subcrenatum
Cosmarium tenue
Cosmocladium saxonicum
Dictyosphaerium pulchellum
Euastrum ciastonii
Euastrum denticulatum
Gleocapsa sp.
Gonatozygon aculeatum
Gonatozygon brebissonii
Gonatozygon monotaenium
Microcoleus iriguus
Microcoleus sp.
Microcoleus vaginatus
Mougeotia sp.
Nostoc macorum

Table L-8. Periphyton collected from the Par Pond System (continued)

Nondiatomic algae from artificial substrate sampling (unpublished data[a]). (continued)

Nostoc sp.
Oedogonium sp.
Oocystis borgei
Oscillatoria lutea
Oscillatoria princeps

[a]Identifications made by the Academy of Natural Sciences of Philadelphia under subcontract with Du Pont.

Table L-9. Zooplankton collected from the Par Pond system

CLADOCERA

BOSMINIDAE

Bosmina longirostris
B. longirostris cornuta
Eubosmina hagmanni
E. tubicens

CHYDORIDAE

Acroperus of. harpae
Alona affinis
A. globulosa
A. guttata tuberculata
A. intermedia
A. karua
A. rectangula
A. rustica
A. setulosa
A. verrucosa
A. sp.
Alonella hamulata
Chydorus brevilabris
C. piger
(C. sphaericus)
Camptocercus cf. rectorpstris
Disparalona acutirostris
(Eurycercus lamellatus)
Eurycercus (Bullatifrons) sp.
E. (Eurycercus) microdontus
Pleuroxus denticulatus
Pseudochydorus globosus

DAPHNIIDAE

Ceriodaphnia lacustris
C. quadrangula
C. sp.
Daphnia parvula
Scapholebris kingi
Simocephalus serrulatus
S. vetulus

HOLOPEDIDAE

(Holopedium amazonicum)
Holopedium cf. gibberum

Table L-9. Zooplankton collected from the Par Pond system (continued)

MACROTHRICIDAE

Ilyocryptus spinifer
Macrothrix laticornus
Macrothrix rosea

MOINIDAE

Moina micrura
M. sp.

COPEPODS

Cyclops leucarti
Cyclops spp.
Diaptomus spp.
Unidentified calanoids

ROTIFERS

Ascomorpha
Asplanchna
Canochilus
Kellicottia
Keratella
Polyarthra
Ptygura
Trichocera

INSECTA (Diptera)

Chaoborus punctipennis

OSTRACODA

Physocypria pustulosa Sharpe
Cypretta uiridis Thompson
Cypridopsis vidua O. F. Muller
Stenocypris fontinalis Varura
Strandesia spinulosa Bronstein
Metacypris americana Furtos
Darwinula stevenson Brady and Robertson

Table L-10. Predicted plankton scenarios for 1000-acre lake

Temp. (°C)	Expected Condition of Plankton Community
30-32.2	High primary production, some thermal stress causing decreased diversity and species composition altered from ambient condition
32.2-35	Blue-green algae replacing diatoms and flagellates; dominance of "summer" type zooplankton in all seasons
35-40	Blue-greens dominant, copepods principal zooplanktons, sporatic algal blooms with accompanying dissolved-oxygen depletion likely
40-45	Zooplankton virtually eliminated
45-50	Total domination of phytoplankton by bluegreens likely
50-55	Phytoplankton limited to only 1-3 species
55-60	Possible monoculture of thermophilic blue-green algae
>60	No primary production

Table L-11. Dominant aquatic macrophytes in Par Pond and Pond C

Species	Par Pond	Pond C
Submerged:		
Myriophyllum spicatum Eurasian watermilfoil	A	-
Potamogeton diversifolius Pondweed	A	-
Najas guadalupensis Bushy pondweed	A	-
Ceratophyllum demersum Coontail	O	-
Utricularia inflata Bladderwort	O	-
Floating-leafed:		
Nelumbo lutea - Lotus	A	-
Nympha odorata - Water lily	A	-
Brasenia schreiberi Water shield	A	-
Numphoides cordata	O	-
Emergent:		
Eleocharis acicularis Tiny spikerush	A	O
Elocharis equisetoides Spikerush	A	-
Eleocharis quadrangulata Spikerush	A	-
Typha latifolia Common cattail	A	-[a]
Typha domingensis Giant cattail	A	-

Table L-11. Dominant aquatic macrophytes in Par Pond and Pond C (continued)

Species	Par Pond	Pond C
Emergent: (continued)		
Scirpus cyperinus - Bullrush	A	-[a]
Erianthus giganteus Giant plume grass	O	-
Bacopa caroliniana	A	-
Pontaderia cordata - Pickerelweed	O	-
Mayaca aubletti - Bog moss	O	-
Ludwigia leptocarpa Water primrose	O	O[b]
Ammannia coccinea	O	O[b]
Rotala ramosoir	O	O[b]
Hydrocotyle umbellata Pennywort	A	-

A - Abundant
O - Occasional or infrequent

[a]Does not typically occur along the shoreline. May occasionally grow in cool refuge coves.
[b]Infrequent on the shoreline; not actually growing in the water.

Only three plants are present in Pond C, and these live above the normal water level. However, 23 species are reported from Par Pond: 5 submerged forms, 4 floating-leafed, and 14 emergent. The standing crop of submerged macrophytes in heated areas of Par Pond was twice that of the unheated area (Grace and Tilly, 1976). This type of plant development in the 1000-acre lake would be sufficient to support a balanced fish community.

The aquatic communities in the reach of Steel Creek above the lake would probably be very similar to those present previously when L-Reactor was operational and the thermal effluent below the outfall isolated this area from downstream influences.

L.4.1.1.3 Socioeconomic impacts

The socioeconomic impacts of operation would be almost the same with the 1000-acre lake as with the direct discharge alternative (reference case). Operational employment for L-Reactor, which began in 1981, peaked at about 400 employees in mid-1983 and is expected to decrease to 350 by mid-1984, or about 4 percent of the current work force at the Savannah River Plant (Du Pont, 1982b). Essentially all the operating work force for L-Reactor has been hired and resides in the SRP area; therefore, no additional impacts due to in-migrating workers are expected to local communities and services. Operating, maintenance, and general service requirements would be performed by personnel sharing duties with normal L-Reactor requirements.

L-Reactor operation is expected to have annual total local expenditures on materials and services of approximately $3 million and a total payroll and overhead expenditure of about $21 million. These expenditures are expected to result in the creation of about 50 regional job opportunities. In addition, these expected expenditures are anticipated to produce an additional direct and indirect income of another $3 million. The total economic benefit to the SRP region during L-Reactor operation will amount to at least 400 direct and indirect job opportunities, about $25 million in direct and indirect annual income and payroll, and $3 million in direct annual expenditures on materials and services.

These contributions to the local economy will help pay for public services directly through income, property, and license taxes and user fees and help indirectly through sales taxes on goods and services. The benefits provided by the project will help offset the small increase in demands that it generates for local services.

L.4.1.2 Radiological impacts

L.4.1.2.1 L-Reactor radiological releases

The operation of L-Reactor with the preferred cooling-water alternative would have the same radiological releases and associated impacts as those described in Section 4.1.2, except power levels would be reduced to meet the criterion of about 50 percent of the lake being maintained below 32.2°C. The power reduction would be approximately 14 percent; if precoolers are installed, the reduction would be approximately 3 percent.

L.4.1.2.2 Cesium-137/cobalt-60 remobilization

The resumption of L-Reactor operation would add only small amounts of radionuclides to Steel Creek. However, the reactivation would transport a portion of the cesium-137 and cobalt-60 inventories that remain in the Steel Creek channel and floodplain.

The transport of radioactivity associated with sediments from the 1000-acre lake would be smaller than that related to direct discharge to Steel Creek. This reduction would be due primarily to the low water velocities over the bottom of the lake and the near-zero erosion of contaminated sediments on the bottom of the lake. However, discharge water from the lake, which would be relatively sediment-free, could rapidly reach equilibrium sediment loading downstream from the embankment. Thus, the total transport of radioactivity by suspended sediments in the Steel Creek system might not differ much from that estimated for direct discharge (i.e., 2.3 curies in the first and second years).

The effects of a thermal lake on desorptive transport (i.e., solution transport) compared to the effects of a flowing stream are somewhat uncertain. However, they are expected to be no greater than those with a flowing stream. The area of contaminated soil exposed to water from a lake covering the contaminated floodplain sediment would be nearly the same as that if the L-Reactor cooling stream is discharged directly to the creek. The hot water would desorb the cesium-137 from the surface sediments on the bottom of the lake; however, the rate of desorption is expected to be significantly slower, because sediments would not be mixed with the water as vigorously as compared to a flowing stream, and the average temperature of water at the bottom of the lake would be considerably lower than the average temperature to which sediments are exposed during direct discharge. As cesium-137 concentration on the surface of the lake bottom sediments reduced from transport out of the lake, further loss would be smaller because diffusion is an extremely slow process for the transfer of material through the sediments.

It is known that in Par Pond, cesium deposits on the bottom of the pond become more soluble during anaerobic conditions (bottom water concentrations are about twice the surface concentrations) when there is thermal stratification in the spring and summer, and then cesium is mixed throughout the depth of the pond when water turnover occurs in the fall. Thermal stratification in the 1000-acre lake would enhance desorption somewhat; however, the net consequence of reduced temperature, reduced flow rate, and the anaerobic effect would be to lessen the transport.

Because the factors that could influence activity transport in the combined lake-stream system are difficult to quantify precisely, transport with the lake-stream system is conservatively estimated to be no more than that associated with direct discharge of cooling water to Steel Creek (i.e., 4.4 ± 2.2 curies of cesium-137 and 0.25 curie of cobalt-60 would be transported in the first year). In the second year, it is anticipated that this value would be reduced to 2.3 ±

1.8 curies. Thereafter, a 20-percent reduction in transport per year is assumed.

L.4.2 Accidents

L.4.2.1 Reactor accidents

Possible accidents and their consequences for the preferred cooling-water alternative are not expected to be different from those described in Section 4.2. Section 4.2.1 discusses reactor malfunctions and Section 4.2.2 discusses hazards due to natural phenomena and non-nuclear hazards. Appendix G treats reactor accidents in detail.

L.4.2.2 Embankment failure

The probability of an embankment failure is extremely low. As indicated in Section L.2.3.2, applicable seismic design criteria would be used for embankment construction. Similarly, the embankment and outlet works and the emergency spillway have been designed to control the runoff (Section L.2.3.1) from the U.S. Army Corps of Engineers' "standard project flood." At SRP this flood is the result of a 96-hour rainfall of 51 centimeters. The standard project flood does not have a direct correspondence to a recurrence interval. However, 51 centimeters in 96 hours is nearly twice the 100-year recurrence interval depth for the area. Extrapolation of the depth-versus-recurrence-interval relationship for the 96-hour duration at the site would imply a recurrence interval of over 10,000 years. An even rarer flood, the probable maximum flood, was also included in the design basis. The embankment is designed to withstand these events.

The consequence analyses of embankment failure indicate that any loss of life is unlikely because no SRP facilities or offsite residences exist in the expected path of the resulting flood wave. However, severe economic loss and environmental impacts would occur.

The consequence analyses of embankment failure were based on a reservoir water-surface elevation of 61 meters. This is the elevation at the top of the embankment, 1.2 meters above the emergency spillway and 1.6 meters above the peak pool level for the standard project flood. Results of the analyses indicate that a failure with the water at the 61-meter elevation would produce a 14-meter-high flood wave. The wave height would decrease as it proceeded downstream. At a distance of 3.7 kilometers downstream from the embankment, the wave height would be about half the initial height, or 7 meters. This station is below the Seaboard Coast Line Railroad bridge and the bridge over Road A (SC Highway 125). These bridges would be overtopped and probably destroyed, and their debris would be carried by the flood wave.

At a distance of 5.2 kilometers downstream from the embankment, the wave would have a height of approximately 3.5 meters and be fully into the Savannah River swamp, both on and off the site. This is downstream from the second Seaboard Coast Line Railroad bridge which is about 900 meters above Cypress

Bridge. This railroad bridge would probably be destroyed or severely damaged. The swamp is not deep enough to sustain a wave height of 3.5 meters, and the trees and shrubs would also attenuate the wave. However, as the wave breaks and scatters through the swamp, it would uproot trees and vegetation and then deposit the entrained debris, including earth from the embankment, scoured sediment, and bridge debris. The effect on the Savannah River itself is expected to be minor.

L.5 MONITORING

L.5.1 Water-quality monitoring

NPDES permit conditions are not finalized. The following is an outline of the anticipated program of measurements designed to assure a balanced biological community in the 1000-acre cooling lake during the initial period of L-Reactor operation.

L.5.1.1 L-Reactor effluent monitoring

The L-Reactor outfall parameters would be monitored as required by the NPDES permit.

L.5.1.2 Lake monitoring

The temperature of the lake would be surveyed on a regular basis with sufficient monitoring points to validate the thermal predictions concerning the lake and also to demonstrate a balanced biological community in the lake and other NPDES requirements.

During the first 3 to 5 years of L-Reactor operation, the Section 316(a) studies would be reported to the State annually or in accordance with the requirements of the NPDES permit.

L.5.2 Embankment inspection and monitoring

Inspection of the embankment would be conducted on a regular basis. Three levels of inspection are planned: a monthly inspection of the embankment; a biannual inspection of all outlet works, gates, and spillways; and an annual settlement check. All inspections would follow standard procedures similar to those established for Par Pond.

The monthly inspection of the embankment would include but not be limited to the following:

1. Measurement of water levels in piezometers.

2. Observation of the embankment slopes for surface cracks, evidence of seepage on the surface, evidence of piping or boils, and condition of the protective covering.

3. Observation of the abutments for evidence of piping or boils or other evidence of seepage.

4. Observation of toe, the embankment, and downstream areas for surface cracks, heaving, and increased seepage.

A biannual inspection would be performed on all outlet works, gates, and the spillway area. The purpose of this inspection would be to determine the condition of the physical, mechanical, and electrical facilities and equipment associated with the various appurtenances with the embankment.

On an annual basis, surveying and leveling of settlement pins located on and around the embankment would be made to determine if there was any indication of excessive settlement or movement.

The results of all inspections would be formally documented and the data stored at SRP for easy access and comparison for further readings or observations.

L.5.3 Radiological monitoring

The radiological monitoring program would include the monitoring of air on and off the site, water from SRP streams and the Savannah River, the SRP ground water, and samples of soil, vegetation, food, drinking water, animals, and fish for their radionuclide content. In addition, aerial radiological surveys of the Savannah River Plant and surrounding areas are conducted periodically by the DOE Remote Sensing Laboratory, operated by EG&G. Independent radiological monitoring programs are also conducted by the South Carolina Department of Health and Environmental Control (SCDHEC) and the Georgia Department of Natural Resources (GDNR).

This program would be the same as that for the reference case (described in Section 6.1), except sampling in Steel Creek will include the lake water and lake sediments.

L.5.4 Radiocesium remobilization monitoring

DOE has established a comprehensive environmental monitoring program to determine the transport of cesium-137 from the Savannah River Plant resulting from the startup of L-Reactor. The program consists of analyses of water samples from Steel Creek, the Savannah River, and the downstream water supplies (Beaufort-Jasper, South Carolina, and Port Wentworth, Georgia). Cesium-137 is not detectable in upstream or downstream river samples by routine monitoring techniques that have minimum detection limits of about 1.0 picocurie per liter. The routine monitoring program has been in effect at the site for about 30 years. A special monitoring for cesium-137 and total suspended solids would be conducted for a minimum of 1 year following L-Reactor startup and operation.

Aerial radiological surveys of the Savannah River Plant and surrounding areas were conducted by the DOE Remote Sensing Laboratory, operated by EG&G, Las Vegas, in 1974, 1979, 1982, and 1983. These surveys would continue after L-Reactor startup.

Special monitoring programs for cesium-137 and total suspended solids were conducted during cooling-water cold-flow tests. These data were used to evaluate releases from individual tests and to verify transport models used to estimate the remobilization of cesium during reactor operations. During tests of limited flow, weekly composite water samples were taken at the mouth of Steel Creek and at Cypress Bridge. For the full-flow tests, daily composite water samples would be taken at multiple points along Steel Creek. Additional special sampling would be made to determine the amount of cesium-137 transported in the suspended sediments.

The drinking-water monitoring program would include measurements of both cesium-137 concentration in the Savannah River above and below the Savannah River Plant and water-treatment plant raw and finished water above and below the Plant. The Savannah River estuary and the Savannah River, as well as water-treatment sludge ponds, would be studied to determine potential cesium-137 buildup in sediments. These measurements started in March 1983, and will continue for at least 1 year following L-Reactor startup.

Measurements in the Savannah River would provide a material balance of the total cesium-137 discharged to and transported by the river. Measurements of raw river water and finished drinking water would provide cesium-137 concentrations to verify earlier estimates made for transport. Measurements of cesium-137 in the estuary would be compared to earlier measurements to determine long-term trends.

L.5.5 Ecological monitoring

The principal objective of the aquatic biological monitoring program that will be established will be to demonstrate that there is, in the cooling lake, a balanced community of aquatic organisms. The program will be designed to characterize the development and stabilization of the ecological communities that will evolve in the new impoundment. Information generated by the studies will also be used for preparing a predictive Section 316(a) demonstration for the cooling-lake system.

As with any newly filled reservoir, the ecological system in the cooling lake would require at least 3 to 5 years to reach maturity and stabilize. In the process, it would pass through a series of characteristic developmental stages that have been observed and documented at other new reservoirs. A balanced biological community of aquatic organisms would not be established until the lake reached maturity. Accordingly, the ecological program would have two phases: (1) monitoring the natural communities through the developmental period (from 3 to 5 years) and establishing when a state of balance has been achieved, and (2) monitoring the balanced community (for a period of time to be determined later) after stability is achieved to ensure that it does not degrade over the longer term. The second phase would require a lower level of effort than the first and would focus on carefully selected organisms to be chosen as indicators of the communities that eventually develop in the cooling lake. As described in Section L.4.1.1.2, it is not possible a priori to describe the nature and complexity of the aquatic community that will become established, nor is it possible to predict which species will be dominant or important or which will serve as good indicators of the balance within the community. Accordingly, the second phase of the biological monitoring program cannot be planned in detail until after the lake has reached maturity and the aquatic communities attain a balanced state. This should occur from 3 to 5 years after the lake is filled. At that time DOE, in consultation with SCDHEC officials, would design and institute a revised monitoring program.

The first phase of the ecological monitoring program would begin as soon as the 1000-acre lake was constructed. It would be similar in design and execution to the program now underway at Par Pond; this program is summarized in Table L-12. Sampling gear types and collection techniques would be the same both to maximize the comparison of data obtained from the two lakes and to take maximum advantage of the experience being gained by the ongoing Par Pond investigations. The frequency of sampling would be similar--monthly or quarterly, depending on the parameter under study.

Parameter	Sampling frequency
Phytoplankton	Monthly
Zooplankton	Monthly
Meroplankton	Monthly
Macroinvertebrates	Quarterly
Macrophytes/habitat formers	Quarterly
Fish	Monthly
Water chemistry	Monthly

Sampling locations would be established at strategic points within the lake and in areas downstream and upstream of the lake. Based on experience with other ongoing studies at SRP, approximately 10 to 15 stations would be set up in the lake, as would some 4 to 6 stations in both the upstream and downstream reaches. The locations of these stations cannot be selected until detailed predictions of the isothermal patterns within the lake are completed prior to its being filled.

L.5.6 Archeological sites

Data recovery of sites impacted by the lake would be completed prior to flooding. During construction, historic, archeological, and cultural resources in the contractor's work area would be designated; precautions would be taken to preserve all such resources. The contractor would install protection for these resources and would be responsible for their preservation. If, during construction activities, the contractor observed unusual items that might have historic

Table L-12. Summary of ongoing aquatic studies at Par Pond

Parameter	Number of Stations	Principal Gear Types
Phytoplankton	6 stations x 4 depths	Van Dorn water bottle
Zooplankton	6 stations x 4 depths	Filter water through 76 micron or 35 micron netting
Meroplankton	7 stations x 2 depths	0.5 m towed nets with 505 micron mesh
Macroinvertebrates	6 stations x 3 sublocations	Petit Ponar bottom grab sampler
Fish	6 stations	Electrofishing, hoop nets, gill nets, angling
Water Chemistry	6 stations	*In situ* meter and water samples
Temperature[a]		
Dissolved oxygen[a]		
pH[a]		
Conductivity[a]		
Primary productivity		
Alkalinity		
Total organic carbon		
Total carbon		
Total inorganic carbon		
Chlorophyl-a		
Nitrate/nitrite		
Ammonia		
Silica		
Ortho-phosphate		
Total phosphate		
Potassium		
Magnesium		
Manganese		
Iron		
Calcium		
Cobalt		
Chloride		

[a]Measured by *in situ* metering.

or archeological value, he would take precautions to preserve the items carefully; such observations would be reported as soon as practicable.

During the first 2 years of L-Reactor operation, those sites not expected to be affected but near Steel Creek below the embankment would be monitored on a monthly basis to determine whether erosion had occurred. If no erosion was evident at the end of the 2-year monitoring period, then the sites should be considered sufficiently protected to assure preservation.

Active erosion protection would be undertaken in the event that adverse erosion threatened the integrity of any of the sites. If erosion barriers were ineffective, recovery and documentation of the archeological data would be carried out.

L.6 FEDERAL AND STATE ENVIRONMENTAL REQUIREMENTS

This section summarizes the Federal and State of South Carolina requirements that are applicable to the resumption of L-Reactor operation, based on the construction and operation of the preferred cooling-water alternative with a 1000-acre lake. Chapter 7 contains general synopses of the applicable laws and regulations. This alternative would require a number of permits or processes regarding water quality, floodplain/wetlands, historic preservation, endangered species, air quality, and noise. The specific requirements for each are described in the following sections:

L.6.1 Surface-water quality

Permits and processes associated with water quality include (1) an NPDES permit, (2) a predictive Section 316(a) demonstration, (3) a U.S. Army Corps of Engineers 404 permit, and (4) an SCDHEC 401 certification.

Section 402 of the Clean Water Act, as amended, is the basis for controlling "point source" discharges of pollutants into navigable waters of the United States through the National Pollutant Discharge Elimination System (NPDES); this system is administered by the EPA, which has delegated NPDES permitting authority in South Carolina to the State of South Carolina. DOE applied to the State in 1981 for renewal and consolidation of its original NPDES permits. All L-Area outfalls with the potential for future use were included in the NPDES permit renewal application. Between 1981 and 1983, negotiations between SCDHEC and DOE were held to resolve issues related to the L-Reactor NPDES permit.

On December 15, 1983, SCDHEC announced its determination to issue a renewal NPDES permit to DOE for the Savannah River Plant, to be effective January 1, 1984. Based on this permit and a mutually agreed on consent order, all discharges except the thermal discharge from L-Reactor would be permitted. Thermal discharges from the three operating SRP reactors (C, K, and P) would be permitted, provided DOE would:

1. Complete a comprehensive study of the thermal effects of all operations at the Savannah River Plant

2. Complete and submit thermal mitigation studies to SCDHEC within 9 months of signing of the consent order

3. Implement the recommended thermal mitigation alternative approved by SCDHEC under a schedule to be established by SCDHEC in a subsequent order

4. Submit and actively support appropriate funding requests to accomplish any actions resulting from the thermal studies.

All L-Area non-reactor cooling-water effluent discharges are permitted pursuant to the December 15, 1983, announcement, including the discharge of sanitary wastewater and various nonprocess cooling waters from the control building, pumphouse, offices, and security building.

SCDHEC considers the proposed 1000-acre lake to be Class B waters of the State. This interpretation would limit the temperature of thermal effluents from L-Reactor as follows [SCDHEC, 1981; Section C.(7)].

- <u>Discharge to a lake or reservoir</u> - The temperature of the discharge "shall not exceed a weekly average temperature of 90°F (32.2°C) after adequate mixing as a result of heated liquids, nor shall a weekly average temperature rise of more than 5°F (2.8°C) above temperatures existing under natural conditions be allowed as a result of the discharge of heated liquids unless an appropriate temperature criteria or mixing zone, as provided below, has been established. The water temperature at the inside boundary of the mixing zone shall not be more than 18°F (10°C) greater than that of water unaffected by the heated discharge. The appropriate temperature criteria or the size of the mixing zone shall be determined on an individual project basis and shall be based on biological, chemical, engineering and physical considerations. Any such determination shall assure the protection and propagation of a balanced, indigenous population of shellfish, fish and wildlife in and on a body of water to which the heated discharge is made and shall allow passage of aquatic organisms."

- <u>Case-by-case determinations</u> - "Upon a case-by-case determination by the Department and in accordance with the Act, the Clean Water Act (P.L. 92-500, 95-217), and related regulations, the above temperature criteria may not apply to cooling water bodies with a primary purpose of providing a source and/or being a receptor of industrial cooling water."

As noted in Section C(8) of the <u>Water Quality Standards</u> (SCDHEC, 1981), the temperature standards for Class B waters of the State are applicable when the flow rate is equal to or greater than the minimum 7-day average flow rate that occurs with an average frequency of once in 10 years. However, the temperature of the discharge cannot be so high that it interferes with water uses or is harmful to human, animal, plant, or aquatic life.

The preferred alternative (the 1000-acre cooling lake) is designed to meet these requirements; it is the subject of ongoing discussions with SCDHEC. The objective of these discussions is the incorporation of L-Reactor thermal discharges into the overall SRP NPDES permit.

In early December 1983, DOE also initiated discussions with the U.S. Army Corps of Engineers on dredge and fill permits under Sections 9 and 10 of the River and Harbor Act and Section 404 of the Clean Water Act. To allow a possible expedited schedule, DOE has submitted its 404 application for the 1000-acre lake, and the public notice describing the proposed construction has been issued.

The public notice of the 404 application also includes a paragraph that constitutes a request by the Corps of Engineers for a review in accordance with Section 401 of the Clean Water Act. Section 401 requires certification from the State (i.e., SCDHEC) that construction and operation-related discharges into the navigable waters will comply with the applicable effluent limitations and water-quality standards of the Clean Water Act. This certification is a prerequisite for the 404 permit approval from the U.S. Army Corps of Engineers.

L.6.2 Floodplain/wetlands

DOE issued a floodplain/wetlands notice regarding the proposed reactivation of L-Reactor on July 14, 1982 (47 FR 30563). A floodplain/wetlands determination regarding no practical alternative was published in the Federal Register on August 23, 1982 (47 FR 36691-2). The floodplain/wetlands assessment has been updated (see Appendix I) and the floodplain/wetlands determination will be updated and/or modified after the completion of the Final Environmental Impact Statement.

The Fish and Wildlife Service's mitigation policy for wetlands is stated in 46 FR 7644-7663. This policy establishes four resource categories to establish mitigation levels consistent with the fish and wildlife resources involved. The wetlands that would be impacted by the restart of L-Reactor are categorized under Resource Category 2 as habitat of "high value for evaluation species" and are "scarce or becoming scarce." The mitigation goal under this policy requires that there be "no net loss of inkind habitat value."

The Department of Energy is working with the Department of Interior to perform a Habitat Evaluation Procedure (HEP). The HEP will identify the value of habitat to be gained or lost with the implementation of the preferred cooling-water mitigation alternative for use in assessing further mitigation. If required, DOE will implement additional mitigative measures that might be identified through the HEP process, depending on Congressional authorization and appropriation.

L.6.3 Historic preservation

The area subject to impact by this alternative contains one prehistoric site and four historic sites eligible for inclusion in the National Register. These sites would be subject to erosion and flooding due to the high water-flow conditions and the establishment of the impoundment. A resource recovery plan has been developed by the University of South Carolina Institute of Archeology and Anthropology and consultations with the SHPO and the Advisory Council on Historic Preservation (ACHP) have been completed. The mitigation plan has been approved by the SHPO and ACHP (Lee, 1982). Erosion and transport of sediment are expected to be slightly reduced in relation to direct discharge.

In March 1984, an intensive survey of the proposed excavation areas (embankment and borrow pit areas) was made (Brooks, 1984). This survey identified seven sites described as of ephemeral quality and not eligible for nomination to the National Register of Historic Places.

Archeological surveying and testing are presently being conducted in the proposed lake area by the University of South Carolina Institute of Archeology and Anthropology. It is anticipated that several sites associated with the Ashley Plantation will be affected. The schedule for completion of the requirements under the National Historic Preservation Act, including data recovery, is consistent with the construction schedule for the embankment, and all mitigation will be completed prior to restart (Hanson, 1984).

L.6.4 Endangered species

Pursuant to the requirements of the Endangered Species Act of 1973, DOE has engaged in a consultation process with the U.S. Fish and Wildlife Service and the National Marine Fisheries Service for the species discussed below.

L.6.4.1 American alligator

Formal consultation on the American alligator was held under the Endangered Species Act in September 1982 with representatives of DOE-SR, Du Pont, NUS Corporation, the Savannah River Ecology Laboratory (SREL), and the U.S. Fish and Wildlife Service (FWS). A Biological Opinion received from the FWS judged that protection of the lagoons at SRP Road A should provide sufficient mitigation for the American alligator potentially affected by the L-Reactor restart under the direct discharge alternative. Protection of these lagoons has been completed. Because the preferred cooling-water alternative is now the 1000-acre lake, DOE has reinitiated consultations with FWS. DOE has transmitted the most recent information on impact projections for this species (Sires, 1984b) to the FWS. DOE is awaiting a decision on its conclusion that the impacts resulting from the delayed restart of L-Reactor will not jeopardize the continued existence of this species.

L.6.4.2 Red-cockaded woodpecker

The FWS has determined that the red-cockaded woodpecker will be unaffected by L-Area operations.

L.6.4.3 Shortnose sturgeon

Sturgeon larvae were identified in water samples taken near the SRP pump-houses at the Savannah River in 1982 and 1983. A few of these were determined to be the federally endangered shortnose sturgeon. A biological assessment and consultation process with the National Marine Fisheries Service (NMFS) has been completed for this species. NMFS has concurred with the DOE determination that the population of the shortnose sturgeon in the Savannah River would not be jeopardized (Oravetz, 1983).

L.6.4.4 Wood stork

The endangered wood stork forages at the Savannah River Plant, but does not breed on the site. The feeding individuals have been observed to be from the Birdsville Rookery, some 50 kilometers away. DOE initiated informal consultation with FWS in July 1983 and in March 1984. DOE has prepared a biological assessment for FWS review and use in formulating its Biological Opinion. DOE is continuing to conduct studies and apprise FWS of the results (Sires, 1984a).

L.6.5 Air quality

The authority for the regulation of air emissions has been delegated by the EPA to the Bureau of Air Quality Control of the SCDHEC. The Bureau issues operating permits and performs Prevention of Significant Deterioration reviews. Emissions due to the construction of the 1000-acre lake will fall within the conditions of the existing air quality permit.

L.6.6 Noise

DOE is obliged by the Noise Control Act of 1972 to carry out programs in a manner that furthers the national policy of promoting an environment free from noise that jeopardizes health or welfare. The major source of noise would be the construction activity in connection with the embankment for the 1000-acre lake. The contractor would be required to keep construction activities under surveillance, and to exercise control to minimize damage to the environment by noise. The contractor would use methods and devices to control noise emitted by equipment to the levels required in the COE, Savannah District General Safety Requirements Manual (COE, 1981a).

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